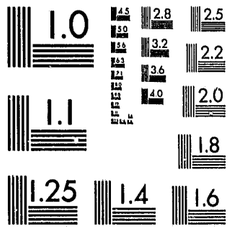
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National Institute of Justice
United States Department of Justice
Washington, D.C. 20531

U.S. Department of Justice
Law Enforcement Assistance Administration

MFF

Criminal Justice Planning and Management Series

Volume 2

Criminal Justice Analysis Course:

19357
19357

U.S. Department of Justice
Law Enforcement Assistance Administration

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ACQUISITIONS

Criminal Justice Planning and Management Series

Volume 2

Criminal Justice Analysis Course:

Instructor Guide

U.S. Department of Justice
National Institute of Justice

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ORIENTATION

The purpose of the orientation is to provide logistic and background information to participants. The Orientation and Introduction are to be presented as a single unit lasting 80 minutes.

ORIENTATION SCHEDULE

TIME ALLOCATION

TOPIC	TIME	PAGE
I. PURPOSE OF ORIENTATION	5 minutes	0 - 2
A. Facility and Area		0 - 2
B. Logistics		0 - 2
C. Aquaint Participants		0 - 2
II. THE FACILITY AND AREA	5 minutes	0 - 2
A. Hotel		0 - 2
B. Restaurants, etc.		0 - 2
III. ADMINISTRATIVE MATTERS	10 minutes	0 - 2
A. Break Policy		0 - 2
B. Room Set-up		0 - 2
C. Dress		0 - 2
D. Travel Vouchers		0 - 2
E. Credit		0 - 3
F. Evaluation		0 - 3
IV. CRIMINAL JUSTICE TRAINING CENTER	*	0 - 3
A. University		0 - 3
B. LEAA		0 - 3
C. Audience		0 - 3
V. STAFF AND FACULTY	5 minutes	0 - 4
A. Backgrounds		0 - 4
B. Academic/Experience		0 - 4
VI. PARTICIPANTS		0 - 4
A. Roster Corrections	*	0 - 4
B. Method of Selection	*	0 - 4
C. Introductions	20 minutes	0 - 4
D. Group Characteristics	*	0 - 4
VII. COURSE MATERIAL	5 minutes	0 - 4
A. Participant Guide		0 - 4
B. Visuals		0 - 4
C. Glossary and Bibliography		0 - 4
TOTAL TIME	50 minutes	

* Less than 5 minutes

NOTES

I. PURPOSE OF ORIENTATION

A. Familiarize Participants with the Training Facility and Surrounding Area

B. Cover Administrative and Logistical Matters

C. Acquaint Participant with--

1. The Criminal Justice Training Center
2. The Staff and Faculty of the Center
3. The Other Participants
4. The Course Material

II. THE FACILITY AND AREA

A. Explain Hotel Lay-out

1. Sleeping Rooms
2. Meeting Rooms
3. Food and Beverage Services
4. Elevators
5. Parking
6. Hospitality Room

B. Explain Area's Restaurants and Other Attractions

III. ADMINISTRATIVE MATTERS

A. Explain "Break" Policy

B. Explain Room Set-up

1. Smoking vs. Non-smoking
2. Placement at Tables
3. Use of Name Cards on Table

C. Appropriate Dress

D. How to Complete Travel Vouchers

NOTES

E. Continuing Education Credits

F. Course "Evaluation" Procedures

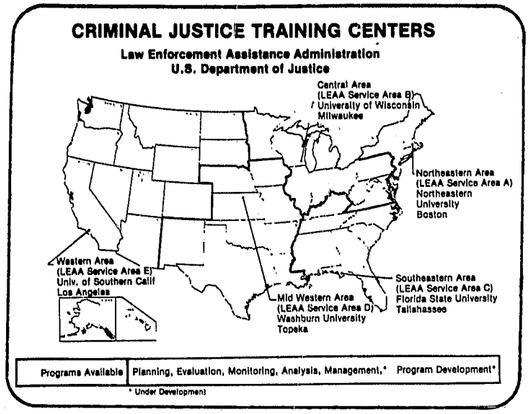
IV. CRIMINAL JUSTICE TRAINING CENTER

A. Explain the Training Center's University Placement and Line of Accountability

B. Financed by LEAA Grants to Provide Training and Technical Assistance

---

SHOW V.A. (O-1):



EMPHASIZE (O-1):

+ Describe System of Five Centers

+ Describe Current Array of Course Offerings

+ Project Future Course Offerings and Services

C. Describe Target Audience for Courses

1. State, Regional, and Local Criminal Justice Planning Unit Staff
2. Operational Agency Planners, Analysts, Evaluators and Monitors

NOTES

V. STAFF AND FACULTY

A. Prepare and distribute hand-out describing backgrounds of key Center staff and all instructors, introducing those present.

B. Point out mix of background and skills and balance between academic and practitioner experience.

VI. PARTICIPANTS

A. Refer to Roster and Request Corrections

B. Describe Method of Selection of Participants

C. Have the participants pair off and tell them to spend the next few minutes interviewing each other. At the end of the interviews tell them they will introduce their partners giving the name, agency, position, function, length of time in the field, and three expectations for the week. (Note: This technique is a very effective ice breaker but it can tend to be time consuming. The manager should be alert to this risk).

D. Summarize Group's Characteristics

VII. COURSE MATERIALS

A. Participant Guide

Instructor Should Explain the Organization and Format of the Participant Guide (P.G.)

B. Visuals

Visuals consist of photo negative (white on black) overhead projections. Generally there will be no need to lower normal room lighting. Other visuals include the "module charts" at the end of each module and a wall chart of each "module chart".

C. Glossary and Bibliography

Explain that the Glossary and Bibliography have been developed for all Training Center programs. Note their location in the P.G.

INTRODUCTION

The opening session of the Analysis Course must accomplish several things in order for the participants to effectively move through the lessons and tasks of the week.

First, the participants must have a clear understanding of the methods, procedures, and objectives of the course. Because of the complexity of the course, it is imperative that faculty, facilitators and participants have a common understanding of the expected product and the steps to be taken to produce that product. Anything less than total understanding and agreement will result in confusion.

The course overview establishes goals, identifies the participants, identifies themes, and discusses the values or purposes of analysis. Finally, the overview establishes that analysis is a process leading to a statement of problems which serve to inform decision-makers.

The course materials are described and discussed. The Problem Statement from Module 1, which has been sent to participants as a pre-reading, is presented as the product of a well managed analysis project. The statement should be used as an example of the product which should result from the Major Exercise.

The final activities of the opening session are to provide an orientation to the Major Exercise.

OBJECTIVES

1. To describe the method, procedures, and objectives of the course.
2. To establish goals, identify participant backgrounds and to identify themes for the course.
3. To identify the values or purposes of analysis.
4. To establish that analysis is a process to aid in decision-making.

INTRODUCTION

TIME ALLOCATION

TOPIC	TIME	PAGE
I. COURSE OVERVIEW	30 minutes	IN-3
A. Course Goals	5 minutes	IN-3
B. Course Participants	5 minutes	IN-3
C. Course Themes	5 minutes	IN-4
D. Values or Purposes of Analysis	10 minutes	IN-5
E. Process as Roadmap	5 minutes	IN-7
TOTAL TIME	30 minutes	

I. COURSE OVERVIEW

A. Course Goals

1. Knowledge Goal:

The participant should understand as a result of this course the purpose and logic of analysis as used to formulate crime and criminal justice system problems which are used to influence decision-making.

Emphasis is on problem formulation as distinct from strategy assessment.

2. Skill Goal:

The participant will be able to select and apply analytic techniques to crime and system data that can lead to improved interpretation of the data and more effective communication of information, thus providing decision-makers with information which they can understand and use in decision-making.

3. Attitude Goal:

Participants with minimal prior analytic training, regardless of preconceived ideas of their quantitative talents, will perceive data analysis as being within their competencies and the use of analytic methods as meaningful and desirable.

In many respects the Criminal Justice Analysis Course provides a setting for overcoming the "intimidation factor" many feel toward criminal justice data analysis.

B. Course Participants

1. The introductory nature and goals of the course indicate that it is for those who seek to understand the analysis process and gain knowledge of how to apply basic analytical tools used in formulating crime and criminal justice system problems.

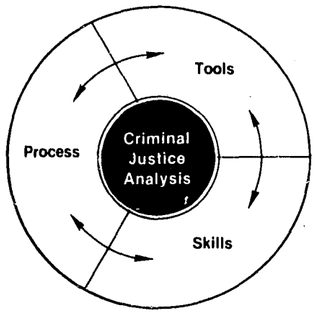
2. The participants should include planners, budget analysts, program coordinators, policy analysts, program developers, program monitors - anyone that informs decision-makers in criminal justice agencies.

C. Course Themes

The Analysis Course has three distinct, yet integrated themes.

SHOW V.A. (IN-1):

THEME OVERVIEW



EMPHASIZE (IN-1):

+ Analysis as a process includes four general parts:

  (1) Problem Specification

  (2) Data Selection and Collection

  (3) Extraction of Information from Data

  (4) Persuasive Presentation of Information

+ Analysis as a set of tools means an understanding of the use, applications, strengths and weaknesses of analytic techniques and statistical procedures.

+ Analysis as a set of skills means how to select, use and manage the tools of analysis effectively.

D. Values or Purposes of Analysis

1. Analysis is an integral part of criminal justice and plays a key part in informing decision-makers.

   a. Unique tasks in LEAA delivery system require analysis (e.g., allocation of funds by geographical area, review of competing proposals).

   b. Problem analysis requirements of guidelines (Re: Guideline Manual: State Planning Agency Grants, M 4100.1S, Jan. 18, 1977, including changes 1, 2, and 3. LEAA, United States Dept. of Justice, Chapter 3, TD Comprehensive Plan, Section 4, Analysis of Problems and Development of Problem Statement, pp.34-38.)

   c. Analysis is used as input to decision-makers.

      (1) If the analyst's work is relevent to the decision-maker's needs, understandable and persuasive, it should have an impact.

      (2) Hundreds of "minor decisions" aren't exclusively "political" and analytic products may be influential in many.

      (3) Good analysis may help the decision-maker out of a political trap if he or she is caught between equally strong interests.

2. Competencies central to the role of the analyst include:

   Instructor might ask participants their role perceptions instead of listing these items and work the group toward these. Another role perspective that should be brought up -- emotional decision making (affective style) vs. decision making based on facts (cognitive style).

a. Data Collection and Interpretation

b. Technical Assistance

c. Written Communication

d. Oral Communication

e. Formal and Informal Communication

f. Interpersonal Skills

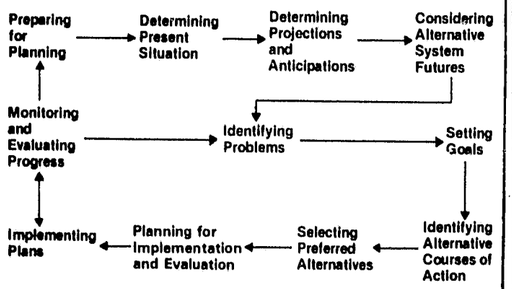
g. Leadership

h. Decision-Making Influence

3. Analysis is an Integral Part of Planning Process

SHOW V.A. (IN-2):

GENERAL PLANNING PROCESS MODEL

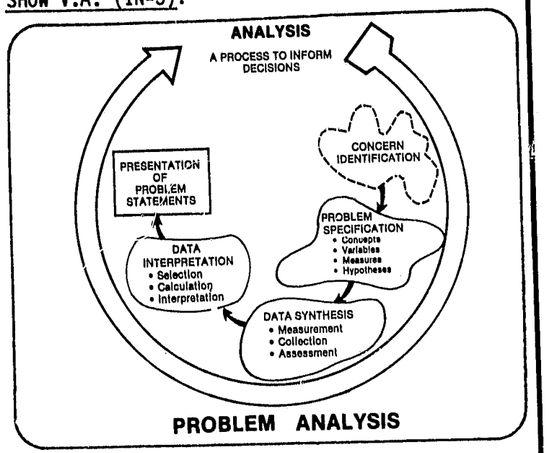


EMPHASIZE (IN-2):

+ In the general planning model, analysis begins in the stage of preparing for planning and results in the identification of problems.

+ Analysis may also occur during the phases of identification/selection of alternatives and monitoring/evaluation.

SHOW V.A. (IN-3):



EMPHASIZE (IN-3):

+ Explain that this model, which outlines the week of instruction, is used to generate effective problem statements.

+ It presents the concept of a problem statement as a product of the analysis process. The content of a problem statement, which the participants have reviewed in the pre-mailing and which will be examined in Module 1, and the process of its preparation and presentation constitute the Criminal Justice Analysis Course.

+ Note especially that this process is oriented toward influencing decision-makers, and is not viewed as either an abstract or academic exercise.

E. Process as Roadmap

1. This week we'll follow the analysis process used to prepare a problem statement.

NOTES

2. The movement will be from identification of concerns and specification of problems to the development and presentation of a good problem statement.

3. Exhibit 1 is a preview of the entire course.

   a. A rectangle will always be used to present an instruction or information.

   b. Diamond-shaped figures will always be used to indicate decision points, or places where choices must be made.

   c. Circle for Module

   d. Triangle for product or outcome.

   e. Arrows will indicate the direction of the flow.

4. A decision map will be elaborated for each module and utilized throughout the week. It is called the module's chart.

5. Exhibit 2 is the course agenda.

   a. CJTC should insert actual schedule. The one provided is a guide based on suggested module and exercise times.

   b. Break times indicate the approximate amount of time available during each morning and afternoon session and not the location of breaks. These need to be programmed by the Training Centers and instructors.

NOTES

   c. The course has approximately 35 hours of activities. The program does, however, require close adherence to the agenda. Program Managers, faculty and especially facilitators will find it necessary to carefully monitor activities in order to stay on schedule. Special attention should be paid to Thursday afternoon. Failure of the work groups to deliver a product from Tasks 3 and 4 in the late afternoon or early evening will prevent the facilitators from preparing adequately for Task 6 of the Major Exercise.

Exhibit 1. Course Overview

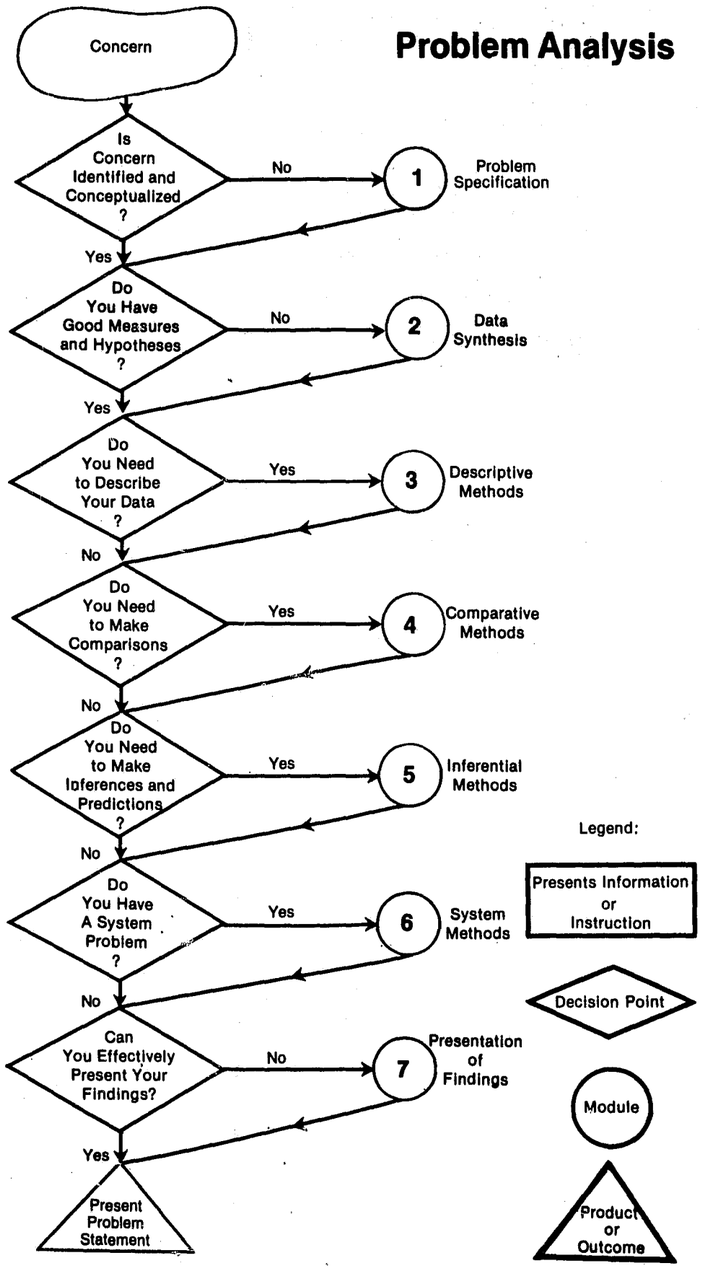


Exhibit 2

SUGGESTED

CRIMINAL JUSTICE ANALYSIS COURSE AGENDA

	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
8:30 A.M.		Module I Problem Specification (120 minutes)	Module III Data Interpretation - - - Descriptive Methods (180 minutes)	Module V Data Interpretation - - - Inferential Methods (180 Minutes)	Module VI Data Interpretation - - - System (120 minutes)	Major Exercise Task #5 (60 minutes)
		Module II Data Synthesis (60 or 90 minutes)			Module VII Presentation of Findings (60 minutes)	Major Exercise Task #6 (180 minutes)
12:00		Lunch	Lunch	Lunch	Lunch	End of Session (60 minutes)
1:30 P.M.		Major Exercise Task #1 (120 minutes)	Module IV Data Interpretation - - - Comparative Methods (150 minutes)	Module V Data Interpretation - - - Inferential Methods (continued) (100 minutes)	Major Exercise Task #3 (120 minutes)	
		Major Exercise Task #2 (120 minutes)	Major Exercise Debriefing (60 minutes)	Calculator Workshop (90 minutes)	Major Exercise Task #4 (130 minutes)	
5:00 P.M.	Orientation/ Introduction (80 minutes)					
	Managing Analysis (80 minutes)					

NOTES

d. The course is 35 hours in length and consists of: 1) Six Modules comprising 11 hours of lectures reinforced by 9 hours in 12 Walk-Throughs and 6 Exercises, 2) an optional Management Module, 3) an optional workshop and 4) a Major Exercise composed of 6 Tasks taking about 13 hours to complete.

e. In addition to the overhead format, visual aids of the module charts are available in a 24" X 48" easel format at the program managers option. These oversize charts can be taped to the classroom wall for a continuing reminder of the process of analysis.

MANAGING ANALYSIS

This optional module emphasizes management skills essential to planning and implementing moderate and large-scale analysis projects. The presentation of management skills should focus on the development, interpretation and utilization of various techniques. The procedures covered in the module include methods for tasking a project and labor and resource allocation procedures.

It is recommended that if this module is used in the course, its most advantageous position is on Sunday evening following the Introduction. However, it can be offered on any evening following the training day at the Training Center's discretion.

It is an optional module in the sense that Training Centers must decide whether the module is to be covered. This decision should be made in light of an understanding of participant needs and interests, time pressures and instructional staff availability.

OBJECTIVES

1. To describe the use of specific techniques for managing analysis tasks.
2. To describe the benefits from planning an analysis effort.

MANAGING ANALYSIS

TIME ALLOCATION

TOPIC	TIME	PAGE
I. ANALYSIS PLAN	10 minutes	MA-3
A. Definition	*	MA-3
B. Need	*	MA-3
C. Developing	*	MA-3
D. Work Plan	5 minutes	MA-5
II. WORK PLAN	40 minutes	MA-6
A. Overview	5 minutes	MA-6
B. Tasking	10 minutes	MA-7
C. Labor Allocation	10 minutes	MA-18
D. Budget	10 minutes	MA-22
E. Summary	5 minutes	MA-24
III. BENEFITS OF PLANNED ANALYSIS	10 minutes	MA-25
IV. CONCLUSION	10 minutes	MA-26
A. Review	*	
	TOTAL TIME 70 minutes	

* Less than 5 minutes

NOTES

I. ANALYSIS PLAN

A. Definition:

1. An analysis plan is a written document which systematically outlines the major components of the analysis task from the initial statement of the analytic concern to a work plan which includes an estimate of the costs of a proposed investigation. (See Exhibit 1)

B. Need for an Analysis Plan

1. Pre-preparation of an analysis plan for any sizeable analysis task is necessary to produce results which are reliable and efficiently produced. Such preparation is almost certain to produce better results than those analyses which are not based on a plan. Analysis plans force the analyst to consider why a particular analysis is worth undertaking, what needs to be analyzed, how the analysis will be undertaken, when and by whom, and to whom and how the results should be transmitted.

2. Inefficiency and missing opportunities characterize approaches which are not scientifically based and are merely "data grubbing" efforts or based on vague ideas of need.

3. Sometimes development of an analysis plan is mandatory. Budget requests or grant applications, whether for federal funds such as LEAA planning funds or for foundation funds, are essentially an analysis plan.

C. Developing an Analysis Plan

1. There are obviously many possible ways of organizing an analysis plan, but the major components generally tend to be similar. The process should be thought of as a flow with steps overlapping and feeding back into each other. The components of the final analysis plan represent the product of this process.

Exhibit 1

Analysis Plan Development, Components, And Uses

STAGES IN DEVELOPING AN ANALYSIS PLAN	State concern for which analysis is needed	Specify concepts, variables, measures, hypotheses	Assess measures and hypotheses	Identify & select data sources	Select analysis techniques	Perform analysis	Identify audience and use for findings	Select presentation format & dissemination procedure	Determine manpower, equipment, time and funds needed
ANALYSIS PLAN COMPONENTS	Questions to be answered	Problem Specification	Prioritized list of hypotheses	Data collection plan	Selected analysis techniques	Interpretation of findings	Audience identification & use for products	Presentation and dissemination	Tasking, Labor allocation, and costing
USE (WHAT EACH STAGE TELLS THE ANALYST)	WHY	WHAT	WHAT	HOW	HOW	WHO WHAT WHEN WHERE WHY	FOR WHOM	FOR WHOM	WHEN, BY WHOM & HOW MUCH
MODULE REFERENCE	MODULE 1: PROBLEM SPECIFICATION		MODULE 2: DATA SYNTHESIS		MODULES 3,4,5,6 METHODS OF ANALYSIS		MODULE 7: PRESENTATION OF FINDINGS		MANAGING ANALYSIS

NOTES

a. Problem Specification

1) Identifying Concerns

2) Conceptualizing Concerns

3) Elaborating Concepts into Variables

4) Establishing Measures for each Variable

5) Postulating Hypotheses

b. Data Synthesis

1) Assessing and Selecting the Hypotheses

2) Collecting the Necessary Data

c. Interpreting the Data Using:

1) Descriptive Methods

2) Comparative Methods

3) Inferential Methods

4) System Methods

d. Persuasive Presentation of:

1) A Written Report

2) An Oral Briefing

D. Work Plan--Putting the Analysis Together

1. Explain the management problem associated with performing analysis. This essentially consists of four interrelated factors:

a. Quality Control

1) This requires constant monitoring of the process and careful elaboration of tasks and milestones.

b. Staff Relations

1) Planning and implementation of who does what, when.

NOTES

c. Budget Control

1) Planning and monitoring of expenditures/resources.

d. Client Relations

1) Developing usable products, responsive to your audience's needs. Module 7 will emphasize this last responsibility. This module is concerned with the first three responsibilities.

II. WORK PLAN

A. Overview

1. One of the most important aspects of analysis is the Work Plan for managing the analysis. Scheduling and resource allocation are needed to ensure that the analysis task actually gets done, is completed on time, and is of high quality.

2. A number of management tools are available to assist in this task. These tools help answer:

a. What tasks, and in which sequence, are required to complete the analysis?

b. How much and what types of manpower are needed?

c. When are the various skills needed?

d. Will delays in any of these analysis tasks hold up completion of the final product?

NOTES

SHOW V.A. (Mgt.-1):

STEPS IN DEVELOPING WORK PLAN

1. Identify tasks to be performed
2. Identify relationships among tasks
3. Determine type and magnitude of resources required for each task
4. Determine major milestones and target dates
5. Prepare time schedule for use of resources to perform tasks

EMPHASIZE (Mgt.-1):

+ Step-by-Step Process
+ Interdependent Steps
+ Numerous Tools Exist to Assist in this Effort

B. Tasking

1. Tasking refers to the sub-division of the analytic activity into a sequential series of tasks to be performed.

2. Proper tasking is an important aspect of quality control, particularly the scheduling of tasks.

3. Two methods for scheduling tasks are the Gantt Chart and the PERT technique.

NOTES

a. Gantt Chart

1) A Gantt Chart is a graphical representation of project tasks in relation to each other and in relation to time.

2) The Gantt Chart can assist the analyst by formalizing time goals, disaggregating analytic tasks, and permitting a comparison to be made between the planned versus the actual progress of the analysis tasks.

3) Characteristics of the Gantt Chart presented in Exhibit 2 are:

- Rows are activities. Activities should be reduced to discrete tasks.

- Columns are months. Use of months as the time interval automatically builds in for a four week slippage factor over the year. To correct for this as well as to provide a more detailed schedule, the preferred time interval on a Gantt Chart is the week rather than the month.

- Products are indicated with a triangle.

- Lines indicate the starting time, duration, and completion time of each task. The gap during the 6 month allows for slippage.

NOTES

4) A limitation of the Gantt Chart is that it does not indicate which activities must be completed before others can begin or which sequence of tasks should be given highest priority.

5) Exhibit 3 presents a weekly Gantt Chart of the same project which adjusts for the time gaps in the months.

Exhibit 2.

GANNT CHART

State Analysis of Local Crime Reduction Program Impacts by Month

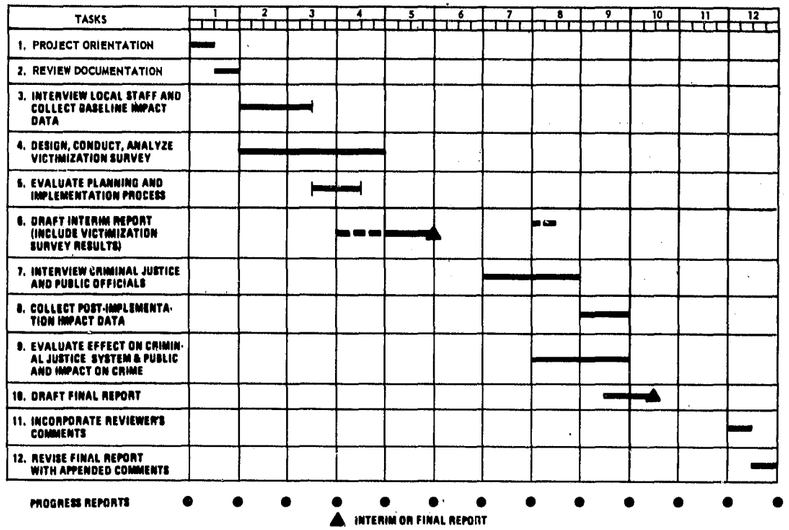
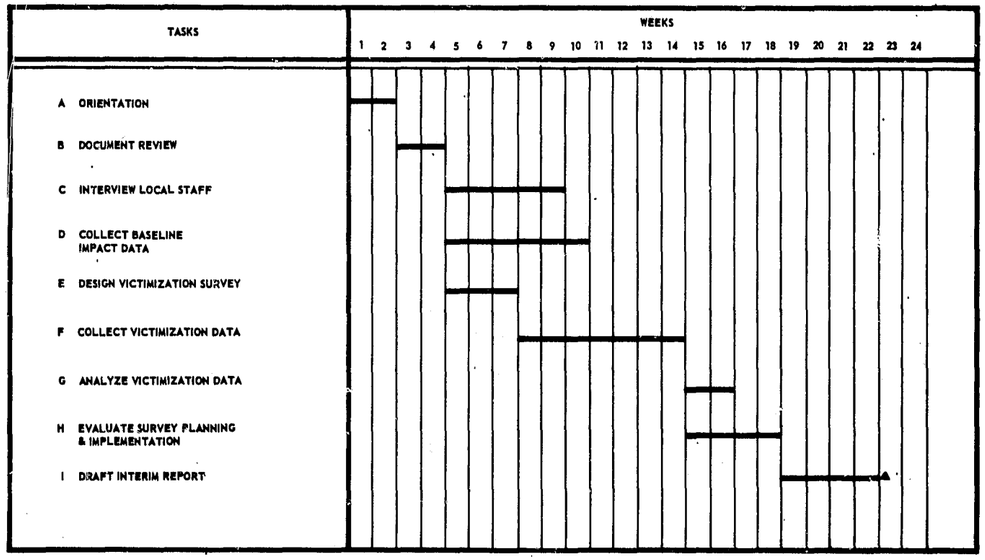


Exhibit 3.

GANTT CHART

State Analysis of Local Crime Reduction Program Impacts - Weekly Schedule



NOTES

b. PERT Chart

1) Another technique which can be particularly useful for large and/or complex analysis projects is PERT (Program Evaluation and Review Technique).

2) The technique was developed in the late 1950's by the Navy for coordinating and controlling complex projects involving a number of geographically dispersed contractors. PERT allows the planner to examine relationships of tasks to each other over time.

3) In turn, this information permits a "critical path" to be charted of the tasks which are expected to take the longest and which are crucial to completion of the task within a given period of time. To illustrate the application of PERT to the tasks presented in Exhibit 2, Exhibit 4 elaborates the first six tasks (from "1. Project Orientation" to "6. Draft Interim Report") into nine activities.

NOTES

Exhibit 4. Nine Activities

A. Project Orientation

B. Review Documentation

C. Interview Local Staff

D. Collect Baseline Impact Data

E. Design Victimization Survey

F. Collect Victimization Data

G. Analyze Victimization Data

H. Evaluate Survey Planning and Implementation

I. Draft Interim Report

4) Exhibit 5, then, refines each of these activities into specific project events.

5) Project orientation consists of events "1 - Start Project" and "2 - Complete Orientation."

Events are indicated by numbered circles.

Arrows between circles indicate activities that link events and the direction these activities take.

Dotted arrows indicate a relationship but no required activity time, e.g., between "2 - Complete Orientation" and "3 - Begin Document Review."

NOTES

Solid arrows indicate both a relationship and a required duration for the activity, e.g., between "3 - Begin Document Review" and "4 - Finish Document Review," requires an estimated two weeks, i.e., activities consume time and resources.

Note the branching at event "4" into three paths which can occur simultaneously.

By adding the times along each possible path, the critical (or longest) path may be determined.

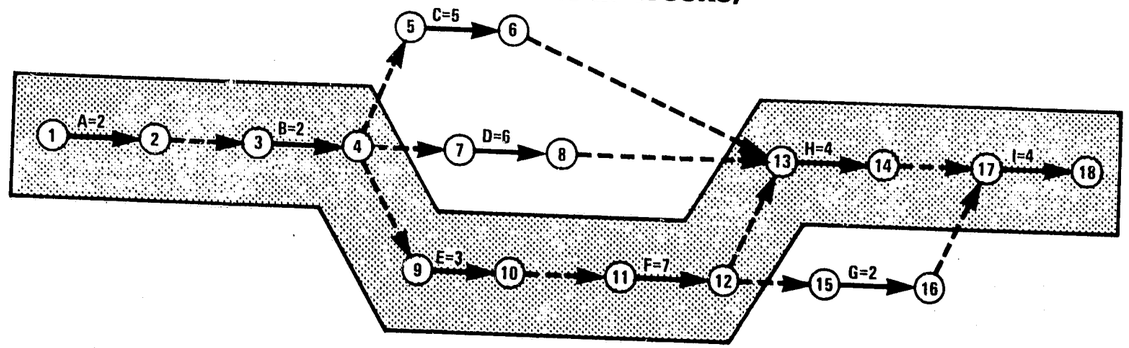
Path 1: A, B, D, H, I = 18 weeks.
Path 2: A, B, C, H, I = 17 weeks.
Path 3: A, B, E, F, H, I = 22 weeks.
Path 4: A, B, E, F, G, I = 20 weeks.

Thus, delays of three and four and two weeks respectively could be tolerated during the implementation of the other three paths without affecting the completion of the Interim Report, whereas any delay along the critical path will in turn delay Interim Report completion.

6) Note how the critical path is boxed in on Exhibit 5.

7) In comparison, a Gantt Chart, while simpler to construct, does not indicate which activities must be completed before others can begin or which sequence of tasks should be given highest priority.

Exhibit 5
PERT Network With Critical Path Indicated For Analysis Project
(Task = Time in Weeks)



EVENTS

1. START PROJECT
2. COMPLETE ORIENTATION
3. BEGIN DOCUMENT REVIEW
4. FINISH DOCUMENT REVIEW
5. START STAFF INTERVIEWS
6. FINISH STAFF INTERVIEWS
7. COLLECT BASELINE DATA
8. BASELINE DATA COLLECTED
9. DESIGN VICTIMIZATION SURVEY
10. SURVEY DESIGN COMPLETED
11. COLLECT VICTIMIZATION DATA
12. VICTIMIZATION DATA COLLECTED
13. EVALUATE SURVEY
14. COMPLETE EVALUATION
15. ANALYSIS OF VICTIMIZATION DATA
16. VICTIMIZATION DATA ANALYZED
17. START INTERIM REPORT
18. FINISH DRAFT REPORT

Key:
- O — Event
- --- — Relationship
- → — Sequence of events
- A=2 — Time between events showing number of weeks

NOTES

8) In an actual application, the PERT network would be specified in more detail than in Exhibit 5. The classic PERT technique also contains procedures for estimating activity times where uncertainty is involved. Estimates are obtained for the "most likely time," "optimistic time," and "pessimistic time," preferably from each individual task or subtask manager; the person directly responsible for the work is responsible for both the estimates and task completion. Variances in the time estimates can be used to calculate the probability of completing the job on schedule.

9) PERT is most useful for large scale and complex tasks such as scheduling and tracking the tasks a large metropolitan or state criminal justice planning agency undertakes over a year period. However, PERT can also be useful on a more informal basis for smaller projects as well.

10) PERT technique is useful for:

- Understanding the relationships and precise nature of the constraints during the development of and implementation of analysis projects.

- During the implementation phase:

- Monitoring progress and slippage during implementation.

- Identifying priorities for resource reallocation through use of the critical path as the highest priority.

NOTES

- A management tool for reminding individual task managers of their schedules and progress.

11) A summary of tasking techniques is presented in Exhibit 6.

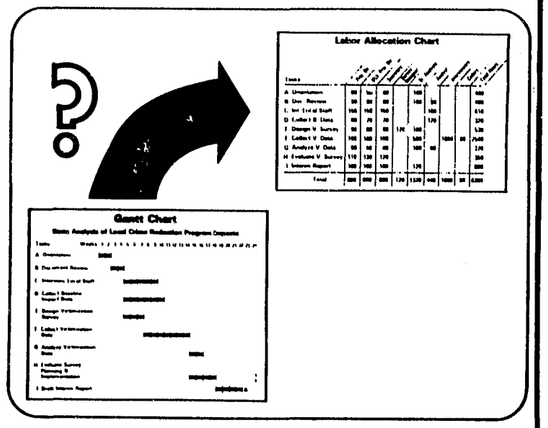
Exhibit 6. Tasking Techniques

1. GANTT CHART
   - * WEEKLY TIME LINE FOR EACH TASK
   - * SIMPLE TO CONSTRUCT
   - * EASY TO UNDERSTAND
   - * FAILS TO SHOW INTERRELATIONSHIPS OF TASKS

2. PERT
   - * IDENTIFIES PRECEDENCE AND CONCURRENCE RELATIONSHIPS BETWEEN ALL ACTIVITIES AND EVENTS
   - * IDENTIFIES CRITICAL ACTIVITIES FOR HIGH PRIORITY ASSIGNMENT OF RESOURCES
   - * USEFUL FOR COMPLEX ANALYSIS PLANS
   - * CAN BE USED TO ASSESS PROBABILITY OF MEETING DEADLINES

C. Labor Allocation

SHOW V.A. (Mgt.-2):



EMPHASIZE (Mgt.-2):

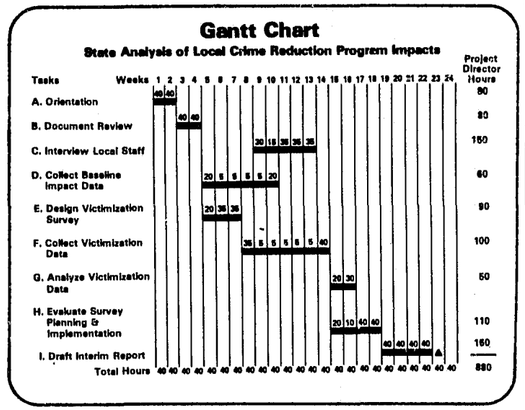
+ This V.A. illustrates how the weekly Gantt Charts may be used to develop the Labor Allocation Chart.

1. Once target dates, based on a preliminary estimate of staff workload and performance, have been outlined on a Gantt Chart, a labor allocation chart can be developed.

2. Knowing how many man-hours to assign to each task requires experience or careful consultation with individuals who have recently completed similar kinds of tasks. A safety margin should be built in since many managers tend to underestimate the actual time needed to complete a task.

3. The Gantt Chart can be used to show personnel requirements for a project.

SHOW V.A. (Mgt.-3):



EMPHASIZE (Mgt.-3):

+ Each weekly column indicates planned allocation of the Director's time for each task.

+ The summation column on the right indicates the total amount of time to be spent during the project on each task.

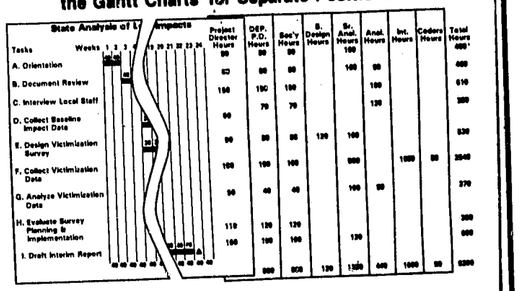
+ Total project time for the Project Director is 880 hours.

NOTES

4. Consolidating Gantt Charts

SHOW V.A. (Mgt.-4):

Labor Allocation Chart - Obtained by Consolidating the Gantt Charts for Separate Positions



EMPHASIZE (Mgt.-4):

+ The procedure for preparing a Labor Allocation Chart from a Gantt Chart requires preparing a weekly Gantt Chart for each position on all tasks.

+ This V.A. illustrates only the total project schedule and not each position's schedules of activity.

5. Labor Allocation Chart

Based on the consolidated Gantt Charts, a labor allocation chart for the victim survey is presented in Exhibit 7.

Exhibit 7.

Labor Allocation Chart

Tasks	Proj. Dir.	Dep. Proj. Dir.	Secretary	Survey Designer	Sr. Analysts	Analyst	Interviewers	Coders	Total Hours
A. Orientation	80	80	80		160				400
B. Doc. Review	80	80	80		160	80			480
C. Int. Local Staff	150	150	150			160			610
D. Collect B. Data	60	70	70			120			320
E. Design V. Survey	90	80	80	120	160				530
F. Collect V. Data	100	100	100		560		1600	80	2540
G. Analyze V. Data	50	40	40		160	80			370
H. Evaluate V. Survey	110	120	120						350
I. Interim Report	160	160	160		120				600
Total	880	880	880	120	1320	440	1600	80	6200

NOTES

After a preliminary manpower allocation is made, the analyst should check to ensure that the labor allocations are sufficient to permit completion of each activity within the allotted time and that the staff assigned to various tasks actually will have the time available which has been allocated. If either is troublesome, adjustments will have to be made to either the Labor Allocation Chart, the Gantt Chart or both until a satisfactory compromise is reached.

D. Budget

1. Assessing the costs of the proposed analysis project should be fairly straightforward once the previous documents have been completed.

2. A sample budget is provided in Exhibit 8 for activities E, F and G of the Labor Allocation Chart (the victimization survey).

3. Three major budget categories -- salary and wages, including fringe benefits; direct expense items; and indirect costs (e.g. overhead) are included.

4. Labor costs, for example, are based on the labor allocations as presented in Exhibit 7.

Exhibit 8. Sample Budget For Proposed Victimization Survey

SALARIES & WAGES	HOURLY RATE	HOURS	COST
Project Director	12.21	240	2,930
Deputy Proj. Director	10.54	220	2,319
Secretary	5.64	220	1,241
Survey Designer	8.65	120	1,038
Senior Analysts	8.03	880	7,066
Analyst	5.17	80	414
Interviewers	3.50	1600	5,600
Coders	5.00	80	400
Total S & W			21,008
Fringe 30% of S & W			6,302
TOTAL DIRECT LABOR			27,310
EXPENSES			
Computer			1,467
Printing			1,000
Telephone			8,400
Keypunch/Verification			1,250
Total Expense			12,117
TOTAL DIRECT COSTS			39,427
*INDIRECT (70% of S & W)			14,706
TOTAL COSTS			54,133

* Negotiated percentage only applicable for a grant or contract application. Not used in operational budgets.

5. In developing a budget the analyst should assess the scope of the tasks (in Exhibit 8, a telephone survey of 5,000 cases to be completed within six weeks), costs of other alternatives (e.g., other consultants or in-house staff work) and what the probable results of various alternatives are likely to be. Such information is essential to the planner when developing and justifying a budget.

6. The steps in preparing a budget are presented in Exhibit 9.

Exhibit 9. Costing: Developing A Budget

(1) ASSESS LEVEL OF EFFORT FOR EACH TASK
- TYPE OF RESOURCES
- MAGNITUDE

(2) ASSESS COSTS OF ALTERNATIVES

(3) BASIS FOR COSTING
- PROFESSIONAL JUDGMENT
- PRIOR STUDIES
- AVAILABLE RESOURCES
- PRE-TEST
- PURE GUESSTIMATES

E. Summary of Work Plan

1. Tasking

Gantt or Pert Chart

2. Labor Allocation

Labor Allocation Chart

3. Budget

III. BENEFITS OF PLANNED ANALYSIS

From the perspective of the city manager, mayor, or taxpayer, analysis plans help to ensure that a useful product will result from the agency funds expended. Such plans also may permit participation in the setting of analysis priorities by citizens and other important actors within the jurisdiction who may have to use the results or support the work.

SHOW V.A. (Mgt.-5):

BENEFITS OF PLANNED ANALYSES

- PROVIDE DIRECTION AND FOCUS TO WORK EFFORT
- BETTER UTILIZATION OF RESOURCES
- IMPROVE PRODUCT QUALITY
- CLARIFIES RESPONSIBILITIES
- CAN BE USED AS A SELLING TOOL

EMPHASIZE (Mgt.-5):

+ An analysis plan, from a manager's or supervisor's point of view, has the following advantages:

  - Provides direction, helps to organize, and reduces uncertainty and risk.

  - Gives the manager a better ability to judge the relative priorities, uses, and resource requirements of various proposed analysis tasks.

  - Enables staff to be more satisfied since their own analysis projects, when evaluated on the basis of clear analysis plans and conducted according to those plans, can be adequately supported and should result in a superior product.

NOTES

- Reduces uncertainty by assisting the manager in making a realistic assessment of what the office can accomplish given present staff and funding.
- Provides the manager with concrete proposals for analysis which could be carried out with additional funding.
- Early agreement among the key actors on the problem and the product is desirable.
- The review and comments can be made before the analysis is conducted. A written plan, of course, would facilitate such review.
- The scale of the proposed analysis warrants a close scrutiny of resource commitment.

IV. CONCLUSION

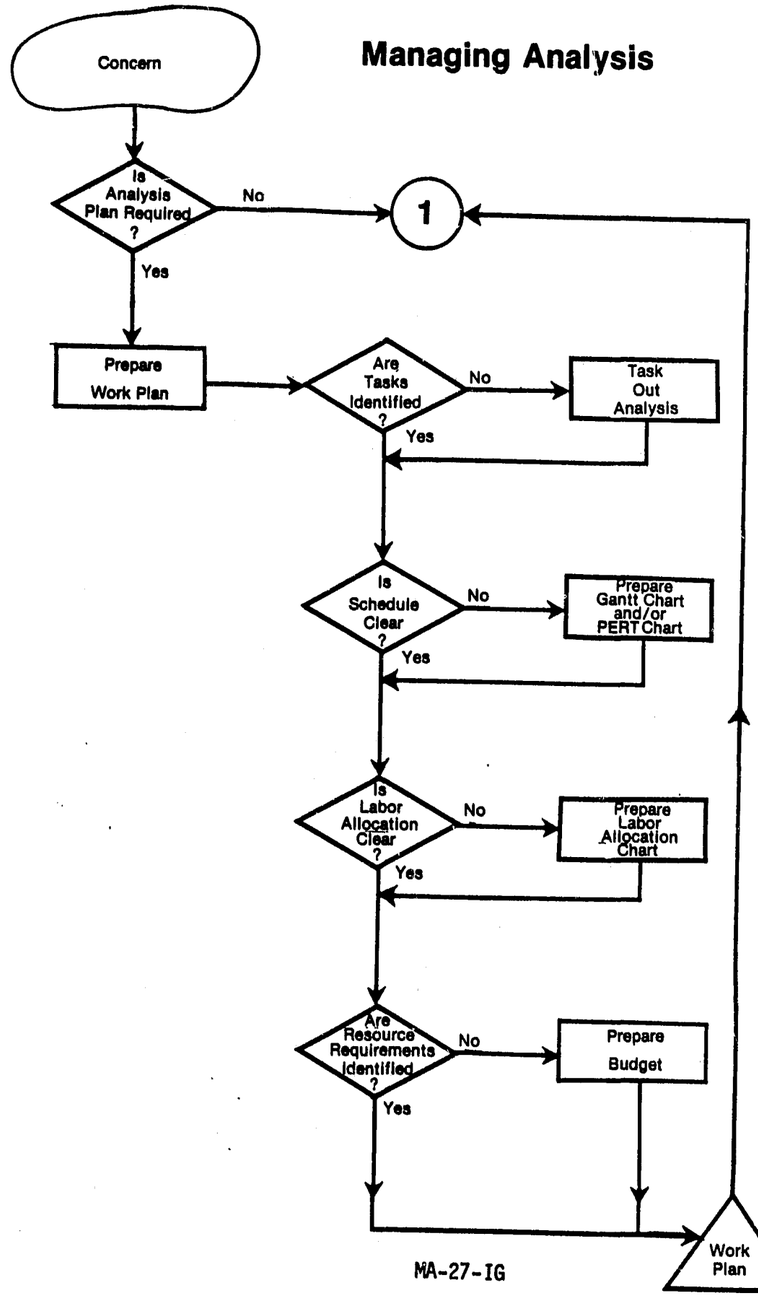
Summarize module using the module chart.

A. Emphasize that analysis projects, such as the simulation in this course, to be effective must be well managed.

B. Emphasize that the principles of this module must be implemented in any large scale analysis activity.

C. Acknowledge that the Criminal Justice Analysis Course is a simulation in which most of the management tasks are already done by virtue of the structure of the week's program.

SHOW V.A. (Mgt.-6):



MODULE 1
PROBLEM SPECIFICATION

Module 1 covers a central and, perhaps, the most difficult aspect of the course: problem specification. Criminal justice analyses have suffered from inadequate and incomplete problem statements as reflected in reviews of state and local plans, research reports and other criminal justice publications. It is important that the participants have a full understanding of the process and use of problem specification. Their ability to successfully complete the Major Exercise, hinges, in part, on their having a clear specification of their assigned problem.

Perhaps the most difficult part in developing an understanding of a problem is the creative work of conceptualizing and hypothesizing. No amount of lecturing on such topics can substitute for participation. Therefore, the material has been structured to provide careful definition, illustrations and then an opportunity to practice these skills in Tasks #1 and #2 of the Major Exercise.

OBJECTIVES

1. To identify the importance and uses of problem specification.
2. To enable participants to perform a problem specification.

SCHEDULE

PROBLEM SPECIFICATION

TIME ALLOCATION

TOPIC	TIME	PAGE
I. HOW ARE PROBLEM STATEMENTS DEVELOPED?	10 minutes	I-3
A. Two General Approaches	5 minutes	I-3
B. Problem Specification	5 minutes	I-5
II. HOW ARE CONCEPTS, VARIABLES AND MEASURES ELABORATED?	50 minutes	I-5
A. Related Concerns	5 minutes	I-5
B. Elaboration of Concepts	10 minutes	I-9
C. Elaboration of Variables	10 minutes	I-11
D. Elaboration of Measures	5 minutes	I-12
E. Examples		I-13
Walk-Through 'A' - TYPICAL STATEMENTS OF CONCERNS	20 minutes	I-14
III. HOW ARE HYPOTHESES CONSTRUCTED?	50 minutes	I-23
A. Postulating Hypotheses	5 minutes	I-23
B. Examples of Hypotheses in a Problem Statement	*	I-27
Walk-Through 'B' - HYPOTHESES IN A WRITTEN PROBLEM STATEMENT	45minutes	I-28
IV. RELATIONSHIP OF PROBLEM SPECIFICATION	5 minutes	I-57
A. The Differences	*	I-57
B. Importance	*	I-57
C. Meaning	*	I-58
D. Definition	*	I-58
V. CONCLUSION	5 minutes	I-58
TOTAL TIME	120 minutes.	

* Less than 5 minutes.

NOTES

I. HOW ARE PROBLEM STATEMENTS DEVELOPED?

A. Two general approaches:

1. Inductive - frequently problem statements are "data-driven." Specific components of information provide compelling evidence that a problem exists. In these cases the analyst moves from the specific to the general using what is called inductive reasoning.

   a. This methodology is frequently used in situations where the data-base is well developed. For example, a crime analyst reviewing Uniform Crime Report data can usually develop a fairly complete problem statement. Deviations from the norm, aberrations or other significant factors literally cause these exceptional data elements to stand out from the rest of the data set and enable the analyst to describe the problem and draw conclusions.

   b. Participants who have participated in the Planning Course will recognize that the Gotham City Exercise enabled this approach and the course taught several techniques to help the analyst detect the deviations, aberrations and other significant factors

2. Deductive - In those cases where the existing data-base is insufficient to the needs of the analyst or in those instances where the analysis is driven by community issues, questions and concerns, the analyst moves from the general to the specific, using deductive reasoning, to describe the problem and reach conclusions.

NOTES

a. This type of analysis is frequently used in situations where concerns are raised by the community, the press, elected officials and agency officials. The evidence to support, modify or reject these contentions must be developed by the analyst using the existing data or generating new data. This procedure results in new information that may be used in the development of a problem statement.

b. Despite the fact that the criminal justice community has significantly expanded the "data-base" at all levels in recent years, the "issues" and concerns being addressed by the criminal justice profession, require the analyst to continue to examine the existing data-base in different ways and selectively expand the data-base to meet special information needs.

   As the data-base expands, it becomes more difficult to inductively analyze to identify exceptions and differences.

   Because expanding the data-base may be expensive, the new data elements need to be carefully selected.

c. This course teaches a deductive approach to problem analysis. Many different procedures have been reviewed and the best elements of several procedures have been selected and integrated into this course.

NOTES

B. Problem Specification:

1. Definition: In this course Problem Specification is defined as the identification of concerns; elaboration of concepts, variables, and measures; and postulation of hypotheses. Problem specification consists of:

   a. the identification of concerns;

   b. the elaboration of concepts, variables and measures; and

   c. postulating hypotheses.

II. HOW ARE CONCEPTS, VARIABLES and MEASURES ELABORATED?

A. Identification of Related Concerns:

1. Definition: In this course a concern is defined as the vague and/or frequently unspecified hunches and/or attitudes about aspects of crime and the criminal justice system. For example, some concerns within the criminal justice system are equity, fairness, crime prevention and offender rehabilitation.

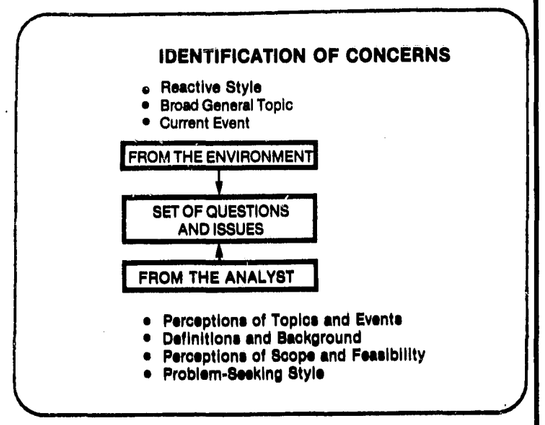
2. Typically concerns are not well articulated and are usually reactions to symptoms -- not causes.

3. Identification of concerns requires both a "reactive" and "problem seeking" style on the part of the analyst.

   a. A reactive style is one in which the analyst responds to the demands and concerns of decision-makers for information.

   b. A problem seeking style is one in which the analyst generates the questions and identifies concerns requiring the attention of decision-makers.

SHOW V.A. (1-1):



EMPHASIZE (1-1):

+ The alternative approaches (styles) an analyst can take to identification of concerns.

+ How concerns are usually expressed as questions or issues.

+ Examples of the genesis of concerns could be used to illustrate these points:

  - one emanating from the environment

  - one emanating from the analyst

  - one that emanates from the environment and the analyst concurrently and for different reasons.

+ These concerns should trigger a deductive search for evidence.

4. There are interactions and interdependencies among concerns.

   a. Many stated concerns may involve interactions and relations among concerns. In performing the Major Exercise as in the actual conduct of analyses some relationships should be explored between such concerns, difficult as it may be.

   b. Problem specification tends to focus the analyst's attention on a single concern, yet the interrelationship among concerns may be central to complete problem analysis.

   c. For example, a full understanding of crime prevention may require an examination of recidivism to explore possible crime patterns among career criminals.

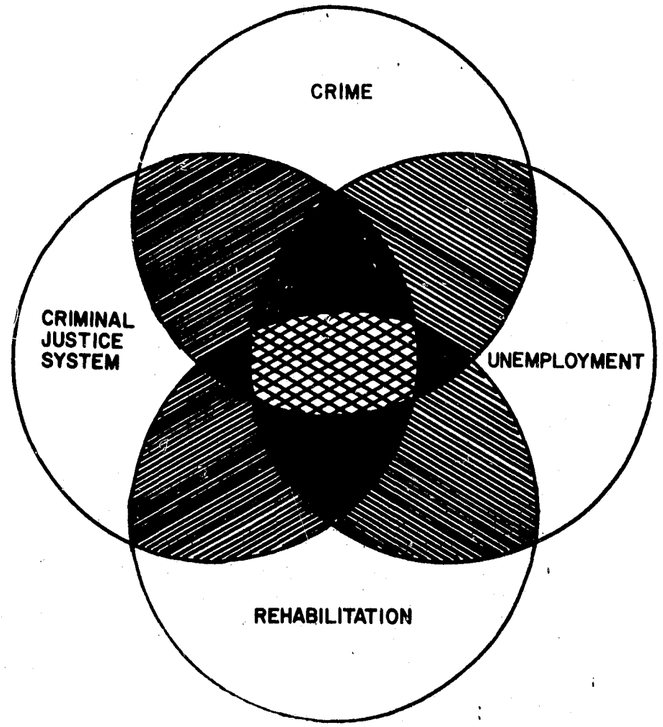
      Refer to Exhibit 1.

      Note in Exhibit 1 that the overlap of circles indicates the interaction and interrelation of factors. The circles for the Criminal Justice System and crime overlap. This overlapping suggests that programs of the Criminal Justice System affect crime and that crime affects criminal justice programming. Furthermore, we see that rehabilitation of offenders impacts both the Criminal Justice System and crime. Together rehabilitation, crime, unemployment and the Criminal Justice System may all be interrelated in some respects.

   d. Thus, before focusing on the problem specification and proceeding, the analyst should consider related concerns, which may not have been expressed, and include those determined relevant.

Exhibit 1

INTERACTION & INTERRELATIONS AMONG CONCERNS



NOTES

B. Elaboration of Concepts

1. Definition: In this course a concept is defined as a distinguishable component found or expressed within a concern. For example, offender attitudes, economic status, system operations and recidivism help further the understanding of what is meant by rehabilitation.

2. Concepts vary in terms of their abstractness; e.g., seriousness of crime is more abstract than the incidence of crime.

3. Concepts are, often, not observable (or counted); e.g., one cannot directly see "crime prevention" nor count it without further elaboration of the concept.

4. Subjecting vague and multiple concerns to analysis frequently results in the production of masses of data which have little analytic utility and produce little useful information.

5. For analytic purposes, it is generally useful to sort out areas of concern so that the questions and concepts inherent in each area may be determined and specified.

   a. Environment: The criminal justice system exists and operates within a context of many external factors composing its environment.

      Some of these factors are:

      geography
      current events
      public attitudes
      politics
      commission of crime

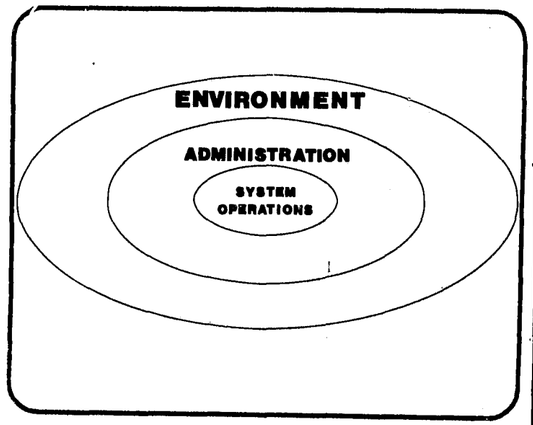
   b. Administration: There are administratively determined factors related to the structure and function of the criminal justice system which serve as a buffer between the environment and the operations of the system.

NOTES

Some examples include:

legislation
policy
organization
standards
goals

SHOW V.A. (1-2)



---

c. System Operations: System Operations encompasses the activities performed by the units of the criminal justice system. These activities occur within the context of and interact with the Environment and Administration.

6. Concepts, while not generally observable, are used to focus our efforts, organize our analyses and, most significantly, guide in the selection of variables.

NOTES

C. Elaboration of Variables

1. Definition: A variable is defined as a characteristic trait, attribute, or event having more than one possible value.

2. Elaborating concepts into variables forces the analyst to clarify exactly what is meant by the concept being studied.

3. Because a concept may usually be expressed through many variables, the choice of the most appropriate variables will be a difficult but important choice.

   a. The variables contained in reported crime often include the type of crime committed, the characteristics of the victim, the area of the city in which the crime was committed and other related variables.

   b. Recidivism might be expressed as rearrests, reconvictions or reincarcerations.

   c. In the context of system operations, variables will usually be expressed as input, performance, output and other factors related to the operation of the criminal justice system.

Instructor Note: System analysis will be covered in detail in Module 6. However, if participants need definitions for these terms now, quickly provide the following general definitions:

Input is those resources, work to be processed, and other factors which enable the system to function.

Performance is how the work is accomplished by the system, e.g. how well, how quickly, etc.

Output is what is actually accomplished by the system, e.g. accidents investigated, cases tried, persons paroled, etc.

NOTES

4. There may be several ways to measure a given variable.

D. Elaboration of Measures

1. Definition: In this course a measure is defined as an observable qualitative or quantitative indicator used as a standard for description or comparison.

2. Some variables are easy to measure, such as the number of residential burglaries reported to the police. Others are quite complex and difficult to measure such as citizen perception about street safety after dark.

3. Measures used to describe the occurance of crime range vary from simple frequency counts to complex index numbers, such as, population-at-risk measures for specific crimes.

4. Similarly, in system operations, measures can be simple frequency counts of workload or more complex measures of system performance, such as efficiency, effectiveness or productivity.

Instructor Note: Module 2 covers the topics of measurement accuracy. Module 4 covers indices. Module 6 covers performance measures. The Glossary provides definitions for most of the terminology used in the course. While participants will not need to know the details until Module 6, you may wish to briefly define these terms:

Efficiency measures how much of the work to be done is done.

Effectiveness measures how the result compares to what is expected.

Productivity measures the results accomplished with the resources used.

NOTES

E. Examples of the Elaboration of Concepts, Variables and Measures.

1. Walk-Through A provides examples of the elaboration of concepts, variables and measures from typical statements of concern.

Typical Statements of Concerns about
Crime and the Criminal Justice System

PURPOSE

The purpose of this Walk-Through is to illustrate how to elaborate concepts, variables and measures from statements about concerns. Such concerns are typically presented in brief narratives with incomplete information. Following are three such narratives which are to be analyzed by identifying either explicit or implicit concerns, concepts, variables and measures.

INSTRUCTOR NOTES

A. Maximum time available for this Walk-Through is 20 minutes. Depending upon how the participants grasp the elaboration of concepts, variables and measures, review two or all three of the examples.

B. Instructor is to first give the group no more than five minutes to review the statement on Crime Trends in Chaos City, Example 1.

C. Secondly, ask the participants to point out the central concern and concepts, variables, and measures. After the participants have given their input, go through the Example 1 Worksheet systematically indicating all these items, call particular attention to those not mentioned by the participants. The worksheets reflect both explicit and implicit concepts, variables and measures. Implicit entries have been made parenthetically. Other concepts not presented on the worksheets may be addressed; however, only those concepts included explicitly in the narrative content appear in the worksheets.

D. The Instructor should not focus on errors within the concern statements, e.g., the confusing definition of variables and measures that are presented. The purpose of this walk-through is to correctly specify concerns, concepts, variables, and measures which would facilitate analyses of the problems.

E. Follow the same procedure for the statements in Example 2 and Example 3.

   1. Example 2 contains a statement of the manner by which a District Court disposed of cases of homicide, rape, robbery and aggravated assault. The instructor should allow discussion of other relevant concepts which might be considered in analyzing the concern.

   2. Example 3 is a typical statement which contains virtually no numerical data. Examples like this often arise as a result of citizen initiatives or public outcry.

DEBRIEFING NOTES

A. The elaboration has shown that omissions sometimes exist in concern statements. Concepts, variables, or measures may not be explicitly stated. The elaboration of these considerations helps to understand the problem better and to understand the logical linkages between concepts, variables, and measures.

DATA SET/WORKSHEET

Example of a Concern Statement

Crime Trends in Chaos City — Concern

Historically, aggravated assault and homicide rates in this area have been relatively low, and these crimes have not been considered serious problems. — Measures (nominal level)

By contrast, the rate of robbery has always been quite high; — Concept

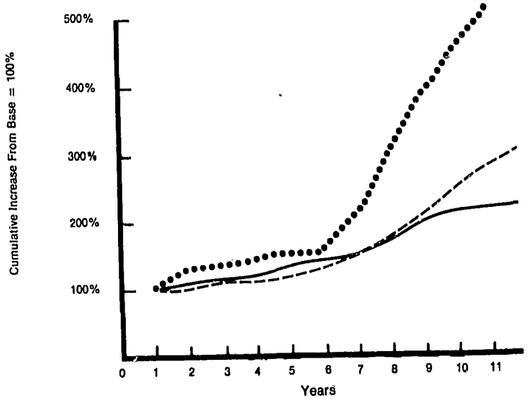
most observers have consistently identified robbery as the jurisdiction's most serious crime problem. — Measure

Analysis of recent trend data, however, indicates that the city's assault rate has shown dramatic increases over the last several years. — Concept

These increases substantially out-distance the proportional increase in robberies and indicate that unless preventive action is taken assaults may become a significant problem. — Measure (nominal level)

This trend is exacerbated by recent signs that the homicide rate is now increasing as a result of the increase in assaults. Fortunately, the assault increase has, according to police statistics, come primarily in assaults which involve knives and blunt instruments. Since these are less often fatal than firearm assaults, the homicide rate has not risen as rapidly as the assault rate. Should firearm assaults resume their traditional proportional role, however, the city is likely to suffer a very substantial increase in homicides. — Concept

Example 1. Table 1. Proportional Increases in Assault, Homicide and Robbery in Chaos City by Year



Aggrevated Assault ●●●●
Homicide -----
Robbery ——

Year One = 100%
Source: Chaos City Police Department, Annual Report, 1977

WALK-THROUGH 'A'

1

WORKSHEET
WALK-THROUGH A, EXAMPLE 1
PROBLEM SPECIFICATION: ELABORATING CONCEPTS, VARIABLES & MEASURES

CONCERN: Crime Trends in Chaos City

CONCEPTS	VARIABLES	MEASURES
Magnitude	Frequency of Occurrence by Crime Type	Cumulative increase by crime type per year
		# Crimes by type
	*(Risk of Crime by Crime Type)	*(# of crimes by type per population at risk)
	*(Reporting Rate by Crime Type)	*(% of persons in victimization survey reporting each type crime)
Seriousness	Perceptions of Seriousness	*(Rank ordering of perception of seriousness)
	*(Harm to Community by Crime Type)	*(Average seriousness score on S-W Scale for harm from each type of crime)

*Statements in parentheses are implied elaborations.

WALK-THROUGH 'A'

WORKSHEET
WALK-THROUGH A, EXAMPLE 1 (CONTINUED)
PROBLEM SPECIFICATION: ELABORATING CONCEPTS, VARIABLES & MEASURES

CONCERN: Crime Trends in Chaos City (Continued)

CONCEPTS	VARIABLES	MEASURES
*(Rate)	*(Rate of Change by Crime Type)	*(Rank ordering of perception of rate of change by crime type)
	*(Rate of Change of Seriousness by Crime Type)	*(% difference over years of average S-W Index for each type crime)
*(System Operation) - Preventive Action	*(Patrol Deployment)	*(% of available manpower allocated per area by time period)

*Statements in parentheses are implied elaborations.

I-1B-IG

WALK-THROUGH 'A'

B. Example 2

District Court Processing of Felony Cases	Concern
A six-month sample of homicide, rape, robbery and aggravated assault offenses during 1974 was analyzed to	Variables
determine how serious felony cases were disposed of	Variables
at the District Court level. A total of 342 such offenses were included in the sample. Twelve percent	Measures
of the cases were still pending, and 10% were deferred prosecution or judgment cases. About half of the remaining cases (43%) of the total were plea bargained to a lesser felony or misdemeanor plea. In addition to this plea bargaining, one-fifth of all cases (one-fourth when pending and deferred cases are excluded) were dismissed. The proportion of those convicted on the original charge varies from case to	Variable Measures
case. None of the 27 homicides, 4% of the assaults, and 5% of the burglaries resulted in a conviction on the original charge. On the other hand, 28% of the rape cases and 15% of robberies had a conviction for the original most serious charge. The analysis leading to the problem statement indicates a significant degree of unevenness in the way these four types of cases were handled at the district court level. This suggests a lack of quality control over cases tried in district court.	Measures

WALK-THROUGH 'A'

WORKSHEET
WALK-THROUGH A, EXAMPLE 2
PROBLEM SPECIFICATION: ELABORATING CONCEPTS, VARIABLES & MEASURES

CONCERN: District Court Processing of Felony Cases in Chaos City

CONCEPTS	VARIABLES	MEASURES
Court Operation	Case Disposition	% of cases falling in each disposition category
		*(% of cases falling in each category compared to national average.)
	*(Input)	*(# of Judges)
		*(# of case filings per Judge)
		*(# of case filings by case type per Judge)
	*(Performance)	*(# of cases heard per Judge)
		*(# of cases heard by case type per Judge)

*Statements in parentheses are implied elaborations.

I-20-I

WALK-THROUGH 'A'

C. Example 3

Rape in Chaos City

Concern

Social agencies have always given too little attention--and too little understanding--to the victims of rape. The results have been both that many, perhaps most, rapes are never reported to law enforcement agencies and that victims, scared by the callousness of the system, are unwilling to testify in court, thereby minimizing the possibilities of conviction for the offender. Chaos City recently witnessed a series of grotesque and highly publicized rapes. Although the overall rate of reported rapes does not seem high for the city, these specific incidents have galvanized citizen interest and have led to the formation of a citizen law enforcement task force; already this group has raised sufficient funds within the community to give it some stability and to allow it to formulate a series of pilot proposals. Thus, the city presents an excellent environment for testing innovative concepts about improving the treatment of rape victims and increasing the conviction rate in the prosecution of rape offenders.

Concept
Measure (nominal level)

Variable

Measure (nominal level)

WORKSHEET
WALK-THROUGH A, EXAMPLE 3
PROBLEM SPECIFICATION: ELABORATING CONCEPTS, VARIABLES & MEASURES

CONCERN: Rape in Chaos City

CONCEPTS	VARIABLES	MEASURES
Magnitude	Reporting of Rape	# of rapes reported # of rapes not reported (via victimization studies)
		*(% of rapes in population at risk.)
System Operation	Conviction Rate	*(% of case filings resulting in conviction)

*Statements in parentheses are implied elaborations.

I-22-IG

WALK-THROUGH 'A'

NOTES

III. HOW ARE HYPOTHESES CONSTRUCTED?

A. Postulating Hypotheses

1. Definition: A hypothesis is a statement asserting a relationship between either concepts, variables, or measures.

2. Formulating hypotheses is an art and not a science. The analyst must draw upon experience, intuition, theory and logic to construct hypotheses.

3. It may be helpful to think of hypotheses as statements which describe the relationship between two factors (which may be concepts, variables or measures). A list of phrases which are frequently used include:

   is related to
   is unrelated to

   is greater than
   is less than

   is increased by
   is decreased by

   is equal to
   is unequal to

4. Hypotheses are important because they help to establish boundaries of a problem, focus the analytic effort and may suggest potential problem-solving strategies.

5. Some hypotheses are descriptive in nature, and principally deal with assertions of relationships.

   Descriptive hypotheses are most typical of the kind usually dealt with in criminal justice. They usually involve considerations of logical or temporal sequence, but do not involve issues of "cause" and "effect".

NOTES

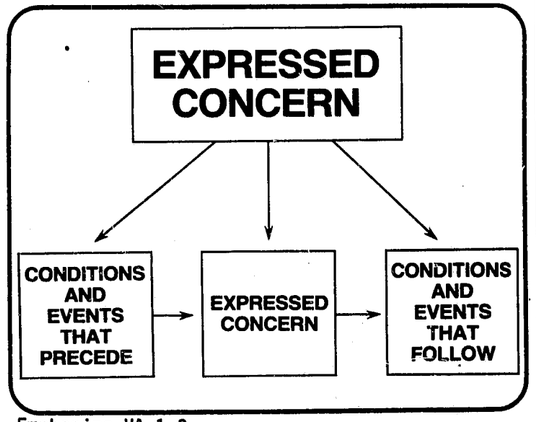
When in a descriptive hypothesis, a relationship is asserted between "dependent" and independent" factors, these factors are determined as follows:

- Independent: that factor which logically or temporally precedes the dependent factor and which is being used to explain or understand something about the dependent factor.

- Dependent: That factor which logically or temporally follows the independent factor and which is under study.

The identification of independent and dependent factors requires the analyst to logically describe the problem (e.g., relate conditions and events that precede and follow the expressed concern and then organize these conditions and events into logical sequence) and use this description to select independent and dependent factors.

SHOW V.A. (i-3):



Emphasize VA 1-3

+ The instructor should use a simple example to illustrate this procedure.

NOTES

6. Other hypotheses imply a "cause" and "effect" relationship. In this course they will be called causal hypotheses.

   Causal hypotheses are inherently complex and risky. It is very difficult to establish an accurate causal relationship in criminal justice problems because of the many factors which effect each concern, condition, or event.

   In a causal hypotheses, a cause and effect relationship is asserted between dependent and independent factors:

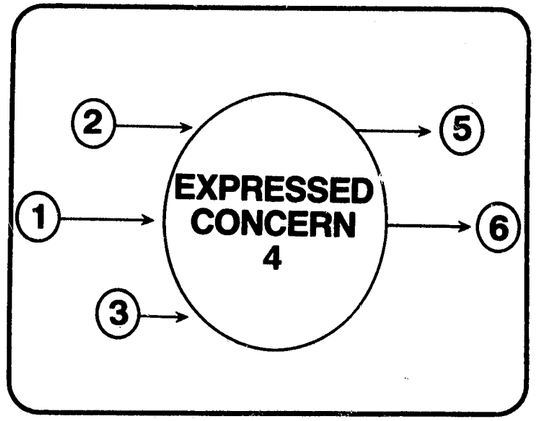
   - Dependent: A characteristic or event which is hypothesized to change as a result of another occurance or change in another characteristic, trait or event.

   - Independent: A characteristic, trait or event which is presumed to affect or influence changes in another characteristic, trait or event.

The selection of causal hypotheses may be guided by organizing events and conditions into three categories: "presumed causes", "primary effects" and "secondary effects." A network or these conditions and events can be contructed to determine these categories.

NOTES

SHOW V.A. (1-4):



Emphasize VA 1-4

+ Numbers 1, 2 and 3 are presumed causes.

+ Number 4 is the primary effect.

+ Numbers 5 and 6 are secondary effects.

+ Note: In the network illustrated the expressed concern is the primary effect. This is not always the case. The expressed concern may be a secondary effect or a presumed cause of the problem rather than the primary effect.

These categories are defined as follows:

- Presumed Causes: Those conditions and events that are thought to come before and lead to the expressed concern and related events and effects.

- Primary Effects: Those events and conditions that directly result from the presumed causes.

- Secondary Effects: Those events and conditions that directly result from the primary effects and indirectly result from the presumed causes.

NOTES

Once these events and conditions have been grouped in categories, then causal hypotheses can be postulated using the following rules:

- In hypotheses that relate presumed causes to primary and secondary effects, the presumed cause is the independent factor.

- In hypotheses that relate primary effects to secondary effects, the primary effect is the independent factor.

Be careful! Avoid spurious relationships: relationships that are illogical or apparent relationships between two factors where the apparent relationship is the result of a third factor.

7. The investigation of cause and effect relationships is critical to the analysis process. The statistical tools presented in this course, by themselves, are insufficient.

   The investigation of causality rarely involves a simple test of a single hypothesis. The analyst must draw on experience, intuition, theory and logic as well as on analytic tools, such as the statistics taught in this course.

B. Examples of Hypotheses in a Problem Statement.

   Walk-Through B presents an example of a Written Problem Statement which illustrates the use of hypotheses.

Hypotheses in a Written Problem Statement

PURPOSE

The purpose of this Walk-Through is to reinforce the elaboration of concepts, variables, and measures and to provide experience in the postulation of hypotheses. The data set for the exercise also provides a concrete example of a Written Problem Statement. The Walk-Through Worksheets also serve as an illustration of two of the products required by the Major Exercise to elaborate concepts, variables, and measures (Worksheet A) and to postulate hypotheses (Worksheet B).

Using the Problem Statement and the completed elaboration worksheets, the instructor will provide an example of the postulation of hypotheses for one of the findings (paragraph 3.1) using a completed Part B Worksheet. Then in class discussion the instructor will lead the class through the postulation of hypotheses for two additional findings.

INSTRUCTOR NOTES

A. Participant Guides contain the written Problem Statement, completed worksheets for Part A (Elaboration Concepts, Variables and Measures) for all sub-sections of Section 3 of the Problem Statement and a completed Part B Worksheet for sub-section 3.1. Completed Part B Worksheets for the remaining sub-sections should be ready to hand out to participants at the completion of the Walk-Through.

Note: Each Participant Guide contains the handouts. These are placed after the Glossary at the end of the book. These pages should be removed before distributing the Participant Guide to the participants. The pages that are removed will serve as hand-outs.

B. The instructor should check to see how many participants have read the Problem Statement provided in the Data Set prior to class participation. (Note: It is suggested that the Problem Statement be provided to participants with pre-course materials and that they be asked to review the Problem Statement prior to course participation.)

C. Prior to the Walk-Through the Instructor should select two additional sub-sections with section 3 of the Problem Statement (e.g. 3.2 and 3.5) to be used in class.

D. Ask all participants to read the Introduction to the Problem Statement (about 3 minutes).

E. Direct the participants to sub-section 3.1 and give them five minutes to review the sub-section and the related Part A Worksheet. (The Worksheets have been keyed to the related sub-sections.) After they have completed this review, lead them through the hypotheses indicated in the Part B Worksheet, emphasizing the differences between hypotheses constructed at the conceptual, variable and measurement levels and the relationships among these hypotheses.

F. Next ask the Participants to review the sub-section and the related Part A Worksheets for the first sub-section you have selected. Ask them to identify hypotheses during this review.

Then using flip charts lead the group through the development of appropriate hypothetical statements. Develop a degree of rigor during this discussion, making distinctions between conceptual, variable, and measurement level hypotheses.

G. Repeat this process for the final sub-section you selected.

H. Time Schedule:

1.	Instructions and Read Introduction	- 5 minutes
2.	Review and illustrate first sub-section	- 15 minutes
3.	Review and discuss two additional sub-sections	- 20 minutes
4.	Debriefing	- 5 minutes
		45 minutes

DEBRIEFING

A. Hand out the completed Part B Worksheets for all sub-sections.

B Debrief the Walk-Through and emphasize the following:

- How measurement level hypotheses are used for the analysis but that conceptual level hypotheses are frequently used to communicate with decision makers.

- The need for logical linkages in the development of hypothesis is critical.

- That two types of hypotheses have been used: descriptive and causal.

- That the construction of hypotheses in the Major Exercise, as in the real world, requires creativity. Theory and practice establishes a basis for hypotheses construction. Other clues to hypotheses construction may come from the provided data set. This process of construction is not rigidly structured by may be an interaction of deductive and inductive thinking.

WALK-THROUGH 'B'

DATA SET

PROBLEM STATEMENT: VEHICLE THEFT IN CHAOS CITY, 1977

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DATA SET (continued)

Problem Statement: Vehicle Theft in Chaos City, 1977.

1.0 Introduction

1.1 Statement of Concerns

Recently, vehicle theft has become the focus of complaints by leading downtown businessmen. The downtown area has been staging a difficult economic comeback the last few years and the businessmen feel that vehicle thefts have increased to a point that shoppers will curtail downtown trade.

1.2 Nature and Source of Concerns

The origin of the businessmen's complaint does not appear to be founded on survey or other data forms that would identify shopper's preference for shopping location. The major thrust of the businessmen's concern seems to be based on their perceptions and possibly reinforced by complaints from customers.

1.3 Scope of Concerns

The problem perceived by the businessmen has been communicated to both the business community and the public. Quite possibly their complaint coupled with news publicity could actually affect shopping location preference. Thus, their fear in itself could become a detrement to downtown trade.

At the request of the Mayor, an analysis of motor vehicle theft has been conducted and is reported in this document.

2.0 Analysis Methodology

2.1 Definition of the Terms Used

According to State of Paradise Statute 609.55 (1971), vehicle theft involves the unauthorized use of a motor vehicle without the consent of the owner or an authorized agent of the owner. This analysis focuses upon thefts and unauthorized use of all motor vehicles. Where apporpriate, distinctions are made between theft of automobiles, trucks, motorcycles and other motorized vehicles. Since the bulk of the vehicle theft is associated with private automobiles, the greater portion of this problem statement is concerned with analysis of automobile thefts.

WALK-THROUGH 'B'

2.2 Measurement Reliability and Validity

Previous victimization surveys have shown that over ninety percent of stolen autos are reported to the police. A primary motivation for this is the need to collect insurance on these stolen vehicles. Thus the figures should be fairly reliable as well as valid. The reporting rates may, however, vary by section of the city as persons without insurance have less incentive to report stolen autos.

The measure of risk, number of cars stolen divided by 1,000 registered vehicles, suffers from the lack of an accurate count of registrations by section of the city. The problem is particularly acute downtown as the number of cars parked downtown greatly exceeds the number registered in that area. In these instances the analysis relies upon measures of frequency to corraborate the risk measure.

2.3 Data Collection Procedures

Data was collected from Chaos City police offense reports for the period under study--July 1, 1974 through June 30, 1975. A random sample of 20 percent, or 1 in 5, offense reports was selected for analysis. These sampled offense reports are the basis of this analysis. Where appropriate, numbers listed in the text, figures, and tables have been multiplied by five to correct for the sampling procedure. References to Chaos police offense report data refer to the sample data.

2.4 Statistical Methods

There are at least three methods by which a crime can be measured: 1) frequency, 2) rate per 100,000 persons, and 3) rate per 1,000 opportunities. The third measure--rate per 1,000 opportunities--gives a more complete understanding of the degree to which any given crime represents a problem in a given geographic area.

The mathematical tools employed in this analysis were: ranking, comparative tables, and chi square.

For Chaos City, the victimization rate for registered automobiles was about 30.9 per 1,000 (1 in 32) for the study period.

WALK-THROUGH 'B'

3.0 Findings

3.1 Magnitude of Motor Vehicle Theft is Similar in Comparable Cities

According to the general impression of the police department, the problem of motor vehicle theft in Chaos City is no larger than that experienced in other cities of similar size across the country. The number recorded by the Department during the study period was 5,085. This figure was found to be about 500 less than the average number motor vehicle thefts for similar size cities.

The 5,085 motor vehicle thefts were distributed as follows:

Automobiles	4,450
Trucks	255
Motorcycles	335
Other motorized vehicles	45

For automobiles the victimization rate (calculated on basis of registered autos) was about 30.9 per 1,000 or roughly 1 in 32. Victimization surveys indicate that approximately 93 percent of all vehicle thefts are reported to police. Correcting for non-reported thefts revises the total of motor vehicle thefts to about 5,470.[1]

3.2 Chaos City System Response is Different than National and State Level System Response

Based on national clearance rates and the clearance rates of other property crimes in Chaos City such as burglary, we anticipated that the clearance rate for vehicle theft would be the same as other vehicle theft and the same as the national clearance rate. Clearance rate is defined here as those cases which are cleared by arrest.

Chaos City police offense reports indicate that the overall clearance rate for all motor vehicle thefts was about 7 percent. For automobiles, clearance rates were 10 percent, trucks-11 percent and motorcycles-5 percent. These clearance rates are lower than the 20 percent clearance rate usually reported for both Paradise and the United States.[2] It is clear that most vehicle thieves in Chaos City have a lower than average likelihood of being caught after the commission of their offense. This low likelihood opens up the possibility of focusing on the prevention of vehicle theft. There is no information on rate of conviction or sentencing patterns.

---

[1] Criminal Victimizations in 13 American Cities, U.S. Department of Justice, LEAA (June 1975), p.124.

[2] Paradise Crime Information, 1973, Bureau of Crime Analysis (BCA) (June 1, 1974), p.49 and Crime in the U.S., Uniform Crime Reports, U.S. Department of Justice (Washington, D.C.: 1975), p.35.

WALK-THROUGH 'B'

CONTINUED

1 OF 14

3.3 Auto Theft in Chaos City is a less Serious Crime Problem

Auto theft was expected to be a less serious problem for Chaos City than other property crimes. Two measures of seriousness were available for this analysis. In addition, although clearance rates for Chaos City are relatively low, the net dollar loss from auto theft may be lower than for other metropolitan areas.

Chaos City Police Department estimates for 1975 indicated that the total value of stolen motor vehicles was $5,828,890. However, the total value of recovered motor vehicles was $4,653,803, indicating a net dollar loss of $1,175,087 for 1975.[3] The difference between the dollar figures for auto theft reflects the fact that most automobiles (90.8 percent) taken from Chaos City are recovered--only 8.5 percent of all thefts are not recovered. The balance of reported thefts (70 percent) are classified as unfounded. For example, the car was not stolen, merely misplaced. Thus, the net dollar loss of $1,175,087 for motor vehicles is less serious than the value of $3,045,624 for unrecovered resident burgulary property. Further, recovery figures for Chaos City are substantially higher than figures for nationwide recovery. National figures indicate that from 70 to 80 percent of all cars are recovered.[4]

Every vehicle theft incurs costs other than those associated with the value of the vehicle. Private vehicles are the nation's primary means of transportation. Loss of an individual's means of transportation, if only for a few days, can impose a burden on the victim of auto theft. Other costs include the cost of prosecution of offenders, increased insurance premiums as a result of vehicle thefts and the intangible cost of increased concern about crime.

There is also no information available as to the cost to the criminal justice system to investigate and prosecute cases of vehicle theft. Likewise, statistics were unavailable to compare the seriousness of auto theft downtown with other crimes occuring downtown.

---

[3]Unpublished data collected for Uniform Crime Reports, Chaos City Police Department.

[4]"Preliminary Study of the Effectiveness of Auto Anti-Theft Devices," NILECJ, LEAA (October 1975), p.3.

WALK-THROUGH 'B'

3.4 Auto Theft Varies by Area and Location

The hypotheses which guided this analysis are:

The magnitude of auto theft varies by geographic area of the city.

The magnitude of auto theft varies by type of parking environment.

As hypothesized, the data show that not all areas of Chaos City have the same rate of auto theft. Table 1 displays the different rates of victimization across the city's ten planning communities. Table 1 also demonstrates that the measure of crime used for analysis gives various perspectives on the crime problem in given communities.

In Table 1, the highest victimization rates, independent of the type of measurement employed, are found in the Central and Powderhorn communities, which supports the hypothesis.

Table 1. Auto Theft Rates by Community, Chaos City, 1977.

COMMUNITY	Rate per 1,000 Registered Passenger Vehicles*	Rank	Rate Per 1,000 Persons	Rank	Rate	Rank
Central	173.9 (1 in 5)	1	43.5	1	1,135	2
Powderhorn	45.6 (1 in 21)	2	16.1	2	1,295	1
University	40.7 (1 in 24)	3	12.5	3	355	5.5
Near North	37.6 (1 in 26)	4	11.0	4	540	3
Citywide	30.9 (1 in 32)	-	11.7	-	4,970	-
Northeast	26.9 (1 in 37)	5	10.1	5.5	455	4
Longfellow	24.9 (1 in 40)	6	9.7	7	325	7
Calhoun-Isles	23.6 (1 in 42)	7	10.1	5.5	355	5.5
Camden	16.5 (1 in 60)	8	6.4	8	220	7
Nokomis	7.3 (1 in 136)	9	2.9	9	145	9
Southwest	5.9 (1 in 169)	10	2.6	10	145	9

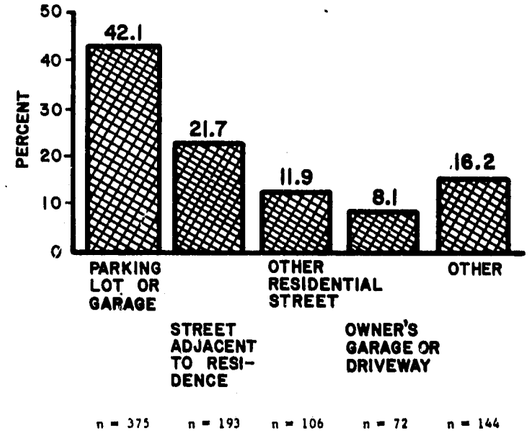
*Each registered passenger vehicle is counted as an opportunity. Each community has a sufficiently large number of vehicles to make meaningful comparisons: Calhoun-Isles, 14,995; Camden, 13,338; Central, 6,525; Longfellow, 13,080; Near North, 14,334; Nokomis, 19,907; Northeast, 16,853; Powderhorn, 28,411; Southwest, 24,464; and University, 8,715. Estimates are derived from the Bureau of the Census (1970) figures reporting number of families in tracts owning 1, 2, and 3 or more vehicles. Weighting on the 3 or more category was done by multiplying by 3.1 in order to approximate the total number of vehicles in each tract. Census data are used because they are the only available geographically-based data. Total citywide auto count = 160,622.

The number of auto thefts in each community was based on a 20% city-wide sample. The sample frequencies in the communities had to be multiplied by 5 to estimate the number stolen.

WALK-THROUGH 'B'

As shown in Figure 1, 42 percent of all automobiles are taken from parking lots or garages while only one-third are taken from near the owner's residence or nearby residential streets. Less than 1 in 10 automobiles are taken from the owner's garage or driveway.

Figure 1. Percentage of Auto Theft by Type of Premise (passenger cars only)

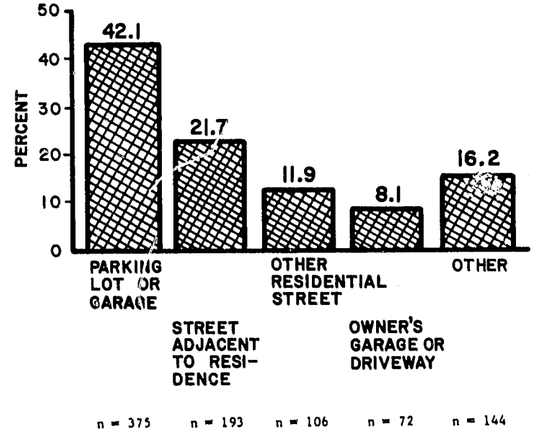


Source: Chaos City Police Offense Report Data, (N=890), 1977.

WALK-THROUGH 'B'

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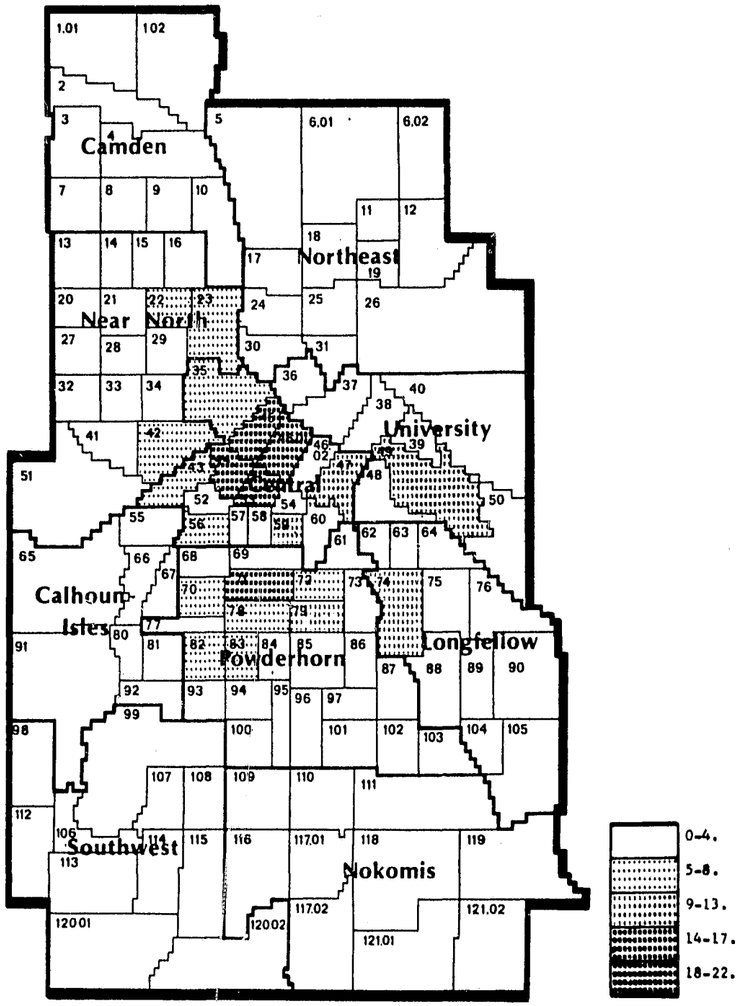
Source: Chaos City Police Offense Report Data, (N=890), 1977.

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WALK-THROUGH 'B'

A detailed analysis of parking garages and lots suggests that the Central, Powderhorn and University communities are most subject to auto theft at these types of sites.

Figure 2.
Frequency of Auto Theft from Parking Garages and Lots by Census Tract

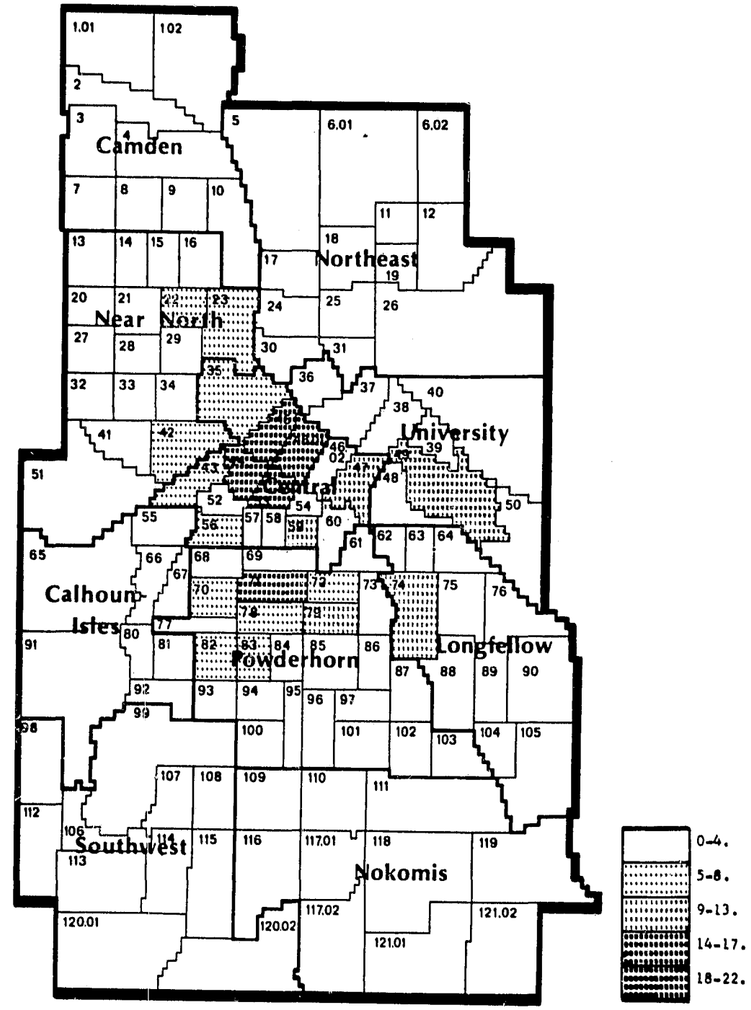


Source: Chaos City Police
Offense Report Data 1977

WALK-THROUGH 'B'

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Figure 2.
Frequency of Auto Theft from Parking Garages and Lots by Census Tract



Source: Chaos City Police
Offense Report Data 1977

WALK-THROUGH 'B'

I-37-IG

3.5 Auto Thefts are Deterred by Reducing Opportunities to Steal

Recent advertising campaigns have suggested that many autos are stolen because of carelessness on the part of the owner. More specifically, these ads suggest that many vehicles are stolen because keys are left in the ignition and that further, locking one's vehicle is sufficient deterrence for auto theft.

Initial data do not support the hypothesis. Data indicate that auto theft is deterred by reducing the opportunity to steal. Most victims report that the keys were not left in the vehicle. As shown in Figure 3, apparently only about 1 in 10 stolen vehicles had the keys left in the car. Only 1 in 20 victims reported the keys as having been left in the ignition. Data also indicate that 57 percent of all victims reported that the car was locked when stolen. These figures, of course, may conceal deliberate misreporting by the victims. The misreporting may be caused by fear of insurance repercussions or by feelings of incompetence.

Clearly, the simple precaution of removing the keys and locking the auto, though increasing the difficulty of theft, is not by itself adequate to deter theft. However other data dealing with opportunity support the hypothesis.

Effective January 1, 1970, the U.S. Department of Transportation instituted Motor Vehicle Safety Standard 114 in an attempt to "reduce the incidence of accidents resulting from unauthorized auto use."[5] This standard established two basic requirements for all cars assembled after January 1, 1970:

1) a key locking system which prevented normal engine activation and either steering or self-mobility in the absence of the proper key;

and

2) a warning sound when the key was left in the locking system or when the driver's door was open.

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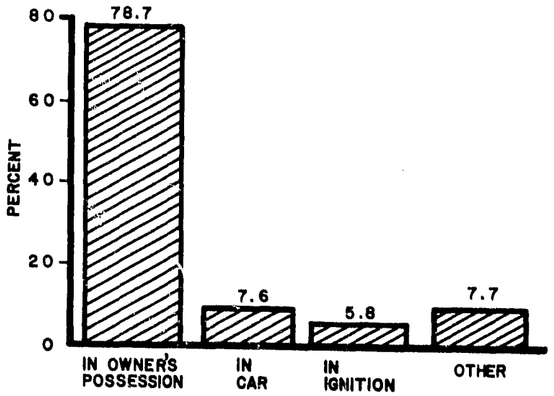
[5]"Preliminary Study of the Effectiveness of Auto Anti-Theft Devices," NILECJ, (Washington, D.C.: October 1975), p, 1.

WALK-THROUGH 'B'

As a result of this standard, all cars manufactured after January 1, 1970, had a steering lock which could only be unlocked with the proper key and a buzzer system that made an audible alarm whenever the key was left in the ignition.

For the basis of analysis there are three time periods for comparing the relative effectiveness of ignition interlock systems. The first period, pre-1968, is that period when no vehicles were equipped according to Standard 114. The second period, 1969 through 1971, is that period when some but not all vehicles were equipped according to Standard 114. The third period, post-1971, is that period when all vehicles were equipped according to Standard 114. Table 2 compares theft rates for various makes of cars for the first and last periods. It also compares thefts of vehicles manufactured before any ignition interlock systems were installed with that period when all vehicles were equipped with ignition interlock systems. As can be seen in Table 2, 55 percent of all vehicles on the road in 1975 (excluding vehicles manufactured during the second period, 1969-1971) were manufactured before implementation of Standard 114 while 45 percent of all vehicles were manufactured after implementation (excluding the second period). However, 88 percent of all stolen vehicles were manufactured before implementation of Standard 114. The figures in Table 2 and 3 present compelling evidence that car thieves preferred to steal cars which were not equipped with anti-auto theft devices. Thus, these data support the general hypothesis.

Figure 3. Percentage of Auto Theft
by Location of Keys (passenger cars only)



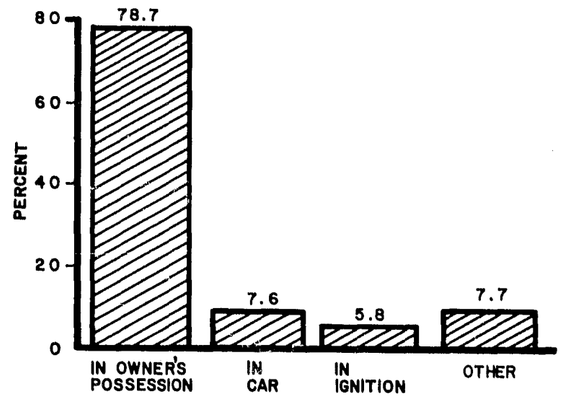
Source: Chaos City Police
Offense Report Data.
(N=844), 1977.

WALK-THROUGH 'B'

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Figure 3. Percentage of Auto Theft
by Location of Keys (passenger cars only)



Source: Chaos City Police
Offense Report Data.
(N=844), 1977.

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WALK-THROUGH 'B'

Table 2. Percentage of Auto Theft as an Indicator of Ignition Interlock Effectiveness

	Number of Cars	Number of Stolen Cars
Period One[1]	157,519[3] (55%)[4]	649 (88%)
Period Two[2]	118,188 (45%)	86 (12%)

[1]Period One: Cars manufactured prior to implementation of Standard 114.

[2]Period Two: Cars manufactured after implementation of Standard 114.

[3]Figures supplied by Department of Motor Vehicles for Chaos City. These figures included a count for some suburbs resulting in figures larger than those listed in U.S. Census data. The relative proportions are assumed to be correct.

[4]Percentages are computed by excluding cars manufactured during the period 1969 through 1971. About 171,000 vehicles were excluded from this table because they were manufactured during this period.

Table 3. Comparison of Expected and Observed Auto Thefts, Two Time Periods

	Expected Number Auto Thefts*	Observed Number Auto Thefts
Period 1	404	649
Period 2	330	86

*Expected number of auto thefts is equal to total number of auto thefts (735) multiplied by the proportion of vehicles manufactured in the period that were on the road (.55 and .45 for the two periods in question)

$\chi^2 = 327.47$, 1 d.f., significant at $p = .001$.

Source: Chaos City Police Department and Department of Motor Vehicle Registration, 1977.

WALK-THROUGH 'B'

Table 2. Percentage of Auto Theft as an Indicator of Ignition Interlock Effectiveness

	Number of Cars	Number of Stolen Cars
Period One[1]	157,519[3] (55%)[4]	649 (88%)
Period Two[2]	118,188 (45%)	86 (12%)

[1]Period One: Cars manufactured prior to implementation of Standard 114.

[2]Period Two: Cars manufactured after implementation of Standard 114.

[3]Figures supplied by Department of Motor Vehicles for Chaos City. These figures included a count for some suburbs resulting in figures larger than those listed in U.S. Census data. The relative proportions are assumed to be correct.

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Source: Chaos City Police Department and Department of Motor Vehicle Registration, 1977.

I-40-IG

WALK-THROUGH 'B'

3.6 Characteristics of Motor Vehicle Theft may Vary by Type of Vehicle

The characteristics of truck and motorcycle theft were anticipated to be similar to that of autos. Generally the data supports this anticipation. However, there are some differences. Trucks tend to be taken from parking lots and garages more frequently (59 percent) than are automobiles (43 percent). Additionally, there are relatively few that are stolen near residences. This is to be expected since many trucks are owned by companies and are parked in company lots.

Motorcycles, however, show a different pattern. Only about one-third (30 percent) of all motorcycle thefts are from garages or lots. More than one-third are taken from premises at or near the victim's residence. The balance are taken from other sites. Unlike the high recovery rates for trucks and autos, only about one-third (35 percent) of all motorcycles are recovered.

3.7 Most Suspects of Auto Theft are Amateur Thieves

Because of the high recovery rate of stolen autos, it was hypothesized that most suspects of vehicle theft are amateur thieves.

Ninety percent of all automobiles were recovered while only about 35 percent of all motorcycles were recovered. The recovery rate of vehicles in Chaos City tends to be substantially higher than the national average. Generally, theft of vehicles does not result in resale of the vehicle or stripping for parts suggesting that most thefts are not thefts for personal gain. Nonetheless, the police clear only 10 percent of their crimes through arrest.

3.8 Those Suspected of and those Arrested for Auto Theft are Generally Young

Suspect information for auto thefts derived from offense reports is very sparse. There was some suspect information in only 58 (12 percent) of the studied cases. This data indicated that most suspects (62 percent) were juveniles.

Chaos Police Department arrest information indicates that from 88 to 97 percent of all auto theft arrests are of juveniles.[1] Between 95 and 98 percent of all arrests are of persons less than 21 years old. However, most of those arrested (76 percent) had a prior record. Unfortunately, additional reliable information is lacking from police offense reports.

[1]Chaos City Police Department, 1977.

4.0 Discussion

4.1 Findings Relative to Expressed Concerns

These findings do indicate that aside from the presumed recent rash of auto thefts from downtown, theft of vehicles is a problem in the downtown area relative to other areas of the city. As might be expected the problem downtown is one of theft from garages and lots. The concentration of thefts from downtown does indicate that local merchants may have reason for concern. However, it could not be determined if the problem in downtown Chaos City is significantly different than might be expected in other cities of similar size.

Theft of vehicles, although potentially one of the most expensive property crimes in Chaos City, appears to be relatively inexpensive. The total net property loss from vehicle theft for the one-year study period was about $1,175,000. The recovery rate of autos and the risk of auto theft suggest that in a broad perspective the problem is not a serious one.

4.2 Limitations

There are no data to indicate whether there has been a recent increase of vehicle thefts from the downtown area or whether the publicity has created the appearance of an upsurge in vehicle theft. Data on a weekly or monthly basis would detect this trend but these data are unavailable.

Vehicle data, also, was unavailable on downtown areas in other cities of similar size. Thus, the magnitude of the downtown problem can only be assessed in relation to non-business areas in Chaos City. It is very possible that cities of similar size experience a similar geographic distribution of vehicle theft.

Limited suspect data does not permit a determination whether recent auto thefts are part of a professional auto theft ring or merely the random attack on the downtown area by the usual amateur. Answers to these questions require more data and analysis.

Public perception of auto theft in downtown Chaos City has not been assessed. Therefore, it is largely unknown if the businessman's fear is reflective of shopper's concerns about crime.

WALK-THROUGH 'B'

5.0 Summary

5.1 Highlights

From July 1, 1976, through June 30, 1977, there were about 5,085 thefts of motorized vehicles recorded by the Chaos City Police Department. The bulk of the theft problem involves automobiles. Thefts of 4,450 automobiles, 255 trucks, 335 motorcycles and 45 other motorized vehicles were reported. Victimization surveys indicated that approximately 93 percent of all vehicle thefts are reported to police. Also, the risk of being a victim of vehicle theft differs by area of the city. The central community clearly has the greatest vehicles theft problem with a 1 in 5 risk (based on number of registered vehicles).

Large numbers of auto thefts are of cars parked at garages or lots (40 percent of all thefts). Most of these thefts from garages and lots occur in a very few localized parts of the Central, University and Powderhorn communities.

Locking cars and removing the keys may tend to reduce the risk of auto theft. However, large numbers of autos are taken which apparently had no keys in them and which were locked. Improved types of auto theft deterrent locks, manufactured according to Standard 114, appear to be a deterrent to vehicle theft. While vehicles equipped with these locking systems are taken, they are stolen at a much lower rate.

The recovery rate for auto theft is higher than the national average, however, the clearance rate is lower.

Thefts of trucks and motorcycles are similar to auto thefts in some aspects but differ in regard to type of premise on which theft occurs. Motorcycles also are recovered at a much lower rate than are autos and trucks.

The profile of the suspect is largely undetermined by specific data. However, amateur involvement is highly likely because of apparent nonconcern about theft for monetary gain and because of the high recovery rate.

WALK-THROUGH 'B'

5.2 Conclusions

Motor vehicle theft does not appear to be a major problem in dollar loss because of a high recovery rate but in consideration of sheer volume of thefts with accompanying costs of inconvenience and police investigation there is clearly a significant problem. As might be expected the problem does not occur evenly in all areas of the city. The downtown and two other areas disproportionately share the burden of vehicle theft. The general sites of theft suggests that crime reduction planning could focus on parking garages and lots. The low clearance rate of these thefts and high recovery rates plus possible involvement of juveniles suggests that preventive measures in addition to investigation and apprehension may offer significant return on the crime reduction effort.

This analysis did not specifically identify what factors caused the perceptions of the downtown businessmen. Therefore, conclusions cannot be drawn about the nature of change needed to improve their perceptions of downtown motor vehicle theft and its impact on trade.

WALK-THROUGH 'B'

Source: Adapted from Douglas W. Frisbie, et. al. Crime in Minneapolis: Proposals for Prevention, May 1977. Minnesota Crime Prevention Center, 2344 Nicolett Avenue, Minneapolis, Minnesota 55404, pp. 191-202.

WORKSHEET
WALK-THROUGH B, PART A
PROBLEM SPECIFICATION: ELABORATING CONCEPTS, VARIABLES & MEASURES

CONCEPTS	VARIABLES	MEASURES
3.1 Magnitude	Frequency	# vehicles stolen Aver. # of vehicles stolen for similar sized cities.
	Victimization Rate	# vehicles stolen as reported in victimization survey. # vehicles stolen divided by number registered autos.
3.2 System Response	Clearance Rate	% of cases with arrested suspect. % of cases cleared nationally. % of cases cleared in State of Paradise.
	Conviction Rate	None provided in Problem Statement.
	Sentencing Pattern	None provided.

I-45-16

WALK-THROUGH 'B'

WORKSHEET
WALK-THROUGH B, PART A (CONTINUED)
PROBLEM SPECIFICATION: ELABORATING CONCEPTS, VARIABLES & MEASURES

CONCEPTS	VARIABLES	MEASURES
3.3 Seriousness	Net Dollar Loss	Dollar value of vehicles not recovered. Dollar value of burglary property not recovered.
	Recovery Rate	% of autos recovered.
	Costs of Victim Due to Theft	Cost of loss of transportation. Amount of increased insurance premiums.
	Cost to Criminal Justice System	Cost of prosecuting offender.
	Other Intangible Costs	None provided.

WALK-THROUGH 'B'

WORKSHEET
WALK-THROUGH, B, PART A (CONTINUED)
PROBLEM SPECIFICATION: ELABORATING CONCEPTS, VARIABLES & MEASURES

CONCEPTS	VARIABLES	MEASURES
3.4 Spatial or Geographical	Geographic Area of City	# autos stolen by planning community.
	Type of Parking Environment	Classification of parking areas into park garages, lots, street, home garages. # autos stolen by parking area classification.
3.5 Opportunity for Auto Theft	Locked Autos	% of stolen vehicles with doors unlocked. % of stolen vehicles with keys left in ignition.
	Improved Security of Automobile	# cars manufactured before and after application of Standard 114.

WALK-THROUGH 'B'

WORKSHEET
WALK-THROUGH B, PART A (CONTINUED)
PROBLEM SPECIFICATION: ELABORATING CONCEPTS, VARIABLES & MEASURES

CONCEPTS	VARIABLES	MEASURES
3.6 Target Characteristics	Type of Motor Vehicle Stolen	% of automobiles stolen. % of trucks stolen. % of motorcycles stolen.
	Location from which Types of Motor Vehicles are stolen.	% of type of vehicle stolen from parking lots and garages.

WALK-THROUGH 'B'

WORKSHEET
WALK-THROUGH B, PART A (CONTINUED)
PROBLEM SPECIFICATION: ELABORATING CONCEPTS, VARIABLES & MEASURES

CONCEPTS	VARIABLES	MEASURES
3.7 Suspect Characterization	Recovery of Stolen Vehicles	% of stolen cars recovered. % of stolen motorcycles recovered.
	Arrest	% of auto thefts, cleared by arrest.
3.8 Offender Characterization	Arrests	# of prior arrests per offender.
	Geographical Area	None provided.

WALK-THROUGH 'B'

WORKSHEET
WALK-THROUGH B, PART B
CONSTRUCTING HYPOTHESES

RELATING CONCEPTS	RELATING VARIABLES	RELATING MEASURES
3.1 The magnitude of motor vehicle theft in Chaos City is similar to the magnitude of the motor vehicle theft in similar size cities.	a. The frequency of motor vehicle theft in Chaos City is the same as the national average for similar size cities.	1) Number of vehicles stolen in Chaos City is the same as national average number of vehicles stolen for cities of 375,000 - 400,000 population, as reported in Uniform Crime Reports (UCR).

WORKSHEET
WALK-THROUGH B, PART B
CONSTRUCTING HYPOTHESES
(Continued)

RELATING CONCEPTS	RELATING VARIABLES	RELATING MEASURES
3.2 1. Chaos City's Criminal Justice System's response to vehicle theft is the same as the national and state response to vehicle theft.	a. The clearance rate for vehicle theft in Chaos City is the same as the national clearance rate.	1) The percentage of vehicle thefts cleared by arrest in Chaos City is the same as the percentage cleared by arrest nationally.
	b. The clearance rate for vehicle theft in Chaos City is the same as the clearance rate for the State of Paradise.	1) The percentage of vehicle thefts cleared by arrest in Chaos City is the same as the percentage cleared by arrest in the State of Paradise.

WORKSHEET
WALK-THROUGH B, PART B
CONSTRUCTING HYPOTHESES
(Continued)

RELATING CONCEPTS	RELATING VARIABLES	RELATING MEASURES
3.3 Auto theft is a less serious crime than other property crimes.	a. The net dollar loss for vehicle theft is less than that for residential burglary.	1) The reported dollar value of unrecovered vehicles is less than the reported value of unrecovered burglary property.
	b. The recovery of stolen cars in Chaos City is higher than the national recovery rate.	1) The percent of cars recovered in Chaos City is greater than the percent of all cars recovered nationwide.
	c. (Because of the costs of auto theft to victims, auto theft is a more serious problem than the net dollar loss suggests.)	1) (The reported dollar value of unrecovered vehicles, the replacement costs for stolen cars and increased insurance premiums are greater than the reported value of burglary property.)

WORKSHEET
WALK-THROUGH B, PART B
CONSTRUCTING HYPOTHESES
(Continued)

RELATING CONCEPTS	RELATING VARIABLES	RELATING MEASURES
3.4 1. The magnitude of auto theft varies by geographical area of the city.	a. The frequency of auto theft varies by area of the city.	1) The number of auto thefts varies by the city's planning communities.
	b. The risk of auto theft varies by area of the city.	1) The proportion of autos stolen to autos registered varies by the city's planning communities.
3.4 2. The magnitude of auto theft varies by parking environment.	a. Auto theft from parking lots and garages is greater than from open streets.	1) The percentage of auto thefts from parking garages and lots is greater than the percentage of auto thefts from streets.

WORKSHEET
WALK-THROUGH B, PART B
CONSTRUCTING HYPOTHESES
(Continued)

RELATING CONCEPTS	RELATING VARIABLES	RELATING MEASURES
3.5 Auto theft is deterred by reducing the opportunity to vehicles.	a. Locking autos deters auto theft.	1) Locked cars are stolen less often than unlocked cars.
	b. Autos with improved security systems are stolen less often than vehicles without improved security.	1) For vehicles manufactured after the implementation of Standard 114 the percent that are stolen is less than the percent stolen of autos manufactured before the implementation of Standard 114.

WORKSHEET
WALK-THROUGH B, PART B
CONSTRUCTING HYPOTHESES
(Continued)

RELATING CONCEPTS	RELATING VARIABLES	RELATING MEASURES
3.6 Characteristics of motor vehicle theft	a. The rate of vehicle theft is the same for all vehicles.	1) None provided.
	b. The rate of vehicle theft from parking lots is the same for all vehicle types.	1) The percent of trucks, motorcycles and cars stolen from garages and lots is the same.
	c. The recovery rate is the same for all types of vehicles.	1) The percent of stolen trucks, motorcycles and autos recovered is the same.

WORKSHEET
WALK-THROUGH B, PART B
CONSTRUCTING HYPOTHESES
(Continued)

RELATING CONCEPTS	RELATING VARIABLES	RELATING MEASURES
3.7 The majority of vehicle suspects.	a. The majority of auto theft suspects are amateur thieves.	1) Because most stolen vehicles are not resold or stripped, most suspects are amateur thieves.
3.8 Auto thieves are young.	a. More auto theft suspects are juveniles than adults.	1) The percentage of juvenile auto theft suspects is greater than the percentage of adult auto theft suspects.
	b. More persons arrested for auto theft are under 21 than over 21 years of age.	1) The percentage of persons under 21 arrested for auto theft is greater than the percentage of persons over 21 arrested for auto theft.

NOTES

IV. RELATIONSHIP OF PROBLEM SPECIFICATION TO THE PROBLEM STATEMENT

A. The difference between a concern and a problem.

1. Concerns frequently are:

a. Hunches based on limited observation.

b. Conclusions drawn from incomplete, unrepresentative and/or unreliable data.

c. Reactions to symptoms.

2. Problems are:

a. Conditions that deviate from a norm or standard that is acceptable in a given community.

b. A conclusion that is based on representative and reliable information.

c. Generally caused by factors that are not readily apparent.

B. Importance of a Problem Statement:

1. The complexity of most criminal justice problems requires a fairly rigorous and iterative analysis in order to describe, draw conclusions about and understand the primary causes.

2. Because problem analysis may be intricate, may use large amounts of data, and often involves statistical computations, it is important that the problem statement have an easily understood structure and be focused on important concerns. Problem specification helps to achieve these objectives of analysis. Consequently, problem statements that are developed using this process are more likely to have an impact on decision making.

NOTES

C. In this course the term Problem Statement has a very specific meaning. In effect, one of the primary purposes of the course is to provide instruction and limited practice in the development and production of the problem statement.

D. Definition of a Problem Statement: A written document or oral presentation which comprehensively describes the nature, magnitude, seriousness, rate of change, persons affected, spatial and temporal aspects of a problem using qualitative and quantitative information. It identifies the nature, extent, and effect of system response; makes projections based on historical inferences, and rigorously attempts to establish the origins of the problem.

Instructor Note: Make sure participants understand this definition.

V. CONCLUSION

A. The quality of a Problem Statement may be threatened by inadequate problem specification.

1. The problem statement may not accurately represent actual or "real" concerns.

2. The concepts and measures used may not be valid.

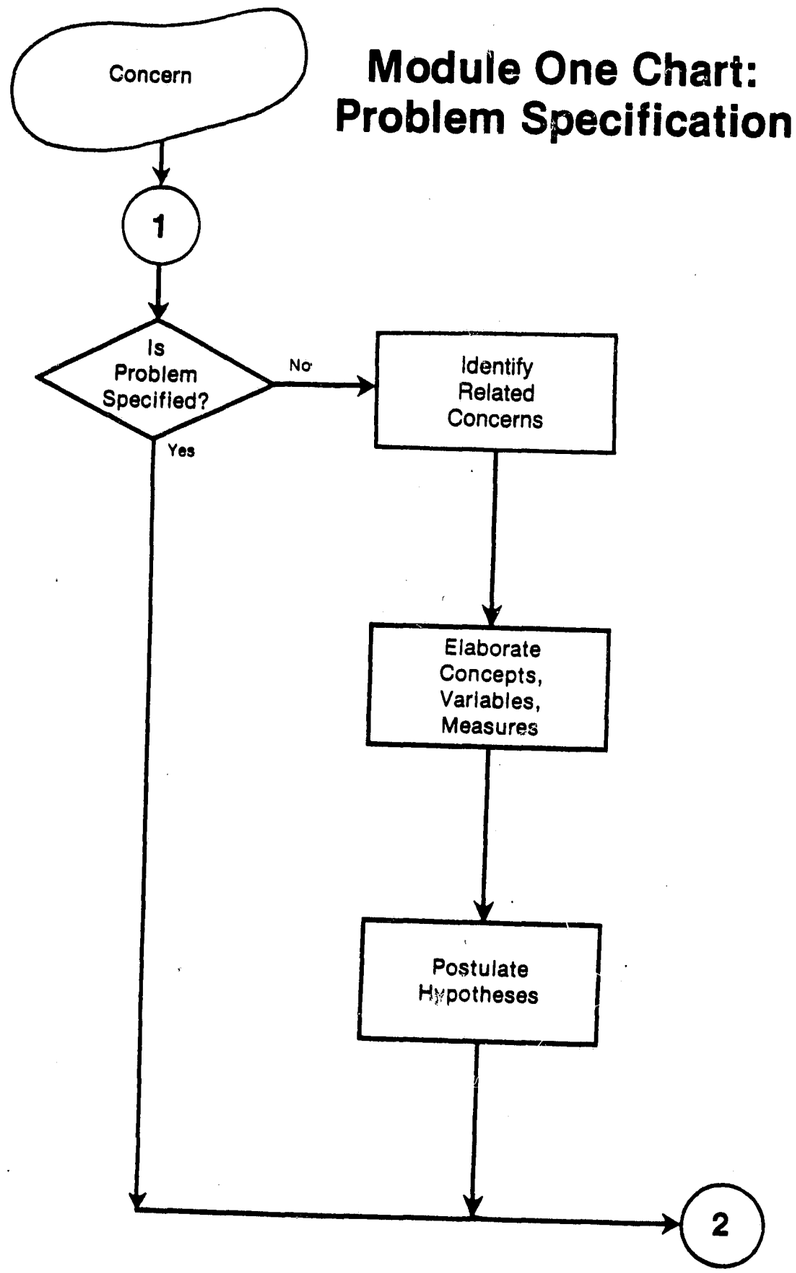
3. The problem statement may be based on illogical relationships.

4. It may not use important conceptual relationships to drive the analysis.

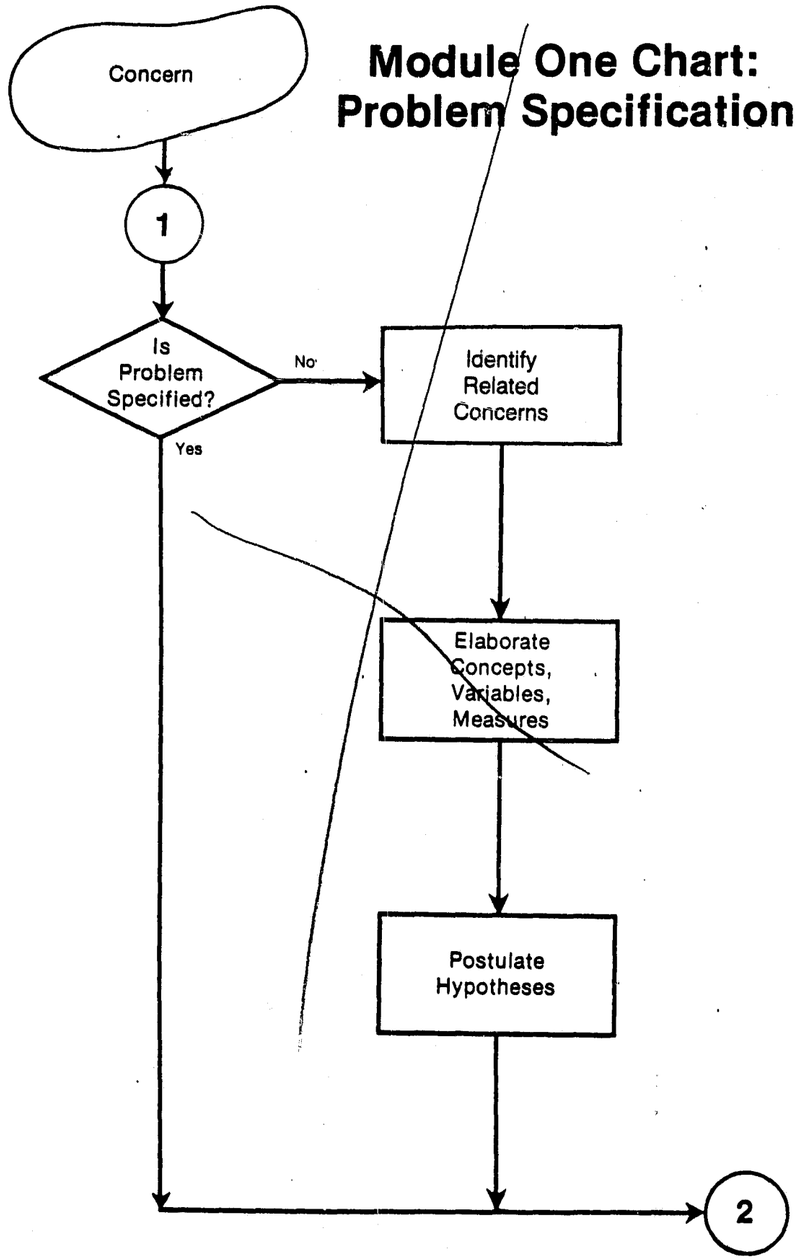
5. It may not make good use of the best existing or easily obtained data

B. Go over the module flowchart. Emphasize the critical evaluation and elaboration of concerns using the process of problem specification.

SHOW V.A. (1-5):



SHOW V.A. (1-5):



MODULE 2
DATA SYNTHESIS

Module 2 establishes a foundation for measuring and obtaining data for specified variables. The module is divided into four distinct sections: (1) measurement, (2) assessing hypotheses, (3) sources of data, and (4) planning a data collection effort.

The data collection portion of the module consists of Walk-Through 'C' - Preparing a Data Collection Plan (optional). The portion of the module dealing with the evaluation of postulated hypotheses provides an opportunity for summarizing much of the material contained in Module 1. Since Task #2 of the Major Exercise is also an evaluation of hypotheses, this last section of the module has added importance.

OBJECTIVES

1. To describe Types and Extent of Measurement Error.
2. To assess Hypotheses.
3. To systematically plan a Data Collection Effort.
4. To distinguish between Secondary and Primary Data.
5. To identify and describe Seven Methods of Data Collection.
6. To understand the Six Types of Secondary Data Used in Criminal Justice Analysis.

SCHEDULE - MODULE 2
DATA SYNTHESIS

TIME ALLOCATION

TOPIC	TIME	PAGE
I. MEASUREMENT	10 minutes	II-3
A. Definition	*	II-3
B. Measurement Accuracy	*	II-4
C. Factors Influencing Accuracy	*	II-5
II. ASSESSING HYPOTHESES	20 minutes	II-8
A. Criteria - Individual Hypotheses	10 minutes	II-8
B. Criteria - Set of Hypotheses	10 minutes	II-10
C. Example	*	II-11
III. DATA SOURCES	25 minutes	II-11
A. Alternative Sources	10 minutes	II-11
B. Methods of Data Collection	15 minutes	II-13
IV. PLANNING FOR DATA COLLECTION	30 minutes	II-18
A. Data Collection Plan	*	II-18
B. Example	*	II-18
Walk-Through 'C' DATA COLLECTION PLAN (Optional)	30 minutes	II-19
V. CONCLUSION	5 minutes	
A. Module Chart	*	II-24
B. Review Schedule	*	II-24
TOTAL TIME	90 minutes	

* Less than 5 minutes

NOTES

I. MEASUREMENT

A. Definition:

Measurement is the process of assigning observable qualitative or quantitative indicators to objects or events according to rules.

1. The assignment rules must specify exactly how to measure, when to, what to, who to, etc. It is the quality of the rules that makes the difference between "good" and "poor" measurement. For example, typically with crime data the rules of measurement are legal definitions based on behavior.

2. There is, and will continue to be, a varying debate over what can and cannot be measured. There are at least two extreme schools of thought on the matter.

   a. One takes the point of view that if you cannot measure something, you're not at all sure what it is that you want to measure.

   b. The other takes the point of view that if you think you can measure something -- then that's not it.

NOTES

B. Measurement Accuracy

1. The criteria used to determine the accuracy of a measure are its validity and reliability.

2. Definition: "Validity is the degree to which measures are true or accurate indicators of the variables they are thought to indicate."

   For example, in self-reported delinquency data, validity tests have included the following:

   a. Asking kids to indicate awareness of unlawful behavior of other youths.

   b. Laboratory testing of cheating.

   c. Asking teachers to report on a child's behavior.

   d. Cross checking available arrest records.

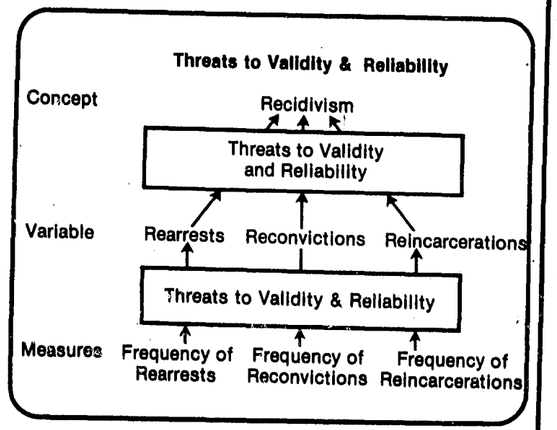
3. Definition: "Reliability is the degree to which measures are dependable or consistent indicators of a variable from one time to another or from one sample to another." Reliability is easier to determine than validity. It is possible to have very reliable measures which are not valid. Poor reliability threatens (or casts doubt on) validity but good reliability does not assure validity.

   For example, in self-report crime data, a typical test of reliability is to test and then retest the individual. Similar responses which are alike after two weeks suggest a high reliability of the measure.

NOTES

C. Factors Influencing Measurement Accuracy

SHOW V.A. (2-1):



EMPHASIZE (2-1)

+ Three types of threats: conceptual, technical and management

1. Conceptual Factors that Influence the Validity and Reliability of Interpretations

   a. Between Concepts and Variables

      (1) Failure to Adequately Represent Concept with Selected Variable(s)

      (2) For example, rearrests is an inadequate variable to fully represent the concept of recidivism, in part, because of the potential discrimination against prior felons in arrest practices.

NOTES

b. Between Variables and Measures

(1) Failure to Adequately Represent Variables with Selected Measure(s)

(2) For example, frequency of rearrest does not make possible any distinctions in regard to types of criminal offenses for which prior felons were rearrested.

2. Technical Factors that Influence Validity and Reliability

a. Method of Collection

(1) Measurement Error in Self-Reported Crime Data

(a) Veracity/Concealment Problem

(b) Exaggeration Problem

(c) Memory Problem

(d) Not Practical for Studying Serious Offenses

(2) Measurement Error in Arrest Records

(a) Underestimate "Actual" Incidence of Crime

(b) Official data are more accurate as crimes get more serious.

b. Type of Measure Sought (Fact or Perception)

c. Source of Data, e.g., Administrative Record System, Public Opinion Poll, Census Document

d. Use of Sample or Census

NOTES

3. Management Factors that Influence Conceptual and Technical Threats to Validity and Reliability:

- Time

- Money

- Organizational Considerations

- Political Considerations

a. An example of management influencing the conceptual adequacy of the problem is that political constraints may make it impossible to obtain information on reincarcerations from the state corrections agency.

b. An example of management influencing the technical adequacy of the problem is in measuring rearrests, self-reported crime data may be too time consuming and/or expensive to be obtained.

c. Planning the data collection effort will help to improve measurement accuracy by reducing conceptual, technical and managerial threats to validity and reliability.

NOTES

II. ASSESSING HYPOTHESES

As indicated previously, the refinement of concerns into concepts, variables, and measures usually produces many, rather than just one, hypotheses. Since many hypotheses may be constructed from a single concern, the analyst must identify the most appropriate hypotheses for subsequent analysis.

A. Criteria for Assessing an Individual Hypothesis

SHOW V.A. (2-2):

CRITERIA FOR ASSESSING A HYPOTHESIS

- Measurement Accuracy
- Data Availability
- Testability
- Utility

NOTES

1. Measurement Accuracy

   a. Possibly the most important criterion of a good hypothesis is whether the analyst can measure the variables stated in the hypothesis.

   b. Consider the statement, "There's a direct relationship between population increase and the incidence of armed robbery." Without good demographic data to describe population increase, the analyst can't test the hypothesis.

   c. Even if variables can be measured, the hypothesis may be of questionable merit if the measures are unreliable or invalid.

   d. This criterion requires the application of an understanding of measurement, measurement error, data source, and data collection.

2. Data Availability

   a. Can all appropriate data be made available? Is there sufficient time, money, manpower, and technical capability to obtain appropriate data?

   b. Are there ethical, legal, or political constraints on data availability?

3. Testability

   a. Given the available data, is it possible to describe, compare, and make generalizations about the concerns?

   b. Is it possible, given the available data, to establish cause and effect relationships?

c. Stating hypotheses in their simplest form and avoiding, when possible, complex multi-factor evaluations will assist in making a hypothesis testable.

4. Utility

a. Can the decision-makers affect the independent variables which have been identified?

b. Are the hypotheses plausible and easily communicated?

B. Criteria for Assessing a Set of Hypotheses

1. Once the proposed hypotheses have been assessed using the criteria of measurement accuracy, data availability, testability and utility then the comprehensiveness of the remaining set of hypotheses should be considered.

2. Hypotheses used to develop a comprehensive problem statement should include, as appropriate, consideration of the following seven characteristics:

- Magnitude: Size, extent and/or importance of a problem.

- Rate of Change: Comparison of a problem in an earlier period of time to a later period.

- Temporal Aspects: Cyclical nature or seasonality of the problem.

- Seriousness: Amount of harm a problem inflicts on a community or person.

- Persons Affected: Considerations of the Victim, Offender, and/or Public related to the problem.

- Spatial Aspects: The geography of the problem.

- System Response: Activities, programs, policies related to the problem.

3. Before beginning to collect and interpret data, it is necessary to consider the comprehensiveness of the problem specification. These characteristics can be used to help select the most appropriate hypotheses to pursue.

C. Example of Assessing Hypotheses

Indicate that Task #2 of the Major Exercise will provide an opportunity for participants to apply these assessment criteria.

III. DATA SOURCES

A. Alternative Data Sources

1. Primary Data:

Definition: Primary data are those data which must be collected for a particular analysis effort. These data generally are not currently available in easily useable form but can be obtained by conducting surveys and polls or from records and reports.

2. Secondary Data:

Definition: Data which have already been collected in conjunction with other analyses and are currently in easily useable form. Secondary data are usually presented in aggregated form and can be obtained from:

- National Crime Panel
- Uniform Crime Reports
- Census Reports/Tapes
- Offender Tracking Reports
- Expenditure Reports

NOTES

3. Secondary Data Sources

SHOW V.A. (2-3):

TYPES OF SECONDARY DATA

1. "Actual" Crime Data
2. Reported Crime Data
3. Public Opinion Data
4. Demographic Data
5. Systems Data
6. Juvenile Data

a. "Actual" Crime Data

(1) These data are indicators of the types and magnitude of crime.

(2) EXAMPLE: The National Crime Panel and local victimization surveys.

b. Public Opinion Data

(1) These data are the perceptual or subjective indicators of crime or criminal justice services.

(2) EXAMPLE: National public opinion polls, political polls, local newspapers, also found in victimization surveys.

NOTES

c. Reported Crime Data

(1) These data are official "crime statistics" on reported offenses and arrests.

(2) EXAMPLE: Local police department records, state UCR, special study reports that may be developed by state or regional criminal justice planning agencies.

d. Demographic Data

(1) These are population statistics which refer to size, density and distribution of vital events, such as births and deaths.

e. System Data

(1) These data are statistics which relate to the organization and operation of the criminal justice system.

(2) EXAMPLE: Offender Based Transaction Statistics, management and administrative statistics and budget documents.

f. Juvenile Data

(1) These are data on various forms of juvenile behavior including criminal acts, quasi-criminal acts, and non-criminal behaviors.

(2) EXAMPLE: Juvenile department reports, local police department reports, school records, juvenile court records, state child service agency records, federal data.

4. Factors Influencing the Selection of Primary and Secondary Data

   - Are there critical missing measures for the postulated hypotheses that require primary data?
   - Is measurement error in secondary data sources of sufficient magnitude and concern to warrant primary data for which measurement error can be controlled?
   - What time and resource constraints exist?

B. Methods of Data Collection

1. Six Methods of Data Collection

Instructor's Note: Quickly go over the six methods of collecting data, identifying their differences and giving examples of the more frequently used techniques.

The first three methods are usually associated with collection of primary data.

a. Field Research

Direct observation of an agency, process or procedure, e.g., Peter Manning's work on police, Police Work: The Social Organization of Policing

b. Experiments

Taking action by changing a process, activity or organization and observing the consequences of the change, e.g., Kansas City Preventive Patrol Experiment

c. Survey Research

Collecting responses to questions asked during a sample or census of individuals or groups, e.g., Surveying Crime, National Research Council, National Academy of Sciences, 1977, and Marvin Wolfgang's research on Delinquency in a Cohort

1) Three frequently used types of surveys:

   a) Personal Interview.

   b) Telephone Interview.

   c) Mailed Questionnaire.

2) Exhibit 1 summarizes comparative advantages/disadvantages for these three types of surveys. Participants may wish to use this as a reference. While the participants may disagree with the conclusions of the authors, the process of answering the criteria questions may be of great value in selecting a survey approach.

d. Content Analysis

Systematic Study of Books, Articles and Documents.

e. Historical Research

Reconstruction of prior events to explain specific consequences, e.g., Roger Lane, "Victimization and Criminal Violence in the Nineteenth Century: Massachusetts as a Test Case," (Journal of Social History, Winter, 1968, pp. 156-163).

NOTES

f. Simulation Modeling

Simulation modeling is based on knowledge of the criminal justice system and/or criminal behavior, the construction of a computerized or non-computerized version of the processes. This model can then be observed and altered to simulate reality, e.g., Jan Chaiken, Criminal Justice Models: An Overview? (Rand, 1975). The work of AT Blumstein on JUSSIM and JUSSIM II.

Exhibit 1. A Comparison of Three Survey Methods

CRITERIA	PERSONAL INTERVIEW	MAILED QUESTIONNAIRE	TELEPHONE INTERVIEW
Inexpensive	no	yes	yes
Random sampling generally feasible	no	no	with RDD*
Entire spectrum of the population potentially contactable	yes	no	no
Sampling of special populations	yes	with list	sometimes
Easy to cover large geographic area	no	yes	yes
Control over who is actual respondent	yes	no	yes
High response rate	sometimes	no	yes
Easy call-backs and follow-ups	no	no	yes
Long interviews generally possible	yes	sometimes	sometimes
Explanations and probings possible	yes	no	yes
Visual materials may be presented	yes	yes	no
Nonthreatening to respondent	no	yes	yes
Interviewer can present credentials	yes	yes	no
Safe for interviewers	no	N.A.	yes
Easy supervision of interviewers	no	N.A.	yes

Source: Tachfarber, Alfred J.; Klecka, William R.; Random Digit Dialing: Lowering the Cost of Victimization Surveys; Police Foundation, 1976.

* Random Digit Dialing

NOTES

IV. PLANNING FOR DATA COLLECTION

A. The development of a data collection plan should address these issues:

- questions to be answered
- measures
- data sources
- collection methods
- assessment
- other collection requirements
- resource requirements

B. An example of using these considerations in planning a data collection effort is illustrated in Walk-Through C. (Note: This Walk-Through is optional based on the needs of the participants and timing.)

DATA COLLECTION PLAN (OPTIONAL)

PURPOSE

This walk-through is intended to involve participants in considering the process of preparing a data collection plan.

The Chaos Crime Planning Board has decided that in 1978 and 1979 to concentrate attention on one of the four most common offenses (Burglary, Theft, Assault and Robbery) reported to the police in Chaos City according to the FBI's Uniform Crime Reports.

A study conducted by the State's Crime Analysis Bureau reveals the rates per 100,000 population for these four offenses for 1976 and 1977 in Chaos. The study also presents comparisons with Tranquility, another city of comparable size in the state.

What can you say about the Chaos City crime problem based on this data?

Using the provided worksheet discuss the development of a data collection plan.

INSTRUCTOR NOTES

A. Begin the walk-through by explaining that its purpose is to prepare the basic components of a data collection plan. Also identify the specifics of the problem being examined, i.e., crime in Chaos City.

B. Go over Table 1, of the Walk-Through and give the group five minutes to assess the data set.

C. Lead the participants through the answer to the question concerning the Chaos City crime problem using Table 1.

Note: The data indicate that the crime most frequently reported to police in Chaos City in both 1976 and 1977 was burglary. Burglary accounted for 42.9% of the total of the four crimes in 1976 and 45.7% of the total of the four crimes in 1977. Burglary not only was the most reported crime but also showed the highest rate of increase between 1976 and 1977 - 18.7%.

D. Tell the participants they need to consider additional data to adequately address the concern expressed by the Chaos Crime Planning Board. Go over Table 2 and then turn to the worksheet. Discuss questions 1-7 on the worksheet. Relate these questions to the characteristics of a problem statement. Discuss the column tables and relate them to Table 2.

E. Have the participants look at Question 1 on the worksheet and suggest additional measures, data sources, collection methods, measurement accuracy, other collection requirements and resource requirements. Have them add to their worksheets as you proceed with the discussions. Do the same for each of the remaining questions on the worksheet. Refer to the Management Checklist in Table 2 throughout the Walk-Through.

F. Keep up a brisk pace going through the worksheet so that all the items are covered within the 30 minutes allotted for this walk-through.

DEBRIEFING

Stress how planning the data collection effort can improve measurement accuracy by minimizing conceptual, technical and managerial sources of error.

DATA SET

Table 1. State of Paradise, Four Crimes Reported to Police Most Frequently in Chaos and Tranquility, 1976 and 1977. (Per 100,000 population)

Crime Type	1976		1977	
	Chaos	Tranquility	Chaos	Tranquility
Burglary	1908	1201	2263	1363
Theft	872	1014	896	1052
Robbery	912	898	991	1054
Assault	761	521	807	533

Source: State of Paradise, Crime Analysis Bureau, 1978.

WALK-THROUGH 'C'

Table 2. Management Checklist for Data Collection

1. Determine Measures to be Used for Each Variable
2. Identify Major Categories of Needed Data
   a. Is appropriate data available?
   b. Is additional data required?
3. Identify and Assess Data Sources
   a. Will these data permit adequate interpretation of the hypotheses?
   b. Are the data reliable?
   c. Can they be obtained in time?
   d. How many data are required to clarify a problem?
   e. What is the most inexpensive data source?
4. Select Best Data Source
5. Identify Data Collection Methods
6. Determine Strengths/Weaknesses of Alternative Data Collection Methods
7. Select Best Data Collection Method
8. Consider Additional Requirements (If Applicable)
   a. Identify Authorization Requirements
   b. Identify Coding Requirements Process
   c. Develop Sampling Requirements
   d. Develop Instrument Requirements
   e. Develop Data Conversion Requirements
9. Determine Resource Needs

WALK-THROUGH 'C'

Table 3. Worksheet

Questions to be answered	Measures	Data Sources	Collection Method	Measurement Accuracy	Other Collection Requirements	Resource Requirements
1. What is the magnitude of the crime problem?	• rates of crime by type	• Data Set	N.A.			N.A.
2. What is the direction and magnitude of the rate of change in the crime problem?	• rates of crime by type and year	• Data Set	N.A.			N.A.
3. How serious is the crime problem?	• weighted frequency of crime by type and year	• Offense Reports	Secondary Data Analysis	• Measurement error • Disaggregation		Little
4. In what areas of Chaos City is the incidence of crime the highest?	• frequency and rates of crime type and area of the city	• Arrest Reports • Census Maps	Secondary Data Analysis	• Measurement error • Disaggregation		Little
5. What is the Chaos City Police Departments/Courts capability for dealing with this problem?	• resource data • manpower allocation data • laws and regulations	• Agency Records • City Council Records • PROMIS	Secondary Data Analysis Simulation/Model	• Measurement error	• Secure Clearances and Authorization for Agency Heads • Estimating parameter • Initial values	Little Moderate
6. Who in Chaos City has been most seriously victimized and affected by the crime problem?	• victimization data	• victim survey • self reports	Survey Survey		• instrument • surveying • coding/editing data	Expensive
7. What are the possible causes of the crime problem?	• social, economic and demographic data • deterrence data • incident/victim/offender data	• Census Records • Victim Survey • Agency Records	Secondary Data, Analysis, Survey Secondary Data Analysis	• Measurement error		Little Expensive

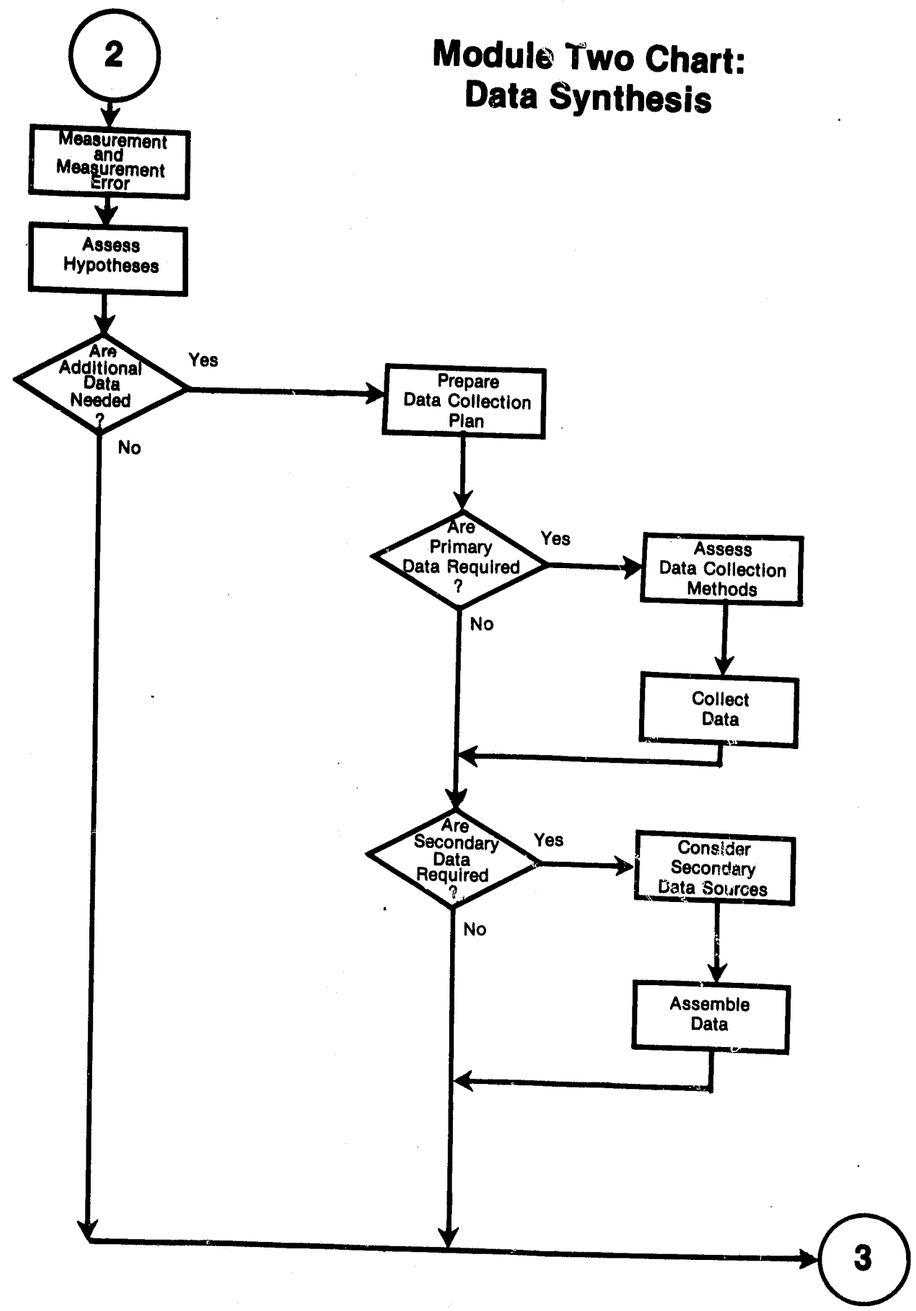
NOTES

V. CONCLUSION

A. Refer participants to the module chart and quickly review the module. Ask whether there are questions about the content of Modules 1 or 2.

B. Indicate the schedule for the afternoon and show how it relates to the morning's activities. In Task #1 of the Major Exercise participants are required to specify a problem, and in Task #2 they are asked to assess the developed hypotheses.

SHOW V.A. (2-4):



Module Two Chart: Data Synthesis

MODULE 3
DESCRIPTIVE METHODS

Modules 3, 4, and 5 concentrate on tools -- descriptive, comparative, and inferential statistics -- needed for the interpretation of data. The emphasis is on developing statistical skills, on learning how the results of various calculations are used to interpret data, and on knowing when to use each tool.

The exercises and walk-throughs are designed to give practical opportunities for the participants to apply the knowledge and skills developed in this module.

Pacing is critical in Module 3 inasmuch as it is very elementary material. Instructors should make every effort to minimize time spent on the lectures in this module. In presenting the various statistical methods, instructors should emphasize practical applications, rules to follow in using the techniques and the interpretation of the results of statistical calculations.

Facilitators for the exercises and instructors should carefully pace the Exercises and Walk-Throughs. If the descriptive material is clearly understood by the audience, move through this section quickly; if a few individuals are having particular difficulty with the material, special efforts should be provided so that they can keep up with the group.

The material for this module covers basic descriptive statistics, the use of tables, graphs and charts, and concludes with a presentation of percent change.

Equipment needed for this module include protractors, graph paper, pencils and calculators for each of the participants.

OBJECTIVES

1. To understand the different levels of measurement and apply them to select appropriate quantitative methods.

2. To select, calculate and interpret:

   a. Mean
   b. Median
   c. Mode
   d. Frequency and Percent Tables
   e. Standard Deviation
   f. Percent Change

3. To select, construct and interpret:

   a. Pie Charts
   b. Bar Graphs
   c. Histograms
   d. Frequency Polygons
   e. Time Charts

SCHEDULE - MODULE 3
DATA INTERPRETATION -- DESCRIPTIVE METHODS

TIME ALLOCATION

TOPIC	TIME	PAGE
I. MEASUREMENT LEVELS	20 minutes	III-3
A. Determining Levels	10 minutes	III-3
B. Utility	10 minutes	III-6
II. STATISTICAL METHODS	80 minutes	III-6
A. Central Tendency	20 minutes	III-7
Walk-Through 'D' MEAN, MEDIAN, MODE	20 minutes	III-12
B. Variation	20 minutes	III-15
Walk-Through 'E' STANDARD DEVIATION	20 minutes	III-20
III. GRAPHICAL METHODS	55 minutes	III-23
A. Pie Charts	5 minutes	III-23
B. Bar Graphs	5 minutes	III-24
C. Histograms	5 minutes	III-25
D. Frequency Polygon	5 minutes	III-26
Exercise #1 GRAPHICAL METHODS	35 minutes	III-28
IV. TIME CHARTS/PERCENT CHANGE	15 minutes	III-34
A. Percent Change	*	III-34
B. Time Charts	*	III-35
C. Distorting Graphical Presentations	10 minutes	III-36
V. CONCLUSION	10 minutes	III-39
B. Descriptive Statistics	*	III-39
A. Review	*	III-39
TOTAL TIME	180 minutes	

* Less than 5 minutes

NOTES

I. MEASUREMENT LEVELS

A. Determining Levels of Measurement

1. The way we measure affects what we can do with our data once it has been collected. How much we know about the values observed determines the level. This is called the level of measurement.

2. When all we know about the values observed is that they belong to different categories, e.g., religions. the level of measurement is called nominal. The nominal level of measurement allows us to say that two observations are the same or different, once measured.

3. Ordinal level measurement is possible when we add information about the ordering or sequencing of the categories.

   a. Example: Police authority when measured by rank--sergeant, lieutenant, captain--may be considered an ordinal level measure.

   b. Example: Another example is the FBI's ten most wanted men/women. This list tells us that the most wanted is wanted more than the second but does not tell us how much more wanted.

4. If one additional piece of information is added about the size of the difference between each category, we have what is called interval level data.

   a. An example of an interval level measure is time.

   b. The size of the difference between the categories is meaningful. For example, six o'clock can be described as two hours later than four o'clock.

NOTES

5. The highest level of measurement, ratio scale, has all the properties of the interval scale plus it has a true and absolute or fixed zero point.

   a. Example: Examples of interval level measures are criminal justice expenditures, age, sentence length.

6. It is important to note that observed data, by itself, has no level of preordained measurement.

   a. Example: The number 6 could be:

      - label (box 6)
      - order (6th)
      - interval (6 degrees)
      - ratio ($6)

   b. Example: As a second example, type of weapon, which is usually measured on a nominal scale, could be ordered, to reflect how lethal a weapon it is (potentially or actually).

   c. The level of measurement used is as much a function of what we know about the concept we are measuring, as it is of our ability to measure.

7. Nominal data is typically referred to as qualitative or categorical. Ordinal, interval, and ratio are typically called quantitative.

8. Review this material using Exhibit 1.

Module 3
Exhibit 1. Measurement Scales

TYPE	LEVEL	DESCRIPTION	EXAMPLES	STATISTICS FREQUENTLY USED
Qualitative	Nominal	Data are placed in mutually exclusive and exhaustive categories.	Sex Race Type of Crime Type of Weapon	Tables of frequencies and rates Mode Pie Charts Bar Graphs Cross tabulation tables Chi square
Quantitative	Ordinal	Data are placed in mutually exclusive and exhaustive categories, ordered along a continuum according to a hierarchy.	Socio-economic status Ranks in law enforcement agency	
	Interval	Data are distributed along a continuum with established distances between points with no reference to an absolute zero.	Time Temperature Intelligence Quotient	Mean Median Range Standard Deviation Statistical Maps Histograms Time Charts Rates Pearson's r Regression Scattergrams
	Ratio	Data are distributed along a continuum with established distances between points with an absolute zero.	Age Years of Education	

B. Utility of Measurement Levels

1. Specifying the level of measurement dictates how we can interpret and compare observations on our data.

2. Examples:

   a. With ratio dollar loss data we can say a $500 average dollar loss is twice that of a $250 loss per crime.

   b. With dollar loss figures which are also interval, we can say that a loss of $100 is $75 more than a loss of $25.

   c. With ordinal data on formal authority in a police department, we can say that a captain has more formal authority than a patrol officer.

   d. With nominal crime type data we can say that a burglary is not an obscene phone call.

3. Different statistical techniques are appropriate for data at different levels of measurement. We can say more about data about which we know more in the first place. Because of this, the most powerful statistical techniques are appropriate only for the higher levels of measurement, interval and ratio data.

II. STATISTICAL METHODS

Note that there are two basic ways for statistically describing data: (1) central tendency and (2) dispersion.

Central tendency refers to identifying, in a single summary number, a "typical" case.

Dispersion refers to identifying how spread out a distribution of observed values is. A distribution is a list of data, produced by measuring a variable of interest, for more than one case.

A. Measures of Central Tendency

More than one way of representing what constitutes a "typical" or average case.

1. Mean

   a. The mean is the sum of all observed values, divided by the number of cases.

SHOW V.A. (3-1):

MEAN

SUM UP VALUES AND DIVIDE BY THE NUMBER OF VALUES.

$$\bar{X} = \frac{\Sigma X}{N}$$

$\bar{X}$ = MEAN

Σ = "SUMMATION" OR "SUM UP"

X = INDIVIDUAL VALUE

N = NUMBER OF VALUES

EMPHASIZE (3-1):

+ These symbols will be used throughout modules 3, 4, 5 and 6.

+ N = number of cases in the distribution

+ x = an observed value, one case from a distribution.

+ Σ = Sigma = summation symbol meaning to add together.

SHOW V.A. (3-2):

MEAN

EXAMPLE: MURDER RATES (PER 100,000 POPULATION) FOR FIVE WESTERN CITIES FOR 1971.

CITY	MURDER RATE (X)
SEATTLE	4
BOISE	5
SACRAMENTO	6
DENVER	8
SAN FRANCISCO	8
N = 5	$\Sigma X = 31$

$$\bar{X} = \frac{\Sigma X}{N} = \frac{31}{5} = 6.2 \text{ MURDERS}$$

EMPHASIZE (3-2):

+ Go through calculations
+ Summary measure of the "typical" observation
+ Allows comparison
+ Economically conveys information

b. The mean is appropriate only for interval or ratio level data because it makes use of information about the distance between each observation.

c. The mean is greatly affected by extreme values. If one additional case is added to distribution, for example 29, the mean will be:

$$\frac{\Sigma X}{N} = \frac{60}{6} = 10$$

The addition of one extreme case has yielded a mean, a "typical case", which is larger than all of the other cases in the distribution. The mean is still valid, but caution is required in its interpretation. One must always be on the lookout for extreme values.

d. The mean is useful as a standard for comparison.

2. Median

a. The median is the "middle" value of a distribution; i.e., there are an equal number of cases greater than and less than the median.

SHOW V.A. (3-3):

MEDIAN

WHEN CONTINUOUS DATA HAVE BEEN ORDERED OR RANKED (e.g., FROM LOW TO HIGH), THE MEDIAN IS THE MIDDLE VALUE.

CITY	MURDER RATES *	
Seattle	4	
Boise	5	
Sacramento	6	←MEDIAN
Denver	8	
San Francisco	8	

MDN = 6

Source: Sourcebook, 1976
*per 100,000

EMPHASIZE (3-3):

+ Median is the middle value.
+ Median of this distribution is .2 less than the mean which is 6.2.

SHOW V.A. (3-4):

MEDIAN

WHEN THERE ARE AN EVEN NUMBER OF VALUES IN THE RANKED LIST, THE MEDIAN IS THE ARITHMETIC MEAN OF THE TWO MIDDLE VALUES.

CITY	MURDER RATES*
Seattle	4
Boise	5
Sacramento	6
Denver	8

$$MDN = \frac{5+6}{2} = \frac{11}{2} = 5.5$$

Source: Sourcebook, 1976
*per 100,000

EMPHASIZE (3-4):

+ With an even number of cases there is no middle value.

+ Solution is the $\overline{X}$ of the two middle values.

b. Because, the median is the "middle" value of a distribution, it is typically used as a preferred measure of central tendency where there are extreme values in a distribution, for example, as in income.

c. The median is time consuming to calculate because it requires the distribution to be rank-ordered.

3. Mode

a. The mode is simply the most frequently occurring value in a distribution.

SHOW V.A. (3-5):

MODE

THE VALUE THAT OCCURS MOST FREQUENTLY.
THE MODE MAY BE USED WITH BOTH QUALITATIVE AND CONTINUOUS DATA.
MORE THAN ONE MODE MAY OCCUR IN A DISTRIBUTION.

CITY	MURDER RATES	
Seattle	4	
Boise	5	
Sacramento	6	
Denver	8	
San Francisco	8	MODE = 8

Source: Sourcebook, 1976
*per 100,000

EMPHASIZE (3-5):

+ Another summary measure of the "typical" case.

+ Contrast the three measures Mean = 6.2 Median = 6 Mode = 8

b. Unlike the mean and the median, the mode is always a real observed value. It is totally unaffected by extreme values.

c. The mode is the best measure of central tendency for nominal data. For interval or ordinal data it ignores all of the other information about the distribution of values in the data set.

d. In the example presented (V.A. 3-5), the mode is higher than all of the other observations in the data set. It is in a real sense, "typical," but the mode is limited in its usefulness.

MEAN, MEDIAN, MODE

PURPOSE

To show participants how to calculate measures of central tendency and to illustrate the effects of extreme scores on measures of central tendency.

The data set on murder rate (in three variations) are to be rank ordered and means, medians, and modes are to be calculated for each variation. This Walk-Through should last no longer than 20 minutes.

INSTRUCTOR NOTES

A. Tell the participants to follow the steps on their worksheet.

B. Go through the steps of (a) rank ordering the data, (b) calculating the mean, (c) calculating the median, and (d) calculating the mode for the data set.

C. Do the same for the variation where the Las Vegas data are left out.

D. Do the same for the variation where the Las Vegas data are left out and the Baltimore data is added.

E. Point out how the measure of central tendency can be altered significantly by addition or subtraction of data, as indicated in the given answers on the worksheet.

F. Explain significant decimal places and rounding off of numbers. How many decimal places is a matter of convention. For a data set like the one used in this Walk-Through, working with whole numbers, one or two decimal places in the answer is often used. Whatever convention established, be consistent.

G. There are rules for rounding. If the last digit you wish to use
- is less than 5, round down.
- is greater than 5, round up
- is exactly 5, round down if the next digit to the left is odd, round up if even.

H. Twenty minutes have been allotted for this Walk-Through.

DATA SET

City	Murder Rate (x)*
Boise	5
Denver	8
Las Vegas	18
Sacramento	6
San Francisco	8
Seattle	4

*Indicates per 100,000 inhabitants
Source: Sourcebook, 1976.

WORKSHEET

A. Rank-order the data.

City	Murder Rate (x)
Seattle	4
Boise	5
Sacramento	6
Denver	8
San Francisco	8
Las Vegas	18

B. Calculate the mean, median and mode.

1. Mean

$$\bar{X} = \frac{\Sigma X}{N} = 8.2$$

2. Median

Median = 7

3. Mode = 8

C. Leaving out Las Vegas, Rank-order the data.

City	Murder Rate (x)
Seattle	4
Boise	5
Sacramento	6
Denver	8
San Francisco	8

D. Calculate the mean, median and mode.

Mean

$$\bar{X} = \frac{\Sigma X}{N} = 6.2$$

Median = 6

Mode = 8

WORKSHEET Continued

E. Still leaving out Las Vegas, add the city of Baltimore (murder rate/100,000 inhabitants = 4)

F. Rank-order the data set.

City	Murder Rate (x)
Baltimore	4
Seattle	4
Boise	5
Sacramento	6
Denver	8
San Francisco	8

G. Calculate the mean, median and mode.

Mean

$\bar{X} = \frac{\Sigma X}{N} = 5.8$

Median = 5.5

Mode = 4, 8

DEBRIEFING NOTES

1. The mean is more useful than mode and median in advanced statistical analysis.
2. In small data sets the mode can be quite unstable.
3. In some data the scores do not tend centrally in a meaningful way. Rather than one measure several modes may be appropriate descriptions.
4. The mode is useful in studying characteristics of populations. For example, the mode describes the most typical case.
5. One or several extreme scores pull the mean away from the values which represents the majority of the cases. In this instance the median may be preferred.
6. Many statisticians suggest calculating all three values (mean, median, mode) in order to determine which value best describes the data.

WALK-THROUGH 'D'

NOTES

B. Measures of variation

Measures of variation provide information on how spread out a distribution is.

1. Frequency tables

SHOW V.A. (3-6):

TABLES OF FREQUENCIES AND PERCENTS

USED WITH DISCRETE OR QUALITATIVE DATA.
ALSO USED WITH CONTINUOUS DATA THAT HAVE BEEN GROUPED INTO CATEGORIES.

f = FREQUENCY OF CASES IN A CATEGORY

$\% = \frac{\text{NUMBER OF CASES IN A GIVEN CATEGORY}}{\text{TOTAL NUMBER OF CASES}} \times 100$

EMPHASIZE (3-6):

+ Frequency tables display the count of cases in each category.
+ Percentaging the frequencies allows us to standardize the frequencies to allow for easy comparison.

NOTES

SHOW V.A. (3-7):

TABLES OF FREQUENCIES AND PERCENTS

EXAMPLE:

TYPES OF ROBBERIES IN CHAOS CITY FOR 1974

TYPE	*f*	%
ROBBERY AND ATTEMPTED ROBBERY W/INJURY	5	33.3
ROBBERY AND ATTEMPTED ROBBERY W/OUT INJURY	10	66.6

$$\% \text{ FIRST CATEGORY} = \frac{5}{15} \times 100 = 33.3\%$$

Source: Hypothetical Data

EMPHASIZE (3-7):

+ Because of rounding error, percentages add up to 99.9 percent.
+ This is interpreted (the distribution of robbery in Chaos City with regard to injury), as meaning:

  (1) no injury in 66.6% of the cases.
  (2) injury in 33.3% of the cases.

NOTES

2. Range

SHOW V.A. (3-8):

RANGE

THE DIFFERENCE BETWEEN THE HIGHEST AND LOWEST VALUES IN A DISTRIBUTION OF CONTINUOUS VALUES.

RANGE = MAXIMUM VALUE – MINIMUM VALUE

EXAMPLE:

CITY	MURDER RATE
Seattle	4
Boise	5
Sacramento	6
Denver	8
San Francisco	8

RANGE = 8 – 4 = 4

Source: Sourcebook, 1976
*per 100,000

EMPHASIZE (3-8):

+ This is same data used to illustrate central tendency.
+ When reporting a range, also report the minimum and maximum values. Two distributions can have same range but vary widely in size.
+ Range emphasizes extremes and often is used to emphasize a point.
+ Range totally ignores non-extreme values.
+ May be used with mean, median, or mode.

NOTES

3. Standard Deviation

   a. Standard deviation is useful in describing interval or ratio data.

   b. Formula for Standard Deviation.

SHOW V.A. (3-9):

STANDARD DEVIATION

A COMMONLY USED MEASURE OF DISPERSION OR VARIABILITY IN A DISTRIBUTION OF CONTINUOUS DATA

$$SD = \sqrt{\frac{\Sigma (X - \bar{X})^2}{N}}$$

EMPHASIZE (3-9):

+ More than one formula can be used for the standard deviation.
+ Standard deviation is based on the mean.

NOTES

SHOW V.A. (3-10):

STANDARD DEVIATION

MURDER RATES FOR FIVE WESTERN CITIES

MURDER RATE* X	$X - \bar{X}$	$(X - \bar{X})^2$
4	− 2.2	4.84
5	− 1.2	1.44
6	− .2	.04
8	1.8	3.24
8	1.8	3.24
$\Sigma X = 31$		$\Sigma (X - \bar{X})^2 = 12.80$

$$\bar{X} = \frac{31}{5} = 6.2 \qquad SD = \sqrt{\frac{\Sigma (X - \bar{X})^2}{N}}$$

$$SD = \sqrt{\frac{12.80}{5}} = 1.6$$

Source: Sourcebook, 1976 *per 100,000

EMPHASIZE (3-10):

+ The sum of deviations from the mean always equals 0.
+ Squaring gets around this problem.
+ Variance is an important statistic; explaining the variance in a set of data is an important activity; inferential statistics is concerned with explaining variance.
+ A square root of the variance converts the "units squared" of variance to simple unit counts.

STANDARD DEVIATION

PURPOSE

To show participants how to calculate and interpret a standard deviation.

The data set on murder rate (in two variations) is to be rank-ordered and standard deviations calculated for each variation.

INSTRUCTOR NOTES

A. Tell the participants to follow the steps on their worksheet.

B. Go through the steps of (a) rank ordering the data, (b) finding the range, (c) calculating required values on worksheet, and (d) calculating the standard deviation for the data set.

C. Do the same for the variation in which the Las Vegas data is left out.

D. Briefly explain to the participants the reasons why the values of these measures of variation change so dramatically from one "sample" to the next, i.e., the sensitivity of the $\overline{X}$ and SD to extreme values in a distribution.

E. Twenty minutes are allotted for this Walk-Through.

F. When most of the participants have completed the Walk-Through, reconvene the class and review debriefing notes.

DATA SET

City	*Murder Rate (x)
Boise	5
Denver	8
Las Vegas	18
Sacramento	6
San Francisco	8
Seattle	4

*Indicates per 100,000 inhabitants.
Source: Sourcebook, 1976.

WORKSHEET

A. Rank-order the data.

City	Murder Rate (x)
Seattle	4
Boise	5
Sacramento	6
Denver	8
San Francisco	8
Las Vegas	18

B. Find the range. Range = 14

C. Develop worksheet and calculate required values.

X	$\overline{X}$	$X-\overline{X}$	$(X-\overline{X})^2$
4	8.17	-4.17	17.39
5	8.17	-3.17	10.05
6	8.17	-2.17	4.71
8	8.17	- .17	.03
8	8.17	- .17	.03
18	8.17	9.83	96.63

$\Sigma X = 49$ $\Sigma(X-\overline{X})^2 = 128.84$

$$\overline{X} = \frac{\Sigma X}{N} = 8.17$$

D. Substitute in formula: $SD = \sqrt{\frac{\Sigma(X-\overline{X})^2}{N}}$

$$SD = \sqrt{\frac{128.84}{6}} = 4.63$$

WORKSHEET (continued)

E. Leaving out Las Vegas, develop a new worksheet and calculate required values.

X	$\bar{X}$	X-$\bar{X}$	$(X-\bar{X})^2$
4	6.2	-2.2	4.84
5	6.2	-1.2	1.44
6	6.2	- .2	.04
8	6.2	1.8	3.24
$\frac{8}{31}$	6.2	1.8	$\frac{3.24}{12.80}$

F. Find the range: Range = 4

G. Find the Mean: $\bar{X} = 6.2$

H. Find the standard deviation:

$$SD = \sqrt{\frac{\Sigma (X-\bar{X})^2}{N}} = \sqrt{\frac{12.8}{5}} = 1.6$$

DEBRIEFING NOTES

1. A common error is to confuse $\Sigma X2$ and $(\Sigma X)2$. In the event a negative value occurs under the square root sign, these two terms are likely to have been confused.

2. A rule of thumb for estimating standard deviation is that the ratio of the range to standard deviation is rarely smaller than 2 or greater than 6. If your calculations produce a ratio outside of these values, this usually indicates an error has been made.

WALK-THROUGH 'E'

III. GRAPHICAL METHODS

Graphics can potentially convey enormous amounts of information in a very compact form with a clarity and force in a way which lists of data or tabular presentations cannot. Three basic types of graphical presentations for frequency distributions and percentaged data are presented:

a. Pie Charts
b. Bar Graphs
c. Frequency Polygons or Line Graphs

All of these graphic representations display frequencies and percentages in a way which makes comparison between categories easy, and have impact.

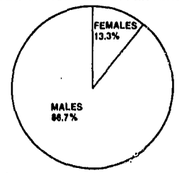
A. Pie Charts

SHOW V.A. (3-11):

PIE CHART

SEX	f	PROP	%	DEGREES
MALE	13	$\frac{13}{15}$ = 0.867	86.7	(0.867)(360°) = 312°
FEMALE	2	$\frac{2}{15}$ = 0.133	13.3	(0.133)(360°) = 48°

SEX OF ROBBERY OFFENDERS



N=15

Source: Hypothetical Data

EMPHASIZE (3-11):

+ Point out that male robbery offenders far outnumber female offenders.
+ Show the process of dividing up pie as illustrated.

CONTINUED

2 OF 14

NOTES

B. Bar Graphs

SHOW V.A. (3-12):

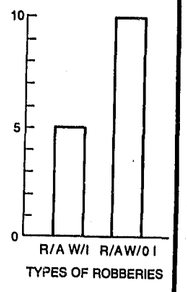
BAR GRAPHS

Used to portray qualitative data. A vertical or horizontal bar is used to represent the number of observations in a given category.

EXAMPLE:

TYPES OF ROBBERIES

TYPE	f
ROBBERY AND ATTEMPTED ROBBERY W/INJURY	5
ROBBERY AND ATTEMPTED ROBBERY W/OUT INJURY	10



Source: Hypothetical Data

EMPHASIZE (3-12):

+ Point out that the graph shows the relative size of each robbery category.

+ Demonstrate the process of constructing bars.

+ Rules for Constructing Bar Graphs:

  (1) Place categories along the horizontal axis; frequencies on the vertical axis.

  (2) For clarity of presentation, leave a space between each category bar.

  (3) Keep bars a uniform width and avoid an excessive number of categories.

NOTES

C. Histograms

SHOW V.A. (3-13):

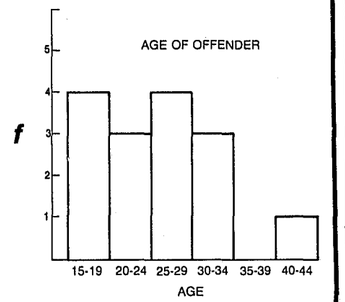
HISTOGRAM

A graphic representation of a grouped distribution

EXAMPLE:

AGE OF OFFENDER

AGE	f
15-19	4
20-24	3
25-29	4
30-34	3
35-39	0
40-44	1



Source: Hypothetical Data

EMPHASIZE (3-13):

+ Emphasize that with grouped data be cautious:

  (1) Collapsing or grouping data throws out information.

  (2) We lose all information about the distribution within each class by grouping data.

  (3) It's not clear if all of the 15-19 year olds are 19 or possibly 15 years old.

+ Point out the process for constructing a histogram consists of the following steps:

  (1) First, establish categories of the variable of interest.

  (2) Second, set up class limits of equal size. In this example, each class interval will be 5 years wide.

NOTES

(3) Finally, complete the grouping process by combining the frequencies or counting the number of cases falling into each category to be displayed.

+ The resulting histogram looks like any other bar graph, except that no space is left between the bars. This reflects the fact that continuous data is being used.

+ The histogram is drawn using apparent interval limits.

D. Frequency Polygons

SHOW V.A. (3-14):

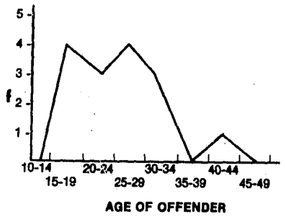
FREQUENCY POLYGON

A graphic representation of a grouped distribution using midpoints of categories with lines connecting the points of the graph.

EXAMPLE:

AGE OF OFFENDER

AGE	f	MIDPOINT
10-14	0	12
15-19	4	17
20-24	3	22
25-29	4	27
30-34	3	32
35-39	0	37
40-44	1	42
45-49	0	47



Source: Hypothetical Data

EMPHASIZE (3-14):

+ The information in a histogram can be represented in the form of a line graph called a "frequency polygon" by connecting the midpoint of each category.

+ The frequency polygon has the advantage of allowing the plotting of more than one distribution on the same set of axes. This facilitates comparison.

+ Provides a clear comparison for two or more frequency distributions.

NOTES

+ Easily communicates information about a large number of data points.

+ Emphasizes distribution as a whole.

+ Not for use with nominal data.

+ May lose its shape when a smaller number of intervals is used and when interval size is large.

+ Information is lost when data are grouped.

+ Intervals must be exhaustive.

+ Height may be misleading.

EXERCISE #1

GRAPHICAL METHODS

PURPOSE

To give participants an opportunity to practice constructing and interpreting tables, charts and graphs.

INSTRUCTIONS

Using the provided crime data, construct the specified graphs and figures. Be sure to completely label each graph or chart and prepare a one or two sentence narrative that highlights the findings of each chart or graph.

Specifically,

(1) For Race of Offender, Construct:

* A Frequency Table
* A Pie Chart

(2) For Type of Weapon, Construct:

* A Frequency Table
* A Bar Graph

(3) For Age of Victim, Construct:

* Complete the Grouped Data Table
* A Histogram
* A Frequency Polygon

INSTRUCTOR NOTES

A. Tell participants they will be using crime data to construct the three required tables.

B. Have them construct the first chart.

C. Have them finish constructing the remaining two graphs and then interpret each.

D. Participants will need protractors, graph paper, pencils, and calculators for this exercise. This equipment will be needed in succeeding exercises.

E. When most of the participants have completed the exercise, reconvene the class and review the debriefing notes.

F. Schedule:
Preparation - 5 min.
Activity - 25 min.
Debriefing - 5 min.

EXERCISE #1

EXERCISE #1 (Continued)

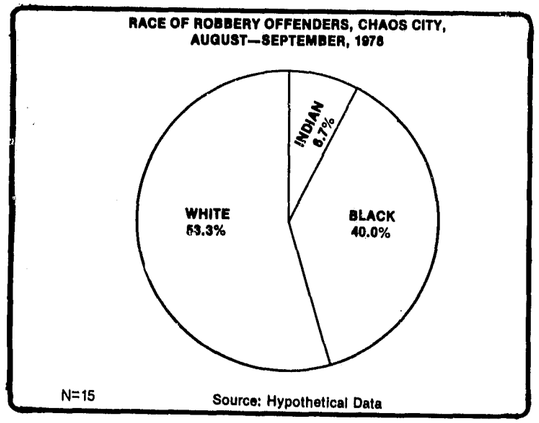
A. Race of Offender

1. Construct a Frequency Table.

Race of Offender	Frequency	Percent	Degrees
White	8	53.3	192
Black	6	40.0	144
Indian	1	6.7	24

2. Construct a Pie Chart.

SHOW ANSWER (Exercise 1-a):



EXERCISE #1

EXERCISE #1 (Continued)

B. Type of Weapon

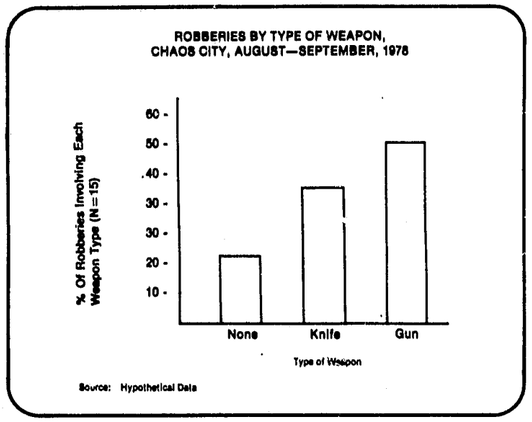
1. Calculate required values and complete the following table.

Weapon Type	Frequency	Percent
Knife	5	33.3%
Gun	7	46.7%
None	3	20.0%

Source: Hypothetical Data

2. Construct a Bar Graph.

SHOW ANSWER (Exercise 1-b):



EXERCISE #1

EXERCISE #1 (Continued)

C. Age of Victim

1. Examine the following grouped data table.

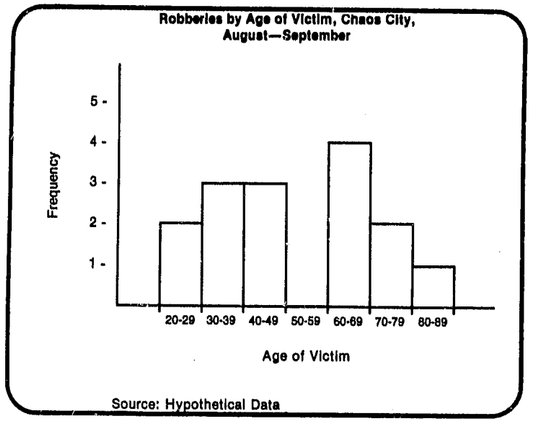
Age of Victim (Apparent Interval Limits)	Frequency
10 - 19	0
20 - 29	2
30 - 39	3
40 - 49	3
50 - 59	0
60 - 69	4
70 - 79	2
80 - 89	1
90 - 99	0

EXERCISE #1

EXERCISE #1 (Continued)

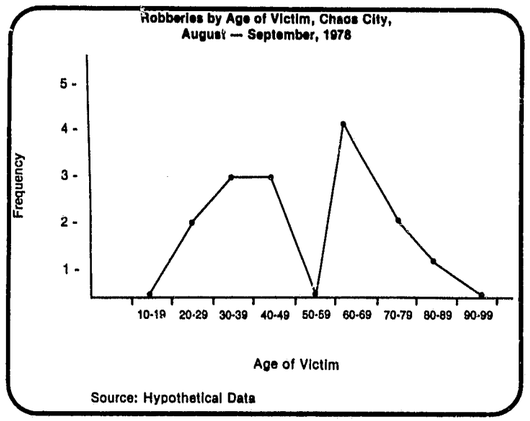
2. Prepare a histogram using the grouped data.

SHOW ANSWER (Exercise 1-c):



3. Prepare a frequency polygon using the grouped data.

SHOW ANSWER (Exercise 1-d):



EXERCISE #1

DEBRIEFING NOTES

1. Visual presentation help to make information easily understood.
2. Use circles (pie charts) when the different characteristics are all parts of a whole, e.g. race of offender.
3. A bar graph helps to compare different characteristics, e.g. type of weapon and percentage of robbery. Usually bars are arranged in order of size.
4. A histogram differs from a bar graph in that it displays continous data such as age of victim while the bar graph displays categorical data, such as weapon types.
5. Unequal intervals cause difficulty in examining visual content and in visually comparing the various aspects depicted.

EXERCISE #1

IV. TIME CHARTS AND PERCENT CHANGE

Module 3 concludes with the introduction of time as an important dimension for use in the description of crime data. Module 4 will add space and seriousness as two more important considerations. Change, or the lack of it, in crime rates across time is a major indicator that the criminal justice system responds to, and uses it (changes) as one indicator of its performance.

A. Percent Change

SHOW V.A. (3-15):

PERCENT CHANGE

$$\text{PERCENT CHANGE} = \frac{\text{CRIME IN LATER PERIOD - CRIME IN EARLIER PERIOD}}{\text{CRIME IN EARLIER PERIOD}} \times 100$$

EXAMPLE:

REPORTED ASSAULTS - 1970: 1128
1974: 1463

$$\text{PERCENT CHANGE} = \frac{1463-1128}{1128} \times 100 = 29.7\%$$

Source: Hypothetical Data
*per 100,000

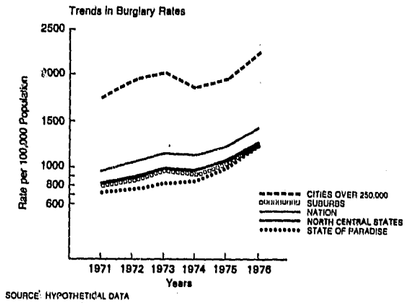
EMPHASIZE (3-15):

+ Basic to measuring change is the use of a percentage change measure.
+ This measure expresses the change from an earlier period as a percent of the value at earlier period.
+ There are other formulas for calculating percent change.

B. Time Charts

SHOW V.A. (3-16):

TRENDS IN BURGLARY RATES BY URBAN SIZE, UNITED STATES AND STATE OF PARADISE, 1971-1976

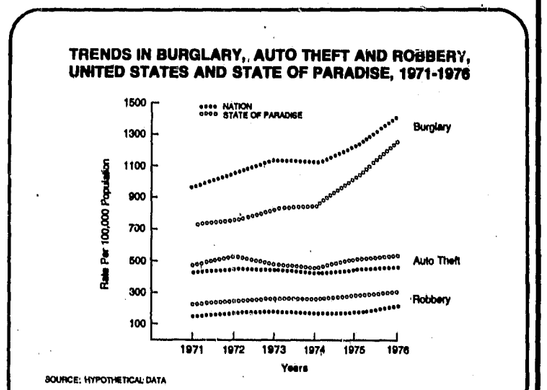


SOURCE: HYPOTHETICAL DATA

EMPHASIZE (3-16):

+ Trends in crime rates can be easily compared for different jurisdictions if the trends for each jurisdiction are plotted on the same set of axes.
+ Note the use of different kinds of lines to identify each jurisdiction.
+ Note that our hypothetical cities over 250,000 population have roughly twice the crime rate of the other jurisdictions, but its time trend follows the same basic shape as the other jurisdictions.
+ Point out what an "interrupted time-series" is using 1973 to illustrate.

SHOW V.A. (3-17):



EMPHASIZE (3-17):

+ Not only can several different jurisdictions be represented on a single graphic, but several different categories of crime can be represented at the same time.

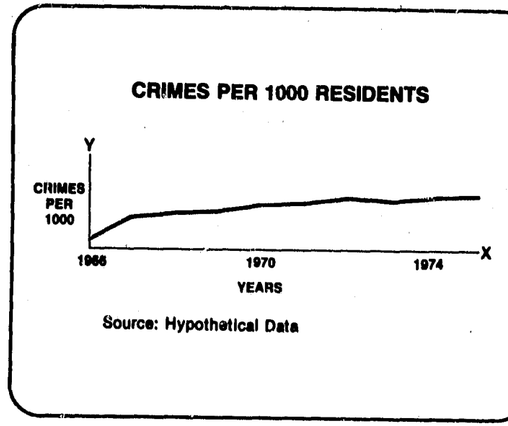
+ Note that the State of Paradise represented by the line made up of hollow circles has a lower burglary rate and higher auto theft and robbery rates than the nation, and that these rates of change remained constant between 1971 and 1976.

C. Distorting Graphical Presentations

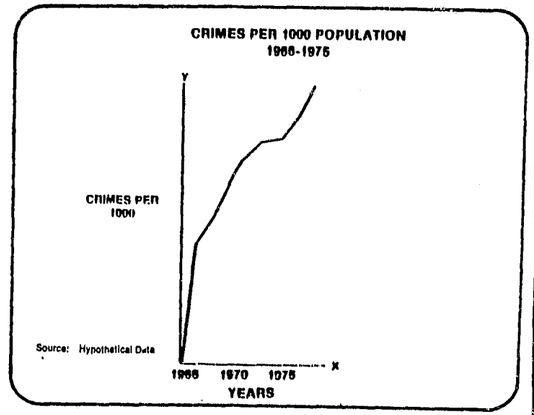
1. The 3/4 rule--Y axis should be between 75-100% of the X axis.

   The following two graphs illustrate violations of the 3/4 rule.

SHOW V.A. (3-18):



SHOW V.A. (3-19):



EMPHASIZE (3-19):

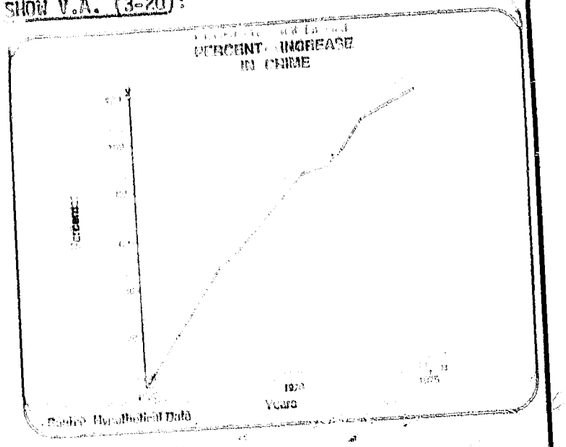
+ Beware of changing measurement definitions or techniques.

+ May require adjustments of data when using time intervals of different lengths.

NOTES

2. Another deceptive practice is to utilize percent change data without proper warning to the reader.

SHOW V.A. (3-20):



EMPHASIZE (3-20):

- Reference Huff's "How to Lie with Statistics."

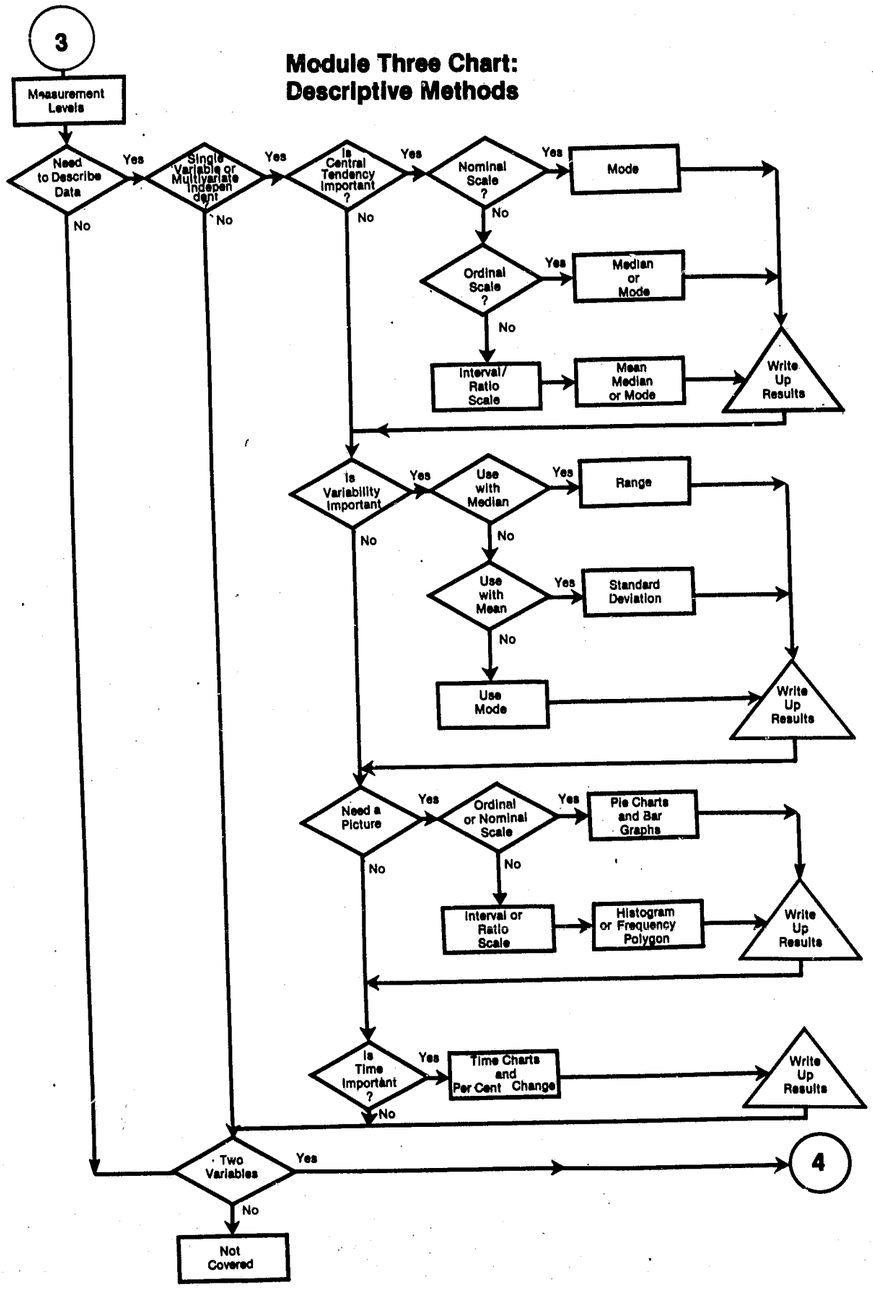
NOTES

V. CONCLUSION

A. In the actual conduct of analysis, as in the Major Exercise, the Task dealing with Descriptive Statistics should be done as a first step in interpreting the data. When presenting information to decision-makers, descriptive statistics are useful to summarize and communicate findings to decision-makers.

B. Refer to module chart and questions. Review the major topics. Indicate that Module 4 will provide tools for comparing variables, such as, time, crime rates, space, and seriousness.

SHOW V.A. (3-21):



MODULE 4
COMPARATIVE METHODS

Module 4 examines a number of comparative techniques used to describe crime and system problems. The module begins by presenting four basic indices, moves through a discussion of a seriousness index, discusses the use of cross classification tables and scattergrams, and concludes with a presentation of statistical maps.

OBJECTIVES

1. To summarize and compare variables using concentration, distribution, density, and unit share indices.
2. To explain and apply a seriousness scale.
3. To develop and interpret cross classification tables.
4. To prepare and explain a scattergram.
5. To explain what a statistical map is and identify spatial patterns in data.

SCHEDULE

COMPARATIVE METHODS

TIME ALLOCATION

TOPIC	TIME	PAGE
I. INDEX NUMBERS	25 minutes	IV-3
A. Definition	*	IV-3
B. Rates	5 minutes	IV-3
C. Four Types	10 minutes	IV-5
D. Comparative Analysis	*	IV-10
Walk-Through 'F' INDEX NUMBERS	10 minutes	IV-12
II. SERIOUSNESS WEIGHTING	60 minutes	IV-14
A. Need	5 minutes	IV-14
B. Sellin-Wolfgang Index	10 minutes	IV-15
C. Uses of Seriousness Scale	*	IV-18
Exercise #2 SERIOUSNESS	45 minutes	IV-19
III. CROSS CLASSIFICATION	30 minutes	IV-23
A. Purpose	5 minutes	IV-23
B. Example	5 minutes	IV-23
C. Percentaging a Table	5 minutes	IV-25
Walk-Through 'G' CROSS CLASSIFICATION TABLES	15 minutes	IV-26
IV. SCATTERGRAMS	20 minutes	IV-29
A. Definition	5 minutes	IV-29
B. Construction/Interpretation	5 minutes	IV-29
Walk-Through 'H' SCATTERGRAM	10 minutes	IV-30
V. STATISTICAL MAPS	10 minutes	IV-34
A. Importance	*	IV-34
B. Principals	*	IV-34
C. Spatial Characteristics	5 minutes	IV-36
VI. CONCLUSION	5 minutes	IV-41
A. Review	*	
TOTAL TIME	150 minutes	

* Less than 5 minutes

NOTES

I. INDEX NUMBERS

A. An index number consists of a:

$$\frac{\text{numerator}}{\text{denominator}}$$

It is a ratio of two measures.

B. Rates

1. The concept of rates is familiar to most criminal justice practitioners, e.g. crime rate, arrest rate, clearance rate, conviction rate, and recidivism rate. In fact, most of these notions are so well known that planners and analysts often fail to question the way that a particular rate is constructed or to examine carefully what a rate or index really measures and how it is applied. This is especially true of Part I Offenses.

   a. Example: As an example, crime rate is commonly distinguished from incidence in that the former represents a standardized version of the latter. That is, crime counts within a geographic unit are divided by the population of the unit (thus arriving at a rate per capita), and the result is multiplied by 100,000 or some other scaling factor to make the results somewhat easier to interpret. In this way, geographic units of different populations are made more comparable through a standardizing process.

NOTES

2. Deriving crime rates for populations at risk represents one way of achieving comparability.

   a. When this method is used for specific crimes, however, the meaning of "rate" is to be interpreted as a "risk" of victimization.

   b. Greater care must be taken in choosing the denominator which is used to calculate the rate.

   c. Example: In a calculation of the rate of forcible rape as a risk of being the victim of such a crime, the number of rapes reported could be divided by the number of females (in the age group where the event would be legally defined as rape) residing in the geographic unit, rather than by the total population.

   d. Example: Similarly, the risk of auto theft could be estimated by dividing the number of autos stolen by the number of autos that could be stolen i.e., the number of registered autos.

   e. The following denominators should be considered:

      Rape/Females
      Auto Theft/Cars
      Central City/population during day

3. While there is nothing inherently "wrong" in dividing the incidence of different types of crime by population (or area) to arrive at a rate, analysts should always be cognizant of what the result really means and how it is to be interpreted.

NOTES

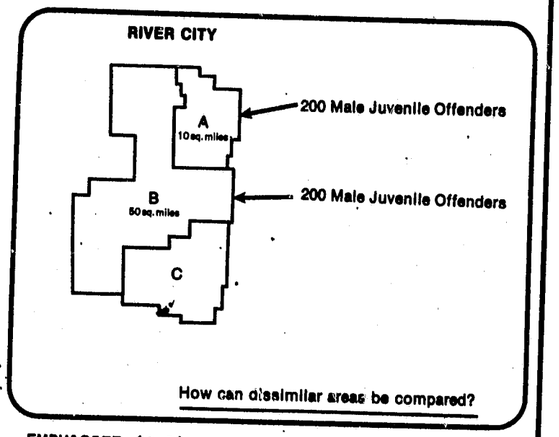
C. Four Types of Index Numbers

1. Density Index

   a. Definition: Density indices reflect population counts per unit area.

$$\text{Density Index} = \frac{\text{Number of Delinquent Juveniles in Chaos City}}{\text{Number of Square Miles in Chaos City}}$$

SHOW V.A. (4-1):



EMPHASIZE (4-1):

+ The density index enables dissimilar areas to be compared.

+ A = 20 male juveniles per square mile and B = 4 male juveniles per square mile.

+ The analysis of the problems related to criminal justice require spatial "standardization."

+ Different action might be taken if the number of juveniles involved, for example 200 reside in an area of five square miles than if they resided in a fifty square mile area. It is also possible that the nature of police operations would depend on the density of risk groups (e.g., male juveniles.)

NOTES

+ Another useful application is that of calculating commercial density such as liquor store robberies per square mile compared to number of liquor stores per square mile.

---

b. Density is particularly important for aggregate statistics, because it standardizes for size of area. Thus, political or administrative areas (e.g., states, counties, cities, police districts, and census tracts), can be converted to comparable units by means of a density index.

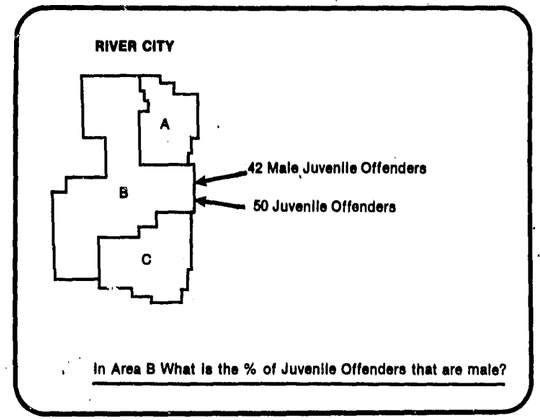
2. Concentration Index

a. Definition: A concentration index identifies what percent of a crime group (victims or offenders) has a particular crime characteristic.

$$\text{Concentration Index} = \frac{\text{Number of male Juveniles in Area B having delinquency petitions}}{\text{Total number of juveniles in Area B having delinquency petitions}}$$

NOTES

SHOW V.A. (4-2):



EMPHASIZE (4-2):

+ In Area B, 84% of juvenile offenders are male.

+ This index does not deal with risk groups but with those who have already become involved in crime as offenders or victim.

+ It is perhaps, the easiest type of index to construct because all the elements come from the same data source.

+ Construction of many criminal justice programs require break-out of information on sub-groups of the victim or offender population.

+ Example: In constructing a juvenile diversion program for a particular area it may be important to determine the percent of males and females so that programs could be designed accordingly. Or in the instance of liquor store burglaries in different regions of the city, it might be important to know what percent of the stores burglarized had a particular security system.

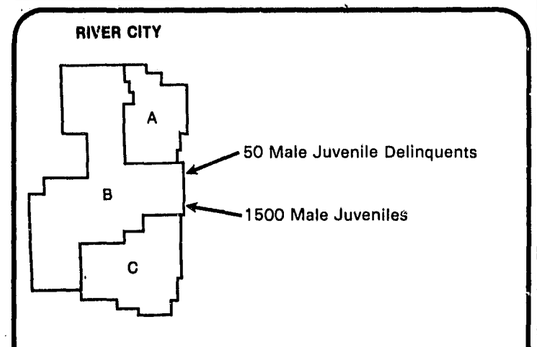
NOTES

3. Distribution Indices.

   a. Definition: A distribution index identifies what percent of the risk group reflects the crime problem.

$$\text{Distribution Index} = \frac{\text{Number of delinquent male juveniles}}{\text{Total number of male juveniles}}$$

SHOW V.A. (4-3):



EMPHASIZE (4-3):

+ Three percent of the male juveniles in Area B have been adjudged delinquent?

+ Two data sets are required as the number of delinquents could not be extracted from a census of male juveniles.

+ The appropriate risk group in this instance would be male juveniles.

+ Other risk groups other than juveniles could be studied, such as places-(liquor stores) or things-(autos).

NOTES

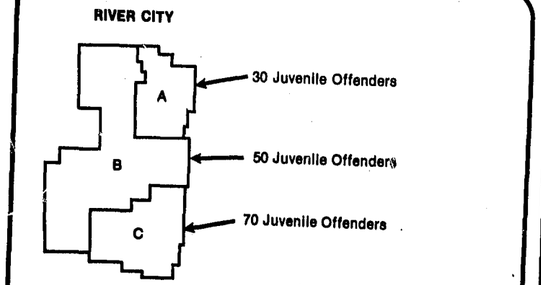
   b. This kind of measure is often useful for resource allocation and/or long-range planning.

4. Index of Unit Share.

   a. Definition: The index of unit share indicates what percent of the total region's crime problem occurs in a given sub-section.

$$\text{Index of Unit Share} = \frac{\text{Number of Delinquent Juveniles in Area B}}{\text{Number of Delinquent Juveniles in Chaos City}}$$

SHOW V.A. (4-4):



EMPHASIZE (4-4):

+ Area B contains 33 percent of the City's juvenile offenders?

+ These indices are commonly used by criminal justice planners in contrasting the share of crime in an area to that area's share of the population.

NOTES

5. Each of the four types of index numbers may be displayed pictorially as we have just seen. Usually, each geographic area is detailed in a particular density of shading which corresponds to the index value. Such pictorial presentations can be easily and quickly understood, thus are excellent tools in communication with decision-makers.

D. Comparative Analysis Using Index Numbers

1. Comparative analysis emphasizes the simultaneous assessment of crime data for many different jurisdictions. It can be done for jurisdictions within a state or for agencies within a metropolitan area. It can be extended by comparisons with crime figures for regional groupings of states or with the nationally aggregated portrait of similar-sized jurisdictions, such as cities 250,000 - 500,000 in population or suburban counties.

2. Data of this sort are provided each year in Crime in the United States. These publications can also be used to obtain data on other jurisdictions and SMSAs which analysts and decision-makers feel are similar to their own. By special request to the FBI, one can often obtain additional crime-specific data (e.g., proportion of crimes involving firearm use) for these juridictions.

3. Comparative analysis is often extended in two directions.

   a. First, victimization data may be introduced. These data allow the analyst to adjust in a rough manner for differences in city-to-city crime reporting. Detailed work with victimization data will also allow the planner to get a richer sense of the typical and not-so-typical characteristics of crime incidents in the local jurisdiction.

NOTES

   b. Second, comparative measures can be combined with time series data, a very powerful combination which remedies several of the weaknesses of each individual technique.

4. These additions to simple comparative analysis are extremely important; still, much can be gained from comparative work which lacks time, trend or reporting rate perspectives.

WALK-THROUGH 'F'

INDEX NUMBERS

PURPOSE

To illustrate the use of crime rate data to compare jurisdictions by using a ranking procedure. Review Table I and interpret the table by identifying extreme patterns. What are the strengths/weaknesses of this approach?

INSTRUCTOR NOTES

A. Explain Table I to the participant. Note ranking for frequency and rates.

B. Interpret Table 1 with participants. Note that the combined ranking is for burglary and larceny. This ranking can then be compared to the Index Crime Ranking.

C. Ask them to consider the strengths and weaknesses of this approach.

D. Ten Minutes are alloted for this Walk-Through.

E. When most of the participants have completed the Walk-Through, reconvene the class and review the debriefing points.

DEBRIEFING NOTES

A. Table I contains selected crime data for major cities within a state and gives them explicit ranks on two crime incidence and crime rate dimensions.

B. As an example, this sort of explicit ranking process may be used to determine eligibility for certain "anti-crime offensive" programs, or it may be incorporated into a formula for determining the contours of block grant fund distributions.

C. Statistics like these are particularly useful because significant differences in ranks may be observed over time and these may, in turn, give the analyst important hints about the nature of crime within the state or local jurisdiction which may lead to more successful crime prevention techniques.

D. Purpose of rates and indices is to make data comparable. Area X is more meaningfully compared to area Y and Year 1 to Year 2 with rates and indices -- data expressed as a ratio.

E. Time series comparisons using rates are powerful. For example, with rates it can be observed that not only is City X higher or lower than Y, but whether or not the two are getting closer together or further apart.

Table 1.
SELECTED CRIME DATA FOR CITIES - 25,000 POPULATION AND LARGER

		FREQUENCY		RATE		FREQUENCY RANK		RATE RANK		SUM OF FREQ.	SUM OF RATE	COMBINED FREQUENCY	COMBINED RATE
CITY	POPULATION	BURGLARY	LARCENY	BURGLARY	LARCENY	BURG.	LARC.	BURG.	LARC.	RANKS	RANKS	RANK	RANK
1.	648,412	8,649	16,984	1,333.9	2,624.1	1	1	7	7	2	14	1	6
2.	400,971	8,361	13,625	2,085.2	3,398.0	2	3	2	5	5	7	2	3
3.	394,497	8,011	15,941	2,030.7	4,040.8	3	2	3	3	5	6	2	2
4.	197,452	4,335	8,931	2,195.5	4,523.1	4	4	1	2	8	3	3	1
5.	170,854	1,641	3,380	960.5	1,978.3	7	7	9	8	14	17	5	7
6.	152,479	2,991	6,027	1,961.6	3,952.7	5	5	5	4	10	9	4	4
7.	126,766	1,334	1,859	1,199.1	1,710.2	8	9	8	10	17	18	7	8
8.	107,304	2,126	2,888	1,981.3	2,691.4	6	8	4	6	14	10	5	5
9.	95,325	1,313	4,346	1,377.4	4,559.1	9	6	6	1	15	7	6	3
10.	67,002	636	1,198	949.2	1,895.5	10	10	10	9	20	19	8	9

KEY: - Rate equals crime frequency divided by population expressed in 100,000
- Sum of Frequency Ranks equals Rank of Burglary Frequency plus Rank of Larceny Frequency
- Sum of Rate Ranks equals Rank of Burglary Rate plus Rank of Larceny Rank
- Combined Frequency Rank is the reranking of Sum of Frequency Ranks according to magnitude
- Combined Rate Rank is the reranking of Sum of Rate Ranks

SOURCE: United States National Criminal Justice Information and Statistics Service. Sourcebook of Criminal Justice Statistics 1977, by Michael R. Gottfredson (and others). Washington, D.C.: USGPO, 1978.

WALK-THROUGH 'F'

NOTES

II. SERIOUSNESS WEIGHTING

A. Need for a Seriousness Scale.

1. Weighting offenses according to seriousness is basically an effort to identify offenses that inflict a greater amount of harm on the community than others. A community's crime problem is linked to the serious offenses; these are what leaders would like to do something about. Therefore, they must be identified. A Seriousness Scale is an attempt to do that.

2. If an accurate measure of seriousness of the crime problem is desired -- analysis of the crime types is not sufficient.

3. Crime types are not sufficient for the following reasons:

   a. Crime types are nominal level data. Seriousness measures are interval level data.

   b. Crime types do not sufficiently provide information which the community can use to determine the level of seriousness.

   c. The UCR program relies on a scoring system in which multiple offenses and, with some types of crime, multiple victims are not recorded. Therefore, a great deal of detail is lost when classifying crime according to UCR rules.

4. A scale is needed that places all offenses on one continuum of seriousness, regardless of crime type -- violent or property.

   a. All the elements of the offense should be considered in a seriousness score.

   b. A ranking method is needed to indicate how much more serious incident X is from Y.

5. Seriousness weights are needed in a seriousness scale.

NOTES

   a. Intuitive values won't work. It is obvious that homicide is more serious than auto theft and auto theft is more serious than loitering.

      But is robbery of $1,000 more serious than assault resulting in hospitalization or burglary of $250 more serious than auto theft?

   b. It is necessary to know the degree of seriousness. For example, how much more serious is homicide than auto theft.

6. Ranking of seriousness is needed so that fine distinctions can be made. Rankings also need to be uniform so that the distinctions are rational.

7. A scale is needed that reflects public sentiment about which crimes are serious and which are not.

B. An example of a Seriousness Scale: Sellin-Wolfgang Index.

1. Thorsten Sellin and Marvin E. Wolfgang created a weighting system for crime that can be used to measure changes in the seriousness of crime over time or among jurisdictions.

2. The Sellin-Wolfgang index has three important characteristics:

   a. The index can be disaggregated down to the smallest geographical and temporal unit.

   b. The index is based on data normally collected by local police departments; thus initial costs are minimized. Also, there is likely to exist a sufficiently long series of data for trend analysis.

   c. The index is a measure of the perceived amount of harm inflicted on the community.

NOTES

3. To develop the index a sample survey was used which asked respondents to describe how serious specific crimes are. These reponses were aggregated to estimate the magnitude of seriousness for specific crimes.

4. Scaling techniques were then used to convert responses to scale values for components of a crime as can be seen in Exhibit 2. These values constitute the Sellin-Wolfgang Index.

Exhibit 2.
Sellin-Wolfgang Seriousness
Components and Scores

I.	Number of victims of bodily harm	
	(a) Receiving minor injuries	1
	(b) Treated and discharged	4
	(c) Hospitalized	7
	(d) Killed	26
II.	Number of victims of forcible sexual intercourse	10
	(a) Number of such victims intimidated by weapon	2
III.	Intimidation (except II above)	
	(a) Physical or verbal only	2
	(b) By weapon	4
IV.	Number of premises forcibly entered	1
V.	Number of motor vehicles stolen	2
VI.	Values of property stolen, damaged, or detroyed (in dollars)	
	(a) Under $10	1
	(b) $10 - $250	2
	(c) $251 - $2,000	3
	(d) $2,001 - $9,000	4
	(e) $9,001 - $30,000	5
	(f) $30,001 - $80,000	6
	(g) Over $80,000	10

Source: Sellin, Thorsten, and Marvin E. Wolfgang. The Measurement of Delinquency. New York: Wiley, 1962.

NOTES

5. If a crime is divided into its specific components, each component is given a score, and the scores are totaled and an aggregate estimate of the crime's seriousness is determined.

6. For example, in the case of a juvenile who steals $50, the seriousness of the crime is assessed as a larceny with a score of 2 using the Sellin-Wolfgang Scale. In a second example, in which an offender breaks into an apartment with a weapon, rapes a woman (treated at hospital and discharged), kills the husband and steals their car, in the Sellin-Wolfgang Index the seriousness of the crime is assessed as follows:

1	= apartment entered
10	= forcible rape
4	= treated and discharged
2	= use of weapon
26	= murder
+ 2	= stolen car
45	= Total

Both of these examples would equal 1 in the Uniform Crime Reports (UCR).

C. Uses of seriousness scale.

1. Police departments can use the seriousness scale to improve measures of police effectiveness, create strategies to reduce the seriousness of crime, and improve manpower deployment.

2. Prosecutors can use a seriousness scale as a basis for whether an offender is to be prosecuted.

3. Judges can use a seriousness index to aid in making sentencing decisions.

SERIOUSNESS

PURPOSE

Module 4 is intended to expose the participants to the techniques and uses of comparative analysis, particularly as it applies to crime data. This section has focused on a comparison of trends in crime incidence using various rates and indices. In this exercise seriousness is introduced to help elaborate the crime problem. The presentation of three descriptors of crime--time trends, rates and seriousness--are used to indicate that the nature of the crime problem can vary depending on how it is defined and interpreted.

INSTRUCTIONS

The participants are to work with the following assault data to compare trends in incidence, rate per 100,000 population, and seriousness.

Following are the specific tasks to be performed:

1. Calculate the raw seriousness of assaults for each year.

2. Transform that figure into "seriousness per incident" so that the annual indices are then comparable.

3. Calculate the percent change in seriousness/incident for the years 1973-1977.

4. Compare it to percent change in incident and rate.

5. Describe trends in assault between 1973 and 1977 using these three descriptors.

INSTRUCTOR NOTES

A. Explain to the participants that they are to compare the change in incidence, rate and seriousness.

B. To do that, they will have to (a) calculate the raw seriousness of assaults for each year in the data set, (b) transform that figure into seriousness per incident to be able to compare the annual indices, (c) calculate the percent of change in seriousness/incident for each year and (d) compare it to percent change in incidence and rate.

C. When most of the participants have completed the exercise, reconvene the class and review the debriefing notes.

D. Exercise Schedule

Briefing	- 5 minutes
Participant Activities	- 30 minutes
Debriefing	- 10 minutes

EXERCISE #2 (Continued)

DEBRIEFING NOTES

A. Go over each of the calculations, emphasizing those points with which participants had difficulties as observed by you and the facilitators.

B. Discuss the observed trends in assault with the participants.

EXERCISE #2

DATA SET

Table 1. Assaults, Chaos City, 1973-1977

	1973	1974	1975	1976	1977	% Change 1973-77
Assault Incidence	1015	1251	1424	1410	1331	31%
Rate*	363.9	446.2	469.0	427.9	390.3	7%

Source: Chaos City Police Department, 1978.
*Per 100,000 Population.

Participants should assume that, according to a modified seriousness index, assault is broken down into the following categories and assigned the following weights:

Receiving Minor Injuries	-	Multiply by 1
Treated and Discharged	-	Multiply by 4
Hospitalized	-	Multiply by 7

The assault data are distributed among these four categories as follows:

Table 2. Assaults by Seriousness Categories
Chaos City, 1973-1977

	1973	1974	1975	1976	1977
Victim Received Minor Injuries	338	376	236	109	146
Victim Treated and Discharged	508	612	756	797	730
Victim Hospitalized	169	263	432	504	455

Source: Chaos City Police Department, 1978.

EXERCISE #2

EXERCISE #2 (Continued)

WORKSHEET

1. Develop matrix and calculate values.

	1973		1974		1975		1976		1977	
	#	SS*	#	SS*	#	SS*	#	SS*	#	SS*
Victim Received Minor Injury	338	338	376	376	236	236	109	109	146	146
Victim Treated And Discharged	508	2032	612	2448	756	3024	797	3188	730	2920
Victim Hospitalized	169	1183	263	1841	432	3024	504	3528	455	3185
Σ	1015	3553	1251	4665	1424	6284	1410	6825	1331	6251

* SS= Seriousness Score

2. Calculate seriousness per incident:

Seriousness per Incident	1973	1974	1975	1976	1977
	3.50	3.73	4.41	4.84	4.70

3. Calculate % change in seriousness per incident: 1973-1977

$$\% \text{ change} = \frac{4.70 - 3.50}{3.50} \times 100$$

% change = 34%

4. Compare change in incident and rate to change in seriousness:

31% incident
7% rate
34% seriousness per incident

EXERCISE #2

NOTES

III. CROSS CLASSIFICATION TABLES

A. The purpose of cross-classification is to begin the examination of the relationship between two variables -- bivariate descriptions.

1. Variables should be organized into hypotheses containing a dependent and an independent variable as discussed in Module 1.

2. Cross classification or cross tabulation is used to describe the relationship between an independent variable and a dependent variable for nominal or ordinal level measures.

B. Illustration of a one-way and two-way cross classification table .

1. The one-way table shows in both absolute and relative terms the preponderance of larceny-theft among all crimes in the total U.S. crime index; larceny-theft accounted for nearly 6 million out of 11.25 million reported crimes, i.e., over 53.1% of all crimes. The next highest category, burglary, represents not quite 33% of the crimes in the index. All of the other categories account for the remaining 18% of reported crimes.

2. When the dimensions of "place of occurrence" are added, it is evident that there is a radical difference in the number of crimes, regardless of category, that occur in SMSA's on the one hand and in other cities and rural areas on the other. This is reasonable since there are much greater numbers of people in absolute terms in SMSA's. However, continued examination of the two-way variable reveals some interesting breakdowns outside of SMSA's which would indicate that more than sheer population density might be at work. For example, the same number of burglaries are reported in other cities as in rural areas, and considerably more murders and forcible rapes are reported in rural areas.

Exhibit 1. One and Two-Way Table Illustrations

One-Way Table Illustration

	Category							
	1	2	3	4	5	6	7	8
	Total U. S. Crime Index	Murder and Non-Negligent Manslaughter	Forcible Rape	Robbery	Aggravated Assault	Burglary	Larceny-Theft	Motor Vehicle Theft
Total Number	11,256,616	20,505	56,093	464,973	484,713	3,252,129	5,977,748	1,000,455
Percent of Total	100%	.2%	.5%	4.1%	4.3%	28.9%	53.1%	8.9%

Two-Way Table Illustration
(Totals from above)

Type of Crime	SMSA'S	%	Other Cities	%	Rural	%
Murder & Non-Negligent Manslaughter	16,490	.2	1,313	.1	2,702	.4
Forcible Rape	48,894	.5	3,196	.3	4,003	.6
Robbery	443,461	4.6	13,685	1.3	7,827	1.2
Aggravated Assault	397,998	4.2	45,523	4.3	41,192	6.2
Burglary	2,729,061	28.6	261,276	24.9	261,792	39.3
Larceny/Theft	4,989,336	52.3	674,718	64.2	313,694	47.1
Motor Vehicle Theft	915,297	9.6	51,038	4.9	34,120	5.1
	9,540,537		1,050,749		665,330	

Source: United States, National Criminal Justice Information and Statistics Service. Sourcebook of Criminal Justice Statistics, 1977, by Michael R. Gottfredson, et al. Washington, D. C.: USGPO, 1978.

NOTES

C. Percentaging a Cross Classification

1. Percentaging a cross classification is the division of the observations according to the independent variable.

2. If we want to know whether two variables in a hypothesis are related, are associated, or if they are independent of one another, percentaging a cross classification is a useful first step.

3. If the variables are independent, then knowledge of the independent variable does not help us understand or predict the dependent variable.

4. Cross classification is not concerned with strength or significance of association (covered in Module 5).

CROSS CLASSIFICATION TABLES

PURPOSE

Walk-Through 'G' illustrates the use of a four-step procedure for interpretation of cross classifications. This Walk-Through also provides an opportunity for discussing causality in regard to recidivism. It demonstrates how percentages enhance the ability to understand the tables.

Go through the four-step procedure using the recidivism data provided. Interpret the table using percentages.

INSTRUCTOR NOTES

A. Explain the four-steps in interpretation of cross-classification.

Describe each of the four steps.

1. Identify independent (columns) and dependent variables (rows) and distribute raw data into appropriate cells.

2. Percentage the dependent variable.

3. Percentage the dependent variable for one of the independent categories.

4. Percentage the dependent variable for each of the remaining independent categories.

B. Interpret the data set. Interpretation should include the following:

1. Sixty percent of unemployed ex-offenders are recidivists; not 60% of recidivists are unemployed. This is why independent is set up as column variable.

2. There appears to be an association between the independent and dependent variable.

3. Indicate use of row, column and total percentages.

a. Row - 80% of the recidivists are unemployed.

b. Column - about 86% of those employed did not recidivate.

c. Total - 20% of the total were unemployed and recidivists.

C. Fifteen minutes are allotted for this Walk-Through.

D. When most of the participants have completed the Walk-Through, reconvene the class and review the debriefing.

DATA SET (See Tables 1 and 2.)

WORKSHEET (Not Applicable)

Table 1. Four Step Interpretation of Cross-Tabulations

Step 1: Identify independent and dependent variables.

Relationship of Employment Status and Recidivism Status			
(Dependent Variable)	(Independent Variable)		
Recidivism Status	Employment Status of Ex-Offenders Unemployed #	Employed #	Total #
Recidivist	30	10	40
Non-Recidivist	20	60	80
Total	50	70	120

Source: Paradise University, Criminal Justice Research Center, 1978.

Step 2: Percentage the dependent variable.

Recidivism Status	Employment Status of Ex-Offenders Unemployed %	Employed %	Total %
Recidivist			33.3
Non-Recidivist			66.7
Total			100.0

Table 2. Four Step Interpretation of Cross Tabulations (Continued)

Step 3: Percentage the dependent variable for one of the independent categories.

Recidivism Status	Employment Status of Ex-Offenders		Total %
	Unemployed %	Employed %	
Recidivist	60.0		33.3
Non-Recidivist	40.0		67.7
Total	100.0		100.0

Step 4: Percentage the dependent variable for the other independent categories.

Recidivism Status	Employment Status of Ex-Offenders		Total %
	Unemployed %	Employed %	
Recidivist	60.0	14.0	33.3
Non-Recidivist	40.0	86.0	67.7
Total	100.0	100.0	100.0

DEBRIEFING NOTES

1. Categories are set up according to the hypothesis, e.g. employment status of ex-offenders is related to recidivism.
2. Each category is unique, e.g. either employed or unemployed.
3. Percentages are easier to interpret than raw frequencies.
4. Percentages should be computed in relation to the believed cause and effect specified in the theory: that is employment status influences recidivisms not recidivism influences employment status.

NOTES

IV. SCATTERGRAMS

A. Definition: A scattergram is a graphical presentation of interval level data.

1. It is a method used to examine the relationship between a pair of variables and to describe patterns in quantitative data.
2. The convention for Scattergram construction is to place the dependent variable on the vertical (Y) axis and the independent variable on the horizontal (X) axis.

B. Construction and Interpretation of Scattergrams.

1. Examples of Scattergrams and their interpretation are presented in Walk-Through H.

SCATTERGRAM

PURPOSE

This Walk-Through illustrates how to construct and interpret a scattergram. Examine Table 1 in the data set for general trends, clustering, and outliers. Interpret the scattergram. Repeat this procedure on Table 2.

INSTRUCTOR NOTES

A. Tell the participants to follow Table 1 as you explain the process of plotting the data and constructing a scattergram.

B. Interpret the Tables.

1. Table 1 presents data on two variables for each of the ten cities in the hypothetical State of Paradise. Each city has been measured for population density and crime level.

2. It seems plausible that the higher an area's population density the more crime there is likely to be.

3. The data help to verify the hypothesized relationship.

4. The scattergram in Table 1 has the following features:

   a. Each community has been plotted as a single dot.

   b. The horizontal and vertical axes have been proportionately scaled and properly and fully labeled.

   c. Title and data source statements are completed.

5. Interpretation of scattergrams usually consists of three types of approaches to the data.

   a. The first emphasizes the overall relationship exhibited by the data. In Table 1 a strong positive linear relationship is visible.

   b. A second approach to interpreting scattergrams involves examining the tendency of the dots to cluster. In Table 2 ten SMSA's have been plotted based on two attributes: total index crime per 100,000 population and police per 100,000 population. These ten SMSA's are the highest and lowest in the U.S. relative to the total crime index in 1975. SMSA's with low crime rates tend to have low police per capita rates, while those with high crime rates tend to have higher police per capita rates.

      Similarly, in Table 1, note the two major clusters of cities--A, F, G, and H and B, D, E and J. Further analyses of these two tables can focus on identifying possible explanations for the clusters as well as on developing descriptive labels for each cluster that captures what it is that the cluster represents.

   c. A final approach to interpreting scattergrams emphasizes so-called outliers. These are extreme values. In Table 2 Las Vegas is such an outlier. An interpretation can be enhanced if the reasons for such extreme values can be understood or speculated about.

C. This Walk-Through should not last longer than ten minutes.

DEBRIEFING NOTES

1. Regardless of the extent of analysis, whether by methods of simple description or by inferential techniques, two-variable data should be plotted before analysis. Knowing the plot of the data helps in selection of appropriate statistical tools.

2. The plot of data is also the last step of analysis, that is, the information of analysis is more easily conveyed when accompanied by a plot.

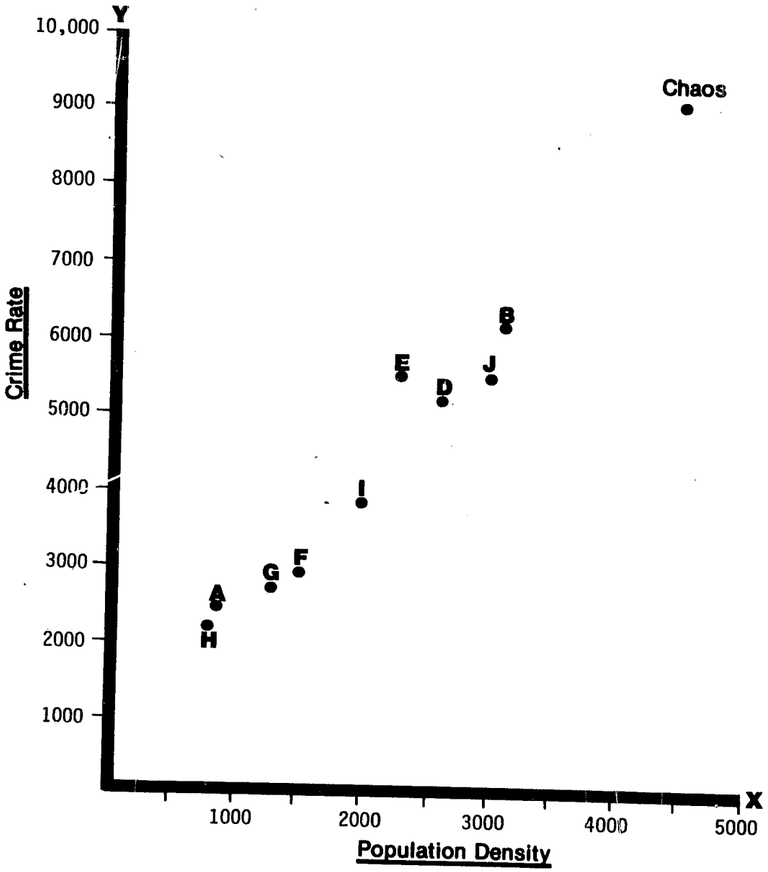


Table 1.

Crime Rate Related to Population Density

LEGEND:

Cities	Population Density*	Crime Rate
A	800	2500
B	3100	6200
Chaos	4500	9140
D	2600	5200
E	2300	5500
F	1500	2900
G	1300	2700
H	750	2200
I	2000	3800
J	3000	5500

* Total Population / Area (in sq. miles)

** Total Crime Index per 100,000 Population

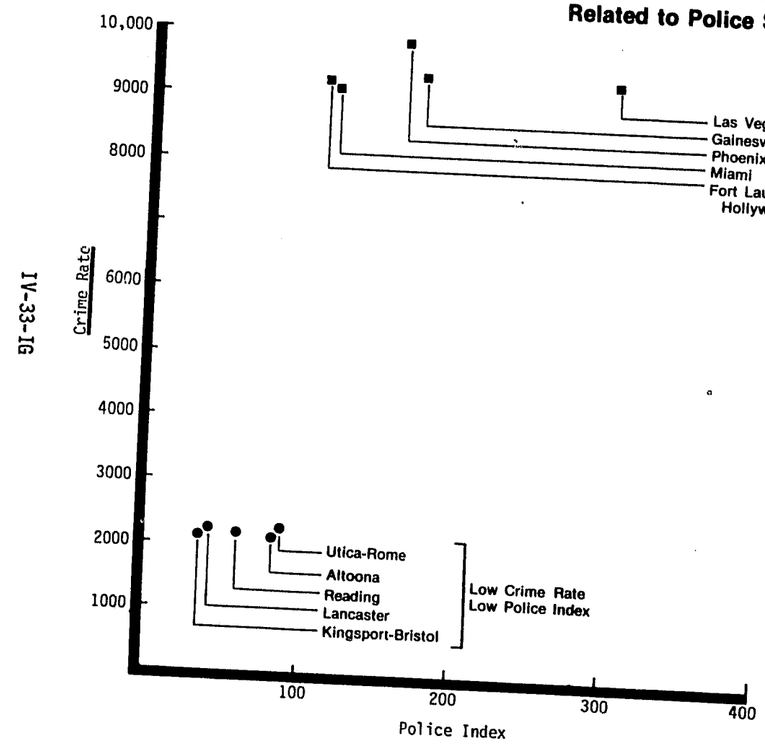
Source: Hypothetical Data

WALK-THROUGH 'H'

DATA SET

Table 2.

Total Crime Index
Related to Police Strength



LEGEND:

Low SMSA's	Police Index *	Crime Rate **
Altoona, Pa	82.7	2112
Kingsport-Bristol, Tenn.	34.7	2159
Lancaster, Pa.	38.8	2244
Reading, Pa.	64	2167
Utica-Rome, N.Y.	85.3	2192
High SMSA's		
Phoenix, Ar.	162.0	9795
Miami, Fla.	117.0	9130
Las Vegas, Nev.	300.2	9318
Gainesville, Fla.	170.3	9328
Fort Lauderdale-Hollywood, Fla.	108.7	9252

* Officers/100,000 population
** Total Crime Index per 100,000 Population

Source: Sourcebook, 1976

IV-33-IG

WALK-THROUGH 'H'

V. Statistical Maps

A. Importance of Statistical Maps

1. Spatial analysis is important in criminal justice planning because it fits many of the operational problems, such as deployment of police, jury selection in courts and isolation of crime and/or victimization and related social problems.

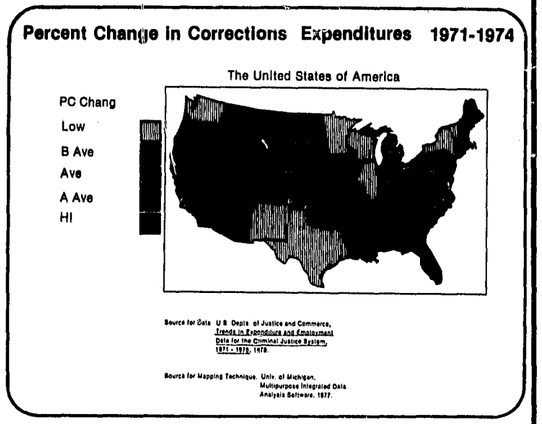
2. Furthermore, program funding is rarely applied to individuals. Rather, funds are applied to problem areas, such as neighborhoods and communities. Therefore, it is important for the analyst to be able to utilize tools that provide ways of aggregating individual cases or transacting statistics into spatial summaries that can be used to display and interpret data.

B. Principles in Map Making

1. A small number of categories and shades to facilitate reading of the map.

2. Select appropriate geographical units to present.

SHOW V.A. (4-5):



EMPHASIZE (4-5):

+ That shading for different classifications must be appropriate.

+ That scaling and shading are of critical importance.

+ In this example the following scale was used to highlight extremes (note uneven category sizes:

  High = 72% + (Maximum is 172.6%)
  High Average = 51 to 71%
  Average = 43 to 50%
  Low Average = 31 to 42%
  Low = 30% (Minimum is -12.5%)

+ In this example, as indicated in the margin, darker shades indicate a higher percent change in expenditures.

NOTES

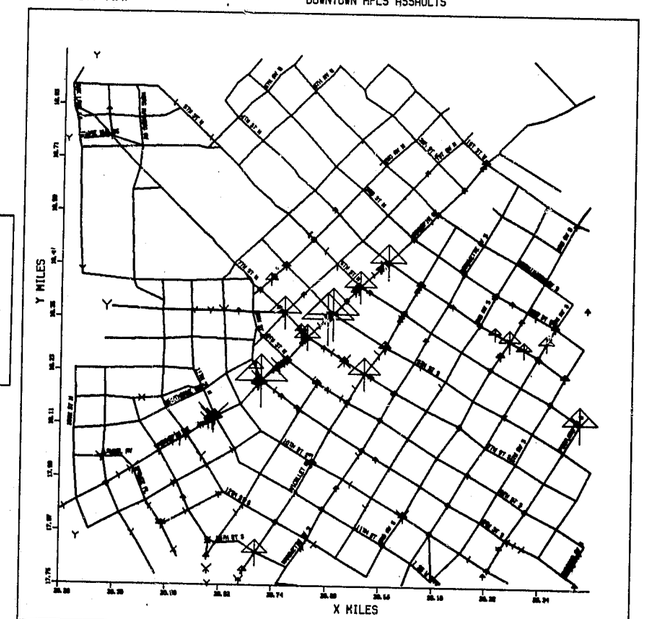
C. Spatial characteristics of crime

1. Following is a series of four computer-drawn maps of downtown Minneapolis. Presented are four related but distinct perspectives on the assault problem in the downtown area.

SHOW V.A. (4-6):

PIN MAP

DOWNTOWN MPLS ASSAULTS



CRIME SYMBOL KEY
DOWNTOWN MPLS ASSAULTS

SIZE INCREASES WITH NUMBER OF CRIMES

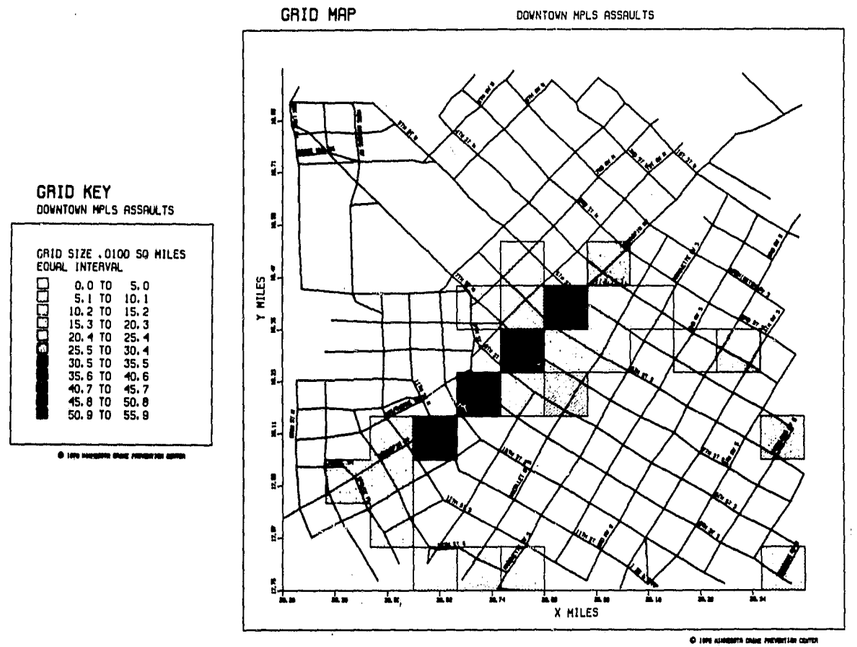
× ASSAULT-SEXUAL
↟ ASSAULT-STRANGER
Y ASSAULT-NONSTRANGER

Used by permission: © 1978 Minnesota Crime Prevention Center
2344 Nicollet Avenue, Minneapolis, Minnesota 55404, (612) 870-0780

EMPHASIZE (4-6):

+ Map of downtown Minneapolis indicating the geographic pattern of three types of assaults in the Central Business District.
+ Symbols are larger for areas with higher frequencies.
+ Each type of assault has a different symbol.

SHOW V.A. (4-7):

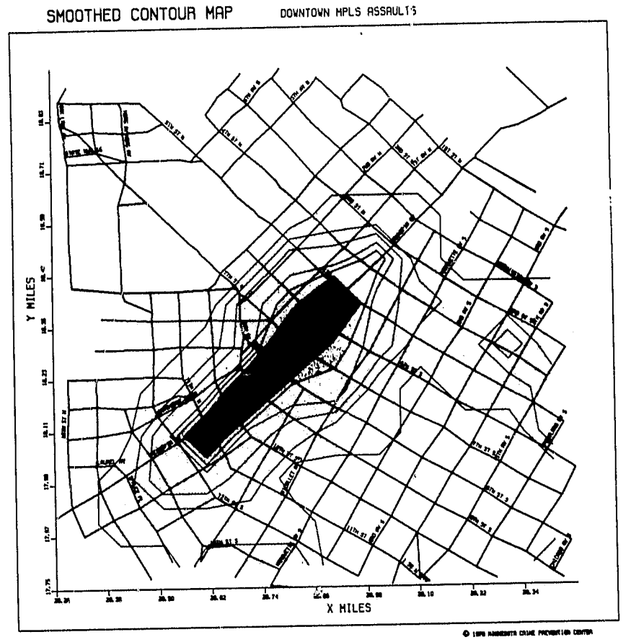


EMPHASIZE (4-7):

+ Mapping of assaults in downtown Minneapolis using same data as in V.A. (4-7).
+ Shading used to indicate the relative intensity of assaults in a specified area.

SHOW V.A. (4-8):

SMOOTHED CONTOUR MAP DOWNTOWN MPLS ASSAULTS



SMOOTHED CONTOUR KEY
DOWNTOWN MPLS ASSAULTS

GRID SIZE .0100 SQ MILES
EQUAL INTERVAL

0.0 TO	2.7
2.8 TO	5.5
5.6 TO	8.3
8.4 TO	11.1
11.2 TO	13.8
13.9 TO	16.6
16.7 TO	19.4
19.5 TO	22.2
22.3 TO	25.0
25.1 TO	27.8
27.9 TO	30.6

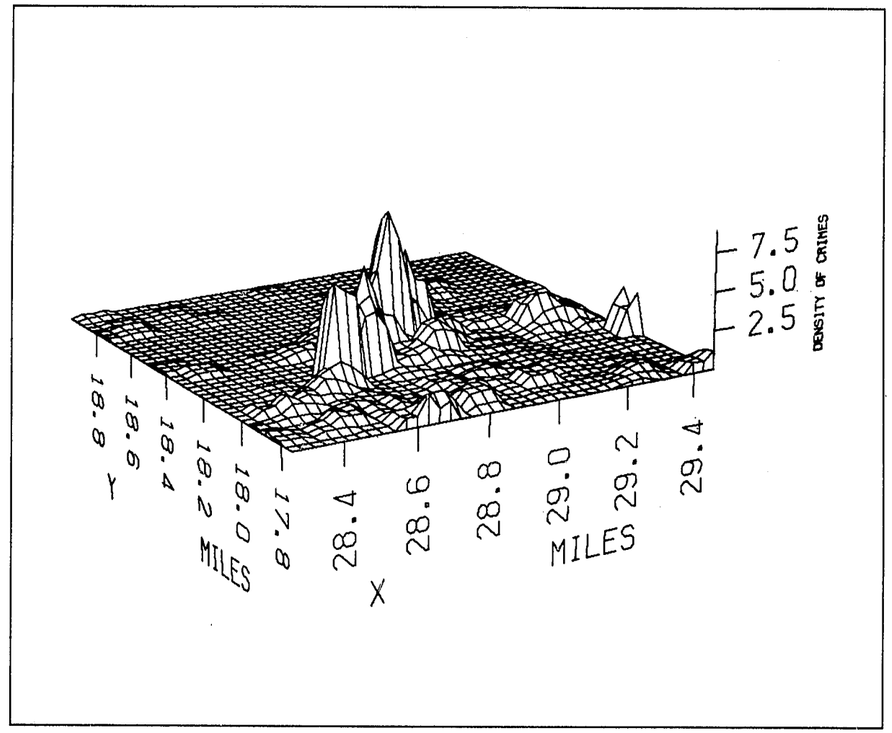
© 1976 MINNESOTA CRIME PREVENTION CENTER

EMPHASIZE (4-8):

+ Contour intervals used to display same assault data as in previous maps.
+ Clearly indicates "corridor" characteristic to the assault problem.

SHOW V.A. (4-9):

3D DENSITY PLOT DOWNTOWN MPLS ASSAULTS



© 1976 MINNESOTA CRIME PREVENTION CENTER

EMPHASIZE (4-9):

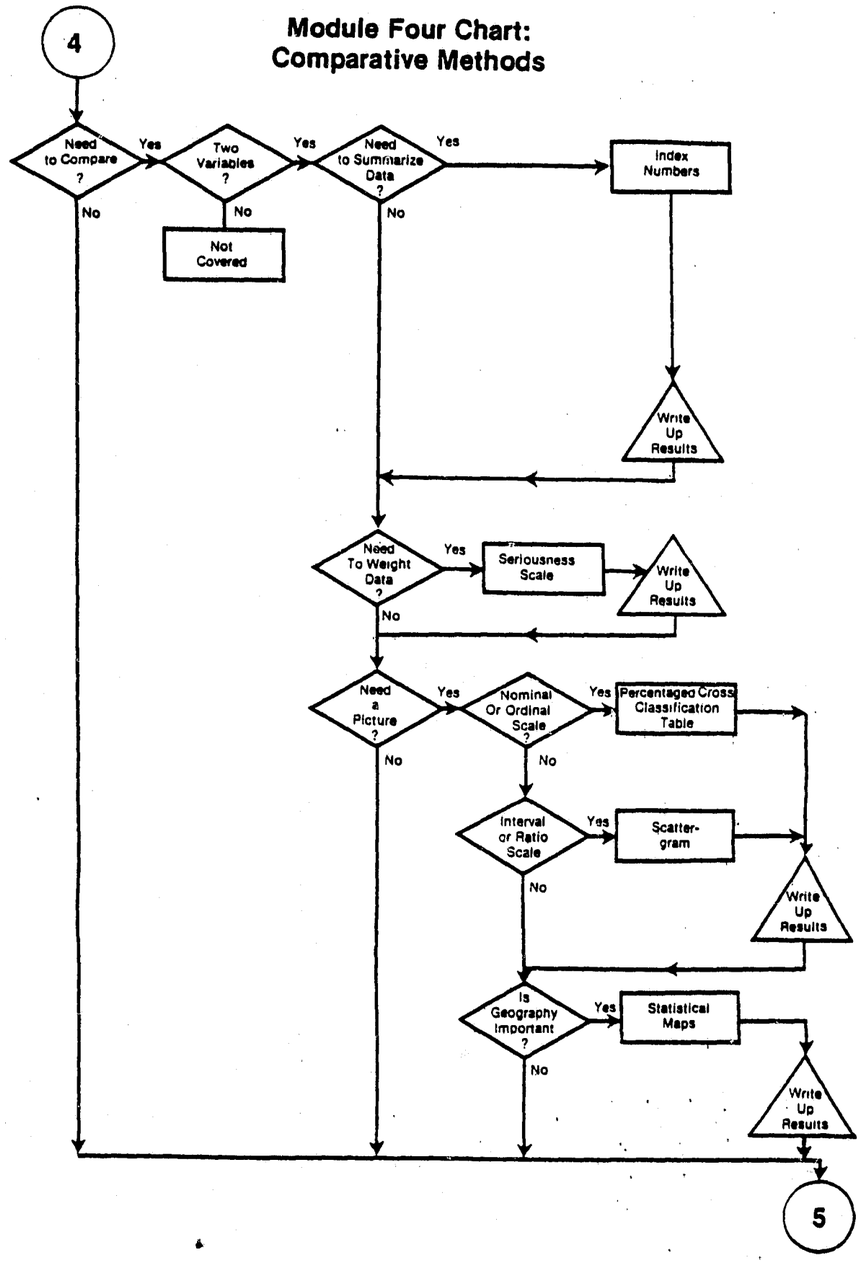
+ Three dimensional contour map of assault densities in downtown Minneapolis.
+ Peaks indicate "hot spots" -- highest peak on this map is the location of Moby Dick's Bar in downtown Minneapolis.

NOTES

VI. CONCLUSION

A. Refer to module chart. Indicate while comparative methods describe and suggest relationships, other tools are necessary to make inferences about relationships. Some of these methods are covered in Module 5.

SHOW V.A. (4-10):



MODULE 5
INFERENTIAL METHODS

Module 5 presents material covering two complex and difficult areas of statistics: inference and prediction. In covering this material the emphasis should be on: 1) when a particular procedure is appropriate; 2) rules to follow and the assumptions made in using a procedure; 3) practical applications of the method, and 4) how the resulting information is interpreted. The specific procedures covered include: chi square, correlation, and least squares regression.

OBJECTIVES

1. To explain the purpose and outline the general process of statistical testing.

2. To define, select, calculate and interpret the following measures of association:

   a. Chi square statistic

   b. Correlation coefficient

3. To define, select, calculate and interpret the following methods of prediction:

   a. Visual estimation

   b. Least squares regression

SCHEDULE

INFERENTIAL METHODS

TIME ALLOCATION

TOPIC	TIME	PAGE
I. STATISTICAL TESTING	30 minutes	V-3
A. Definition	10 minutes	V-3
B. Statistical Tests	20 minutes	V-4
II. CHI SQUARE TEST OF INDEPENDENCE	60 minutes	V-7
A. Uses	*	V-7
B. Characteristics	*	V-7
Walk-Through 'I' CHI SQUARE	10 minutes	V-10
Exercise #3 CHI SQUARE	50 minutes	V-13
III. CORRELATION COEFFICIENT	60 minutes	V-18
A. Uses	*	V-18
B. Characteristics	*	V-18
C. Calculating r	10 minutes	V-19
D. Testing Significance of r	*	V-20
E. Limitation	*	V-20
Walk-Through 'J' CORRELATION COEFFICIENT	10 minutes	V-21
Exercise #4 CORRELATION COEFFICIENT	40 minutes	V-25
IV. REGRESSION	60 minutes	V-31
A. Time Series Data	*	V-31
B. Visual Estimate of Regression Line	5 minutes	V-34
C. Least Squares Regression	20 minutes	V-37
Exercise #5 REGRESSION	35 minutes	V-40
V. INTERPRETATION OF FINDINGS	60 minutes	V-47
A. Purpose	*	V-47
B. Examples	*	V-47
Exercise #6 INTERPRETATION OF FINDINGS	60 minutes	V-48
VI. CONCLUSION	10 minutes	V-65
TOTAL TIME	280 minutes	

* Less than 5 minutes

NOTES

I. STATISTICAL TESTING

A. Definition:

1. In Modules 3 and 4 we distinguished between two primary purposes of statistics: description and inference.

   a. Description involves summarizing masses of data to facilitate communication.

   b. Inference involves summarizing also, but goes beyond description enabling us to make generalizations based on incomplete information.

2. Two basic areas of inference are: questions of difference and questions of association.

   a. Questions of difference involve comparing one group to another to determine if they are dissimilar. For example, are urban female senior citizens more prone to predatory crime than the general population?

   b. Questions of association involve examining the relationships between variables. For example, is family income and delinquency somehow related? If so, how are these variables related? A second example is, does the length of incarceration increase as the seriousness of the offense increases?

3. Samples and Inference

   a. A primary reason for inferential statistics is our dependency on samples rather than on a census; incomplete information rather than complete information.

   b. There are two issues when using a sample:

      (1) Is our result "true?" i.e., would they be the same if we could measure the entire population?

NOTES

I. STATISTICAL TESTING

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3. Samples and Inference

a. A primary reason for inferential statistics is our dependency on samples rather than on a census; incomplete information rather than complete information.

b. There are two issues when using a sample:

(1) Is our result "true?" i.e., would they be the same if we could measure the entire population?

(2) How confident are we in our findings?

c. Generally, as sample size decreases, the importance of statistical inference increases.

B. Statistical Tests.

1. Step by step procedure is used for organization and interpretation of various inferential statistics.

2. The procedure is as follows:

SHOW V.A. (5-1)

STATISTICAL TEST PROCESS

1. State Null Hypothesis
2. State an Alternative Hypothesis
3. Select Statistical Test
4. Determine Level of Significance
5. Calculate Test Statistic
6. Compare Test Statistic To Table Values
7. Interpret Findings

EMPHASIZE (5-1):

+ Step One: State a null hypothesis.
  - A null hypothesis is a mathematical statement that suggests there is no relationship between the variables being studied.
  - For example,"There is no relationship between the location where a person lives in Chaos City and his or her attitude toward the police."
+ Step Two: State an alternative hypothesis.
  - An alternative hypothesis is simply the affirmative statement of the null hypothesis. For example, "There is a relationship between where a person lives in the Chaos City and his or her attitude toward the police."
+ Step Three: Select the appropriate statistical test.
  - A statistical test is a means for determination of the statistical significance of the association between two variables.
  - It is a test in that a calculated statistic (from the data) is compared to a predicted value of the statistic (obtained from tables of such statistics).
  - What is being tested is whether the measured association could reasonably be attributed to chance.
+ Step Four: Determine the level of significance to be applied to the problem.
  - The level of significance is interpreted as the probability of an association having resulted from sampling error.
  - That is, if the level of significance is set at .05, this would indicate the probability of the observed association having resulted from chance, i.e., only 5 in 100. This means that if the population of people were sampled 100 times, only 5 times would we expect these results by chance.

+ Step Five: Calculate the test statistic.

+ Step Six: Compare the test statistic to table value.

+ Step Seven: Interpret the finding(s) of the test.

---

3. Problems in utilizing such tests result from the improper statement of the null hypothesis, a misunderstanding of the underlying assumptions of such tests, and the misinterpretation of the findings.

4. Perhaps the greatest danger in applying measures of association is what is referred to as a "spurious" correlation. A relationship is spurious when either there are illegitimate inferences of causation or when two variables are related only by a third.

5. Example: An example of an intervening variable problem is the relationship between population density and the crime rate. One model implied here is that higher density causes a higher crime rate. This implied relationship apparently has some merit. However, population density does not directly cause crimes to occur. Instead, there must be some intervening factors, such as reduced police visibility, which result in the higher crime rates; higher density results in less police visibility which causes a higher crime rate. Perhaps the most parsimonious model would suggest that higher population density reduces police visibility which increases the opportunity for an individual to commit crime. It's parsimonious because the most direct explanation is that people cause crime.

6. The point of this example is that the existence of a correlation does not prove any causal connection.

II. CHI SQUARE TEST OF INDEPENDENCE

A. Uses

1. This test indicates the degree of independence of two classifications.

2. It tests a null hypothesis of independent classifications.

3. It helps interpret cross classification tables.

B. Characteristics

SHOW V.A. (5-2):

CHI SQUARE GENERAL CALCULATION FORMULA

(1) $\chi^2 = \sum \frac{(O - E)^2}{E}$

Where: E = An expected cell frequency
O = An observed cell frequency
Σ = Means sum for all cells in the table

(2) $E = \frac{RT(CT)}{T}$

Where: RT = Observed Row Total
CT = Observed Column Total
T = Total Observed Frequencies

EMPHASIZE (5-2):

+ Used with categorical data.

+ Does not indicate the presence or absence of intervening factors.

+ Does not preclude a spurious relationship.

+ Information above the nominal level may be hidden.
+ Must have an expected frequency of at least five in each cell.
+ Requires a large sample size, but if it is too large, Chi Square is not very discriminating.
+ Assumes outcomes are independent and that each sample observation can fall in only one category.

SHOW V.A.(5-3):

DEGREES OF FREEDOM

Degrees of Freedom are determined by multiplying the number of rows minus one times the number of columns minus one.

(Rows - 1) (Columns -1) = Degrees of Freedom

√ = freely specified	√	√	√	√	√	0	RT1
O = Not freely specified	0	0	0	0	0	0	RT2
	CT1	CT2	CT3	CT4	CT5	CT6	

2 x 6

(2 — 1) (6 — 1) = 5 Degrees of Freedom

EMPHASIZE (5-3):

+ Degrees of freedom are the number of values that can be chosen freely.
+ Given (RT_1,CT_1) (RT_1,CT_2) (RT_1,CT_3) (RT_1,CT_4) and (RT_1,CT_5) freely specified, the others must take on specified values.
+ Use of a Chi Square Table requires knowledge of the degrees of freedom.

SHOW V.A. (5-4):

VALUES OF CHI SQUARE (χ^2) AT THE 5% AND 1% LEVELS OF SIGNIFICANCE

DEGREES OF FREEDOM	5%	1%
1	3.84	6.63
2	5.99	9.21
3	7.81	11.34
4	9.49	13.28
5	11.07	15.09
6		
Etc.		

Source: Robert Parsons, Statistical Analysis: A Decision-Making Approach. (N.Y.: Harper and Row, 1974) p. 824.

EMPHASIZE (5-4):

+ Significance level is used to select the probability value.
+ Table presents some representative Chi Square values.
+ No single standard for selecting a level of significance to test a hypothesis exists.

CHI SQUARE

PURPOSE

This problem examines the association between responses to a survey question, "What level of regard do you hold for Police?" and the race of the respondent using a cross classification table and the Chi Square test of independence.

Perform each of the following steps:

1. State the null hypotheses, H_o: Response is independent of race.
2. State the alternative hypotheses, H_a: Response and race are related.
3. Calculate expected values, substitute in formula.
4. Establish rejection region at .05. Calculate degrees of freedom.
5. What are your conclusions about H_o and H_a?

INSTRUCTOR NOTES

A. Tell participants to follow their work sheets as you explain the procedures and calculations.

B. Be sure to cover the following:

1. Requires categorical data.
2. Determination of level of significance is important.
3. Does not indicate the presence or absence of intervening factors.
4. Does not preclude a spurious relationship.
5. Must have an expected frequency of at least 5 in each cell.
6. Requires a large sample size, but if it is too large, X^2 is not very discriminating.
7. Assumes outcomes are independent and that each sample observation can fall in only one category.

C. State your conclusions based on the tested relationship.

D. Walk-Through should last no more than 10 minutes.

WALK-THROUGH "I"

DATA SET

Table 1. Race of Respondent and Regard for Police

	RACE		
	White	Black	Totals
High Regard for Police	80	25	105
Low Regard for Police	45	50	95
Totals	125	75	200

Source: Paradise University, Criminal Justice Research Center, 1978.

WORKSHEET

A. State Null Hypothesis:

H_o: response independent of race

H_a: response and race are dependent

B. Calculate Expected Values:

$$E_1 = \frac{105\ (125)}{200} = 65.63$$

$$E_2 = \frac{105\ (75)}{200} = 39.38$$

$$E_3 = \frac{95\ (125)}{200} = 59.38$$

$$E_4 = \frac{95\ (75)}{200} = 35.63$$

WALK-THROUGH "I"

WORKSHEET (Continued)

C. Develop Worksheet and Calculate Values:

Cell	Observed (O)	Expected (E)	O-E	$(O-E)^2$	$(O-E)^2/E$
1	80	65.63	14.37	206.50	3.15
2	25	39.38	-14.38	206.78	5.25
3	45	59.38	-14.38	206.78	3.48
4	50	35.63	14.37	206.50	5.80
					Σ = 17.68

D. $\Sigma((O-E)^2/E) = \chi^2 = 17.68$

E. Determine Degrees of Freedom = (r-1)(c-1) = 1
Establish Rejection Region at .05

F. Compare calculated and Table χ^2; interpret result.

Table χ^2 = 3.84; Calculated χ^2 = 17.68

G. Conclusions: H_o: response is independent of race (rejected)
H_a: response and race are related (accepted)

SHOW V.A. (5-4) AGAIN

VALUES OF CHI SQUARE
(χ^2) AT THE 5% AND 1% LEVELS OF SIGNIFICANCE

DEGREES OF FREEDOM	5%	1%
1	3.84	6.63
2	5.99	9.21
3	7.81	11.34
4	9.49	13.28
5	11.07	15.09
6		
Etc.		

Source: Robert Parsons, Statistical Analysis: A Decision-Making Approach. (N.Y.: Harper and Row, 1974) p. 824.

WALK-THROUGH "I"

EXERCISE #3

CHI SQUARE

PURPOSE

To give participants an opportunity to calculate and interpret a Chi Square statistic.

INSTRUCTIONS

You are to perform an analysis and interpretation of the results of a survey of the State of Paradise residents using a Chi Square Test of Independence.

A. You will be assigned one of the hypotheses in the Worksheets (Part I or Part II) to evaluate. The hypothesis in Part I of the Worksheet may be stated as: crime trend is independent of type of geographic area. The hypothesis in Part II is: attitude toward burglary is independent of residential location.

B. State the null and the alternative hypotheses.

C. Determine the number of degrees of freedom for each table.

D. Decide on a level of significance.

E. Calculate the χ^2 statistics.

F. State your decision about H_0 and H_a, based on the χ^2 test.

G. Write one or two sentences describing the results of your test on these data.

INSTRUCTOR NOTES

A. Tell the participants to analyze the result of a survey of State of Paradise residents using a Chi Square Test of Independence. Tell them to perform the exercise following the steps outlined in the Worksheet.

B. Depending on time available, have participants work on either Part I or Part II of the problem; Part II has a 3 X 3 Table while Part I is a 2 X 3 Table.

C. The Exercise is to be done at the tables in groups.

D. When most of the participants have completed the exercise, reconvene the class and review the debriefing notes.

E. Schedule

1. Preparation - 5 minutes
2. Activities - 35 minutes
3. Debriefing - 10 minutes

EXERCISE #3

DATA SET

Table 1. State Of Paradise
Burglary Crime Trends, by area, 1976 & 1977

AREA	1976	1977	Totals
Urban	2015	2563	4578
Suburban	819	710	1529
Rural	1050	805	1855
Totals	3884	4078	7962

Source: FBI, UCR, 1978

Table 2. State of Paradise
Victimization Survey Results, Burglary, 1977

How important is burglary as a problem?	Urban	Suburban	Rural	Totals
Very Important	356	52	28	436
Important	90	31	158	279
Not Important	52	50	62	164
Totals	498	133	248	879

Source: Paradise University, Survey Research Center, 1978.

EXERCISE #3

WORKSHEET

A. Part One:

1. State Null and Alternative Hypotheses

H_o: crime trend is independent of area

H_a: they are dependent

2. Calculate Expected Values:

$E_1 = \frac{4578\ (3884)}{7962} = 2233.23$ $\quad E_4 = \frac{1529\ (4078)}{7962} = 783.13$

$E_2 = \frac{4578\ (4078)}{7962} = 2344.77$ $\quad E_5 = \frac{1855\ (3884)}{7962} = 904.90$

$E_3 = \frac{1529\ (3884)}{7962} = 745.87$ $\quad E_6 = \frac{1855\ (4078)}{7962} = 950.10$

3. Develop worksheet and calculate values.

Cell	O	E	O-E	$(O-E)^2$	$(O-E)^2/E$
1	2015	2233.23	-218.23	47624.33	21.33
2	2563	2344.77	218.23	47624.33	20.31
3	819	745.87	73.13	5348.00	7.17
4	710	783.13	-73.13	5348.00	6.83
5	1050	904.90	145.1	21054.01	23.27
6	805	950.10	-145.1	21054.01	22.16

4. $\Sigma((O-E)^2/E) = \quad \chi^2 = 101.07$

5. Determine Degrees of Freedom = (r-1)(c-1) = 2
Establish Rejection Region at .05

6. Compare calculated and Table χ^2; interpret result.

Table $\chi^2 = 5.99$

Calculated $\chi^2 = 101.07$

EXERCISE #3

WORKSHEET (Continued)

B. Part Two:

1. State Null and Alternative Hypotheses

H_o: attitude independent of area

H_a: they are dependent

2. Calculate expected values.

$E_1 = \frac{(436)\ (498)}{879} = 247.02$ $\quad E_6 = \frac{(279)\ (248)}{879} = 78.72$

$E_2 = \frac{(436)\ (133)}{879} = 65.97$ $\quad E_7 = \frac{(164)\ (498)}{879} = 92.91$

$E_3 = \frac{(436)\ (248)}{879} = 123.01$ $\quad E_8 = \frac{(164)\ (133)}{879} = 24.81$

$E_4 = \frac{(279)\ (498)}{879} = 158.07$ $\quad E_9 = \frac{(164)\ (248)}{879} = 46.27$

$E_5 = \frac{(279)\ (133)}{879} = 42.22$

3. Develop worksheet and calculate values.

Cell	O	E	O-E	$(O-E)^2$	$(O-E)^2/E$
1	356	247.02	108.98	11876.64	48.08
2	52	65.97	-13.97	195.16	2.96
3	28	123.01	-95.01	9026.90	73.38
4	90	158.07	-68.07	4633.52	29.31
5	31	42.22	-11.22	125.89	2.98
6	158	78.72	79.28	6285.32	79.84
7	52	92.91	-40.91	1673.63	18.01
8	50	24.81	25.19	634.54	25.58
9	62	46.27	15.73	247.43	5.35

4. $\Sigma((O-E)^2/E) = \quad \chi^2 = 285.50$

5. Determine Degrees of Freedom = (r-1)(c-1) = 4
Establish Rejection Region at .05.

6. Compare calculated and Table χ^2; interpret result.

Table $\chi^2 = 9.49$

Calculated $\chi^2 = 285.49$

EXERCISE #3

DEBRIEFING NOTES

A. Show the participants the correct answers for each item, spending more time on those which you and the facilitators identified as problems.

B. Have each group report how it described the results and comment upon the reports.

C. Point out that the Chi Square test is a method to be used along with percentaging a cross classification table.

NOTES

III. CORRELATION COEFFICIENT

A. Uses

1. The correlation coefficient is a measure of association which describes the degree to which one interval or ratio scale variable is related to another.

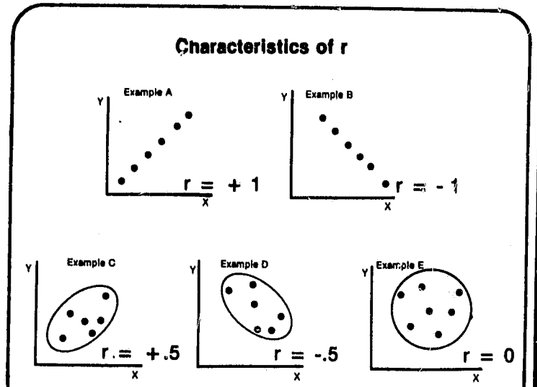
2. Indicates the nature of strength of a relationship between two variables.

3. Reflects the shape of a distribution.

4. Correlation coefficient helps to interpret scattergrams.

B. Characteristics

SHOW V.A. (5-5):



EMPHASIZE (5-5):

+ Correlation coefficient based on two sets of measures on the same unit of analysis.

+ Values of r range from +1 to -1.

+ A positive relationship means that the measures vary directly.

+ A negative relationship means that the measures vary inversely.

NOTES

C. Calculating r

SHOW V.A. (5-6):

FORMULA FOR PEARSON'S CORRELATION COEFFICIENT

$$r = \frac{N\Sigma XY - (\Sigma X)(\Sigma Y)}{\sqrt{N\Sigma X^2 - (\Sigma X)^2}\sqrt{N\Sigma Y^2 - (\Sigma Y)^2}}$$

Where: Y = Values of dependent variable
X = Values of independent variable
N = Number of observations

EMPHASIZE (5-6):

+ No New Symbols or Notations
+ Order of Calculation
+ Does not Determine Cause/Effect
+ Correlation coefficient should not be interpreted as a percentage, i.e., .6 is not 60%.

NOTES

D. Testing the Significance of r

SHOW V.A. (5-7):

CRITICAL VALUES OF r

d.f.*	Level of Significance .05	.01
3	.878	.959
4	.811	.917
5	.754	.874
6	.707	.834
7	.666	.798
8	.632	.765
9	.602	.735
10	.576	.708
11	.553	.684
12	.532	.661
13	.514	.641
14	.497	.623
15	.482	.606

*d.f. = degrees of freedom = n-2

Source: Snedecor, George W. & Cochran, William G. Statistical Methods, 6th Edition. Ames, Iowa: Iowa State University Press, 1974, p. 557.

EMPHASIZE (5-7):

+ Test is for H_0: $\rho = 0$
(rho) ρ = population r
+ If absolute value of r from a sample of size n exceeds the table value for a specified and n-2 degrees of freedom, the null hypothesis may be rejected.

E. Limitation:

1. While r determines the strength of the relationship between two variables, it does not establish causality.
2. The variables may be related to a third intervening variable that causes the observed relationship.
3. Relationships demonstrated using r may only be used to disprove a theory.
4. Causality is explained by theory used in problem specification.

CORRELATION COEFFICIENT

PURPOSE

To illustrate how to calculate and interpret a correlation coefficient. Calculate the correlation coefficient for the murder rates in 1971 and 1974 for the ten southern cities in Table 1. Test the significance of r and interpret the result.

INSTRUCTOR NOTES

A. Tell the participants to scan the data set with you.

B. Tell them to follow you on their worksheets as you explain how to plot the data and calculate a correlation coefficient.

C. Emphasize the following:

1. Requires quantitative data.
2. Does not indicate intervening factors.
3. Does not preclude spurious relationships.
4. With small samples, a high correlation may result from an extreme pair of values.
5. Low correlations do not necessarily indicate a nonlinear relationship; there may be a curvilinear one.
6. The range of values must be large and should not be discontinuous.
7. Less reliable with values of r close to zero.

D. Walk-Through should last no more than 10 minutes.

WALK-THROUGH 'J'

DATA SET

Table 1. Murder Rates* for Thirty Cities from the North, South and West, 1971 and 1974

South	1971	1974
Atlanta, Ga.	20	21
Augusta, Ga.	22	17
Birmingham, Ala.	14	18
Charlotte, N.C.	25	18
Corpus Christi, Tex.	13	14
Dallas, Tex.	18	15
Houston, Tex.	17	19
Richmond, Va.	15	15
Washington, D.C.	11	13
Wichita Falls, Tex.	6	14
North		
Albany, N.Y.	3	3
Atlantic City, N.J.	5	15
Chicago, Ill.	13	16
Detroit, Mich.	15	20
Grand Rapids, Mich.	3	4
Lancaster, Pa.	2	1
Madison, Wis.	2	2
Pittsfield, Mass.	1	1
South Bend, Ind.	6	8
Syracuse, N.Y.	4	4
West		
Boise, Idaho	5	4
Denver, Colo.	8	7
Fresno, Calif.	8	13
Honolulu, Hawaii	4	9
Kansas City, Mo.	13	12
Sacramento, Calif.	6	7
St. Louis, Mo.	15	14
San Francisco, Calif.	8	12
Seattle, Wash.	4	6
Vallejo, Calif.	4	9

*Rates represent the number of murders per 100,000 population rounded to nearest whole number.

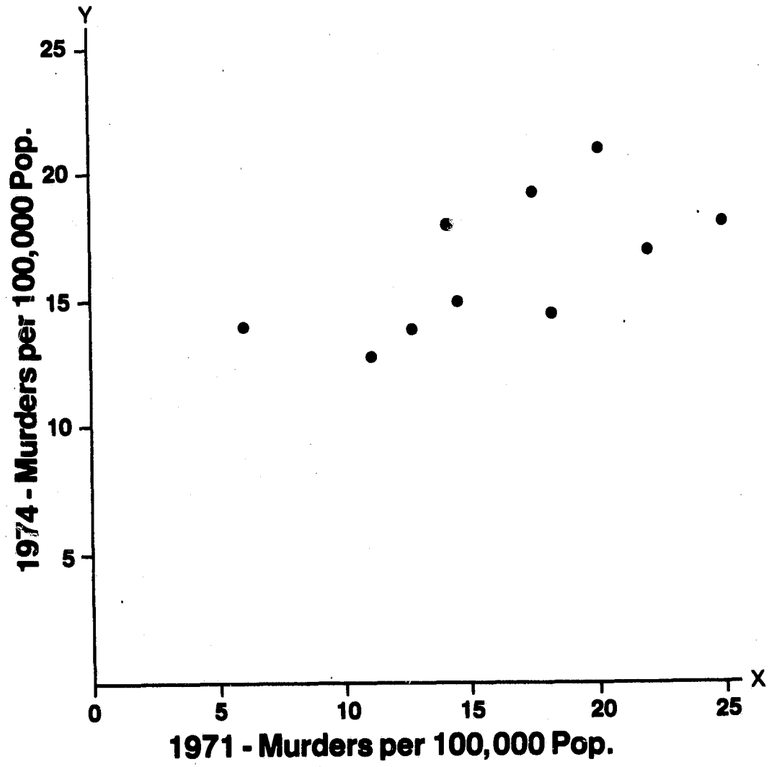
Sources: Sourcebook, 1976; also, Mendenhall, Ott and Larson. Statistics for the Social Sciences, 1975.

WALK-THROUGH 'J'

WORKSHEET

A. Plot the data:

MURDER RATES FOR TEN CITIES, 1971 & 1974



Source: Sourcebook, 1976

WALK-THROUGH 'J'

WORKSHEET

A. Calculate r

1. Prepare Matrix

CITY	X	Y	XY	X^2	Y^2
1	20	21	420	400	441
2	22	17	374	484	289
3	14	18	252	196	324
4	25	18	450	625	324
5	13	14	182	169	196
6	18	15	270	324	225
7	17	19	323	289	361
8	15	15	225	225	225
9	11	13	143	121	169
10	6	14	84	36	196
Σ	161	164	2723	2869	2750

2. $(\Sigma X)^2 = 25921$

   $(\Sigma Y)^2 = 26896$

3. $$r = \frac{N\Sigma XY - (\Sigma X)(\Sigma Y)}{\sqrt{N\Sigma X^2 - (\Sigma X)^2}\sqrt{N\Sigma Y^2 - (\Sigma Y)^2}}$$

   $$r = \frac{10\,(2723) - (161)(164)}{\sqrt{10(2869) - (161)^2}\sqrt{10(2750) - (164)^2}}$$

   $r = .639$

4. Table r = .632 (d.f. = n-2 = 8, $\alpha = .05$)

WALK-THROUGH 'J'

EXERCISE #4

CORRELATION COEFFICIENT

PURPOSE

To give the participants an opportunity to calculate and interpret a correlation coefficient.

INSTRUCTIONS

A. Prepare a scattergram.

B. Calculate and interpret the correlation coefficient between population density and larceny offenses for 13 counties in Florida.

C. Determine the significance of r (refer to the V.A. 5-7 for critical values of r).

INSTRUCTOR NOTES

A. Have participants prepare a scattergram using the graph paper provided in the participant guide prior to calculation of the correlation coefficient. A copy of the completed scattergram is provided in the Instructor Guide.

B. Have participants calculate the correlation coefficient.

C. Ask them to determine whether the correlation between larceny and population density is significant. V.A. 5-8 contains critical values of r. Note that in the worksheet larceny values have been recorded in hundreds to avoid the problem of calculator overflow.

D. Have them interpret their results.

E. When most of the participants have completed the exercise, reconvene the class and review the debriefing notes.

F. Schedule:

1. Preparation - 5 min.
2. Activity - 25 min.
3. Debriefing - 10 min.

EXERCISE #4

DATA SET

Table 1. Reported Larceny by Population Density
Thirteen Florida Counties, 1977

COUNTY	POPULATION PER SQ. MILE 7-1-77	REPORTED LARCENY OFFENSES
1. Alachua	146	5,740
2. Duval	748	21,645
3. Hillsborough	581	25,040
4. Orange	467	17,920
5. Polk	151	10,750
6. Leon	202	5,495
7. Volusia	206	11,700
8. Seminole	466	2,930
9. Escambia	345	10,215
10. Sarasota	291	5,840
11. Brevard	252	9,085
12. Lee	220	4,775
13. Palm Beach	250	20,830

Source: FBI, UCR, 1978

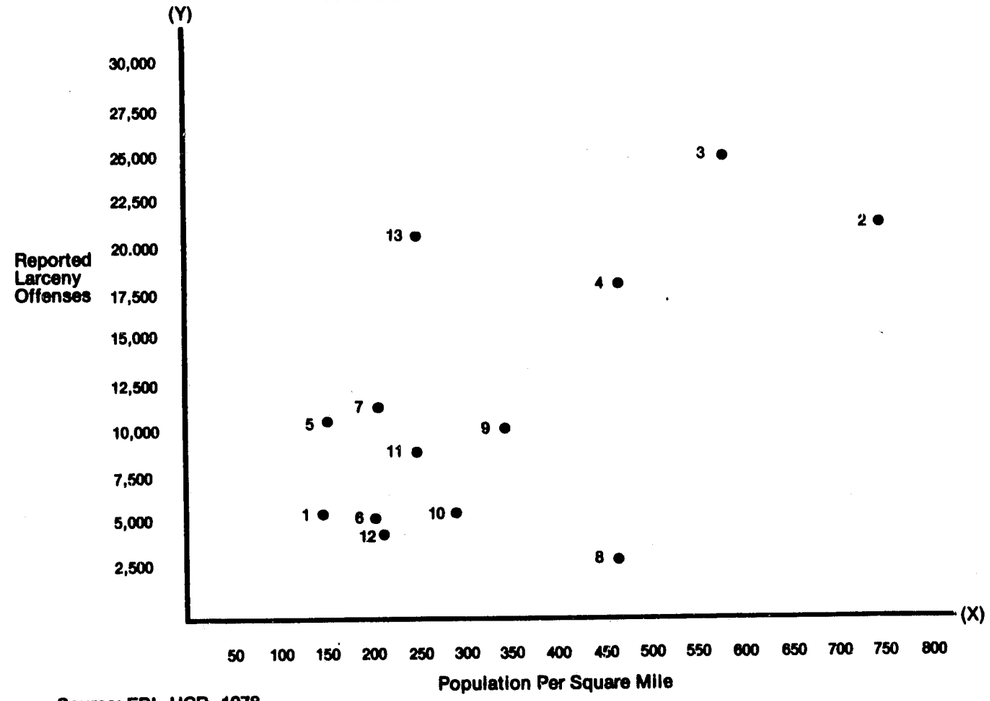
EXERCISE #4

WORKSHEET

A. Prepare a scattergram.

SHOW ANSWER

Reported Larceny by Population Density, Thirteen Florida Counties, 1977



Source: FBI, UCR, 1978

EXERCISE #4

CONTINUED

3 OF 14

WORKSHEET

B. Develop worksheet and calculate required values

COUNTY	X	Y (In hundreds)	XY	X^2	Y^2
1	146	57	8,322	21,316	3,249
2	748	217	162,316	559,504	47,089
3	581	250	145,250	337,561	62,500
4	467	179	83,593	218,089	32,041
5	151	108	16,308	22,801	11,664
6	202	55	11,110	40,804	3,025
7	206	117	24,102	42,436	13,689
8	466	29	13,514	217,156	841
9	345	102	35,190	119,025	10,404
10	291	58	16,878	84,681	3,364
11	252	91	22,932	63,504	8,281
12	220	48	10,560	48,400	2,304
13	250	208	52,000	62,500	43,264
Σ	4,325	1,519	602,075	1,837,777	241,715

C. Substitute in formula

$$r = \frac{N\Sigma XY - (\Sigma X)(\Sigma Y)}{\sqrt{N(\Sigma X^2) - (\Sigma X)^2}\sqrt{N(\Sigma Y^2) - (\Sigma Y)^2}}$$

$$r = \frac{13\ (602,075) - (4325)(1519)}{\sqrt{13\ (1,837,777) - (4325)^2}\sqrt{13\ (241,715) - (1519)^2}}$$

$$= \frac{1257300}{\sqrt{5185476}\ \sqrt{834934}}$$

$$= \frac{1257300}{(2277.164)(913.747)}$$

$$= .60$$

D. Test Significance (d.f. = n-2 = 11, α = .05, r = .553)

$r_{.60} > r_{.553}$ = Significant relationship between reported larceny offenses and population per square mile.

DEBRIEFING NOTES

A. Indicate the first step in conducting analysis of this data is to calculate means and standard deviations for the two variables:

   -- Population Density: $\overline{X}$ = 333; SD = 182

   -- Reported Larceny: $\overline{Y}$ = 11,690; SD = 7,315

B. The second step is to prepare a scattergram.

C. The third step is to calculate the correlation coefficient, r = .60. This is calculated with Y expressed in hundreds.

D. According to Table for Critical Values of r for α =.05 with d.f.=11, the r value is .553. Therefore, the correlation coefficient is significant. We can conclude that there is a positive and moderate relationship between population density and larceny in these 13 counties.

E. Go over the worksheet with the required values worked out and have the participants compare their calculations.

F. Show them the substitutions in the formula and the r = .60.

G. If any difficulties were observed by you or the facilitator, clear up the problems.

H. Indicate the following:

1. To use r you should have two variables that are at least interval level.

2. Assumes a linear relationship.

3. Does not prove causality; only theory--not statistics--suggests proof, statistics indicate evidence.

4. Larger the sample size, the more powerful r is.

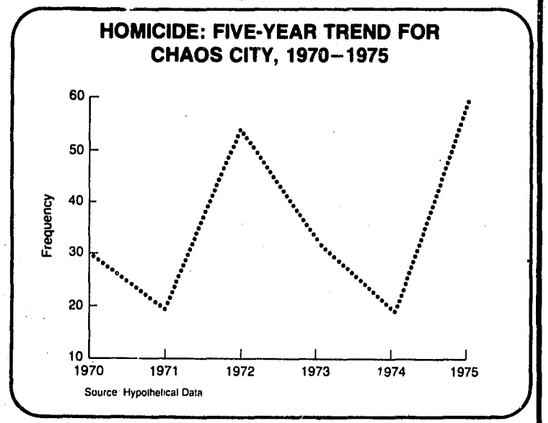
EXERCISE #4

NOTES

IV. REGRESSION

A. Time Series Data

SHOW V.A. (5-8):



EMPHASIZE (5-8):

+ A planner may discover that the homicide rate in Chaos City increased significantly in 1975, a fact that might encourage consideration of a range of programmatic responses.

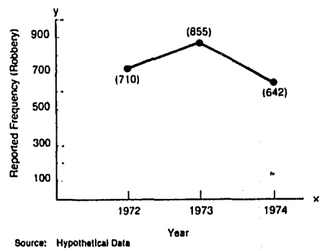
+ A review of crime trends for the prior five years might disclose that the homicide rate is susceptible to large proportional changes--both increases and decreases.

+ The planner could then reasonably conclude that the increases in 1975 do not represent a fundamental shift.

1. Short Time Series

SHOW V.A. (5-9):

THREE YEAR TIME SERIES OF ANNUAL ROBBERY DATA, CHAOS CITY, 1971–1974



Source: Hypothetical Data

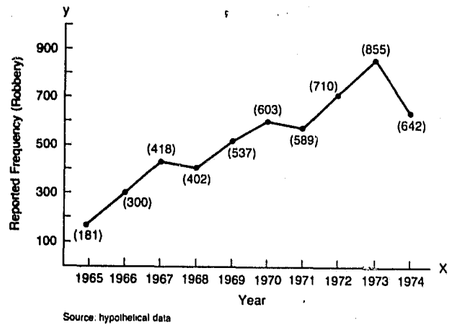
EMPHASIZE (5-9):

+ Generally, one can make more accurate forecasts on the basis of longer time series than on the basis of shorter ones.
+ Shorter time series have a tendency to mask irregular (anomalous) fluctuations.
+ For example, a three-year series of annual robbery data might look like that which appears in V. A. 5-10.

2. Extended Time Series

SHOW V.A. (5-10):

TEN YEAR TIME SERIES OF ANNUAL ROBBERY DATA, CHAOS CITY, 1965–1974



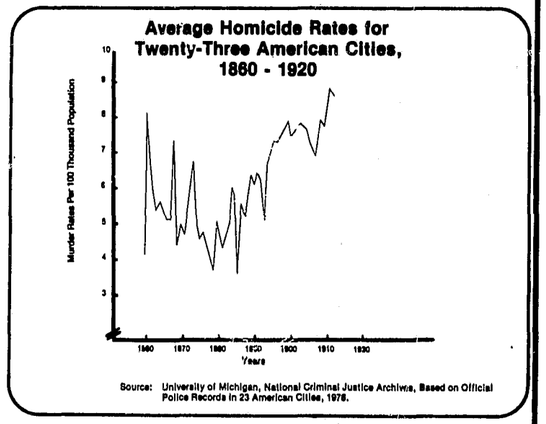
Source: hypothetical data

EMPHASIZE (5-10):

+ A longer, ten-year series may reveal a very different trend, as seen in V.A. 5-11.
+ Generally, it is advisable to use as long a time series as is available. However, length alone does not assure accuracy.

NOTES

SHOW V.A. (5-11):



EMPHASIZE (5-11):

+ Extended time series are subject to discontinuities or interruptions.

+ Note changing directions and magnitude of the trendline and its relationship to major events, e.g., World War I, Depression.

B. Visual Estimation of Regression Line.

1. Procedures.

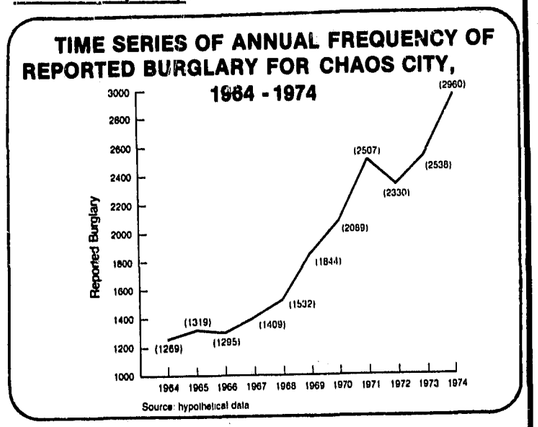
a. The first step is to fit a straight line through the time series which minimizes the distance between the data and the line.

b. Step two is to extend the line and "read" the resulting point estimate of a future value for the measure.

NOTES

2. EXAMPLE:

SHOW V.A. (5-12):



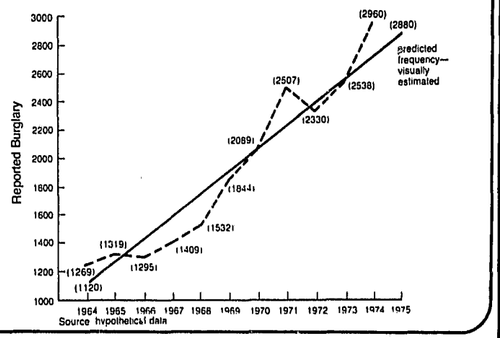
EMPHASIZE (5-12):

+ Data on reported annual incidents of burglary in Chaos City.

+ Strong indication of constant increase in incidents.

SHOW V.A. (5-13):

ANNUAL FREQUENCY OF REPORTED BURGLARY WITH VISUALLY ESTIMATED REGRESSION LINE FOR CHAOS CITY, 1964–1974



EMPHASIZE (5-13):

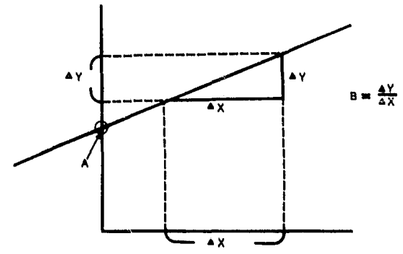
+ Line fitted to data.
+ Estimated prediction for 1975 is 2880 based on line.
+ This is a crude point estimate; least-squares regression defines the line algebraically, consequently, with greater precision.
+ A rough estimation is difficult to make with many scattered points.
+ Assumes all relevant factors will continue to operate as in the past.
+ Precision generally decreases with shorter time series and with highly fluctuating data.
+ This example assumes a straight line (linear) relationship. Visually the data suggest an exponential curve. Consequently we might estimate a higher incidence of burglary than 2880.

C. Least Squares Regression

1. Purpose
   a. To aid in forecasting where there are trends in time series data.
   b. To measure "best fit" for an estimating line.
2. Procedure for algebraically determining a straight line:

SHOW V.A. (5-14):

Slope and Y-Intercept



EMPHASIZE (5-14):

+ A is the Y-intercept.
+ B is the slope.
+ Changing either the A or B, changes the line.

SHOW V.A. (5-15):

FORMULA FOR REGRESSION COEFFICIENTS

Step 1: $$B = \frac{N\Sigma XY - (\Sigma X)(\Sigma Y)}{N\Sigma X^2 - (\Sigma X)^2}$$

Step 2: $$A = \frac{\Sigma Y - B\Sigma X}{N}$$

Step 3: $$\hat{Y} = A + BX$$

EMPHASIZE (5-15):

+ B and A can be algebraically determined providing greater accuracy than a graphic estimation.

+ Procedure involves three steps.

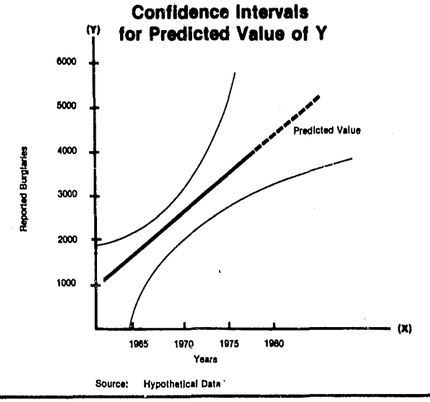
  (1) Determine B - the slope.

  (2) Determine A - the Y intercept.

  (3) Using the derived equations, estimate a predicted value of y, given a value for x.

3. Assessing the Utility and Accuracy of a Least Squares Prediction

SHOW V.A. (5-16):



EMPHASIZE (5-16):

+ Confidence interval increases as estimate moves farther from existing data.

+ Widening interval indicates increased likelihood of error in estimate.

+ Consequently, should not predict five years ahead with five years of data.

+ Confidence interval about a point estimate determined algebraically using a 't' distribution.

REGRESSION

PURPOSE

To give participants the opportunity to make projections using linear regression.

INSTRUCTIONS

A. Using only a ruler and the provided graph paper, visually estimate 1978 and 1979 homicides for Chaos City.

B. Using the formulas provided, calculate A and B, the regression coefficients for these data.

C. On the same piece of graph paper, draw the least squares regression line. Locate the regression line by using the formula $\hat{y} = A + Bx$ for at least two data pairs.

D. Predict the 1978 and 1979 homicides using the regression model calculated.

INSTRUCTOR NOTES

A. Explain the problem, Data Set, and use of Worksheet.

B. When most of the participants have completed the exercise, reconvene the class and review the debriefing notes.

C. Schedule:

1. Preparation - 5 minutes
2. Activity - 20 minutes
3. Debriefing - 10 minutes

EXERCISE #5

See page V-45-IG for the answer.

EXERCISE #5

DATA SET

Exercise #6

Table 1. Homicides in Chaos City, 1967 - 1977

YEAR (X)	HOMICIDES (Y)
1967	12
1968	13
1969	12
1970	14
1971	15
1972	18
1973	20
1974	25
1975	23
1976	25
1977	29

Source: FBI, UCR, 1978.

WORKSHEET

A. Complete the following table.

X	Y	XY	X^2
1	12	12	1
2	13	26	4
3	12	36	9
4	14	56	16
5	15	75	25
6	18	108	36
7	20	140	49
8	25	200	64
9	23	207	81
10	25	250	100
11	29	319	121
66	206	1429	506

B. Calculate the slope (B)

$$B = \frac{N\Sigma XY - (\Sigma X)(\Sigma Y)}{N\Sigma X^2 - (\Sigma X)^2}$$

$$B = \frac{11(1429) - (66)(206)}{11(506) - (66)^2}$$

$$B = \frac{2123}{1210}$$

$$B = 1.75$$

WORKSHEET Continued:

C. Calculate the Y intercept (A)

$$A = \frac{\Sigma Y - B(\Sigma X)}{N}$$

$$A = \frac{206 - 1.75(66)}{11}$$

$$A = 8.23$$

D. Substitute calculated values of A and B in equation.

$$\hat{y} = A + BX$$

$$\hat{y} = 8.23 + 1.75\ X$$

E. Substitute two arbitrary values of x into the equation and plot the line.

1.

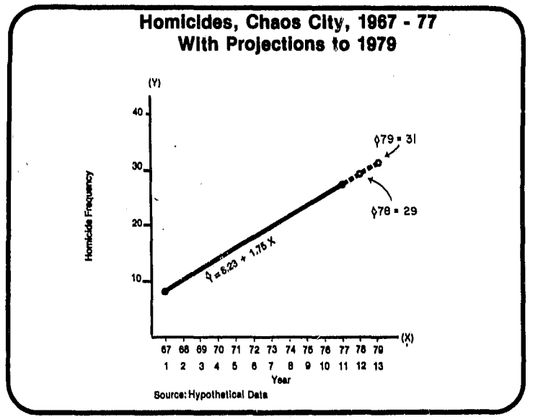
X	$\hat{Y}$
1	9.98
10	25.73

2. Now plot the line on graph paper.

EXERCISE #5

WORKSHEET Continued:

SHOW ANSWER: (Answer 5-a)



F. Estimate 1979 predicted homicide rate:

1. If 1978 = 12

   1979 = 13

2. $\hat{Y}_{78} = 8.23 + 1.75\ (12)$

   $\hat{Y}_{78} = 29$ homicides

   $\hat{Y}_{79} = 8.23 + 1.75\ (13)$

   $\hat{Y}_{79} = 31$ homicides

EXERCISE #5

DEBRIEFING NOTES

A. Step-by-step, lead participants through the worksheet.

B. Compare visually estimated lines and the calculated regression lines.

   1. Direction and Slope of Regression Line.

   2. Intercept and Predicted Value.

C. Point out:

   1. Assumption that all relevant factors will continue to operate as in the past.

   2. Accuracy decreases with shorter time series and highly fluctuating data.

   3. The conclusions are less reliable with lower values of r. Correlation coefficient equals .96.

   4. Provides no information about variability by itself.

   5. Does not preclude spuriousness.

D. Least squares regression builds upon descriptive statistics ($\bar{Y}$ = 18.72 homicides, S_Y = 6.03 homicides), the scattergram, and must be based on a strong conceptual foundation as outlined in a problem specification.

E. Note the convention of redesignating the years on the horizontal axis as years 1 to 13. This redesignation facilitates calculation of the equation and inspection of the value of the Y intercept.

EXERCISE #5

NOTES

V. INTERPRETATION OF FINDINGS

A. The purpose of these statistical techniques is to enable the analyst to draw conclusions about hypotheses postulated during problem specification.

B. Examples: Exercise #6 provides practice in interpreting statistics taught in Modules 3, 4, and 5.

EXERCISE #6

INTERPRETATION OF FINDINGS

PURPOSE

This exercise demonstrates the process of specifying a system problem using the methods just discussed. It provides practice in interpreting the statistics of Modules 3, 4 and 5.

The concern examined in the exercise is parolee recidivism, and specifically the relationship, if any, between parolee recidivism and the caseload of parole officers in Chaos City. Provided are some of the measures and related statistics needed to analyze the problem.

INSTRUCTIONS

A. For the problem you are to:

1. Consider the underlying issues implicit or explicit in the concern.
2. Become familiar with the particular data involved.
3. Consider the validity and reliability of the measures.
4. Consider the adequacy and limitations of the statistical operations performed.

B. In the final product, for each question, you are to:

1. Interpret the statistics, stating their meaning and significance.
2. Note the major possible limitations on the interpretation.
3. Outline other factors bearing on the interpretation.

C. Questions to be answered:

1. Describe the trend in the number of parole recidivists during the past five years.
2. What is the estimate of the parolee recidivism rate for 1978?
3. What is the relationship between the workload per parole officer upon the recidivism rate?
4. If existing workloads (142 cases/officers in 1977) were reduced by 20% what effect would this have on recidivism rates?
5. Is the workload of parole officers related to the incidence of technical violations by parolees?

EXERCISE #6

INSTRUCTOR NOTES

A. The exercise covers material presented in Modules 3, 4, and 5.

B. The exercise deals with the measurement and examination of the relationships between the system concepts.

C. Explain purpose of exercise as outlined above.

D. Explain desired products as outlined in Activities Section of student guide.

E. Walk-through the Data-Set--system and sub-system measures--indicating which concept is being measured.

F. Point out the three "givens" of the problem (1) Questions, (2) Concepts and Measures, and (3) Statistics. Indicate participants are to provide interpretation.

G. Indicate the Exercise's schedule:

1. Briefing - 5 minutes
2. Activities - 35 minutes
3. Debriefing - 20 minutes

H. The first two questions may be done with participants interacting still in the class, or it may be done by each group separately.

I. When most of the participants complete the exercise, reconvene the class and review the debriefing notes.

SHOW V.A. (5-17)

Each Problem Provides

- Questions
- Concepts and Measures
- Statistics

You Provide:

- Answers
- Interpretations
- Limitations
- Other Factors

DATA SET

Table 1. Selected System Measures, Chaos City, 1973-1977

Parole Sub-system Indicators	1973	1974	1975	1976	1977
A. Number of Parolees					
(1) District A	1160	1090	990	1064	1098
(2) District B	1248	1157	1093	1128	1202
(3) District C	1008	981	985	936	966
Total	3416	3228	3068	3128	3266
B. Parolees with Technical Violations					
(1) District A	358	360	314	295	351
(2) District B	220	195	209	189	210
(3) District C	446	413	391	411	378
Total	1024	968	914	895	939
C. Parolees with no Technical Violations					
(1) District A	802	730	676	769	747
(2) District B	1028	962	884	939	992
(3) District C	562	568	594	525	588
Total	2392	2260	2154	2233	2327
D. County Caseload/ Officer					
(1) District A	111	114	129	120	137
(2) District B	132	128	162	152	172
(3) District C	77	75	120	115	121
Average	107	106	137	129	143
E. Recidivism Rate (number rearrested/100 parolees)	14.8	14.6	18.3	16.2	19.8

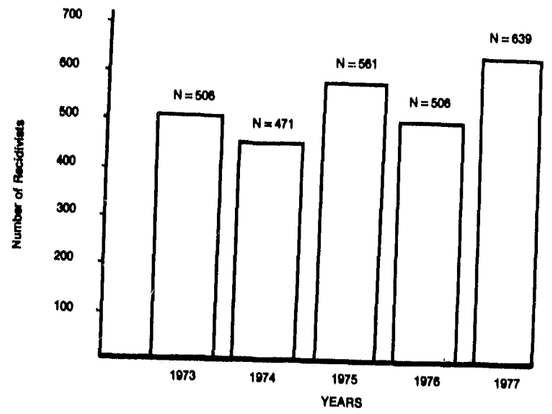
Source: Department of Corrections, State of Paradise, Chaos City Office, 1978.

DATA SET

QUESTION #1: Describe the trend in the number of recidivists during the past five years.

Table 2.

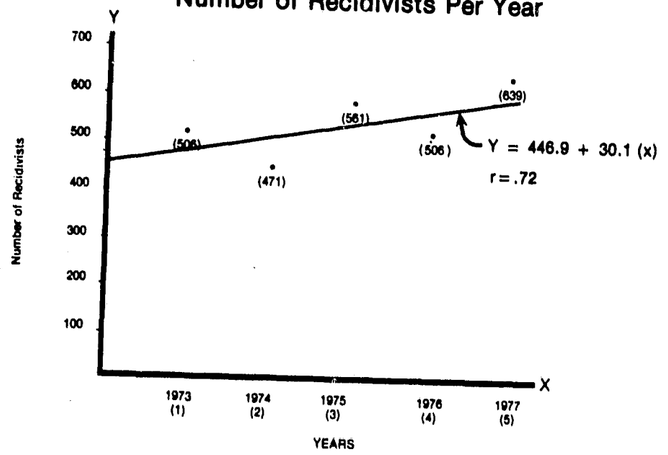
Number of Recidivists Per Year



Source: Chaos City Dept. of Corretions, 1978.

Table 3.

Number of Recidivists Per Year

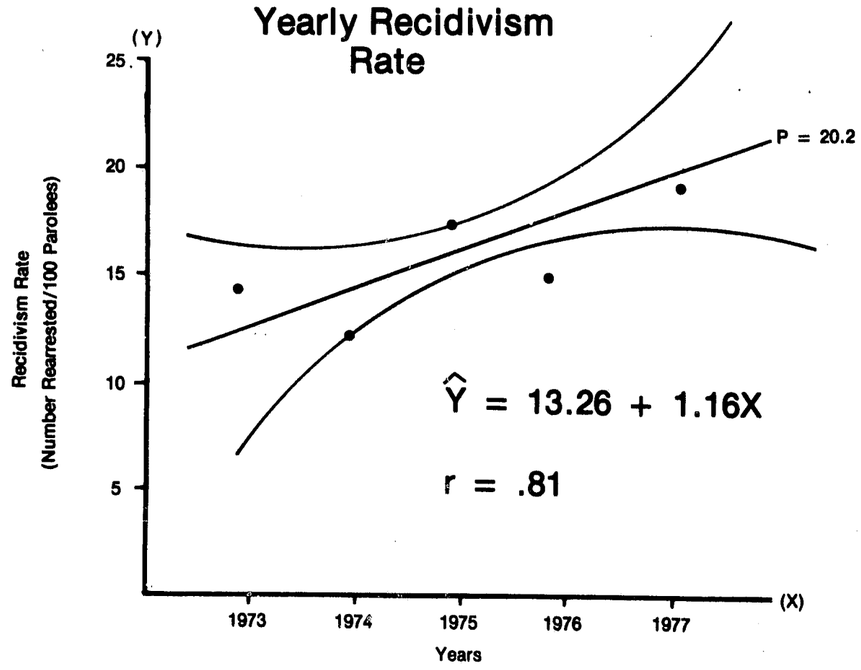


Source: Chaos City Dept. of Corrections

DATA SET

QUESTION #2: Estimate the parolee recidivism rate for 1978.

Table 4.



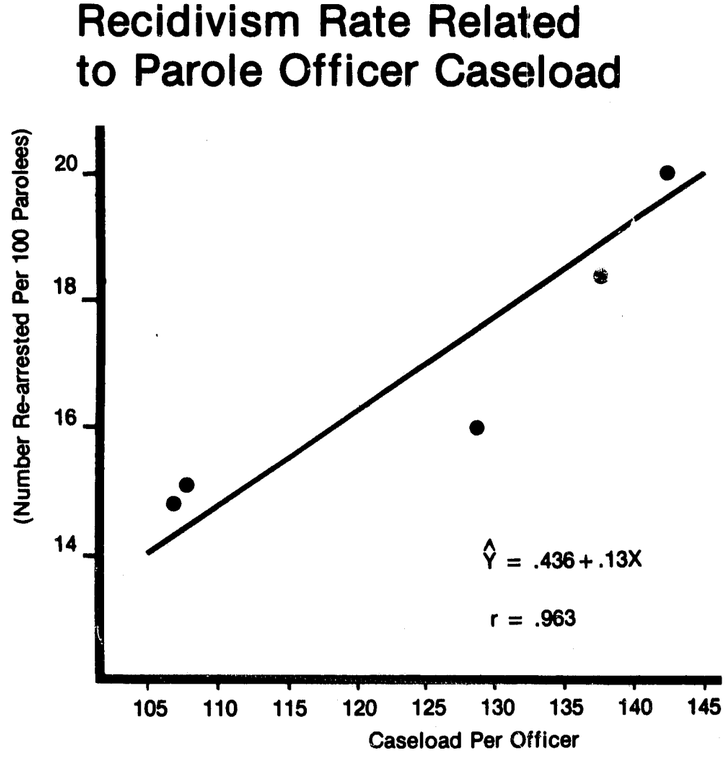
Source: Chaos City Dept. of Corrections, 1978.

EXERCISE #6

DATA SET

QUESTION #3: What is the relationship between the case load per officer and the recidivism rate?

Table 5.



Source: Chaos City Dept. of Corrections

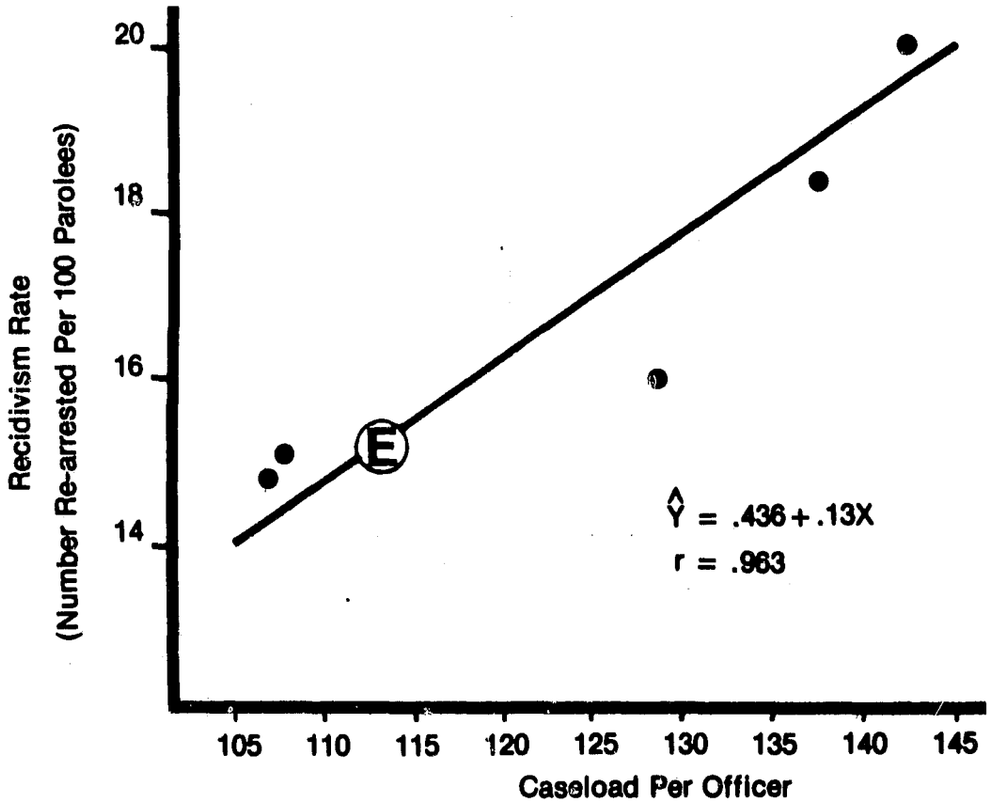
EXERCISE #6

DATA SET

QUESTION #4: If existing workloads were reduced 20%, what effect would this have on recidivism?

Table 6.

Recidivism Rate Related to Parole Officer Caseload



Source: Chaos City Dept. of Corrections

EXERCISE #6

EXERCISE #6

WORKSHEET

A. Describe the trend in the number of parole recidivists during the past five years.

1. Answer/Interpretation

2. Limitations/Qualifications

3. Other Factors

B. Estimate the parolee recidivism rate for 1978.

1. Answer/Interpretation

2. Limitations/Qualifications

3. Other Factors

C. What affect does the caseload of parole officers have on the recidivism rate?

1. Answer/Interpretation

EXERCISE #6

WORKSHEET (continued)

2. Limitations/Qualifications

3. Other Factors

D. If existing workloads were reduced by 20%, what affect would this have on recidivism?

1. Answer/Interpretation

2. Limitations/Qualifications

3. Other Factors

E. Is the workload of parole officers related to the incidence of technical violations committed by parolees?

1. Answer/Interpretation

2. Limitations/Qualifications

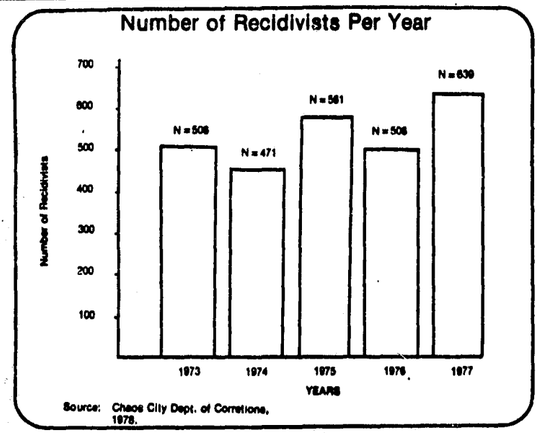
3. Other Factors

DEBRIEFING NOTES

A. Question 1

Describe the trend in recidivism for parolees during the past five years?

SHOW ANSWER (Answer 6-a):



EMPHASIZE (Answer 6-a):

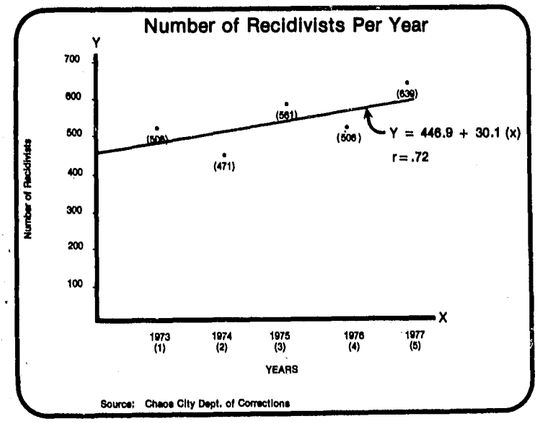
+ $\bar{X}$ = 536 Recidivists
+ s = 66 Recidivists
+ Average Annual % Change = 7.2% in Recidivists
+ Percent Change 1973 to 1977 is 26.3%
+ Number of Recidivists = Recidivism Rate X Number of Parolees.

DEBRIEFING NOTES

+ Limitations:

(1) Small data set
(2) Need to extend data base
(3) Take x-section of most recent year
(4) Develop monthly data on recidivism for the period
(5) Other variables

SHOW ANSWER (Answer 6-b):



EMPHASIZE (Answer 6-b):

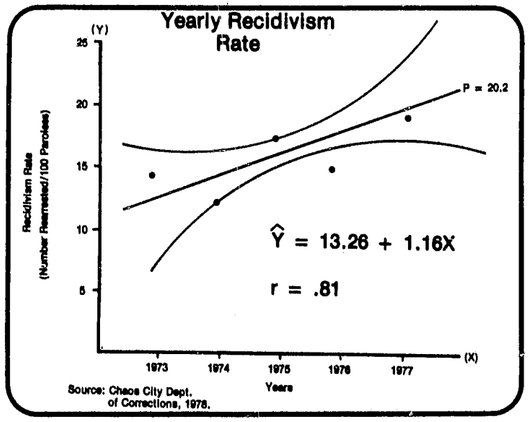
+ Slight Upward Trend
+ Only a Fair Fit of the Regression Line: r^2 = .53
+ Estimate of Annual Increase is 30 Recidivists

DEBRIEFING NOTES

B. Question #2

What is the estimate of the parolee recidivism rate for 1978?

SHOW ANSWER (Answer 6-c):



EMPHASIZE (Answer 6-c):

+ Prediction equation $\hat{Y} = 13.26 + 1.16X$

+ 1978 is 6th year, $X = 6$

$\hat{Y} = 13.26 + 1.16\ (6)$

$\hat{Y} = 20.22$ Recidivists

+ Decreasing confidence in estimate the farther the estimate is from the actual data indicated by confidence interval

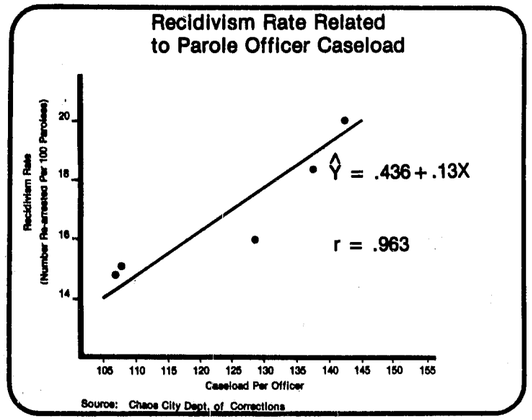
+ Only five data points

DEBRIEFING NOTES

C. Question #3

What is the relationship between the caseload per parole officer and the recidivism rate?

SHOW ANSWER (Answer 6-d):



EMPHASIZE (Answer 6-d):

+ Describe X and Y $\quad \bar{X} = 123.6 \quad S_x = 16.5 \quad \bar{Y} = 16.7 \quad S_y = 2.3$

+ Strong relationship r = .963, Significant at .05

+ Regression line fits data very well

+ Indicates higher recidivism rates tend to be associated with higher workloads

+ Caseload increase of 8, increases the recidivism rate by about 1 person/100 parolees

+ As workload (cases/officer) is reduced performance (recidivism) improves

+ Limitations:

(1) Small data set, although line fits data well

(2) Caseload per officer and recidivism may be functions of other variables

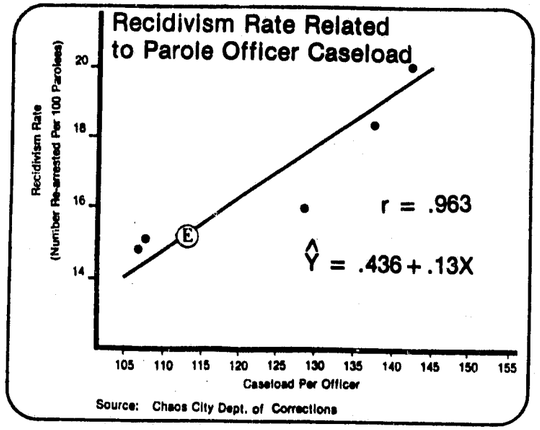
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DEBRIEFING NOTES

D. Question #4

If existing caseloads (142 parolees per officer) were reduced 20% what effect would this have on recidivism?

SHOW ANSWER (Answer 6-e):



EMPHASIZE (Answer 6-e):

+ Caseload in 1977 = 142 parolees per officer

+ Prediction Equation $\hat{Y} = .436 + .13X$

  20% Reduction: = 113.6 parolees per officer

  If X = 113.6 $\hat{Y}$ = .436 + .13 (113.6) = 15.2 Recidivists/100 parolees.

+ Interpretation: A 20% reduction in the 1977 caseload level from about 19.8 recidivists per 100 parolees to 15.2.

+ Limitations:

  (1) Small data set, although line fits data well
  (2) Other variables may be responsible for relationship
  (3) Projections outside range of data are suspect but not in this case
  (4) Is it valid to presume that a reduction in caseload would result in a reduction in recidivism rate? Increasing time available for the parole officer may result in an increase in rearrest based on technical violations.

DEBRIEFING NOTES

E. Question #5

Is the caseload of parole officers related to the incidence of technical parole violations?

SHOW ANSWER (Answer 6-f):

Incidence of Technical Violations By Parole Officer Caseload

	Caseload			TOTALS
	Low 70-109	Medium 110-149	High 150-189	
Parolees with Technical Violations	859 (43.2%)	3273 (30.6%)	606 (17.6%)	4740 (29.4%)
Parolees with no Technical Violations	1130 (56.8%)	7421 (69.4%)	2815 (82.2%)	11366 (70.6%)
TOTALS	1989 (100%)	10694 (100%)	3423 (100%)	16106*

Source: Chaos City Dept. of Corrections, 1978.

*Total from Rows B and C of Table 1 for all five years

χ^2 calculated = 412.76
χ^2 .05, 2df. = 5.99

EMPHASIZE (Answer 6-f):

+ There appears to be a significant, negative relationship between caseload size and the incidence of technical violation.

+ Chi Square test of independence confirms a dependent classification.

+ Comparing results from Question #4 and Question #5:

  A decrease in caseload will decrease recidivism, but is likely to increase technical violations. A typical tradeoff for these types of problems.

+ 76% of the parolees supervised on a low caseload had a technical violation while only 17.8% of the parolees supervised on a high caseload had technical violations.

+ Validity questions: Are parolee technical violations a fair measure of performance? Is caseload per officer an accurate measure of workload (i.e., varying requirements of individual cases for supervision.)

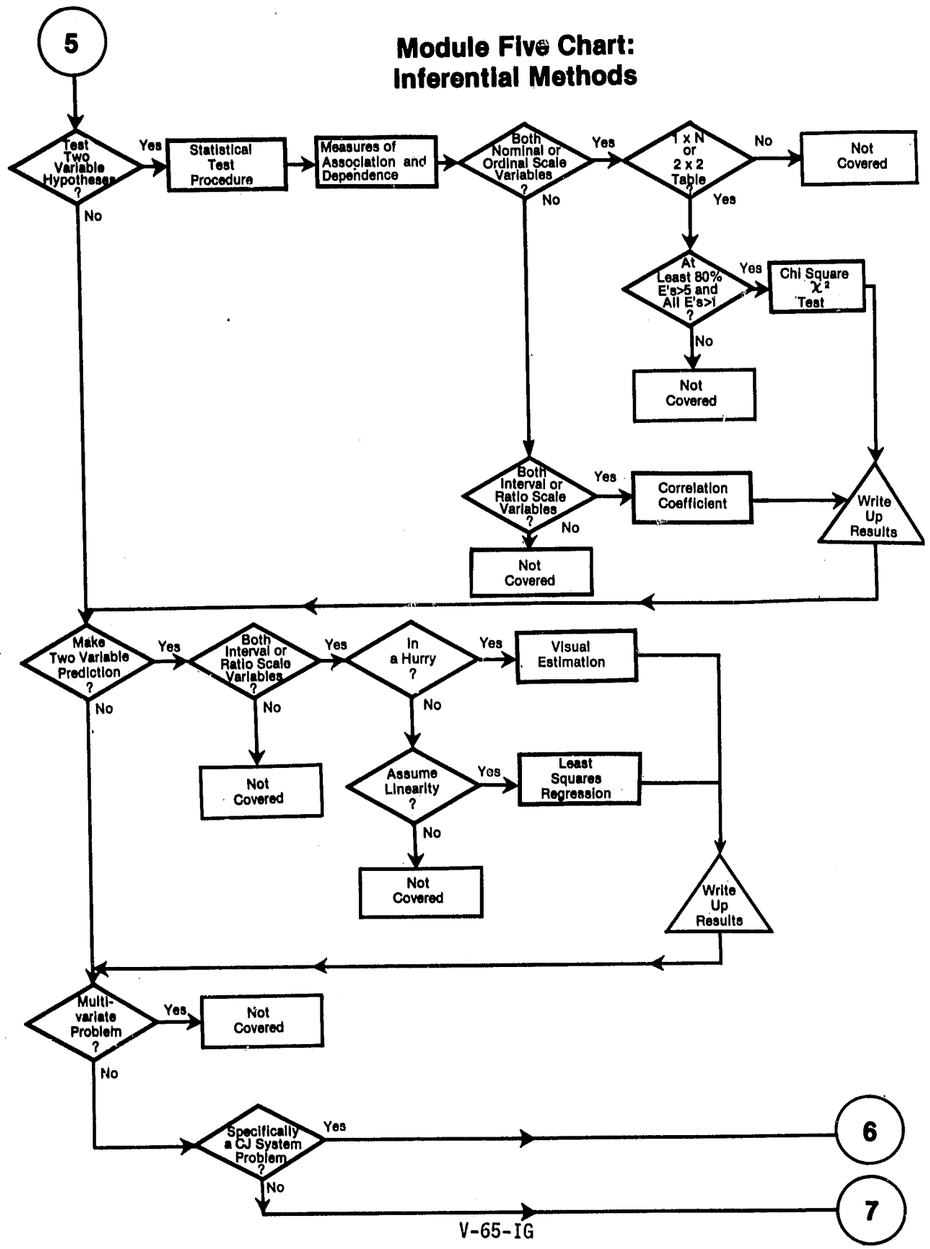
+ Reliability questions: What changes over time occurred in counting caseloads and violations?

NOTES

VI. CONCLUSION

A. Review the Module Chart and respond to participant questions. Begin the Briefing of Task #3 of the Major Exercise.

SHOW V.A. (5-18):



MODULE 6
DATA INTERPRETATION -- SYSTEM

The purpose of Module 6 is to introduce system analysis and to illustrate the use of the system variables and related measures in analyzing the criminal justice system.

The instructor should define carefully, using appropriate examples and illustrations, the concepts, variables and measures introduced in this module. The Walk-Through illustration of input-output flow analysis should be used to discuss application of system analysis.

OBJECTIVES

1. To describe criminal justice system problems using:

    a. System Concepts, Variables and Measures
    b. Flow Charts
    c. Descriptive Methods

2. To analyze the system using:

    a. System Concepts, Variables and Measures
    b. Comparative Methods
    c. Input/Output Flow Analysis

SCHEDULE

DATA INTERPRETATION - SYSTEM

TIME ALLOCATION

	TOPIC	TIME	PAGE
I.	INTRODUCTION	10 minutes	VI-3
A.	What is a System?	5 minutes	VI-3
B.	What is the Criminal Justice System?	5 minutes	VI-4
C.	How can the Criminal Justice System be Analyzed?	*	VI-7
II.	FLOW CHARTS	40 minutes	VI-7
A.	Uses	5 minutes	VI-7
B.	Types	5 minutes	VI-7
	Walk-Through 'K' FLOW CHARTS	30 minutes	VI-12
III.	SYSTEM CONCEPTS	70 minutes	VI-20
A.	Overview	*	VI-20
B.	Environment	5 minutes	VI-21
C.	Administration	*	VI-21
D.	System Operations	10 minutes	VI-21
E.	System Operations Variables	15 minutes	VI-26
	Walk-Through 'L' FLOW ANALYSIS	40 minutes	VI-34
IV.	CONCLUSION	10 minutes	VI-45
	TOTAL TIME	120 minutes	

* Less than 5 minutes

MODULE 6: DATA INTERPRETATION -- SYSTEM

NOTES

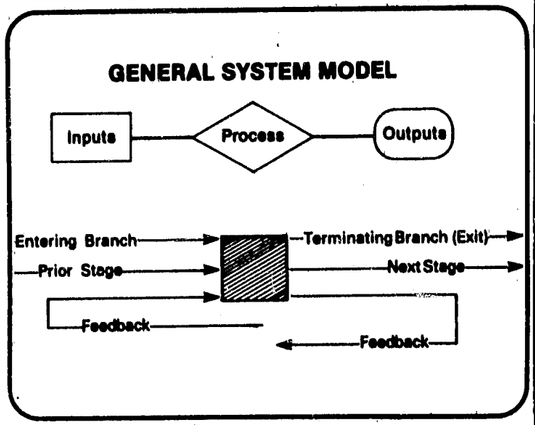
I. INTRODUCTION

A. What is a System?

1. A system is "a regularly interacting or interdependent group of items forming a unified whole."

   - Common goals.
   - Dynamic character.
   - Input/output model.

SHOW V.A. (6-1):



EMPHASIZE (6-1):

+ The generalizable character of this model.
+ Can be applied to into most administrative processes either at the "macro" e.g., criminal justice system level, or "micro" level, e.g., police department.
+ Explain model terms.

  Note "feedback" arrows are not connected: feedback may be direct from a particular process or stage or from some other system component.

NOTES

B. What is the Criminal Justice System?

1. The criminal justice system is a collection of agencies that perform an enormous complex of operations. These activities are organized in a sequential manner in response to the problems created by the commission of criminal acts.

2. The purpose of the criminal justice system is to deal with crime and delinquency. Each component pursues specific objectives which may or may not be consistent with other components of the system.

3. In systems terms, the elements of the criminal justice system are the offender and other individuals who have been arrested for the commission of criminal acts, criminal justice agencies and their personnel, equipment and facilities.

4. Examples of external system inputs are community attitudes toward crime, public per capita expenditures for the criminal justice system, and legislation. The influx of new offenders also may be considered an external input, however, the flow of recidivists is often treated as an internal criminal justice input. Internal inputs would be the flow of offenders between criminal justice agencies and agency activities that impact the criminal justice system, such as court decisions that affect police and corrections.

   The criminal justice system produces a flow of individuals directed toward a speedy and just disposition. This flow is caused by the criminal acts committed and the calls for service they generate.

5. The components of the criminal justice system are interdependent. For example, calls for service and the number of personnel available influence the number of dispatches made. The number of dispatches made, in turn, influences the number of arrests that are made; and the

NOTES

number of arrests made in the law enforcement subsystem provides flow to the judicial subsystem, influencing its workload. Judicial workload, in turn, influences trial dates and consequently, trial times.

6. One way of viewing the criminal justice system, emphasizing its components, is presented in Exhibit 1.

   a. In Exhibit 1, law enforcement, courts and correctional agencies, their personnel and their facilities interact in such a way that responses to criminal acts are made and case flows established.

   b. The agencies, their personnel, facilities, equipment and budgets, as they respond to the offender and his acts, can be considered the primary components of the criminal justice system.

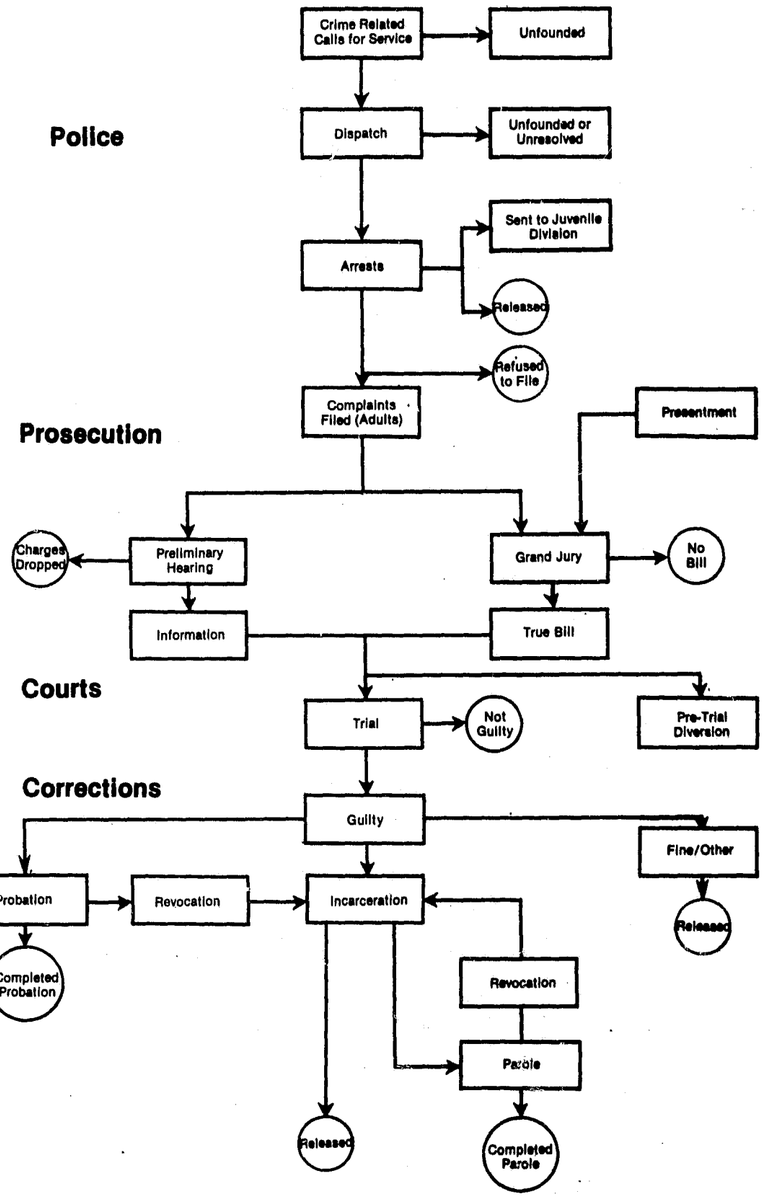
   c. The primary inputs to the system are the criminal acts.

   d. The primary outputs are the offenders, case flows and the time relationships involved in the processing of the individual through the system.

   e. The legal code and statutes, which define crime, and the criminal justice agencies provide the framework for the delivery of criminal justice services.

   f. Suggest how the general system model can be plugged into virtually any point on the Exhibit, and would substantially contribute to beginning to untangle the "dynamic" characteristic of criminal justice.

Exhibit 1. The Criminal Justice System



C. How can the Criminal Justice System be Analyzed?

1. Flow charts.

2. Input/Output analysis.

3. Within these system analysis techniques using the tools taught in Modules 3, 4, and 5.

II. FLOW CHARTS

A. Uses of Flow Charts.

1. Aid to Reader or Audience.

2. It clarifies thinking.

a. Identify gaps in knowledge.

b. Tighten logic.

B. Types of Flow Charts.

1. Process flow chart.

a. Physical flow of offenders from one component to another is shown.

b. Exhibit 1 provided an example.

2. Operations charts.

a. Shows essential operational aspects of the system.

b. Exhibit 2 provides an example.

c. Note that:

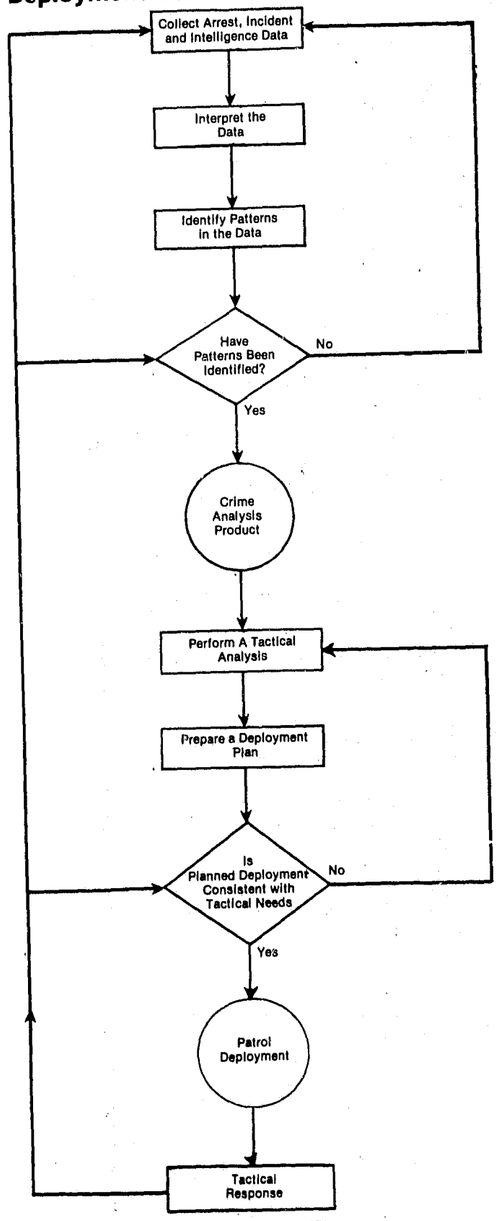
- A rectangle should be used to present an instruction or information.

- A diamond-shape is used to indicate decision points, or places where choices must be made.

- Arrows indicate the direction of the flow.

- Circles, ovals, or triangles indicate products or end points in the flow.

Exhibit 2. Operations Flow Chart, Deployment Decision-Making System



Source: Chaos City Police Department, 1978.

NOTES

3. Dependency Chains.

   a. Portrays a sequence of events.

   b. Dependence of various events and not flows is emphasized.

   c. Examples of a dependency chain are PERT Charts.

4. Organizational Patterns.

   a. Exhibit 3 is an organizational chart for Chaos City's Regional Planning Unit.

   b. Shows relationships and flows of authority and responsibility in an organization.

   c. Generally, solid lines are used to indicate authority and responsibility. Dotted lines are used to indicate "confer and advise."

5. Convergence/divergence flow charts.

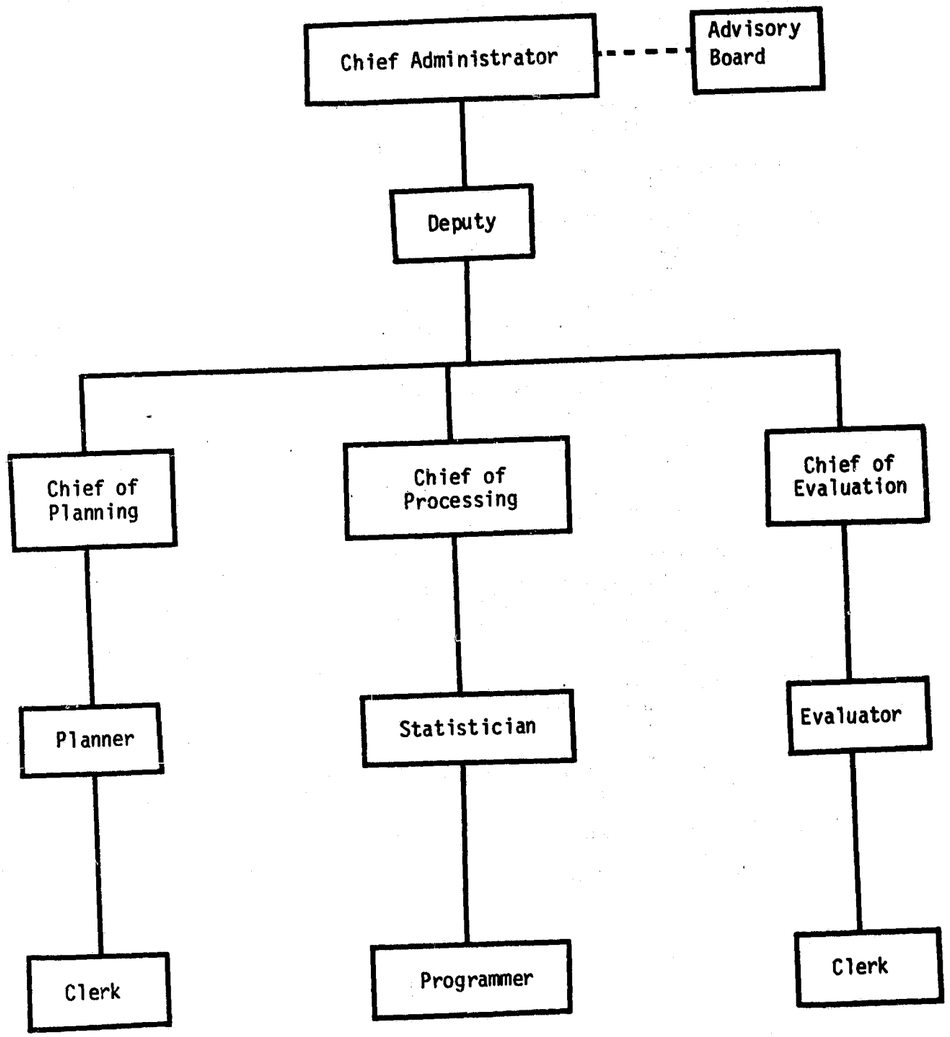
   a. A statistical flow of offenders may diverge or converge leading to one or several outcomes. This is the principle of a disposition tree.

   b. Disposition trees are a type of widely used flow chart in criminal justice.

   c. See Exhibit 4 for an example of a disposition tree.

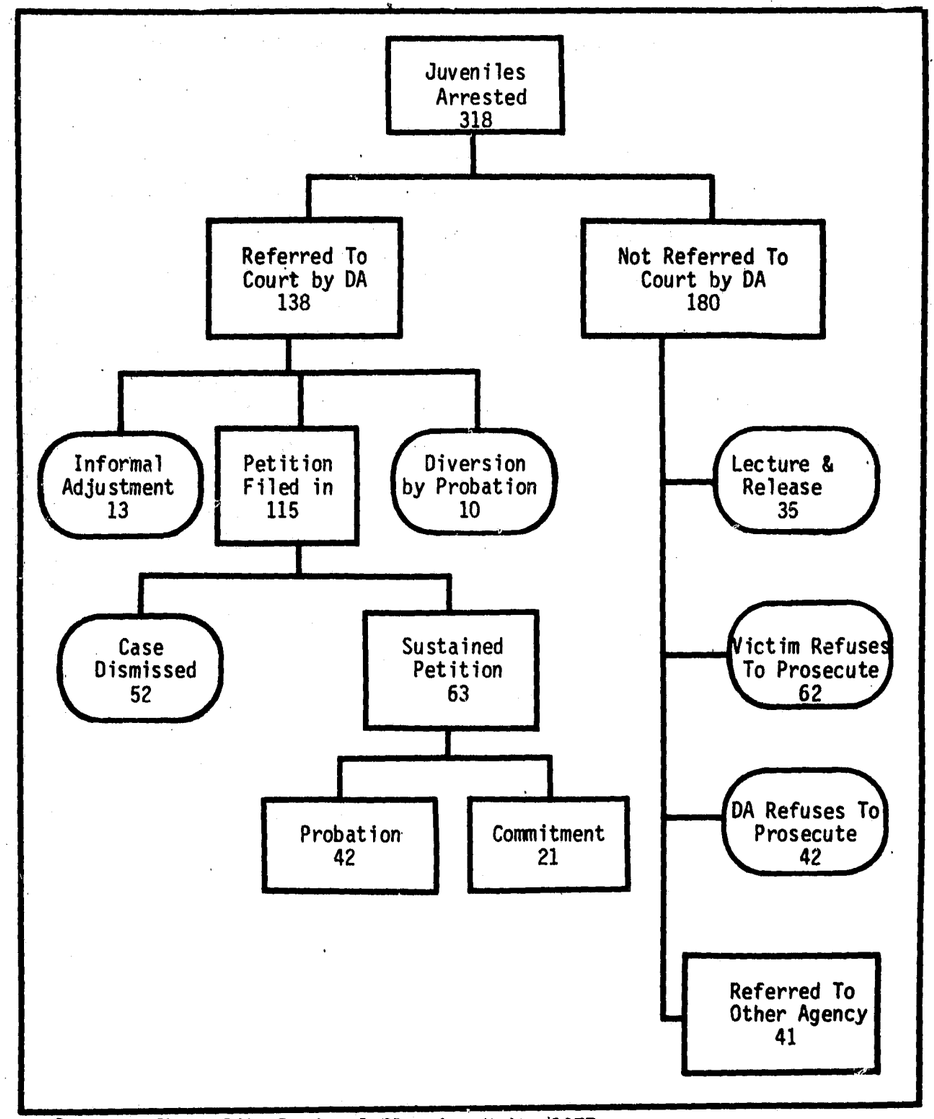
   d. The use and interpretation of various types of disposition trees is covered in the next section.

Exhibit 3. Organizational Chart, Chaos City, Regional Planning Unit



Source: Chaos City, Regional Planning Unit, 1977.

Exhibit 4. Divergence Flow Chart
Assault Arrests (Juveniles Only) Chaos City, 1977



Source: Chaos City Regional Planning Unit, 1977.

FLOW CHARTS

PURPOSE

To illustrate the construction, uses, and interpretation of flow charts with related summary tabulations of offender flows.

INSTRUCTOR NOTES

A. Go over the structure and design of a disposition tree (V.A. 6-2).

B. Interpret the disposition with input percentages (V.A. 6-3).

C. Interpret the disposition tree with decision point percentages (V.A. 6-4).

D. Interpret the disposition tree with elapsed time (V.A. 6-5).

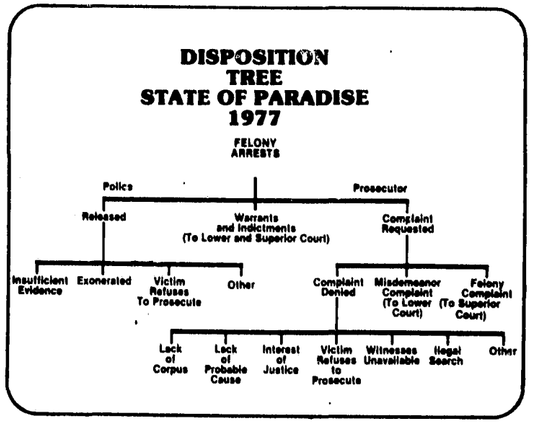
E. The time available for this Walk-Through is 30 minutes.

F. Following are four flow charts and three exhibits. The exhibits present two of the flow charts in summary tabulations. The final exhibit, which concludes the Walk-Through, compares the uses of transaction data as presented in the disposition trees, and summary tabulations.

DATA SET/WORKSHEET

A. Disposition Tree

SHOW V.A. (6-2):



EMPHASIZE (6-2):

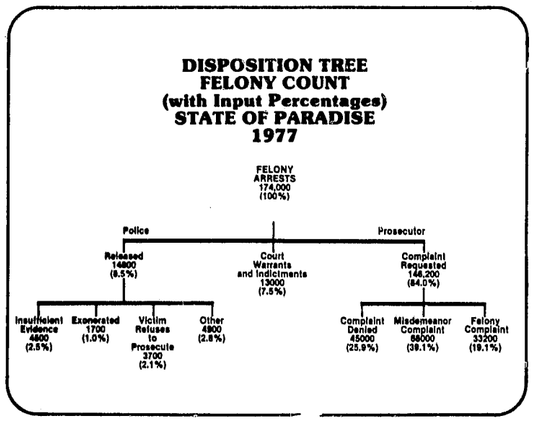
+ The structure and design of the tree. This tree presents the flow of offenders in the State of Paradise for the year 1977.

+ Try to anticipate offender flows with participants.

DATA SET/WORKSHEET (Continued)

B. Disposition tree with input percentages.

SHOW V.A. (6-3):



EMPHASIZE (6-3):

+ Point out that each limb of the tree represents part of the total. A major finding of this particular tree is that felony complaints only account for 19.1% of all felony arrests and that 8.5% of all those arrested are released.

NOTE:

1. Table 1 presents a different perspective on the data in V.A. 6-3.

2. Note that (1) data presented are for a single county and not for an entire state; (2) the county data have been subdivided by arresting agencies; and (3) since Agency A accounts for nearly 63% of all dispositions the last column has been added to isolate the remainder of the agencies.

3. Inspection of the table indicates that D & E are similar in performance. This is verified by calculating an r = .94. Comparing Agency A with County Less A results in an r = .66 indicating less similar performance between A and other agencies. Also note that Agency A, while high on law enforcement releases and complaints denied, is quite low on percent convictions.

WALK-THROUGH 'K'

1

Table 1. Disposition of Felony Arrests
Comparison of State and County Agencies
(With Input Percentages)

	STATEWIDE (56 COUNTIES)	CHAOS COUNTY	COUNTY ARRESTING AGENCIES						COUNTY LESS AGENCY A
			AGENCY A	AGENCY B	AGENCY C	AGENCY D	AGENCY E	AGENCY F	
Total felony arrests dispositions	174,069	19,698	12,351	3,793	1,326	684	506	1,038	7,347
Not convicted - number - (% total)	89,820 (51.6)	11,684 (59.3)	7,622 (61.7)	2,211 (58.3)	676 (51.0)	330 (48.3)	246 (48.6)	599 (57.7)	4,062 (55.3)
• Law enforcement releases	8.5	13.9	(20.1)	0.7	8.6	7.3	6.7	5.3	2.6
• Complaints denied	25.9	13.1	(14.9)	11.0	18.0	17.0	14.8	8.7	11.4
• Lower court	14.4	32.1	24.4	44.3	22.9	22.5	24.9	43.2	35.9
• Superior court	4.0	.2	2.3	2.3	1.5	1.5	2.2	0.5	2.3
Convicted - number - (% total)	84,249 (47.2)	8,014 (40.7)	4,729 (38.2)	1,582 (41.7)	650 (49.0)	354 (51.7)	260 (51.3)	439 (42.4)	3,285 (44.7)
• Lower court	28.0	24.6	(19.6)	27.1	35.0	33.7	28.0	33.3	30.8
• Superior court	19.2	16.1	(18.6)	14.6	14.0	18.0	23.3	9.1	17.0

Source: Chaos County, 1977.

r = .94

r = .66

WALK-THROUGH 'K'

Table 1. Disposition of Felony Arrests
Comparison of State and County Agencies
(With Input Percentages)

	STATEWIDE (56 COUNTIES)	CHAOS COUNTY	COUNTY ARRESTING AGENCIES						COUNTY LESS AGENCY A
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• Lower court	14.4	32.1	24.4	44.3	22.9	22.5	24.9	43.2	35.9
• Superior court	4.0	.2	2.3	2.3	1.5	1.5	2.2	0.5	2.3
Convicted - number - (% total)	84,249 (47.2)	8,014 (40.7)	4,729 (38.2)	1,582 (41.7)	650 (49.0)	354 (51.7)	260 (51.3)	439 (42.4)	3,285 (44.7)
• Lower court	28.0	24.6	(19.6)	27.1	35.0	33.7	28.0	33.3	30.8
• Superior court	19.2	16.1	(18.6)	14.6	14.0	18.0	23.3	9.1	17.0

Source: Chaos County, 1977.

r = .94

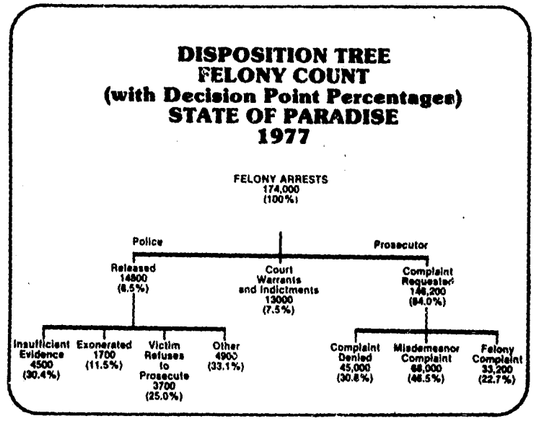
r = .66

WALK-THROUGH 'K'

DATA SET/WORKSHEET (Continued)

C. Disposition tree with decision points.

SHOW V.A. (6-4)



EMPHASIZE (6-4):

+ Note how this format focuses attention on specific components of the decision, e.g., indicates the consequences of certain decisions made by the prosecutor.

+ When compared to the input percentage table, this chart indicates that, of the cases handled by the prosecutor, the felony complaint problem is more of a problem than was indicated by input percentages alone.

+ This format also emphasizes the relative importance of insufficient evidence as a reason for police release.

NOTE:

1. Table 2 presents the county level data on Law Enforcement releases.

2. Note in Agency B and E the comparatively high percentage of exonerated arrestees. Agency A is much different from the remainder of county (r = .51).

3. When law enforcement releases are compared with total arrest disposition A = 20% versus B = less than 1% and a statewide average of 8.5% (from Table 1).

WALK-THROUGH 'K'

Table 2. Disposition Of Felony Arrests/Comparison of County Agencies (With Decision Point Percentages) Chaos County - 1977

DISPOSITION	CHAOS COUNTY	SELECTED COUNTY ARRESTING AGENCIES						COUNTY LESS AGENCY A
		AGENCY A	AGENCY B	AGENCY C	AGENCY D	AGENCY E	AGENCY F	
Total felony arrest dispositions. . .	19,698	12,351	3,793	1,326	684	506	1,038	7,347
Law enforcement releases.	2,757	3,482	27	114	50	34	32	257
• Insufficient evidence	76.4	(81.9)	22.2	32.5	(56.0)	5.9	0.0	35.4
• Exonerated.	0.8	0.3	7.4	4.4	0.0	8.0	(31.3)	4.3
• Victim refuses to prosecute . . .	12.6	12.3	7.4	20.2	16.0	2.9	28.1	14.3
• Further investigation	3.7	3.5	3.7	9.6	6.0	0.0	40.6	5.8
• Unspecified, other.	6.5	2.0	(59.3)	33.3	22.0	(82.4)	0.0	40.0

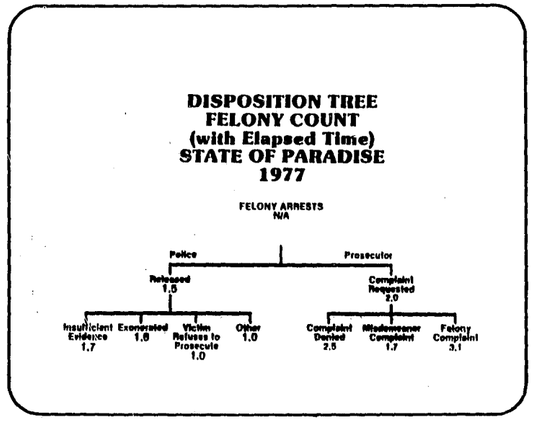
Source: Chaos County, 1977.

WALK-THROUGH 'K'

DATA SET/WORKSHEET (Continued)

D. Disposition tree with elapsed times.

SHOW V.A. (6-5):



EMPHASIZE (6-5):

+ This format represents for each limb, average elapsed time from point of arrest to release or to complaint requested and from there to disposition.

+ Time is measured in days and includes weekends.

E. Limits and uses of transaction data and summary tabulations. Table 3 concludes the Walk-Through.

DATA SET/WORKSHEET (Continued)

Table 3. Uses Of Transaction Statistics/Disposition Trees

SUMMARY

* Traces the flow of offenders through the criminal justice system.
* Aids in developing explanations of the observed characteristics when backlogs occur.
* Permits measurement of the recirculation of offenders.
* Helps in performing input-output analysis.
* Helps in monitoring the system.

LIMITS OF SUMMARY TABULATIONS

* Can not be used to identify the impact of system changes.
* Can not be used to elaborate the process or "dynamic" aspects of the criminal justice system.

MODULE 6: DATA INTERPRETATION -- SYSTEM

NOTES

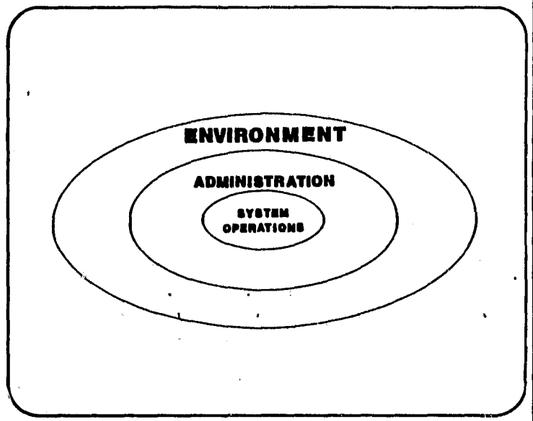
III. SYSTEM CONCEPTS

This section is to be presented in the manner of a group discussion with the instructor initiating the presentation of each concept and with subsequent group additions and expansions of definitions and examples. The instructor should provide an appropriate illustration for each concept.

A. Overview of System Concepts.

1. Environment, administration and system operations are difficult concepts to specify.
2. All three are interrelated.
3. The following discussion will first consider definitions of the environment and administration.
4. Next, within the context of system operations will be a discussion of system operations variables.
5. Finally, there is a comprehensive illustration of how these concepts and variables can be applied to system problems.

SHOW V.A. (6-6):



NOTES

B. Environment.

1. Refer to Exhibit 5, define the concept, and discuss how it may be applied.

C. Administration.

1. Refer to Exhibit 6 and discuss the definition, examples and applications.

D. Systems Operations.

1. Refer to Exhibit 7 and discuss the definition, examples and applications.

Exhibit 5. Environment

I. THE CONCEPT CONSIDERS:

What factors outside the system affect the system?

II. CONCEPTUAL DEFINITION:

External interactions with the criminal justice system. Crime and community characteristics which affect and are affected by the criminal justice system.

III. EXAMPLES:

Community Characteristics	Crime Characteristics
Population	Type
Population Change	Magnitude
Population Density	Rate of Change
Racial Composition	Offender Characteristics
Households Receiving Aid to Families with Dependent Children	Victim Characteristics
Unemployment Rate	Crime Characteristics
Juvenile Population	
Attitudies	

IV. DISCUSSION:

- The environment places constraints on the range and type of system responses to crime:

  --Defines the overall mission of the system.

  --Changes in public attitudes toward offenders example: "punishment" vs. "rehabilitation".

- The environment provides external inputs to the system which impacts system and agency administration.

Exhibit 6. Administration

I THE CONCEPT CONSIDERS:

How is the work to be organized and managed? What are the goals and standards?

II. CONCEPTUAL DEFINITION:

Organization, management and operations of the criminal justice system, components and agencies.

III. EXAMPLES:

- Agency Goals and Standards.
- Agency Policies and Procedures.
- Agency Organization.
- Personnel Skill and Training Level.

III. DISCUSSION:

- Administrative decision-making can critically influence system operations by changing: goals and standards; resources and workloads; and the organization and procedures used.
- Environment, administration and system operation are interdependent and interactive.

Exhibit 7. System Operations

I. THE CONCEPT CONSIDERS:

How does the system function and how do components within the system interrelate?

II. CONCEPTUAL DEFINITION:

The activities of a regularly interreacting group of agencies forming a unified whole and with a common goal.

III. EXAMPLES:

- Water and Sewer System.
- School System.
- State Corrections System.
- State University System.
- Interstate Highway.
- Postal System.
- Criminal Justice System.

IV. DISCUSSION

- Criminal Justice System is one of the most complex systems.
- System Operations can be further refined in terms of variables such as standards, goals, input, performance and outputs. These variables are explained further in the following section.

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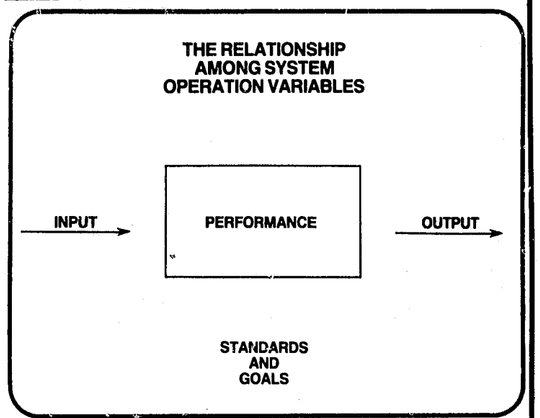
E. System Operations Variables and Measures

1. As indicated in Exhibit #7, the concept of System Operations can be further defined as the variables:

   - Standards
   - Goals
   - Input
   - Performance
   - Output

2. Consider the relationship of these variables in an input/output model:

SHOW V.A. (6-7)



EMPAHSIZE 6-7:

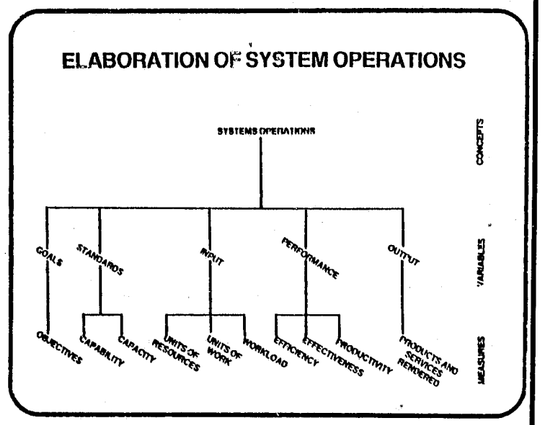
+ Standards and Goals are determined in Administration. Once determined, they serve as a framework for System Operations.

+ Input and Output can be measured more readily than Performance. One of the primary purposes of systems analysis is to help the analyst measure Performance.

NOTES

3. The measures which can be used to operationalize Systems Operations variables are illustrated in the chart provided in V. A. 6-8.

SHOW V.A. (6-8):



EMPHASIZE 6-8

+ Illustrates the break-out and relationship of variables and measures to the concept of System Operations.

+ These variables and measures are used as the basis for systems analysis in this Module.

+ Use Exhibits 8-13 to further explain these variables and measures:

  - Standards (Exhibit 8).
  - Goals (Exhibit 9).
  - Input (Exhibit 10).
  - Performance (Exhibit 11).
  - Output (Exhibit 12).
  - Summary (Exhibit 13).

Exhibit 8. Standards

I. THE VARIABLE CONSIDERS:

The ideal conditions for System Operations

II. VARIABLE DEFINITION:

An established criteria by which qualitative and quantitative judgements can be made.

III. MEASURES:

Standards are usually qualitative and or quantitative criteria for system performance which have external validity. Two commonly used performance standards are capability and capacity.

A. Capability is the expected level of output at a planned level of productivity with a specified amount of resources in a given time period.

Capability = Resource Measure X Productivity Standard

B. Capacity is the potential output when productivity is maximized with a specified level of resources in a given time period.

Capacity = Resource Measure X Maximum Productivity Standard

IV. EXAMPLES:

A. Capability: Assuming a productivity standard of 1,800 cases per judge per year and a court with 15 judges, the capability of the court would be 27,000 cases per year.

15 judges X 1800 cases/judges = 27,000 cases/year

B. Capacity: The minumum case cost during 1977 was determined to be $210 and this figure is assumed to be a reasonable indicator of maximum productivity. Given an annual budget of $6,500,000 and assuming a maximum productivity of $210 per case, 30,952 cases could be processed.

$6,500,000 ÷ $210/case = 30,952 cases

Exhibit 9. Goals

I. THE VARIABLE CONSIDERS:

Expectations for system performance

II. VARIABLE DEFINITION:

A desired future state; plans expressed as results to be achieved, usually general and not time limited.

III. MEASURES:

Goals are made measurable when expressed as objectives.

An objective is a specific condition to be attained by a specific set of activities, stated in time-limited and measurable terms.

IV. EXAMPLE:

Paradise Department of Corrections should provide high quality mental health care at all correctional institutions.

Exhibit 10. Input

I. THE VARIABLE CONSIDERS:

What will be processed?

II. VARIABLE DEFINITION:

The work to be processed and the resources allocated to enable processing.

III. MEASURES:

There are three common measures of input:

A. Units of Resources: Units of manpower, funds, and facilities to process work through the criminal justice system or its components.

B. Units of Work: Units of persons, things or endeavors to be processed through the criminal justice system or its components within a specific time period; usually some level of priority has been assigned to the work.

C. Workload: The units of work to be processed per unit of resource in a given amount of time; usually expressed as a rate that compares measures of work to be processed with measures of resources budgeted.

$$\text{Workload} = \frac{\text{Work Measure}}{\text{Resource Measure}}$$

IV. EXAMPLES:

A. Units of Resources for an Anti-fencing Unit:

Budget = $60,000
Personnel = five full time sworn officers and one secretary.
Equipment = three police cars; one video camera/recorder, etc.

B. Units of Work: 150 motor vehicle accidents to investigate in January.

C. Workload: 30 investigations per officer to be investigated in January.

V. DISCUSSION:

A. When measuring resources make distinctions between:

- Operating staff (Detectives, etc.) and support staff (Clerks).
- Capital expenditures and operating expenditures.
- Fixed costs and variables costs.

B. Generally, work measures cannot be directly compared between system components because measures vary among agencies.

C. The Output of one system component (the number of work units which are processed in a given amount of time) becomes the Work to be processed by a subsequent component of the system.

Exhibit 11. Performance

I. THE VARIABLE CONSIDERS:

The activities of organizations, units and individuals.

II. VARIABLE DEFINITION:

The execution of policy, the conduct of operations and the accomplishment of tasks.

III. MEASURES:

There are three common measures of performance:

A. Productivity: The amount of work that can be produced or processed with specified resources in a given amount of time. Productivity is usually expressed as a rate that compares measures of output with measures of resources budgeted or consumed per unit of time.

$$\text{Productivity} = \frac{\text{Output Measure}}{\text{Resource Measure}}$$

B. Efficiency: The amount of work to be done which is accomplished in a specified time. Generally, efficiency is expressed as a ratio of output to work. Efficiency measures are usually expressed as a percentage or as a percent change and in directional or comparative terms, i.e., more, less, the same.

$$\text{Efficiency} = \frac{\text{Output Measure}}{\text{Work Measure}}$$

C. Effectiveness: The extent to which standards, goals, objectives and estimates are achieved. Measures of effectiveness compare the output achieved to a planned output or standard and are usually expressed as rates or percentages.

$$\text{Effectiveness} = \frac{\text{Output Measures}}{\text{Standard}}$$

IV. EXAMPLES

A. Productivity: In December a five man squad investigated 80 accidents.

$$\text{Productivity} = \frac{80 \text{ accidents}}{5 \text{ officers}} = 16 \text{ accidents per officer}$$

B. Efficiency: In 1978, the Chaos City Police Department followed up 10,989 out of a total of 46,560 reported larceny thefts.

$$\text{Efficiency} = \frac{10{,}989 \text{ larceny thefts follow-ups during 1978}}{46{,}560 \text{ reported larceny thefts during 1978}} = 23.6\%$$

C. Effectiveness: The objective of a police department is to establish a response time on all non-emergency calls at not greater than 6 minutes. During the last year a sample of calls (n-685) was taken. 620 of those calls had response times of 6 minutes or less.

$$\text{Effectiveness} = \frac{620 \text{ Responses w/in 6 minutes}}{685 \text{ calls requiring response within 6 minutes}} = 90.5\%$$

V. DISCUSSION

A. Productivity and efficiency need to be clearly distinguished by emphasizing the use of resources in deriving measures of productivity.

B. Efficiency measures invite simplistic comparisons subject to significant measurement error.

C. Effectivness measures are often difficult to estimate since goals and standards are often qualitative and not amenable to quantification.

D. Frequently the comparison of workload expected and actual productivity during specific time periods provide a basis for refining estimates of capability, capacity and performance standards and objectives.

Exhibit 12. Output

I. THE VARIABLE CONSIDERS:

The products and services produced.

II. VARIABLE DEFINITION:

The number of workload units processed or produced at the end of specified time period.

III. MEASURES:

Output is generally measured in terms of units produced or services rendered in a specified time period.

IV. EXAMPLES:

A. Products: The Prosecuting Attorneys office filed 36 complaints in District Court during January.

B. Services: The Traffic Division investigated 80 accidents in December.

V. DISCUSSION

A. Output measures are most frequently expressed in terms of products and services produced.

B. Remember the output of one component can become the work for the subsequent component.

Exhibit 13. Summary of System Concepts, Variables and Measures

I. ENVIRONMENT:

What factors outside the system affect the system?

II. ADMINISTRATION:

How is the work to be organized and managed? What are the goals and standards?

III. SYSTEM OPERATIONS:

How does the system function and how do components within the system interrelate?

A. Goals: What is expected?

1. Objectives: What is expected in a given time period?

B. Standards: What is ideal?

1. Capability: How much is expected to be done?

2. Capacity: How much can be done using maximum potential?

C. Input: What is to be processed?

1. Resources: What is available to work with?

2. Work: What is to be done?

3. Workload: How much has to be done per unit of resources?

D. Performance: What are the results?

1. Productivity: What results are accomplished with the resources used?

2. Efficiency: How much of the work to be done is done?

3. Effectiveness: How does the result compare to goals, standards, objectives or estimates?

E. Output: What has been done?

PURPOSE

This Walk-Through illustrates input/output flow analysis using indexes and provides an example of the analysis of systems operations. It demonstrates the relationships among system variables and demonstrates how to measure and interpret these variables.

INSTRUCTOR NOTES

A. In introducing the Walk-Through, cover the following:

1. This is an example of input/output analysis utilizing system variables and measures.

2. This a comparative analysis using indexes derived from system measures.

3. Specifically, this is a court example--the same method and procedure could be applied to other components of the criminal justice system.

B. Examine Table 1 - Input/Output Flow Model

1. Describe system model

a. Input-cases

b. Process-court trials

c. Output-final dispositions

d. Feedback-backlog

2. Point out concerns about:

a. Backlog

b. Low number of convictions

3. The Walk-Through will analyze backlog problem and assess strategies to reduce court backlog.

C. Measuring System Variables (Section A-E of Data Set and Worksheet)

1. Analysis of problem (backlog) will be accomplished using system variables and their related measures.

INSTRUCTOR NOTES (Continued)

2. Point out that the critical resources are time and judges for the backlog problem.

3. Discuss each measure in the data set (Sections A - E) referring to the flow model (Table 1) when appropriate.

4. In discussion, reiterate variable definitions relating them to measures. Emphasize the derived nature of most of the measures.

5. Indicate that productivity, efficiency and effectiveness are three different measures of performance.

6. Key formulas and calculations should be placed on newsprint or on overheads to help participants expedite and maintain the continuity of the walk-through.

D. Analyzing System Data (Sections F-J of Data Set and Worksheet)

1. State problem in system terms, for example, convert more work to outputs, try more cases. There are two extreme strategies.

2. Strategy #1 - if productivity is fixed, then resources must be increased:

   a. To deal with backlog, judge resources must be increased.

   b. This strategy implies an increase in court budget and capacity.

3. Strategy #2 - if resources are fixed, then productivity must be increased to take care of backlog problem.

   a. This strategy requires that actual productivity must be increased.

   b. Use of productivity objectives or standards are an important aspect to this strategy.

   c. This strategy implies cases must be tried in less time - which has implications for the quality of justice and fairness of the process.

   d. Key to this analysis is making participants aware of how the concepts help to structure the problem and how many system problems involve difficult tradeoffs--in this case between resources and equity.

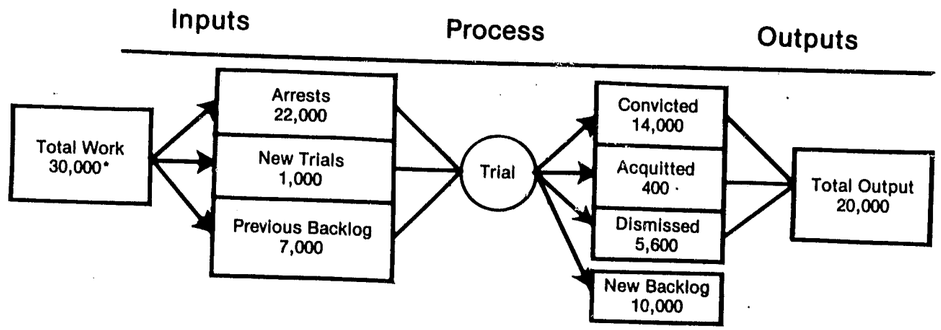
4. Explain Table 2 to participants and discuss the tradeoffs made in determining an appropriate mix of strategies.

E. Time available for this Walk-Through is 40 minutes.

WALK-THROUGH 'L'

1

Table 1. Input/Output Flow Model



*All measures are "cases"

WALK-THROUGH 'L'

DATA SET/WORKSHEET

A. Resources

1. 15 Judges
2. 1,600 Hours/Judge/Year
3. 96,000 Minutes/Judge/Year
4. 24,000 Judge/Hours/Year
5. $6.5 Million Budgeted
   $6.0 Million Expended

B. Work/Output

1. Work is 30,000 Cases/Year

2. Output is 20,000 Cases/Year

C. Workload (Based on Resource and Work Measures)

1. 2,000 cases per judge per year required to process existing workload

$$WL_1 = \frac{W}{R} = \frac{30,000 \text{ Cases/Year}}{15 \text{ Judges}} = 2,000 \text{ Cases/Judge Year}$$

*2. .8 judge hours per case required to process existing workload

$$WL_2 = \frac{R}{W} = \frac{24,000 \text{ Judge-Hours/Year}}{30,000 \text{ Cases/Year}} = .8 \text{ Judge-Hours/Case (48 minutes)}$$

D. Productivity (Based on Resources & Output Measures)

1. 1,333 Cases/Judge were tried last year.

$$P_1 = \frac{O}{R} = \frac{20,000 \text{ Cases}}{15 \text{ Judges}} = 1,333 \text{ Cases/Judge}$$

*2. $300 per case

$$P_2 = \frac{R}{O} = \frac{\$6.0 \text{ Million}}{20,000 \text{ Cases}} = \$300/\text{Case}$$

*3. 1.2 Judge-Hours per Case (72 minutes)

$$P_3 = \frac{R}{O} = \frac{24,000 \text{ Judge-Hours/Case}}{20,000 \text{ Cases/Year}} = 1.2 \text{ Judge-Hours/Case (72 minutes)}$$

*Instructor's Note: These are accepted reciprocal relationships that are commonly used to express workload and productivity.

WALK-THROUGH 'L'

E. Efficiency

1. Based on time series comparison.

Year	1972	1973	1974	1976	1977
Work	28,000	28,500	28,200	29,100	30,000
Output	15,000	14,000	15,050	16,000	20,000

$$\text{Efficiency} = \frac{\text{Output Measure}}{\text{Work Measure}}$$

a. $E_{77} = 66.6\% = \frac{\text{Output}}{\text{Work}} = \frac{20,000}{30,000} \times 100$

$E_{72} = 53.5\% = \frac{\text{Output}}{\text{Work}} = \frac{15,000}{28,000} \times 100$

b. $\frac{66.6 - 53.5}{53.5} = 24.5\%$ improvement in percentage of cases processed in the past five years.

2. Based on inter-agency comparison.

	Chaos Court	State Mean*
Work	30,000	13,000
Output	20,000	11,000

*Based on calculated mean amount of work (in number of trials) and output of 15 criminal courts in the State of Paradise during 1977 (excluding Chaos City).

a. $E_{Chaos} = \frac{\text{Output}}{\text{Work}} = \frac{20,000}{30,000} = 66.6\%$

$E_{State} = \frac{\text{Output}}{\text{Work}} = \frac{11,000}{13,000} - 84.6\%$

b. $E = \frac{66.6 - 84.6}{84.6} = -21.3\%$

Chaos' Trial Court in 1977 processed 21.3% less of its work than did the other 15 trial courts in the State.

WALK-THROUGH 'L'

F. Effectiveness

$$\text{Effectiveness} = \frac{\text{Output Measures}}{\text{Standard}}$$

1. Based on an objective of processing 24,000 cases, the court was 83.3% effective:

$$E_f = \frac{20,000 \text{ Cases (Output)}}{24,000 \text{ Cases (Planned Output)}} \times 100 = 83.3\%$$

2. Based on an objective of not increasing the backlog of 7,000 cases, the court was 42.8% ineffective:

$$E_f = \frac{\text{Output (Later Period)} - \text{Output (Earlier Period)}}{\text{Planned Output}} \times 100$$

$$E_f = \frac{10,000 \text{ Case Backlog} - 7,000 \text{ Case Backlog}}{7,000 \text{ Case Backlog}} \times 100$$

$E_f = 42.8\%$

WALK-THROUGH 'L'

G. Capability

1. Assuming a productivity standard of 1,800 Cases/Judge/Year one measure of the court's capability would be 27,000 Cases/Year.

$C_1 = R \times PS = 15 \text{ judges} \times 1{,}800 \text{ Cases/Judge} = 27{,}000 \text{ Cases}$

2. Assuming a productivity standard of $275/Case, a second measure of court capability would be 23,636 cases.

$C_2 = R \div PS = \$6{,}500{,}000 \quad \$275/\text{Case} = 23{,}636 \text{ Cases}$

3. Assuming a productivity standard of 1 Judge-Hour/Case, a third measure of capability would be 24,000 cases.

$C_3 = R \div PS = 24{,}000 \text{ Judge-Hours} \div 1 \text{ Judge-Hour/Case} = 24{,}000 \text{ Cases}$

H. Capacity

The minimum case cost during 1977 was determined to be $210 and this figure is assumed to be a reasonable indicator of maximum productivity (Pm). Assuming a maximum productivity of $210 per case, 30,952 cases could be processed.

$CAP = R \div Pm = \$6{,}500{,}000 \div \$210/\text{Case} = 30{,}952 \text{ Cases}$

I. Determining Resource Requirements Based on Fixed Productivity Standards

Step 1. The number of Judge-Hours (J-Hrs) required to meet existing work is 36,000 Judge-Hours.

$R_1 = \text{Work} \times P_s = 30{,}000 \text{ cases} \times 1.2 \text{ J-Hrs/Case} = 36{,}000 \text{ J-Hrs}$

Step 2. The total number of judges required to meet existing work is determined by converting Judge-Hours into Judges. Since there are 1,600 Judge-Hours/Judges Available the number of Judges required is 22.5 Judges.

$R_2 = \frac{R_1}{R_2} = \frac{36{,}000 \text{ Judges-Hours}}{1{,}600 \text{ Judge-Hours/Judge}} = 22.5 \text{ Judges}$

Step 3. Therefore, 7.5 additional judges are required to process all cases, assuming a productivity standard of 1.2 J-Hrs per case.

Step 4. This requires a resource increase of 50% in the number of Judges.

$R_3 = R \frac{(\text{Required}) - R (\text{Existing})}{R (\text{Existing})} \times 100$

$R_3 = 22.5 - 15 \times 100 = 50\%$

J. Determining Workload Requirements Assuming Fixed Resources

Step 1. The workload necessary to process all 30,000 cases is:

$$WL_1 = \frac{W}{R} = \frac{30{,}000 \text{ Cases}}{15 \text{ Judges}} = 2{,}000 \text{ Cases/Judge}$$

Step 2. Similarly, the workload necessary for each Judge to process 2,000 cases is:

$$WL_2 = \frac{R}{W} = \frac{1{,}600 \text{ Judge-Hours}}{2{,}000 \text{ Cases}} = .8 \text{ Judge-Hours/Case} \quad (48 \text{ Judge Min./Case})$$

Step 3. Accepting 48 Judge minutes per case as a productivity standard (P_S) would require a 50% increase in productivity.

Where: Productivity (P) equals 72 Judge minutes per case and productivity standard = 48 Judge minutes per case (see: Walk-Through "L", Data Set Worksheet, D. Productivity, 3).

$$\frac{P - P_S}{P_S} \times 100 = \frac{72-48}{48} \times 100 = 50\%$$

K. Comparative Analysis of Two Strategies for Reducing Court Backlog

1. Strategy 1--increase number of judges (increase resources)

   If productivity remains 1.2 Judge-Hours per case and resources are increased to 22.5 judges, the court backlog will be reduced to zero.

2. Strategy 2--reduce average time per case (increase productivity)

   If resources remain at 15 judges and productivity is increased to 48 Judge-Minutes per case, court backlog will be reduced to zero.

3. The following table allows comparison of these two strategies. The numbers inside the table represent court backlogs at varying levels of court productivity and resource.

Table 2. Comparing Changes in Resources and Productivity and Resulting Court Backlog

Productivity Standard (PS) (Judge-Minutes/Case)	Resource (R) (Number of Judges)				
	15	17	19	21	23
72	10,000*	7,333**	4,666	2,000	0
62	6,774	3,677	580	0	0
52	2,308	0	0	0	0
42	0	0	0	0	0

$$\text{Backlog} = \text{Work} - \frac{\text{Resources}}{\text{Productivity Standard}}$$

*Existing Backlog (given 15 judges and 72 Judge-Minutes/Case) =

$$30{,}000 \text{ cases} - \frac{(15 \text{ judges} \times 96{,}000 \text{ Judge-Minutes/Year})}{72 \text{ Judge-Minutes/Case}} = 10{,}000 \text{ Cases}$$

**Estimated Backlog (given 17 Judges and 72 Judge-Minutes/Case) =

$$30{,}000 \text{ Cases} - \frac{(17 \text{ Judges} \times 96{,}000 \text{ Judge-Minutes/Year})}{72 \text{ Judge-Minutes/Case}} = 7{,}333 \text{ Cases}$$

WALK-THROUGH 'L'

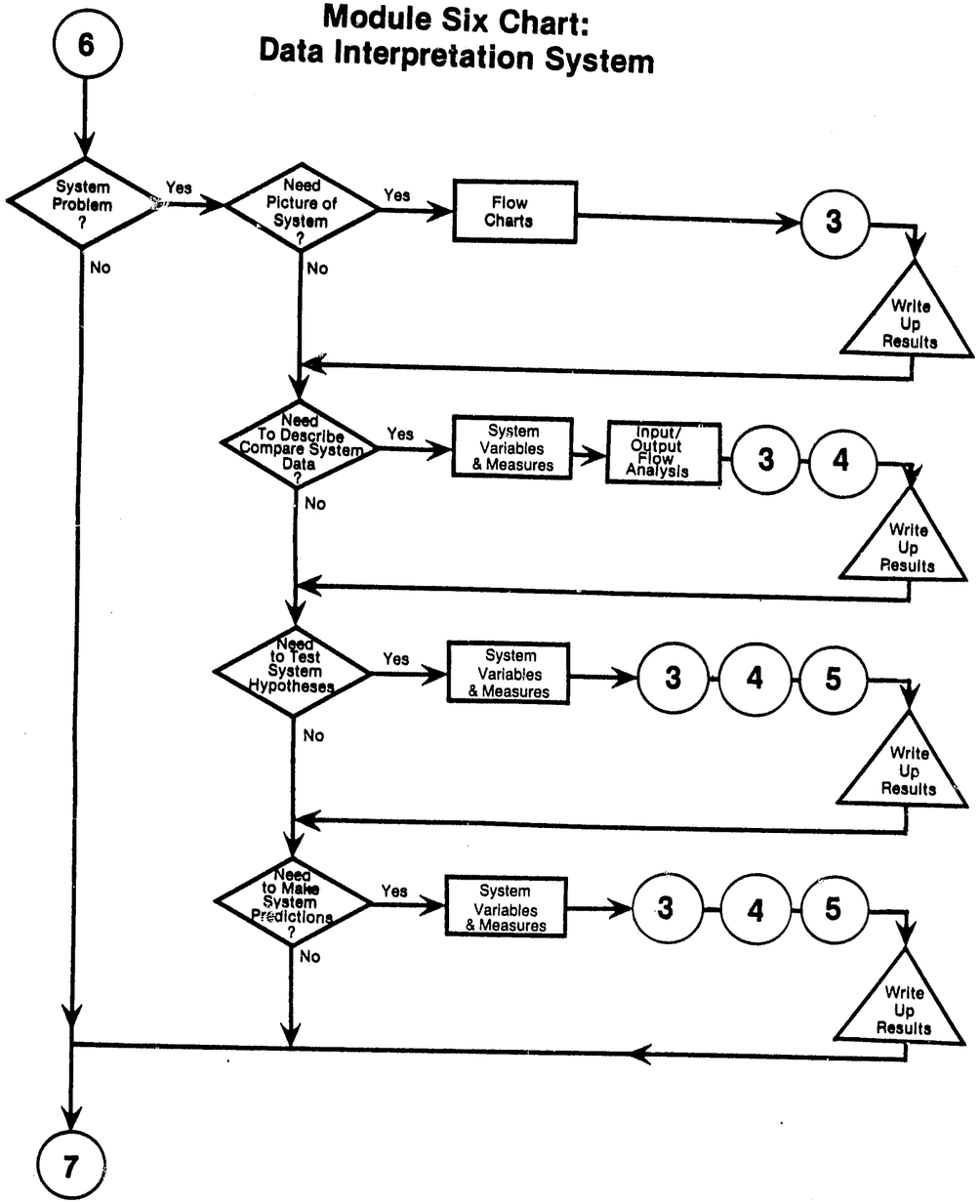
MODULE 6: DATA INTERPRETATION -- SYSTEM

NOTES

V. CONCLUSION

A. Review the Module Chart.

SHOW V.A. (6-9):



MODULE 7
PRESENTATION OF FINDINGS

This module suggests methods of making effective presentations both written and orally before an audience. Although the lecture is relatively brief, its importance cannot be stressed enough since all the products of analysis are useless if they are not persuasively presented to the proper individuals and organizations.

The lesson is divided into three segments: an introduction which includes a technical checklist of the major topics necessary for sound analysis; a discussion of the importance of understanding the roles, motivations, and purposes of the various actors, including the analyst, in criminal justice decision-making; and finally, a list of guidelines for making stronger written and oral presentations.

This module should last no longer than 60 minutes. The instructor should take care throughout the presentation to provide guidance to participants for their presentations required in the Major Exercise. Following this module participants will have an opportunity to complete their problem statements and prepare their presentations which will take place on Friday morning.

OBJECTIVES

1. To develop a sound perspective on criminal justice problems using:

   a. Knowledge about the roles of principal participants and concerned parties

   b. Audience information.

2. To develop a complete and effective presentation by:

   a. Using presentation guidelines.

   b. Using good organization and appropriate content

   c. Using appropriate briefing materials and taking care to develop an effective presentation manner.

   d. Recognizing the interdependence of technical preparation and proper perspectives in making presentations that influence decisions.

CONTINUED

4 OF 14

SCHEDULE

PRESENTATION OF FINDINGS

TIME ALLOCATION

TOPIC	TIME	PAGE
I. CONSIDERATIONS IN PREPARING PRESENTATIONS	5 minutes	VII-3
A. Preparation	*	VII-3
B. Responsibilities	*	VII-3
C. Cautions	*	VII-3
D. Objectives	*	VII-4
E. Technical Checklist	*	VII-5
II. ACHIEVING PERSPECTIVE	10 minutes	VII-7
A. Role/Politicians	*	VII-7
B. Role/Citizens	*	VII-8
C. Role/Administrators	*	VII-9
D. Role/Analyst	*	VII-10
III. GUIDELINES FOR EFFECTIVE PRESENTATIONS	10 minutes	VII-10
A. Uses	*	VII-10
B. Guidelines	*	VII-11
C. Clarification/Interpretation.	*	VII-12
D. Contrasts/Comparisons	*	VII-13
E. Illustrations/Examples	*	VII-13
F. Anticipate Questions	*	VII-14
G. Important Terms	*	VII-15
IV. PREPARING A WRITTEN REPORT	20 minutes	VII-15
A. Content	10	VII-15
B. Guides	*	VII-16
C. Organization	10	VII-17
V. CONDUCTING A BRIEFING	10 minutes	VII-18
A. Briefing Materials	*	VII-18
B. Manner	*	VII-18
C. Balanced Presentation	*	VII-20
VI. CONCLUSION	5 minutes	VII-21
A. Balance	*	VII-21
B. Review	*	VII-24
TOTAL TIME	60 minutes	

* Less than 5 minutes

NOTES

I. CONSIDERATIONS IN PREPARING PRESENTATIONS

A. Preparation

1. When presentations are not properly prepared, essential facts and messages are either destroyed or lost.

2. Presentation should be considered a "selling of products", not just a "problem statement."

B. Responsibilities

1. Analyst or presenter must be certain the information is transmitted clearly and succinctly.

2. When presenting a report an analyst should assume ownership and be responsible for its contents.

3. The report should be in a form that is meaningful to the audience/reader.

C. Cautions

1. Because of brief audience interest span, if a presentation is rambling or confusing most of the audience will "turn off."

2. With rare exceptions most of the problems that fall on the analyst's desk are not purely "criminal justice" in nature.

3. Rather, the problems are usually complex issues that touch and concern many other things:

   a. Other "systems"

   b. Other "problems"

   c. Other people

NOTES

D. Presentation Objectives

1. Develop in your problem statement a sense of the "larger picture." You should not only address the concerns of the audience but also the related concerns and presumed causes identified by the analysis.

2. The problem or issue should be separated into two essential parts:

   a. The nature of the issue.

   b. Authority of the audience.

3. The presentation should answer the following questions:

   a. Why is the problem important?

   b. What areas can the decision-makers effectively devote their attention to?

4. Efforts need to be expended to overcome the major barriers to effective presentations:

   a. The presentation of complex technical information.

   b. Inadequate data/information.

   c. Inadequate tools.

   d. Limitations of time.

   e. Staff skills.

5. "Refinement" should be considered as a continuous process; however, the reality of today's world is that frequently public decisions are rarely based on any sophisticated "analysis" but rather on other things:

   a. Conventional wisdom.

   b. Distorted and/or untested data/information.

NOTES

E. Technical Checklist.

SHOW V.A. (7-1):

Technical Checklist

- ✓ Is there a well-stated conceptual foundation for the problem statement?
- ✓ Have the critical hypotheses been selected?
- ✓ Are the variables and measures reliable and valid?
- ✓ Are the statistical techniques used appropriately?
- ✓ Are the data used effectively and interpreted correctly?

EMPHASIZE (7-1):

+ Conceptual foundation is the first building block of a well-stated problem.

  (1) Clarity
  (2) Directly related to audience's concern(s)
  (3) Causality

+ The hypotheses should directly relate to concepts and should exhibit the characteristics identified in Module 2:

  (1) Measurable
  (2) Accurate
  (3) Testable
  (4) Importance

+ The set of hypotheses used should be comprehensive:

  (1) Magnitude
  (2) Rate of Change
  (3) Temporal Aspects
  (4) Seriousness
  (5) Persons Affected
  (6) Spatial Aspects
  (7) System Response

NOTES

+ The measures selected should be:

  (1) Reliable
  (2) Valid
  (3) Carefully qualified in terms of definitions and potential sources of measurement error.

+ The statistics used should be:

  (1) Correctly Selected
  (2) Properly Interpreted
  (3) Useful to Reader/Audience

+ The final problem statement should meet all the above, as well as covering the problem statement characteristics--contained in the definition of Problem Statement in Module 1: A written document or oral presentation which comprehensively describes the nature, magnitude, seriousness, rate of change, persons affected, and spatial, and temporal aspects of a problem using qualitative and quantitative information. It identifies the nature, extent, and effect of system response; makes projections based on historical inferences, and rigorously attempts to establish the orgins of the problem.

NOTES

II. ACHIEVING PERSPECTIVE

A. Role of Elected Politicians

SHOW V.A. (7-2):

THE ROLE BEHAVIOR OF ELECTED POLITICIANS

- Pragmatic, not ideological
- Committed to election and reelection
- Avoid, ameliorate, or resolve conflict by:
  - anticipating reactions
  - manipulating symbols
  - simplifying issues
  - personalizing and particularizing issues
  - promising solutions for the insoluble

EMPHASIZE (7-2):

+ Politicians tend to have a practical orientation.

+ They often work under a crisis mandate.

+ Emphasis from the analyst's perspective must be to communicate influence.

NOTES

B. Role Behavior of Private Citizens.

SHOW V.A. (7-3):

ROLE BEHAVIOR OF PRIVATE CITIZENS

- Concerned About Costs
- Want To Know Impact On Community
- Expect Response to Concerns (Real and/or Imagined)

EMPHASIZE (7-3):

+ Interest groups form in response to concerns.
+ Analyst needs to be sensitive to perceptions, and not just facts.
+ Problem statement should be prepared with cost and impact criteria explicit.
+ Methods of Communicating Concern
  a. Letters to Editor/Politicians
  b. Public Hearings
  c. Other Less Formal Methods

NOTES

C. Role Behavior of Administrators

SHOW V.A. (7-4):

ROLE BEHAVIOR OF CRIMINAL JUSTICE ADMINISTRATORS

- Accountable for programs.
- Delegate authority.
- Protect turf.
- Not rewarded for efficiency.
- Get it in writing.

EMPHASIZE (7-4):

+ Administrative Accountability for Funds and Programs
+ Need for Delegating Authority
+ Lack of Incentives for Efficiency
+ Problem statements should reflect attention to programmatic aspects of the concern.
+ Attention must be given to the measures most amenable to interventions.

D. Role of Analyst

SHOW V.A.(7-5):

OPTIMAL ROLE BEHAVIOR OF ANALYST

- Objective
- Realistic
- Flexible
- Sensitive
  - — Politics
  - — Emotional Issues
- Future Oriented

EMPHASIZE (7-5):

+ Need for care and attention to detail, e.g., edit fully--numbers, writing, labels.

+ Must anticipate and be proactive -- a "problem seeker" as well as responsive to circumstances.

III. GUIDELINES FOR EFFECTIVE PRESENTATIONS

A. Uses

1. Guidelines can serve as an instrument to minimize major mistakes.

2. Improved presentations can be an effective medium for communication between the analyst and decision-maker.

3. These quidelines are relevant to both written and oral presentations.

B. Guidelines

SHOW V.A. (7-6):

PRESENTATION GUIDELINES

1. Emphasize Priority Message
2. Clarify and Interpret Finding by
   - Using Contrasts and Comparisons
   - Using Illustrations and Examples
3. Anticipate Questions, Problems, Assumptions
4. Use Terms Important to the Audience

EMPHASIZE (7-6):

+ Stick to priority message. An analyst simply cannot hope to impart all the information collected and interpreted; rather the analyst should select and develop those priority messages which are of major importance to the decision-maker. He or she should include the minor issues in his references which may be part of the supportive materials.

+ Decision-makers have limited time to devote to the task of listening to staff reports and studies, regardless of the critical nature of the problem and painstaking analysis.

+ If the analyst doesn't maximize this opportunity, it will leave the audience with a blurred impression or, even worse, outright incorrect impressions.

NOTES

C. Clarification and Interpretation

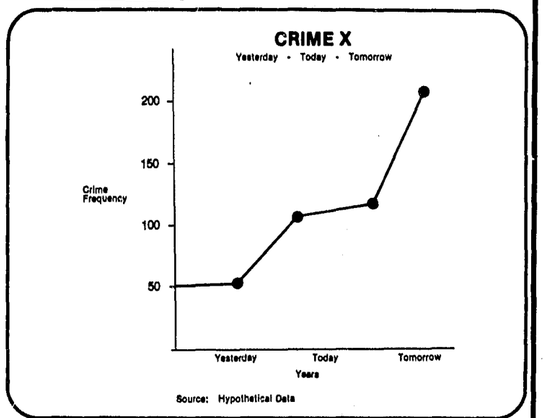
1. The audience should be aware at the end of a presentation what the problem actually means to them.

2. If, through research, the analyst is reasonably informed as to the audience's level of awareness, the presented materials should have some context that will reinforce both interest and memory.

3. Avoid over-interpreting the data.

4. Avoid, as well, too much data.

SHOW V.A. (7-7):



EMPHASIZE (7-7):

+ Problem statements should provide, if possible, a sense of the past, present, and future.

  (1) What is the history of the problem?

  (2) What is the current problem?

  (3) What might be the result of inaction?

NOTES

D. Use Contrasts and Comparisons

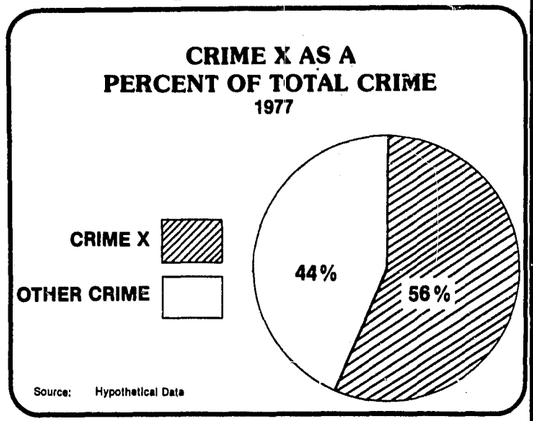
1. Reinforce the context of the presentation, by comparing the problem with knowledge the audience already has.

2. This consideration is particularly important when the messages are new and innovative.

3. Comparison also helps the audience more clearly envision the possible effects or results.

E. Use Illustrations and Examples

SHOW V.A. (7-8):



EMPHASIZE (7-8):

+ Make the message convincing by stressing pertinent facts.

+ Hold attention and focus it.

+ Avoid tangled logic.

+ Use contrasts, comparisons, and analogies.

+ Use illustrations the audience knows, e.g., time, neighborhoods. Most people tend to remember better when ideas are transmitted by picture or example.

+ Illustrations are particularly suitable to the criminal justice field where the data lend themselves to charts, graphs, and diagrams.

F. Anticipate Questions and Issues

SHOW V.A. (7-9):

ANTICIPATE QUESTIONS AND ISSUES

- Identify Assumptions
- Develop Awareness
- Establish Credibility
- Prepare for Presentation

EMPHASIZE (7-9):

+ Make explicit the assumptions of your presentation.

+ Brainstorm the problem/presentation with others to develop an awareness of what the weak points are and where to anticipate questions.

+ If a question is beyond available information, don't deceive your audience. To do so and be caught can ruin an analyst's credibility.

+ Rehearsal and editing should be from the audience and reader's perspectives.

+ Plan responses to anticipated questions.

G. Use Terms Important to the Audience.

1. While the technical language is helpful if the group can use it, it is not if there are no technically trained people.

2. Conversely, if the audience has technical knowledge, then technical terms should be used appropriately.

3. Audiences and decision-makers resent efforts at being manipulated or patronized.

IV. PREPARING A WRITTEN REPORT

Note: If possible this should be drawn from participants in class discussion:

Written Reports

1. Provide greater detail than oral reports.

2. Can supplement oral reports.

3. Are essential in situations where the analyst is unable to provide oral reports.

4. Can be broadly disseminated.

5. Provide necessary documentation for program development and evaluation.

Note: This information should be oriented toward assisting participants in preparing the required portfolio for the Major Exercise.

A. Content

1. Avoid Major Omissions

2. Logical Organization is Vital

NOTES

3. Consistency of Form, as well as content, is essential.

   a. Constant Revision and Editing

   b. Familiarity with the Report

4. Writing must be Clear and to the Point.

5. Report should Highlight the Priority Message(s).

B. Guides for use of quantitative data and statistics in written reports:

1. Purpose of data in a report must be clearly understood by the writer and the reader.

   a. Data are useful in focusing attention.

   b. Can be used to build confidence in the conclusions.

   c. Too much or poorly organized data can confuse the presentation and understanding.

2. Data should be integrated into the narrative.

   a. Use Proper Labels

   b. Proper interpretation of the data requires a narrative for every table, chart, or graph used. Don't leave the interpretation of a table, chart, or graph up to the reader.

   c. Data should support the text, not challenge it.

3. Selection of data should be made on the basis of its relevancy, clarity, validity, reliability, and assistance to the reader in understanding the problem.

4. The presentation guidelines presented in Part III should be followed.

NOTES

C. Written Report Organization.

SHOW V.A. (7-10):

WRITTEN REPORT ORGANIZATION

Section 1.0	**Introduction** 1.1 Statement of concerns 1.2 Nature and source of concerns 1.3 Scope of concerns
Section 2.0	**Analysis Methodology** 2.1 Definition of terms used 2.2 Measurement reliability and validity 2.3 Data Collection procedures used 2.4 Statistical Methods used
Section 3.0	**Findings** 3.1 Conceptual Hypothesis #1 — Supporting variable and measurement hypotheses, results, interpretations and conclusions 3.2 Conceptual Hypothesis #2 — Supporting variable and measurement hypotheses, results, interpretations and conclusions 3.3 Etc.
Section 4.0	**Discussion of findings in general** 4.1 Discussion of findings in relation to the concerns expressed 4.2 Discussion of limitations
Section 5.0	**Summary** 5.1 Highlights 5.2 Conclusions
Section 6.0	**Appendices**

EMPHASIZE (7-10):

+ Remind the participants that this is consistant with the organization of the problem statement used in Walk-Through B in Module 1.

+ Indicate that this is a suggested format, that attempts to structure the presentation in a logical order. The format is not as important as the logic of the organization.

+ The product of Task 4 of the Major Exercise is to use this format.

+ Priority messages should be in 5.1 (highlights).

+ Data reporting should not mask message or scare reader.

+ Tables and charts, unless used rigorously and sparingly, can be negative symbols.

NOTES

+ The problem statement should include all appropriate information. In some instances full information may not be available or applicable. In other instances the audience may require an abbreviation or summarization of report sections. The analyst must above all else be aware of the audience to whom the problem statement is addressed and must emphasize the elements of special interest to that audience.

+ One of the biggest problems in providing information for decision-making is how to get decision-makers to deal with important details. Special formats such as an executive summary of the problem statement can be instrumental in building interest and directing attention to specific areas of the full report.

V. CONDUCTING A BRIEFING

A. Briefing Materials

1. Use of flipcharts, overheads, slides or other visual aids can be effective if clear, neat and informative.

2. Be sure that the visual aid is relevant to your priority message(s).

3. Be sure that the visual aid does not lead to questions for which you have no answers, e.g., know your data source's assumption behind the visual aid.

4. Avoid excessive visual aids. This can detract from and confuse your message.

5. Prepare a summary to distribute which succinctly covers the content of your briefing.

B. Manner of Presentation

1. If more than one person will make the presentation, clearly specify individual responsibilities in the briefing, e.g., one person will cover Introduction, another Methodology, a third Findings, and possibly a fourth the Summary.

NOTES

2. Speak to your audience, be direct, and know your own material.

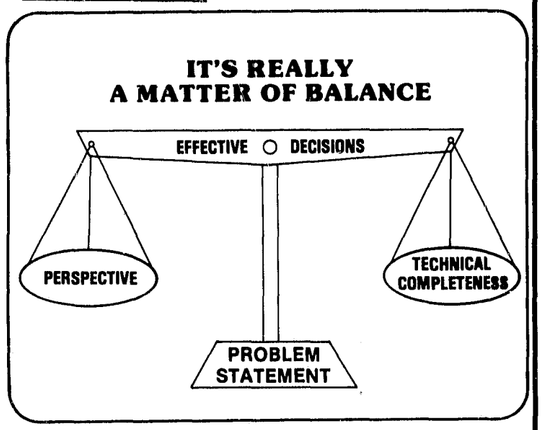
3. Face your audience and locate your visual aids in a manner so that they are easily read.

4. Avoid "loaded" words and negative symbols.

5. Be responsive to audience reactions and questions.

C. Provide a balanced presentation:

SHOW V.A. (7-11):



+ Problem specification, measurement and data interpretation, by themselves, are insufficient.

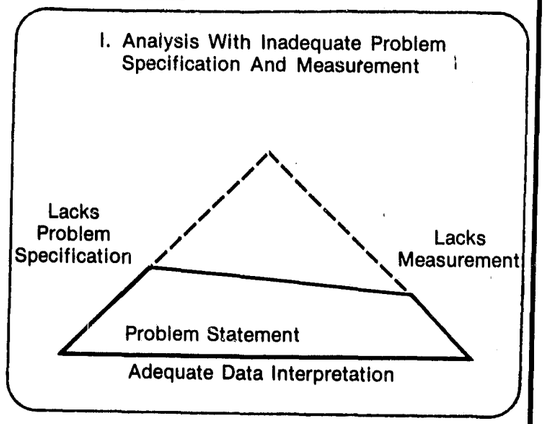
+ They must be refined and adjusted to the interests, concerns and perspectives of the audience.

VI. CONCLUSION

A. Finding Balance in Presentations: When well done, a problem statement, both written and orally presented, is a delicate balance among problem specification, measurement and data interpretation.

1. Analysis with Inadequate Problem Specification and Measurement.

SHOW V.A. (7-12):



EMPHASIZE (7-12):

+ If too little emphasis is given to the conceptualization of the problem, the resulting hypotheses will suffer accordingly.

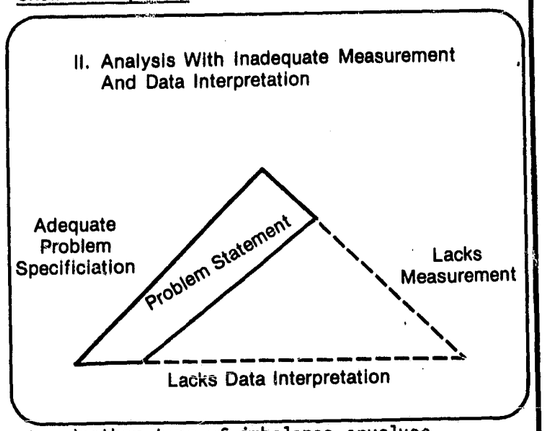
+ Typically, when too little thought is given to concepts, the result is massive "number crunching" without the production of much information. The analyst compares, graphs, contrasts, correlates, tabulates, and re-analyzes large volumes of data which result from an aimless searching when specific hypotheses are not constructed.

NOTES

+ Example: Suppose a patrol commander were to ask for an analysis of the department's performance without reducing his vague concerns to specific concepts. The result would be dismay, ambiguity, excessive analytic false starts, and the production of a confusing accumulation of answers without questions.

2. Analysis with Inadequate Measurement and Data Interpretation.

SHOW V.A. (7-13):



+ Another type of imbalance involves insufficient measurement. In this situation concerns have been refined to specific concepts; but the process for securing data to analyze these concepts is haphazard, unscientific, superficial, or mismanaged. Not infrequently, the analyst is presented with specific questions; but, due to the pressures of time, inadequate preparation, or insufficient technical capability, the measurement of the concepts is insufficient or inadequate. The statistical procedures employed are superficial. Sampling procedures are inadequate. The amount of data gathered is too small or unrepresentative. Computational errors are made, and inappropriate statistical procedures are applied.

NOTES

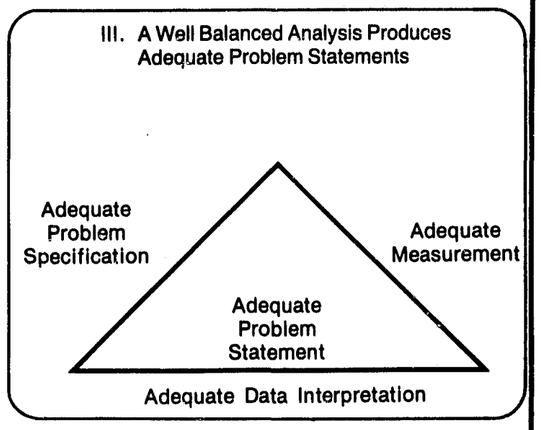
+ Example: The crime analyst responds to the patrol commander's concerns about performance by examining only the calls for police service on Friday and Saturday nights, disregarding the other days of the week. Or imagine if the analyst doesn't take into consideration seasonal fluctuations and the effects of climactic conditions on response time. Or, use of a statistical technique or graphic technique because the analyst is familar with the technique and fails to recognize situations in which the technique is inappropriate.

+ This type of imbalance results in problem statements which are superficial and unsubstantiated. The results of such analyses are difficult to replicate and do not lead to confident generalizations. Since this imbalance frequently results in superficial analyses, the resulting problem statements include suggested alternatives which attack symptoms not problems. They address the transitory aspects of the problem and may not result in any long-term solutions.

NOTES

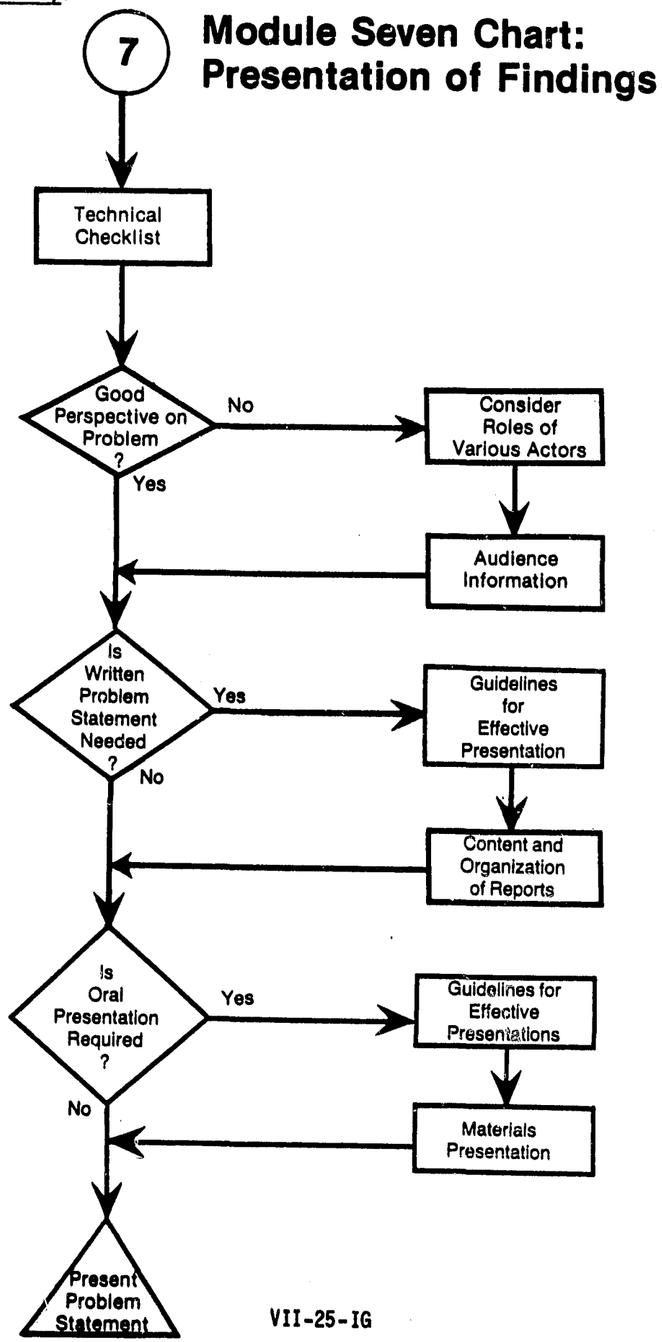
3. A Well Balanced Analysis Process Results in an Adequate Problem Statment.

SHOW V.A. (7-14):



B. Review the module chart.

SHOW V.A. (7-15):



MAJOR EXERCISE: CHAOS CITY

MAJOR EXERCISE INTRODUCTION

I. OBJECTIVES

A. The purpose of the Major Exercise is to practice, develop and apply the skills, techniques and knowledge acquired during the Criminal Justice Analysis Course. While the focus is on the development of a problem statement, the general approach utilized and procedures incorporated in the exercise have direct bearing on all aspects of the criminal justice decision-making process: planning, program development, management or evaluation. Moreover, the process of developing a problem statement should generate many of the complex questions and difficult choices which would normally be encountered in crime or systems analyses.

B. The Major Exercise provides the analyst an opportunity to develop and present an original problem statement involving one of three current issues in criminal justice: (1) community crime prevention, (2) attrition in case dispositions, or (3) recidivism among adult offenders. These problem statements will be constructed step-by-step following the logic of the course and utilizing the methods and procedures of each module.

C. The Major Exercise makes a significant contribution to the achievement of the course goals. It provides a context for the exploration of the purpose and logic of analysis as used to formulate crime and criminal justice system problems. It requires careful selection and application of quantitative methods to crime and system data and the development of an effective presentation of a Problem Statement. Finally, the Major Exercise provides a setting for the analysis of many preconceived ideas about the complexity, ambiguity and/or lack of utility of analysis in criminal justice decision-making.

MAJOR EXERCISE: CHAOS CITY

II. ACTIVITIES AND PRODUCTS

A. The Major Exercise is divided into six specific tasks. Each task requires the application of modular material preceding it.

B. The Six Tasks are as follows:

1. Task #1 - Specifying Problem.
2. Task #2 - Assessing Hypotheses.
3. Task #3 - Data Interpretation.
4. Task #4 - Preparing Portfolio.
5. Task #5 - Preparing Briefing.
6. Task #6 - Presentations.

C. The Major Exercise is a small-group activity.

1. Groups will be organized to achieve a balanced mixture of educational and experience levels within each group. Each group will be assisted by a facilitator who will provide occasional guidance and some assistance.
2. The nature of the exercise and, specifically the product requirements, necessitates that each group organize itself. Initially a group recorder will be required.
3. To initiate the Major Exercise three Staff Reports (SR) have been prepared for review. These represent an initial effort at responding to the concerns of Chaos City's political leadership and citizenry. They are based on only current, readily available data.
4. The nature of the exercise requires each group to assume a specific role and audience within the hypothetical Chaos City environment.
5. Throughout the Major Exercise, participants should draw upon the modular material for ideas and instructions for proceeding. The worksheets and tasks of the Major Exercise very closely parallel the walk-throughs and exercises of the course.
6. Do not waste time on inferences and assumptions where no basis of data or information exist in the materials you are provided.
7. Each Task has its own set of procedural instructions which follow the general form of the exercises in the course: I. Purpose, II. Instruments, III. Products and IV. Time.
8. The exercise is an analysis, not a plan to conduct an analysis. The plan for conducting your analysis is presented in Exhibit 1 and the instructions for the tasks.

MAJOR EXERCISE

MAJOR EXERCISE: CHAOS CITY

D. The specific products required of each group are:

1. Completed worksheets
2. An outline of a completed problem statement.
3. An oral presentation
   - This presentation will be made to a review group (e.g., the class in plenary session; a criminal justice review board; a Mayor, Chief of Police, District Attorney, and supporting staff; or a technical review committee).

MAJOR EXERCISE

Major Exercise
Exhibit 1. Tasks and Schedule

TASK	ACTIVITY	TIME	DURATION	PRODUCT	PAGE
#1	Specify Problem	Monday p.m.	120 min.	Worksheets	5-8
#2	Assess Hypotheses	Monday p.m.	120 min.	Worksheets	9-14
Debriefing	Review Tasks #1 and #2	Tuesday p.m.	60 min.	Worksheets	15-16
#3	Data Interpretation	Thursday p.m.	120 min.	Worksheets	17-20
#4	Preparing Portfolio	Thursday p.m.	130 min.	Problem Statement Outline	21-27
Submit	Problem Statement Outline	Thursday p.m.		Problem Statement Outline	21-27
#5	Preparing Briefing	Friday a.m.	60 min.	Briefing Materials	28-30
#6	Presentations	Friday a.m./p.m.	180 min.	Formal Presentations	28-31

STAFF REPORTS	Page
Group A - Crime Prevention	33-35
Group B - Attrition Rate of Cases	36-38
Group C - Criminal Recidivism Among Adult Offenders	39-40

DATA SETS	Page
Group A - Crime Prevention	42-55
Group B - Attrition Rate of Cases	56-59
Group C - Criminal Recidivism Among Adult Offenders	60-65

TASK #1 - SPECIFY PROBLEM

I. PURPOSE

Task #1 initiates the Major Exercise and is designed to provide participants an opportunity for applying the technique of problem specification to a fairly vague preliminary analysis contained in a Staff Report. By using problem specification on these reports, as in actual experience, the analyst will be able to more clearly define the issues and concerns under study and to outline an approach for addressing these concerns.

II. INSTRUCTIONS

A. Each group will be assigned a Staff Report which should be read and discussed by the group. The group should identify the concepts contained in the staff report. Also, other concepts the group feels are important but not mentioned in the report may be identified.

B. Prepare a list of variables for each concept.

C. Prepare a list of measures for each variable.

D. Use Worksheet A to record concepts, variables and measures. Worksheet B should be used to record your hypotheses.

E. Generate a set of hypotheses at the conceptual, varaiable and measurement levels using such terms as:

is greater than	is increased by	a change in
is less than	is decreased by	no change in
is related to	is equal to	an increase in
is unrelated to	is unequal to	a decrease in

F. Worksheet B should be used to record your hypotheses.

G. Throughout this task changes in concepts, variables measures and/or hypotheses should be considered as the group develops a clearer sense of the problem.

III. PRODUCT

The group will provide a completed copy of Parts A and B worksheets to the group's facilitator at the conclusion of the task.

IV. TIME SCHEDULE - TASK #1

Review Staff Report	- 10 minutes
Discuss and List Concepts, Variables and Measures	- 30 minutes
Prepare Part A Worksheet	- 30 minutes
Prepare Part B Worksheet	- 30 minutes
Review Problem Specification	- 20 minutes
Total	120 minutes

MAJOR EXERCISE: CHAOS CITY

V. INSTRUCTOR NOTES

A. The instructor is to brief the participants on Task #1 before they begin. This briefing should include:

1. Purpose of Task #1.

2. Activities of Task #1.

3. Describe, in general, the nature and content of the three Staff Reports -- a crime prevention problem, a case attrition problem, and a recidivism problem.

4. Assign groups their respective Staff Report.

5. Indicate that the Worksheets used in Walk-Through A & B should be used as a reference.

B. The class should be informed that they should proceed with Task #2 at the appropriate time. The Facilitator should be sure that Task #1 is completed on time.

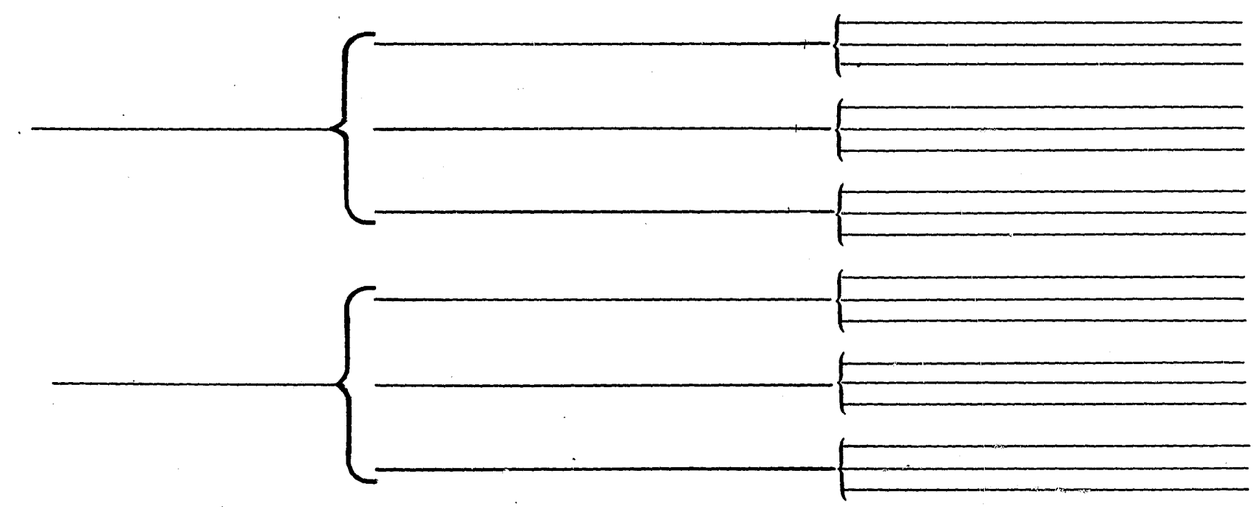
MAJOR EXERCISE

MAJOR EXERCISE: CHAOS CITY

MAJOR EXERCISE: CHAOS CITY
TASK I: PROBLEM SPECIFICATION
PART A: ELABORATING CONCEPTS, VARIABLES & MEASURES

CONCERN:

CONCEPTS	VARIABLES	MEASURES



M E-7-IG

MAJOR EXERCISE

MAJOR EXERCISE: CHAOS CITY

TASK I: PROBLEM SPECIFICATION

PART B: CONSTRUCTING HYPOTHESES

RELATING CONCEPTS	RELATING VARIABLES	RELATING MEASURES
1)	a)	1)
		2)
	b	1)
		2)
2)	a)	1)
		2)
	b)	1)
		2)

MAJOR EXERCISE: CHAOS CITY

ME-8-IG

MAJOR EXERCISE

MAJOR EXERCISE: CHAOS CITY

TASK #2 - ASSESSING HYPOTHESES

I. PURPOSE

Task #2 is designed to help you review and assess the completed problem specification from Task #1 in terms of the criteria discussed in Module II. The product of this task is a listing of hypotheses which will be tested in Task #3.

II. INSTRUCTIONS

A. For each hypothesis developed in Task #1 complete the Part A Worksheet by first listing the hypothesis, checking the availability of relevant data, and then noting the strengths and weaknesses of that hypothesis in terms of the four criteria listed on the form.

Consider both conceptual and technical sources of measurement error in the data which is most likely available. Comment in the appropriate box for each hypothesis whether these are significant factors impeding an understanding of data which might be collected. See the Worksheet supplement for considerations that may help in evaluating your hypotheses.

B. When all hypotheses have been evaluated, identify the best hypotheses which you propose to test.

C. List your best hypotheses on the Part B Worksheet. Assess each hypothesis by placing a check in the appropriate box(es) to indicate those elements of a problem statement it covers. Identify and discuss elements of the problem that are not addressed and determine whether additional hypotheses need to be generated.

III. PRODUCT

Copies of Worksheets A and B for Tasks #2 will be provided to the facilitator at conclusion of this task.

IV. TIME SCHEDULE - TASK #2

List Hypotheses and Review Data Set	-	20 min.
Assessing Hypotheses	-	40 min.
Assessing Comprehensiveness	-	20 min.
Consider Additional Hypotheses	-	20 min.
Discuss and Complete Group Worksheet	-	20 min.
Total		120 min.

MAJOR EXERCISE: CHAOS CITY

V. INSTRUCTOR NOTES

A. Go over the Task #2 worksheets with the participants.

B. Briefly review the data set with the group. Indicate that while primary attention should be given to the portion of the data set most directly related to their problem, each group may make use of any part of the data set in their work.

C. Indicate that they should feel free to make changes in their Task #1 worksheets in light of the assessment and additional insights on the problem achieved during Task #2.

D. Legible and complete group worksheets are due at the end of the task.

E. Task #1 and #2 are, perhaps, the most difficult and challenging tasks of the Major Exercise. It is critical that each group has, by the end of the day, at least three or four hypotheses which are supported by the Data Set. They must also adequately cover and describe the problem. Facilitators should cue groups during Part B of Task #2 to such hypotheses if not generated by the group discussion in the time provided. These additional hypotheses should be suggested by the characteristics listed in the worksheet. In making suggestions, their facilitator should work toward comprehensiveness and require the participants to define their problem specification and assessment of hypotheses.

F. Extra worksheets may be needed by the groups.

MAJOR EXERCISE: CHAOS CITY

WORKSHEET SUPPLEMENT

Considerations of Measurement Error and Utility

1. Conceptual Factors that Influence the Validity and Reliability of Interpretations.

   a. Between Concepts and Variables

      (1) Failure to Adequately Represent Concept with Selected Variable(s).

      (2) For example, rearrests is an inadequate variable to fully represent the concept of recidivism, in part, because of the potential discrimination against prior felons in arrest practices.

   b. Between Variables and Measures

      (1) Failure to Adequately Represent Variables with Selected Measure(s).

      (2) For example, frequency of rearrest does not make possible any distinctions in regard to types of criminal offenses for which prior felons were rearrested.

2. Technical Factors that Influence Validity and Reliability.

   a. Method of Collection

      (1) Measurement Error in Self-Reported Crime Data.

         (a) Veracity/Concealment Problem

         (b) Exaggeration Problem

         (c) Memory Problem

         (d) Not Practical for Studying Serious Offenses

      (2) Measurement Error in Arrest Records

         (a) Underestimation of "Actual" Incidence of Crime

         (b) Official data are more accurate as crimes get more serious.

   b. Type of Measure Sought (Fact or Perception)

   c. Source of Data, e.g. Administrative Record System, Public Opinion Poll, Census Document.

   d. Is a census of the entire population or group taken or is a sample taken? Are sampling errors possible?

MAJOR EXERCISE

MAJOR EXERCISE: CHAOS CITY

3. Testability.

   a. Are there statistical techniques available to assess the measures selected?

   b. Is the implied causal relationship in the hypothesis logical?

4. Utility: Management Factors that Influence Conceptual and Technical Threats to Validity and Reliability.

   a. Time

   b. Money

   c. Organizational Considerations

   d. Are the measures in each hypothesis subject to influence by the decision-maker?

   e. Does the hypothesis address weakness in the original staff report?

   f. Will interpretation of the hypothesis contribute to a better understanding of the problem?

      (1) An example of management influencing the conceptual adequacy of the problem is that political constraints may make it impossible to obtain information on reincarcerations from the state corrections agency.

      (2) An example of management influencing the technical adequacy of the problem is in measuring rearrests, self-reported crime data may be too time consuming and/or expensive to be obtained.

MAJOR EXERCISE

MAJOR EXERCISE: CHAOS CITY
TASK 2: ASSESSING HYPOTHESES
PART A: EVALUATING & ASSESSING INDIVIDUAL HYPOTHESES

FROM TASK 1 SELECT UP TO TEN MEASUREMENT LEVEL HYPOTHESES TO BE ASSESSED:	DATA AVAIL.	MEASUREMENT ERROR		TESTABILITY	UTILITY OR IMPORTANCE	OVERALL ASSESSMENT
		CONCEPTUAL	TECHNICAL			

MAJOR EXERCISE

MAJOR EXERCISE: CHAOS CITY
TASK 2: ASSESSING HYPOTHESES
PART B: DETERMINING COMPREHENSIVENESS OF A SET OF HYPOTHESES

LIST HYPOTHESES THAT ARE ASSESSED USEFUL (RESTATE, IF NECESSARY)	INDICATE THE CHARACTERISTICS ADDRESSED BY HYPOTHESES							COMMENT
	MAGNITUDE	RATE OF CHANGE	TEMPORAL ASPECTS	SERIOUSNESS	PERSONS AFFECTED	SPATIAL ASPECTS	SYSTEM RESPONSE	
TOTAL BY TYPE OF CHARACTERISTICS								

MAJOR EXERCISE

MAJOR EXERCISE: CHAOS CITY

Major Exercise
Debriefing
Tasks #1 and #2

I. PURPOSE

The debriefing provides an opportunity for discussion of the results of the first two tasks. It is focused on the substantive, procedural and technical aspects of these tasks.

II. INSTRUCTOR NOTES

A. Copies of the Task #1 and #2 Worksheets should be picked up from the groups Monday evening and reviewed by the instructor and facilitators prior to the debriefing.

B. Carefully review the group worksheets prior to debriefing and, at the conclusion of the debriefing, provide each group with a set of your written comments. In these comments suggest gaps in logic, or substantive understanding that, with correction, will strengthen their final product.

C. In plenary session, the lead instructor should:

1. Explain where groups should be in the exercise by the end of the debriefing period.

2. Explain the debriefing process.

3. Briefly cover general problems identified in the review of group products.

4. Direct the groups to their break-out rooms for debriefing to be conducted by group facilitators.

D. The specific debriefing is to be conducted by the facilitator with the assistance of the instructor in the break out groups.

1. Sufficient copies of the Task #1 and #2 worksheets should be made and distributed at the beginning of the debriefing to participants.

2. Prepare on newsprint each group's final list of hypotheses. Post these in a location that all can see.

3. In commenting on the participants' work, focus on their strengths and weaknesses and solicit from the group comments on problems encountered in hypothesizing.

4. Be sure that the following are understood by the end of the debriefing:

a. That the problem area has been comprehensively covered by the hypotheses.

b. That the logic of the problem specification is clearly stated and understood.

c. That the remaining set of hypotheses form the basis for further analysis.

4. The debriefing should next be opened to questions and comments from the participants.

5. The written comments prepared by the instructor and facilitators should be distributed to the groups at the conclusion of the debriefing. The instructor and facilitators should make themselves available to clarify comments not addressed during the debriefing.

III. TIME SCHEDULE - DEBRIEFING

Plenary Session	-	10 minutes
Group Debriefing	-	50 minutes
	TOTAL	60 minutes

TASK #3 - DATA INTERPRETATION

I. PURPOSE

Task #3 requires the selection, application and interpretation of various methods to produce information that is to be part of the Problem Statement prepared by each group.

II. INSTRUCTIONS

A. Task #3 involves selection, calculation and interpretation of the various methods covered in Modules 3-6 on the hypotheses identified in Task #2.

B. These interpretations are to be used in preparing the required narrative problem statement outline.

C. Part A Worksheet deals with the application of statistical methods in data interpretation.

1. The Worksheet provides a list of questions which guide interpretation. Space also is provided for responding to the questions.

2. Each hypothesis should be placed on a separate worksheet. Also for each hypothesis a null hypothesis is to be stated. These hypotheses should be specified at the measurement level.

3. The full range of methods for data analysis should be used when possible. For example, some data can be analyzed by both descriptive and inferential methods. Methods to be considered are:

a) Descriptive--Central Tendency, Variation, and Graphics.

b) Comparative--Rates and Index Numbers, Cross Tabulations and Scattergrams, and Flow Charts.

c) Inferential--Chi Square test, Correlation Coefficient, Visual Estimation and Least Squares Regression

4. The module charts may be useful in selecting the appropriate methods for analyzing the data.

5. When appropriate a quickly sketched graphic should accompany the interpretation. This graphic can be made on a separate sheet or on back of Part A Worksheet. The purpose of this graphic is to quickly document an illustrative intrepretation that may be used later in drawing-up graphics to support the oral presentation.

6. The work should be divided among the group members. This depends upon the number of group members and the number of hypotheses. For example, one or two members may choose to complete a Part A Worksheet on a particular hypothesis.

D. After all Part A Worksheets are completed the group should use Part B Worksheet to discuss the implications of the collective findings in regard to the original concern.

1. The group is to indicate in the matrix which one of the categories from strongly agree to strongly disagree represents the group concensus about the evidential support for a hypothesis.

2. Next the group should discuss to what extent the evidence provides insight into the original concern.

III. PRODUCT

Copies of Worksheets A and B for Task #3 will be provided to the facilitator at the conclusion of this task.

IV. TIME SCHEDULE - TASK #3

Briefing for Task	-	10 minutes
Deciding Work Allocation for Part A	-	15 minutes
Performing Data Interpretation	-	60 minutes
Discussion of Relation of Findings to Concern	-	35 minutes
	TOTAL	120 minutes

V. INSTRUCTOR NOTES

A. Some groups may need to return briefly to Tasks #1 and #2 to obtain closure and group understanding of the debriefing comments. Time spent on this must be limited by the facilitators. At a minimum before beginning Task #3, each group needs agreement on their measurement-level hypotheses.

B. The group should be encouraged to reach agreement quickly on who will perform the data interpretation for each hypothesis. Work allocation may be based on skill or familarity with analytic methods. Cursory inspection of the data may be needed before assignment so that members can identify which data they feel competent to analyze. The instructor and facilitators should be flexible on the time spent on each activity during Task #3. Adequate time should be given to Task #4 which is to be completed immediately following Task #3. There is no reconvening of the groups prior to Task #4.

TASK #3 - PART A WORKSHEET
DATA INTERPRETATION

I. State the measurement level hypothesis:

Alternative Hypothesis:

Null Hypothesis:

II. Apply (if appropriate) descriptive methods to the data.

a. What are the findings?

b. Do the findings prove or disprove the null hypothesis?

III. Apply (if appropriate) comparative methods to data.

a. What are the findings?

b. Do the findings prove or disprove the null hypothesis?

IV. Apply (if appropriate) inferential methods to data.

a. What are the findings?

b. Do the findings prove or disprove the null hypothesis?

V. Attach hand-drawn graphic of this interpretation (if appropriate).

TASK #3 - PART B WORKSHEET
RELATION OF FINDING TO CONCERN

I. The evidence strongly supports the hypotheses:

Hypothesis	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
1.					
2.					
3.					
4.					
5.					
6.					

II. Summarize the implications of these findings to the original concern.

TASK #4 - PREPARING PORTFOLIO

I. PURPOSE

This task is designed to use and build on the skills and information developed throughout the week and most particularly those discussed in the preceding module on the presentation of analytical findings. During the previous tasks of the Major Exercise, a data base has been reviewed, a concern has been identified and conceptualized, hypotheses have been developed and the data has been carefully studied and interpreted. The next step of the process -- Preparing a Written Presentation -- will be completed in this part of the exercise.

This task provides the participant an opportunity to develop an outline of the Problem Statement that utilizes the presentation guidelines suggested in Module 7. This presentation should be well organized, should demonstrate both an understanding of the audience who will review the products of the analysis and be sound technically with the results sensitive to the needs of the user.

II. INSTRUCTIONS

A. Review your previously prepared worksheets and identify the priority messages and supporting information which will be used to finalize your portfolio.

B. Finalize your portfolio consisting of:

1. Completed/Legible Worksheets for Tasks #1 - #3.

2. A two-to-three page Problem Statement outline (tables, charts or graphs not included in page count). An example Problem Statement outline in the following pages can be used as a guide in preparation of your problem statement outline.

C. Edit the portfolio and finalize its content.

D. The portfolio is to be completed and submitted by Thursday evening.

III. TIME SCHEDULE TASK #4

Briefing for Task #4	- 10 minutes
Clean-up Tasks #1 - #3 Worksheets	- 20 minutes
Identify Priority Messages and Supporting Information	- 20 minutes
Prepare Problem Statement Outline	- 60 minutes
Review Portfolio	- 20 minutes
Total	130 minutes

MAJOR EXERCISE: CHAOS CITY

VI. INSTRUCTOR NOTES

A. In preparing the groups for Task #4, the facilitator should:

1. Go over in detail the final products expected. Indicate the cover sheet should be completed by the group.

2. Identify the membership of the review group (e.g., the class in plenary session; a criminal justice review board: a Mayor, Chief of Police, Judge, District Attorney, and supporting staff; or a technical review committee.)

3. Indicate that the contents of Module 7 are to be drawn upon in developing these products.

4. Refer to the Critique Form and indicate the five criteria to be used in evaluating the Portfolio.

5. Remind the group that the portfolio will have to be submitted at the completion of this Task.

MAJOR EXERCISE: CHAOS CITY

EXAMPLE PROBLEM STATEMENT OUTLINE: Motor Vehicle Theft in Chaos City

1.0 Introduction

1.1 Statement of Concerns
- a. Complaints by businessmen.
- b. Possible curtailment of shopper trade because of fear.

1.2 Nature and Source of Concerns
- a. Businessman's complaint not founded on data.
- b. Businessman's perception may be reinforced by some customers complaints.

1.3 Scope of Concerns
- a. Businessmen have communicated among themselves and to the news.
- b. The businessmen's perception could affect shopper's selection of store location.
- c. Mayor has to respond to businessmen.

2.0 Analysis Methodology

2.1 Definition of Terms Used
- a. Unauthorized use.
- b. Differences in types of motor vehicles.

2.2 Measurement Reliability and Validity
- a. Over 90% reported.
- b. Rates vary by location.
- c. Risk per 1,000 registered vehicles by location substantiated by frequency measurements.

2.3 Data Collection Procedures
- a. 1 year study.
- b. Random sample of 20% of reports.

2.4 Statistical methods used
- a. Methods of measurement.
  - -frequency.
  - -rate per 1,000 persons.
  - -rate per 1,000 opportunity.
- b. Correlational analysis.
- c. Chi square.

3.0 Findings

3.1 Magnitude
- a. Hypothesis: Motor vehicle theft in Chaos City is no different than in similar size cities.
- b. Found: Number in Chaos City is about 500 less than the average for similar size cities.

3.2 System Response
- a. Hypothesis: Clearance rate for Chaos City expected to be the same as the national average.
- b. Found: The clearance rate for Chaos City was lower by 10 percent from the 20 percent national average.

3.3 Seriousness
- a. Hypothesis 1: Auto theft was expected to be less serious than other property crimes in Chaos City.
- b. Found: Net dollar loss of auto theft was less than for burglary and recovery rate was better for auto theft.
- c. Hypothesis 2: Chaos City's recovery rate for stolen cars is no different than the national average.
- d. Found: Recovery rate in Chaos City is substantially better than national average.

3.4 Where Autos are Stolen
- a. Hypothesis 1: Magnitude varies by geographic area.
- b. Found: Three of the city's areas have risks relatively higher than other areas.
- c. Hypothesis 2: Magnitude varies by type of parking environment.
- d. Found: Parking lots and garages account for most thefts.

3.5 Auto Thefts are Deterred by Reducing Opportunities to Steal
- a. Hypothesis 1: Autos are stolen because keys are left in the ignition.
- b. Found: Victim reporting indicates only 1 in 20 stolen cars were left with key in ignition and that 43 percent were left unlocked.
- c. Hypothesis 2: Locking cars deters theft.
- d. Found: Half of all cars stolen were locked.
- e. Found: Cars with interlock ignition systems are stolen less often than cars without this system.

3.6 Charactertistics of Motor Vehicle Theft May Vary by Type of Vehicle
- a. Hypothesis 1: Truck theft is similar to auto theft in location of occurrence.
- b. Found: Trucks are taken more frequently from parking lots and garages but less often near residences than cars.
- c. Hypothesis 2: Truck theft is similar to auto theft in clearance rate.
- d. Found: Similarity of rates.
- e. Hypothesis 3: Motorcycle theft is similar to auto theft in location of occurrence.
- f. Found: Only one-third of thefts occur from garages and one-third from near victim's residence.
- g. Hypothesis 4: Motorcycle theft is similar to auto theft in clearance rate.
- h. Found: Clearance rate is much lower.

3.7 Most Suspects are Amateur Thieves
- a. Hypothesis: Most suspects of vehicle theft are amateur thieves.
- b. Found: Only 10% of cases are cleared by arrest.
- c. Found: Theft does not result in stripping of auto for sale.

3.8 Most Suspects are Young
- a. Hypothesis: The majority of all suspects are less than 21 years old.
- b. Found: Only 12 % of cases studied had known offenders.
- c. Found: 62% of suspects were less than 21.
- d. Found: 95 to 98% of all arrests are of persons less than 21 years of age.
- e. Found: 76% of all persons arrested had prior record.

4.0 Discussion

4.1 Discussion of Findings in Relation to Concerns.
- a. Auto thefts tend to occur more often in downtown area than in other areas.
- b. Unknown if the problem in downtown Chaos City differs from downtown areas in other cities.
- c. The recovery rate suggests that auto theft involves only a moderate expense to the community.

4.2 Limitations
- a. Cannot determine if frequency of vehicle thefts has changed over time.
- b. Cannot evaluate magnitude of downtown vehicle theft problem in relation to business sectors in similar size cities.
- c. Suspect information does not permit development of an offender profile.
- d. Public perception of auto theft has not been assessed.

5.0 Summary

5.1 Highlights
- a. Magnitude - bulk of problem.
- b. Victimization - reporting and risk.
- c. Location.
- d. Locking cars.
- e. Recovery and clearance rates.
- f. Truck and motorcycle thefts.
- g. Offender profile.

5.2 Conclusions
- a. Motor vehicle theft is not a major problem.
- b. Downtown and two other areas disportionately share city's motor vehicle theft problem.
- c. General sites of parking garages and lots could be possible focus of crime reduction efforts.
- d. Implication of recovery and clearance rates and possible juvenile involvement for preventive measures.
- e. Analysis could not identify factors affecting businessmen's perceptions of motor vehicle theft.

MAJOR EXERCISE: CHAOS CITY

TASK #4 -- COVERSHEET

TITLE: _____

_____

_____

_____

FINAL REPORT

GROUP: _____

CONTENTS

Task #1 Worksheets
Task #2 Worksheets
Task #3 Worksheets
Problem Statement Outline

PREPARED BY:

_____

_____

_____

_____

_____

M E-26-IG

MAJOR EXERCISE

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TASK #4 - CRITIQUE CRITERIA

1. Is the problem clearly and accurately stated?
2. Are the hypotheses comprehensive?
3. Is the list of variables and measures comprehensive and realistic?
4. Are the techniques used to analyze the data appropriate?
5. Is the interpretation of the data accurate and useful?
6. Does the outline properly emphasize the information?
7. Is the problem statement easy to understand?

M E-27-IG

MAJOR EXERCISE

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TASK #5 and #6 - PREPARING AND DELIVERING BRIEFING

I. PURPOSE

The final tasks of the exercise require the preparation and delivery of a formal presentation. At the conclusion of each group's presentation of its problem analysis, a debriefing of both the oral presentations and written portfolios will be held.

II. INSTRUCTIONS

A. Prepare an oral presentation consisting of:

1. A 15-Minute briefing to a review group.

2. Use appropriate visual aids, e.g., flip charts, overheads.

3. Respond to review group questions for 5-10 minutes.

B. In preparing the oral presentation, assignments are to be made to individual presenters. If time permits, a dry-run should be held to rehearse the presentation.

C. The groups should discuss and identify the weaknesses in their portfolio and presentation in anticipation of the review group's questions.

III. INSTRUCTOR NOTES

A. Go over the activities and schedule for Tasks #5 and #6.

1. Task #5

* Prepare Briefing Material	30 min.
* Rehearse Briefing	15 min.
* Finalize Briefing	15 min.

2. Task #6

* Group Presentations	60 min.
* Review Group Questions	30 min.
* Debriefing and Discussion	90 min.

B. Refer to the critique form and indicate the four criteria to be used in evaluating the oral presentations.

C. A recommended procedure for conducting Task #6 is to have the first group -- randomly assigned -- make its presentation and then have selected questions from the review group. Indicate to the groups that questions about either their oral presentation or portfolio can be anticipated. The review group, in assessing the portfolios Thursday evening should prepare one or two questions for each group in advance of the oral presentations.

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D. In conducting the debriefing be sure to allow the class to ask questions, make comments and react.

E. The debriefing should focus on the process and substantive problems encountered by the groups and their solutions to these. As these points surface in the general discussion following the presentations, they should be recorded on newsprint.

F. The review group should be sure to also identify strengths in each groups work.

G. A second important function of the Debriefing is to identify the specific knowledge, skills, or attitudes that can be transferred from the training environment to their work. This debriefing also provides an excellent opportunity to summarize the major course themes identified in the Introduction.

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TASK #5 - CRITIQUE CRITERIA

1. Is the presentation well organized and focused?
2. Were the interests and concerns of the audience addressed?
3. How effectively are visual aids used?
4. How responsive and prepared is the presentor(s) to questions?

MAJOR EXERCISE

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TASK #6 - CRITIQUE FORM

INSTRUCTIONS: Rate each of the categories in Parts I and II on a one to ten scale. A fair rating would lie in the range of 1-3, 4-7 (good), 8-10 (excellent). A subtotal for each part, as well as an overall total, can be calculated. The comments section should be used to support the ratings and document other observations.

PART I: FINAL WRITTEN REPORT OUTLINE	SCORE
1. Is the problem clearly and accurately stated?	
2. Are the hypotheses comprehensive?	
3. Is the list of variables and measures comprehensive and realistic?	
4. Are the techniques used to analyze the data appropriate?	
5. Is the interpretation of the data accurate and useful?	
6. Does the outline properly emphasize the information?	
7. Is the problem statement easy to understand?	
MAXIMUM POSSIBLE SCORE: 70 PTS Sub-Total	
PART II: PRESENTATION	
8. How effectively are visual aids used?	
9. Were the interests and concerns of the audience addressed?	
10. Is the presentation well organized and focused?	
11. How responsive and prepared is the presentor(s) to questions?	
MAXIMUM POSSIBLE SCORE: 40 PTS. Sub-Total	
MAXIMUM POSSIBLE SCORE: 110 PTS Total	

Comments: _____

MAJOR EXERCISE

MAJOR EXERCISE-STAFF REPORTS

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GROUP A - Crime Prevention	33-35
GROUP B - Attrition Rate of Cases	36-38
GROUP C - Criminal Recidivism Among Adult Offenders	39-40

STAFF REPORT
ON
CRIME PREVENTION IN CHAOS CITY

As recent newspaper headlines have indicated, Chaos City has a major crime problem. An apparent wave of robberies, burglaries and auto thefts has spread throughout the city resulting in a growing concern about neighborhood safety and pressure for increased preventive measures. At the request of the mayor, this Preliminary Analysis Statement has been prepared to summarize what is currently known about this problem.

During 1977 police records indicate that there were 8800 burglaries (79.5% residential), 1900 robberies (63.2% street robberies), 3600 assaults (including 150 rapes), and 4000 auto thefts. (See Table 1.)

Table 1. Chaos City Neighborhood Reported Crime Data, 1977

TYPE OF CRIME	NEIGHBORHOOD					TOTAL REPORTED
	CENTRAL	WESTSIDE	UNIVERSITY	PARK	WASHINGTON	
Residential Burglary	800	2400	700	2100	1000	7000
Commercial Burglary	500	500	200	400	200	1800
Commercial Robbery	200	100	50	300	50	700
Street Robbery	500	200	100	300	100	1200
Assault (Rape)	600 (20)	900 (18)	400 (75)	900 (18)	800 (19)	3600 (150)
Auto Theft	2000	400	400	1000	200	4000
Totals	4600	4500	1850	5000	2350	18,300

Source: Chaos City Police Department, 1978.

While no neighborhood has been unaffected by the crime wave, certain neighborhoods appear to be less prone to certain crimes. For example, the Washington area had only 200 auto thefts reported in 1977. Other areas, in contrast, appear to be suffering a disproportionate share of the crimes. For example, there were 75 rapes in the University area; 2400 residential burglaries were on the Westside; 500 commercial robberies and the 500 street robberies in Central indicate, to some extent, a localized pattern to these different offenses.

A recent victimization survey of city residents conducted by the Survey Research Center at Paradise University indicates that (1) more than 47% of the city's residents feel unsafe in their neighborhood; (2) 46% are restricting their activities because of a fear of crime; and that (3) 32% of the residents perceive crime to be increasing. (See Table 2.)

A number of factors may be contributing to the crime problem in Chaos City. The data indicate that large numbers of illegal entries are unforced, thus, suggesting that residents and businessmen may be failing to employ basic security measures. Certain city areas as well as certain targets may be more prone to crimes than other areas due to physical and/or social/economic characteristics. Current police policies of distributing patrol resources evenly throughout the city and around the clock may not be consistent with the prevailing patterns in these certain crime categories. Indeed, the evidence suggests that crime is a major problem in Chaos City. New policies and programs need to be implemented by which the fear and the reality of crime in the city can be reduced.

Chaos City has never had an explicit planned crime prevention program. The city administration at this time seems to have become more receptive to crime prevention programs because of the public's perception of crime in the city and from the influence of national crime prevention programs on the federal level and in other cities.

Table 2. Chaos City 1977 Public Opinion Survey

SURVEY	CHAOS CITY RESIDENTS
1. Neighborhood Safety	%
Very Safe	16.5%*
Reasonably Safe	35.9%
Somewhat Unsafe	26.9%
Very Unsafe	20.7%
2. Safety Compared to Other Neighborhoods	
Much More Dangerous	2%*
Somewhat More Dangerous	8%
About the Same	39%
Less Dangerous	36%
Much Less Dangerous	14%
3. Limiting Activity Because of Crime	
Yes	46%*
No	54%
4. Neighborhood Crime Trend	
Increased	32%*
Decreased	7%
About the Same	50%
Don't Know	11%
5. Evaluation of Police Performance	
Good	37%*
Average	46%
Poor	17%

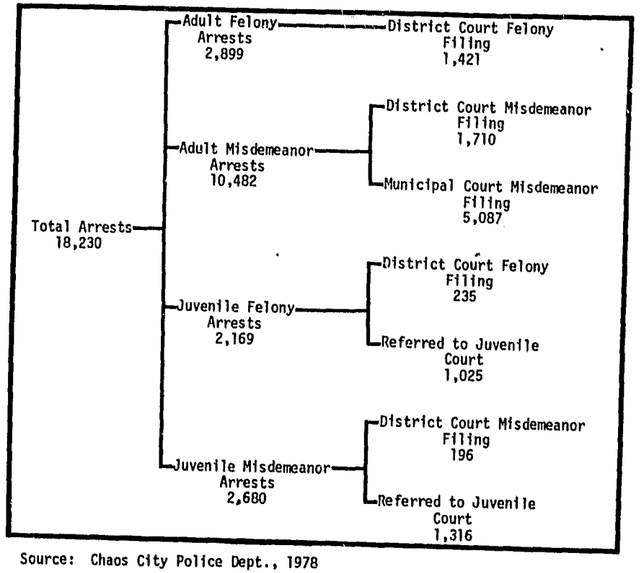
* May not add to 100% due to rounding n = 1500
Source: Paradise University, Survey Research Center, 1978.

STAFF REPORT
ON
ATTRITION RATE OF CASES IN CHAOS CITY

A recent article in the Chaos Rag has brought attention to the problem of crimes committed by individuals who, while arrested, have never been brought to trial. Specifically, the Rag's article concerned a man who was arrested three separate times for burglary, but each case never reached the court. Most recently the man was captured after he had shotgunned an elderly couple to death as he robbed their small grocery store. There was less than $150 in their cash register. At the request of the Mayor this staff report has been prepared to provide background on this problem.

A quick analysis of available data indicates that in 1977, the Chaos City case drop-out rate from the point of arrest to court filing was high for felony cases. Of a total of 2,899 adults arrested for a felony there were 1,421 felony cases filed. In other words, there were about twice as many arrests as filings. A one-to-one ratio between filings and arrests is unrealistic, but a one-to-two ratio seems excessively high. (See Table 1.)

Table 1. Chaos City Arrests and Case Filings, 1977



Source: Chaos City Police Dept., 1978

MAJOR EXERCISE: CHAOS CITY
(GROUP B)

Cases are frequently dropped because either the victim refuses to prosecute or the DA does not accept the case because of insufficient evidence. Some of the disparity between arrest and filing rates can be attributed to multiple cases involving the same suspect or several suspects involved in the same filing, and does not necessarily represent poor quality arrests. However, with evidence problems apparent in 46% of the cases which the DA refused to prosecute, the quality of case preparation by the investigator or the arresting officer may represent a legitimate problem area. (See Table 2.)

Table 2. Reasons for DA Case Refusal, 1977

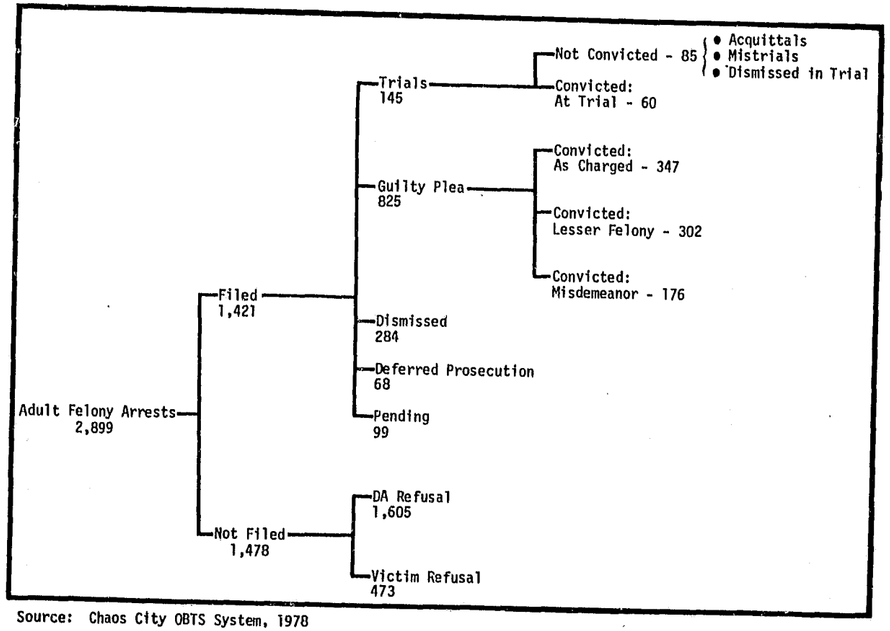
Reason for Refusal	N	%
Evidence Problem		
Inadmissable evidence	252	25
Unavailable physical evidence	50	5
Insufficient physical evidence	161	16
Total	463	46%
Witness Problem		
Unable to locate	40	4
Related/friend of offender	30	3
Witness story/credibility	70	7
Reluctant to get involved w/system	30	3
Total	170	17%
Prosecutorial Merit		
Multi-case disposition	60	6
Office policy	30	3
Diversion program	242	24
Total	332	33%
Unknown	40	4
TOTAL	1005	100%

Source: Chaos City District Attorney's Office, 1978.

MAJOR EXERCISE: CHAOS CITY
(GROUP B)

What is even more disturbing than the number of cases dropped is the disposition of cases adult felony after filing. Only 10% of the felony filings in 1977 were actually tried. About two times more cases were dismissed than tried. Of those tried only 41% were convicted, that is 60 persons out of 145 were convicted. In the consideration of the total number of convictions, guilty pleas accounted for 93% of all convictions and trial convictions only accounted for 7%. (See Table 3) A total of 885 convictions and guilty pleas out of over 1421 filings represents only a 62% conviction rate.

Table 3. Chaos City Arrests, Felony Filings and Case Dispositions, 1977



Source: Chaos City OBTS System, 1978

MAJOR EXERCISE

MAJOR EXERCISE: CHAOS CITY
(GROUP C)

STAFF REPORT
ON
CRIMINAL RECIDIVISM AMONG ADULT OFFENDERS IN CHAOS CITY

The failure of our criminal justice systems' rehabilation components is suggested by a recent study released by Paradise University's Criminal Justice Research Center. Their study revealed that over a two year follow-up period, a sample of 250 felony offenders were rearrested at the rate of 48% and reconvicted at a rate of 30%. Among the 48% who were rearrested at least once, the mean number of rearrests was 2.7. Rearrest rates were found to be higher among certain types of offenders (such as burglars) than other crime categories (such as assault). (See Table 1.)

Table 1. Two Year Recidivism Rates
for Adult Offenders in Chaos City

Original Commitment Offense	Number of Cases	Rearrested	Not Rearrested	Reconvicted	No Reconvictions
Assault	40	10 (25%)	30 (75%)	6 (15%)	34 (85%)
Rape	25	4 (16%)	21 (84%)	4 (16%)	21 (84%)
Robbery	61	32 (52%)	29 (48%)	17 (28%)	44 (72%)
Burglary	75	44 (59%)	31 (41%)	25 (33%)	50 (67%)
Theft	49	30 (61%)	19 (39%)	22 (45%)	27 (55%)
Total	250	120 (48%)	130 (52%)	74 (30%)	176 (70%)

Source: Paradise University, Criminal Justice Research Center, 1978

There is concern in the Chaos City criminal justice community about the recidivism problem. The Chief of Police has publicly stated that relatively few offenders account for most serious felony arrests in Chaos City. He further contends that these "career criminals" are frequently not convicted or, if convicted, given sentences that are too light. There is general concern among the judges about the effectiveness of their sentencing practices. The issue of whether length of sentence affects recidivism has repeatedly been raised.

The Chief Probation Officer feels that offenders are less likely to recidivate if given employment and related support services when released. He also feels that the sentencing recommendations made by his staff on the pre-sentence report are based upon socio-economic and other background characteristics of the offender are good predictors of recidivism, and that judges should follow these recommendations more consistently.

The probation officer has found in a follow-up study of the Paradise University Recidivism Study that when the court closely followed his recommended sentence, only 40% of the offenders were rearrested compared to 60% when his report was not followed at all. (See Table 2.)

MAJOR EXERCISE

Table 2. Influence of Pre-Sentence Report on Rearrests, 1977

Offender Status	Pre-Sentence Report			Total
	Not Followed	Influenced	Closely Followed	
Rearrested	60	40	20	120
Not Rearrested	40	60	30	130
Totals	100	100	50	250

Source: Chaos City, Chief Probation Officer, Department of Corrections, 1978.

MAJOR EXERCISE
DATA SET

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GROUP C	TABLES C-1 to C-4	60-65

MAJOR EXERCISE

Table A-1. Chaos City 1977 Census Data

HOUSING UNITS	#	%
Single Family	73,500	49
Two-Four Plex	26,800	18
Apartment	49,700	33
TOTAL	150,000	100

COMMERCIAL ESTABLISHMENTS	#
Gas Stations	165
Drug Stores	51
Schools	133
Grocery Stores	140
Hotel/Motels	131
Department Stores	82
Bars/Restaurants	301
Factory Buildings	253
Office Buildings	4050
Banks	98
Other	3596

POPULATION CHARACTERISTICS		
SEX	#	%
Male	171,500	49
Female	178,500	51

AGE	#	%
Under 5	28,600	8
5-14	62,900	18
15-19	31,900	9
20-34	73,800	21
35-64	114,000	32
65-over	38,500	12

RACE	#	%
White	245,000	70
Black	101,000	29
Other	4,000	1

HOUSEHOLD INCOME LEVEL	#	%
Below $5000	16,500	11
$5000--6999	18,100	12
7000--9999	26,800	18
10,000-14,000	43,800	29
15,000-24,999	28,200	19
25,000 +	16,600	11

Source: Chaos City Planning Department Estimates, 1978.

MAJOR EXERCISE: CHAOS CITY
(GROUP A)

Table A-2. Chaos City, Neighborhood Data, 1977

CHARACTERISTICS	CITY TOTAL	NEIGHBORHOOD				
		CENTRAL	WESTSIDE	UNIVERSITY	PARK	WASHINGTON
Population	350,000	65,000	90,000	50,000	80,000	65,000
Geog. Size	70 sq.mi.	5	22	10	18	15
Housing Units	150,000	25,000	40,000	25,000	36,000	24,000
Commercial Establishments	9,000	3,000	2,000	1,000	2,500	500
Median Income Households	11,400	9,100	12,900	14,200	6,800	21,500
% Minority	30%	54%	1%	2%	86%	1%

Source: See Table A-1.

Table A-3. 1971-1977 Census Data for Chaos City

CATEGORY	1971	1972	1973	1974	1975	1976	1977
Population	250,000	270,000	300,000	310,000	330,000	340,000	350,000
Housing Units	90,000	100,000	115,000	120,000	135,000	140,000	150,000
Commercial Establishments	5,300	5,800	6,300	7,300	8,000	8,600	9,000

Source: See Table A-1.

MAJOR EXERCISE

Table A-4. Chaos City, Reported Crime Data, 1971-1977

CRIME CATEGORY	1971	1972	1973	1974	1975	1976	1977
Residential Burglary	4100	4000	4900	6000	5800	6800	7000
Commercial Burglary	540	600	650	700	1000	1500	1800
Commercial Robbery	250	300	360	500	550	600	700
Street Robbery	300	350	450	600	850	1000	1200
Assault (Incl. Rape)	2600 (101)	2800 (98)	3100 (97)	3200 (110)	3500 (92)	3400 (120)	3600 (150)
Auto Theft	3800	3700	4000	4100	3900	3800	4000
Total	11,590	11,750	13,460	15,100	15,600	17,100	18,300

Source: Chaos City Police Department, 1978.

MAJOR EXERCISE: CHAOS CITY
(GROUP A)

Table A-5. Chaos City, Public Opinion Survey, 1977

SURVEY RESPONSE	NEIGHBORHOOD				
	CENTRAL	WESTSIDE	UNIVERSITY	PARK	WASHINGTON
Neighborhood Safety					
Very Safe	10%	15%	23%	4%	38%
Reasonably Safe	31%	46%	39%	29%	31%
Somewhat Unsafe	31%	18%	26%	36%	25%
Very Unsafe	28%	21%	12%	31%	6%
Safety Compared to Other Neighborhoods					
Much More Dangerous	2%	1%	1%	3%	1%
Somewhat More Dangerous	11%	8%	4%	12%	6%
About the same	43%	33%	39%	48%	32%
Less Dangerous	32%	40%	39%	31%	41%
Much Less Dangerous	12%	18%	17%	6%	20%
Limiting Activity Because of Crime					
Yes	56%	45%	41%	47%	39%
No	44%	55%	59%	53%	61%
Neighborhood Crime Trend					
Increased	42%	38%	47%	10%	30%
Decreased	3%	7%	4%	8%	10%
Same	39%	42%	37%	71%	58%
Don't Know	16%	13%	12%	11%	2%
Evaluation of Police Performance					
Good	26%	49%	39%	13%	65%
Average	49%	40%	52%	54%	32%
Poor	25%	11%	9%	33%	3%
	n=248	n=402	n=251	n=360	n=238

Source: Paradise University, Survey Research Center, 1978.

Table A-6. 1977 Residential Burglary Characteristics

MONTH OF OCCURENCE	#	%
January	138	6.9
February	145	7.3
March	133	6.7
April	141	7.1
May	179	9.0
June	204	10.2
July	218	10.9
August	231	11.6
September	169	8.5
October	174	8.7
November	138	6.9
December	130	6.5
TIME OF DAY	**#**	**%**
Day (6AM-6PM)	542	27.1
Night (6PM-6AM)	709	35.5
Unknown	749	37.5
PLACE OF ENTRY	**#**	**%**
Front	720	36.0
Side	860	43.0
Back	420	21.0
TYPE OF ENTRY	**#**	**%**
Force	1460	73.0
No Force	540	27.0
TYPE OF TARGET	**#**	**%**
Single-Family Dwelling	1080	54%
Two-Four Plex	380	19%
Apartment	540	27%

MAJOR EXERCISE: CHAOS CITY
(GROUP A)

Table A-6. - Continued

PROPERTY LOSS VALUE	#	%
0	261	13%
1-99	82	4%
100-199	319	16%
200-299	378	18%
300-399	220	11%
400-499	203	10%
500-599	162	8%
600-699	101	5%
700-799	99	5%
800-899	83	4%
900-999	58	3%
1000 +	34	2%

TYPE OF ENTRY BY TYPE OF STRUCTURE

TYPE OF ENTRY	SINGLE	TWO-FOUR PLEX	APARTMENT	TOTAL
Unforced				
Window	5%	7%	5%	6%
Door w/o key	13%	17%	18%	15%
Door w/ key	2%	4%	13%	6%
Total	20%	28%	36%	36%
Forced				
Window	34%	28%	23%	20%
Door	46%	44%	41%	44%
Total	80%	72%	64%	64%
	n=1080	n=380	n=540	n=2000

Source: Chaos City Police Department, 1978
(Based on a sample of 2000 police reports)

Table A-7. 1977 Commercial Burglary Characteristics

MONTH OF OCCURRENCE	#	%
January	65	7.2
February	74	8.2
March	61	6.8
April	82	9.1
May	73	8.1
June	89	10.0
July	91	10.1
August	73	8.1
September	66	7.3
October	81	9.0
November	74	8.2
December	71	7.9
TIME OF DAY	**#**	**%**
Day (6am-6pm)	76	8.5
Night (6pm-6am)	652	72.4
Unknown	172	19.1
PLACE OF ENTRY	**#**	**%**
Front	361	40.1
Side	256	28.4
Back	247	27.4
Other/Unknown	36	4.0
TYPE OF ENTRY	**#**	**%**
Force	760	84.5
No Force	140	15.5
TYPE OF TARGET	**#**	**%**
Gas Station	61	6.8
Drug Store	10	1.1
School	34	3.8
Grocery Store	27	3.0
Hotel/Motel	31	3.4
Department Store	5	.6
Bar/Restaurant	33	3.7
Factory	36	4.0
Office Building	220	24.5
Other	443	49.2

MAJOR EXERCISE: CHAOS CITY
(GROUP A)

Table A-7. - Continued

PLACE AND METHOD OF ENTRY BY TYPE OF TARGET

TYPE OF TARGET	PLACE OF ENTRY				TYPE OF ENTRY	
	Front	Side	Back	Other/Unk.	Force	No Force
Gas Station (n=61)	27	22	9	3	60	1
Drug Store (n=10)	4	2	3	1	10	-
School (n=34)	7	22	4	1	27	7
Grocery Store (n=27)	14	5	5	3	25	2
Hotel/Motel (n=31)	27	1	2	1	4	27
Department Store (n=5)	3	1	1	-	5	-
Bar/Restaurant (n=33)	13	2	18	-	30	3
Factory (n=36)	7	16	12	1	27	9
Office Building (n=220)	79	63	75	3	168	52

Source: See Table A-6. (Based on a sample of 900 police reports)

Table A-8. Street Robbery, 1977

TYPE	#	%
Personal	502	84
Purse-snatch	73	12
Business	25	4
MONTH OF OCCURRENCE	**#**	**%**
January	41	7
February	49	8
March	40	7
April	60	10
May	47	8
June	58	10
July	42	7
August	57	9
September	62	10
October	40	7
November	55	9
December	49	8
TIME OF DAY	**#**	**%**
Midnight-9am	95	16
9am-3pm	132	22
3pm-Midnight	373	62
LOCATION	**#**	**%**
Street	443	74
Parking Area	55	9
Alley	49	8
Other	53	9
VICTIM SEX	**#**	**%**
Male	263	44
Female	337	56
VICTIM AGE	**#**	**%**
Juvenile (-18)	91	15
Young Adult (18-29)	127	21
Older Adult (30-64)	238	40
Elderly (65+)	144	24

Table A-8. - Continued

INJURY LEVEL	#	%
None	391	64
Injury-no hospitalization	186	31
Injury with hospitalization	23	4
FORCE LEVEL	**#**	**%**
No threat	113	19
Threatened, no force used	126	21
Bodily force only	323	54
Weapon used	38	6

INJURY LEVEL BY VICTIM RESISTANCE

INJURY LEVEL	COOPERATIVE VICTIMS	RESISTANT VICTIMS
None	272	119
At least some	99	110
TOTAL	371	229

Source: See Table A-8. (Estimates based on a sample of 600 police reports)

Table A-9. Commercial Robbery Characteristics, 1977

MONTH OF OCCURRENCE	#	%
January	29	8
February	32	9
March	28	8
April	29	8
May	18	5
June	17	5
July	25	7
August	15	4
September	26	7
October	49	14
November	46	13
December	36	10
TIME OF DAY	**#**	**%**
Midnight-6am	43	12
6am-noon	44	13
Noon-6pm	81	23
6pm-midnight	182	52
TYPE OF WEAPON	**#**	**%**
Gun	278	79
Knife	31	9
Others	18	5
None	23	7
TYPE OF TARGET	**#**	**%**
Grocery Store	48	14
Gas Station	63	18
Drug Store	19	5
Bar/Restaurant	17	5
Bank	6	2
Hotel/Motel	14	4
Other	183	52
LEVEL OF FORCE	**#**	**%**
Weapon visible, not used	251	72
Physical force only	42	12
Weapon used	57	16
INJURY	**#**	**%**
No injuries	304	87
Minor injury only	24	7
Hospital treatment	22	6

Source: See Table A-6. (Estimates based on a sample of 350 police reports)

Table A-10. Assaults (including Sexual Assaults), 1977

MONTH OF OCCURRENCE	#	%
January	143	8
February	131	7
March	137	8
April	142	8
May	168	9
June	148	8
July	141	8
August	146	8
September	166	9
October	139	8
November	165	9
December	174	10
TIME OF DAY	**#**	**%**
2am-10am	253	14
10am-6pm	451	25
6pm-2am	1096	61
TYPE OF WEAPON	**#**	**%**
Gun	325	18
Knife	305	17
Other	361	20
None	809	45
INJURY LEVEL	**#**	**%**
None	593	33
Minor	559	31
Treated and Released	485	27
Hospitalized	163	9
VICTIM-OFFENDER RELATIONSHIP	**#**	**%**
Strangers	631	35
Non-strangers	1169	65
VICTIM AGE	**#**	**%**
Under 18	361	20
18-24	558	31
25-34	467	26
35-44	180	10
45-64	194	11
65 +	40	2

Table A-10. - Continued

VICTIM CHARACTERISTICS BY TYPE OF ASSAULT

VICTIM SEX	STRANGER TO STRANGER	NON-STRANGER
Male	474	503
Female	157	666
VICTIM AGE		
Under 18	89	272
18-24	201	357
25-34	187	280
35-44	41	139
45-64	95	99
65 +	18	22

Source: See Table A-6. (Estimates based on a sample of 1800 police reports)

Table A-11. Auto Theft Characteristics, 1977

TYPE OF VEHICLE	#	%
Auto	869	87
Trucks	51	5
Motorcycle	73	7
Other	7	1
TYPE OF PREMISE	**#**	**%**
Parking Lot	432	43
Street Adjacent to Residence	218	22
Other Residential Street	119	12
Owner's Garage or Driveway	77	8
Other	154	15
LOCATION OF KEYS	**#**	**%**
In owner's possession	789	79
In car	77	8
In ignition	64	6
Other	70	7
NEIGHBORHOOD WHERE VEHICLE RECOVERED	**#**	**%**
Central	186	19
Westside	61	6
University	103	10
Park	474	47
Washington	14	1
Recovered out of city	84	8
Not recovered	98	10

Source: See Table A-6. (Based on a sample of 1000 police reports)

B. Attrition Rate of Cases in Chaos City

Table B-1. Chaos City, Adult Felony Case Processing Statistics

	1973	1974	1975	1976	1977
Adult Felony Arrests	1423	2089	2569	2609	2899
Filed	968	1253	1387	1291	1421
Trials	125	144	166	116	145
Trial Convictions	54	72	78	50	60
Guilty Plea	565	711	807	803	825
As Charged	241	290	340	340	347
Lessor Felony	183	212	260	280	302
Misdemeanor	141	209	207	183	176
Court Dismissals	182	270	273	223	284
Deferred Prosecutions	31	48	46	61	68
Cases Pending	65	80	95	88	99
Not Filed	455	836	1182	1318	1478
DA Refusal	278	668	827	817	1005
Victim Refusal	177	168	355	501	473

Source: Chaos City OBTS System, 1978. (Includes homicides, rape, burglary, assault and theft)

MAJOR EXERCISE: CHAOS CITY
(GROUP B)

Table B-2. Chaos City Arrests, Felony Filings and Case Dispositions, Violent and Property Crimes, 1977.

	VIOLENT	PROPERTY
Adults Felony Arrests	725	2174
Filed	463	958
Trials	94	51
Trial Convictions	36	24
Guilty Plea	205	620
As Charged	65	282
Lesser Charge	85	217
Misdemeanor	55	121
Court Dismissals	114	170
Deferred Prosecutions	17	51
Cases Pending	38	61
Not Filed	262	1216
DA Refusal	102	903
Victim Refusal	160	313

Source: Chaos City OBTS System, 1978

Table B-3. 1977 UCR Disposition Data

	VIOLENT	PROPERTY	BOTH
Adults Charged	36,725	132,651	169,376
Guilty - As Charged	17,191	92,190	109,381
Guilty - Lesser Charge	4,497	9,811	14,308
Acquitted or Dismissed	15,037	30,650	45,687

Source: FBI, UCR, 1978. (Based upon 2566 cities - 1977 estimated population 37 million)

MAJOR EXERCISE

Table B-4. Reasons for DA Case Refusal, 1973 and 1977.

Reason for Refusal	1973 #	1973 %	1977 #	1977 %
Evidence Problem				
Inadmissable evidence	43	15	252	25
Unavailable physical evidence	13	5	50	5
Insufficient physical evidence	38	14	161	16
Total	94	34	463	46
Witness Problem				
Unable to locate	8	3	40	4
Related/Friend of offender	10	4	30	3
Witness story/Credibility	48	17	70	7
Reluctant to get involved w/system	15	5	30	3
Total	81	29	170	17
Prosecutorial Merit				
Multi-case disposition	22	8	60	6
Office policy	19	7	30	3
Diversion program	34	12	242	24
Total	75	27	332	33
Unknown	28	10	40	4
Total	278	100%	1005	100%

Source: Chaos City District Attorney's Office 1978.

Table B-5. Chaos City Criminal Justice System Staffing

	1973	1974	1975	1976	1977
District Attorneys (Staff Attorneys)	8	9	10	11	11
Judges	15	15	20	20	20
Police Officers (Uniformed Offiers)	386	386	396	400	420

Source: Chaos City, Office of the Budget, 1978

MAJOR EXERCISE: CHAOS CITY
(GROUP C)

Table C-1. Two Year Cohort Study of Recidivism
By Selected Characteristics and Original Commitment Offense

Original Commitment Offense	Number of Cases	Rearrested	Not Rearrested	Reconvicted
Assault	40	10 (25%)	30 (75%)	6 (15%)
Rape	25	4 (16%)	21 (84%)	4 (16%)
Robbery	61	32 (52.5%)	29 (47.5%)	17 (27.9%)
Burglary	75	44 (58.7%)	31 (41.3%)	25 (33.3%)
Theft	49	30 (61.2%)	19 (38.8%)	22 (44.9%)
Total	250	120 (48%)	130 (52%)	74 (29.6%)

Number of Prior Felony Arrests (Not including that which resulted in original commitment)	Number of Cases	Rearrested	Not Rearrested	Reconvicted
None or None Known	85	31 (36.5%)	54 (63.5%)	15 (17.6%)
One	72	32 (44.4%)	40 (55.6%)	18 (25%)
Two	41	23 (56.1%)	18 (43.9%)	14 (34.1%)
Three	23	15 (65.2%)	8 (34.8%)	9 (39.1%)
Four	13	9 (69.2%)	4 (30.8%)	8 (61.5%)
Five	7	4 (57.1%)	3 (42.9%)	4 (57.1%)
Six or More	9	6 (66.7%)	3 (33.3%)	6 (66.7%)
Total	250	120 (48%)	130 (53%)	74 (29.6%)

Table C-1. Continued

History of Substance Abuse	Number of Cases	Rearrested	Not Rearrested	Reconvicted
Alcohol Abuse History	75	34 (45.3%)	41 (54.7%)	24 (32%)
Drug Abuse History	55	27 (49.1%)	28 (50.9%)	18 (32.7%)
Combination	23	13 (56.5%)	10 (43.5%)	10 (43.5%)
None	97	46 (47.4%)	51 (52.6%)	22 (22.7%)
Totals	250	120 (48%)	130 (52%)	74 (29.6%)

Post-Release Employment Status (2 months after release)	Number of cases	Rearrested	Not Rearrested	Reconvicted
Employed Part-time	43	20 (46.5%)	23 (53.5%)	12 (27.9%)
Employed Full-time	142	57 (40.1%)	85 (59.9%)	31 (21.8%)
Unemployed	65	43 (66.1%)	22 (33.9%)	31 (47.7%)
Total	250	120 (48%)	130 (52%)	74 (29.6%)

Total number of jobs during 2-year follow-up	Number of Cases	Rearrested	Not Rearrested	Reconvicted
None	42	28 (66.7%)	14 (33.3%)	18 (42.9%)
One	83	29 (34.9%)	54 (65.1%)	17 (20.5%)
Two	71	34 (47.9%)	37 (52.1%)	21 (29.6%)
Three or more	54	29 (53.7%)	25 (46.3%)	18 (33.3%)
Total	250	120 (48%)	130 (52%)	74 (29.6%)

MAJOR EXERCISE: CHAOS CITY
(GROUP C)

Table C-1. Continued

Average Annual Income Level During Followup Period	Number of Cases	Rearrested	Not Rearrested	Reconvicted
$2,000	45	23 (51.1%)	22 (48.9%)	14 (31.1%)
$2,001 - $4,000	91	45 (49.5%)	46 (50.5%)	27 (29.7%)
$4,001 - $6,000	59	29 (49.2%)	30 (50.8%)	18 (30.5%)
$6,001 - $8,000	31	14 (45.2%)	17 (54.8%)	8 (25.8%)
$8,001 - $10,000	20	9 (45.0%)	11 (55.0%)	7 (35.0%)
$10,000	4	0 (0%)	4 (100%)	0 (0%)
Total	250	120 (48%)	130 (52%)	74 (29.6%)

Number of known Residences During Followup Period	Number of Cases	Rearrested	Not Rearrested	Reconvicted
One	87	35 (40.2%)	52 (59.8%)	23 (26.4%)
Two	91	42 (46.2%)	49 (53.8%)	27 (29.7%)
Three	49	26 (53.1%)	23 (46.9%)	17 (34.7%)
Four or More	23	17 (73.9%)	6 (26.1%)	7 (30.4%)
Total	250	120 (48%)	130 (52%)	74 (29.6%)

MAJOR EXERCISE

CONTINUED

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Table C-1. Continued

Sex and Ethnic Background	Number of Cases	Rearrested	Not Rearrested	Reconvicted
White Male	94	47 (50%)	47 (50%)	30 (31.9%)
Other Male	61	34 (55.7%)	27 (44.3%)	20 (32.8%)
White Female	63	24 (38.1%)	39 (61.9%)	16 (25.4%)
Other Female	32	15 (46.9%)	17 (53.1%)	8 (25%)
Total	250	120 (48%)	130 (52%)	74 (29.6%)

Age	Number of Cases	Rearrested	Not Rearrested	Reconvicted
18 - 21	62	37 (59.7%)	25 (40.3%)	22 (35.5%)
22 - 25	49	29 (59.2%)	20 (40.8%)	17 (34.7%)
26 - 29	31	16 (51.6%)	15 (48.4%)	11 (35.5%)
30 - 33	33	22 (66.7%)	11 (33.3%)	11 (33.3%)
34 - 37	20	6 (30%)	14 (70%)	5 (25%)
38 - 41	36	8 (22.2%)	28 (77.8%)	6 (16.7%)
Over 42	19	2 (10.5%)	17 (89.5)	2 (10.5%)
Total	250	120 (48%)	130 (52%)	74 (29.6%)

Type of Sentence Received Under Previous Offense	Number of Cases	Rearrested	Not Rearrested	Reconvicted
Probation	72	25 (34.7%)	47 (65.3%)	17 (23.6%)
Less Than One Year	123	61 (49.6%)	62 (50.4)	37 (30.1%)
Greater Than One Year	55	34 (61.8%)	21 (38.2%)	20 (36.4%)
Total	250	120 (48%)	130 (52%)	74 (29.6%)

Source: Paradise University, Criminal Justice Research Center, 1978

MAJOR EXERCISE: CHAOS CITY
(GROUP C)

Table C-2. Multiple Rearrests by Original Commitment Offense

Number of Rearrests (Two-year Follow-up)	Original Commitment Offense				
	Assault	Rape	Robbery	Burglary	Theft
None	30	21	29	31	19
One	5	2	8	10	4
Two	3	1	7	14	4
Three	----	----	8	11	9
Four	2	----	4	5	6
Five	----	1	5	4	7
	N = 40	N = 25	N = 61	N = 75	N= 49

Source: See Table C-1.

Table C-3. Type of Rearrest by Original Commitment Offense

Type of Rearrest	Assault	Rape	Robbery	Burglary	Theft
Rape	1	1	----	2	1
Robbery	5	1	55	2	6
Assault	2	2	7	1	8
Burglary	----	4	20	81	19
Felony Theft	9	----	3	13	59
Misdemeanor	2	1	2	11	5
Victimless	----	----	----	1	----
Total Rearrests*	19	9	87	111	98
Total Original Cases	N = 40	N = 25	N = 61	N = 75	N = 49

*The number of rearrests is greater than 120 since the average recidivist is rearrested 2.7 times.

Source: See Table C-1.

MAJOR EXERCISE

MAJOR EXERCISE: CHAOS CITY
(GROUP C)

Table C-4. Chaos City Felony Arrest Statistics

Number of Prior Adult Arrests	1973		1974		1975		1976		1977	
	#	%	#	%	#	%	#	%	#	%
0	726	51%	1002	48%	1156	45%	1096	42%	1160	40%
1	313	22%	397	19%	437	17%	391	15%	464	16%
2	157	11%	251	12%	308	12%	261	10%	406	14%
3	85	6%	167	8%	206	8%	130	5%	145	5%
4	71	5%	84	4%	128	5%	287	11%	174	6%
5	43	3%	104	5%	180	7%	235	9%	290	10%
6+	28	2%	84	4%	154	6%	209	8%	260	9%
Total	1423	100%	2089	100%	2569	100%	2609	100%	2899	100%

Note: This table reflects the distribution of all felony arrests for the years from 1973 through 1977.

Source: Chaos City OBTS System, 1978. (Includes homicides, rape, burglarly, assault and theft)

MAJOR EXERCISE

79356

U.S. Department of Justice
Law Enforcement Assistance Administration

Criminal Justice Planning and Management Series

Volume 2

Criminal Justice Analysis Course:

Participant Guide

79356

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FOREWARD

THE CRIMINAL JUSTICE TRAINING CENTERS

The Law Enforcement Assistance Administration is actively engaged in providing assistance to state and local governments to support their administrative capabilities. Good analyses are prerequisite to the development and implementation of effective programs for improving criminal justice and reducing crime. Decision-makers understand that policies and programs must begin with analysis of the crime and criminal justice system problems they face and that efficient utilization of scarce resources can be achieved only by the careful interpretation of available information. In this context analysis is a powerful tool to be utilized in criminal justice planning, program development, management, and evaluation.

The expertise of analysts, planners, researchers, and of greatest importance, people who have had direct personal experience with state and local criminal justice problems has been tapped by LEAA's Training Division, Office of Operations Support, to develop and deliver the Criminal Justice Analysis Course. The Criminal Justice Analysis Course concentrates on the specification of crime and system problems utilizing basic statistical and other analytic tools essential to this process. This course is offered to state and local governments to assist and support them in identifying, acquiring, and using the best available data, analytic techniques, and problem-solving methods.

The Analysis Course is companion to the LEAA developed training courses in Criminal Justice Planning, Criminal Justice Program Evaluation, and Criminal Justice Program Development and Criminal Justice Program Management. The design of these programs of instruction is intended to form a comprehensive and complementary curriculum of criminal justice tools for planning and decision-making.

The Training Center System for delivering these programs of instruction consists of major universities located throughout the country. Centers are located at the Northeastern University, University of Wisconsin-Milwaukee, Florida State University, Washburn University, and the University of Southern California. Each Criminal Justice Training Center is responsible for delivering these courses and providing technical assistance to jurisdictions within its region.

THE CRIMINAL JUSTICE ANALYSIS COURSE

Background

The training course in Analysis of Crime and the Criminal Justice System was originally designed and developed by Abt Associates, Inc., Cambridge, Massachusetts, to help support the proposed High Crime Area Program. While this program was not implemented, the need for this type of training for criminal justice planners and analysts remained critical. The Analysis training was presented five times at the State University of New York at Albany (SUNY). A comprehensive evaluation of those deliveries identified some areas requiring revision.

A Task Order for the revision of the curriculum for training in the Analysis of Crime and the Criminal Justice System Course was issued to Abt Associates, February 2, 1977, under contract number J-LEAA-001-77. This revision was completed and delivered to the Law Enforcement Assistance Administration, August 15, 1977. This product was pilot tested by the Criminal Justice Training Center at the University of Southern California in January, 1978, and subsequently delivered several times by the training center system between January and June, 1978.

In June, 1978, LEAA and the five Criminal Justice Training Centers agreed that a "Finalization" of the original analysis course was appropriate. The Criminal Justice Training Center at Washburn University received a grant from LEAA to manage and coordinate the Finalization process. The consultant revising the original document was retained as the principal consultant to perform the major task of synthesizing the suggested course modifications from the five Training Centers, their faculties, and LEAA.

Description

The Criminal Justice Analysis Course consists of an Orientation, Introduction, seven instructional units (modules), and two optional instructional units.

The emphasis in the Criminal Justice Analysis Course is on an interactive, participatory learning environment. Several activities help insure the achievement of course and module objectives. During the course there are traditional classroom lectures, six small exercises, one major exercise, one optional workshop, ten "walk-throughs" and one optional "walk-through".

The walk-throughs are exercises or problems in which all of the answers or expected outcomes are revealed to participant and instructor. The instructor will describe the process or "walk-through" these activities with participants. No actual participant work or facilitation is required. The walk-throughs illustrate teaching points and lesson objectives within a module.

Frequently walk-throughs are followed by one of the small exercises or one of the tasks of the major exercise. The exercises are designed to provide opportunities to "do the work" of the course. All exercises will require a product from participants. Instructors and facilitators will be available to help participants in these activities.

To aid faculty and students in understanding the Criminal Justice Analysis Course, as well as to provide a useful decision-making tool in the conduct of analysis, the course structure and content is recorded in module charts or decision maps.* These module charts provide a guide for organizing

*For an example of the use of decision maps in statistics see Thad R. Harshbarger, Introductory Statistics: A Decision Map (New York: MacMillan Publishing Co., 1977).

the conduct of analysis. They classify the concerns, outline the application of data sources and statistical techniques, and they identify the topics and instruction sequence of the Course. The charts provide a graphical integration of the Course's instructional units. Instructors will use them as a reference to the interrelationships between course modules and as an aid for making transitions between modules. They are useful also as summaries of each module and for subsequent reference by participants.

Documentation and detailed materials pertaining to the Criminal Justice Analysis Course are also presented in the Criminal Justice Analysis Text.

Acknowledgements

The Principal Consultant to the Washburn Criminal Justice Training Center who served as the author/coordinator of instructional material is Seth I. Hirshorn, Ph. D., Ann Arbor, Michigan.

Consultants who assisted in the development of instructional materials were: Etta Cain, Des Moines, Iowa; John Carr, Denver, Colorado; Douglas Dallio, New York, New York; John Fettes, Santa Fe, New Mexico; Charles Friel, Huntsville, Texas; Stephen Gottfriedson, Baltimore, Maryland; Stanley M. Grabowski, West Newton, Massachusetts; Wendell Harper, Council Bluffs, Iowa; Michael Lowther, Oklahoma City, Oklahoma; Michael Miller, Jefferson City, Missouri; Broderick Reischl, Chicago, Illinois; Charles Weller, Denver, Colorado; Robert M. Wertz, Baton Rouge, Louisiana.

At the Washburn University Criminal Justice Training Center the project was under the general direction of Lyle D. Newton, Director of the Center. Allen R. Beck, Ph. D., Assistant Director for Analysis, served as the manager of the Analysis project. Kathy J. Goldsmith, Elizabeth Ann Lorenzen, Keri D. Luttijohann, and Tina J. Sumpter were in charge of the extensive word processing requirements of the project. Leslie C. Fraser, Administrative Officer and Robert C. Tompkins, Administrative Assistant, performed a multitude of tasks ranging from management to printing. Rita M. Eraas, Michael W. Goldsmith, Robert J. Mason, Pat A. Overbey, Vickie A. Rush, and Ormond L. Wimberly worked on numerous graphics and production tasks.

The glossary was compiled by Carolyn A. Thieme-Busch, Training Division, Office of Operations Support, LEAA.

Richard N. Ulrich, Director Training Division, Office of Operations, LEAA, served as project monitor.

ORIENTATION

The purpose of the orientation is to provide logistic and background information to participants.

ORIENTATION MODULE

NOTES

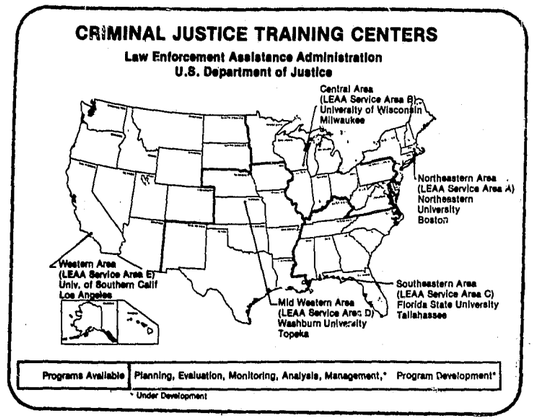
I. PURPOSE OF ORIENTATION

II. THE FACILITY AND AREA

III. ADMINISTRATIVE MATTERS

IV. CRIMINAL JUSTICE TRAINING CENTER

V.A. (O-1):



V. STAFF AND FACULTY

VI. PARTICIPANTS

VII. COURSE MATERIALS

INTRODUCTION

The opening session of the Analysis Course must accomplish several things in order for the participants to effectively move through the lessons and tasks of the week.

First, the participants must have a clear understanding of the methods, procedures, and objectives of the course. Because of the complexity of the course, it is imperative that faculty, facilitators and participants have a common understanding of the expected product and the steps to be taken to produce that product. Anything less than total understanding and agreement will result in confusion.

The course overview establishes goals, identifies the participants, identifies themes, and discusses the values or purposes of analysis. Finally, the overview establishes that analysis is a process leading to a statement of problems which serve to inform decision-makers.

OBJECTIVES

1. To describe the method, procedures, and objectives of the course.
2. To establish goals, identify participant backgrounds and to identify themes for the course.
3. To identify the values or purposes of analysis.
4. To establish that analysis is a process to aid in decision-making.

NOTES

I. COURSE OVERVIEW

A. Course Goals

+ Knowledge Goal:

  The participant should understand as a result of this course the purpose and logic of analysis as used to formulate crime and criminal justice system problems which are used to influence decision-making.

+ Skill Goal:

  The participant will be able to select and apply analytic techniques to crime and system data that can lead to improved interpretation of the data and more effective communication of information, thus providing decision-makers with information which they can understand and use in decision-making.

+ Attitude Goal:

  Participants with minimal prior analytic training, regardless of preconceived ideas of their quantitative talents, will perceive data analysis as being within their competencies and the use of analytic methods as meaningful and desirable.

B. Course Participants

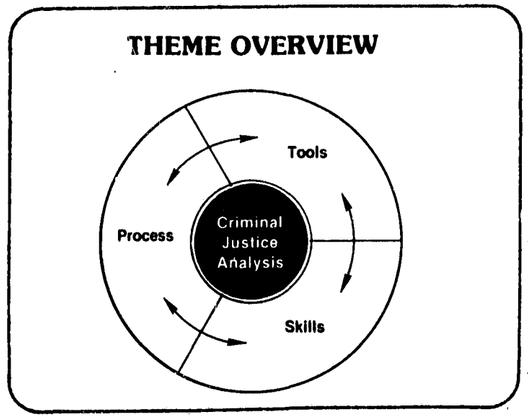
+ The introductory nature and goals of the course indicate that it is for those who seek to understand the analysis process and gain knowledge of how to apply basic analytical tools used in formulating crime and criminal justice system problems.

+ The participants should include planners, budget analysts, program coordinators, policy analysts, program developers, program monitors - anyone that informs decision-makers in criminal justice agencies.

C. Course Themes

+ The Analysis Course has three distinct, yet integrated themes.

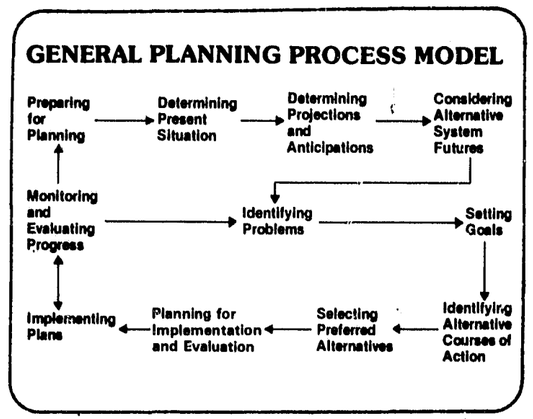
V.A. (IN-1):



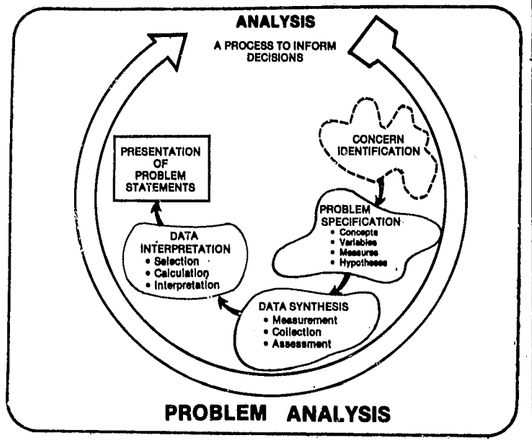
D. Values or Purposes of Analysis

+ Analysis is an integral part of criminal justice and plays a key part in informing decision-makers.
  - Unique tasks in LEAA delivery system require analysis.
  - Problem analysis requirements of guidelines.
  - Analysis is used as input to decision-makers.
+ Competencies central to the role of the analyst.
+ Analysis is an integral part of Planning Process.

V.A. (IN-2):



V.A. (IN-3):



E. Process as Roadmap

+ This week we'll follow the analysis process used to prepare a problem statement.

+ The movement will be from identification of concerns and specification of problems to the development and presentation of a good problem statement.

+ Exhibit 1 is a preview of the entire course.

+ A decision map will be elaborated for each module and utilized throughout the week. It is called the module's chart.

+ Exhibit 2 is the course agenda.

Introduction
Exhibit 1. Course Overview

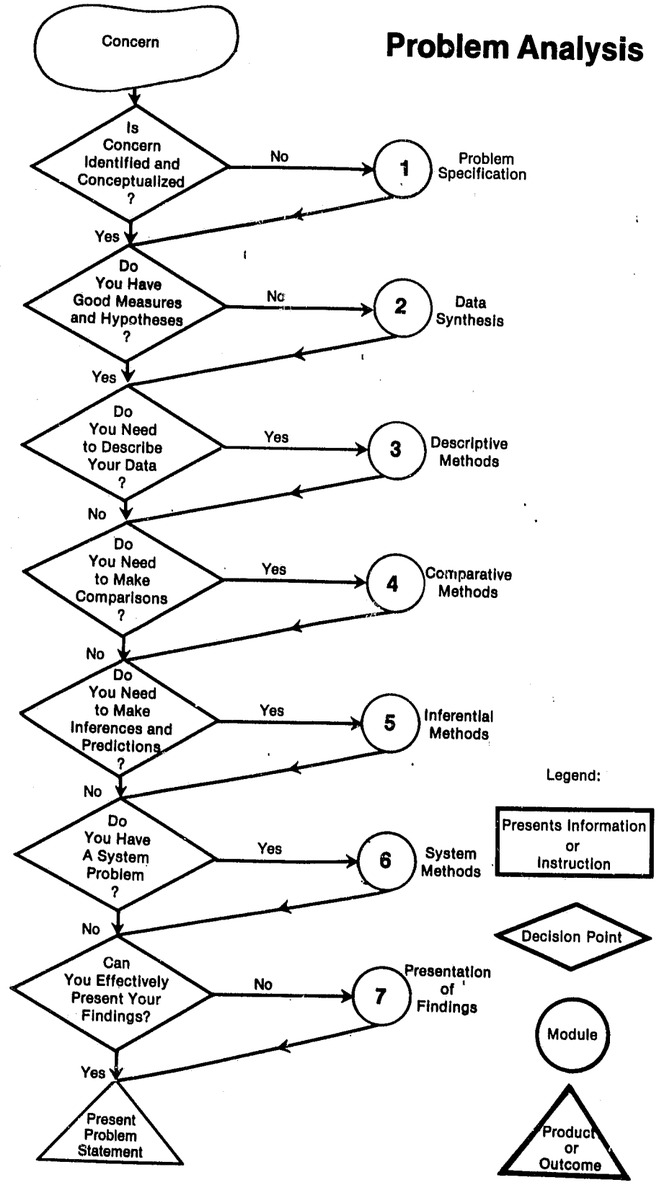


Exhibit 2

SUGGESTED

CRIMINAL JUSTICE ANALYSIS COURSE AGENDA

	SUNDAY	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
8:30 A.M.		Module I Problem Specification (120 minutes)	Module III Data Interpretation --- Descriptive Methods (180 minutes)	Module V Data Interpretation --- Inferential Methods (180 Minutes)	Module VI Data Interpretation --- System (120 minutes)	Major Exercise Task #5 (60 minutes)
		Module II Data Synthesis (60 or 90 minutes)			Module VII Presentation of Findings (60 minutes)	Major Exercise Task #6 (180 minutes)
12:00		Lunch	Lunch	Lunch	Lunch	End of Session (60 minutes)
1:30 P.M.		Major Exercise Task #1 (120 minutes)	Module IV Data Interpretation --- Comparative Methods (150 minutes)	Module V Data Interpretation --- Inferential Methods (continued) (100 minutes)	Major Exercise Task #3 (120 minutes)	
		Major Exercise Task #2 (120 minutes)	Major Exercise Debriefing (60 minutes)	Calculator Workshop (90 minutes)	Major Exercise Task #4 (130 minutes)	
5:00 P.M.	Orientation/ Introduction (80 minutes)					
	Managing Analysis (80 minutes)					

MANAGING ANALYSIS

This optional module emphasizes management skills essential to planning and implementing moderate and large-scale analysis projects. The presentation of management skills should focus on the development, interpretation and utilization of various techniques. The procedures covered in the module include methods for tasking a project and labor and resource allocation procedures.

OBJECTIVES

1. To describe the use of specific techniques for managing analysis tasks.
2. To describe the benefits from planning an analysis effort.

NOTES

I. ANALYSIS PLAN

A. Definition

+ An analysis plan is a written document which systematically outlines the major components of the analysis task from the initial statement of the analytic concern to a work plan which includes an estimate of the costs of a proposed investigation. (See Exhibit 1)

B. Need for an Analysis Plan

+ Pre-preparation of an analysis plan for any sizeable analysis task is necessary to produce results which are reliable and efficiently produced.

+ Inefficiency and missing opportunities characterize approaches which are not scientifically based and are merely "data grubbing" efforts or based on vague ideas of need.

+ Sometimes development of an analysis plan is mandatory.

C. Developing an Analysis Plan

+ There are obviously many possible ways of organizing an analysis plan, but the major components generally tend to be similar. The process should be thought of as a flow with steps overlapping and feeding back into each other. The components of the final analysis plan represent the product of this process.

D. Work Plan

+ Quality Control

+ Staff Relations

+ Budget Control

+ Client Relations

Exhibit 1

Analysis Plan Development, Components, And Uses

STAGES IN DEVELOPING AN ANALYSIS PLAN	State concern for which analysis is needed	Specify concepts, variables, measures, hypotheses	Assess measures and hypotheses	Identify & select data sources	Select analysis techniques	Perform analysis	Identify audience and use for findings	Select presentation format & dissemination procedure	Determine manpower, equipment, time and funds needed
ANALYSIS PLAN COMPONENTS	Questions to be answered	Problem Specification	Prioritized list of hypotheses	Data collection plan	Selected analysis techniques	Interpretation of findings	Audience identification & use for products	Presentation and dissemination	Tasking, Labor allocation, and costing
USE (WHAT EACH STAGE TELLS THE ANALYST)	WHY	WHAT	WHAT	HOW	HOW	WHO WHAT WHEN WHERE WHY	FOR WHOM	FOR WHOM	WHEN, BY WHOM & HOW MUCH
MODULE REFERENCE	MODULE 1: PROBLEM SPECIFICATION		MODULE 2: DATA SYNTHESIS		MODULES 3,4,5,6 METHODS OF ANALYSIS		MODULE 7: PRESENTATION OF FINDINGS		MANAGING ANALYSIS

II. WORK PLAN

A. Overview

+ One of the most important aspects of analysis is the Work Plan for managing the analysis. Scheduling and resource allocation are needed to ensure that the analysis task actually gets done, is completed on time, and is of high quality.

+ A number of management tools are available to assist in this task.

V.A. (Mgt.-1):

STEPS IN DEVELOPING WORK PLAN

1. Identify tasks to be performed
2. Identify relationships among tasks
3. Determine type and magnitude of resources required for each task
4. Determine major milestones and target dates
5. Prepare time schedule for use of resources to perform tasks

---

NOTES

B. Tasking

+ Tasking refers to the sub-division of the analytic activity into a sequential series of tasks to be performed.

+ Proper tasking is an important aspect of quality control, particularly the scheduling of tasks.

+ Two methods for scheduling tasks are the Gantt Chart and the PERT technique.

- Gantt Chart

A Gantt Chart is a graphical representation of project tasks in relation to each other and in relation to time.

A limitation of the Gantt Chart is that it does not indicate which activities must be completed before others can begin or which sequence of tasks should be given highest priority.

Exhibit 3 presents a weekly Gantt Chart of the same project which adjusts for the time gaps in the months.

Exhibit 2.

GANTT CHART

State Analysis of Local Crime Reduction Program Impacts by Month

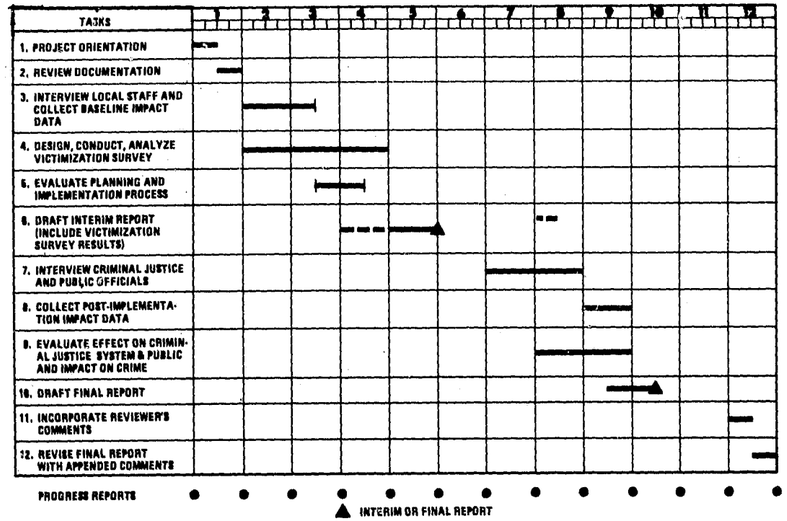
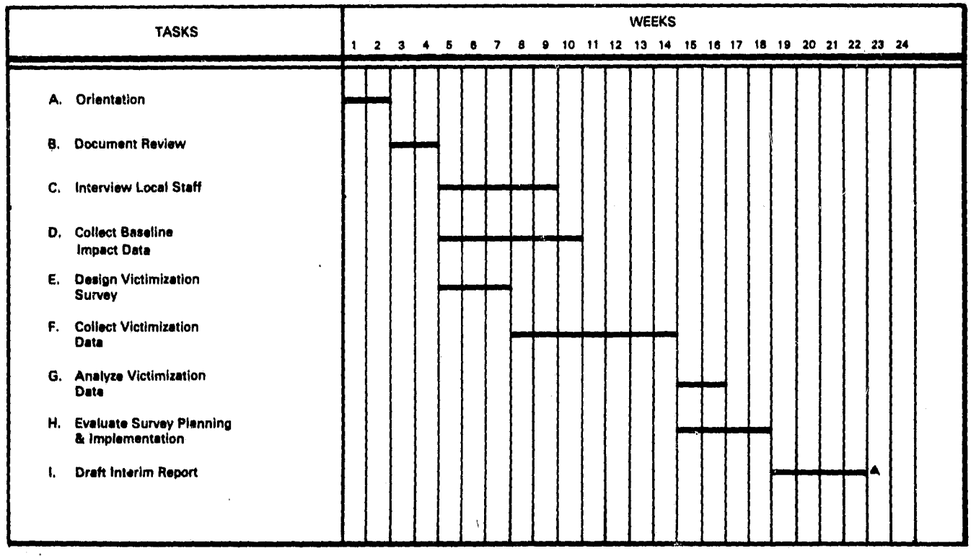


Exhibit 3.

GANTT CHART

State Analysis of Local Crime Reduction Program Impacts - Weekly Schedule



NOTES

PERT Chart

Another technique which can be particularly useful for large and/or complex analysis projects is PERT (Program Evaluation and Review Technique).

To illustrate the application of PERT to the tasks presented in Exhibit 2, Exhibit 4 elaborates the first six tasks (from " 1. Project Orientation" to "6. Draft Interim Report" into nine activities.

Exhibit 4. Nine Activities

A. Project Orientation

B. Review Documentation

C. Interview Local Staff

D. Collect Baseline Impact Data

E. Design Victimization Survey

F. Collect Victimization Data

G. Analyze Victimization Data

H. Evaluate Survey Planning and Implementation

I. Draft Interim Report

Exhibit 5, then, refines each of these activities into specific project events.

Project orientation consists of events "1 - Start Project" and "2 - Complete Orientation."

NOTES

Events are indicated by numbered circles.

Arrows between circles indicate activities that link events and the direction these activities take.

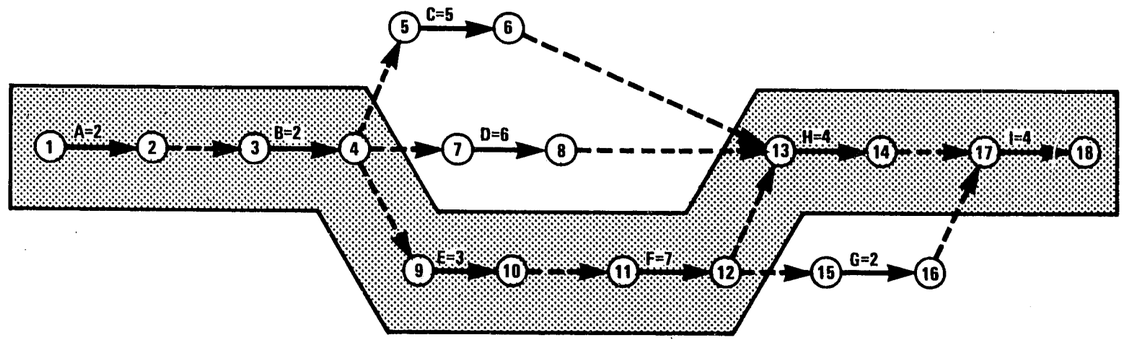
Dotted arrows indicate a relationship but no required activity time, e.g., between "2 - Complete Orientation" and "3 - Begin Document Review."

Solid arrows indicate both a relationship and a required duration for the activity, e.g., between "3 - Begin Document Review" and "4 - Finish Document Review," requires an estimated two weeks, i.e., activities consume time and resources.

By adding the times along each possible path, the critical (or longest) path may be determined.

Path 1: A, B, D, H, I = 18 weeks.
Path 2: A, B, C, H, I = 17 weeks.
Path 3: A, B, E, F, H, I = 22 weeks.
Path 4: A, B, E, F, G, I = 20 weeks.

Exhibit 5
PERT Network With Critical Path Indicated For Analysis Project
(Task = Time in Weeks)



EVENTS

1. START PROJECT	7. COLLECT BASELINE DATA	13. EVALUATE SURVEY
2. COMPLETE ORIENTATION	8. BASELINE DATA COLLECTED	14. COMPLETE EVALUATION
3. BEGIN DOCUMENT REVIEW	9. DESIGN VICTIMIZATION SURVEY	15. ANALYSIS OF VICTIMIZATION DATA
4. FINISH DOCUMENT REVIEW	10. SURVEY DESIGN COMPLETED	16. VICTIMIZATION DATA ANALYZED
5. START STAFF INTERVIEWS	11. COLLECT VICTIMIZATION DATA	17. START INTERIM REPORT
6. FINISH STAFF INTERVIEWS	12. VICTIMIZATION DATA COLLECTED	18. FINISH DRAFT REPORT

Key:
- O — Event
- --- — Relationship
- → — Sequence of events
- A = 2 — Time between events showing number of weeks

NOTES

PERT technique is useful for:

Understanding the relationships and precise nature of the constraints during the development of and implementation of analysis projects.

During the implementation phase:

Monitoring progress and slippage during implementation.

Identifying priorities for resource reallocation through use of the critical path as the highest priority.

A management tool for reminding individual task managers of their schedules and progress.

A summary of tasking techniques is presented in Exhibit 6.

Exhibit 6. Tasking Techniques

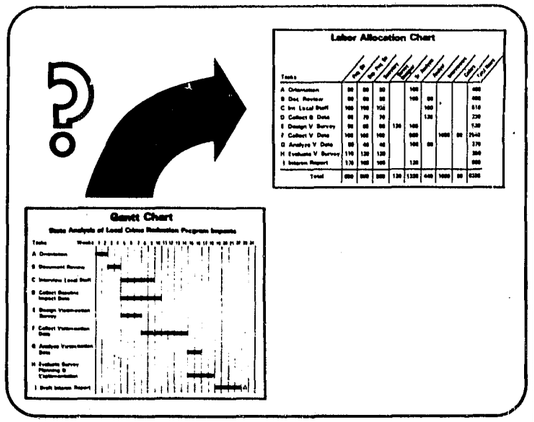
1. GANTT CHART
   - * WEEKLY TIME LINE FOR EACH TASK
   - * SIMPLE TO CONSTRUCT
   - * EASY TO UNDERSTAND
   - * FAILS TO SHOW INTERRELATIONSHIPS OF TASKS

2. PERT
   - * IDENTIFIES PRECEDENCE AND CONCURRENCE RELATIONSHIPS BETWEEN ALL ACTIVITIES AND EVENTS
   - * IDENTIFIES CRITICAL ACTIVITIES FOR HIGH PRIORITY ASSIGNMENT OF RESOURCES
   - * USEFUL FOR COMPLEX ANALYSIS PLANS
   - * CAN BE USED TO ASSESS PROBABILITY OF MEETING DEADLINES

NOTES

C. Labor Allocation

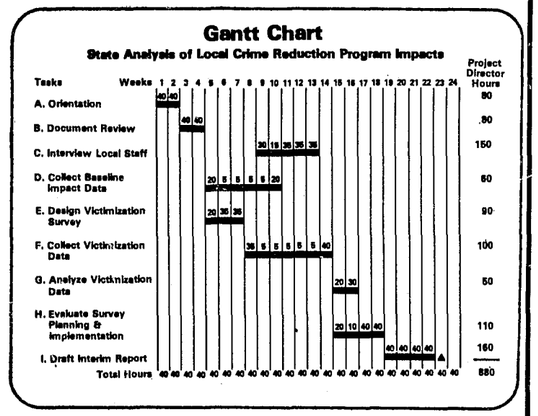
V.A. (Mgt.-2):



- Once target dates, based on a preliminary estimate of staff workload and performance, have been outlined on a Gantt Chart, a labor allocation chart can be developed.
- The Gantt Chart can be used to show personnel requirements for a project.

NOTES

V.A. (Mgt.-3):



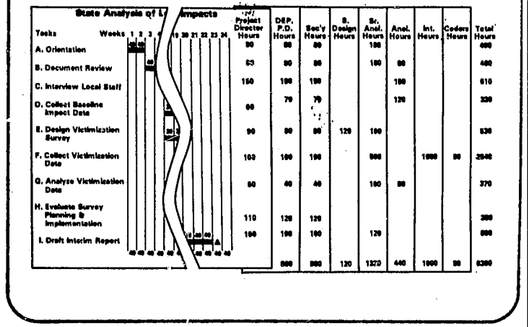
MANAGING ANALYSIS

NOTES

- Consolidating Gantt Charts

V.A. (Mgt.-4):

Labor Allocation Chart - Obtained by Consolidating the Gantt Charts for Separate Positions



- Labor Allocation Chart

- Based on the consolidated Gantt Charts, a labor allocation chart for the victim survey is presented in Exhibit 7.

Exhibit 7.

Labor Allocation Chart

Tasks	Proj. Dir.	Dep. Proj. Dir.	Secretary	Survey Designer	Sr. Analysts	Analyst	Interviewers	Coders	Total Hours
A. Orientation	80	80	80		160				400
B. Doc. Review	80	80	80		160	80			480
C. Int. Local Staff	150	150	150			160			610
D. Collect B. Data	60	70	70			120			320
E. Design V. Survey	90	80	80	120	160				530
F. Collect V. Data	100	100	100		560		1600	80	2540
G. Analyze V. Data	50	40	40		160	80			370
H. Evaluate V. Survey	110	120	120						350
I. Interim Report	160	160	160		120				600
Total	880	880	880	120	1320	440	1600	80	6200

NOTES

D. Budget

+ Assessing the costs of the proposed analysis project should be fairly straightforward once the previous documents have been completed.

+ A sample budget is provided in Exhibit 8 for activities E, F and G of the Labor Allocation Chart (the victimization survey).

+ Three major budget categories -- salary and wages, including fringe benefits; direct expense items; and indirect costs (e.g. overhead) are included.

Exhibit 8. Sample Budget For Proposed Victimization Survey

SALARIES & WAGES	HOURLY RATE	HOURS	COST
Project Director	12.21	240	2,930
Deputy Proj. Director	10.54	220	2,319
Secretary	5.64	220	1,241
Survey Designer	8.65	120	1,038
Senior Analysts	8.03	880	7,066
Analyst	5.17	80	414
Interviewers	3.50	1600	5,600
Coders	5.00	80	400
Total S & W			21,008
Fringe 30% of S & W			6,302
TOTAL DIRECT LABOR			27,310
EXPENSES			
Computer			1,467
Printing			1,000
Telephone			8,400
Keypunch/Verification			1,250
Total Expense			12,117
TOTAL DIRECT COSTS			39,427
*INDIRECT (70% of S & W)			14,706
TOTAL COSTS			54,133

* Negotiated percentage only applicable for a grant or contract application. Not used in operational budgets.

NOTES

+ The steps in preparing a budget are presented in Exhibit 9.

Exhibit 9. Costing: Developing A Budget

(1) ASSESS LEVEL OF EFFORT FOR EACH TASK
- TYPE OF RESOURCES
- MAGNITUDE

(2) ASSESS COSTS OF ALTERNATIVES

(3) BASIS FOR COSTING
- PROFESSIONAL JUDGMENT
- PRIOR STUDIES
- AVAILABLE RESOURCES
- PRE-TEST
- PURE GUESSTIMATES

E. Summary of Work Plan

+ Tasking

Gantt or Pert Chart

+ Labor Allocation

Labor Allocation Chart

+ Budget

NOTES

III. BENEFITS OF PLANNED ANALYSIS

+ From the perspective of the city manager, mayor, or taxpayer, analysis plans help to ensure that a useful product will result from the agency funds expended. Such plans also may permit participation in the setting of analysis priorities by citizens and other important actors within the jurisdiction who may have to use the results or support the work.

V.A. (Mgt.-5):

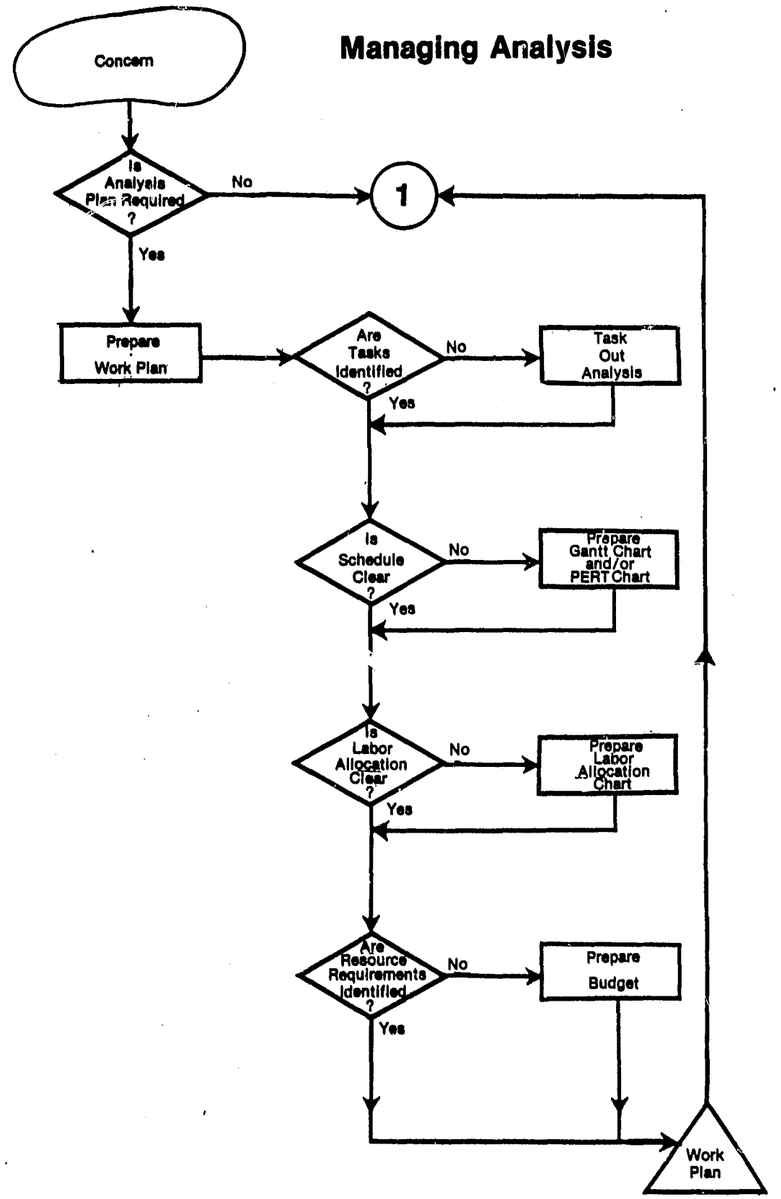
BENEFITS OF PLANNED ANALYSES

- PROVIDE DIRECTION AND FOCUS TO WORK EFFORT
- BETTER UTILIZATION OF RESOURCES
- IMPROVE PRODUCT QUALITY
- CLARIFIES RESPONSIBILITIES
- CAN BE USED AS A SELLING TOOL

NOTES

IV. CONCLUSION

V.A. (Mgt.-6):



MODULE 1
PROBLEM SPECIFICATION

Module 1 covers a central and, perhaps, the most difficult aspect of the course: problem specification. Criminal justice analyses have suffered from inadequate and incomplete problem statements as reflected in reviews of state and local plans, research reports and other criminal justice publications. It is important that the participants have a full understanding of the process and use of problem specification. Their ability to successfully complete the Major Exercise, hinges, in part, on their having a clear specification of their assigned problem.

Perhaps the most difficult part in developing an understanding of a problem is the creative work of conceptualizing and hypothesizing. No amount of lecturing on such topics can substitute for participation. Therefore, the material has been structured to provide careful definition, illustrations and then an opportunity to practice these skills in Tasks #1 and #2 of the Major Exercise.

OBJECTIVES

1. To identify the importance and uses of problem specification.

2. To enable participants to perform a problem specification.

I. HOW ARE PROBLEM STATEMENTS DEVELOPED?

A. Two general approaches:

+ Inductive - frequently problem statements are "data-driven." Specific components of information provide compelling evidence that a problem exists. In these cases the analyst moves from the specific to the general using what is called inductive reasoning.

+ Deductive - In those cases where the existing data-base is insufficient to the needs of the analyst or in those instances where the analysis is driven by community issues, questions and concerns, the analyst moves from the general to the specific, using deductive reasoning, to describe the problem and reach conclusions.

- This course teaches a deductive approach to problem analysis. Many different procedures have been reviewed and the best elements of several procedures have been selected and intergrated into this course.

B. Problem Specification:

+ Definition: In this course Problem Specification is defined as the identification of concerns; elaboration of concepts, variables, and measures; and postulating of hypotheses.

II. HOW ARE CONCEPTS, VARIABLES and MEASURES ELABORATED?

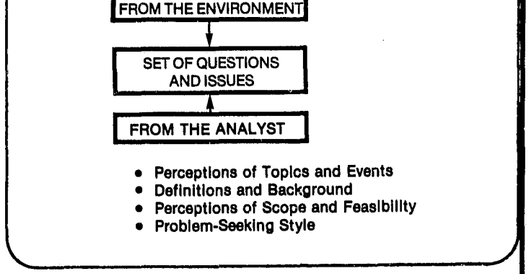
A. Identification of Related Concerns:

+ Definition: In this course a concern is defined as the vague and/or frequently unspecified hunches and/or attitudes about aspects of crime and the criminal justice system.

+ Typically concerns are not well articulated and are usually reactions to symptoms -- not causes.

+ Identification of concerns requires both a "reactive" and "problem seeking" style on the part of the analyst.

V.A. (1-1):



NOTES

+ There are interactions and inter-dependencies among concerns.

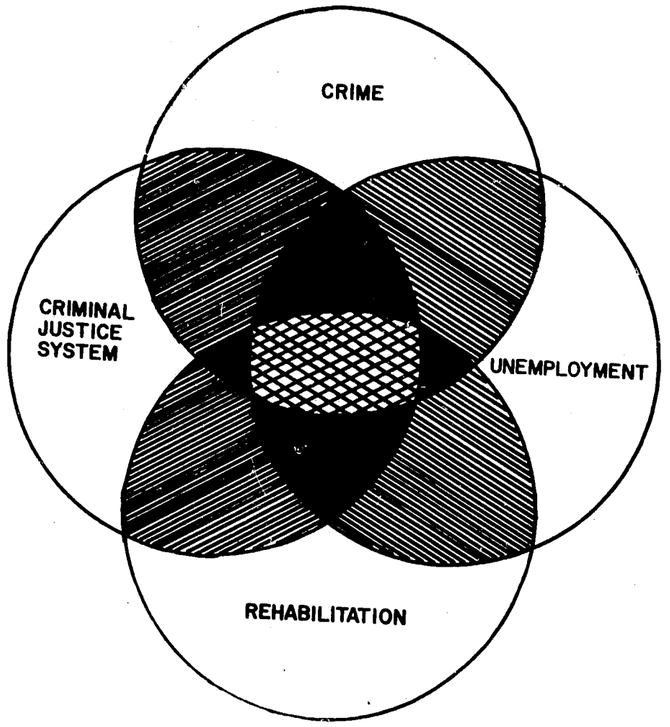
  - Many stated concerns may involve interactions and relations among concerns.

  - Problem specification tends to focus the analyst's attention on a single concern, yet the interrelationship among concerns may be central to complete problem analysis.

  - Thus, before focusing on the problem specification and proceeding, the analyst should consider related concerns, which may not have been expressed, and include those determined relevant.

Exhibit 1

INTERACTION & INTERRELATIONS AMONG CONCERNS



B. Elaboration of Concepts

+ Definition: In this course a concept is defined as a distinguishable component found or expressed within a concern. For example, offender attitudes, economic status, system operations and recidivism help further the understanding of what is meant by rehabilitation.

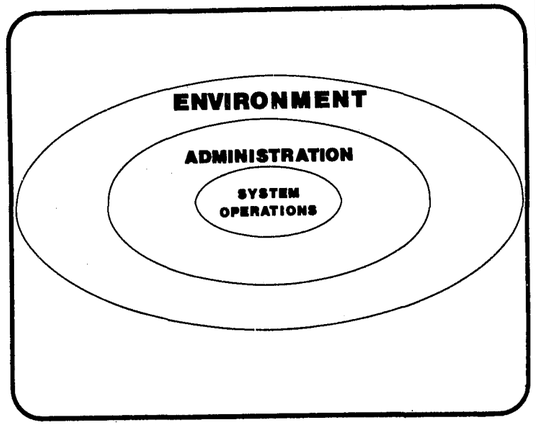
+ Concepts vary in terms of their abstractness; e.g., seriousness of crime is more abstract than the incidence of crime.

+ For analytic purposes, it is generally useful to sort out areas of concern so that the questions and concepts inherent in each area may be determined and specified.

  - Environment: The criminal justice system exists and operates within a context of many external factors composing its environment.

  - Administration: There are administratively determined factors related to the structure and function of the criminal justice system which serve as a buffer between the environment and the operations of the system.

V.A. (1-2):



  - System Operations: System Operations encompasses the activities performed by the units of the criminal justice system. These activities occur within the context of and interact with the Environment and Administration.

C. Elaboration of Variables

+ Definition: A variable is defined as a characteristic trait, attribute, or event having more than one possible value.

+ Elaborating concepts into variables forces the analyst to clarify exactly what is meant by the concept being studied.

+ Because a concept may usually be expressed through many variables, the choice of the most appropriate variables will be a difficult but important choice.

NOTES

D. Elaboration of Measures

+ Definition: In this course a measure is defined as an observable qualitative or quantitative indicator used as a standard for description or comparison.

+ Some variables are easy to measure, such as the number of residential burglaries reported to the police. Others are quite complex and difficult to measure such as citizen perception about street safety after dark.

+ Measures used to describe the occurance of crime range vary from simple frequency counts to complex index numbers, such as, population-at-risk measures for specific crimes.

+ Similarly, in system operations, measures can be simple frequency counts of workload or more complex measures of system performance, such as efficiency, effectiveness or productivity.

E. Examples of the Elaboration of Concepts, Variables and Measures.

Typical Statements of Concerns about
Crime and the Criminal Justice System

PURPOSE

The purpose of this Walk-Through is to illustrate how to elaborate concepts, variables and measures from statements about concerns. Such concerns are typically presented in brief narratives with incomplete information. Following are three such narratives which are to be analyzed by identifying either explicit or implicit concerns, concepts, variables and measures.

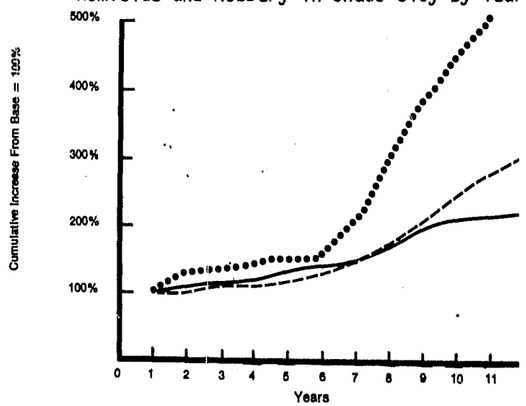
DATA SET/WORKSHEET

A. Example 1 Example of a Concern Statement

Crime Trends in Chaos City

Historically, aggravated assault and homicide rates in this area have been relatively low, and these crimes have not been considered serious problems. By contrast, the rate of robbery has always been quite high; most observers have consistently identified robbery as the jurisdiction's most serious crime problem. Analysis of recent trend data, however, indicates that the city's assault rate has shown dramatic increases over the last several years. These increases substantially out-distance the proportional increase in robberies and indicate that unless preventive action is taken assaults may become a significant problem. This trend is exacerbated by recent signs that the homicide rate is now increasing as a result of the increase in assaults. Fortunately, the assault increase has, according to police statistics, come primarily in assaults which involve knives and blunt instruments. Since these are less often fatal than firearm assaults, the homicide rate has not risen as rapidly as the assault rate. Should firearm assaults resume their traditional proportional role, however, the city is likely to suffer a very substantial increase in homicides.

Example 1. Table 1. Proportional Increases in Assault, Homicide and Robbery in Chaos City by Year



Aggrevated Assault ●●●●
Homicide -----
Robbery ——

Year One = 100%
Source: Chaos City Police Department, Annual Report, 1977

WALK-THROUGH 'A'

1

WORKSHEET
WALK-THROUGH A, EXAMPLE 1
PROBLEM SPECIFICATION: ELABORATING CONCEPTS, VARIABLES & MEASURES

CONCERN: Crime Trends in Chaos City

CONCEPTS	VARIABLES	MEASURES
Magnitude	Frequency of Occurrence by Crime Type	Cumulative increase by crime type per year
		# Crimes by type
	*(Risk of Crime by Crime Type)	*(# of crimes by type per population at risk)
	*(Reporting Rate by Crime Type)	*(% of persons in victimization survey reporting each type crime)
Seriousness	Perceptions of Seriousness	*(Rank ordering of perception of seriousness)
	*(Harm to Community by Crime Type)	*(Average seriousness score on S-W Scale for harm from each type of crime)

*Statements in parentheses are implied elaborations.

WALK-THROUGH 'A'

WORKSHEET
WALK-THROUGH A, EXAMPLE 1 (CONTINUED)
PROBLEM SPECIFICATION: ELABORATING CONCEPTS, VARIABLES & MEASURES

CONCERN: Crime Trends in Chaos City (Continued)

CONCEPTS	VARIABLES	MEASURES
*(Rate)	*(Rate of Change by Crime Type)	*(Rank ordering of perception of rate of change by crime type)
	*(Rate of Change of Seriousness by Crime Type)	*(% difference over years of average S-W Index for each type crime)
*(System Operation) - Preventive Action	*(Patrol Deployment)	*(% of available manpower allocated per area by time period)

*Statements in parentheses are implied elaborations.

WALK-THROUGH 'A'

B. Example 2

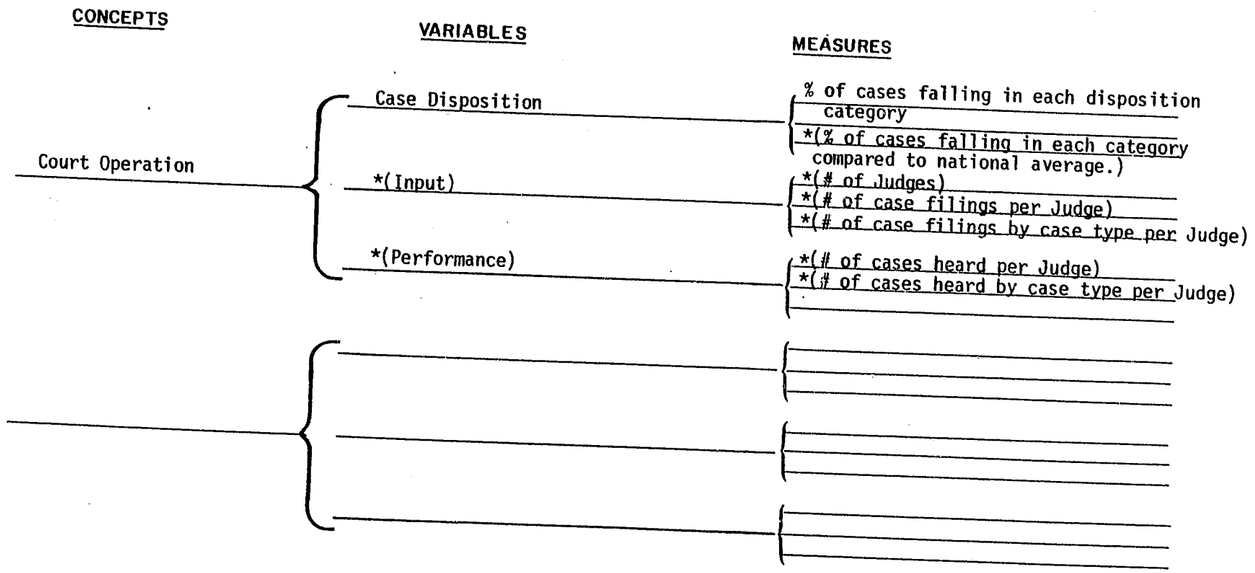
District Court Processing of Felony Cases

A six-month sample of homicide, rape, robbery and aggravated assault offenses during 1974 was analyzed to determine how serious felony cases were disposed of at the District Court level. A total of 342 such offenses were included in the sample. Twelve percent of the cases were still pending, and 10% were deferred prosecution or judgment cases. About half of the remaining cases (43%) of the total were plea bargained to a lesser felony or misdemeanor plea. In addition to this plea bargaining, one-fifth of all cases (one-fourth when pending and deferred cases are excluded) were dismissed. The proportion of those convicted on the original charge varies from case to case. None of the 27 homicides, 4% of the assaults, and 5% of the burglaries resulted in a conviction on the original charge. On the other hand, 28% of the rape cases and 15% of robberies had a conviction for the original most serious charge. The analysis leading to the problem statement indicates a significant degree of unevenness in the way these four types of cases were handled at the district court level. This suggests a lack of quality control over cases tried in district court.

WALK-THROUGH 'A'

WORKSHEET
WALK-THROUGH A, EXAMPLE 2
PROBLEM SPECIFICATION: ELABORATING CONCEPTS, VARIABLES & MEASURES

CONCERN: District Court Processing of Felony Cases in Chaos City



*Statements in parentheses are implied elaborations.

WALK-THROUGH 'A'

C. Example 3

Rape in Chaos City

Social agencies have always given too little attention--and too little understanding--to the victims of rape. The results have been both that many, perhaps most, rapes are never reported to law enforcement agencies and that victims, scared by the callousness of the system, are unwilling to testify in court, thereby minimizing the possibilities of conviction for the offender. Chaos City recently witnessed a series of grotesque and highly publicized rapes. Although the overall rate of reported rapes does not seem high for the city, these specific incidents have galvanized citizen interest and have led to the formation of a citizen law enforcement task force; already this group has raised sufficient funds within the community to give it some stability and to allow it to formulate a series of pilot proposals. Thus, the city presents an excellent environment for testing innovative concepts about improving the treatment of rape victims and increasing the conviction rate in the prosecution of rape offenders.

WORKSHEET
WALK-THROUGH A, EXAMPLE 3
PROBLEM SPECIFICATION: ELABORATING CONCEPTS, VARIABLES & MEASURES

CONCERN: Rape in Chaos City

CONCEPTS	VARIABLES	MEASURES
Magnitude	Reporting of Rape	# of rapes reported # of rapes not reported (via victimization studies)
		*(% of rapes in population at risk.)
System Operation	Conviction Rate	*(% of case filings resulting in conviction)

*Statements in parentheses are implied elaborations.

WALK-THROUGH 'A'

NOTES

III. HOW ARE HYPOTHESES CONSTRUCTED?

A. Postulating Hypotheses

1. Definition: A hypothesis is a statement asserting a relationship between either concepts, variables, or measures.

2. Formulating hypotheses is an art and not a science.

3. It may be helpful to think of hypotheses as statements which describe the relationship between two factors (which may be concepts, variables or measures). A list of phrases which are frequently used include:

   is related to
   is unrelated to

   is greater than
   is less than

   is increased by
   is decreased by

   is equal to
   is unequal to

4. Hypotheses are important because they help to establish boundaries of a problem and may suggest potential problem-solving strategies.

5. Some hypotheses are descriptive in nature, and principally deal with assertions of relationship.

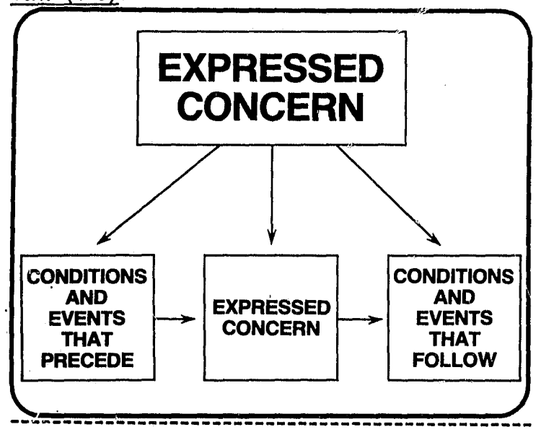
   Descriptive hypotheses are most typical of the kind usually dealt with a criminal justice. They usually involve considerations of logical or temporal sequence, but do not involve issues of "cause" and "effect".

When a descriptive hypothesis, a relationship is asserted between "dependent" and "independent: factors, these factors are determined as follows:

- Independent: That factor which logically or temporally precedes the dependent factor and which is being used to explain or understand something about the dependent factor.

- Dependent: That factor which logically or temporally follows the independent factor which is under study.

V.A. (1-3):



---

6. Other hypotheses imply a "cause" and "effect" relationship. In this course they will be called causal hypotheses.

   Causal hypotheses are inherently complex and it is very difficult to establish an accurate causal relationship in criminal justice because many factors usually factors which effect each concern, condition, or event.

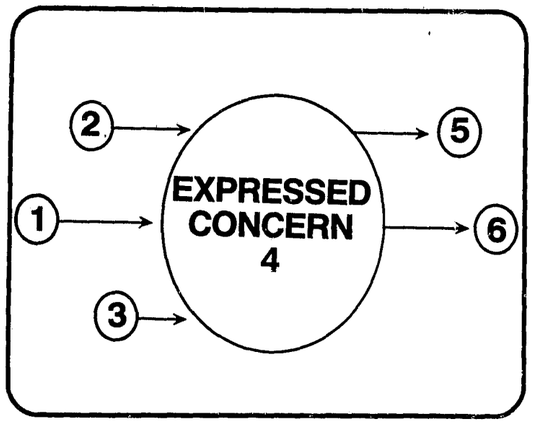
In a causal hypotheses, a cause and effect relationship is asserted between dependent and independent factors:

- Dependent: A characteristic or event which is hypothesized to change as a result of another occurance or change in another characteristic, trait or event.

- Independent: A characteristic, trait or event which is presumed to affect or influence changes in another characteristic, trait or event.

The selection of causal hypotheses may be guided by organizing events and conditions into three catagories: "presumed causes", "primary effects" and "secondary effects".

V.A. (1-4):



NOTES

These categories are defined as follows:

- Presumed Causes: Those conditions and events that are thought to come before and lead to the expressed concern and related events and effects.
- Primary Effects: Those events and conditions that directly result from the presumed causes.
- Secondary Effects: Those events and conditions that directly result from the primary effects and indirectly result from the presumed causes.

Be careful! Avoid spurious relationships: relationships that are illogical or apparent relationships between two factors where the apparent relationship is the result of a third factor.

7. The investigation of cause and effect relationships is critical to the analysis process. The statistical tools presented in this course, by themselves, are insufficient.

   The investigation of causality rarely involves a simple test of a single hypothesis. The analyst must draw on experience, intuition, theory and logic as well as on analytic tools, such as the statistics taught in this course.

Hypotheses in a Written Problem Statement

PURPOSE

The purpose of this Walk-Through is to reinforce the elaboration of concepts, variables, and measures and to provide experience in the postulation of hypotheses. The data set for the exercise also provides a concrete example of a Written Problem Statement. The Walk-Through Worksheets also serve as an illustration of two of the products required by the Major Exercise to elaborate concepts, variables, and measures (Worksheet A) and to postulate hypotheses (Worksheet B).

Using the Problem Statement and the completed elaboration worksheets, the instructor will provide an example of the postulation of hypotheses for one of the findings (paragraph 3.1) using a completed Part B Worksheet. Then in class discussion the instructor will lead the class through the postulation of hypotheses for two additional findings.

DATA SET

PROBLEM STATEMENT: VEHICLE THEFT IN CHAOS CITY, 1977

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WALK-THROUGH 'B'

Problem Statement: Vehicle Theft in Chaos City, 1977.

1.0 Introduction

1.1 Statement of Concerns

Recently, vehicle theft has become the focus of complaints by leading downtown businessmen. The downtown area has been staging a difficult economic comeback the last few years and the businessmen feel that vehicle thefts have increased to a point that shoppers will curtail downtown trade.

1.2 Nature and Source of Concerns

The origin of the businessmen's complaint does not appear to be founded on survey or other data forms that would identify shopper's preference for shopping location. The major thrust of the businessmen's concern seems to be based on their perceptions and possibly reinforced by complaints from customers.

1.3 Scope of Concerns

The problem perceived by the businessmen has been communicated to both the business community and the public. Quite possibly their complaint coupled with news publicity could actually affect shopping location preference. Thus, their fear in itself could become a detrement to downtown trade.

At the request of the Mayor, an analysis of motor vehicle theft has been conducted and is reported in this document.

2.0 Analysis Methodology

2.1 Definition of the Terms Used

According to State of Paradise Statute 609.55 (1971), vehicle theft involves the unauthorized use of a motor vehicle without the consent of the owner or an authorized agent of the owner. This analysis focuses upon thefts and unauthorized use of all motor vehicles. Where apporpriate, distinctions are made between theft of automobiles, trucks, motorcycles and other motorized vehicles. Since the bulk of the vehicle theft is associated with private automobiles, the greater portion of this problem statement is concerned with analysis of automobile thefts.

WALK-THROUGH 'B'

2.2 Measurement Reliability and Validity

Previous victimization surveys have shown that over ninety percent of stolen autos are reported to the police. A primary motivation for this is the need to collect insurance on these stolen vehicles. Thus the figures should be fairly reliable as well as valid. The reporting rates may, however, vary by section of the city as persons without insurance have less incentive to report stolen autos.

The measure of risk, number of cars stolen divided by 1,000 registered vehicles, suffers from the lack of an accurate count of registrations by section of the city. The problem is particularly acute downtown as the number of cars parked downtown greatly exceeds the number registered in that area. In these instances the analysis relies upon measures of frequency to corraborate the risk measure.

2.3 Data Collection Procedures

Data was collected from Chaos City police offense reports for the period under study--July 1, 1974 through June 30, 1975. A random sample of 20 percent, or 1 in 5, offense reports was selected for analysis. These sampled offense reports are the basis of this analysis. Where appropriate, numbers listed in the text, figures, and tables have been multiplied by five to correct for the sampling procedure. References to Chaos police offense report data refer to the sample data.

2.4 Statistical Methods

There are at least three methods by which a crime can be measured: 1) frequency, 2) rate per 100,000 persons, and 3) rate per 1,000 opportunities. The third measure--rate per 1,000 opportunities--gives a more complete understanding of the degree to which any given crime represents a problem in a given geographic area.

The mathematical tools employed in this analysis were: ranking, comparative tables, and chi square.

For Chaos City, the victimization rate for registered automobiles was about 30.9 per 1,000 (1 in 32) for the study period.

WALK-THROUGH 'B'

3.0 Findings

3.1 Magnitude of Motor Vehicle Theft is Similar in Comparable Cities

According to the general impression of the police department, the problem of motor vehicle theft in Chaos City is no larger than that experienced in other cities of similar size across the country. The number recorded by the Department during the study period was 5,085. This figure was found to be about 500 less than the average number motor vehicle thefts for similar size cities.

The 5,085 motor vehicle thefts were distributed as follows:

Automobiles	4,450
Trucks	255
Motorcycles	335
Other motorized vehicles	45

For automobiles the victimization rate (calculated on basis of registered autos) was about 30.9 per 1,000 or roughly 1 in 32. Victimization surveys indicate that approximately 93 percent of all vehicle thefts are reported to police. Correcting for non-reported thefts revises the total of motor vehicle thefts to about 5,470.[1]

3.2 Chaos City System Response is Different than National and State Level System Response

Based on national clearance rates and the clearance rates of other property crimes in Chaos City such as burglary, we anticipated that the clearance rate for vehicle theft would be the same as other vehicle theft and the same as the national clearance rate. Clearance rate is defined here as those cases which are cleared by arrest.

Chaos City police offense reports indicate that the overall clearance rate for all motor vehicle thefts was about 7 percent. For automobiles, clearance rates were 10 percent, trucks-11 percent and motorcycles-5 percent. These clearance rates are lower than the 20 percent clearance rate usually reported for both Paradise and the United States.[2] It is clear that most vehicle thieves in Chaos City have a lower than average likelihood of being caught after the commission of their offense. This low likelihood opens up the possibility of focusing on the prevention of vehicle theft. There is no information on rate of conviction or sentencing patterns.

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[1] Criminal Victimizations in 13 American Cities, U.S. Department of Justice, LEAA (June 1975), p.124.

[2] Paradise Crime Information, 1973, Bureau of Crime Analysis (BCA) (June 1, 1974), p.49 and Crime in the U.S., Uniform Crime Reports, U.S. Department of Justice (Washington, D.C.: 1975), p.35.

WALK-THROUGH 'B'

WALK-THROUGH 'B'

3.3 Auto Theft in Chaos City is a less Serious Crime Problem

Auto theft was expected to be a less serious problem for Chaos City than other property crimes. Two measures of seriousness were available for this analysis. In addition, although clearance rates for Chaos City are relatively low, the net dollar loss from auto theft may be lower than for other metropolitan areas.

Chaos City Police Department estimates for 1975 indicated that the total value of stolen motor vehicles was $5,828,890. However, the total value of recovered motor vehicles was $4,653,803, indicating a net dollar loss of $1,175,087 for 1975.[3] The difference between the dollar figures for auto theft reflects the fact that most automobiles (90.8 percent) taken from Chaos City are recovered--only 8.5 percent of all thefts are not recovered. The balance of reported thefts (70 percent) are classified as unfounded. For example, the car was not stolen, merely misplaced. Thus, the net dollar loss of $1,175,087 for motor vehicles is less serious than the value of $3,045,624 for unrecovered resident burgulary property. Further, recovery figures for Chaos City are substantially higher than figures for nationwide recovery. National figures indicate that from 70 to 80 percent of all cars are recovered.[4]

Every vehicle theft incurs costs other than those associated with the value of the vehicle. Private vehicles are the nation's primary means of transportation. Loss of an individual's means of transportation, if only for a few days, can impose a burden on the victim of auto theft. Other costs include the cost of prosecution of offenders, increased insurance premiums as a result of vehicle thefts and the intangible cost of increased concern about crime.

There is also no information available as to the cost to the criminal justice system to investigate and prosecute cases of vehicle theft. Likewise, statistics were unavailable to compare the seriousness of auto theft downtown with other crimes occuring downtown.

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[3]Unpublished data collected for Uniform Crime Reports, Chaos City Police Department.

[4]"Preliminary Study of the Effectiveness of Auto Anti-Theft Devices," NILECJ, LEAA (October 1975), p.3.

WALK-THROUGH 'B'

3.4 Auto Theft Varies by Area and Location

The hypotheses which guided this analysis are:

The magnitude of auto theft varies by geographic area of the city.

The magnitude of auto theft varies by type of parking environment.

As hypothesized, the data show that not all areas of Chaos City have the same rate of auto theft. Table 1 displays the different rates of victimization across the city's ten planning communities. Table 1 also demonstrates that the measure of crime used for analysis gives various perspectives on the crime problem in given communities.

In Table 1, the highest victimization rates, independent of the type of measurement employed, are found in the Central and Powderhorn communities, which supports the hypothesis.

Table 1. Auto Theft Rates by Community, Chaos City, 1977.

COMMUNITY	Rate per 1,000 Registered Passenger Vehicles*	Rank	Rate Per 1,000 Persons	Rank	Rate	Rank
Central	173.9 (1 in 5)	1	43.5	1	1,135	2
Powderhorn	45.6 (1 in 21)	2	16.1	2	1,295	1
University	40.7 (1 in 24)	3	12.5	3	355	5.5
Near North	37.6 (1 in 26)	4	11.0	4	540	3
Citywide	30.9 (1 in 32)	-	11.7	-	4,970	-
Northeast	26.9 (1 in 37)	5	10.1	5.5	455	4
Longfellow	24.9 (1 in 40)	6	9.7	7	325	7
Calhoun-Isles	23.6 (1 in 42)	7	10.1	5.5	355	5.5
Camden	16.5 (1 in 60)	8	6.4	8	220	7
Nokomis	7.3 (1 in 136)	9	2.9	9	145	9
Southwest	5.9 (1 in 169)	10	2.6	10	145	9

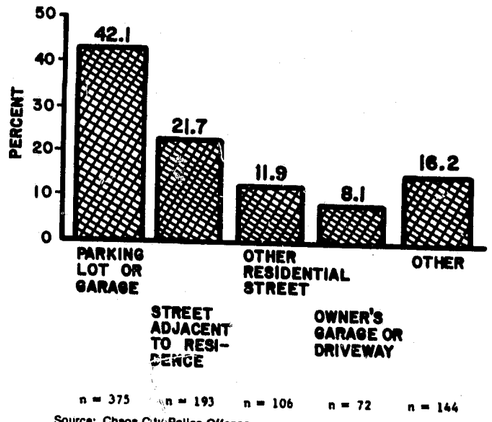
*Each registered passenger vehicle is counted as an opportunity. Each community has a sufficiently large number of vehicles to make meaningful comparisons: Calhoun-Isles, 14,995; Camden, 13,338; Central, 6,525; Longfellow, 13,080; Near North, 14,334; Nokomis, 19,907; Northeast, 16,853; Powderhorn, 28,411; Southwest, 24,464; and University, 8,715. Estimates are derived from the Bureau of the Census (1970) figures reporting number of families in tracts owning 1, 2, and 3 or more vehicles. Weighting on the 3 or more category was done by multiplying by 3.1 in order to approximate the total number of vehicles in each tract. Census data are used because they are the only available geographically-based data. Total citywide auto count = 160,622.

The number of auto thefts in each community was based on a 20% city-wide sample. The sample frequencies in the communities had to be multiplied by 5 to estimate the number stolen.

WALK-THROUGH 'B'

As shown in Figure 1, 42 percent of all automobiles are taken from parking lots or garages while only one-third are taken from near the owner's residence or nearby residential streets. Less than 1 in 10 automobiles are taken from the owner's garage or driveway.

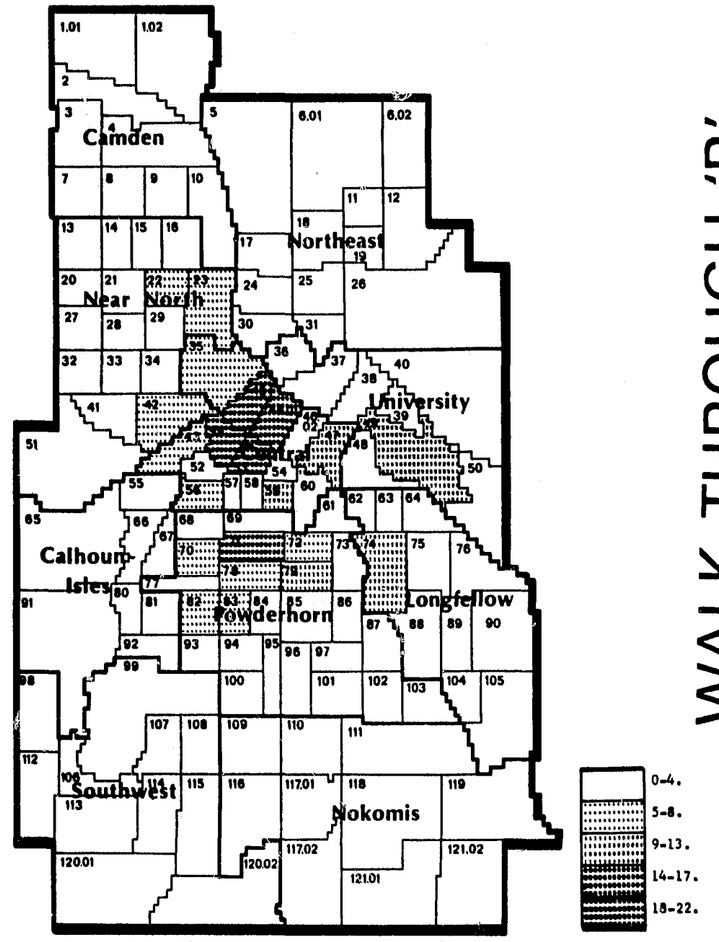
Figure 1. Percentage of Auto Theft by Type of Premise (passenger cars only)



Source: Chaos City Police Offense Report Data, (N=890), 1977.

A detailed analysis of parking garages and lots suggests that the Central, Powderhorn and University communities are most subject to auto theft at these types of sites.

Figure 2.
Frequency of Auto Theft from Parking Garages and Lots by Census Tract



Source: Chaos City Police
Offense Report Data 1977

3.5 Auto Thefts are Deterred by Reducing Opportunities to Steal

Recent advertising campaigns have suggested that many autos are stolen because of carelessness on the part of the owner. More specifically, these ads suggest that many vehicles are stolen because keys are left in the ignition and that further, locking one's vehicle is sufficient deterrence for auto theft.

Initial data do not support the hypothesis. Data indicate that auto theft is deterred by reducing the opportunity to steal. Most victims report that the keys were not left in the vehicle. As shown in Figure 3, apparently only about 1 in 10 stolen vehicles had the keys left in the car. Only 1 in 20 victims reported the keys as having been left in the ignition. Data also indicate that 57 percent of all victims reported that the car was locked when stolen. These figures, of course, may conceal deliberate misreporting by the victims. The misreporting may be caused by fear of insurance repercussions or by feelings of incompetence.

Clearly, the simple precaution of removing the keys and locking the auto, though increasing the difficulty of theft, is not by itself adequate to deter theft. However other data dealing with opportunity support the hypothesis.

Effective January 1, 1970, the U.S. Department of Transportation instituted Motor Vehicle Safety Standard 114 in an attempt to "reduce the incidence of accidents resulting from unauthorized auto use."[5] This standard established two basic requirements for all cars assembled after January 1, 1970:

1) a key locking system which prevented normal engine activation and either steering or self-mobility in the absence of the proper key;

and

2) a warning sound when the key was left in the locking system or when the driver's door was open.

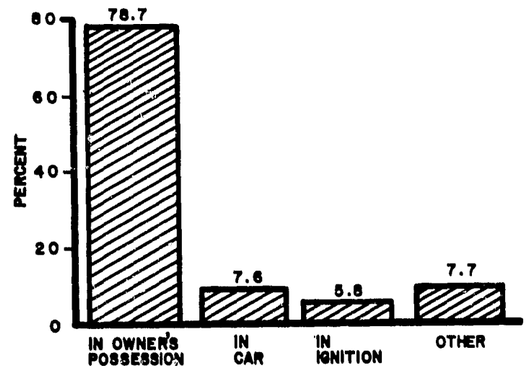
5"Preliminary Study of the Effectiveness of Auto Anti-Theft Devices," NILECJ, (Washington, D.C.: October 1975), p, 1.

WALK-THROUGH 'B'

As a result of this standard, all cars manufactured after January 1, 1970, had a steering lock which could only be unlocked with the proper key and a buzzer system that made an audible alarm whenever the key was left in the ignition.

For the basis of analysis there are three time periods for comparing the relative effectiveness of ignition interlock systems. The first period, pre-1968, is that period when no vehicles were equipped according to Standard 114. The second period, 1969 through 1971, is that period when some but not all vehicles were equipped according to Standard 114. The third period, post-1971, is that period when all vehicles were equipped according to Standard 114. Table 2 compares theft rates for various makes of cars for the first and last periods. It also compares thefts of vehicles manufactured before any ignition interlock systems were installed with that period when all vehicles were equipped with ignition interlock systems. As can be seen in Table 2, 55 percent of all vehicles on the road in 1975 (excluding vehicles manufactured during the second period, 1969-1971) were manufactured before implementation of Standard 114 while 45 percent of all vehicles were manufactured after implementation (excluding the second period). However, 88 percent of all stolen vehicles were manufactured before implementation of Standard 114. The figures in Table 2 and 3 present compelling evidence that car thieves preferred to steal cars which were not equipped with anti-auto theft devices. Thus, these data support the general hypothesis.

Figure 3. Percentage of Auto Theft
by Location of Keys (passenger cars only)



Source: Chaos City Police
Offense Report Data.
(N=844), 1977.

WALK-THROUGH 'B'

CONTINUED

6 OF 14

Table 2. Percentage of Auto Theft as an Indicator of Ignition Interlock Effectiveness

	Number of Cars	Number of Stolen Cars
Period One[1]	157,519[3] (55%)[4]	649 (88%)
Period Two[2]	118,188 (45%)	86 (12%)

[1]Period One: Cars manufactured prior to implementation of Standard 114.

[2]Period Two: Cars manufactured after implementation of Standard 114.

[3]Figures supplied by Department of Motor Vehicles for Chaos City. These figures included a count for some suburbs resulting in figures larger than those listed in U.S. Census data. The relative proportions are assumed to be correct.

[4]Percentages are computed by excluding cars manufactured during the period 1969 through 1971. About 171,000 vehicles were excluded from this table because they were manufactured during this period.

Table 3. Comparison of Expected and Observed Auto Thefts, Two Time Periods

	Expected Number Auto Thefts*	Observed Number Auto Thefts
Period 1	404	649
Period 2	330	86

*Expected number of auto thefts is equal to total number of auto thefts (735) multiplied by the proportion of vehicles manufactured in the period that were on the road (.55 and .45 for the two periods in question)

$\chi^2 = 327.47$, 1 d.f., significant at $p = .001$

Source: Chaos City Police Department and Department of Motor Vehicle Registration, 1977.

3.6 Characteristics of Motor Vehicle Theft may Vary by Type of Vehicle

The characteristics of truck and motorcycle theft were anticipated to be similar to that of autos. Generally the data supports this anticipation. However, there are some differences. Trucks tend to be taken from parking lots and garages more frequently (59 percent) than are automobiles (43 percent). Additionally, there are relatively few that are stolen near residences. This is to be expected since many trucks are owned by companies and are parked in company lots.

Motorcycles, however, show a different pattern. Only about one-third (30 percent) of all motorcycle thefts are from garages or lots. More than one-third are taken from premises at or near the victim's residence. The balance are taken from other sites. Unlike the high recovery rates for trucks and autos, only about one-third (35 percent) of all motorcycles are recovered.

3.7 Most Suspects of Auto Theft are Amateur Thieves

Because of the high recovery rate of stolen autos, it was hypothesized that most suspects of vehicle theft are amateur thieves.

Ninety percent of all automobiles were recovered while only about 35 percent of all motorcycles were recovered. The recovery rate of vehicles in Chaos City tends to be substantially higher than the national average. Generally, theft of vehicles does not result in resale of the vehicle or stripping for parts suggesting that most thefts are not thefts for personal gain. Nonetheless, the police clear only 10 percent of their crimes through arrest.

3.8 Those Suspected of and those Arrested for Auto Theft are Generally Young

Suspect information for auto thefts derived from offense reports is very sparse. There was some suspect information in only 58 (12 percent) of the studied cases. This data indicated that most suspects (62 percent) were juveniles.

Chaos Police Department arrest information indicates that from 88 to 97 percent of all auto theft arrests are of juveniles.[1] Between 95 and 98 percent of all arrests are of persons less than 21 years old. However, most of those arrested (76 percent) had a prior record. Unfortunately, additional reliable information is lacking from police offense reports.

[1]Chaos City Police Department, 1977.

WALK-THROUGH 'B'

4.0 Discussion

4.1 Findings Relative to Expressed Concerns

These findings do indicate that aside from the presumed recent rash of auto thefts from downtown, theft of vehicles is a problem in the downtown area relative to other areas of the city. As might be expected the problem downtown is one of theft from garages and lots. The concentration of thefts from downtown does indicate that local merchants may have reason for concern. However, it could not be determined if the problem in downtown Chaos City is significantly different than might be expected in other cities of similar size.

Theft of vehicles, although potentially one of the most expensive property crimes in Chaos City, appears to be relatively inexpensive. The total net property loss from vehicle theft for the one-year study period was about $1,175,000. The recovery rate of autos and the risk of auto theft suggest that in a broad perspective the problem is not a serious one.

4.2 Limitations

There are no data to indicate whether there has been a recent increase of vehicle thefts from the downtown area or whether the publicity has created the appearance of an upsurge in vehicle theft. Data on a weekly or monthly basis would detect this trend but these data are unavailable.

Vehicle data, also, was unavailable on downtown areas in other cities of similar size. Thus, the magnitude of the downtown problem can only be assessed in relation to non-business areas in Chaos City. It is very possible that cities of similar size experience a similar geographic distribution of vehicle theft.

Limited suspect data does not permit a determination whether recent auto thefts are part of a professional auto theft ring or merely the random attack on the downtown area by the usual amateur. Answers to these questions require more data and analysis.

Public perception of auto theft in downtown Chaos City has not been assessed. Therefore, it is largely unknown if the businessman's fear is reflective of shopper's concerns about crime.

WALK-THROUGH 'B'

5.0 Summary

5.1 Highlights

From July 1, 1976, through June 30, 1977, there were about 5,085 thefts of motorized vehicles recorded by the Chaos City Police Department. The bulk of the theft problem involves automobiles. Thefts of 4,450 automobiles, 255 trucks, 335 motorcycles and 45 other motorized vehicles were reported. Victimization surveys indicated that approximately 93 percent of all vehicle thefts are reported to police. Also, the risk of being a victim of vehicle theft differs by area of the city. The central community clearly has the greatest vehicles theft problem with a 1 in 5 risk (based on number of registered vehicles).

Large numbers of auto thefts are of cars parked at garages or lots (40 percent of all thefts). Most of these thefts from garages and lots occur in a very few localized parts of the Central, University and Powderhorn communities.

Locking cars and removing the keys may tend to reduce the risk of auto theft. However, large numbers of autos are taken which apparently had no keys in them and which were locked. Improved types of auto theft deterrent locks, manufactured according to Standard 114, appear to be a deterrent to vehicle theft. While vehicles equipped with these locking systems are taken, they are stolen at a much lower rate.

The recovery rate for auto theft is higher than the national average, however, the clearance rate is lower.

Thefts of trucks and motorcycles are similar to auto thefts in some aspects but differ in regard to type of premise on which theft occurs. Motorcycles also are recovered at a much lower rate than are autos and trucks.

The profile of the suspect is largely undetermined by specific data. However, amateur involvement is highly likely because of apparent nonconcern about theft for monetary gain and because of the high recovery rate.

WALK-THROUGH 'B'

5.2 Conclusions

Motor vehicle theft does not appear to be a major problem in dollar loss because of a high recovery rate but in consideration of sheer volume of thefts with accompanying costs of inconvenience and police investigation there is clearly a significant problem. As might be expected the problem does not occur evenly in all areas of the city. The downtown and two other areas disproportionately share the burden of vehicle theft. The general sites of theft suggests that crime reduction planning could focus on parking garages and lots. The low clearance rate of these thefts and high recovery rates plus possible involvement of juveniles suggests that preventive measures in addition to investigation and apprehension may offer significant return on the crime reduction effort.

This analysis did not specifically identify what factors caused the perceptions of the downtown businessmen. Therefore, conclusions cannot be drawn about the nature of change needed to improve their perceptions of downtown motor vehicle theft and its impact on trade.

Source: Adapted from Douglas W. Frisbie, et. al. Crime in Minneapolis: Proposals for Prevention, May 1977. Minnesota Crime Prevention Center, 2344 Nicolett Avenue, Minneapolis, Minnesota 55404, pp. 191-202.

WALK-THROUGH 'B'

1

WORKSHEET
WALK-THROUGH B, PART A
PROBLEM SPECIFICATION: ELABORATING CONCEPTS, VARIABLES & MEASURES

CONCEPTS	VARIABLES	MEASURES
3.1 Magnitude	Frequency	# vehicles stolen Aver. # of vehicles stolen for similar sized cities.
	Victimization Rate	# vehicles stolen as reported in victimization survey. # vehicles stolen divided by number registered autos.
3.2 System Response	Clearance Rate	% of cases with arrested suspect. % of cases cleared nationally. % of cases cleared in State of Paradise.
	Conviction Rate	None provided in Problem Statement.
	Sentencing Pattern	None provided.

WALK-THROUGH 'B'

WORKSHEET
WALK-THROUGH B, PART A (CONTINUED)
PROBLEM SPECIFICATION: ELABORATING CONCEPTS, VARIABLES & MEASURES

CONCEPTS	VARIABLES	MEASURES
3.3 Seriousness	Net Dollar Loss	Dollar value of vehicles not recovered. Dollar value of burglary property not recovered.
	Recovery Rate	% of autos recovered.
	Costs of Victim Due to Theft	Cost of loss of transportation. Amount of increased insurance premiums.
	Cost to Criminal Justice System	Cost of prosecuting offender.
	Other Intangible Costs	None provided.

WALK-THROUGH 'B'

WORKSHEET
WALK-THROUGH, B, PART A (CONTINUED)
PROBLEM SPECIFICATION: ELABORATING CONCEPTS, VARIABLES & MEASURES

CONCEPTS	VARIABLES	MEASURES
3.4 Spatial or Geographical	Geographic Area of City	# autos stolen by planning community.
	Type of Parking Environment	Classification of parking areas into park garages, lots, street, home garages. # autos stolen by parking area classification.
3.5 Opportunity for Auto Theft	Locked Autos	% of stolen vehicles with doors unlocked. % of stolen vehicles with keys left in ignition.
	Improved Security of Automobile	# cars manufactured before and after application of Standard 114.

WALK-THROUGH 'B'

WORKSHEET
WALK-THROUGH B, PART A (CONTINUED)
PROBLEM SPECIFICATION: ELABORATING CONCEPTS, VARIABLES & MEASURES

CONCEPTS	VARIABLES	MEASURES
3.6 Target Characteristics	Type of Motor Vehicle Stolen	% of automobiles stolen. % of trucks stolen. % of motorcycles stolen.
	Location from which Types of Motor Vehicles are stolen.	% of type of vehicle stolen from parking lots and garages.

WALK-THROUGH 'B'

WORKSHEET
WALK-THROUGH B, PART A (CONTINUED)
PROBLEM SPECIFICATION: ELABORATING CONCEPTS, VARIABLES & MEASURES

CONCEPTS	VARIABLES	MEASURES
3.7 Suspect Characterization	Recovery of Stolen Vehicles	% of stolen cars recovered. % of stolen motorcycles recovered.
	Arrest	% of auto thefts, cleared by arrest.
3.8 Offender Characterization	Arrests	# of prior arrests per offender.
	Geographical Area	None provided.

WALK-THROUGH 'B'

WORKSHEET
WALK-THROUGH B, PART B
CONSTRUCTING HYPOTHESES

RELATING CONCEPTS	RELATING VARIABLES	RELATING MEASURES
3.1 The magnitude of motor vehicle theft in Chaos City is similar to the magnitude of the motor vehicle theft in similar size cities.	a. The frequency of motor vehicle theft in Chaos City is the same as the national average for similar size cities.	1) Number of vehicles stolen in Chaos City is the same as national average number of vehicles stolen for cities of 375,000 - 400,000 population, as reported in Uniform Crime Reports (UCR).

WORKSHEET
WALK-THROUGH B, PART B
CONSTRUCTING HYPOTHESES
(Continued)

RELATING CONCEPTS	RELATING VARIABLES	RELATING MEASURES

WORKSHEET
WALK-THROUGH B, PART B
CONSTRUCTING HYPOTHESES
(Continued)

RELATING CONCEPTS	RELATING VARIABLES	RELATING MEASURES

WALK-THROUGH 'B'

WORKSHEET
WALK-THROUGH B, PART B
CONSTRUCTING HYPOTHESES
(Continued)

RELATING CONCEPTS	RELATING VARIABLES	RELATING MEASURES

WALK-THROUGH 'B'

WORKSHEET
WALK-THROUGH B, PART B
CONSTRUCTING HYPOTHESES
(Continued)

RELATING CONCEPTS	RELATING VARIABLES	RELATING MEASURES

WALK-THROUGH 'B'

WORKSHEET
WALK-THROUGH B, PART B
CONSTRUCTING HYPOTHESES

(Continued)

RELATING CONCEPTS	RELATING VARIABLES	RELATING MEASURES

WORKSHEET
WALK-THROUGH B, PART B
CONSTRUCTING HYPOTHESES
(Continued)

RELATING CONCEPTS	RELATING VARIABLES	RELATING MEASURES

WALK-THROUGH 'B'

NOTES

IV. RELATIONSHIP OF PROBLEM SPECIFICATION TO THE PROBLEM STATEMENT

A. The difference between a concern and a problem.

B. Importance of a Problem Statement:

+ The complexity of most criminal justice problems requires a fairly rigorous and iterative analysis in order to describe, draw conclusions about and understand the primary causes.

C. In this course the term Problem Statement has a very specific meaning. In effect, one of the primary purposes of the course is to provide instruction and limited practice in the development and production of the problem statement.

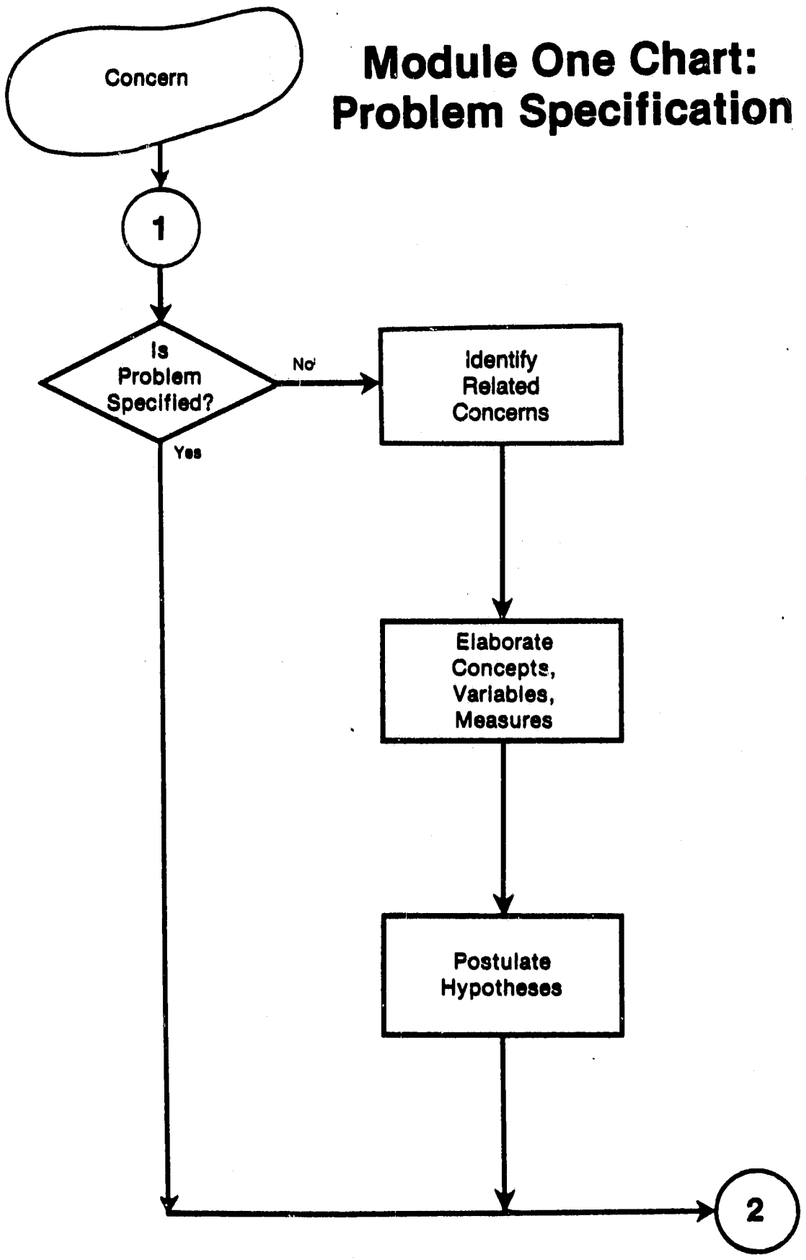
D. Definition of a Problem Statement: A written document or oral presentation which comprehensively describes the nature, magnitude, seriousness, rate of change, persons affected, spatial and temporal aspects of a problem using qualitative and quantitative information. It identifies the nature, extent, and effect of system response; makes projections based on historical inferences, and rigorously attempts to establish the origins of the problem.

V. CONCLUSION

A. The quality of a Problem Statement may be threatened by inadequate problem specification.

V.A. (1-5):

Module One Chart: Problem Specification



MODULE 2
DATA SYNTHESIS

Module 2 establishes a foundation for measuring and obtaining data for specified variables. The module is divided into four distinct sections: (1) measurement, (2) assessing hypotheses, (3) sources of data, and (4) planning a data collection effort.

OBJECTIVES

1. To describe Types and Extent of Measurement Error.
2. To assess Hypotheses.
3. To systematically plan a Data Collection Effort.
4. To distinguish between Secondary and Primary Data.
5. To identify and describe Seven Methods of Data Collection.
6. To understand the Six Types of Secondary Data Used in Criminal Justice Analysis.

I. MEASUREMENT

A. Definition:

Measurement is the process of assigning observable qualitative or quantitative indicators to objects or events according to rules.

+ The assignment rules must specify exactly how to measure, when to, what to, who to, etc. It is the quality of the rules that makes the difference between "good" and "poor" measurement.

B. Measurement Accuracy

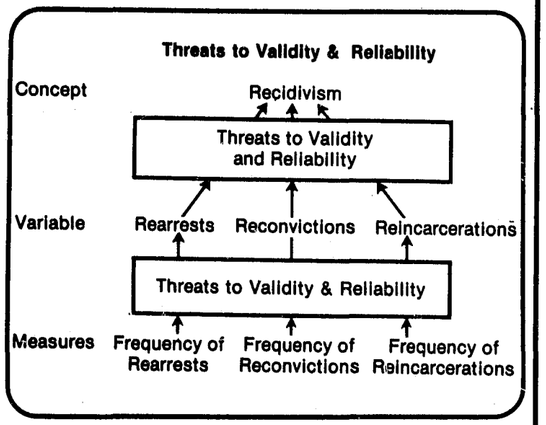
+ The criteria used to determine the accuracy of a measure are its validity and reliability.

+ Definition: "Validity is the degree to which measures are true or accurate indicators of the variables they are thought to indicate."

+ Definition: "Reliability is the degree to which measures are dependable or consistent indicators of a variable from one time to another or from one sample to another."

C. Factors Influencing Measurement Accuracy

V.A. (2-1):



+ Conceptual Factors that Influence the Validity and Reliability of Interpretations

- Between Concepts and Variables

  Failure to Adequately Represent Concept with Selected Variable(s)

- Between Variables and Measures

  Failure to Adequately Represent Variables with Selected Measure(s)

NOTES

+ Technical Factors that Influence Validity and Reliability

  - Method of Collection

    Measurement Error in Self-Reported Crime Data

    Measurement Error in Arrest Records

  - Type of Measure Sought (Fact or Perception)

  - Source of Data

  - Use of Sample or Census

+ Management Factors that Influence Conceptual and Technical Threats to Validity and Reliability:

  Time

  Money

  Organizational Considerations

  Political Considerations

NOTES

II. ASSESSING HYPOTHESES

As indicated previously, the refinement of concerns into concepts, variables, and measures usually produces many, rather than just one, hypotheses. Since many hypotheses may be constructed from a single concern, the analyst must identify the most appropriate hypotheses for subsequent analysis.

A. Criteria for Assessing an Individual Hypothesis

V.A. (2-2):

CRITERIA FOR ASSESSING A HYPOTHESIS

- Measurement Accuracy
- Data Availability
- Testability
- Utility

+ Measurement Accuracy

  - Possibly the most important criterion of a good hypothesis is whether the analyst can measure the variables stated in the hypothesis.

  - Even if variables can be measured, the hypothesis may be of questionable merit if the measures are unreliable or invalid.

NOTES

+ Data Availability

  - Can all appropriate data be made available? Is there sufficient time, money, manpower, and technical capability to obtain appropriate data?

  - Are there ethical, legal, or political constraints on data availability?

+ Testability

  - Given the available data, is it possible to describe, compare, and make generalizations about the concerns?

  - Is it possible, given the available data, to establish cause and effect relationships?

  - Stating hypotheses in their simplest form and avoiding, when possible, complex multi-factor evaluations will assist in making a hypothesis testable.

+ Utility

  - Can the decision-makers affect the independent variables which have been identified?

  - Are the hypotheses plausible and easily communicated?

NOTES

B. Criteria for Assessing a Set of Hypothesis

+ Once the proposed hypotheses have been assessed using the criteria of measurement accuracy, data availability, testability and utility then the comprehensiveness of the remaining set of hypotheses should be considered.

+ Hypotheses used to develop a comprehensive problem statement should include, as appropriate, consideration of the following seven characteristics:

  Magnitude: Size, extent and/or importance of a problem.

  Rate of Change: Comparison of a problem in an earlier period of time to a later period.

  Temporal Aspects: Cyclical nature or seasonality of the problem.

  Seriousness: Amount of harm a problem inflicts on a community or person.

  Persons Affected: Considerations of the Victim, Offender, and/or Public related to the problem.

  Spatial Aspects: The geography of the problem.

  System Response: Activities, programs, policies related to the problem.

C. Example of Assessing Hypotheses

NOTES

III. DATA SOURCES

A. Alternative Data Sources

+ Primary Data:

Definition: Primary data are those data which must be collected for a particular analysis effort. These data generally are not currently available in easily useable form but can be obtained by conducting surveys and polls or from records and reports.

+ Secondary Data:

Definition: Data which have already been collected in conjunction with other analyses and are currently in easily useable form. Secondary data are usually presented in aggregated form and can be obtained from:

National Crime Panel

Uniform Crime Reports

Census Reports/Tapes

Offender Tracking Reports

Expenditure Reports

NOTES

+ Secondary Data Sources

V.A. (2-3):

TYPES OF SECONDARY DATA

1. "Actual" Crime Data
2. Reported Crime Data
3. Public Opinion Data
4. Demographic Data
5. Systems Data
6. Juvenile Data

- "Actual" Crime Data

  These data are indicators of the types and magnitude of crime.

- Public Opinion Data

  These data are the perceptual or subjective indicators of crime or criminal justice services.

- Reported Crime Data

  These data are official "crime statistics" on reported offenses and arrests.

NOTES

- Demographic Data

  These are population statistics which refer to size, density and distribution of vital events, such as births and deaths.

- System Data

  These data are statistics which relate to the organization and operation of the criminal justice system.

- Juvenile Data

  These are data on various forms of juvenile behavior including criminal acts, quasi-criminal acts, and non-criminal behaviors.

+ Factors Influencing the Selection of Primary and Secondary Data

  Are there critical missing measures for the postulated hypotheses that require primary data?

  Is measurement error in secondary data sources of sufficient magnitude and concern to warrant primary data for which measurement error can be controlled?

  What time and resource constraints exist?

NOTES

B. Methods of Data Collection

+ Six Methods of Data Collection

- Field Research

  Direct observation of an agency, process, or procedure.

- Experiments

  Taking action by changing a process, activity or organization and observing the consequences of the change.

- Survey Research

  Collecting responses to questions asked during a sample or census of individuals or groups.

  Three frequently used types of surveys:

  Personal Interview.

  Telephone Interview.

  Mailed Questionnaire.

  Exhibit 1 summarizes comparative advantages/disadvantages for these three types of surveys.

- Content Analysis

  Systematic Study of Books, Articles and Documents.

- Historical Research

  Reconstruction of prior events to explain specific consequences.

- Simulation Modeling

  Simulation modeling is based on knowledge of the criminal justice system and/or criminal behavior, the construction of a computerized or non-computerized version of the processes. This model can then be observed and altered to simulate reality.

Module 2
Exhibit 1. A Comparison of Three Survey Methods

CRITERIA	PERSONAL INTERVIEW	MAILED QUESTIONNAIRE	TELEPHONE INTERVIEW
Inexpensive	no	yes	yes
Random sampling generally feasible	no	no	with RDD*
Entire spectrum of the population potentially contactable	yes	no	no
Sampling of special populations	yes	with list	sometimes
Easy to cover large geographic area	no	yes	yes
Control over who is actual respondent	yes	no	yes
High response rate	sometimes	no	yes
Easy call-backs and follow-ups	no	no	yes
Long interviews generally possible	yes	sometimes	sometimes
Explanations and probings possible	yes	no	yes
Visual materials may be presented	yes	yes	no
Nonthreatening to respondent	no	yes	yes
Interviewer can present credentials	yes	yes	no
Safe for interviewers	no	N.A.	yes
Easy supervision of interviewers	no	N.A.	yes

Source: Tachfarber, Alfred J.; Klecka, William R.; Random Digit Dialing: Lowering the Cost of Victimization Surveys; Police Foundation 1976.

* Random Digit Dialing

NOTES

IV. PLANNING FOR DATA COLLECTION

A. The development of a data collection plan should address these issues:

- questions to be answered
- measures
- data sources
- collection methods
- assessment
- other collection requirements
- resource requirements

DATA COLLECTION PLAN
(OPTIONAL)

PURPOSE

This walk-through is intended to involve participants in considering the process of preparing a data collection plan.

The Chaos Crime Planning Board has decided that in 1978 and 1979 to concentrate attention on one of the four most common offenses (Burglary, Theft, Assault and Robbery) reported to the police in Chaos City according to the FBI's Uniform Crime Reports.

A study conducted by the State's Crime Analysis Bureau reveals the rates per 100,000 population for these four offenses for 1976 and 1977 in Chaos. The study also presents comparisons with Tranquility, another city of comparable size in the state.

What can you say about the Chaos City crime problem based on this data?

Using the provided worksheet discuss the development of a data collection plan.

DATA SET

Table 1. State of Paradise, Four Crimes Reported to Police Most Frequently in Chaos and Tranquility, 1976 and 1977. (Per 100,000 population)

Crime Type	1976		1977	
	Chaos	Tranquility	Chaos	Tranquility
Burglary	1908	1201	2263	1363
Theft	872	1014	896	1052
Robbery	912	898	991	1054
Assault	761	521	807	533

Source: State of Paradise, Crime Analysis Bureau, 1978.

DATA SET

Table 2. Management Checklist for Data Collection

1. Determine Measures to be Used for Each Variable
2. Identify Major Categories of Needed Data
   a. Is appropriate data available?
   b. Is additional data required?
3. Identify and Assess Data Sources
   a. Will these data permit adequate interpretation of the hypotheses?
   b. Are the data reliable?
   c. Can they be obtained in time?
   d. How many data are required to clarify a problem?
   e. What is the most inexpensive data source?
4. Select Best Data Source
5. Identify Data Collection Methods
6. Determine Strengths/Weaknesses of Alternative Data Collection Methods
7. Select Best Data Collection Method
8. Consider Additional Requirements (If Applicable)
   a. Identify Authorization Requirements
   b. Identify Coding Requirements Process
   c. Develop Sampling Requirements
   d. Develop Instrument Requirements
   e. Develop Data Conversion Requirements
9. Determine Resource Needs

WALK-THROUGH 'C'

Table 3. Worksheet

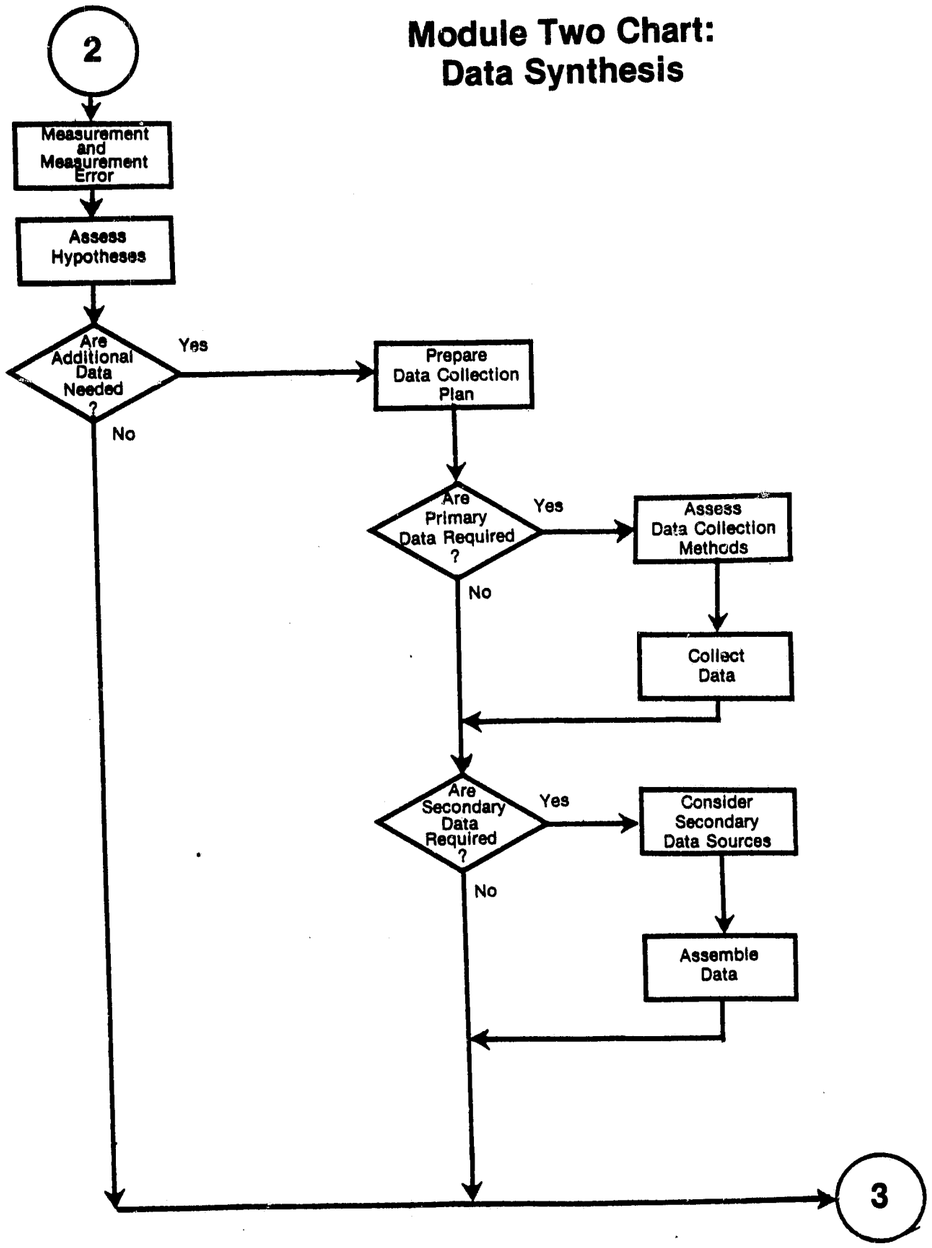
Questions to be answered	Measures	Data Sources	Collection Method	Measurement Accuracy	Other Collection Requirements	Resource Requirements
1. What is the magnitude of the crime problem?	• rates of crime by type	• Data Set	N.A.			N.A.
2. What is the direction and magnitude of the rate of change in the crime problem?	• rates of crime by type and year	• Data Set	N.A.			N.A.
3. How serious is the crime problem?	• weighted frequency of crime by type and year	• Offense Reports	Secondary Data Analysis	• Measurement error • Disaggregation		Little
4. In what areas of Chaos City is the incidence of crime the highest?	• frequency and rates of crime type and area of the city	• Arrest Reports • Census Maps	Secondary Data Analysis	• Measurement error • Disaggregation		Little
5. What is the Chaos City Police Departments/Courts capability for dealing with this problem?	• resource data • manpower allocation data • laws and regulations	• Agency Records • City Council Records • PROMIS	Secondary Data Analysis Simulation/Model	• Measurement error	• Secure Clearances and Authorization for Agency Heads • Estimating parameter • Initial values	Little Moderate
6. Who in Chaos City has been most seriously victimized and affected by the crime problem?	• victimization data	• victim survey • self reports	Survey Survey		• instrument • surveying • coding/editing data	Expensive
7. What are the possible causes of the crime problem?	• social, economic and demographic data • deterrence data • incident/victim/offender data	• Census Records • Victim Survey • Agency Records	Secondary Data, Analysis, Survey Secondary Data Analysis	• Measurement error		Little Expensive

WALK-THROUGH 'C'

MODULE 2: DATA SYNTHESIS	NOTES
V. CONCLUSION	

V.A. (2-4):

Module Two Chart: Data Synthesis



MODULE 3
DESCRIPTIVE METHODS

Modules 3, 4, and 5 concentrate on tools -- descriptive, comparative, and inferential statistics -- needed for the interpretation of data. The emphasis is on developing statistical skills, on learning how the results of various calculations are used to interpret data, and on knowing when to use each tool.

The exercises and walk-throughs are designed to give practical opportunities for the participants to apply the knowledge and skills developed in this module.

OBJECTIVES

1. To understand the different levels of measurement and apply them to select appropriate quantitative methods.

2. To select, calculate and interpret:

   a. Mean
   b. Median
   c. Mode
   d. Frequency and Percent Tables
   e. Standard Deviation
   f. Percent Change

3. To select, construct and interpret:

   a. Pie Charts
   b. Bar Graphs
   c. Histograms
   d. Frequency Polygons
   e. Time Charts

NOTES

I. MEASUREMENT LEVELS

A. Determining Levels of Measurement

+ The way we measure affects what we can do with our data once it has been collected. How much we know about the values observed determines the level. This is called the level of measurement.

+ When all we know about the values observed is that they belong to different categories, e.g., religions. the level of measurement is called nominal. The nominal level of measurement allows us to say that two observations are the same or different, once measured.

+ Ordinal level measurement is possible when we add information about the ordering or sequencing of the categories.

+ If one additional piece of information is added about the size of the difference between each category, we have what is called interval level data.

+ The highest level of measurement, ratio scale, has all the properties of the interval scale plus it has a true and absolute or fixed zero point.

+ It is important to note that observed data, by itself, has no level of preordained measurement.

+ Nominal data is typically referred to as qualitative or categorical. Ordinal, interval, and ratio are typically called quantitative.

+ Review this material using Exhibit 1.

Module 3
Exhibit 1. Measurement Scales

TYPE	LEVEL	DESCRIPTION	EXAMPLES	STATISTICS FREQUENTLY USED
Qualitative	Nominal	Data are placed in mutually exclusive and exhaustive categories.	Sex Race Type of Crime Type of Weapon	Tables of frequencies and rates Mode Pie Charts Bar Graphs Cross tabulation tables Chi square
Quantitative	Ordinal	Data are placed in mutually exclusive and exhaustive categories, ordered along a continuum according to a hierarchy.	Socio-economic status Ranks in law enforcement agency	
	Interval	Data are distributed along a continuum with established distances between points with no reference to an absolute zero.	Time Temperature Intelligence Quotient	Mean Median Range Standard Deviation Statistical Maps Histograms Time Charts Rates Pearson's r Regression Scattergrams
	Ratio	Data are distributed along a continuum with established distances between points with an absolute zero.	Age Years of Education	

B. Utility of Measurement Levels

+ Specifying the level of measurement dictates how we can interpret and compare observations on our data.

+ Different statistical techniques are appropriate for data at different levels of measurement. We can say more about data about which we know more in the first place. Because of this, the most powerful statistical techniques are appropriate only for the higher levels of measurement, interval and ratio data.

II. STATISTICAL METHODS

A. Measures of Central Tendency

+ Mean

- The mean is the sum of all observed values, divided by the number of cases.

V.A. (3-1):

MEAN

SUM UP VALUES AND DIVIDE BY THE NUMBER OF VALUES.

$$\bar{X} = \frac{\Sigma X}{N}$$

$\bar{X}$ = MEAN

Σ = "SUMMATION" OR "SUM UP"

X = INDIVIDUAL VALUE

N = NUMBER OF VALUES

V.A. (3-2):

MEAN

EXAMPLE: MURDER RATES (PER 100,000 POPULATION) FOR FIVE WESTERN CITIES FOR 1971.

CITY	MURDER RATE (X)
SEATTLE	4
BOISE	5
SACRAMENTO	6
DENVER	8
SAN FRANCISCO	8
N = 5	$\Sigma X = 31$

$$\bar{X} = \frac{\Sigma X}{N} = \frac{31}{5} = 6.2 \text{ MURDERS}$$

- The mean is appropriate only for interval or ratio level data because it makes use of information about the distance between each observation.
- The mean is greatly affected by extreme values. If one additional case is added to distribution, for example 29, the mean will be:

$$\frac{\Sigma X}{N} = \frac{60}{6} = 10$$

- The mean is useful as a standard for comparison.

+ Median
  - The median is the "middle" value of a distribution; i.e., there are an equal number of cases greater than and less than the median.

V.A. (3-3):

MEDIAN

WHEN CONTINUOUS DATA HAVE BEEN ORDERED OR RANKED (e.g., FROM LOW TO HIGH), THE MEDIAN IS THE MIDDLE VALUE.

CITY	MURDER RATES *
Seattle	4
Boise	5
Sacramento	6 ←MEDIAN
Denver	8
San Francisco	8

MDN = 6

Source: Sourcebook, 1976
*per 100,000

V.A. (3-4):

MEDIAN

WHEN THERE ARE AN EVEN NUMBER OF VALUES IN THE RANKED LIST, THE MEDIAN IS THE ARITHMETIC MEAN OF THE TWO MIDDLE VALUES.

CITY	MURDER RATES*
Seattle	4
Boise	5
Sacramento	6
Denver	8

$$MDN = \frac{5+6}{2} = \frac{11}{2} = 5.5$$

Source: Sourcebook, 1976
*per 100,000

- Because, the median is the "middle" value of a distribution, it is typically used as a preferred measure of central tendency where there are extreme values in a distribution, for example, as in income.
- The median is time consuming to calculate because it requires the distribution to be rank-ordered.

+ Mode
  - The mode is simply the most frequently occurring value in a distribution.

V.A. (3-5):

MODE

THE VALUE THAT OCCURS MOST FREQUENTLY.
THE MODE MAY BE USED WITH BOTH QUALITATIVE AND CONTINUOUS DATA.
MORE THAN ONE MODE MAY OCCUR IN A DISTRIBUTION.

CITY	MURDER RATES	
Seattle	4	
Boise	5	
Sacramento	6	
Denver	8	
San Francisco	8	MODE = 8

Source: Sourcebook, 1976
*per 100,000

- Unlike the mean and the median, the mode is always a real observed value. It is totally unaffected by extreme values.
- The mode is the best measure of central tendency for nominal data.

MEAN, MEDIAN, MODE

PURPOSE

To show participants how to calculate measures of central tendency and to illustrate the effects of extreme scores on measures of central tendency.

The data set on murder rate (in three variations) are to be rank ordered and means, medians, and modes are to be calculated for each variation. This Walk-Through should last no longer than 20 minutes.

DATA SET

City	Murder Rate (x)*
Boise	5
Denver	8
Las Vegas	18
Sacramento	6
San Francisco	8
Seattle	4

*Indicates per 100,000 inhabitants
Source: Sourcebook, 1976.

WORKSHEET

A. Rank-order the data.

City	Murder Rate (x)
Seattle	4
Boise	5
Sacramento	6
Denver	8
San Francisco	8
Las Vegas	18

B. Calculate the mean, median and mode.

1. Mean

$$\bar{X} = \frac{\Sigma X}{N} = 8.2$$

2. Median

Median = 7

3. Mode = 8

C. Leaving out Las Vegas, Rank-order the data.

City	Murder Rate (x)
Seattle	4
Boise	5
Sacramento	6
Denver	8
San Francisco	8

D. Calculate the mean, median and mode.

Mean

$$\bar{X} = \frac{\Sigma X}{N} = 6.2$$

Median = 6

Mode = 8

MEAN, MEDIAN, MODE

PURPOSE

To show participants how to calculate measures of central tendency and to illustrate the effects of extreme scores on measures of central tendency.

The data set on murder rate (in three variations) are to be rank ordered and means, medians, and modes are to be calculated for each variation. This Walk-Through should last no longer than 20 minutes.

DATA SET

City	Murder Rate (x)*
Boise	5
Denver	8
Las Vegas	18
Sacramento	6
San Francisco	8
Seattle	4

*Indicates per 100,000 inhabitants
Source: Sourcebook, 1976.

WORKSHEET

A. Rank-order the data.

City	Murder Rate (x)
Seattle	4
Boise	5
Sacramento	6
Denver	8
San Francisco	8
Las Vegas	18

B. Calculate the mean, median and mode.

1. Mean

$$\bar{X} = \frac{\Sigma X}{N} = 8.2$$

2. Median

Median = 7

3. Mode = 8

C. Leaving out Las Vegas, Rank-order the data.

City	Murder Rate (x)
Seattle	4
Boise	5
Sacramento	6
Denver	8
San Francisco	8

D. Calculate the mean, median and mode.

Mean

$$\bar{X} = \frac{\Sigma X}{N} = 6.2$$

Median = 6

Mode = 8

WALK-THROUGH 'D'

WORKSHEET Continued

E. Still leaving out Las Vegas, add the city of Baltimore (murder rate/100,000 inhabitants = 4)

F. Rank-order the data set.

City	Murder Rate (x)
Baltimore	4
Seattle	4
Boise	5
Sacramento	6
Denver	8
San Francisco	8

G. Calculate the mean, median and mode.

Mean

$\bar{X} = \frac{\Sigma X}{N} = 5.8$

Median = 5.5

Mode = 4, 8

WALK-THROUGH 'D'

B. Measures of variation

+ Frequency tables

V.A. (3-6):

TABLES OF FREQUENCIES AND PERCENTS

USED WITH DISCRETE OR QUALITATIVE DATA.
ALSO USED WITH CONTINUOUS DATA THAT HAVE BEEN GROUPED INTO CATEGORIES.

f = FREQUENCY OF CASES IN A CATEGORY

$\% = \frac{\text{NUMBER OF CASES IN A GIVEN CATEGORY}}{\text{TOTAL NUMBER OF CASES}} \times 100$

V.A. (3-7):

TABLES OF FREQUENCIES AND PERCENTS

EXAMPLE:

TYPES OF ROBBERIES IN CHAOS CITY FOR 1974

TYPE	f	%
ROBBERY AND ATTEMPTED ROBBERY W/INJURY	5	33.3
ROBBERY AND ATTEMPTED ROBBERY W/OUT INJURY	10	66.6

% FIRST CATEGORY $= \frac{5}{15} \times 100 = 33.3\%$

Source: Hypothetical Data

+ Range

V.A. (3-8):

RANGE

THE DIFFERENCE BETWEEN THE HIGHEST AND LOWEST VALUES IN A DISTRIBUTION OF CONTINUOUS VALUES.

RANGE = MAXIMUM VALUE – MINIMUM VALUE

EXAMPLE:

CITY	MURDER RATE
Seattle	4
Boise	5
Sacramento	6
Denver	8
San Francisco	8

RANGE = 8 – 4 = 4

Source: Sourcebook, 1976
*per 100,000

+ Standard Deviation
  - Standard deviation is useful in describing interval or ratio data.
  - Formula for Standard Deviation.

V.A. (3-9):

STANDARD DEVIATION

A COMMONLY USED MEASURE OF DISPERSION OR VARIABILITY IN A DISTRIBUTION OF CONTINUOUS DATA

$$SD = \sqrt{\frac{\Sigma (X - \bar{X})^2}{N}}$$

V.A. (3-10):

STANDARD DEVIATION

MURDER RATES FOR FIVE WESTERN CITIES

MURDER RATE*		
X	$X - \bar{X}$	$(X - \bar{X})^2$
4	− 2.2	4.84
5	− 1.2	1.44
6	− .2	.04
8	1.8	3.24
8	1.8	3.24
$\Sigma X = 31$		$\Sigma(X - \bar{X})^2 = 12.80$

$$\bar{X} = \frac{31}{5} = 6.2 \qquad SD = \sqrt{\frac{\Sigma(X - \bar{X})^2}{N}}$$

$$SD = \sqrt{\frac{12.80}{5}} = 1.6$$

Source: Sourcebook, 1976 *per 100,000

PURPOSE

To show participants how to calculate and interpret a standard deviation.

The data set on murder rate (in two variations) is to be rank-ordered and standard deviations calculated for each variation.

DATA SET

City	*Murder Rate (x)
Boise	5
Denver	8
Las Vegas	18
Sacramento	6
San Francisco	8
Seattle	4

*Indicates per 100,000 inhabitants.
Source: Sourcebook, 1976.

WALK-THROUGH 'E'

WORKSHEET

A. Rank-order the data.

City	Murder Rate (x)
Seattle	4
Boise	5
Sacramento	6
Denver	8
San Francisco	8
Las Vegas	18

B. Find the range: Range = 14

C. Develop worksheet and calculate required values.

X	$\overline{X}$	$X-\overline{X}$	$(X-\overline{X})^2$
4	8.17	-4.17	17.39
5	8.17	-3.17	10.05
6	8.17	-2.17	4.71
8	8.17	- .17	.03
8	8.17	- .17	.03
18	8.17	9.83	96.63

$\Sigma X = 49$ $\Sigma (X-\overline{X})^2 = 128.84$

$\overline{X} = \frac{\Sigma X}{N} = 8.17$

D. Substitute in formula: $SD = \sqrt{\frac{\Sigma(X-\overline{X})^2}{N}}$

$SD = \sqrt{\frac{128.84}{6}} = 4.63$

WORKSHEET (continued)

E. Leaving out Las Vegas, develop a new worksheet and calculate required values.

X	$\overline{X}$	$X-\overline{X}$	$(X-\overline{X})^2$
4	6.2	-2.2	4.84
5	6.2	-1.2	1.44
6	6.2	- .2	.04
8	6.2	1.8	3.24
$\frac{8}{31}$	6.2	1.8	$\frac{3.24}{12.80}$

F. Find the range: Range = 4

G. Find the Mean: $\overline{X} = 6.2$

H. Find the standard deviation:

$SD = \sqrt{\frac{\Sigma(X-\overline{X})^2}{N}} = \sqrt{\frac{12.8}{5}} = 1.6$

WALK-THROUGH 'E'

III. GRAPHICAL METHODS

Graphics can potentially convey enormous amounts of information in a very compact form with a clarity and force in a way which lists of data or tabular presentations cannot. Three basic types of graphical presentations for frequency distributions and percentaged data are presented:

a. Pie Charts
b. Bar Graphs
c. Frequency Polygons or Line Graphs

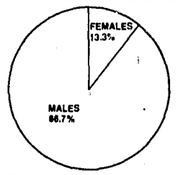
A. Pie Charts

V.A. (3-11):

PIE CHART

SEX	f	PROP	%	DEGREES
MALE	13	$\frac{13}{15} = 0.867$	86.7	(0.867)(360°) = 312°
FEMALE	2	$\frac{2}{15} = 0.133$	13.3	(0.133)(360°) = 48°

SEX OF ROBBERY OFFENDERS



N=15

Source: Hypothetical Data

B. Bar Graphs

V.A. (3-12):

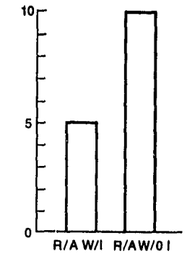
BAR GRAPHS

Used to portray qualitative data. A vertical or horizontal bar is used to represent the number of observations in a given category.

EXAMPLE:

TYPES OF ROBBERIES

TYPE	f
ROBBERY AND ATTEMPTED ROBBERY W/INJURY	5
ROBBERY AND ATTEMPTED ROBBERY W/OUT INJURY	10



Source: Hypothetical Data

C. Histograms

V.A. (3-13):

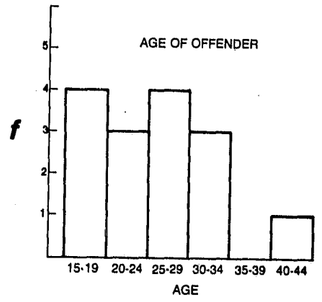
HISTOGRAM

A graphic representation of a grouped distribution

EXAMPLE:

AGE OF OFFENDER

AGE	f
15-19	4
20-24	3
25-29	4
30-34	3
35-39	0
40-44	1



Source: Hypothetical Data

NOTES

D. Frequency Polygons

V.A. (3-14):

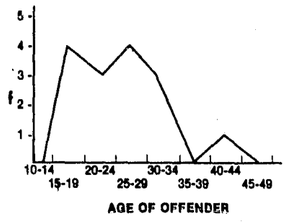
FREQUENCY POLYGON

A graphic representation of a grouped distribution using midpoints of categories with lines connecting the points of the graph.

EXAMPLE:

AGE OF OFFENDER

AGE	f	MIDPOINT
10-14	0	12
15-19	4	17
20-24	3	22
25-29	4	27
30-34	3	32
35-39	0	37
40-44	1	42
45-49	0	47



Source: Hypothetical Data

GRAPHICAL METHODS

PURPOSE

To give participants an opportunity to practice constructing and interpreting tables, charts and graphs.

INSTRUCTIONS

Using the provided crime data, construct the specified graphs and figures. Be sure to completely label each graph or chart and prepare a one or two sentence narrative that highlights the findings of each chart or graph.

Specifically,

For Race of Offender, Construct:

* A Frequency Table
* A Pie Chart

For Type of Weapon, Construct:

* A Frequency Table
* A Bar Graph

For Age of Victim, Construct:

* A Completed Grouped Data Table
* A Histogram
* A Frequency Polygon

EXERCISE #1

EXERCISE #1 (Continued)

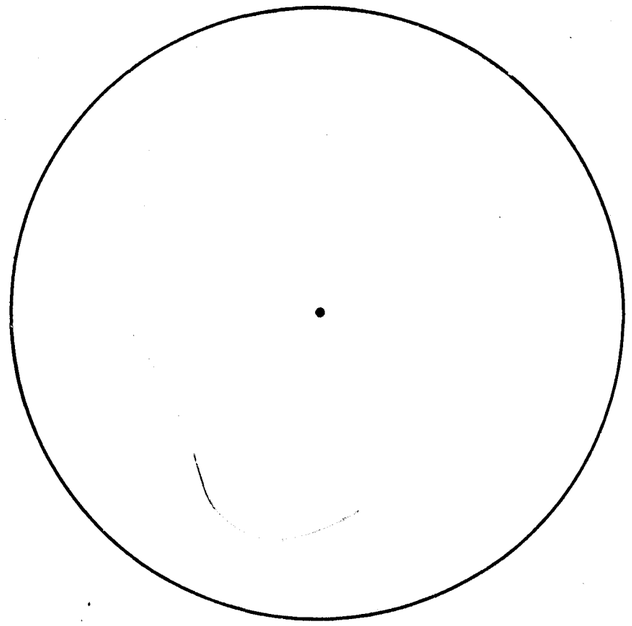
A. Race of Offender

+ Construct a Frequency Table.

Race of Offender	Frequency	Percent	Degrees
White	8		
Black	6		
Indian	1		

Source: Hypothetical Data

+ Construct a Pie Chart.



EXERCISE #1

EXERCISE #1 (Continued)

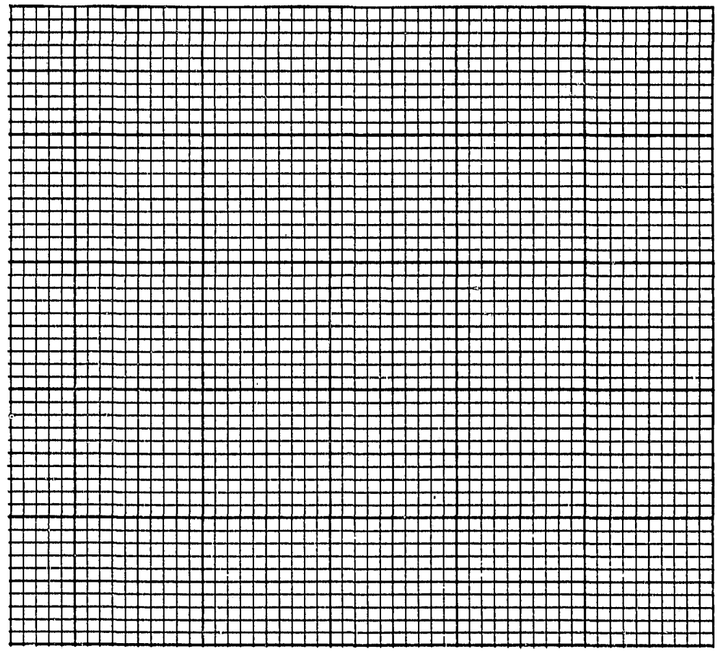
B. Type of Weapon

+ Calculate required values and complete the following table.

Weapon Type	Frequency	Percent
Knife	5	
Gun	7	
None	3	

Source: Hypothetical Data

+ Construct a Bar Graph.



EXERCISE #1

EXERCISE #1 (Continued)

C. Age of Victim

1. Examine the following grouped data table.

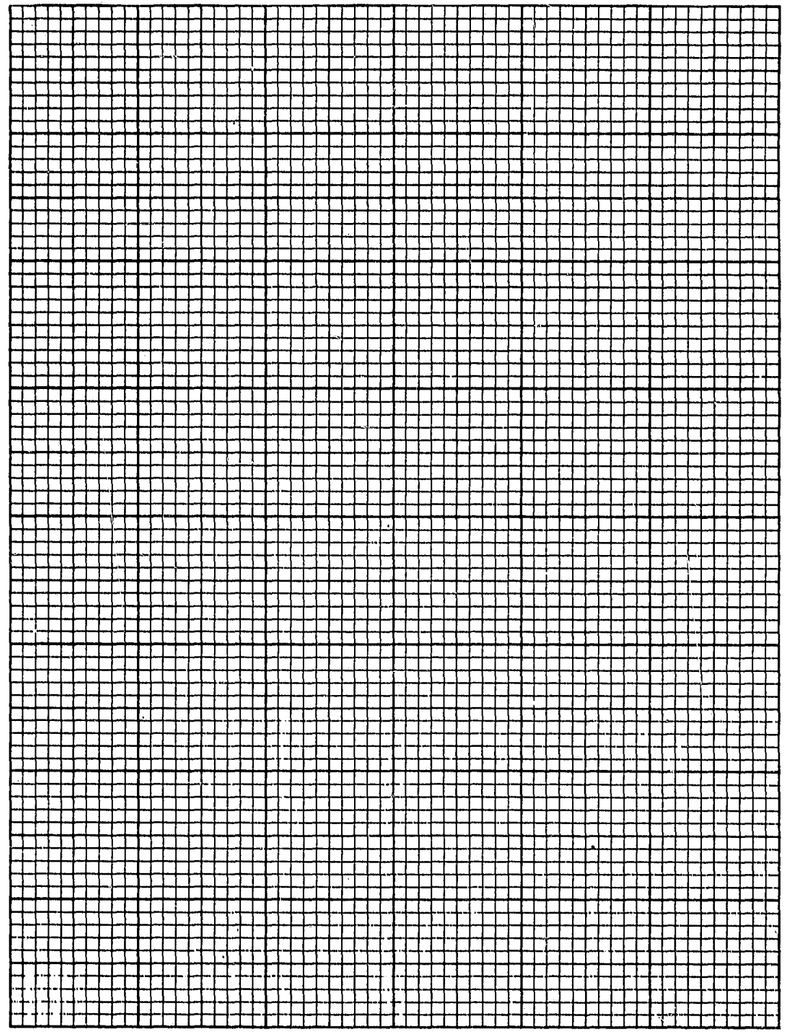
Age of Victim (Apparent Interval Limits)	Frequency
10 - 19	0
20 - 29	2
30 - 39	3
40 - 49	3
50 - 59	0
60 - 69	4
70 - 79	2
80 - 89	1
90 - 99	0

Source: Hypothetical Data

EXERCISE #1

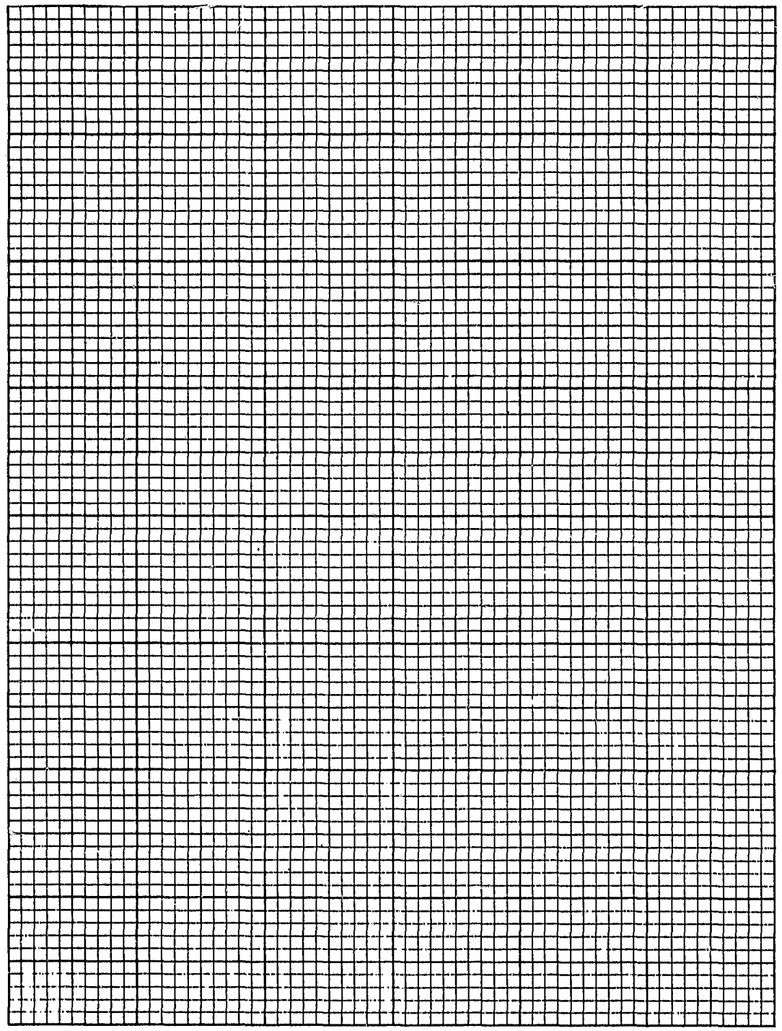
EXERCISE #1 (Continued)

+ Prepare a histogram using the grouped data.



EXERCISE #1

+ Prepare a frequency polygon using the grouped data.



EXERCISE #1

NOTES

IV. TIME CHARTS AND PERCENT CHANGE

Module 3 concludes with the introduction of time as an important dimension for use in the description of crime data. Module 4 will add space and seriousness as two more important considerations. Change, or the lack of it, in crime rates across time is a major indicator that the criminal justice system responds to, and uses it (changes) as one indicator of its performance.

A. Percent Change

V.A. (3-15):

PERCENT CHANGE

$$\text{PERCENT CHANGE} = \frac{\text{CRIME IN LATER PERIOD} - \text{CRIME IN EARLIER PERIOD}}{\text{CRIME IN EARLIER PERIOD}} \times 100$$

EXAMPLE:

REPORTED ASSAULTS* – 1970: 1128
1974: 1463

$$\%\ \text{CHANGE} = \frac{1463-1128}{1128} \times 100 = 29.7\%$$

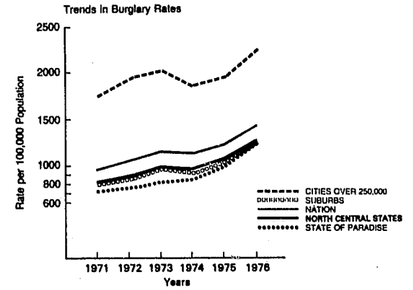
Source: Hypothetical Data
*per 100,000

NOTES

B. Time Charts

V.A. (3-16):

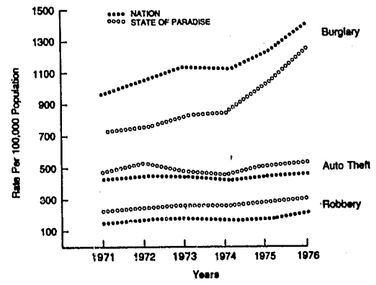
TRENDS IN BURGLARY RATES BY URBAN SIZE, UNITED STATES AND STATE OF PARADISE, 1971-1976



SOURCE HYPOTHETICAL DATA

V.A. (3-17):

TRENDS IN BURGLARY, AUTO THEFT AND ROBBERY, UNITED STATES AND STATE OF PARADISE, 1971-1976

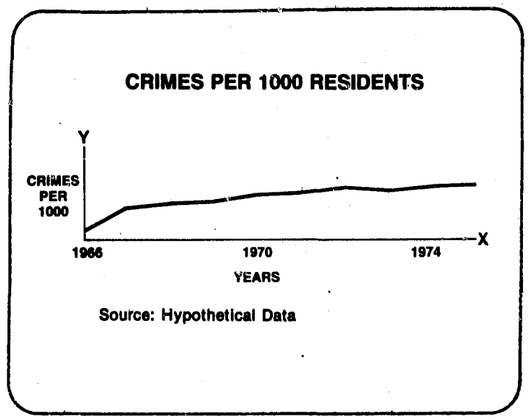


SOURCE: HYPOTHETICAL DATA

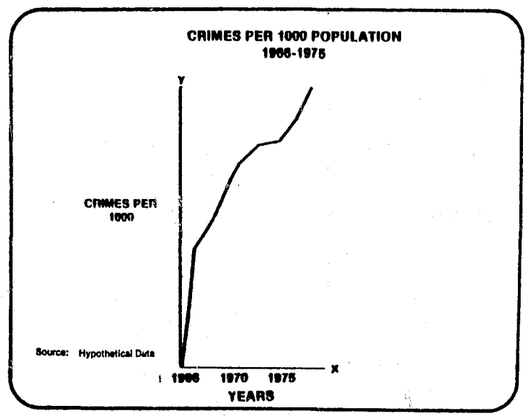
C. Distorting Graphical Presentations

+ The 3/4 rule--Y axis should be between 75-100% of the X axis.

V.A. (3-18):

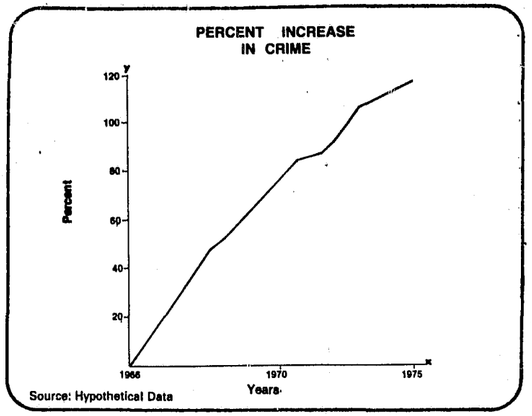


V.A. (3-19):



+ Another deceptive practice is to utilize percent change data without proper warning to the reader.

V.A. (3-20):

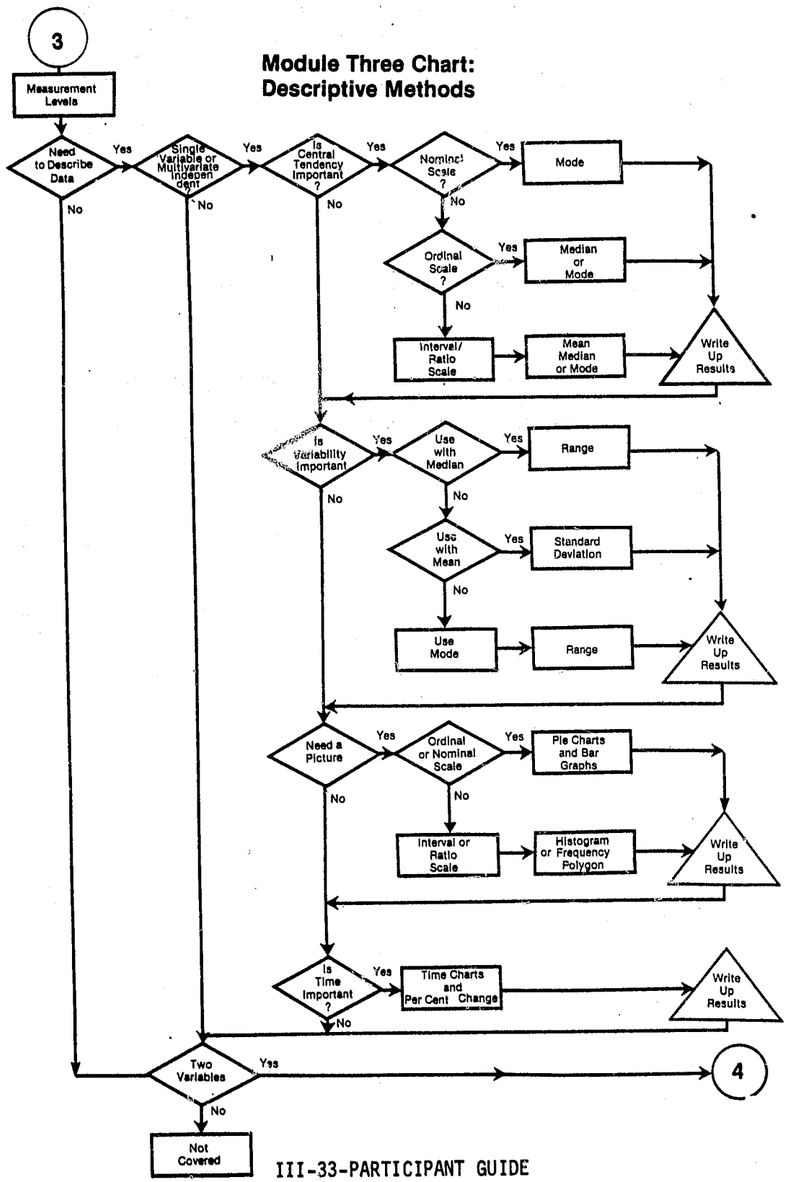


NOTES

V. CONCLUSION

A. In the actual conduct of analysis, as in the Major Exercise, the Task dealing with Descriptive Statistics should be done as a first step in interpreting the data. When presenting information to decision-makers, descriptive statistics are useful to summarize and communicate findings to decision-makers.

V.A. (3-21):



MODULE 4
COMPARATIVE METHODS

Module 4 examines a number of comparative techniques used to describe crime and system problems. The module begins by presenting four basic indices, moves through a discussion of a seriousness index, discusses the use of cross classification tables and scattergrams, and concludes with a presentation of statistical maps.

OBJECTIVES

1. To summarize and compare variables using concentration, distribution, density, and unit share indices.
2. To explain and apply a seriousness scale.
3. To develop and interpret cross classification tables.
4. To prepare and explain a scattergram.
5. To explain what a statistical map is and identify spatial patterns in data.

I. INDEX NUMBERS

A. An index number consists of a:

$$\frac{\text{numerator}}{\text{denominator}}$$

It is a ratio of two measures.

B. Rates.

+ The concept of rates is familiar to most criminal justice practitioners, e.g. crime rate, arrest rate, clearance rate, conviction rate, and recidivism rate. In fact, most of these notions are so well known that planners and analysts often fail to question the way that a particular rate is constructed or to examine carefully what a rate or index really measures and how it is applied. This is especially true of Part I Offenses.

+ Deriving crime rates for populations at risk represents one way of achieving comparability.

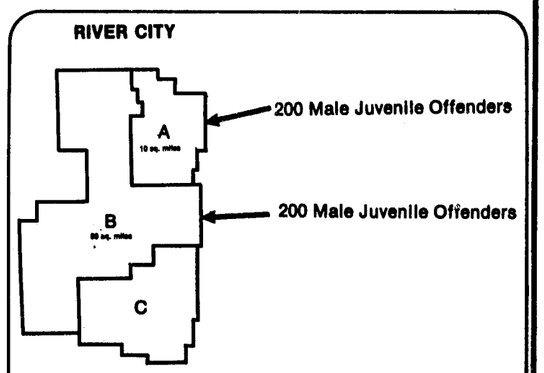
C. Four Types of Index Numbers

+ Density Index.

- Definition: Density indices reflect population counts per unit area.

$$\text{Density Index} = \frac{\text{Number of Delinquent Juveniles in Chaos City}}{\text{Number of Square Miles in Chaos City}}$$

V.A. (4-1):

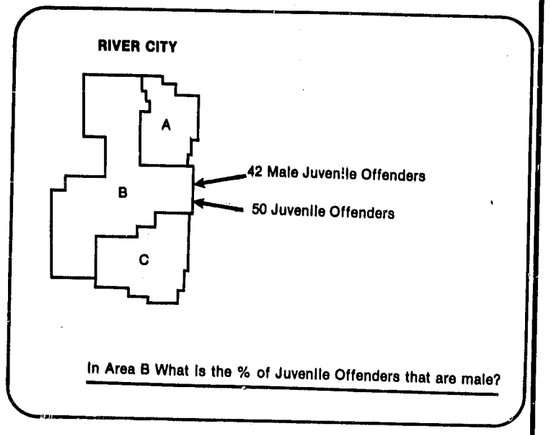


+ Concentration Index.

- Definition: A concentration index identifies what percent of a crime group (victims or offenders) has a particular crime characteristic.

$$\text{Concentration Index} = \frac{\text{Number of male juveniles in Area B having delinquency petitions}}{\text{Total number of juveniles in Area B having delinquency petitions}}$$

V.A. (4-2):

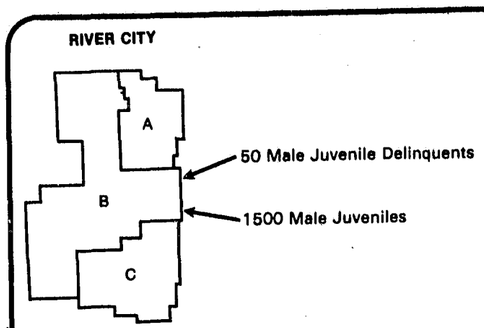


+ Distribution Indices.

  - Definition: A distribution index identifies what percent of the risk group reflects the crime problem.

$$\text{Distribution Index} = \frac{\text{Number of delinquent male juveniles}}{\text{Total number of male juveniles}}$$

V.A. (4-3):

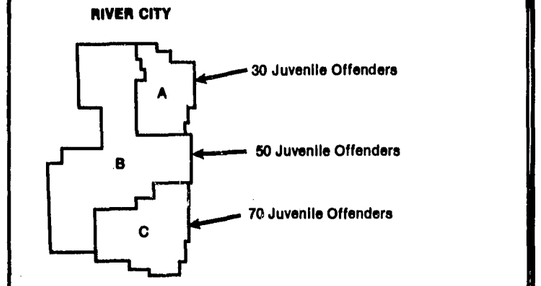


+ Index of Unit Share.

  - Definition: The index of unit share indicates what percent of the total region's crime problem occurs in a given sub-section.

$$\text{Index of Unit Share} = \frac{\text{Number of Delinquent Juveniles in Area B}}{\text{Number of Delinquent Juveniles in Chaos City}}$$

V.A. (4-4):



CONTINUED

7 OF 14

NOTES

D. Comparative Analysis Using Index Numbers

+ Comparative analysis emphasizes the simultaneous assessment of crime data for many different jurisdictions.

+ Comparative analysis is often extended in two directions.

  - First, victimization data may be introduced.

  - Second, comparative measures can be combined with time series data, a very powerful combination which remedies several of the weaknesses of each individual technique.

PURPOSE

To illustrate the use of crime rate data to compare jurisdictions by using a ranking procedure. Review Table I and interpret the table by identifying extreme patterns. What are the strengths/weaknesses of this approach?

WALK-THROUGH 'F'

Table 1.
SELECTED CRIME DATA FOR CITIES - 25,000 POPULATION AND LARGER

		FREQUENCY		RATE		FREQUENCY RANK		RATE RANK		SUM OF FREQ.	SUM OF RATE	COMBINED FREQUENCY	COMBINED RATE
CITY	POPULATION	BURGLARY	LARCENY	BURGLARY	LARCENY	BURG.	LARC.	BURG.	LARC.	RANKS	RANKS	RANK	RANK
1.	648,412	8,649	16,984	1,333.9	2,624.1	1	1	7	7	2	14	1	6
2.	400,971	8,361	13,625	2,085.2	3,398.0	2	3	2	5	5	7	2	3
3.	394,497	8,011	15,941	2,030.7	4,040.8	3	2	3	3	5	6	2	2
4.	197,452	4,335	8,931	2,195.5	4,523.1	4	4	1	2	8	3	3	1
5.	170,854	1,641	3,380	960.5	1,978.3	7	7	9	8	14	17	5	7
6.	152,479	2,991	6,027	1,961.6	3,952.7	5	5	5	4	10	9	4	4
7.	126,766	1,334	1,859	1,199.1	1,710.2	8	9	8	10	17	18	7	8
8.	107,304	2,126	2,888	1,981.3	2,691.4	6	8	4	6	14	10	5	5
9.	95,325	1,313	4,346	1,377.4	4,559.1	9	6	6	1	15	7	6	3
10.	67,002	636	1,198	949.2	1,895.5	10	10	10	9	20	19	8	9

KEY: - Rate equals crime frequency divided by population expressed in 100,000
- Sum of Frequency Ranks equals Rank of Burglary Frequency plus Rank of Larceny Frequency
- Sum of Rate Ranks equals Rank of Burglary Rate plus Rank of Larceny Rank
- Combined Frequency Rank is the reranking of Sum of Frequency Ranks according to magnitude
- Combined Rate Rank is the reranking of Sum of Rate Ranks

SOURCE: United States National Criminal Justice Information and Statistics Service. Sourcebook of Criminal Justice Statistics 1977, by Michael R. Gottfredson (and others). Washington, D.C.: USGPO, 1978.

WALK-THROUGH 'F'

NOTES

II. SERIOUSNESS WEIGHTING

A. Need for a Seriousness Scale

+ Weighting offenses according to seriousness is basically an effort to identify offenses that inflict a greater amount of harm on the community than others. A community's crime problem is linked to the serious offenses; these are what leaders would like to do something about. Therefore, they must be identified. A Seriousness Scale is an attempt to do that.

+ If an accurate measure of seriousness of the crime problem is desired -- analysis of the crime types is not sufficient.

+ Crime types are not sufficient for the following reasons:

  - A scale is needed that places all offenses on one continuum of seriousness, regardless of crime type -- violent or property.

  - Seriousness weights are needed in a seriousness scale.

+ Ranking of seriousness is needed so that fine distinctions can be made. Rankings also need to be uniform so that the distinctions are rational.

+ A scale is needed that reflects public sentiment about which crimes are serious and which are not.

NOTES

B. An example of a Seriousness Scale: Sellin-Wolfgang Index.

+ Thorsten Sellin and Marvin E. Wolfgang created a weighting system for crime that can be used to measure changes in the seriousness of crime over time or among jurisdictions.

+ The Sellin-Wolfgang index has three important characteristics:

- The index can be disaggregated down to the smallest geographical and temporal unit.

- The index is based on data normally collected by local police departments; thus initial costs are minimized. Also, there is likely to exist a sufficiently long series of data for trend analysis.

- The index is a measure of the perceived amount of harm inflicted on the community.

NOTES

+ If a crime is divided into its specific components, each component is given a score, and the scores are totaled and an aggregate estimate of the crime's seriousness is determined.

C. Uses of seriousness scale.

Exhibit 2.
Sellin-Wolfgang Seriousness
Components and Scores

I.	Number of victims of bodily harm	
(a)	Receiving minor injuries	1
(b)	Treated and discharged	4
(c)	Hospitalized	7
(d)	Killed	26
II.	Number of victims of forcible sexual intercourse	10
(a)	Number of such victims intimidated by weapon	2
III.	Intimidation (except II above)	
(a)	Physical or verbal only	2
(b)	By weapon	4
IV.	Number of premises forcibly entered	1
V.	Number of motor vehicles stolen	2
VI.	Values of property stolen, damaged, or detroyed (in dollars)	
(a)	Under $10	1
(b)	$10 - $250	2
(c)	$251 - $2,000	3
(d)	$2,001 - $9,000	4
(e)	$9,001 - $30,000	5
(f)	$30,001 - $80,000	6
(g)	Over $80,000	10

Source: Sellin, Thorsten, and Marvin E. Wolfgang. The Measurement of Delinquency, New York: Wiley, 1962.

PURPOSE

Module 4 is intended to expose the participants to the techniques and uses of comparative analysis, particularly as it applies to crime data. This section has focused on a comparison of trends in crime incidence using various rates and indices. In this exercise seriousness is introduced to help elaborate the crime problem. The presentation of three descriptors of crime--time trends, rates and seriousness--are used to indicate that the nature of the crime problem can vary depending on how it is defined and interpreted.

INSTRUCTIONS

The participants are to work with the following assault data to compare trends in incidence, rate per 100,000 population, and seriousness.

Following are the specific tasks to be performed:

1. Calculate the raw seriousness of assaults for each year.
2. Transform that figure into "seriousness per incident" so that the annual indices are then comparable.
3. Calculate the percent change in seriousness/incident for the years 1973-1977.
4. Compare it to percent change in incident and rate.
5. Describe trends in assault between 1973 and 1977 using these three descriptors.

EXERCISE #2

DATA SET

Table 1. Assaults, Chaos City, 1973-1977

	1973	1974	1975	1976	1977	% Change 1973-77
Assault Incidence	1015	1251	1424	1410	1331	31%
Rate*	363.9	446.2	469.0	427.9	390.3	7%

Source: Chaos City Police Department, 1978.
*Per 100,000 Population.

Participants should assume that, according to a modified seriousness index, assault is broken down into the following categories and assigned the following weights:

Receiving Minor Injuries	-	Multiply by 1
Treated and Discharged	-	Multiply by 4
Hospitalized	-	Multiply by 7

The assault data are distributed among these four categories as follows:

Table 2. Assaults by Seriousness Categories
Chaos City, 1973-1977

	1973	1974	1975	1976	1977
Victim Received Minor Injuries	338	376	236	109	146
Victim Treated and Discharged	508	612	756	797	730
Victim Hospitalized	169	263	432	504	455

Source: Chaos City Police Department, 1978.

EXERCISE #2

WORKSHEET

1. Develop matrix and calculate values.

	1973		1974		1975		1976		1977	
	#	SS*	#	SS*	#	SS*	#	SS*	#	SS*
Victim Received Minor Injury	338	338	376		236		109		146	
Victim Treated And Discharged	508	2032	612		756		797		730	
Victim Hospitalized	169	1183	263		432		504		455	
$\sum$	1015	3553	1251		1424		1410		1331	

* SS= Seriousness Score

2. Calculate seriousness per incident:

Seriousness per Incident	1973	1974	1975	1976	1977
	3.50				

3. Calculate % change in seriousness per incident: 1973-1977

$$\% \text{ change} = \frac{-3.50}{3.50} \times 100$$

% change =

4. Compare change in incident and rate to change in seriousness:

incident
rate
seriousness per incident

EXERCISE #2

NOTES

III. CROSS CLASSIFICATION TABLES.

A. The purpose of cross-classification is to begin the examination of the relationship between two variables -- bivariate descriptions.

B. Illustration of a one-way and two-way cross classification table.

Exhibit 1. One and Two-Way Table Illustrations

One-Way Table Illustration

	Category							
	1	2	3	4	5	6	7	8
	Total U. S. Crime Index	Murder and Non-Negligent Manslaughter	Forcible Rape	Robbery	Aggravated Assault	Burglary	Larceny-Theft	Motor Vehicle Theft
Total Number	11,256,616	20,505	56,093	464,973	484,713	3,252,129	5,977,748	1,000,455
Percent of Total	100%	.2%	.5%	4.1%	4.3%	28.9%	53.1%	8.9%

Two-Way Table Illustration
(Totals from above)

Type of Crime	SMSA'S	%	Other Cities	%	Rural	%
Murder & Non-Negligent Manslaughter	16,490	.2	1,313	.1	2,702	.4
Forcible Rape	48,894	.5	3,196	.3	4,003	.6
Robbery	443,461	4.6	13,685	1.3	7,827	1.2
Aggravated Assault	397,998	4.2	45,523	4.3	41,192	6.2
Burglary	2,729,061	28.6	261,276	24.9	261,792	39.3
Larceny/Theft	4,989,336	52.3	674,718	64.2	313,694	47.1
Motor Vehicle Theft	915,297	9.6	51,038	4.9	34,120	5.1
	9,540,537		1,050,749		665,330	

Source: United States, National Criminal Justice Information and Statistics Service. Sourcebook of Criminal Justice Statistics, 1977, by Michael R. Gottfredson, et al. Washington, D. C.: USGPO, 1978.

NOTES

C. Percentaging a Cross Classification.

+ Percentaging a cross classification is the division of the observations according to the independent variable.

+ If we want to know whether two variables in a hypothesis are related, are associated, or if they are independent of one another, percentaging a cross classification is a useful first step.

+ If the variables are independent, then knowledge of the independent variable does not help us understand or predict the dependent variable.

+ Cross classification is not concerned with strength or significance of association (covered in Module 5).

CROSS CLASSIFICATION TABLES

PURPOSE

Walk-Through 'G' illustrates the use of a four-step procedure for interpretation of cross classifications. This Walk-Through also provides an opportunity for discussing causality in regard to recidivism. It demonstrates how percentages enhance the ability to understand the tables.

Go through the four-step procedure using the recidivism data provided. Interpret the table using percentages.

Table 1. Four Step Interpretation of Cross-Tabulations

Step 1: Identify independent and dependent variables.

Relationship of Employment Status and Recidivism Status

(Dependent Variable)	(Independent Variable)		
	Employment Status of Ex-Offenders		
Recidivism Status	Unemployed #	Employed #	Total #
Recidivist	30	10	40
Non-Recidivist	20	60	80
Total	50	70	120

Source: Paradise University, Criminal Justice Research Center, 1978.

Step 2: Percentage the dependent variable.

Recidivism Status	Employment Status of Ex-Offenders Unemployed %	Employed %	Total %
Recidivist			33.3
Non-Recidivist			66.7
Total			100.0

Table 2. Four Step Interpretation of Cross Tabulations (Continued)

Step 3: Percentage the dependent variable for one of the independent categories.

Recidivism Status	Employment Status of Ex-Offenders		Total %
	Unemployed %	Employed %	
Recidivist	60.0		33.3
Non-Recidivist	40.0		67.7
Total	100.0		100.0

Step 4: Percentage the dependent variable for the other independent categories.

Recidivism Status	Employment Status of Ex-Offenders		Total %
	Unemployed %	Employed %	
Recidivist	60.0	14.0	33.3
Non-Recidivist	40.0	86.0	67.7
Total	100.0	100.0	100.0

WALK-THROUGH 'G'

NOTES

IV. SCATTERGRAMS

A. Definition: A scattergram is a graphical presentation of interval level data.

+ It is a method used to examine the relationship between a pair of variables and to describe patterns in quantitative data.

+ The convention for Scattergram construction is to place the dependent variable on the vertical (Y) axis and the independent variable on the horizontal (X) axis.

B. Construction and Interpretation of Scattergrams.

+ Examples of Scattergrams and their interpretation are presented in Walk-Through H.

SCATTERGRAM

PURPOSE

This Walk-Through illustrates how to construct and interpret a scattergram. Examine Table 1 in the data set for general trends, clustering, and outliers. Interpret the scattergram. Repeat this procedure on Table 2.

WALK-THROUGH 'H'

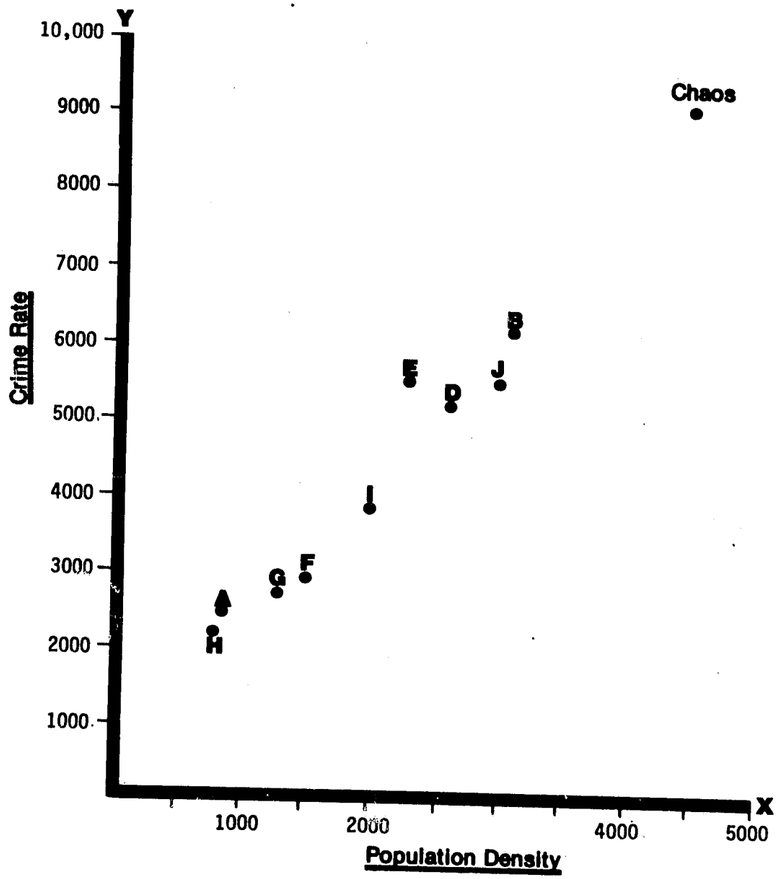


Table 1.

Crime Rate Related to Population Density

LEGEND:

Cities	Population Density*	Crime Rate
A	800	2500
B	3100	6200
Chaos	4500	9140
D	2600	5200
E	2300	5500
F	1500	2900
G	1300	2700
H	750	2200
I	2000	3800
J	3000	5500

* Total Population / Area (in sq. miles)

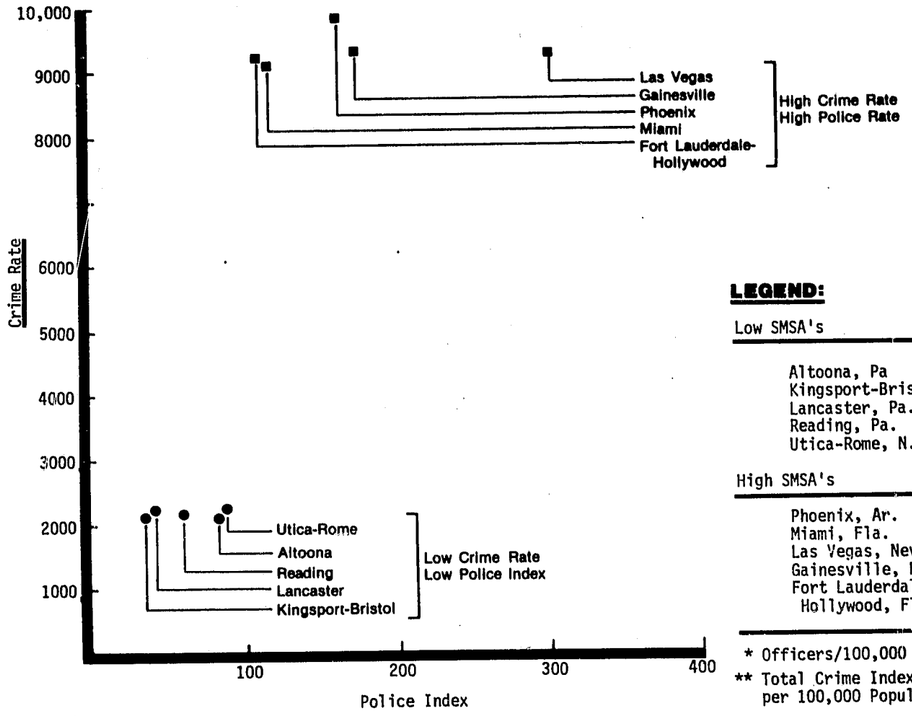
** Total Crime Index per 100,000 Population

Source: Hypothetical Data

WALK-THROUGH 'H'

Table 2.

Total Crime Index
Related to Police Strength



LEGEND:

Low SMSA's	Police Index *	Crime Rate **
Altoona, Pa	82.7	2112
Kingsport-Bristol, Tenn.	34.7	2159
Lancaster, Pa.	38.8	2244
Reading, Pa.	64	2167
Utica-Rome, N.Y.	85.3	2192
High SMSA's		
Phoenix, Ar.	162.0	9795
Miami, Fla.	117.0	9130
Las Vegas, Nev.	300.2	9318
Gainesville, Fla.	170.3	9328
Fort Lauderdale-Hollywood, Fla.	108.7	9252

* Officers/100,000 population

** Total Crime Index per 100,000 Population

Source: Sourcebook, 1976

WALK-THROUGH 'H'

NOTES

V. Statistical Maps

A. Importance of Statistical Maps

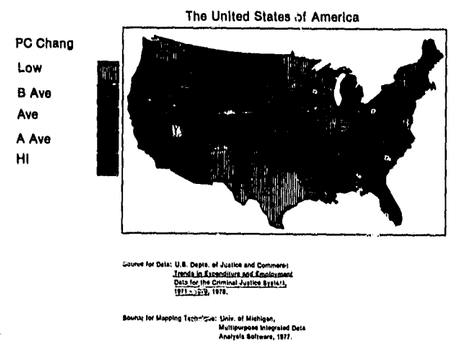
B. Principles in Map Making

+ A small number of categories and shades to facilitate reading of the map.

+ Select appropriate geographical units to present.

V.A. (4-5):

Percent Change in Corrections Expenditures 1971-1974



Source for Data: U.S. Depts. of Justice and Commerce:
Trends in Expenditure and Employment Data for the Criminal Justice System, 1971-1979, 1979.

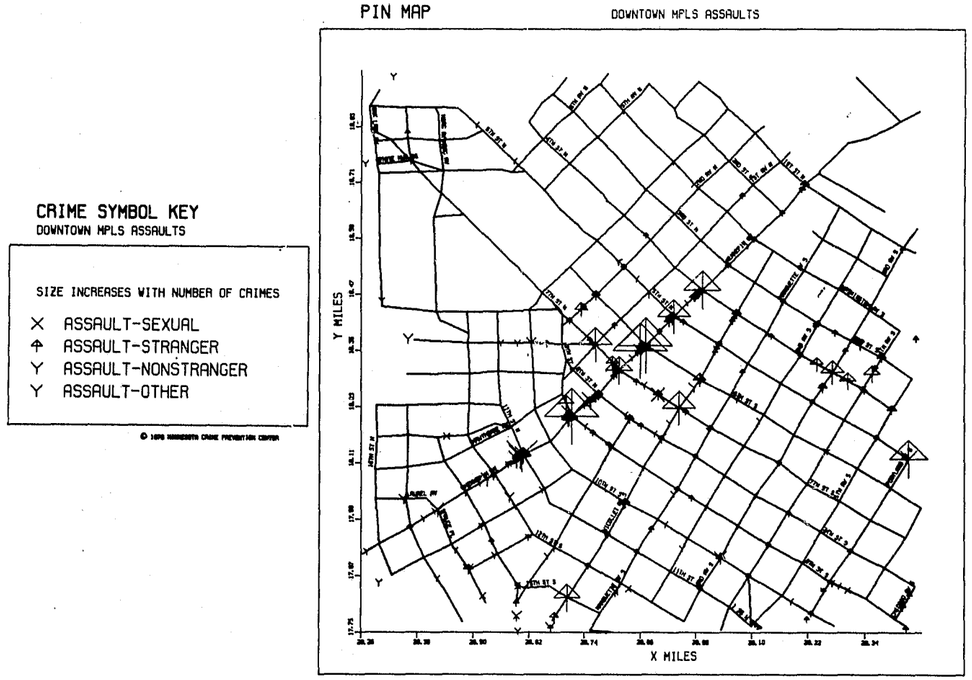
Source for Mapping Technique: Univ. of Michigan, Multipurpose Integrated Data Analysis Software, 1977.

NOTES

C. Spatial characteristics of crime

+ Following is a series of four computer-drawn maps of downtown Minneapolis. Presented are four related but distinct perspectives on the assault problem in the downtown area.

V.A. (4-6):

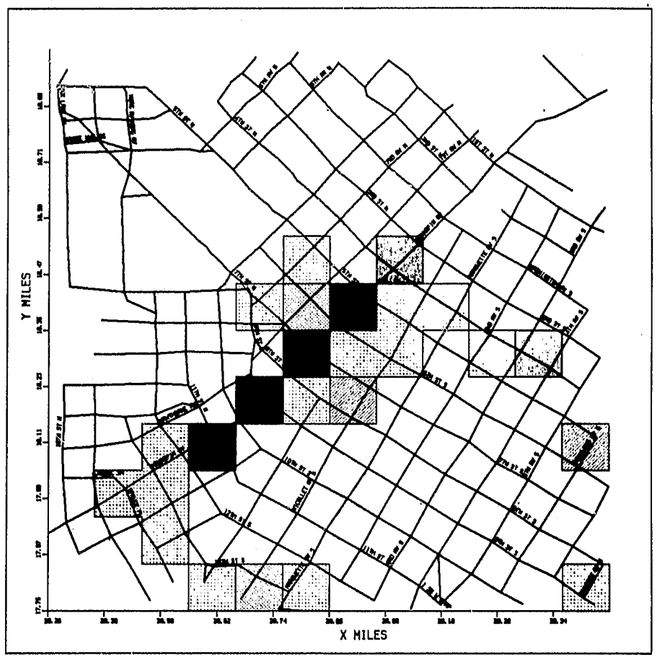


Used by permission: © 1978 Minnesota Crime Prevention Center
2344 Nicollet Avenue, Minneapolis, Minnesota 55404, (612) 870-0780

V.A. (4-7):

GRID MAP

DOWNTOWN MPLS ASSAULTS



© 1976 MINNESOTA CRIME PREVENTION CENTER

GRID KEY

DOWNTOWN MPLS ASSAULTS

GRID SIZE .0100 SQ MILES
EQUAL INTERVAL

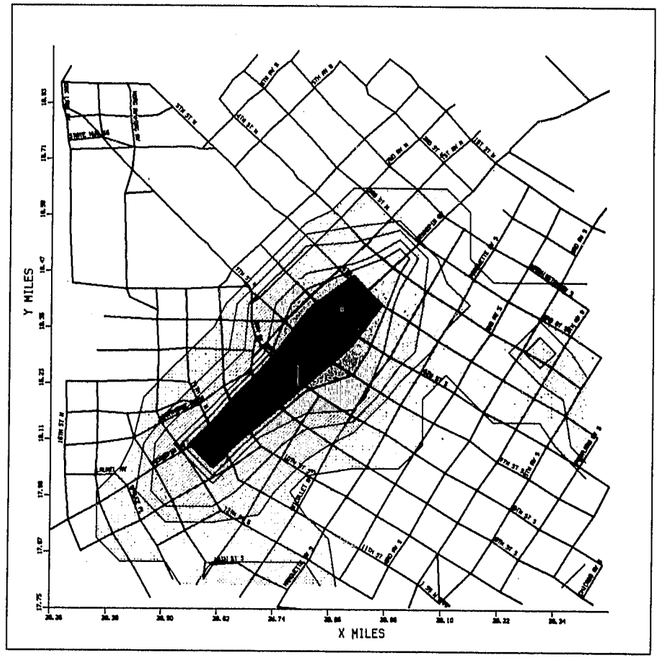
0.0 TO	5.0
5.1 TO	10.1
10.2 TO	15.2
15.3 TO	20.3
20.4 TO	25.4
25.5 TO	30.4
30.5 TO	35.5
35.6 TO	40.6
40.7 TO	45.7
45.8 TO	50.8
50.9 TO	55.9

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V.A. (4-8):

SMOOTHED CONTOUR MAP

DOWNTOWN MPLS ASSAULTS



© 1976 MINNESOTA CRIME PREVENTION CENTER

SMOOTHED CONTOUR KEY

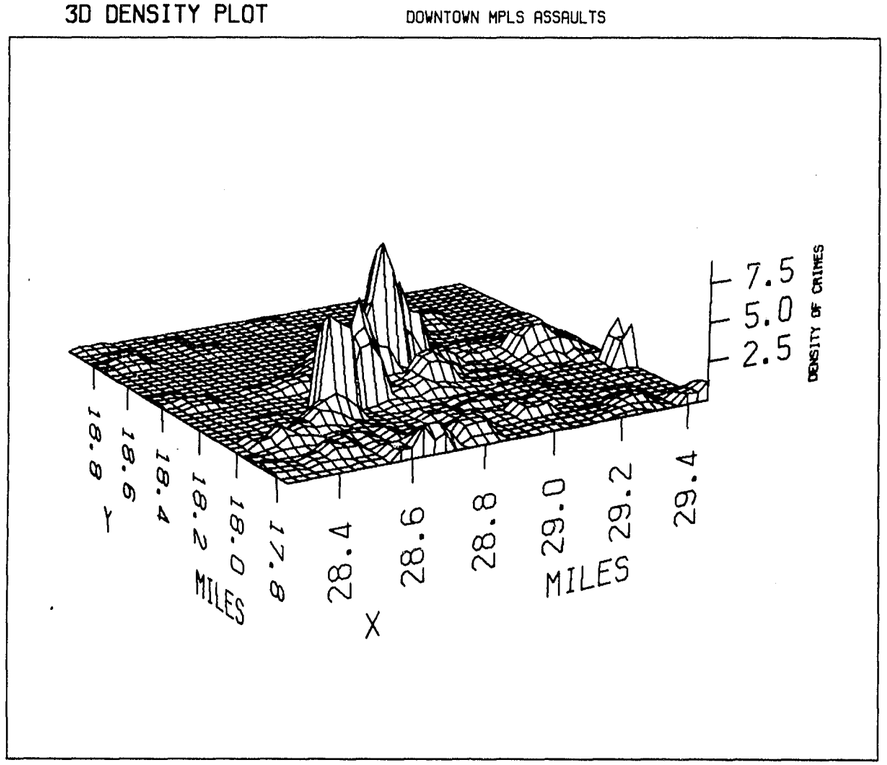
DOWNTOWN MPLS ASSAULTS

GRID SIZE .0100 SQ MILES
EQUAL INTERVAL

0.0 TO	2.7
2.8 TO	5.5
5.6 TO	8.3
8.4 TO	11.1
11.2 TO	13.8
13.9 TO	16.6
16.7 TO	19.4
19.5 TO	22.2
22.3 TO	25.0
25.1 TO	27.8
27.9 TO	30.6

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V.A. (4-9):

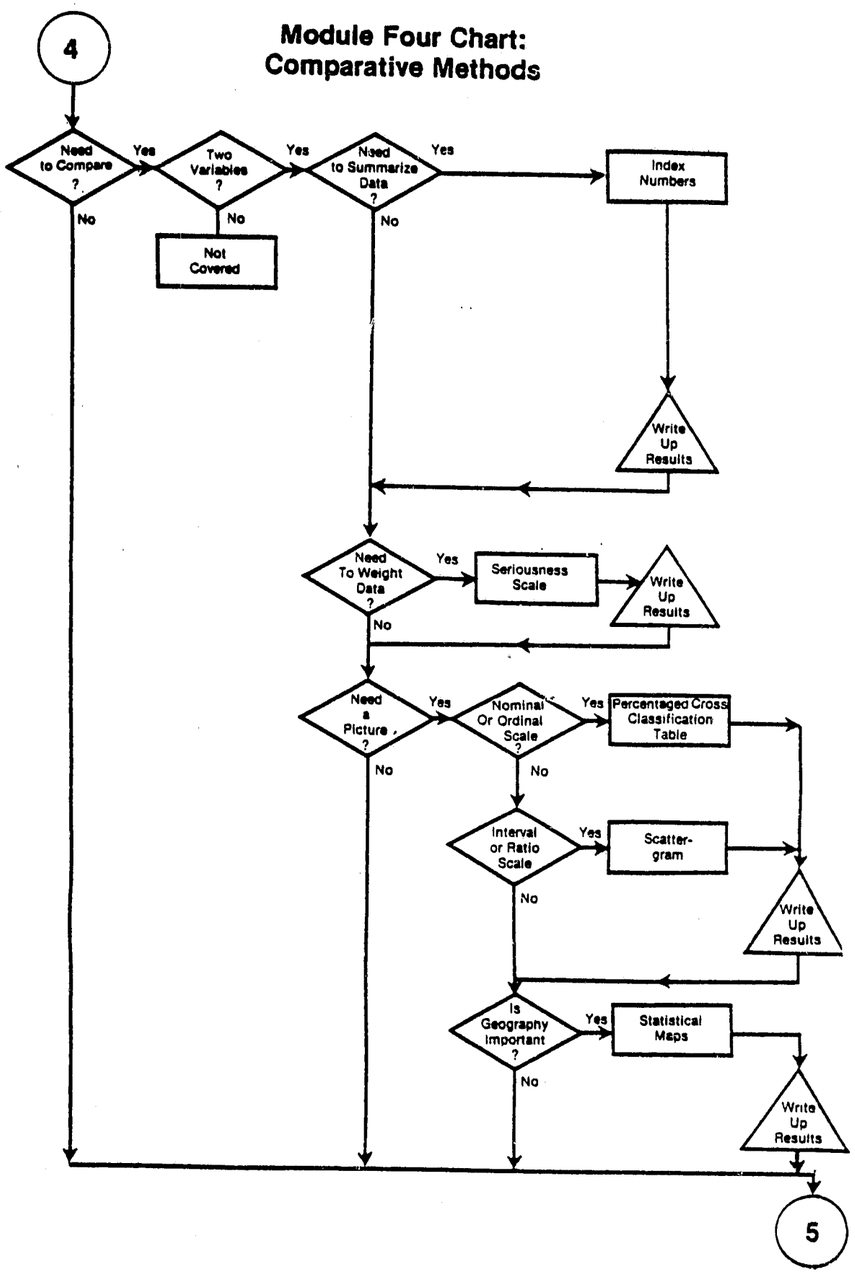


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NOTES

VI. CONCLUSION

V.A. (4-10):


4
Module Four Chart:
Comparative Methods
Need to Compare ?
Yes
Two Variables ?
Yes
Need to Summarize Data ?
Yes
Index Numbers
No
Not Covered
No
Write Up Results
Need To Weight Data ?
Yes
Seriousness Scale
Write Up Results
No
Need a Picture ?
Yes
Nominal Or Ordinal Scale ?
Yes
Percentaged Cross Classification Table
No
No
Interval or Ratio Scale
Yes
Scatter-gram
No
Write Up Results
Is Geography Important ?
Yes
Statistical Maps
No
Write Up Results
5

MODULE 5
INFERENTIAL METHODS

Module 5 presents material covering two complex and difficult areas of statistics: inference and prediction. In covering this material the emphasis should be on: 1) when a particular procedure is appropriate; 2) rules to follow and the assumptions made in using a procedure; 3) practical applications of the method, and 4) how the resulting information is interpreted. The specific procedures covered include: chi square, correlation, and least squares regression.

OBJECTIVES

1. To explain the purpose and outline the general process of statistical testing.

2. To define, select, calculate and interpret the following measures of association:

   a. Chi square statistic.

   b. Correlation coefficient.

3. To define, select, calculate and interpret the following methods of prediction:

   a. Visual estimation.

   b. Least squares regression.

I. STATISTICAL TESTING

A. Definition:

+ In Modules 3 and 4 we distinguished between two primary purposes of statistics: description and inference.

  - Description involves summarizing masses of data to facilitate communication.

  - Inference involves summarizing also, but goes beyond description enabling us to make generalizations based on incomplete information.

+ Two basic areas of inference are: questions of difference and questions of association.

+ Samples and Inference

  - A primary reason for inferential statistics is our dependency on samples rather than on a census; incomplete information rather than complete information.

  - There are two issues when using a sample:

    Is our result "true?" i.e., would they be the same if we could measure the entire population?

    How confident are we in our findings?

  - Generally, as sample size decreases, the importance of statistical inference increases.

B. Statistical Tests.

+ Step by step procedure is used for organization and interpretation of various inferential statistics.

+ The procedure is as follows:

V.A. (5-1)

STATISTICAL TEST PROCESS

1. State Null Hypothesis
2. State an Alternative Hypothesis
3. Select Statistical Test
4. Determine Level of Significance
5. Calculate Test Statistic
6. Compare Test Statistic To Table Values
7. Interpret Findings

+ Problems in utilizing such tests result from the improper statement of the null hypothesis, a misunderstanding of the underlying assumptions of such tests, and the misinterpretation of the findings.

+ Perhaps the greatest danger in applying measures of association is what is referred to as a "spurious" correlation.

II. CHI SQUARE TEST OF INDEPENDENCE

A. Uses.

+ This test indicates the degree of independence of two classifications.

+ It tests a null hypothesis of independent classifications.

+ It helps interpret cross classification tables.

B. Characteristics.

V.A. (5-2):

CHI SQUARE GENERAL CALCULATION FORMULA

$$(1)\quad \chi^2 = \Sigma \frac{(O - E)^2}{E}$$

Where: E = An expected cell frequency
O = An observed cell frequency
Σ = Means sum for all cells in the table

$$(2)\quad E = \frac{RT(CT)}{T}$$

Where: RT = Observed Row Total
CT = Observed Column Total
T = Total Observed Frequencies

V.A.(5-3):

DEGREES OF FREEDOM

Deg.ees of Freedom are determined by multiplying the number of rows minus one times the number of columns minus one.

(Rows - 1) (Columns -1) = Degrees of Freedom

√ = freely specified	√	√	√	√	√	0	RT1
O = Not freely specified	0	0	0	0	0	0	RT2
	CT1	CT2	CT3	CT4	CT5	CT6	

2 x 6

(2 — 1) (6 — 1) = 5 Degrees of Freedom

V.A. (5-4):

VALUES OF CHI SQUARE

(χ^2) AT THE 5% AND 1% LEVELS OF SIGNIFICANCE

DEGREES OF FREEDOM	5%	1%
1	3.84	6.63
2	5.99	9.21
3	7.81	11.34
4	9.49	13.28
5	11.07	15.09
6		
Etc.		

Source: Robert Parsons, Statistical Analysis: A Decision-Making Approach. (N.Y.: Harper and Row, 1974) p. 824.

PURPOSE

This problem examines the association between responses to a survey question, "What level of regard do you hold for Police?" and the race of the respondent using a cross classification table and the Chi Square test of independence.

Perform each of the following steps:

1. State the null hypotheses, H_o: Response is independent of race.
2. State the alternative hypotheses, H_a: Response and race are related.
3. Calculate expected values, substitute in formula.
4. Establish rejection region at .05. Calculate degrees of freedom.
5. What are your conclusions about H_o and H_a?

DATA SET

Table 1. Race of Respondent and Regard for Police

	RACE		Totals
	White	Black	
High Regard for Police	80	25	105
Low Regard for Police	45	50	95
Totals	125	75	200

Source: Paradise University, Criminal Justice Research Center, 1978.

WALK-THROUGH 'I'

WORKSHEET

A. State Null Hypothesis:

H_o: response independent of race

H_a: response and race are dependent

B. Calculate Expected Values:

$$E_1 = \frac{105\ (125)}{200} = 65.63$$

$$E_2 = \frac{105\ (75)}{200} = 39.38$$

$$E_3 = \frac{95\ (125)}{200} = 59.38$$

$$E_4 = \frac{95\ (75)}{200} = 35.63$$

C. Develop Worksheet and Calculate Values:

Cell	Observed (O)	Expected (E)	O-E	$(O-E)^2$	$(O-E)^2/E$
1	80	65.63	14.37	206.50	3.15
2	25	39.38	-14.38	206.78	5.25
3	45	59.38	-14.38	206.78	3.48
4	50	35.63	14.37	206.50	5.80
					Σ = 17.68

D. $\Sigma((O-E)^2/E) = \chi^2 = 17.68$

E. Determine Degrees of Freedom = (r-1)(c-1) = 1
Establish Rejection Region at .05

F. Compare calculated and Table χ^2; interpret result.

Table χ^2 = 3.84; Calculated χ^2 = 17.68

G. Conclusions: H_o: response is independent of race (rejected)
H_a: response and race are related (accepted)

WALK-THROUGH 'I'

CHI SQUARE

PURPOSE

To give participants an opportunity to calculate and interpret a Chi Square statistic.

INSTRUCTIONS

You are to perform an analysis and interpretation of the results of a survey of the State of Paradise residents using a Chi Square Test of Independence.

A. You will be assigned one of the hypotheses in the Worksheets (Part I or Part II) to evaluate. The hypothesis in Part I of the Worksheet may be stated as: crime trend is independent of type of geographic area. The hypothesis in Part II is: attitude toward burglary is independent of residential location.

B. State the null and the alternative hypotheses.

C. Determine the number of degrees of freedom for each table.

D. Decide on a level of significance.

E. Calculate the χ^2 statistics.

F. State your decision about H_o and H_a, based on the χ^2 test.

G. Write one or two sentences describing the results of your test on these data.

EXERCISE #3

DATA SET

Table 1. State Of Paradise
Burglary Crime Trends, by area, 1976 & 1977

AREA	1976	1977	Totals
Urban	2015	2563	4578
Suburban	819	710	1529
Rural	1050	805	1855
Totals	3884	4078	7962

Source: FBI, UCR, 1978

Table 2. State of Paradise
Victimization Survey Results, Burglary, 1977

How important is burglary as a problem?	Urban	Suburban	Rural	Totals
Very Important	356	52	28	436
Important	90	31	158	279
Not Important	52	50	62	164
Totals	498	133	248	879

Source: Paradise University, Survey Research Center, 1978.

WORKSHEET

A. Part One:

1. State Null and Alternative Hypotheses

H_o: crime trend is independent of area

H_a: they are dependent

2. Calculate Expected Values:

$E_1 = \frac{4578\ (3884)}{7962} = 2233.23$ $E_4=$

$E_2=$ $E_5=$

$E_3=$ $E_6=$

3. Develop worksheet and calculate values.

Cell	O	E	O-E	$(O-E)^2$	$(O-E)^2/E$
1	2015	2233.23	-218.23	47624.33	21.33
2					
3					
4					
5					
6					

4. $\Sigma((O-E)^2/E) = \chi^2 =$

5. Determine Degrees of Freedom = (r-1)(c-1) = 2
Establish Rejection Region at .05

6. Compare calculated and Table χ^2; interpret result.

Table χ^2 =

Calculated χ^2 =

EXERCISE #3

WORKSHEET (Continued)

B. Part Two:

1. State Null and Alternative Hypotheses

H_o:

H_a:

2. Calculate expected values.

$E_1 = \frac{(436)\ (498)}{879} = 247.02$ E_6=

E_2= E_7 =

E_3= E_8=

E_4= E_9=

E_5=

3. Develop worksheet and calculate values.

Cell	O	E	O-E	$(O-E)^2$	$(O-E)^2/E$
1	356	247.02	108.98	11876.64	48.08
2					
3					
4					
5					
6					
7					
8					
9					

EXERCISE #3

4. $\Sigma((O-E)^2/E) = \chi^2 =$

5. Determine Degrees of Freedom = (r-1)(c-1)
Establish Rejection Region at .05.

6. Compare calculated and Table χ^2; interpret result.

Table χ^2 =

Calculated χ^2 =

III. CORRELATION COEFFICIENT

A. Uses

+ The correlation coefficient is a measure of association which describes the degree to which one interval or ratio scale variable is related to another.

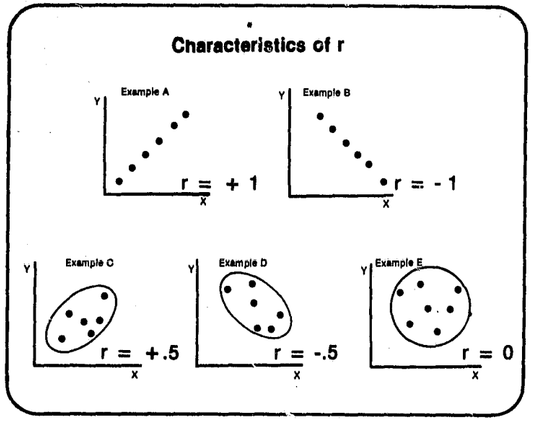
+ Indicates the nature of strength of a relationship between two variables.

+ Reflects the shape of a distribution.

+ Correlation coefficient helps to interpret scattergrams.

B. Characteristics

V.A. (5-5):



C. Calculating r

V.A. (5-6):

FORMULA FOR PEARSON'S CORRELATION COEFFICIENT

$$r = \frac{N\Sigma XY - (\Sigma X)(\Sigma Y)}{\sqrt{N\Sigma X^2 - (\Sigma X)^2}\sqrt{N\Sigma Y^2 - (\Sigma Y)^2}}$$

Where: Y = Values of dependent variable
X = Values of independent variable
N = Number of observations

D. Testing the Significance of r

V.A. (5-7):

CRITICAL VALUES OF r

d.f.*	Level of Significance .05	.01
3	.878	.959
4	.811	.917
5	.754	.874
6	.707	.834
7	.666	.798
8	.632	.765
9	.602	.735
10	.576	.708
11	.553	.684
12	.532	.661
13	.514	.641
14	.497	.623
15	.482	.606

*d.f. - degrees of freedom = n-2

Source: Snedecor, George W. & Cochran, William G. Statistical Methods, 6th Edition, Ames, Iowa: Iowa State University Press, 1974, p. 557.

E. Limitation:

+ While r determines the strength of the relationship between two variables, it does not establish causality.

+ The variables may be related to a third intervening variable that causes the observed relationship.

+ Relationships demonstrated using r may only be used to disprove a theory.

+ Causality is explained by theory used in problem specification.

CORRELATION COEFFICIENT

PURPOSE

To illustrate how to calculate and interpret a correlation coefficient. Calculate the correlation coefficient for the murder rates in 1971 and 1974 for the ten southern cities in Table 1. Test the significance of r and interpret the result.

WALK-THROUGH 'J'

WALK-THROUGH 'J'

DATA SET

Table 1. Murder Rates* for Thirty Cities from the North, South and West, 1971 and 1974

South	1971	1974
Atlanta, Ga.	20	21
Augusta, Ga.	22	17
Birmingham, Ala.	14	18
Charlotte, N.C.	25	18
Corpus Christi, Tex.	13	14
Dallas, Tex.	18	15
Houston, Tex.	17	19
Richmond, Va.	15	15
Washington, D.C.	11	13
Wichita Falls, Tex.	6	14
North		
Albany, N.Y.	3	3
Atlantic City, N.J.	5	15
Chicago, Ill.	13	16
Detroit, Mich.	15	20
Grand Rapids, Mich.	3	4
Lancaster, Pa.	2	1
Madison, Wis.	2	2
Pittsfield, Mass.	1	1
South Bend, Ind.	6	8
Syracuse, N.Y.	4	4
West		
Boise, Idaho	5	4
Denver, Colo.	8	7
Fresno, Calif.	8	13
Honolulu, Hawaii	4	9
Kansas City, Mo.	13	12
Sacramento, Calif.	6	7
St. Louis, Mo.	15	14
San Francisco, Calif.	8	12
Seattle, Wash.	4	6
Vallejo, Calif.	4	9

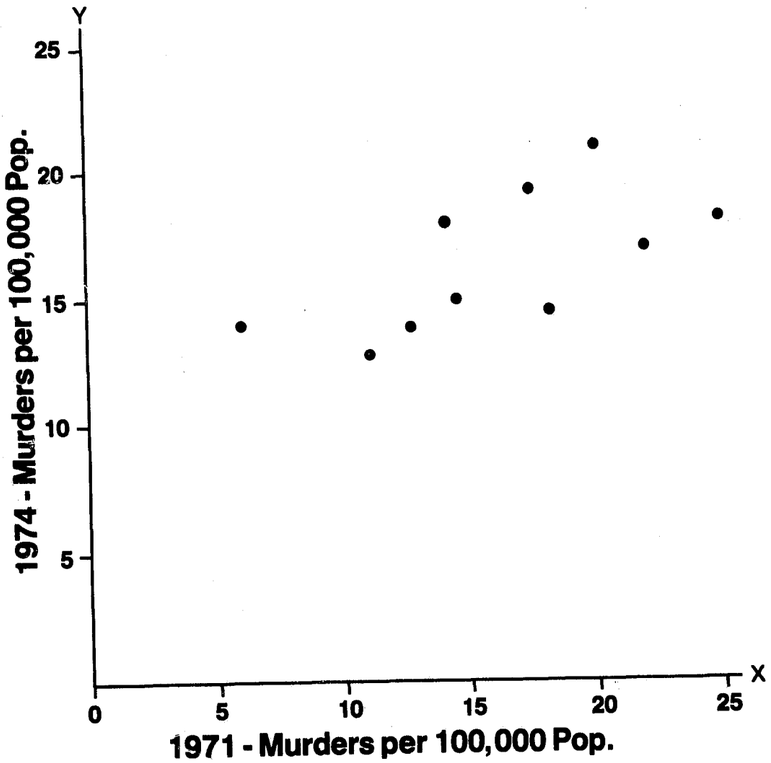
*Rates represent the number of murders per 100,000 population rounded to nearest whole number.

Sources: Sourcebook, 1976; also, Mendenhall, Ott and Larson. Statistics for the Social Sciences, 1975.

WORKSHEET

A. Plot the data:

MURDER RATES FOR TEN CITIES, 1971 & 1974



Source: Sourcebook, 1976

WORKSHEET

A. Calculate r

1. Prepare Matrix

CITY	X	Y	XY	X^2	Y^2
1	20	21	420	400	441
2	22	17	374	484	289
3	14	18	252	196	324
4	25	18	450	625	324
5	13	14	182	169	196
6	18	15	270	324	225
7	17	19	323	289	361
8	15	15	225	225	225
9	11	13	143	121	169
10	6	14	84	36	196
Σ	161	164	2723	2869	2750

2. $(\Sigma X)^2 = 25921$

   $(\Sigma Y)^2 = 26896$

3. $$r = \frac{N\Sigma XY - (\Sigma X)(\Sigma Y)}{\sqrt{N\Sigma X^2 - (\Sigma X)^2}\sqrt{N\Sigma Y^2 - (\Sigma Y)^2}}$$

$$r = \frac{10\,(2723) - (161)(164)}{\sqrt{10(2869) - (161)^2}\sqrt{10(2750) - (164)^2}}$$

$r = .639$

4. Table $r = .632$ ($d.f. = n-2 = 8$, $\alpha = .05$)

EXERCISE #4

CORRELATION COEFFICIENT

PURPOSE

To give the participants an opportunity to calculate and interpret a correlation coefficient.

INSTRUCTIONS

A. Prepare a scattergram.

B. Calculate and interpret the correlation coefficient between population density and larceny offenses for 13 counties in Florida.

C. Determine the significance of r. (Refer to the V.A. 5-7 for critical values of r.)

EXERCISE #4

DATA SET

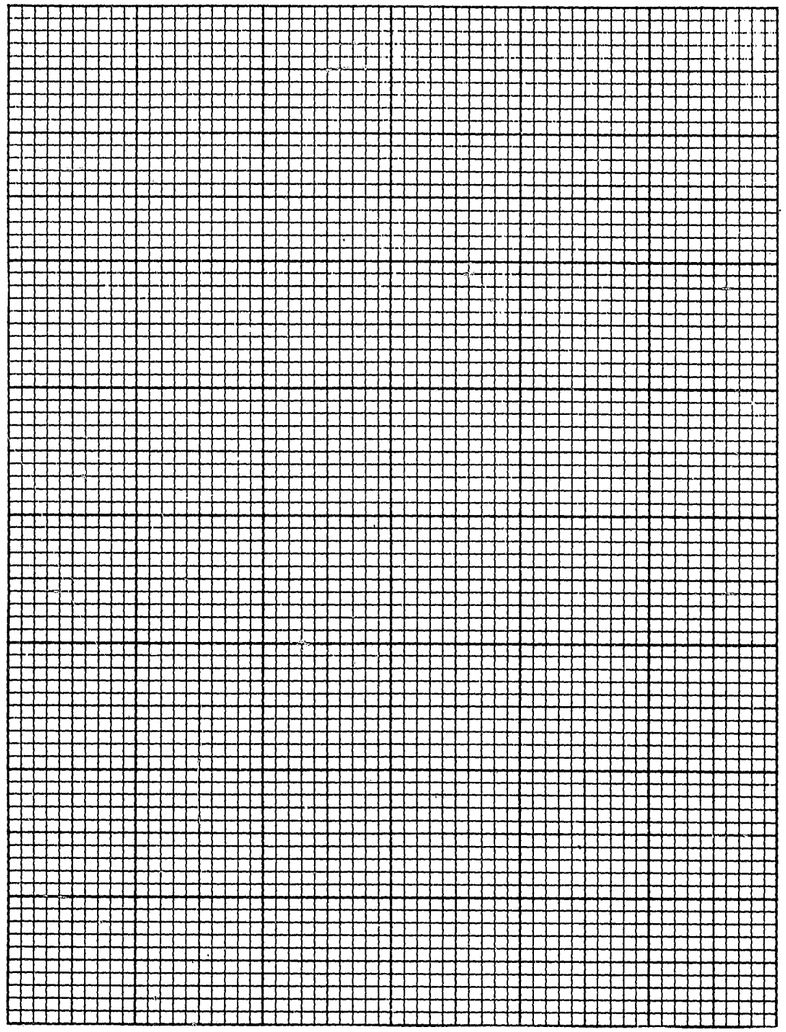
Table 1. Reported Larceny by Population Density
Thirteen Florida Counties, 1977

COUNTY	POPULATION PER SQ. MILE 7-1-77	REPORTED LARCENY OFFENSES
1. Alachua	146	5,740
2. Duval	748	21,645
3. Hillsborough	581	25,040
4. Orange	467	17,920
5. Polk	151	10,750
6. Leon	202	5,495
7. Volusia	206	11,700
8. Seminole	466	2,930
9. Escambia	345	10,215
10. Sarasota	291	5,840
11. Brevard	252	9,085
12. Lee	220	4,775
13. Palm Beach	250	20,830

Source: FBI, UCR, 1978

WORKSHEET

A. Prepare a scattergram.



EXERCISE #4

WORKSHEET

B. Develop worksheet and calculate required values

COUNTY	X	Y (In hundreds)	XY	X^2	Y^2
1	146	57	8,322	21,316	3,249
2	748	217			
3	581	250			
4	467	179			
5	151	108			
6	202	55			
7	206	117			
8	466	29			
9	345	102			
10	291	58			
11	252	91			
12	220	48			
13	250	208			
Σ					

EXERCISE #4

C. Substitute in formula

$$r = \frac{N\Sigma XY - (\Sigma X)(\Sigma Y)}{\sqrt{N(\Sigma X^2) - (\Sigma X)^2}\sqrt{N(\Sigma Y^2) - (\Sigma Y)^2}}$$

$r =$

D. Test Significance (d.f. = n-2 = $\alpha = .05$, $r =$)

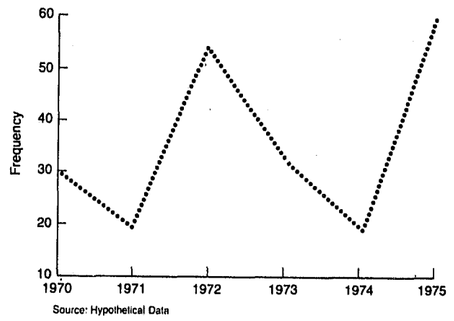
EXERCISE #4

IV. REGRESSION

A. Time Series Data

V.A. (5-8):

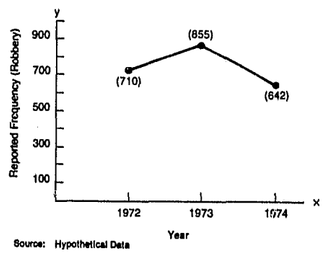
HOMICIDE: FIVE-YEAR TREND FOR CHAOS CITY, 1970–1975



Source: Hypothetical Data

V.A. (5-9):

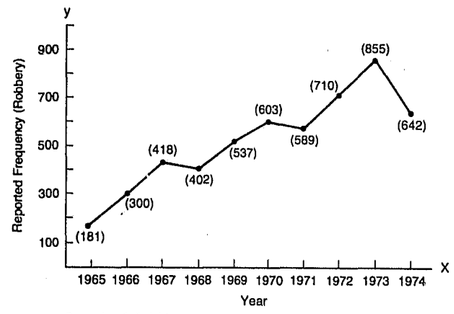
THREE YEAR TIME SERIES OF ANNUAL ROBBERY DATA, CHAOS CITY, 1971–1974



Source: Hypothetical Data

V.A. (5-10):

TEN YEAR TIME SERIES OF ANNUAL ROBBERY DATA, CHAOS CITY, 1965–1974



Source: hypothetical data

V.A. (5-11):

Average Homicide Rates for Twenty-Three American Cities, 1860 - 1920



Source: University of Michigan, National Criminal Justice Archives, Based on Official Police Records in 23 American Cities, 1978.

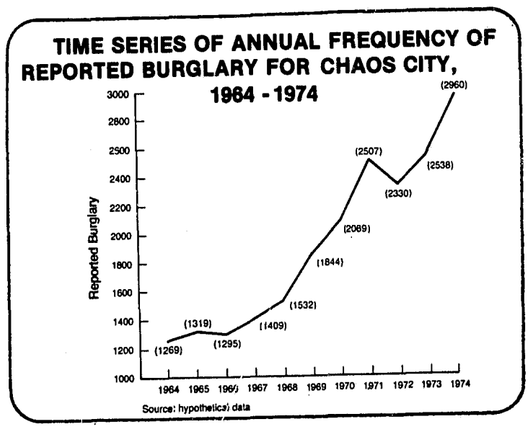
B. Visual Estimation of Regression Line.

+ Procedures.

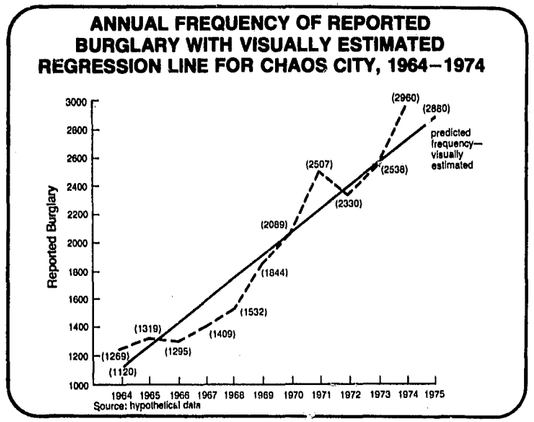
- The first step is to fit a straight line through the time series which minimizes the distance between the data and the line.

- Step two is to extend the line and "read" the resulting point estimate of a future value for the measure.

V.A. (5-12):



V.A. (5-13):



C. Least Squares Regression

+ Purpose

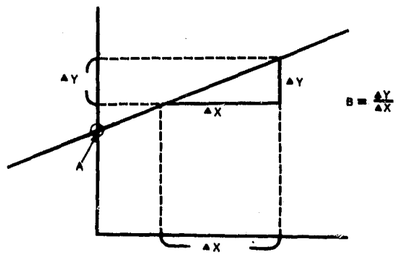
  - To aid in forecasting where there are trends in time series data.

  - To measure "best fit" for an estimating line.

+ Procedure for algebraically determining a straight line:

V.A. (5-14):

Slope and Y-intercept



V.A. (5-15):

FORMULA FOR REGRESSION COEFFICIENTS

Step 1: $B = \frac{N\Sigma XY - (\Sigma X)(\Sigma Y)}{N\Sigma X^2 - (\Sigma X)^2}$

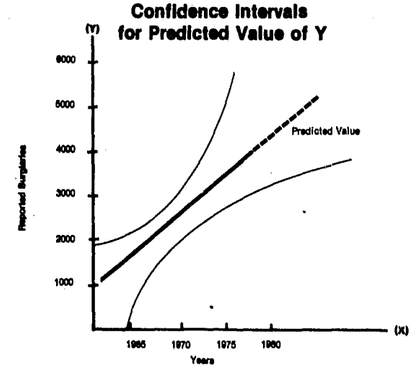
Step 2: $A = \frac{\Sigma Y - B\Sigma X}{N}$

Step 3: $\hat{Y} = A + BX$

+ Assessing the Utility and Accuracy of a Least Squares Prediction

V.A. (5-16):

Confidence Intervals for Predicted Value of Y



Source: Hypothetical Data

EXERCISE #5

REGRESSION

PURPOSE

To give participants the opportunity to make projections using linear regression.

INSTRUCTIONS

A. Using only a ruler and the provided graph paper, visually estimate 1978 and 1979 homicides for Chaos City.

B. Using the formulas provided, calculate A and B, the regression coefficients for these data.

C. On the same piece of graph paper, draw the least squares regression line. Locate the regression line by using the formula $\hat{y} = A + Bx$ for at least two data pairs.

D. Predict the 1978 and 1979 homicides using the regression model calculated.

EXERCISE #5

DATA SET

Table 1. Homicides in Chaos City, 1967 - 1977

YEAR (X)	HOMICIDES (Y)
1967	12
1968	13
1969	12
1970	14
1971	15
1972	18
1973	20
1974	25
1975	23
1976	25
1977	29

Source: FBI, UCR, 1978.

EXERCISE #5

WORKSHEET

A. Complete the following table.

X	Y	XY	X^2
1	12		
2	13		
3	12		
4	14		
5	15		
6	18		
7	20		
8	25		
9	23		
10	25		
11	29		
Σ			

B. Calculate the slope (B)

$$B = \frac{N\Sigma XY - (\Sigma X)(\Sigma Y)}{N\Sigma X^2 - (\Sigma X)^2}$$

B =

B =

EXERCISE #5

WORKSHEET Continued:

C. Calculate the Y intercept (A)

$$A = \frac{\Sigma Y - B(\Sigma X)}{N}$$

D. Substitute calculated values of A and B in equation.

$$\hat{y} = A + BX$$

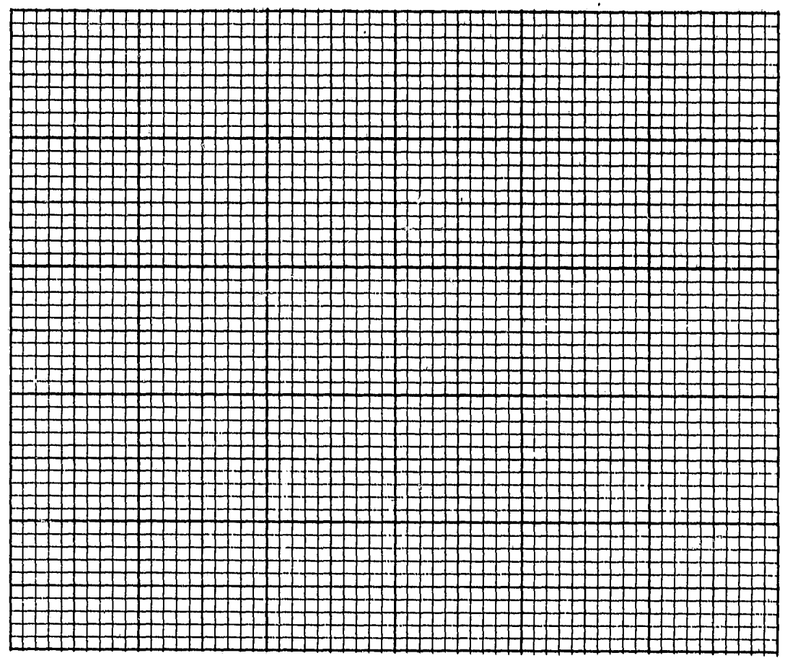
E. Substitute two arbitrary values of x into the equation and plot the line.

1. X $\hat{Y}$

2. Now plot the line on graph paper.

EXERCISE #5

WORKSHEET Continued:



F. Estimate 1979 predicted homicide rate:

1. If 1978 = 12

   1979 =

2. $\hat{Y}_{78}$=

   $\hat{Y}_{78}$=

   $\hat{Y}_{79}$=

   $\hat{Y}_{79}$=

EXERCISE #5

NOTES

V. INTERPRETATION OF FINDINGS

+ The purpose of these statistical techniques is to enable the analyst to draw conclusions about hypotheses postulated during problem specification.

EXERCISE #6

INTERPRETATION OF FINDINGS

PURPOSE

This exercise demonstrates the process of specifying a system problem using the methods just discussed. It provides practice in interpreting the statistics of Modules 3, 4 and 5.

The concern examined in the exercise is parolee recidivism, and specifically the relationship, if any, between parolee recidivism and the caseload of parole officers in Chaos City. Provided are some of the measures and related statistics needed to analyze the problem.

INSTRUCTIONS

A. For the problem you are to:

1. Consider the underlying issues implicit or explicit in the concern.
2. Become familiar with the particular data involved.
3. Consider the validity and reliability of the measures.
4. Consider the adequacy and limitations of the statistical operations performed.

B. In the final product, for each question, you are to:

1. Interpret the statistics, stating their meaning and significance.
2. Note the major possible limitations on the interpretation.
3. Outline other factors bearing on the interpretation.

C. Questions to be answered:

1. Describe the trend in the number of parole recidivists during the past five years.
2. What is the estimate of the parolee recidivism rate for 1978?
3. What is the relationship between the workload per parole officer upon the recidivism rate?
4. If existing workloads (142 cases/officers in 1977) were reduced by 20% what effect would this have on recidivism rates?
5. Is the workload of parole officers related to the incidence of technical violations by parolees?

Each Problem Provides

- Questions
- Concepts and Measures
- Statistics

You Provide:

- Answers
- Interpretations
- Limitations
- Other Factors

EXERCISE #6

Table 1. Selected System Measures, Chaos City, 1973-1977

Parole Sub-system Indicators	1973	1974	1975	1976	1977
A. Number of Parolees					
(1) District A	1160	1090	990	1064	1098
(2) District B	1248	1157	1093	1128	1202
(3) District C	1008	981	985	936	966
Total	3416	3228	3068	3128	3266
B. Parolees with Technical Violations					
(1) District A	358	360	314	295	351
(2) District B	220	195	209	189	210
(3) District C	446	413	391	411	378
Total	1024	968	914	895	939
C. Parolees with no Technical Violations					
(1) District A	802	730	676	769	747
(2) District B	1028	962	884	939	992
(3) District C	562	568	594	525	588
Total	2392	2260	2154	2233	2327
D. County Caseload/ Officer					
(1) District A	111	114	129	120	137
(2) District B	132	128	162	152	172
(3) District C	77	75	120	115	121
Average	107	106	137	129	143
E. Recidivism Rate (number rearrested/100 parolees)	14.8	14.6	18.3	16.2	19.8

Source: Department of Corrections, State of Paradise, Chaos City Office, 1978.

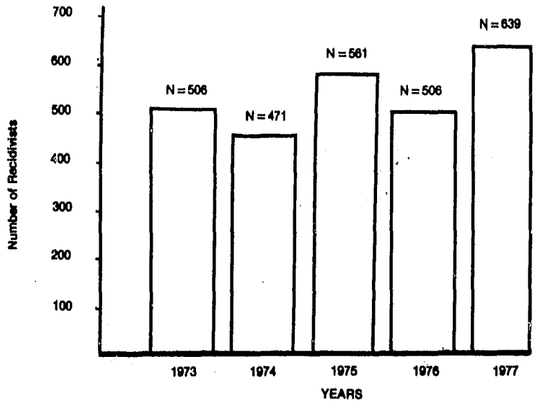
EXERCISE #6

DATA SET

QUESTION #1: Describe the trend in the number of recidivists during the past five years.

Table 2.

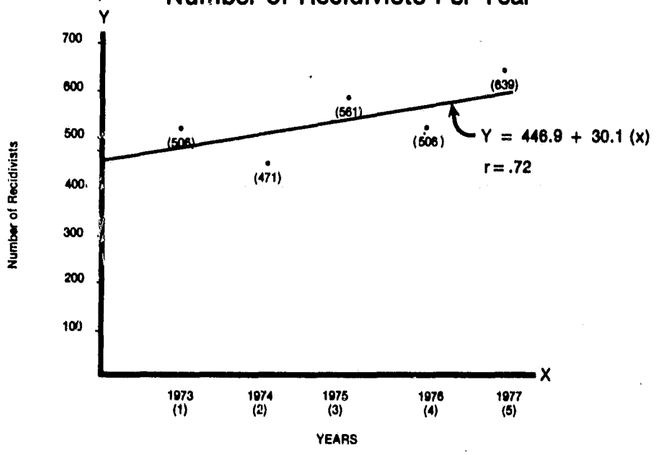
Number of Recidivists Per Year



Source: Chaos City Dept. of Corretions, 1978.

Table 3.

Number of Recidivists Per Year



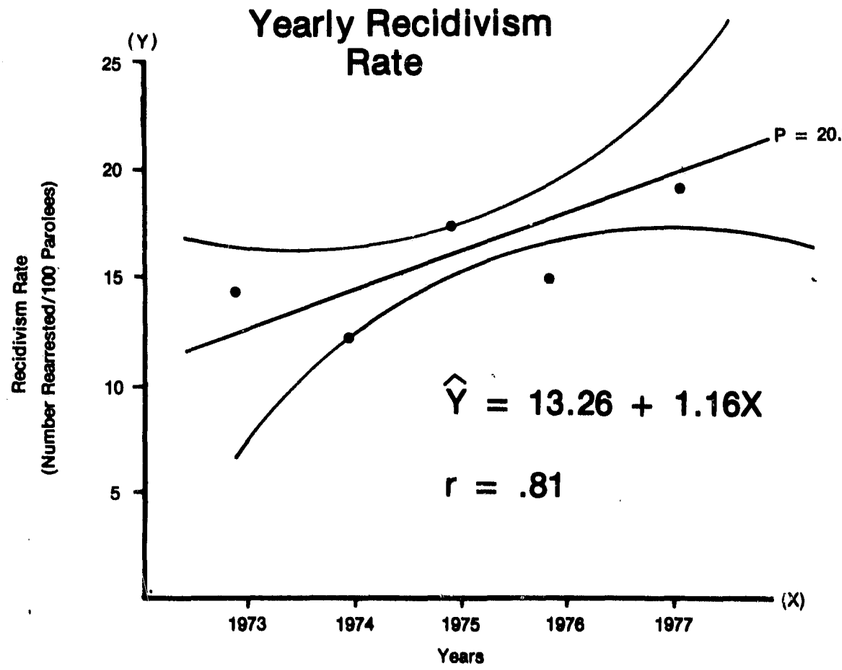
Source: Chaos City Dept. of Corrections

EXERCISE #6

DATA SET

QUESTION #2: Estimate the parolee recidivism rate for 1978.

Table 4.



Source: Chaos City Dept. of Corrections, 1978.

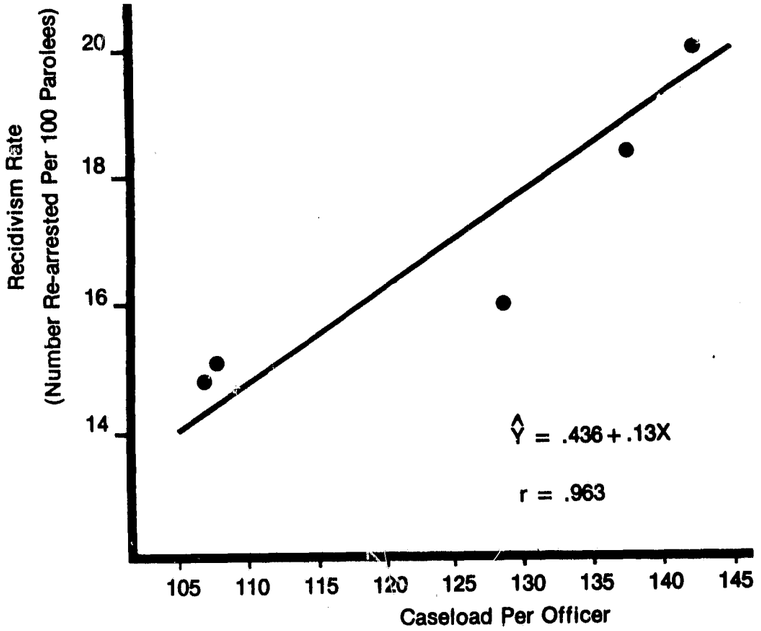
EXERCISE #6

DATA SET

QUESTION #3: What is the relationship between the case load per officer and the recidivism rate?

Table 5.

Recidivism Rate Related to Parole Officer Caseload



Source: Chaos City Dept. of Corrections

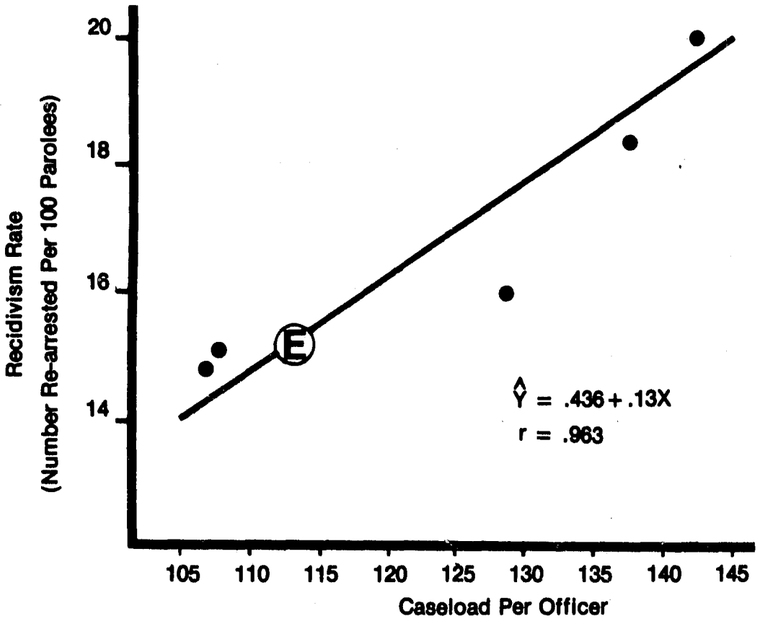
EXERCISE #6

DATA SET

QUESTION #4: If existing workloads were reduced 20%, what effect would this have on recidivism?

Table 6.

Recidivism Rate Related to Parole Officer Caseload



Source: Chaos City Dept. of Corrections

EXERCISE #6

DATA SET

QUESTION #5: Is the workload of parole officers related to the incidence of technical violations by parolees?

Table 7. Incidence of Technical Violations by Parole Officer Caseload

	Caseload			Totals
	Low (70-109)	Medium (110-149)	High (150-189)	
Parolees with Technical Violations	859** (43.2%)	3273 (30.6%)	608 (17.8%)	4740
Parolees with no Technical Violations	1130 (56.8%)	7421 (69.4%)	2815 (82.2%)	11366
Totals	1989 (100%)	10694 (100%)	3423 (100%)	16106*

*Total from rows B and C of Table 1 for all five years.

**Cell counts determined by categorizing parolees by caseload for each district for each year.

a. χ^2 calculated = 412.76

b. χ^2 (.05, 2df.) = 5.99

EXERCISE #6

WORKSHEET

A. Describe the trend in the number of parole recidivists during the past five years.

1. Answer/Interpretation

2. Limitations/Qualifications

3. Other Factors

B. Estimate the parolee recidivism rate for 1978.

1. Answer/Interpretation

2. Limitations/Qualifications

3. Other Factors

C. What affect does the caseload of parole officers have on the recidivism rate?

1. Answer/Interpretation

EXERCISE #6

WORKSHEET (continued)

2. Limitations/Qualifications

3. Other Factors

D. If existing workloads were reduced by 20%, what affect would this have on recidivism?

1. Answer/Interpretation

2. Limitations/Qualifications

3. Other Factors

E. Is the workload of parole officers related to the incidence of technical violations committed by parolees?

1. Answer/Interpretation

2. Limitations/Qualifications

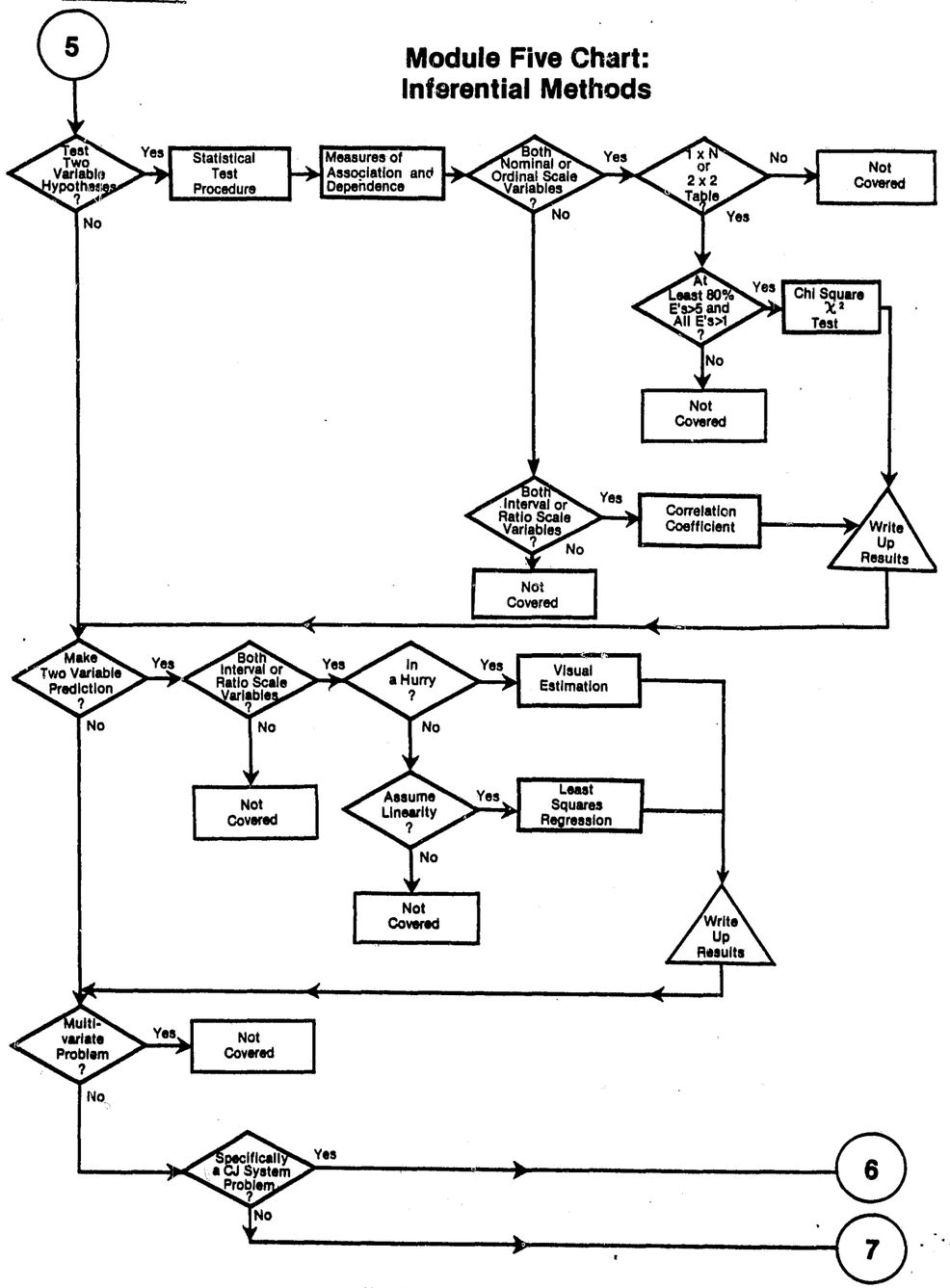
3. Other Factors

EXERCISE #6

NOTES

VI. CONCLUSION

V.A. (5-18):



WORKSHOP ADVANCED CALCULATOR

WORKSHOP

Introduction to the Advanced Calculator

The purpose of this workshop is to introduce the use of an advanced hand calculator as an exploratory and labor saving tool in the analysis process. Specifically, this workshop covers basic operations, statistical operations and the programming capability of the TI55 calculator.

WORKSHOP ADVANCED CALCULATOR

I. BASIC OPERATIONS

A. Arithmetic Operations

Calculate each of the following:

1. 2930 + 5740 =
2. 2930 - 5740 =
3. 2930 ÷ 5740 =
4. 2930 x 5740 =
5. 2930^2 =
6. $\sqrt{2930}$ =

PRESS	DISPLAY	COMMENT
CLR	0	Clears Machine
2930 +	2930.	Enter Data
5740 =	8670.	The Result of the Addition
CLR	0	
2930 -	2930.	Enter Data
5740 =	-2810.	The result of Subtraction
CLR	0	
2930 ÷	2930.	Enter Data
5740 =	0.510453	The Result of Division
CLR	0	
2930 x	2930.	Enter Data
5740 =	16818200.	The Result of Multiplication
CLR	0	
2930 x2	8584900.	The Result of Squaring
CLR	0	
2930 √x	54.129474	The Resulting Square Root

WORKSHOP ADVANCED CALCULATOR

B. Parentheses and Fixed Decimal Control

Calculate to three decimal places the following:

$$\frac{(3X4) + (9X -2)}{\sqrt{(4 + 2) X .5}} =$$

PRESS	DISPLAY	COMMENT
CLR	0	
2nd FIX 3	0.000	Fixes All Subsequent Results at 3 Decimal Places
((3 X 4)	12.000	(3X4) Displayed
÷ (9 X 2 +/-))	-6.000	Value of Numerator
÷ ((4 + 2)	6.000	(4+2) Displayed
X . 5)	3.000	(6X.5) Displayed
√x	1.732	Value of Denominator
=	-3.464	The Result

C. Percent Change

If the homicide rate in Chaos City in 1970 was 14 and the rate in 1977 was 29, what was the percent change in the homicide rate?

PRESS	DISPLAY	COMMENT
CLR	0	
2nd FIX 2	0.00	Set 2 Decimal Places
29 2nd Δ%	29.00	Enter Most Recent Year First
14 =	107.14	Percent Change

D. Constants

The total number of robberies in 1977 for five cities in the State of Paradise was 5130, 4920, 3170, 9200 and 4301. What was the average monthly number of robberies in each city?

PRESS	DISPLAY	COMMENT
CLR		
2nd FIX 0	0	Rounds to Nearest Integer
12 ÷ 2nd const	12	Divides Each Subsequent Entry by 12
5130 =	428.	Average Monthly Number of Robberies in the Five Cities
4920 =	410.	
3170 =	264.	
9200 =	767.	
4301 =	358.	

II. STATISTICAL OPERATIONS

A. Mean and Standard Deviation

Describe the incidence of reported larcenies for the 13 Florida counties presented in Table 1.

PRESS	DISPLAY	COMMENT
2nd CA	0	Clears Entire Machine
2nd FIX . 2	0.00	Set Decimal to 2 Places
5740 Σ+	1.00	Enter First Data Point; Calculator Counts and Displays The Data Points
21645 Σ+	2.00	
25040 Σ+	3.00	
17920 Σ+	4.00	
10750 Σ+	5.00	
5495 Σ+	6.00	
11700 Σ+	7.00	
2930 Σ+	8.00	
10215 Σ+	9.00	
5840 Σ+	10.00	
9085 Σ+	11.00	
4775 Σ+	12.00	
20830 Σ+	13.00	
2nd MEAN	11689.62	Mean
2nd S DEV	7314.83	Standard Deviation
RCL 5	151965.00	Total Number of Larcenies
RCL 7	13.00	Number of Counties

TABLE 1. REPORTED LARCENY BY POPULATION DENSITY FOR THIRTEEN FLORIDA COUNTIES, 1977

COUNTY	POPULATION PER SQ. MILE (X)	REPORTED LARCENY OFFENSES (Y)
Alachua	146	5,740
Duval	748	21,645
Hillsborough	581	25,040
Orange	467	17,920
Polk	151	10,750
Leon	202	5,495
Volusia	206	11,700
Seminole	466	2,930
Escambia	345	10,215
Sarasota	291	5,840
Brevard	252	9,085
Lee	220	4,775
Palm Beach	250	20,830

Source: FBI, UCR, 1978

B. Linear Regression

Discuss the relationship between population density and reported larcenies (See Table 1).

PRESS	DISPLAY	COMMENT
[2nd] [CA]	0	
[2nd] [FIX] 2	0.00	
146 [X⇆Y]	0.00	Enter First X Value
5740 [Σ+]	1.00	Enter First Y Value
748 [X⇆Y]	147.00	Enter X_2
21645 [Σ+]	2.00	Enter Y_2
Continue for remaining data points		
220 [X⇆Y]	253.00	Enter X_{12}
4775 [Σ+]	12.00	Enter Y_{12}
250 [X⇆Y]	221.00	Enter X_{13}
20830 [Σ+]	13.00	Enter Y_{13} (Last Data Point)
[2nd] [MEAN]	11689.62	Mean of Y
[÷] [INV] [2nd] [MEAN]	332.69	Mean of X
[2nd] [S. DEV.]	7314.83	Standard Deviation of Y
[÷] [INV] [2nd] [S. DEV.]	182.32	Standard Deviation of X
[2nd] [CORR]	0.60	Correlation Coefficient
[2nd] [SLOPE]	24.24	Slope of Regression Line
[2nd] [Intcp]	3626.21	Y-Intercept of Regression Line

C. Trend-Line Analysis

Using the data in Table 2, predict the homicide rate in Chaos City for 1978 and 1980. In what year is the homicide rate likely to reach 100?

PRESS	DISPLAY	COMMENT
[2nd] [CA]	0	
[2nd] [FIX] 4	0.0000	
1967 [X⇆Y]	0.0000	Enter First X_1 Value
12 [Σ+]	1.0000	Enter First Y_1 Value
13 [Σ+]	2.0000	Enter Y_2: Calculator Automatically Increases X Value by One for Each Value Entered
12 [Σ+]	3.0000	
14 [Σ+]	4.0000	
15 [Σ+]	5.0000	
18 [Σ+]	6.0000	
20 [Σ+]	7.0000	
25 [Σ+]	8.0000	
23 [Σ+]	9.0000	
25 [Σ+]	10.0000	
29 [Σ+]	11.0000	1977 Y_{10} Value
[2nd] [CORR] [x^2]	.9298	Coefficient of Determination
1978 [2nd] [y^1]	29.2545	Homicide Rate Estimate for 1978
1980 [2nd] [y^1]	32.7636	Homicide Rate Estimate for 1980
100 [2nd] [x^1]	2018.3212	2018 Estimated Year
[2nd] [SLOPE]	1.7545	Slope
[2nd] [Intcp]	-3441.2365	Y-Intercept

TABLE 2. MURDERS IN CHAOS CITY, 1964 - 1977

YEAR (X)	HOMICIDE RATE (Y)
1967	12
1968	13
1969	12
1970	14
1971	15
1972	18
1973	20
1974	25
1975	23
1976	25
1977	29

Source: Hypothetical Data

CONTINUED

8 OF 14

WORKSHOP ADVANCED CALCULATOR

III. PROGRAMMING

A. Programming Keys

Develop a program to evaluate the regression equation:

$$Y = 1.7545 X - 3441$$

PRESS	DISPLAY	COMMENT
2nd CA	0	
2nd FIX 2	0.00	
2nd LRN	00 00	In Learn Mode
X 1.7545	07 00	
= 3441 =	13 00	
2nd R/S 2nd RST	15 00	
2nd LRN	0	End of Program
2nd RST	0.00	Reset to 0
1980 2nd R/S	32.91	Homicide Rate Estimates for the Period 1980-1985
1981 2nd R/S	34.66	
1982 2nd R/S	36.42	
1983 2nd R/S	38.17	
1984 2nd R/S	39.93	
1985 2nd R/S	41.68	

MODULE 6
DATA INTERPRETATION -- SYSTEM

The purpose of Module 6 is to introduce system analysis and to illustrate the use of the system variables and related measures in analyzing the criminal justice system.

The instructor should define carefully, using appropriate examples and illustrations, the concepts, variables and measures introduced in this module. The Walk-Through illustration of input-output flow analysis should be used to discuss application of system analysis.

OBJECTIVES

1. To describe criminal justice system problems using:
   a. System Concepts, Variables and Measures
   b. Flow Charts
   c. Descriptive Methods
2. To analyze the system using:
   a. System Concepts, Variables and Measures
   b. Comparative Methods
   c. Input/Output Flow Analysis

NOTES

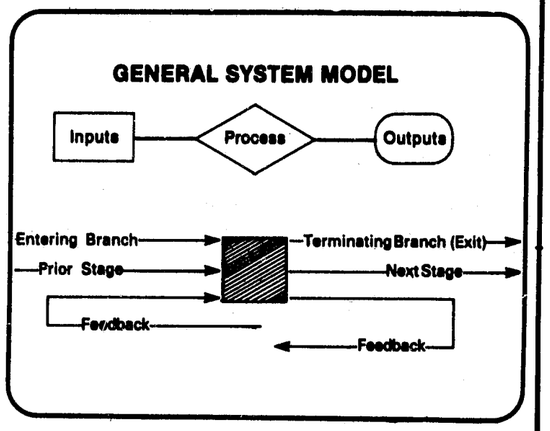
I. INTRODUCTION

A. What is a System?

+ A system is "a regularly interacting or interdependent group of items forming a unified whole."

- Common goals.
- Dynamic character.
- Input/output model.

V.A. (6-1):



NOTES

B. What is the Criminal Justice System?

+ The criminal justice system is a collection of agencies that perform an enormous complex of operations. These activities are organized in a sequential manner in response to the problems created by the commission of criminal acts.

+ The purpose of the criminal justice system is to deal with crime and delinquency. Each component pursues specific objectives which may or may not be consistent with other components of the system.

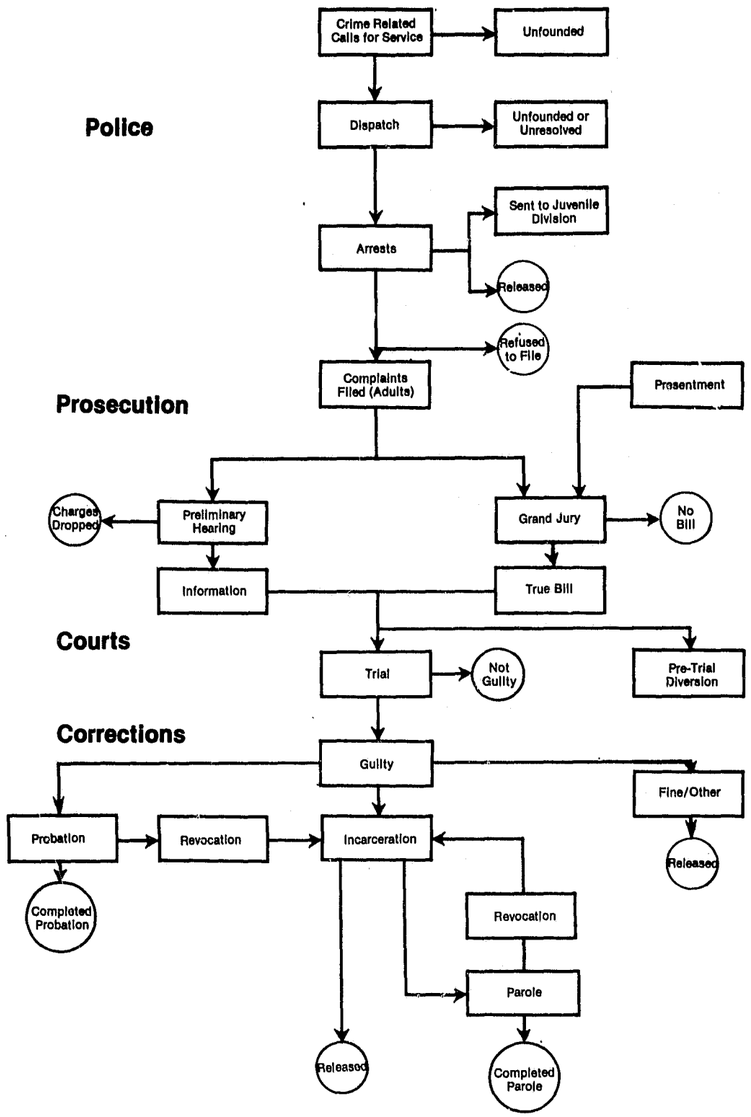
+ In systems terms, the elements of the criminal justice system are the offender and other individuals who have been arrested for the commission of criminal acts, criminal justice agencies and their personnel, equipment and facilities.

  The criminal justice system produces a flow of individuals directed toward a speedy and just disposition. This flow is caused by the criminal acts committed and the calls for service they generate.

+ The components of the criminal justice system are interdependent.

+ One way of viewing the criminal justice system, emphasizing its components, is presented in Exhibit 1.

Exhibit 1. The Criminal Justice System



NOTES

C. How can the Criminal Justice System be Analyzed?

+ Flow charts.

+ Input/Output analysis.

+ System analysis techniques using the tools taught in Modules 3, 4, and 5.

II. FLOW CHARTS

A. Uses of Flow Charts.

+ Aid to Reader or Audience.

+ It clarifies thinking.

- Identify gaps in knowledge.

- Tighten logic.

B. Types of Flow Charts.

+ Process flow chart.

- Physical flow of offenders from one component to another is shown.

- Exhibit 1 provided an example.

+ Operations charts.

- Shows essential operational aspects of the system.

- Exhibit 2 provides an example.

- Note that:

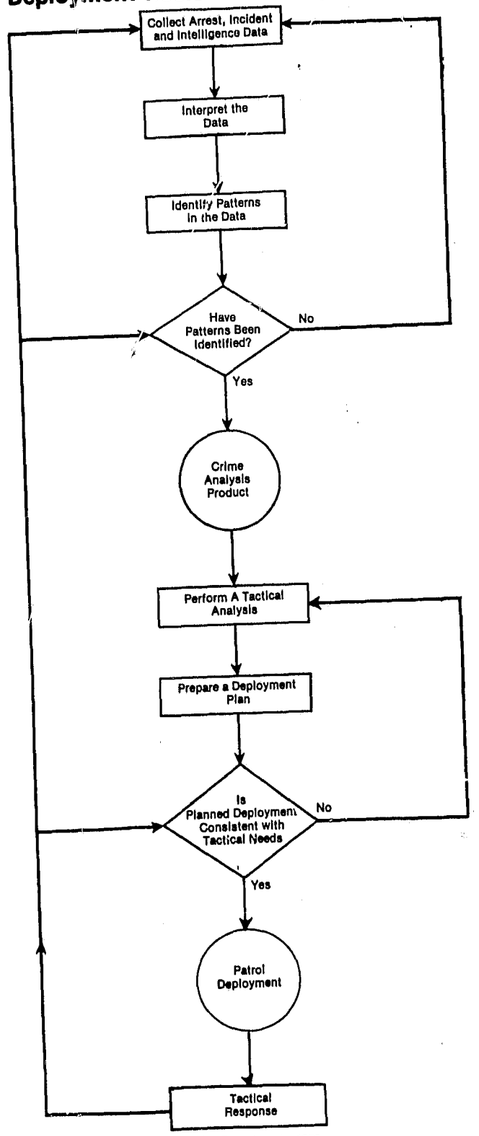
A rectangle should be used to present an instruction or information.

A diamond-shape is used to indicate decision points, or places where choices must be made.

Arrows indicate the direction of the flow.

Circles, ovals, or triangles indicate products or end points in the flow.

Exhibit 2. Operations Flow Chart, Deployment Decision-Making System

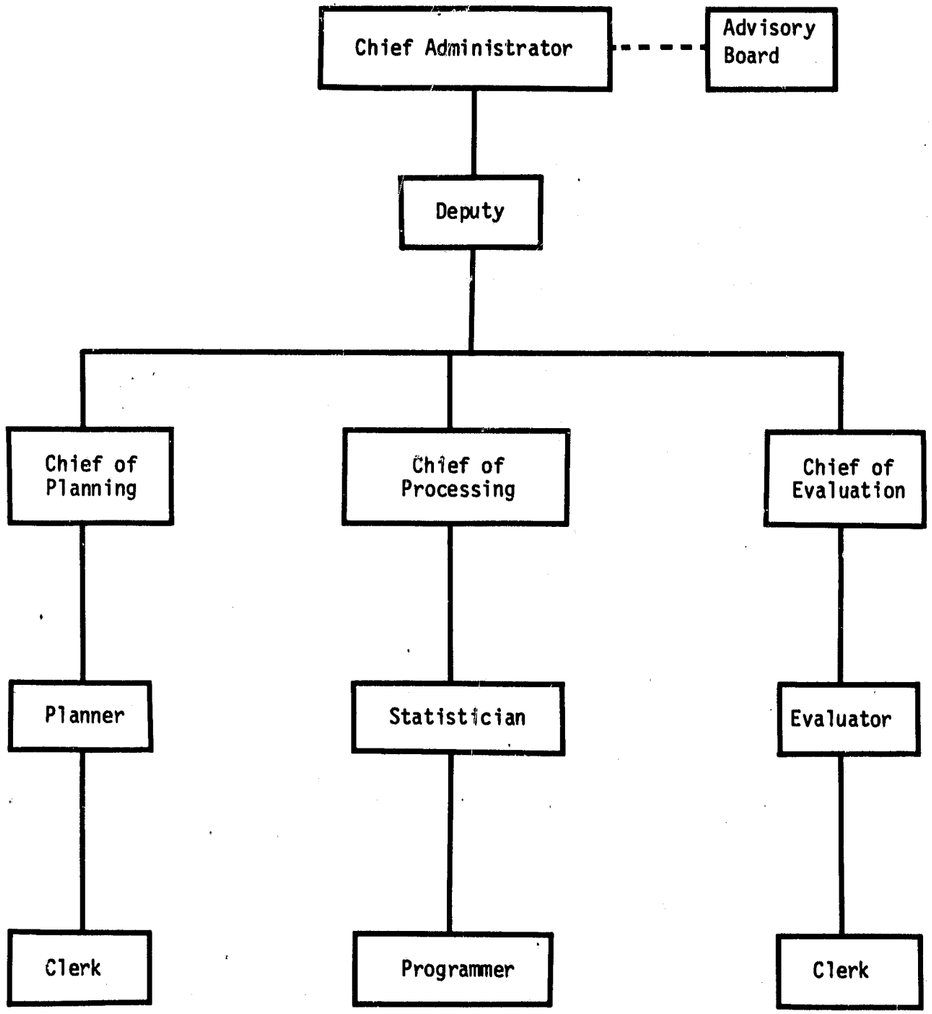


Source: Chaos City Police Department, 1978.

NOTES

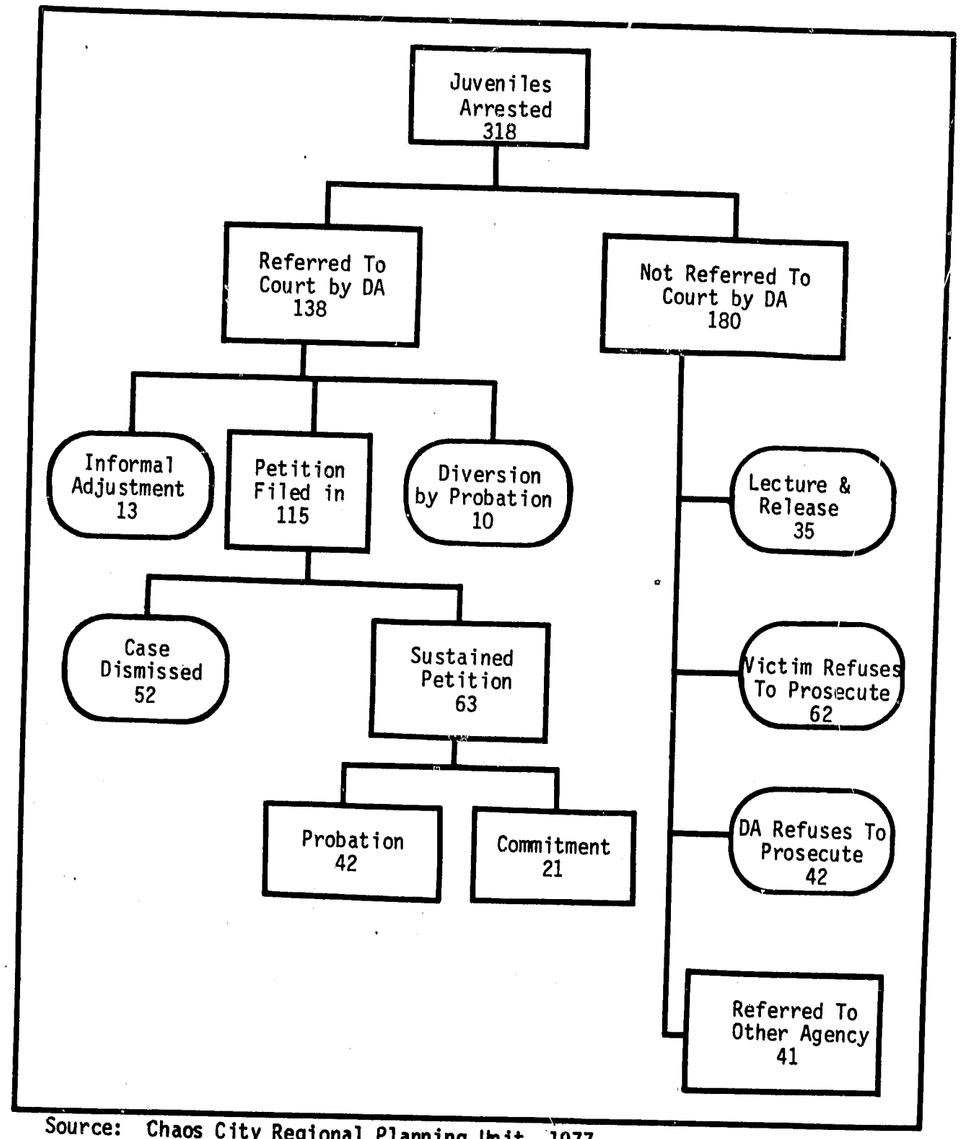
+ Dependency Chains.
  - Portrays a sequence of events.
  - Dependence of various events and not flows is emphasized.
  - Examples of a dependency chain are PERT Charts.
+ Organizational Patterns.
  - Exhibit 3 is an organizational chart for Chaos City's Regional Planning Unit.
  - Shows relationships and flows of authority and responsibility in an organization.
  - Generally, solid lines are used to indicate authority and responsibility. Dotted lines are used to indicate "confer and advise."
+ Convergence/divergence flow charts.
  - A statistical flow of offenders may diverge or converge leading to one or several outcomes. This is the principle of a disposition tree.
  - Disposition trees are a type of widely used flow chart in criminal justice.
  - See Exhibit 4 for an example of a disposition tree.
  - The use and interpretation of various types of disposition trees is covered in the next section.

Exhibit 3. Organizational Chart, Chaos City, Regional Planning Unit



Source: Chaos City, Regional Planning Unit, 1977.

Exhibit 4. Divergence Flow Chart
Assault Arrests (Juveniles Only) Chaos City, 1977



Source: Chaos City Regional Planning Unit, 1977.

FLOW CHARTS

PURPOSE

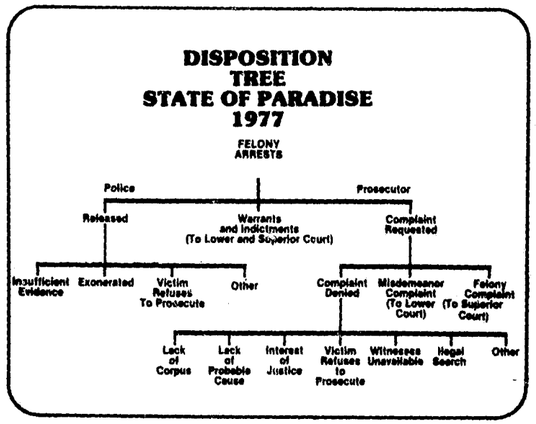
To illustrate the construction, uses, and interpretation of flow charts with related summary tabulations of offender flows.

WALK-THROUGH 'K'

DATA SET/WORKSHEET

A. Disposition Tree

V.A. (6-2):

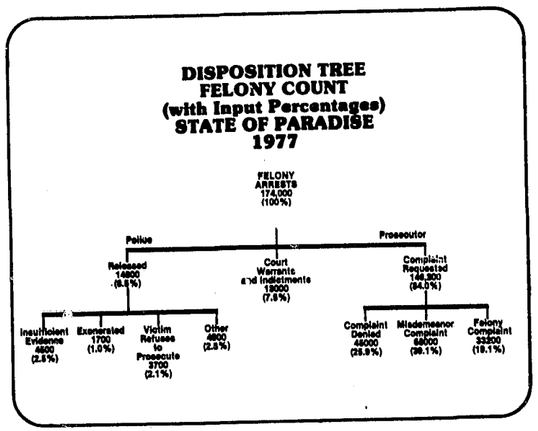


WALK-THROUGH 'K'

DATA SET/WORKSHEET (Continued)

B. Disposition tree with input percentages.

V.A. (6-3):



WALK-THROUGH 'K'

Table 1. Disposition of Felony Arrests
Comparison of State and County Agencies
(With Input Percentages)

	STATEWIDE (56 COUNTIES)	CHAOS COUNTY	COUNTY ARRESTING AGENCIES						COUNTY LESS AGENCY A
			AGENCY A	AGENCY B	AGENCY C	AGENCY D	AGENCY E	AGENCY F	
Total felony arrests dispositions	174,069	19,698	12,351	3,793	1,326	684	506	1,038	7,347
Not convicted - number - (% total)	89,820 (51.6)	11,684 (59.3)	7,622 (61.7)	2,211 (58.3)	676 (51.0)	330 (48.3)	246 (48.6)	599 (57.7)	4,062 (55.3)
• Law enforcement releases	8.5	13.9	(20.1)	0.7	8.6	7.3	6.7	5.3	2.6
• Complaints denied	25.9	13.1	(14.9)	11.0	18.0	17.0	14.8	8.7	11.4
• Lower court	14.4	32.1	24.4	44.3	22.9	22.5	24.9	43.2	35.9
• Superior court	4.0	.2	2.3	2.3	1.5	1.5	2.2	0.5	2.3
Convicted - number - (% total)	84,249 (47.2)	8,014 (40.7)	4,729 (38.2)	1,582 (41.7)	650 (49.0)	354 (51.7)	260 (51.3)	439 (42.4)	3,285 (44.7)
• Lower court	28.0	24.6	(19.6)	27.1	35.0	33.7	28.0	33.3	30.8
• Superior court	19.2	16.1	(18.6)	14.6	14.0	18.0	23.3	9.1	17.0

Source: Chaos County, 1977.

r = .94

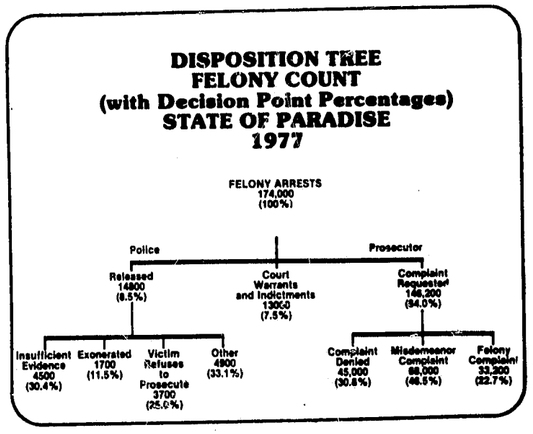
r = .66

WALK-THROUGH 'K'

DATA SET/WORKSHEET (Continued)

C. Disposition tree with decision points.

V.A. (6-4)



WALK-THROUGH 'K'

Table 2. Disposition Of Felony Arrests/Comparison of County Agencies (With Decision Point Percentages) Chaos County - 1977

DISPOSITION	CHAOS COUNTY	SELECTED COUNTY ARRESTING AGENCIES						COUNTY LESS
		AGENCY A	AGENCY B	AGENCY C	AGENCY D	AGENCY E	AGENCY F	AGENCY A
Total felony arrest dispositions. . .	19,698	12,351	3,793	1,326	684	506	1,038	7,347
Law enforcement releases.	2,757	3,482	27	114	50	34	32	257
• Insufficient evidence	76.4	(81.9)	22.2	32.5	(56.0)	5.9	0.0	35.4
• Exonerated.	0.8	0.3	7.4	4.4	0.0	8.0	(31.3)	4.3
• Victim refuses to prosecute . . .	12.6	12.3	7.4	20.2	16.0	2.9	28.1	14.3
• Further investigation	3.7	3.5	3.7	9.6	6.0	0.0	40.6	5.8
• Unspecified, other.	6.5	2.0	(59.3)	33.3	22.0	(82.4)	0.0	40.0

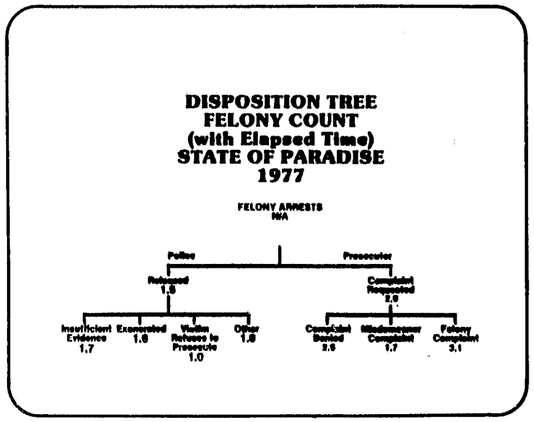
Source: Chaos County, 1977.

WALK-THROUGH 'K'

DATA SET/WORKSHEET (Continued)

D. Disposition tree with elapsed times.

V.A. (6-5):



E. Limits and uses of transaction data and summary tabulations.

WALK-THROUGH 'K'

DATA SET/WORKSHEET (Continued)

Table 3. Uses Of Transaction Statistics/Disposition Trees

SUMMARY

* Traces the flow of offenders through the criminal justice system.
* Aids in developing explanations of the observed characteristics when backlogs occur.
* Permits measurement of the recirculation of offenders.
* Helps in performing input-output analysis.
* Helps in monitoring the system.

LIMITS OF SUMMARY TABULATIONS

* Can not be used to identify the impact of system changes.
* Can not be used to elaborate the process or "dynamic" aspects of the criminal justice system.

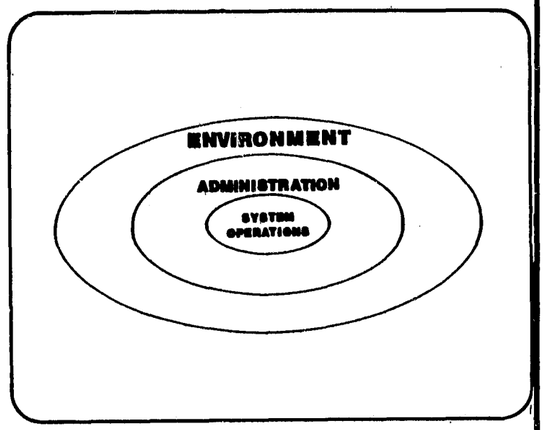
NOTES

III. SYSTEM CONCEPTS

A. Overview of System Concepts.

+ Environment, administration and system operations are difficult concepts to specify.

V.A. (6-6):



B. Environment.

C. Administration.

D. Systems Operations.

Exhibit 5. Environment

I. THE CONCEPT CONSIDERS:

What factors outside the system affect the system?

II. CONCEPTUAL DEFINITION:

External interactions with the criminal justice system. Crime and community characteristics which affect and are affected by the criminal justice system.

III. EXAMPLES:

Community Characteristics	Crime Characteristics
Population	Type
Population Change	Magnitude
Population Density	Rate of Change
Racial Composition	Offender Characteristics
Households Receiving Aid to Families with Dependent Children	Victim Characteristics
Unemployment Rate	Crime Characteristics
Juvenile Population	
Attitudies	

Exhibit 6. Administration

I. THE CONCEPT CONSIDERS:

How is the work to be organized and managed? What are the goals and standards?

II. CONCEPTUAL DEFINITION:

Organization, management and operations of the criminal justice system, components and agencies.

III. EXAMPLES:

- Agency Goals and Standards.
- Agency Policies and Procedures.
- Agency Organization.
- Personnel Skill and Training Level.

Exhibit 7. System Operations

I. THE CONCEPT CONSIDERS:

How does the system function and how do components within the system interrelate?

II. CONCEPTUAL DEFINITION:

The activities of a regularly interreacting group of agencies forming a unified whole and with a common goal.

III. EXAMPLES:

- Water and Sewer System
- School System
- State Corrections System
- State University System
- Interstate Highway
- Postal System
- Criminal Justice System

NOTES

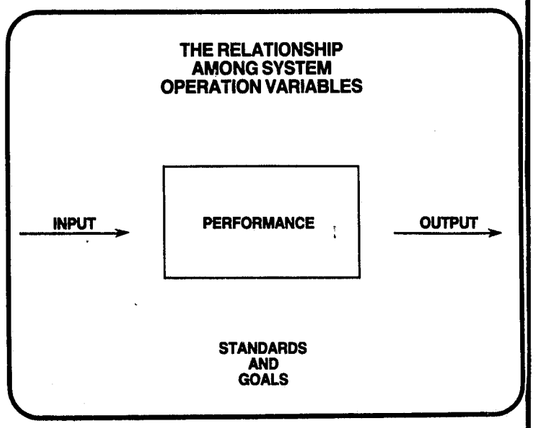
E. System Operations Variables and Measures

+ As indicated in Exhibit #7, the concept of System Operations can be further defined as the variables:

  - Standards
  - Goals
  - Input
  - Performance
  - Output

+ Consider the relationship of these variables in an input/output model.

V.A. (6-7)



NOTES

+ The measures which can be used to operationalize Systems Operations variables are illustrated in the chart provided in V. A. 6-8.

V.A. (6-8):

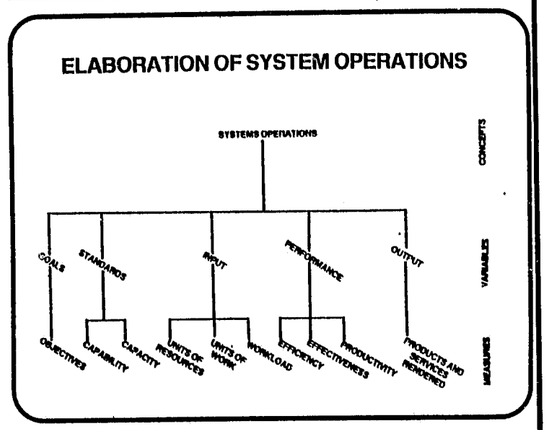


Exhibit 8. Standards

I. THE VARIABLE CONSIDERS:

The ideal conditions for System Operations

II. VARIABLE DEFINITION:

An established criteria by which qualitative and quantitative judgements can be made.

III. MEASURES:

Standards are usually qualitative and or quantitative criteria for system performance which have external validity. Two commonly used performance standards are capability and capacity.

A. Capability is the expected level of output at a planned level of productivity with a specified amount of resources in a given time period.

Capability = Resource Measure X Productivity Standard

B. Capacity is the potential output when productivity is maximized with a specified level of resources in a given time period.

Capacity = Resource Measure X Maximum Productivity Standard

IV. EXAMPLES:

A. Capability: Assuming a productivity standard of 1,800 cases per judge per year and a court with 15 judges, the capability of the court would be 27,000 cases per year.

15 judges X 1800 cases/judges = 27,000 cases/year

B. Capacity: The minumum case cost during 1977 was determined to be $210 and this figure is assumed to be a reasonable indicator of maximum productivity. Given an annual budget of $6,500,000 and assuming a maximum productivity of $210 per case, 30,952 cases could be processed.

$6,500,000 $210/case = 30,952 cases

Exhibit 9. Goals

I. THE VARIABLE CONSIDERS:

Expectations for system performance.

II. VARIABLE DEFINITION:

A desired future state; plans expressed as results to be achieved, usually general and not time limited.

III. MEASURES:

Goals are made measurable when expressed as objectives.

An objective is a specific condition to be attained by a specific set of activities, stated in time-limited and measurable terms.

IV. EXAMPLE:

The Paradise Department of Corrections should provide high quality mental health care at all correctional institutions.

Exhibit 10. Input

I. THE VARIABLE CONSIDERS:

What will be processed?

II. VARIABLE DEFINITION:

The work to be processed and the resources allocated to enable processing.

III. MEASURES:

There are three common measures of input.

A. Units of Resources: Units of manpower, funds, and facilities to process work through the criminal justice system or its components.

B. Units of Work: Units of persons, things or endeavors to be processed through the criminal justice system or its components within a specific time period; usually some level of priority has been assigned to the work.

C. Workload: The units of work to be processed per unit of resource in a given amount of time; usually expressed as a rate that compares measures of work to be processed with measures of resources budgeted.

$$\text{Workload} = \frac{\text{Work Measure}}{\text{Resource Measure}}$$

IV. EXAMPLES:

A. Units of Resources for an Anti-fencing Unit:

Budget = $60,000
Personnel = five full time sworn officers and one secretary.
Equipment = three police cars; one video camera/recorder, etc.

B. Units of Work: 150 motor vehicle accidents to investigate in January.

C. Workload: 30 investigations per officer to be investigated in January.

Exhibit 11. Performance

I. THE VARIABLE CONSIDERS:

The activities of organizations, units and individuals.

II. VARIABLE DEFINITION:

The execution of policy, the conduct of operations and the accomplishment of tasks.

III. MEASURES:

There are three common measures of performance:

A. Productivity: The amount of work that can be produced or processed with specified resources in a given amount of time. Productivity is usually expressed as a rate that compares measures of output with measures of resources budgeted or consumed per unit of time.

$$\text{Productivity} = \frac{\text{Output Measure}}{\text{Resource Measure}}$$

B. Efficiency: The amount of work to be done which is accomplished in a specified time. Generally, efficiency is expressed as a ratio of output to work. Efficiency measures are usually expressed as a percentage or as a percent change and in directional or comparative terms, i.e., more, less, the same.

$$\text{Efficiency} = \frac{\text{Output Measure}}{\text{Work Measure}}$$

C. Effectiveness: The extent to which standards, goals, objectives and estimates are achieved. Measures of effectiveness compare the output achieved to a planned output or standard and are usually expressed as rates or percentages.

$$\text{Effectiveness} = \frac{\text{Output Measures}}{\text{Standard}}$$

IV. EXAMPLES

A. Productivity: In December a five man squad investigated 80 accidents.

$$\text{Productivity} = \frac{\text{80 accidents}}{\text{5 officers}} = \text{16 accidents per officer}$$

B. Efficiency: In 1978, the Chaos City Police Department followed up 10,989 out of a total of 46,560 reported larceny thefts.

$$\text{Efficiency} = \frac{\text{10,989 larceny thefts follow-ups during 1978}}{\text{46,560 reported larceny thefts during 1978}} = 23.6\%$$

C. Effectiveness: The objective of a police department is to establish a response time on all non-emergency calls at not greater than 6 minutes. During the last year a sample of calls (n-685) was taken. 620 of those calls had response times of 6 minutes or less.

$$\text{Effectiveness} = \frac{\text{620 Responses w/in 6 minutes}}{\text{685 calls requiring response within 6 minutes}} = 90.5\%$$

Exhibit 12. Output

I. THE VARIABLE CONSIDERS:

The products and services produced.

II. VARIABLE DEFINITION:

The number of workload units processed or produced at the end of specified time period.

III. MEASURES:

Output is generally measured in terms of units produced or services rendered in a specified time period.

IV. EXAMPLES:

A. Products: The Prosecuting Attorneys office filed 36 complaints in District Court during January.

B. Services: The Traffic Division investigated 80 accidents in December.

Exhibit 13. Summary of System Concepts, Variables and Measures

I. ENVIRONMENT:

What factors outside the system affect the system?

II. ADMINISTRATION:

How is the work to be organized and managed? What are the goals and standards?

III. SYSTEM OPERATIONS:

How does the system function and how do components within the system interrelate?

A. Goals: What is expected?

1. Objectives: What is expected in a given time period?

B. Standards: What is ideal?

1. Capability: How much is expected to be done?

2. Capacity: How much can be done using maximum potential?

C. Input: What is to be processed?

1. Resources: What is available to work with?

2. Work: What is to be done?

3. Workload: How much has to be done per unit of resources?

D. Performance: What are the results?

1. Productivity: What results are accomplished with the resources used?

2. Efficiency: How much of the work to be done is done?

3. Effectiveness: How does the result compare to goals, standards, objectives or estimates?

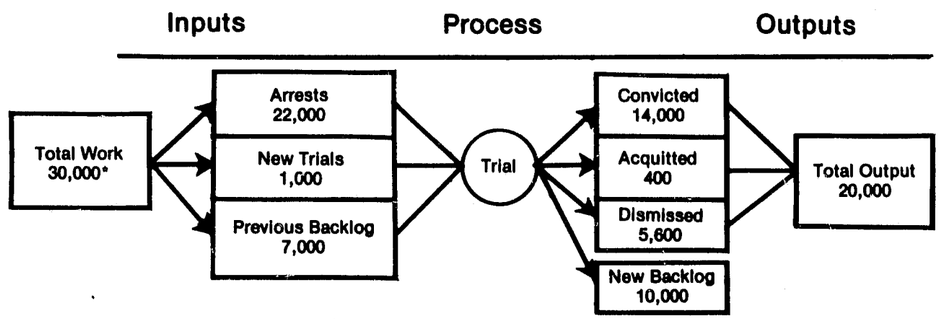
E. Output: What has been done?

FLOW ANALYSIS

PURPOSE

This Walk-Through illustrates input/output flow analysis using indexes and provides an example of the analysis of systems operations. It demonstrates the relationships among system variables and demonstrates how to measure and interpret these variables.

Table 1. Input/Output Flow Model



*All measures are "cases"

WALK-THROUGH 'L'

DATA SET/WORKSHEET

A. Resources

1. 15 Judges
2. 1,600 Hours/Judge/Year
3. 96,000 Minutes/Judge/Year
4. 24,000 Judge/Hours/Year
5. $6.5 Million Budgeted
   $6.0 Million Expended

B. Work/Output

1. Work is 30,000 Cases/Year

2. Output is 20,000 Cases/Year

WALK-THROUGH 'L'

C. Workload (Based on Resource and Work Measures)

1. 2,000 cases per judge per year required to process existing workload

$$WL_1 = \frac{W}{R} = \frac{30,000 \text{ Cases/Year}}{15 \text{ Judges}} = 2,000 \text{ Cases/Judge Year}$$

*2. .8 judge hours per case required to process existing workload

$$WL_2 = \frac{R}{W} = \frac{24,000 \text{ Judge-Hours/Year}}{30,000 \text{ Cases/Year}} = .8 \text{ Judge-Hours/Case (48 minutes)}$$

D. Productivity (Based on Resources & Output Measures)

1. 1,333 Cases/Judge were tried last year.

$$P_1 = \frac{O}{R} = \frac{20,000 \text{ Cases}}{15 \text{ Judges}} = 1,333 \text{ Cases/Judge}$$

*2. $300 per case

$$P_2 = \frac{R}{O} = \frac{\$6.0 \text{ Million}}{20,000 \text{ Cases}} = \$300/\text{Case}$$

*3. 1.2 Judge-Hours per Case (72 minutes)

$$P_3 = \frac{R}{O} = \frac{24,000 \text{ Judge-Hours/Case}}{20,000 \text{ Cases/Year}} = 1.2 \text{ Judge-Hours/Case (72 minutes)}$$

E. Efficiency

1. Based on time series comparison.

Year	1972	1973	1974	1976	1977
Work	28,000	28,500	28,200	29,100	30,000
Output	15,000	14,000	15,050	16,000	20,000

$$\text{Efficiency} = \frac{\text{Output Measure}}{\text{Work Measure}}$$

a. $E_{77} = 66.6\% = \frac{\text{Output}}{\text{Work}} = \frac{20,000}{30,000} \times 100$

$E_{72} = 53.5\% = \frac{\text{Output}}{\text{Work}} = \frac{15,000}{28,000} \times 100$

b. $\frac{66.6 - 53.5}{53.5} = 24.5\%$ improvement in percentage of cases processed in the past five years.

2. Based on inter-agency comparison.

	Chaos Court	State Mean*
Work	30,000	13,000
Output	20,000	11,000

*Based on calculated mean amount of work (in number of trials) and output of 15 criminal courts in the State of Paradise during 1977 (excluding Chaos City).

a. $E_{Chaos} = \frac{\text{Output}}{\text{Work}} = \frac{20,000}{30,000} = 66.6\%$

$E_{State} = \frac{\text{Output}}{\text{Work}} = \frac{11,000}{13,000} - 84.6\%$

b. $E = \frac{66.6 - 84.6}{84.6} = -21.3\%$

Chaos' Trial Court in 1977 processed 21.3% less of its work than did the other 15 trial courts in the State.

WALK-THROUGH 'L'

F. Effectiveness

$$\text{Effectiveness} = \frac{\text{Output Measures}}{\text{Standard}}$$

1. Based on an objective of processing 24,000 cases, the court was 83.3% effective:

$$E_f = \frac{\text{20,000 Cases (Output)}}{\text{24,000 Cases (Planned Output)}} \times 100 = 83.3\%$$

2. Based on an objective of not increasing the backlog of 7,000 cases, the court was 42.8% ineffective:

$$E_f = \frac{\text{Output (Later Period) - Output (Earlier Period)}}{\text{Planned Output}} \times 100$$

$$E_f = \frac{\text{10,000 Case Backlog - 7,000 Case Backlog}}{\text{7,000 Case Backlog}} \times 100$$

$$E_f = 42.8\%$$

G. Capability

1. Assuming a productivity standard of 1,800 Cases/Judge/Year one measure of the court's capability would be 27,000 Cases/Year.

   $C_1 = R \times P^S = 15 \text{ judges} \times 1{,}800 \text{ Cases/Judge} = 27{,}000 \text{ Cases}$

2. Assuming a productivity standard of $275/Case, a second measure of court capability would be 23,636 cases.

   $C_2 = R \div P^S = \$6{,}500{,}000 \quad \$275/\text{Case} = 23{,}636 \text{ Cases}$

3. Assuming a productivity standard of 1 Judge-Hour/Case, a third measure of capability would be 24,000 cases.

   $C_3 = R \div P^S = 24{,}000 \text{ Judge-Hours} \div 1 \text{ Judge-Hour/Case} = 24{,}000 \text{ Cases}$

H. Capacity

The minimum case cost during 1977 was determined to be $210 and this figure is assumed to be a reasonable indicator of maximum productivity (P^m). Assuming a maximum productivity of $210 per case, 30,952 cases could be processed.

$CAP = R \div P^m = \$6{,}500{,}000 \div \$210/\text{Case} = 30{,}952 \text{ Cases}$

WALK-THROUGH 'L'

WALK-THROUGH 'L'

I. Determining Resource Requirements Based on Fixed Productivity Standards

Step 1. The number of Judge-Hours (J-Hrs) required to meet existing work is 36,000 Judge-Hours.

R_1 = Work X P_s = 30,000 cases X 1.2 J-Hrs/Case = 36,000 J-Hrs

Step 2. The total number of judges required to meet existing work is determined by converting Judge-Hours into Judges. Since there are 1,600 Judge-Hours/Judges Available the number of Judges required is 22.5 Judges.

$$R_2 = \frac{R_2}{R_1} = \frac{36{,}000 \text{ Judge-Hours}}{1{,}600 \text{ Judge-Hours/Judges}} = 22.5 \text{ Judges}$$

Step 3. Therefore, 7.5 additional judges are required to process all cases, assuming a productivity standard of 1.2 J-Hrs per case.

Step 4. This requires a resource increase of 50% in the number of Judges.

$$R_3 = R \frac{\text{(Required)} - \text{R (Existing)}}{\text{R (Existing)}} \text{ X } 100$$

$$R_3 = 22.5 - 15 \text{ X } 100 = 50\%$$

J. Determining Workload Requirements Assuming Fixed Resources

Step 1. The workload necessary to process all 30,000 cases is:

$$WL_1 = \frac{W}{R} = \frac{30{,}000 \text{ Cases}}{15 \text{ Judges}} = 2{,}000 \text{ Cases/Judge}$$

Step 2. Similarly, the workload necessary for each Judge to process 2,000 cases is:

$$WL_2 = \frac{R}{W} = \frac{1{,}600 \text{ Judge-Hours}}{2{,}000 \text{ Cases}} = .8 \text{ Judge-Hours/Case}$$
(48 Judge Minutes/Case)

Step 3. Accepting 48 Judge minutes per case as a productivity standard (P_s) would require a 50% increase in productivity.

Where: Productivity (P) equals 72 Judge minutes per case and productivity standard = 48 Judge minutes per case (see Walk-Through "L", Data Set Worksheet, D. Productivity, 3.)

$$\frac{P - P_s}{P_s} \times 100 = \frac{72-48}{48} \times 100 = 50\%$$

K. Comparative Analysis of Two Strategies for Reducing Court Backlog

1. Strategy 1--increase number of judges (increase resources)

   If productivity remains 1.2 Judge-Hours per case and resources are increased to 22.5 judges, the court backlog will be reduced to zero.

2. Strategy 2--reduce average time per case (increase productivity)

   If resources remain at 15 judges and productivity is increased to 48 Judge-Minutes per case, court backlog will be reduced to zero.

3. The following table allows comparison of these two strategies. The numbers inside the table represent court backlogs at varying levels of court productivity and resource.

Table 2. Comparing Changes in Resources and Productivity and Resulting Court Backlog

Productivity Standard (PS) (Judge-Minutes/Case)	Resource (R) (Number of Judges)				
	15	17	19	21	23
72	10,000*	7,333**	4,666	2,000	0
62	6,774	3,677	580	0	0
52	2,308	0	0	0	0
42	0	0	0	0	0

$$\text{Backlog} = \text{Work} - \frac{\text{Resources}}{\text{Productivity Standard}}$$

*Existing Backlog (given 15 judges and 72 Judge-Minutes/Case) =

$$30{,}000 \text{ cases} - \frac{15 \text{ judges} \times 96{,}000 \text{ Judge-Minutes/Year}}{72 \text{ Judge-Minutes/Case}} = 10{,}000 \text{ Cases}$$

**Estimated Backlog (given 17 Judges and 72 Judge-Minutes/Case) =

$$30{,}000 \text{ Cases} - \frac{17 \text{ Judges} \times 96{,}000 \text{ Judge-Minutes/Year}}{72 \text{ Judge-Minutes/Case}} = 7{,}333 \text{ Cases}$$

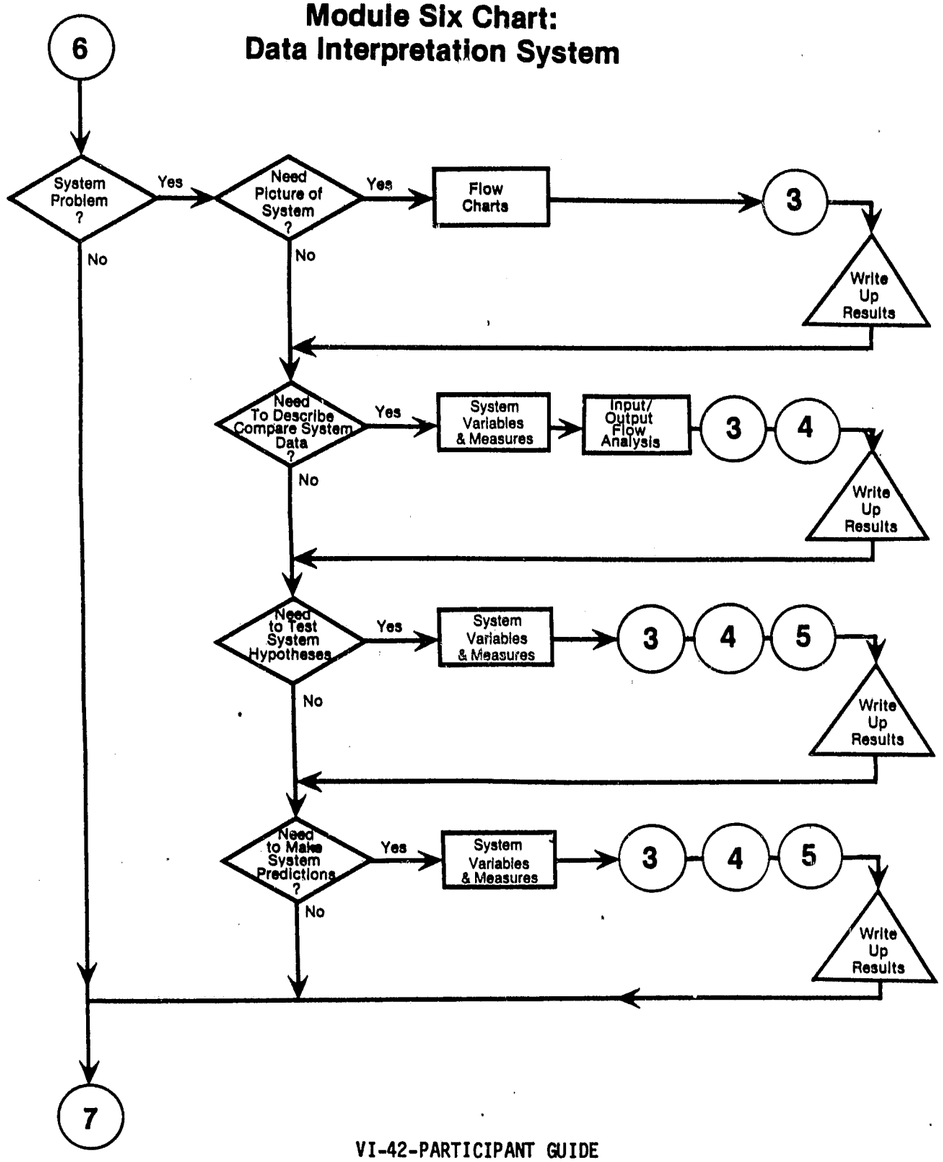
WALK-THROUGH 'L'

V. CONCLUSION

NOTES

V.A. (6-9):

Module Six Chart: Data Interpretation System



MODULE 7
PRESENTATION OF FINDINGS

This module suggests methods of making effective presentations both written and orally before an audience. Although the lecture is relatively brief, its importance cannot be stressed enough since all the products of analysis are useless if they are not persuasively presented to the proper individuals and organizations.

The lesson is divided into three segments: an introduction which includes a technical checklist of the major topics necessary for sound analysis; a discussion of the importance of understanding the roles, motivations, and purposes of the various actors, including the analyst, in criminal justice decision-making; and finally, a list of guidelines for making stronger written and oral presentations.

This module should last no longer than 60 minutes. The instructor should take care throughout the presentation to provide guidance to participants for their presentations required in the Major Exercise. Following this module participants will have an opportunity to complete their problem statements and prepare their presentations which will take place on Friday morning.

OBJECTIVES

1. To develop a sound perspective on criminal justice problems using:
   a. Knowledge about the roles of principal participants and concerned parties.
   b. Audience information.
2. To develop a complete and effective presentation by:
   a. Using presentation guidelines.
   b. Using good organization and appropriate content.
   c. Using appropriate briefing materials and taking care to develop an effective presentation manner.
   d. Recognizing the interdependence of technical preparation and proper perspectives in making presentations that influence decisions.

NOTES

I. CONSIDERATIONS IN PREPARING PRESENTATIONS

A. Preparation.

+ When presentations are not properly prepared, essential facts and messages are either destroyed or lost.

B. Responsibilities.

+ Analyst or presenter must be certain the information is transmitted clearly and succinctly.

C. Cautions.

+ Because of brief audience interest span, if a presentation is rambling or confusing most of the audience will "turn off."

+ With rare exceptions most of the problems that fall on the analyst's desk are not purely "criminal justice" in nature.

D. Presentation Objectives.

+ Develop in your problem statement a sense of the "larger picture."

+ The problem or issue should be separated into two essential parts.

+ Efforts need to be expended to overcome the major barriers to effective presentations.

+ "Refinement" should be considered as a continuous process; however, the reality of today's world is that frequently public decisions are rarely based on any sophisticated "analysis" but rather on other things.

NOTES

E. Technical Checklist.

V.A. (7-1):

Technical Checklist

- ✓ Is there a well-stated conceptual foundation for the problem statement?
- ✓ Have the critical hypotheses been selected?
- ✓ Are the variables and measures reliable and valid?
- ✓ Are the statistical techniques used appropriately?
- ✓ Are the data used effectively and interpreted correctly?

NOTES

II. ACHIEVING PERSPECTIVE

A. Role of Elected Politicians.

V.A. (7-2):

THE ROLE BEHAVIOR OF ELECTED POLITICIANS

- Pragmatic, not ideological
- Committed to election and reelection
- Avoid, ameliorate, or resolve conflict by:
  - anticipating reactions
  - manipulating symbols
  - simplifying issues
  - personalizing and particularizing issues
  - promising solutions for the insoluble

NOTES

B. Role Behavior of Private Citizens.

V.A. (7-3):

ROLE BEHAVIOR OF PRIVATE CITIZENS

- Concerned About Costs
- Want To Know Impact On Community
- Expect Response to Concerns (Real and/or Imagined)

C. Role Behavior of Administrators.

V.A. (7-4):

ROLE BEHAVIOR OF CRIMINAL JUSTICE ADMINISTRATORS

- Accountable for programs.
- Delegate authority.
- Protect turf.
- Not rewarded for efficiency.
- Get it in writing.

D. Role of Analyst.

V.A.(7-5):

OPTIMAL ROLE BEHAVIOR OF ANALYST

- Objective
- Realistic
- Flexible
- Sensitive
  - — Politics
  - — Emotional Issues
- Future Oriented

NOTES

III. GUIDELINES FOR EFFECTIVE PRESENTATIONS

A. Uses.

B. Guidelines.

V.A. (7-6):

PRESENTATION GUIDELINES

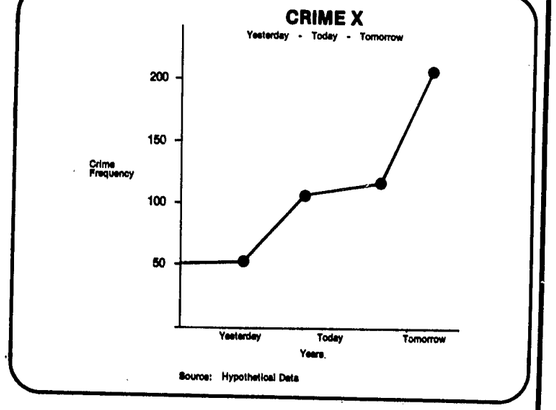
1. Emphasize Priority Message
2. Clarify and Interpret Finding by
   - Using Contrasts and Comparisons
   - Using Illustrations and Examples
3. Anticipate Questions, Problems, Assumptions
4. Use Terms Important to the Audience

NOTES

C. Clarification and Interpretation.

+ The audience should be aware at the end of a presentation what the problem actually means to them.

V.A. (7-7):

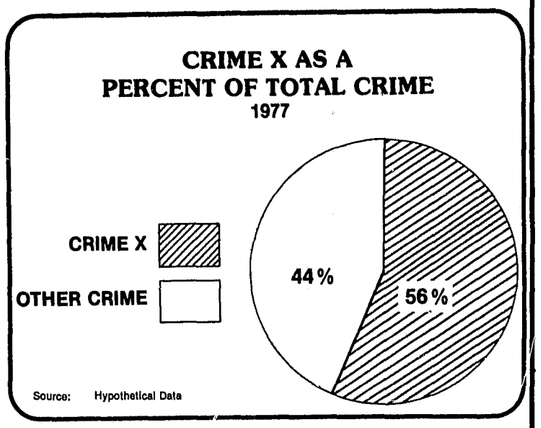


D. Use Contrasts and Comparisons.

+ Reinforce the context of the presentation, by comparing the problem with knowledge the audience already has.

E. Use Illustrations and Examples.

V.A. (7-8):



F. Anticipate Questions and Issues.

V.A. (7-9):

ANTICIPATE QUESTIONS AND ISSUES

- Identify Assumptions
- Develop Awareness
- Establish Credibility
- Prepare for Presentation

G. Use Terms Important to the Audience.

+ While the technical language is helpful if the group can use it, it is not helpful if there are no technically trained people.

NOTES

IV. PREPARING A WRITTEN REPORT

A. Content

+ Avoid major omissions.

+ Logical organization is vital.

+ Consistency of form, as well as content, is essential.

+ Writing must be clear and to the point.

+ Report should highlight the priority message(s).

B. Guides for use of quantitative data and statistics in written reports:

+ Purpose of data in a report must be clearly understood by the writer and the reader.

+ Data should be integrated into the narrative.

+ Selection of data should be made on the basis of its relevancy, clarity, validity, reliability, and assistance to the reader in understanding the problem.

NOTES

C. Written Report Organization.

V.A. (7-10):

WRITTEN REPORT ORGANIZATION

Section 1.0	**Introduction** 1.1 Statement of concerns 1.2 Nature and source of concerns 1.3 Scope of concerns
Section 2.0	**Analysis Methodology** 2.1 Definition of terms used 2.2 Measurement reliability and validity 2.3 Data Collection procedures used 2.4 Statistical Methods used
Section 3.0	**Findings** 3.1 Conceptual Hypothesis #1 — Supporting variable and measurement hypotheses, results, interpretations and conclusions 3.2 Conceptual Hypothesis #2 — Supporting variable and measurement hypotheses, results, interpretations and conclusions 3.3 Etc.
Section 4.0	**Discussion of findings in general** 4.1 Discussion of findings in relation to the concerns expressed 4.2 Discussion of limitations
Section 5.0	**Summary** 5.1 Highlights 5.2 Conclusions
Section 6.0	**Appendices**

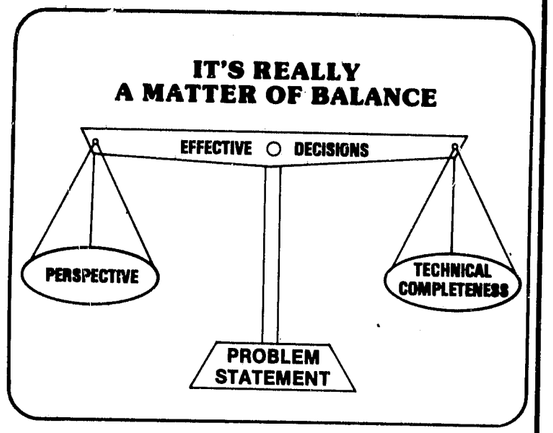
V. CONDUCTING A BRIEFING

A. Briefing Materials.

B. Manner of Presentation.

C. Provide a balanced presentation.

V.A. (7-11):

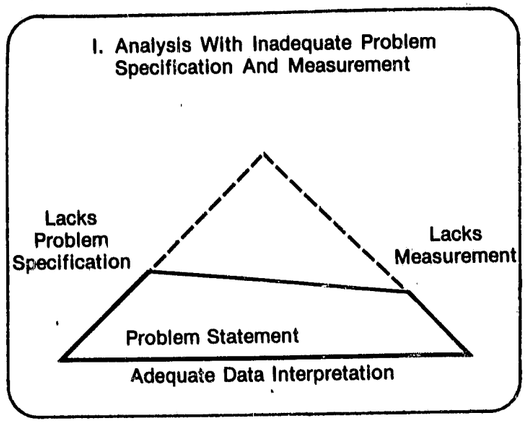


VI. CONCLUSION

A. Finding Balance in Presentations: When well done, a problem statement, both written and orally presented, is a delicate balance among problem specification measurement and data interpretation.

+ Analysis with Inadequate Problem Specification and Measurement.

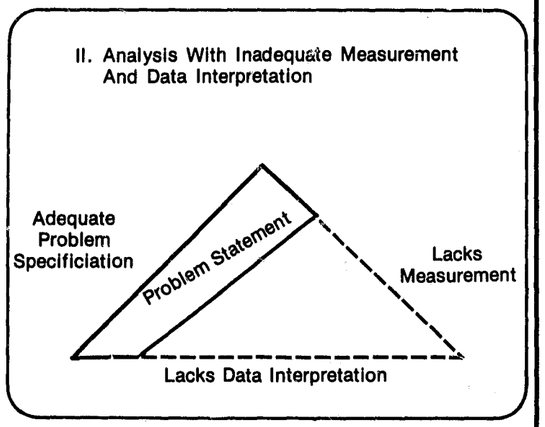
V.A. (7-12):



NOTES

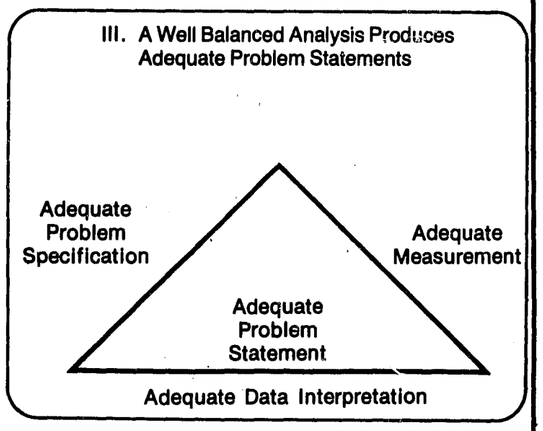
+ Analysis with Inadequate Measurement and Data Interpretation.

V.A. (7-13):

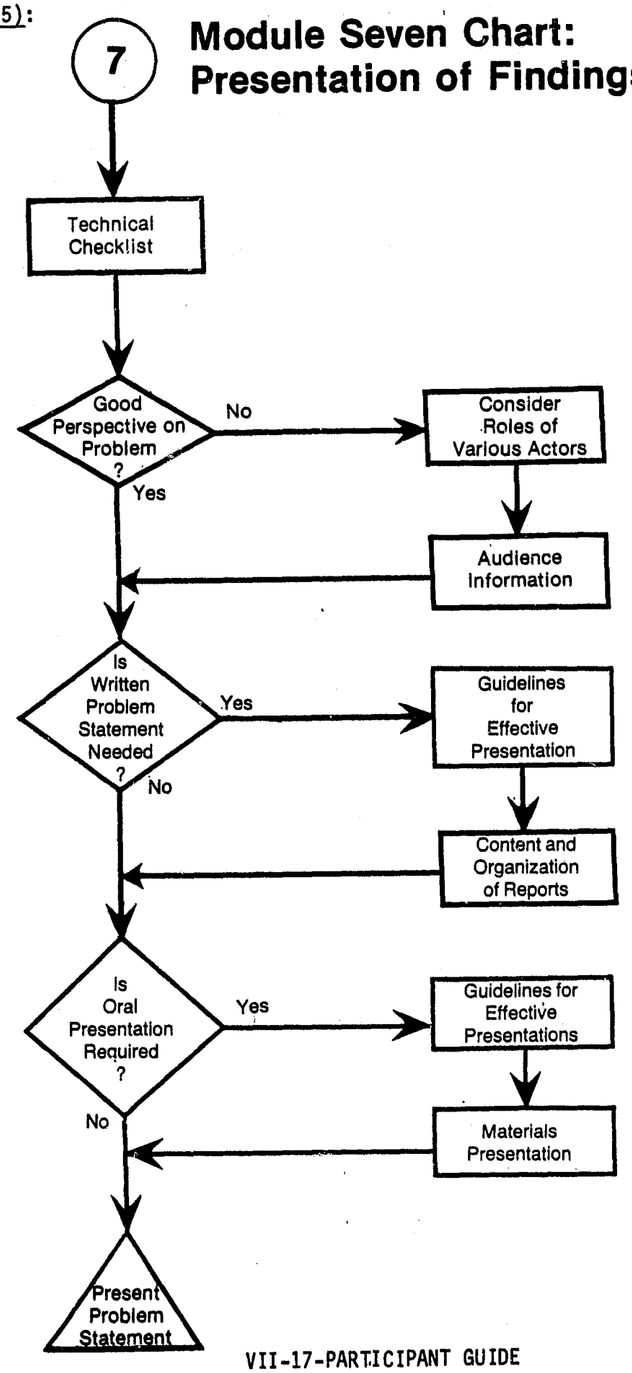


+ A Well Balanced Analysis Process Results in an Adequate Problem Statement.

V.A. (7-14):



V.A. (7-15):



MAJOR EXERCISE INTRODUCTION

I. OBJECTIVES

A. The purpose of the Major Exercise is to practice, develop and apply the skills, techniques and knowledge acquired during the Criminal Justice Analysis Course. While the focus is on the development of a problem statement, the general approach utilized and procedures incorporated in the exercise have direct bearing on all aspects of the criminal justice decision-making process: planning, program development, management or evaluation. Moreover, the process of developing a problem statement should generate many of the complex questions and difficult choices which would normally be encountered in crime or systems analyses.

B. The Major Exercise provides the analyst an opportunity to develop and present an original problem statement involving one of three current issues in criminal justice: (1) community crime prevention, (2) attrition in case dispositions, or (3) recidivism among adult offenders. These problem statements will be constructed step-by-step following the logic of the course and utilizing the methods and procedures of each module.

C. The Major Exercise makes a significant contribution to the achievement of the course goals. It provides a context for the exploration of the purpose and logic of analysis as used to formulate crime and criminal justice system problems. It requires careful selection and application of quantitative methods to crime and system data and the development of an effective presentation of a Problem Statement. Finally, the Major Exercise provides a setting for the analysis of many preconceived ideas about the complexity, ambiguity and/or lack of utility of analysis in criminal justice decision-making.

II. ACTIVITIES AND PRODUCTS

A. The Major Exercise is divided into six specific tasks. Each task requires the application of modular material preceding it.

B. The Six Tasks are as follows:

1. Task #1 - Specifying Problem.
2. Task #2 - Assessing Hypotheses.
3. Task #3 - Data Interpretation.
4. Task #4 - Preparing Portfolio.
5. Task #5 - Preparing Briefing.
6. Task #6 - Presentations.

C. The Major Exercise is a small-group activity.

1. Groups will be organized to achieve a balanced mixture of educational and experience levels within each group. Each group will be assisted by a facilitator who will provide occasional guidance and some assistance.
2. The nature of the exercise and, specifically the product requirements, necessitates that each group organize itself. Initially a group recorder will be required.
3. To initiate the Major Exercise three Staff Reports (SR) have been prepared for review. These represent an initial effort at responding to the concerns of Chaos City's political leadership and citizenry. They are based on only current, readily available data.
4. The nature of the exercise requires each group to assume a specific role and audience within the hypothetical Chaos City environment.
5. Throughout the Major Exercise, participants should draw upon the modular material for ideas and instructions for proceeding. The worksheets and tasks of the Major Exercise very closely parallel the walk-throughs and exercises of the course.
6. Do not waste time on inferences and assumptions where no basis of data or information exist in the materials you are provided.
7. Each Task has its own set of procedural instructions which follow the general form of the exercises in the course: I. Purpose, II. Instruments, III. Products and IV. Time.
8. The exercise is an analysis, not a plan to conduct an analysis. The plan for conducting your analysis is presented in Exhibit 1 and the instructions for the tasks.

D. The specific products required of each group are:

1. Completed worksheets.

2. An outline of a completed problem statement.

3. An oral presentation.

   - This presentation will be made to a review group (e.g., the class in plenary session; a criminal justice review board; a Mayor, Chief of Police, District Attorney, and supporting staff; or a technical review committee.

MAJOR EXERCISE

Major Exercise
Exhibit 1. Tasks and Schedule

TASK	ACTIVITY	TIME	DURATION	PRODUCT	PAGE
#1	Specify Problem	Monday p.m.	120 min.	Worksheets	5-7
#2	Assess Hypotheses	Monday p.m.	120 min.	Worksheets	8-12
Debriefing	Review Tasks #1 and #2	Tuesday p.m.	60 min.	Worksheets	13
#3	Data Interpretation	Thursday p.m.	120 min.	Worksheets	14-17
#4	Preparing Portfolio	Thursday p.m.	130 min.	Problem Statement Outline	18-23
Submit	Problem Statement Outline	Thursday p.m.		Problem Statement Outline	18-23
#5	Preparing Briefing	Friday a.m.	60 min.	Briefing Materials	24-26
#6	Presentations	Friday a.m./p.m.	180 min.	Formal Presentations	24-26

STAFF REPORTS	Page
Group A - Crime Prevention	28-30
Group B - Attrition Rate of Cases	31-33
Group C - Criminal Recidivism Among Adult Offenders	34-35

DATA SETS	Page
Group A - Crime Prevention	37-50
Group B - Attrition Rate of Cases	51-54
Group C - Criminal Recidivism Among Adult Offenders	55-60

TASK #1 - SPECIFY PROBLEM

I. PURPOSE

Task #1 initiates the Major Exercise and is designed to provide participants an opportunity for applying the technique of problem specification to a fairly vague preliminary analysis contained in a Staff Report. By using problem specification on these reports, as in actual experience, the analyst will be able to more clearly define the issues and concerns under study and to outline an approach for addressing these concerns.

II. INSTRUCTIONS

A. Each group will be assigned a Staff Report which should be read and discussed by the group. The group should identify the concepts contained in the staff report. Also, other concepts the group feels are important but not mentioned in the report may be identified.

B. Prepare a list of variables for each concept.

C. Prepare a list of measures for each variable.

D. Use Worksheet A to record concepts, variables and measures. Worksheet B should be used to record your hypotheses.

E. Generate a set of hypotheses at the conceptual, varaiable and measurement levels using such terms as:

is greater than	is increased by	a change in
is less than	is decreased by	no change in
is related to	is equal to	an increase in
is unrelated to	is unequal to	a decrease in

F. Worksheet B should be used to record your hypotheses.

G. Throughout this task changes in concepts, variables measures and/or hypotheses should be considered as the group develops a clearer sense of the problem.

III. PRODUCT

The group will provide a completed copy of Parts A and B worksheets to the group's facilitator at the conclusion of the task.

IV. TIME SCHEDULE - TASK #1

Review Staff Report	- 10 minutes
Discuss and List Concepts, Variables and Measures	- 30 minutes
Prepare Part A Worksheet	- 30 minutes
Prepare Part B Worksheet	- 30 minutes
Review Problem Specification	- 20 minutes
Total	120 minutes

MAJOR EXERCISE

MAJOR EXERCISE: CHAOS CITY
TASK I: PROBLEM SPECIFICATION
PART A: ELABORATING CONCEPTS, VARIABLES & MEASURES

CONCERN:

CONCEPTS	VARIABLES	MEASURES

MAJOR EXERCISE

MAJOR EXERCISE: CHAOS CITY

TASK I: PROBLEM SPECIFICATION

PART B: CONSTRUCTING HYPOTHESES

RELATING CONCEPTS	RELATING VARIABLES	RELATING MEASURES
1)	a)	1)
		2)
	b	1)
		2)
2)	a)	1)
		2)
	b)	1)
		2)

MAJOR EXERCISE

MAJOR EXERCISE: CHAOS CITY

TASK #2 - ASSESSING HYPOTHESES

I. PURPOSE

Task #2 is designed to help you review and assess the completed problem specification from Task #1 in terms of the criteria discussed in Module II. The product of this task is a listing of hypotheses which will be tested in Task #3.

II. INSTRUCTIONS

A. For each hypothesis developed in Task #1 complete the Part A Worksheet by first listing the hypothesis, checking the availability of relevant data, and then noting the strengths and weaknesses of that hypothesis in terms of the four criteria listed on the form.

Consider both conceptual and technical sources of measurement error in the data which is most likely available. Comment in the appropriate box for each hypothesis whether these are significant factors impeding an understanding of data which might be collected. See the Worksheet supplement for considerations that may help in evaluating your hypotheses.

B. When all hypotheses have been evaluated, identify the best hypotheses which you propose to test.

C. List your best hypotheses on the Part B Worksheet. Assess each hypothesis by placing a check in the appropriate box(es) to indicate those elements of a problem statement it covers. Identify and discuss elements of the problem that are not addressed and determine whether additional hypotheses need to be generated.

III. PRODUCT

Copies of Worksheets A and B for Tasks #2 will be provided to the facilitator at conclusion of this task.

IV. TIME SCHEDULE - TASK #2

List Hypotheses and Review Data Set	- 20 min.
Assessing Hypotheses	- 40 min.
Assessing Comprehensiveness	- 20 min.
Consider Additional Hypotheses	- 20 min.
Discuss and Complete Group Worksheet	- 20 min.
Total	120 min.

WORKSHEET SUPPLEMENT

Considerations of Measurement Error and Utility

1. Conceptual Factors that Influence the Validity and Reliability of Interpretations

   a. Between Concepts and Variables

      (1) Failure to Adequately Represent Concept with Selected Variable(s)

      (2) For example, rearrests is an inadequate variable to fully represent the concept of recidivism, in part, because of the potential discrimination against prior felons in arrest practices.

   b. Between Variables and Measures

      (1) Failure to Adequately Represent Variables with Selected Measure(s)

      (2) For example, frequency of rearrest does not make possible any distinctions in regard to types of criminal offenses for which prior felons were rearrested.

2. Technical Factors that Influence Validity and Reliability

   a. Method of Collection

      (1) Measurement Error in Self-Reported Crime Data

         (a) Veracity/Concealment Problem

         (b) Exaggeration Problem

         (c) Memory Problem

         (d) Not Practical for Studying Serious Offenses

      (2) Measurement Error in Arrest Records

         (a) Underestimation of "Actual" Incidence of Crime

         (b) Official data are more accurate as crimes get more serious.

   b. Type of Measure Sought (Fact or Perception)

   c. Source of Data, e.g. Administrative Record System, Public Opinion Poll, Census Document

   d. Is a census of the entire population or group taken or is a sample taken? Are sampling errors possible?

3. Testability

   a. Are there statistical techniques available to assess the measures selected?

   b. Is the implied causal relationship in the hypothesis logical?

4. Utility: Management Factors that Influence Conceptual and Technical Threats to Validity and Reliability

   a. Time

   b. Money

   c. Organizational Considerations

   d. Are the measures in each hypothesis subject to influence by the decision-maker?

   e. Does the hypothesis address weakness in the original staff report?

   f. Will interpretation of the hypothesis contribute to a better understanding of the problem?

      (1) An example of management influencing the conceptual adequacy of the problem is that political constraints may make it impossible to obtain information on reincarcerations from the state corrections agency.

      (2) An example of management influencing the technical adequacy of the problem is in measuring rearrests, self-reported crime data may be too time consuming and/or expensive to be obtained.

MAJOR EXERCISE: CHAOS CITY
TASK 2: ASSESSING HYPOTHESES
PART A: EVALUATING & ASSESSING INDIVIDUAL HYPOTHESES

FROM TASK 1 SELECT UP TO TEN MEASUREMENT LEVEL HYPOTHESES TO BE ASSESSED:	DATA AVAIL.	MEASUREMENT ERROR		TESTABILITY	UTILITY OR IMPORTANCE	OVERALL ASSESSMENT
		CONCEPTUAL	TECHNICAL			

MAJOR EXERCISE: CHAOS CITY
TASK 2: ASSESSING HYPOTHESES
PART B: DETERMINING COMPREHENSIVENESS OF A SET OF HYPOTHESES

LIST HYPOTHESES THAT ARE ASSESSED USEFUL (RESTATE, IF NECESSARY)	INDICATE THE CHARACTERISTICS ADDRESSED BY HYPOTHESES							COMMENT
	MAGNITUDE	RATE OF CHANGE	TEMPORAL ASPECTS	SERIOUSNESS	PERSONS AFFECTED	SPATIAL ASPECTS	SYSTEM RESPONSE	
TOTAL BY TYPE OF CHARACTERISTICS								

Major Exercise
Debriefing
Tasks #1 and #2

I. PURPOSE

The debriefing provides an opportunity for discussion of the results of the first two tasks. It is focused on the substantive, procedural and technical aspects of these tasks.

TASK #3 - DATA INTERPRETATION

I. PURPOSE

Task #3 requires the selection, application and interpretation of various methods to produce information that is to be part of the Problem Statement prepared by each group.

II. INSTRUCTIONS

A. Task #3 involves selection, calculation and interpretation of the various methods covered in Modules 3-6 on the hypotheses identified in Task #2.

B. These interpretations are to be used in preparing the required narrative problem statement outline.

C. Part A Worksheet deals with the application of statistical methods in data interpretation.

1. The Worksheet provides a list of questions which guide interpretation. Space also is provided for responding to the questions.

2. Each hypothesis should be placed on a separate worksheet. Also for each hypothesis a null hypothesis is to be stated. These hypotheses should be specified at the measurement level.

3. The full range of methods for data analysis should be used when possible. For example, some data can be analyzed by both descriptive and inferential methods. Methods to be considered are:

a) Descriptive--Central Tendency, Variation, and Graphics.

b) Comparative--Rates and Index Numbers, Cross Tabulations and Scattergrams, and Flow Charts.

c) Inferential--Chi Square test, Correlation Coefficient, Visual Estimation and Least Squares Regression

4. The module charts may be useful in selecting the appropriate methods for analyzing the data.

5. When appropriate a quickly sketched graphic should accompany the interpretation. This graphic can be made on a separate sheet or on back of Part A Worksheet. The purpose of this graphic is to quickly document an illustrative intrepretation that may be used later in drawing-up graphics to support the oral presentation.

6. The work should be divided among the group members. This depends upon the number of group members and the number of hypotheses. For example, one or two members may choose to complete a Part A Worksheet on a particular hypothesis.

D. After all Part A Worksheets are completed the group should use Part B Worksheet to discuss the implications of the collective findings in regard to the original concern.

1. The group is to indicate in the matrix which one of the categories from strongly agree to strongly disagree represents the group concensus about the evidential support for a hypothesis.

2. Next the group should discuss to what extent the evidence provides insight into the original concern.

III. PRODUCT

Copies of Worksheets A and B for Task #3 will be provided to the facilitator at the conclusion of this task.

IV. TIME SCHEDULE - TASK #3

Briefing for Task	-	10 minutes
Deciding Work Allocation for Part A	-	15 minutes
Performing Data Interpretation	-	60 minutes
Discussion of Relation of Findings to Concern	-	35 minutes
	TOTAL	120 minutes

TASK #3 - PART A WORKSHEET
DATA INTERPRETATION

I. State the measurement level hypothesis:

Alternative Hypothesis:

Null Hypothesis:

II. Apply (if appropriate) descriptive methods to the data.

a. What are the findings?

b. Do the findings prove or disprove the null hypothesis?

III. Apply (if appropriate) comparative methods to data.

a. What are the findings?

b. Do the findings prove or disprove the null hypothesis?

IV. Apply (if appropriate) inferential methods to data.

a. What are the findings?

b. Do the findings prove or disprove the null hypothesis?

V. Attach hand-drawn graphic of this interpretation (if appropriate).

MAJOR EXERCISE: CHAOS CITY

TASK #3 - PART B WORKSHEET
RELATION OF FINDING TO CONCERN

I. The evidence strongly supports the hypotheses:

Hypothesis	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
1.					
2.					
3.					
4.					
5.					
6.					

II. Summarize the implications of these findings to the original concern.

CONTINUED

9 OF 14

MAJOR EXERCISE: CHAOS CITY

TASK #4 - PREPARING PORTFOLIO

I. PURPOSE

This task is designed to use and build on the skills and information developed throughout the week and most particularly those discussed in the preceding module on the presentation of analytical findings. During the previous tasks of the Major Exercise, a data base has been reviewed, a concern has been identified and conceptualized, hypotheses have been developed and the data has been carefully studied and interpreted. The next step of the process -- Preparing a Written Presentation -- will be completed in this part of the exercise.

This task provides the participant an opportunity to develop an outline of the Problem Statement that utilizes the presentation guidelines suggested in Module 7. This presentation should be well organized, should demonstrate both an understanding of the audience who will review the products of the analysis and be sound technically with the results sensitive to the needs of the user.

II. INSTRUCTIONS

A. Review your previously prepared worksheets and identify the priority messages and supporting information which will be used to finalize your portfolio.

B. Finalize your portfolio consisting of:

1. Completed/Legible Worksheets for Tasks #1 - #3.

2. A two-to-three page Problem Statement outline (tables, charts or graphs not included in page count). An example Problem Statement outline in the following pages can be used as a guide in preparation of your problem statement outline.

C. Edit the portfolio and finalize its content.

D. The portfolio is to be completed and submitted by Thursday evening.

III. TIME SCHEDULE TASK #4

Briefing for Task #4	- 10 minutes
Clean-up Tasks #1 - #3 Worksheets	- 20 minutes
Identify Priority Messages and Supporting Information	- 20 minutes
Prepare Problem Statement Outline	- 60 minutes
Review Portfolio	- 20 minutes
Total	130 minutes

MAJOR EXERCISE: CHAOS CITY

EXAMPLE PROBLEM STATEMENT OUTLINE: Motor Vehicle Theft in Chaos City

1.0 Introduction

1.1 Statement of Concerns
- a. Complaints by businessmen.
- b. Possible curtailment of shopper trade because of fear.

1.2 Nature and Source of Concerns
- a. Businessman's complaint not founded on data.
- b. Businessman's perception may be reinforced by some customers complaints.

1.3 Scope of Concerns
- a. Businessmen have communicated among themselves and to the news.
- b. The businessmen's perception could affect shopper's selection of store location.
- c. Mayor has to respond to businessmen.

2.0 Analysis Methodology

2.1 Definition of Terms Used
- a. Unauthorized use.
- b. Differences in types of motor vehicles.

2.2 Measurement Reliability and Validity
- a. Over 90% reported.
- b. Rates vary by location.
- c. Risk per 1,000 registered vehicles by location substantiated by frequency measurements.

2.3 Data Collection Procedures
- a. 1 year study.
- b. Random sample of 20% of reports.

2.4 Statistical methods used
- a. Methods of measurement.
  - -frequency.
  - -rate per 1,000 persons.
  - -rate per 1,000 opportunity.
- b. Correlational analysis.
- c. Chi square.

3.0 Findings

3.1 Magnitude
- a. Hypothesis: Motor vehicle theft in Chaos City is no different than in similar size cities.
- b. Found: Number in Chaos City is about 500 less than the average for similar size cities.

3.2 System Response
- a. Hypothesis: Clearance rate for Chaos City expected to be the same as the national average.
- b. Found: The clearance rate for Chaos City was lower by 10 percent from the 20 percent national average.

3.3 Seriousness
- a. Hypothesis 1: Auto theft was expected to be less serious than other property crimes in Chaos City.
- b. Found: Net dollar loss of auto theft was less than for burglary and recovery rate was better for auto theft.
- c. Hypothesis 2: Chaos City's recovery rate for stolen cars is no different than the national average.
- d. Found: Recovery rate in Chaos City is substantially better than national average.

3.4 Where Autos are Stolen
- a. Hypothesis 1: Magnitude varies by geographic area.
- b. Found: Three of the city's areas have risks relatively higher than other areas.
- c. Hypothesis 2: Magnitude varies by type of parking environment.
- d. Found: Parking lots and garages account for most thefts.

3.5 Auto Thefts are Deterred by Reducing Opportunities to Steal
- a. Hypothesis 1: Autos are stolen because keys are left in the ignition.
- b. Found: Victim reporting indicates only 1 in 20 stolen cars were left with key in ignition and that 43 percent were left unlocked.
- c. Hypothesis 2: Locking cars deters theft.
- d. Found: Half of all cars stolen were locked.
- e. Found: Cars with interlock ignition systems are stolen less often than cars without this system.

3.6 Charactertistics of Motor Vehicle Theft May Vary by Type of Vehicle
- a. Hypothesis 1: Truck theft is similar to auto theft in location of occurrence.
- b. Found: Trucks are taken more frequently from parking lots and garages but less often near residences than cars.
- c. Hypothesis 2: Truck theft is similar to auto theft in clearance rate.
- d. Found: Similarity of rates.
- e. Hypothesis 3: Motorcycle theft is similar to auto theft in location of occurrence.
- f. Found: Only one-third of thefts occur from garages and one-third from near victim's residence.
- g. Hypothesis 4: Motorcycle theft is similar to auto theft in clearance rate.
- h. Found: Clearance rate is much lower.

3.7 Most Suspects are Amateur Thieves
- a. Hypothesis: Most suspects of vehicle theft are amateur thieves.
- b. Found: Only 10% of cases are cleared by arrest.
- c. Found: Theft does not result in stripping of auto for sale.

3.8 Most Suspects are Young
- a. Hypothesis: The majority of all suspects are less than 21 years old.
- b. Found: Only 12 % of cases studied had known offenders.
- c. Found: 62% of suspects were less than 21.
- d. Found: 95 to 98% of all arrests are of persons less than 21 years of age.
- e. Found: 76% of all persons arrested had prior record.

4.0 Discussion

4.1 Discussion of Findings in Relation to Concerns.
- a. Auto thefts tend to occur more often in downtown area than in other areas.
- b. Unknown if the problem in downtown Chaos City differs from downtown areas in other cities.
- c. The recovery rate suggests that auto theft involves only a moderate expense to the community.

4.2 Limitations
- a. Cannot determine if frequency of vehicle thefts has changed over time.
- b. Cannot evaluate magnitude of downtown vehicle theft problem in relation to business sectors in similar size cities.
- c. Suspect information does not permit development of an offender profile.
- d. Public perception of auto theft has not been assessed.

5.0 Summary

5.1 Highlights
- a. Magnitude - bulk of problem.
- b. Victimization - reporting and risk.
- c. Location.
- d. Locking cars.
- e. Recovery and clearance rates.
- f. Truck and motorcycle thefts.
- g. Offender profile.

5.2 Conclusions
- a. Motor vehicle theft is not a major problem.
- b. Downtown and two other areas disportionately share city's motor vehicle theft problem.
- c. General sites of parking garages and lots could be possible focus of crime reduction efforts.
- d. Implication of recovery and clearance rates and possible juvenile involvement for preventive measures.
- e. Analysis could not identify factors affecting businessmen's perceptions of motor vehicle theft.

MAJOR EXERCISE

TASK #4 -- COVERSHEET

TITLE: _____

FINAL REPORT

GROUP: _____

CONTENTS

Task #1 Worksheets
Task #2 Worksheets
Task #3 Worksheets
Problem Statement Outline

PREPARED BY:

_____

MAJOR EXERCISE

MAJOR EXERCISE: CHAOS CITY

TASK #4 - CRITIQUE CRITERIA

1. Is the problem clearly and accurately stated?
2. Are the hypotheses comprehensive?
3. Is the list of variables and measures comprehensive and realistic?
4. Are the techniques used to analyze the data appropriate?
5. Is the interpretation of the data accurate and useful?
6. Does the outline properly emphasize the information?
7. Is the problem statement easy to understand?

MAJOR EXERCISE

MAJOR EXERCISE: CHAOS CITY

TASK #5 and #6 - PREPARING AND DELIVERING BRIEFING

I. PURPOSE

The final tasks of the exercise require the preparation and delivery of a formal presentation. At the conclusion of each group's presentation of its problem analysis, a debriefing of both the oral presentations and written portfolios will be held.

II. INSTRUCTIONS

A. Prepare an oral presentation consisting of:

1. A 15-Minute briefing to a review group.

2. Use appropriate visual aids, e.g., flip charts, overheads.

3. Respond to review group questions for 5-10 minutes.

B. In preparing the oral presentation, assignments are to be made to individual presenters. If time permits, a dry-run should be held to rehearse the presentation.

C. The groups should discuss and identify the weaknesses in their portfolio and presentation in anticipation of the review group's questions.

MAJOR EXERCISE: CHAOS CITY

TASK #5 - CRITIQUE CRITERIA

1. Is the presentation well organized and focused?
2. Were the interests and concerns of the audience addressed?
3. How effectively are visual aids used?
4. How responsive and prepared is the presentor(s) to questions?

MAJOR EXERCISE

TASK #6 - CRITIQUE FORM

INSTRUCTIONS: Rate each of the categories in Parts I and II on a one to ten scale. A fair rating would lie in the range of 1-3, 4-7 (good), 8-10 (excellent). A subtotal for each part, as well as an overall total, can be calculated. The comments section should be used to support the ratings and document other observations.

PART I: FINAL WRITTEN REPORT OUTLINE	SCORE
1. Is the problem clearly and accurately stated?	
2. Are the hypotheses comprehensive?	
3. Is the list of variables and measures comprehensive and realistic?	
4. Are the techniques used to analyze the data appropriate?	
5. Is the interpretation of the data accurate and useful?	
6. Does the outline properly emphasize the information?	
7. Is the problem statement easy to understand?	
MAXIMUM POSSIBLE SCORE: 70 PTS Sub-Total	
PART II: PRESENTATION	
8. How effectively are visual aids used?	
9. Were the interests and concerns of the audience addressed?	
10. Is the presentation well organized and focused?	
11. How responsive and prepared is the presentor(s) to questions?	
MAXIMUM POSSIBLE SCORE: 40 PTS. Sub-Total	
MAXIMUM POSSIBLE SCORE: 110 PTS Total	

Comments: _____

MAJOR EXERCISE: CHAOS CITY

MAJOR EXERCISE-STAFF REPORTS

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MAJOR EXERCISE

STAFF REPORT
ON
CRIME PREVENTION IN CHAOS CITY

As recent newspaper headlines have indicated, Chaos City has a major crime problem. An apparent wave of robberies, burglaries and auto thefts has spread throughout the city resulting in a growing concern about neighborhood safety and pressure for increased preventive measures. At the request of the mayor, this Preliminary Analysis Statement has been prepared to summarize what is currently known about this problem.

During 1977 police records indicate that there were 8800 burglaries (79.5% residential), 1900 robberies (63.2% street robberies), 3600 assaults (including 150 rapes), and 4000 auto thefts. (See Table 1.)

Table 1. Chaos City Neighborhood Reported Crime Data, 1977

TYPE OF CRIME	NEIGHBORHOOD					TOTAL REPORTED
	CENTRAL	WESTSIDE	UNIVERSITY	PARK	WASHINGTON	
Residential Burglary	800	2400	700	2100	1000	7000
Commercial Burglary	500	500	200	400	200	1800
Commercial Robbery	200	100	50	300	50	700
Street Robbery	500	200	100	300	100	1200
Assault (Rape)	600 (20)	900 (18)	400 (75)	900 (18)	800 (19)	3600 (150)
Auto Theft	2000	400	400	1000	200	4000
Totals	4600	4500	1850	5000	2350	18,300

Source: Chaos City Police Department, 1978.

While no neighborhood has been unaffected by the crime wave, certain neighborhoods appear to be less prone to certain crimes. For example, the Washington area had only 200 auto thefts reported in 1977. Other areas, in contrast, appear to be suffering a disproportionate share of the crimes. For example, there were 75 rapes in the University area; 2400 residential burglaries were on the Westside; 500 commercial robberies and the 500 street robberies in Central indicate, to some extent, a localized pattern to these different offenses.

MAJOR EXERCISE: CHAOS CITY
(GROUP A)

A recent victimization survey of city residents conducted by the Survey Research Center at Paradise University indicates that (1) more than 47% of the city's residents feel unsafe in their neighborhood; (2) 46% are restricting their activities because of a fear of crime; and that (3) 32% of the residents perceive crime to be increasing. (See Table 2.)

A number of factors may be contributing to the crime problem in Chaos City. The data indicate that large numbers of illegal entries are unforced, thus, suggesting that residents and businessmen may be failing to employ basic security measures. Certain city areas as well as certain targets may be more prone to crimes than other areas due to physical and/or social/economic characteristics. Current police policies of distributing patrol resources evenly throughout the city and around the clock may not be consistent with the prevailing patterns in these certain crime categories. Indeed, the evidence suggests that crime is a major problem in Chaos City. New policies and programs need to be implemented by which the fear and the reality of crime in the city can be reduced.

Chaos City has never had an explicit planned crime prevention program. The city administration at this time seems to have become more receptive to crime prevention programs because of the public's perception of crime in the city and from the influence of national crime prevention programs on the federal level and in other cities.

Table 2. Chaos City 1977 Public Opinion Survey

SURVEY	CHAOS CITY RESIDENTS
1. Neighborhood Safety	%
Very Safe	16.5%*
Reasonably Safe	35.9%
Somewhat Unsafe	26.9%
Very Unsafe	20.7%
2. Safety Compared to Other Neighborhoods	
Much More Dangerous	2%*
Somewhat More Dangerous	8%
About the Same	39%
Less Dangerous	36%
Much Less Dangerous	14%
3. Limiting Activity Because of Crime	
Yes	46%*
No	54%
4. Neighborhood Crime Trend	
Increased	32%*
Decreased	7%
About the Same	50%
Don't Know	11%
5. Evaluation of Police Performance	
Good	37%*
Average	46%
Poor	17%

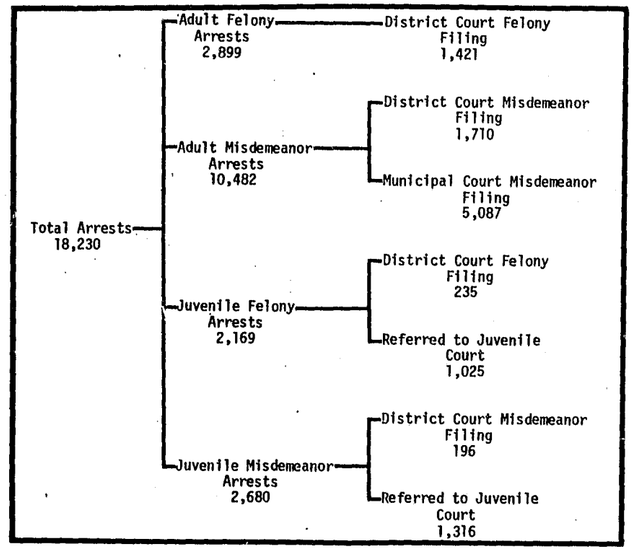
* May not add to 100% due to rounding n = 1500
Source: Paradise University, Survey Research Center, 1978.

STAFF REPORT
ON
ATTRITION RATE OF CASES IN CHAOS CITY

A recent article in the Chaos Rag has brought attention to the problem of crimes committed by individuals who, while arrested, have never been brought to trial. Specifically, the Rag's article concerned a man who was arrested three separate times for burglary, but each case never reached the court. Most recently the man was captured after he had shotgunned an elderly couple to death as he robbed their small grocery store. There was less than $150 in their cash register. At the request of the Mayor this staff report has been prepared to provide background on this problem.

A quick analysis of available data indicates that in 1977, the Chaos City case drop-out rate from the point of arrest to court filing was high for felony cases. Of a total of 2,899 adults arrested for a felony there were 1,421 felony cases filed. In other words, there were about twice as many arrests as filings. A one-to-one ratio between filings and arrests is unrealistic, but a one-to-two ratio seems excessively high. (See Table 1.)

Table 1. Chaos City Arrests and Case Filings, 1977



Source: Chaos City Police Dept., 1978

MAJOR EXERCISE: CHAOS CITY
(GROUP B)

Cases are frequently dropped because either the victim refuses to prosecute or the DA does not accept the case because of insufficient evidence. Some of the disparity between arrest and filing rates can be attributed to multiple cases involving the same suspect or several suspects involved in the same filing, and does not necessarily represent poor quality arrests. However, with evidence problems apparent in 46% of the cases which the DA refused to prosecute, the quality of case preparation by the investigator or the arresting officer may represent a legitimate problem area. (See Table 2.)

Table 2. Reasons for DA Case Refusal, 1977

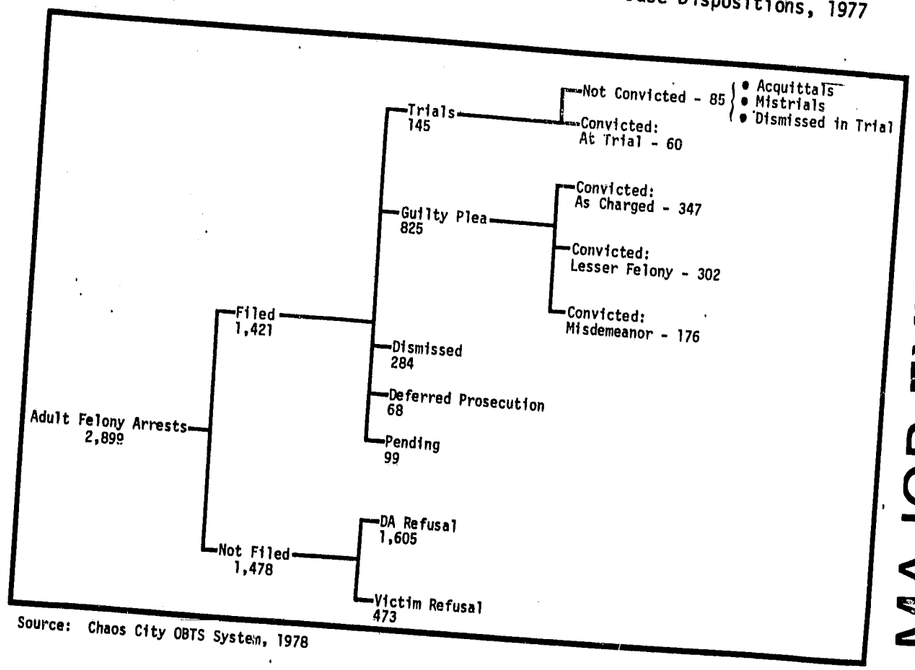
Reason for Refusal	N	%
Evidence Problem		
Inadmissable evidence	252	25
Unavailable physical evidence	50	5
Insufficient physical evidence	161	16
Total	463	46%
Witness Problem		
Unable to locate	40	4
Related/friend of offender	30	3
Witness story/credibility	70	7
Reluctant to get involved w/system	30	3
Total	170	17%
Prosecutorial Merit		
Multi-case disposition	60	6
Office policy	30	3
Diversion program	242	24
Total	332	33%
Unknown	40	4
TOTAL	1005	100%

Source: Chaos City District Attorney's Office, 1978.

MAJOR EXERCISE: CHAOS CITY
(GROUP B)

What is even more disturbing than the number of cases dropped is the disposition of cases adult felony after filing. Only 10% of the felony filings in 1977 were actually tried. About two times more cases were dismissed than tried. Of those tried only 41% were convicted, that is 60 persons out of 145 were convicted. In the consideration of the total number of convictions, guilty pleas accounted for 93% of all convictions and trial convictions only accounted for 7%. (See Table 3) A total of 885 convictions and guilty pleas out of over 1421 filings represents only a 62% conviction rate.

Table 3. Chaos City Arrests, Felony Filings and Case Dispositions, 1977



Source: Chaos City OBTS System, 1978

STAFF REPORT
ON
CRIMINAL RECIDIVISM AMONG ADULT OFFENDERS IN CHAOS CITY

The failure of our criminal justice systems' rehabilation components is suggested by a recent study released by Paradise University's Criminal Justice Research Center. Their study revealed that over a two year follow-up period, a sample of 250 felony offenders were rearrested at the rate of 48% and reconvicted at a rate of 30%. Among the 48% who were rearrested at least once, the mean number of rearrests was 2.7. Rearrest rates were found to be higher among certain types of offenders (such as burglars) than other crime categories (such as assault). (See Table 1.)

Table 1. Two Year Recidivism Rates for Adult Offenders in Chaos City

Original Commitment Offense	Number of Cases	Rearrested	Not Rearrested	Reconvicted	No Reconvictions
Assault	40	10 (25%)	30 (75%)	6 (15%)	34 (85%)
Rape	25	4 (16%)	21 (84%)	4 (16%)	21 (84%)
Robbery	61	32 (52%)	29 (48%)	17 (28%)	44 (72%)
Burglary	75	44 (59%)	31 (41%)	25 (33%)	50 (67%)
Theft	49	30 (61%)	19 (39%)	22 (45%)	27 (55%)
Total	250	120 (48%)	130 (52%)	74 (30%)	176 (70%)

Source: Paradise University, Criminal Justice Research Center, 1978

There is concern in the Chaos City criminal justice community about the recidivism problem. The Chief of Police has publicly stated that relatively few offenders account for most serious felony arrests in Chaos City. He further contends that these "career criminals" are frequently not convicted or, if convicted, given sentences that are too light. There is general concern among the judges about the effectiveness of their sentencing practices. The issue of whether length of sentence affects recidivism has repeatedly been raised.

The Chief Probation Officer feels that offenders are less likely to recidivate if given employment and related support services when released. He also feels that the sentencing recommendations made by his staff on the pre-sentence report are based upon socio-economic and other background characteristics of the offender are good predictors of recidivism, and that judges should follow these recommendations more consistently.

The probation officer has found in a follow-up study of the Paradise University Recidivism Study that when the court closely followed his recommended sentence, only 40% of the offenders were rearrested compared to 60% when his report was not followed at all. (See Table 2.)

MAJOR EXERCISE: CHAOS CITY
(GROUP C)

Table 2. Influence of Pre-Sentence Report on Rearrests, 1977

Offender Status	Pre-Sentence Report			Total
	Not Followed	Influenced	Closely Followed	
Rearrested	60	40	20	120
Not Rearrested	40	60	30	130
Totals	100	100	50	250

Source: Chaos City, Chief Probation Officer, Department of Corrections, 1978.

MAJOR EXERCISE: CHAOS CITY

MAJOR EXERCISE
DATA SET

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GROUP B	TABLES B-1 to B-5	51-54
GROUP C	TABLES C-1 to C-4	55-60

MAJOR EXERCISE

(GROUP A)

Table A-1. Chaos City 1977 Census Data

HOUSING UNITS	#	%
Single Family	73,500	49
Two-Four Plex	26,800	18
Apartment	49,700	33
TOTAL	150,000	100

COMMERCIAL ESTABLISHMENTS	#
Gas Stations	165
Drug Stores	51
Schools	133
Grocery Stores	140
Hotel/Motels	131
Department Stores	82
Bars/Restaurants	301
Factory Buildings	253
Office Buildings	4050
Banks	98
Other	3596

POPULATION CHARACTERISTICS		
SEX	#	%
Male	171,500	49
Female	178,500	51

AGE	#	%
Under 5	28,600	8
5-14	62,900	18
15-19	31,900	9
20-34	73,800	21
35-64	114,000	32
65-over	38,500	12

RACE	#	%
White	245,000	70
Black	101,000	29
Other	4,000	1

HOUSEHOLD INCOME LEVEL	#	%
Below $5000	16,500	11
$5000--6999	18,100	12
7000--9999	26,800	18
10,000-14,000	43,800	29
15,000-24,999	28,200	19
25,000 +	16,600	11

Source: Chaos City Planning Department Estimates, 1978.

Table A-2. Chaos City, Neighborhood Data, 1977

CHARACTER-ISTICS	CITY TOTAL	NEIGHBORHOOD				
		CENTRAL	WESTSIDE	UNIVERSITY	PARK	WASHINGTON
Population	350,000	65,000	90,000	50,000	80,000	65,000
Geog. Size	70 sq.mi.	5	22	10	18	15
Housing Units	150,000	25,000	40,000	25,000	36,000	24,000
Commercial Establishments	9,000	3,000	2,000	1,000	2,500	500
Median Income Households	11,400	9,100	12,900	14,200	6,800	21,500
% Minority	30%	54%	1%	2%	86%	1%

Source: See Table A-1.

Table A-3. 1971-1977 Census Data for Chaos City

CATEGORY	1971	1972	1973	1974	1975	1976	1977
Population	250,000	270,000	300,000	310,000	330,000	340,000	350,000
Housing Units	90,000	100,000	115,000	120,000	135,000	140,000	150,000
Commercial Establishments	5,300	5,800	6,300	7,300	8,000	8,600	9,000

Source: See Table A-1.

MAJOR EXERCISE: CHAOS CITY
(GROUP A)

Table A-4. Chaos City, Reported Crime Data, 1971-1977

CRIME CATEGORY	1971	1972	1973	1974	1975	1976	1977
Residential Burglary	4100	4000	4900	6000	5800	6800	7000
Commercial Burglary	540	600	650	700	1000	1500	1800
Commercial Robbery	250	300	360	500	550	600	700
Street Robbery	300	350	450	600	850	1000	1200
Assault (Incl. Rape)	2600 (101)	2800 (98)	3100 (97)	3200 (110)	3500 (92)	3400 (120)	3600 (150)
Auto Theft	3800	3700	4000	4100	3900	3800	4000
Total	11,590	11,750	13,460	15,100	15,600	17,100	18,300

Source: Chaos City Police Department, 1978.

MAJOR EXERCISE

Table A-5. Chaos City, Public Opinion Survey, 1977

SURVEY RESPONSE	NEIGHBORHOOD				
	CENTRAL	WESTSIDE	UNIVERSITY	PARK	WASHINGTON
Neighborhood Safety					
Very Safe	10%	15%	23%	4%	38%
Reasonably Safe	31%	46%	39%	29%	31%
Somewhat Unsafe	31%	18%	26%	36%	25%
Very Unsafe	28%	21%	12%	31%	6%
Safety Compared to Other Neighborhoods					
Much More Dangerous	2%	1%	1%	3%	1%
Somewhat More Dangerous	11%	8%	4%	12%	6%
About the same	43%	33%	39%	48%	32%
Less Dangerous	32%	40%	39%	31%	41%
Much Less Dangerous	12%	18%	17%	6%	20%
Limiting Activity Because of Crime					
Yes	56%	45%	41%	47%	39%
No	44%	55%	59%	53%	61%
Neighborhood Crime Trend					
Increased	42%	38%	47%	10%	30%
Decreased	3%	7%	4%	8%	10%
Same	39%	42%	37%	71%	58%
Don't Know	16%	13%	12%	11%	2%
Evaluation of Police Performance					
Good	26%	49%	39%	13%	65%
Average	49%	40%	52%	54%	32%
Poor	25%	11%	9%	33%	3%
	n=248	n=402	n=251	n=360	n=238

Source: Paradise University, Survey Research Center, 1978.

MAJOR EXERCISE: CHAOS CITY
(GROUP A)

Table A-6. 1977 Residential Burglary Characteristics

MONTH OF OCCURENCE	#	%
January	138	6.9
February	145	7.3
March	133	6.7
April	141	7.1
May	179	9.0
June	204	10.2
July	218	10.9
August	231	11.6
September	169	8.5
October	174	8.7
November	138	6.9
December	130	6.5
TIME OF DAY	**#**	**%**
Day (6AM-6PM)	542	27.1
Night (6PM-6AM)	709	35.5
Unknown	749	37.5
PLACE OF ENTRY	**#**	**%**
Front	720	36.0
Side	860	43.0
Back	420	21.0
TYPE OF ENTRY	**#**	**%**
Force	1460	73.0
No Force	540	27.0
TYPE OF TARGET	**#**	**%**
Single-Family Dwelling	1080	54%
Two-Four Plex	380	19%
Apartment	540	27%

Table A-6. - Continued

PROPERTY LOSS VALUE	#	%
0	261	13%
1-99	82	4%
100-199	319	16%
200-299	378	18%
300-399	220	11%
400-499	203	10%
500-599	162	8%
600-699	101	5%
700-799	99	5%
800-899	83	4%
900-999	58	3%
1000 +	34	2%

TYPE OF ENTRY BY TYPE OF STRUCTURE

TYPE OF ENTRY	SINGLE	TWO-FOUR PLEX	APARTMENT	TOTAL
Unforced				
Window	5%	7%	5%	6%
Door w/o key	13%	17%	18%	15%
Door w/ key	2%	4%	13%	6%
Total	20%	28%	36%	36%
Forced				
Window	34%	28%	23%	20%
Door	46%	44%	41%	44%
Total	80%	72%	64%	64%
	n=1080	n=380	n=540	n=2000

Source: Chaos City Police Department, 1978
(Based on a sample of 2000 police reports)

MAJOR EXERCISE: CHAOS CITY
(GROUP A)

Table A-7. 1977 Commercial Burglary Characteristics

MONTH OF OCCURRENCE	#	%
January	65	7.2
February	74	8.2
March	61	6.8
April	82	9.1
May	73	8.1
June	89	10.0
July	91	10.1
August	73	8.1
September	66	7.3
October	81	9.0
November	74	8.2
December	71	7.9
TIME OF DAY	**#**	**%**
Day (6am-6pm)	76	8.5
Night (6pm-6am)	652	72.4
Unknown	172	19.1
PLACE OF ENTRY	**#**	**%**
Front	361	40.1
Side	256	28.4
Back	247	27.4
Other/Unknown	36	4.0
TYPE OF ENTRY	**#**	**%**
Force	760	84.5
No Force	140	15.5
TYPE OF TARGET	**#**	**%**
Gas Station	61	6.8
Drug Store	10	1.1
School	34	3.8
Grocery Store	27	3.0
Hotel/Motel	31	3.4
Department Store	5	.6
Bar/Restaurant	33	3.7
Factory	36	4.0
Office Building	220	24.5
Other	443	49.2

Table A-7. - Continued

PLACE AND METHOD OF ENTRY BY TYPE OF TARGET

TYPE OF TARGET	PLACE OF ENTRY				TYPE OF ENTRY	
	Front	Side	Back	Other/Unk.	Force	No Force
Gas Station (n=61)	27	22	9	3	60	1
Drug Store (n=10)	4	2	3	1	10	-
School (n=34)	7	22	4	1	27	7
Grocery Store (n=27)	14	5	5	3	25	2
Hotel/Motel (n=31)	27	1	2	1	4	27
Department Store (n=5)	3	1	1	-	5	-
Bar/Restaurant (n=33)	13	2	18	-	30	3
Factory (n=36)	7	16	12	1	27	9
Office Building (n=220)	79	63	75	3	168	52

Source: See Table A-6. (Based on a sample of 900 police reports)

Table A-8. Street Robbery, 1977

TYPE	#	%
Personal	502	84
Purse-snatch	73	12
Business	25	4
MONTH OF OCCURRENCE	**#**	**%**
January	41	7
February	49	8
March	40	7
April	60	10
May	47	8
June	58	10
July	42	7
August	57	9
September	62	10
October	40	7
November	55	9
December	49	8
TIME OF DAY	**#**	**%**
Midnight-9am	95	16
9am-3pm	132	22
3pm-Midnight	373	62
LOCATION	**#**	**%**
Street	443	74
Parking Area	55	9
Alley	49	8
Other	53	9
VICTIM SEX	**#**	**%**
Male	263	44
Female	337	56
VICTIM AGE	**#**	**%**
Juvenile (-18)	91	15
Young Adult (18-29)	127	21
Older Adult (30-64)	238	40
Elderly (65+)	144	24

Table A-8. - Continued

INJURY LEVEL	#	%
None	391	64
Injury-no hospitalization	186	31
Injury with hospitalization	23	4

FORCE LEVEL	#	%
No threat	113	19
Threatened, no force used	126	21
Bodily force only	323	54
Weapon used	38	6

INJURY LEVEL BY VICTIM RESISTANCE

INJURY LEVEL	COOPERATIVE VICTIMS	RESISTANT VICTIMS
None	272	119
At least some	99	110
TOTAL	371	229

Source: See Table A-8. (Estimates based on a sample of 600 police reports)

Table A-9. Commercial Robbery Characteristics, 1977

MONTH OF OCCURRENCE	#	%
January	29	8
February	32	9
March	28	8
April	29	8
May	18	5
June	17	5
July	25	7
August	15	4
September	26	7
October	49	14
November	46	13
December	36	10

TIME OF DAY	#	%
Midnight-6am	43	12
6am-noon	44	13
Noon-6pm	81	23
6pm-midnight	182	52

TYPE OF WEAPON	#	%
Gun	278	79
Knife	31	9
Others	18	5
None	23	7

TYPE OF TARGET	#	%
Grocery Store	48	14
Gas Station	63	18
Drug Store	19	5
Bar/Restaurant	17	5
Bank	6	2
Hotel/Motel	14	4
Other	183	52

LEVEL OF FORCE	#	%
Weapon visible, not used	251	72
Physical force only	42	12
Weapon used	57	16

INJURY	#	%
No injuries	304	87
Minor injury only	24	7
Hospital treatment	22	6

Source: See Table A-6. (Estimates based on a sample of 350 police reports)

Table A-10. Assaults (including Sexual Assaults), 1977

MONTH OF OCCURRENCE	#	%
January	143	8
February	131	7
March	137	8
April	142	8
May	168	9
June	148	8
July	141	8
August	146	8
September	166	9
October	139	8
November	165	9
December	174	10
TIME OF DAY	**#**	**%**
2am-10am	253	14
10am-6pm	451	25
6pm-2am	1096	61
TYPE OF WEAPON	**#**	**%**
Gun	325	18
Knife	305	17
Other	361	20
None	809	45
INJURY LEVEL	**#**	**%**
None	593	33
Minor	559	31
Treated and Released	485	27
Hospitalized	163	9
VICTIM-OFFENDER RELATIONSHIP	**#**	**%**
Strangers	631	35
Non-strangers	1169	65
VICTIM AGE	**#**	**%**
Under 18	361	20
18-24	558	31
25-34	467	26
35-44	180	10
45-64	194	11
65 +	40	2

Table A-10. - Continued

VICTIM CHARACTERISTICS BY TYPE OF ASSAULT

VICTIM SEX	STRANGER TO STRANGER	NON-STRANGER
Male	474	503
Female	157	666
VICTIM AGE		
Under 18	89	272
18-24	201	357
25-34	187	280
35-44	41	139
45-64	95	99
65 +	18	22

Source: See Table A-6. (Estimates based on a sample of 1800 police reports)

Table A-11. Auto Theft Characteristics, 1977

TYPE OF VEHICLE	#	%
Auto	869	87
Trucks	51	5
Motorcycle	73	7
Other	7	1
TYPE OF PREMISE	**#**	**%**
Parking Lot	432	43
Street Adjacent to Residence	218	22
Other Residential Street	119	12
Owner's Garage or Driveway	77	8
Other	154	15
LOCATION OF KEYS	**#**	**%**
In owner's possession	789	79
In car	77	8
In ignition	64	6
Other	70	7
NEIGHBORHOOD WHERE VEHICLE RECOVERED	**#**	**%**
Central	186	19
Westside	61	6
University	103	10
Park	474	47
Washington	14	1
Recovered out of city	84	8
Not recovered	98	10

Source: See Table A-6. (Based on a sample of 1000 police reports)

B. Attrition Rate of Cases in Chaos City

Table B-1. Chaos City, Adult Felony Case Processing Statistics

	1973	1974	1975	1976	1977
Adult Felony Arrests	1423	2089	2569	2609	2899
Filed	968	1253	1387	1291	1421
Trials	125	144	166	116	145
Trial Convictions	54	72	78	50	60
Guilty Plea	565	711	807	803	825
As Charged	241	290	340	340	347
Lessor Felony	183	212	260	280	302
Misdemeanor	141	209	207	183	176
Court Dismissals	182	270	273	223	284
Deferred Prosecutions	31	48	46	61	68
Cases Pending	65	80	95	88	99
Not Filed	455	836	1182	1318	1478
DA Refusal	278	668	827	817	1005
Victim Refusal	177	168	355	501	473

Source: Chaos City OBTS System, 1978. (Includes homicides, rape, burglary, assault and theft)

Table B-2. Chaos City Arrests, Felony Filings and Case Dispositions, Violent and Property Crimes, 1977.

	VIOLENT	PROPERTY
Adults Felony Arrests	725	2174
Filed	463	958
Trials	94	51
Trial Convictions	36	24
Guilty Plea	205	620
As Charged	65	282
Lesser Charge	85	217
Misdemeanor	55	121
Court Dismissals	114	170
Deferred Prosecutions	17	51
Cases Pending	38	61
Not Filed	262	1216
DA Refusal	102	903
Victim Refusal	160	313

Source: Chaos City OBTS System, 1978

Table B-3. 1977 UCR Disposition Data

	VIOLENT	PROPERTY	BOTH
Adults Charged	36,725	132,651	169,376
Guilty - As Charged	17,191	92,190	109,381
Guilty - Lesser Charge	4,497	9,811	14,308
Acquitted or Dismissed	15,037	30,650	45,687

Source: FBI, UCR, 1978. (Based upon 2566 cities - 1977 estimated population 37 million)

MAJOR EXERCISE: CHAOS CITY
(GROUP B)

Table B-4. Reasons for DA Case Refusal, 1973 and 1977.

Reason for Refusal	1973 #	1973 %	1977 #	1977 %
Evidence Problem				
Inadmissable evidence	43	15	252	25
Unavailable physical evidence	13	5	50	5
Insufficient physical evidence	38	14	161	16
Total	94	34	463	46
Witness Problem				
Unable to locate	8	3	40	4
Related/Friend of offender	10	4	30	3
Witness story/Credibility	48	17	70	7
Reluctant to get involved w/system	15	5	30	3
Total	81	29	170	17
Prosecutorial Merit				
Multi-case disposition	22	8	60	6
Office policy	19	7	30	3
Diversion program	34	12	242	24
Total	75	27	332	33
Unknown	28	10	40	4
Total	278	100%	1005	100%

Source: Chaos City District Attorney's Office 1978.

MAJOR EXERCISE: CHAOS CITY
(GROUP B)

Table B-5. Chaos City Criminal Justice System Staffing

	1973	1974	1975	1976	1977
District Attorneys (Staff Attorneys)	8	9	10	11	11
Judges	15	15	20	20	20
Police Officers (Uniformed Offiers)	386	386	396	400	420

Source: Chaos City, Office of the Budget, 1978

MAJOR EXERCISE: CHAOS CITY
(GROUP C)

Table C-1. Two Year Cohort Study of Recidivism
By Selected Characteristics and Original Commitment Offense

Original Commitment Offense	Number of Cases	Rearrested	Not Rearrested	Reconvicted
Assault	40	10 (25%)	30 (75%)	6 (15%)
Rape	25	4 (16%)	21 (84%)	4 (16%)
Robbery	61	32 (52.5%)	29 (47.5%)	17 (27.9%)
Burglary	75	44 (58.7%)	31 (41.3%)	25 (33.3%)
Theft	49	30 (61.2%)	19 (38.8%)	22 (44.9%)
Total	250	120 (48%)	130 (52%)	74 (29.6%)

Number of Prior Felony Arrests (Not including that which resulted in original commitment)	Number of Cases	Rearrested	Not Rearrested	Reconvicted
None or None Known	85	31 (36.5%)	54 (63.5%)	15 (17.6%)
One	72	32 (44.4%)	40 (55.6%)	18 (25%)
Two	41	23 (56.1%)	18 (43.9%)	14 (34.1%)
Three	23	15 (65.2%)	8 (34.8%)	9 (39.1%)
Four	13	9 (69.2%)	4 (30.8%)	8 (61.5%)
Five	7	4 (57.1%)	3 (42.9%)	4 (57.1%)
Six or More	9	6 (66.7%)	3 (33.3%)	6 (66.7%)
Total	250	120 (48%)	130 (53%)	74 (29.6%)

Table C-1. Continued

History of Substance Abuse	Number of Cases	Rearrested	Not Rearrested	Reconvicted
Alcohol Abuse History	75	34 (45.3%)	41 (54.7%)	24 (32%)
Drug Abuse History	55	27 (49.1%)	28 (50.9%)	18 (32.7%)
Combination	23	13 (56.5%)	10 (43.5%)	10 (43.5%)
None	97	46 (47.4%)	51 (52.6%)	22 (22.7%)
Totals	250	120 (48%)	130 (52%)	74 (29.6%)

Post-Release Employment Status (2 months after release)	Number of cases	Rearrested	Not Rearrested	Reconvicted
Employed Part-time	43	20 (46.5%)	23 (53.5%)	12 (27.9%)
Employed Full-time	142	57 (40.1%)	85 (59.9%)	31 (21.8%)
Unemployed	65	43 (66.1%)	22 (33.9%)	31 (47.7%)
Total	250	120 (48%)	130 (52%)	74 (29.6%)

Total number of jobs during 2-year follow-up	Number of Cases	Rearrested	Not Rearrested	Reconvicted
None	42	28 (66.7%)	14 (33.3%)	18 (42.9%)
One	83	29 (34.9%)	54 (65.1%)	17 (20.5%)
Two	71	34 (47.9%)	37 (52.1%)	21 (29.6%)
Three or more	54	29 (53.7%)	25 (46.3%)	18 (33.3%)
Total	250	120 (48%)	130 (52%)	74 (29.6%)

MAJOR EXERCISE: CHAOS CITY
(GROUP C)

Table C-1. Continued

Average Annual Income Level During Followup Period	Number of Cases	Rearrested	Not Rearrested	Reconvicted
$2,000	45	23 (51.1%)	22 (48.9%)	14 (31.1%)
$2,001 - $4,000	91	45 (49.5%)	46 (50.5%)	27 (29.7%)
$4,001 - $6,000	59	29 (49.2%)	30 (50.8%)	18 (30.5%)
$6,001 - $8,000	31	14 (45.2%)	17 (54.8%)	8 (25.8%)
$8,001 - $10,000	20	9 (45.0%)	11 (55.0%)	7 (35.0%)
$10,000	4	0 (0%)	4 (100%)	0 (0%)
Total	250	120 (48%)	130 (52%)	74 (29.6%)

Number of known Residences During Followup Period	Number of Cases	Rearrested	Not Rearrested	Reconvicted
One	87	35 (40.2%)	52 (59.8%)	23 (26.4%)
Two	91	42 (46.2%)	49 (53.8%)	27 (29.7%)
Three	49	26 (53.1%)	23 (46.9%)	17 (34.7%)
Four or More	23	17 (73.9%)	6 (26.1%)	7 (30.4%)
Total	250	120 (48%)	130 (52%)	74 (29.6%)

Table C-1. Continued

Sex and Ethnic Background	Number of Cases	Rearrested	Not Rearrested	Reconvicted
White Male	94	47 (50%)	47 (50%)	30 (31.9%)
Other Male	61	34 (55.7%)	27 (44.3%)	20 (32.8%)
White Female	63	24 (38.1%)	39 (61.9%)	16 (25.4%)
Other Female	32	15 (46.9%)	17 (53.1%)	8 (25%)
Total	250	120 (48%)	130 (52%)	74 (29.6%)

Age	Number of Cases	Rearrested	Not Rearrested	Reconvicted
18 - 21	62	37 (59.7%)	25 (40.3%)	22 (35.5%)
22 - 25	49	29 (59.2%)	20 (40.8%)	17 (34.7%)
26 - 29	31	16 (51.6%)	15 (48.4%)	11 (35.5%)
30 - 33	33	22 (66.7%)	11 (33.3%)	11 (33.3%)
34 - 37	20	6 (30%)	14 (70%)	5 (25%)
38 - 41	36	8 (22.2%)	28 (77.8%)	6 (16.7%)
Over 42	19	2 (10.5%)	17 (89.5)	2 (10.5%)
Total	250	120 (48%)	130 (52%)	74 (29.6%)

Type of Sentence Received Under Previous Offense	Number of Cases	Rearrested	Not Rearrested	Reconvicted
Probation	72	25 (34.7%)	47 (65.3%)	17 (23.6%)
Less Than One Year	123	61 (49.6%)	62 (50.4)	37 (30.1%)
Greater Than One Year	55	34 (61.8%)	21 (38.2%)	20 (36.4%)
Total	250	120 (48%)	130 (52%)	74 (29.6%)

Source: Paradise University, Criminal Justice Research Center, 1978

Table C-2. Multiple Rearrests by Original Commitment Offense

Number of Rearrests (Two-year Follow-up)	Original Commitment Offense				
	Assault	Rape	Robbery	Burglary	Theft
None	30	21	29	31	19
One	5	2	8	10	4
Two	3	1	7	14	4
Three	----	----	8	11	9
Four	2	----	4	5	6
Five	----	1	5	4	7
	N = 40	N = 25	N = 61	N = 75	N= 49

Source: See Table C-1.

Table C-3. Type of Rearrest by Original Commitment Offense

Type of Rearrest	Assault	Rape	Robbery	Burglary	Theft
Rape	1	1	----	2	----
Robbery	5	1	55	2	6
Assault	2	2	7	1	8
Burglary	----	4	20	81	19
Felony Theft	9	----	3	13	59
Misdemeanor	2	1	2	11	5
Victimless	----	----	----	1	----
Total Rearrests*	19	9	87	111	98
Total Original Cases	N = 40	N = 25	N = 61	N = 75	N = 49

*The number of rearrests is greater than 120 since the average recidivist is rearrested 2.7 times.

Source: See Table C-1.

MAJOR EXERCISE: CHAOS CITY
(GROUP C)

Table C-4. Chaos City Felony Arrest Statistics

Number of Prior Adult Arrests	1973		1974		1975		1976		1977	
	#	%	#	%	#	%	#	%	#	%
0	726	51%	1002	48%	1156	45%	1096	42%	1160	40%
1	313	22%	397	19%	437	17%	391	15%	464	16%
2	157	11%	251	12%	308	12%	261	10%	406	14%
3	85	6%	167	8%	206	8%	130	5%	145	5%
4	71	5%	84	4%	128	5%	287	11%	174	6%
5	43	3%	104	5%	180	7%	235	9%	290	10%
6+	28	2%	84	4%	154	6%	209	8%	260	9%
Total	1423	100%	2089	100%	2569	100%	2609	100%	2899	100%

Note: This table reflects the distribution of all felony arrests for the years from 1973 through 1977.

Source: Chaos City OBTS System, 1978. (Includes homicides, rape, burglarly, assault and theft)

CRIMINAL JUSTICE TRAINING CENTER
WASHBURN UNIVERSITY

A SELECTED BIBLIOGRAPHY IN CRIMINAL JUSTICE PLANNING, ANALYSIS, & EVALUATION

The material presented herein does not represent an exhaustive search of the literature. This bibliography is developed as a supplement for further information concerning specific areas by individuals participating in the Criminal Justice Training Center programs. The bibliography is separated into three major areas: criminal justice planning, analysis and evaluation. These three program areas have been sub-categorized for ease of reference and correlation with the three programs offered through the Criminal Justice Training Center. Originally prepared by Michael Agopian for the Criminal Justice Training Center at the University of Southern California, Los Angeles, California, October, 1978.

A SELECTED BIBLIOGRAPHY FOR CRIMINAL JUSTICE PLANNING, ANALYSIS & EVALUATION

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HANDOUTS

FOR

MODULE I

- DON'T PUT IN PARTICIPANT GUIDE
- USE AT INSTRUCTOR'S DISCRETION

WORKSHEET
WALK-THROUGH B, PART B
CONSTRUCTING HYPOTHESES
(Continued)

RELATING CONCEPTS	RELATING VARIABLES	RELATING MEASURES
3.2 1. Chaos City's Criminal Justice System's response to vehicle theft is the same as the national and state response to vehicle theft.	a. The clearance rate for vehicle theft in Chaos City is the same as the national clearance rate.	1) The percentage of vehicle thefts cleared by arrest in Chaos City is the same as the percentage cleared by arrest nationally.
	b. The clearance rate for vehicle theft in Chaos City is the same as the clearance rate for the State of Paradise.	1) The percentage of vehicle thefts cleared by arrest in Chaos City is the same as the percentage cleared by arrest in the State of Paradise.

WORKSHEET
WALK-THROUGH B, PART B
CONSTRUCTING HYPOTHESES
(Continued)

RELATING CONCEPTS	RELATING VARIABLES	RELATING MEASURES
3.3 Auto theft is a less serious crime than other property crimes.	a. The net dollar loss for vehicle theft is less than that for residential burglary.	1) The reported dollar value of unrecovered vehicles is less than the reported value of unrecovered burglary property.
	b. The recovery of stolen cars in Chaos City is higher than the national recovery rate.	1) The percent of cars recovered in Chaos City is greater than the percent of all cars recovered nationwide.
	c. (Because of the costs of auto theft to victims, auto theft is a more serious problem than the net dollar loss suggests.)	1) (The reported dollar value of unrecovered vehicles, the replacement costs for stolen cars and increased insurance premiums are greater than the reported value of burglary property.)

WORKSHEET
WALK-THROUGH B, PART B
CONSTRUCTING HYPOTHESES
(Continued)

RELATING CONCEPTS	RELATING VARIABLES	RELATING MEASURES
3.4 1. The magnitude of auto theft varies by geographical area of the city.	a. The frequency of auto theft varies by area of the city.	1) The number of auto thefts varies by the city's planning communities.
	b. The risk of auto theft varies by area of the city.	1) The proportion of autos stolen to autos registered varies by the city's planning communities.
3.4 2. The magnitude of auto theft varies by parking environment.	a. Auto theft from parking lots and garages is greater than from open streets.	1) The percentage of auto thefts from parking garages and lots is greater than the percentage of auto thefts from streets.

WALK-THROUGH 'B'

WORKSHEET
WALK-THROUGH B, PART B
CONSTRUCTING HYPOTHESES
(Continued)

RELATING CONCEPTS	RELATING VARIABLES	RELATING MEASURES
3.5 Auto theft is deterred by reducing the opportunity to vehicles.	a. Locking autos deters auto theft.	1) Locked cars are stolen less often than unlocked cars.
	b. Autos with improved security systems are stolen less often than vehicles without improved security.	1) For vehicles manufactured after the implementation of Standard 114 the percent that are stolen is less than the percent stolen of autos manufactured before the implementation of Standard 114.

WORKSHEET
WALK-THROUGH B, PART B
CONSTRUCTING HYPOTHESES

(Continued)

RELATING CONCEPTS	RELATING VARIABLES	RELATING MEASURES
3.6 Characteristics of motor vehicle theft.	a. The rate of vehicle theft is the same for all vehicles.	1) None provided.
	b. The rate of vehicle theft from parking lots is the same for all vehicle types.	1) The percent of trucks, motorcycles and cars stolen from garages and lots is the same.
	c. The recovery rate is the same for all types of vehicles.	1) The percent of stolen trucks, motorcycles and autos recovered is the same.

WORKSHEET
WALK-THROUGH B, PART B
CONSTRUCTING HYPOTHESES
(Continued)

RELATING CONCEPTS	RELATING VARIABLES	RELATING MEASURES
3.7 The majority of vehicle suspects.	a. The majority of auto theft suspects are amateur thieves.	1) Because most stolen vehicles are not resold or stripped, most suspects are amateur thieves.
3.8 Auto thieves are young.	a. More auto theft suspects are juveniles than adults.	1) The percentage of juvenile auto theft suspects is greater than the percentage of adult auto theft suspects.
	b. More persons arrested for auto theft are under 21 than over 21 years of age.	1) The percentage of persons under 21 arrested for auto theft is greater than the percentage of persons over 21 arrested for auto theft.

79357

U.S. Department of Justice
Law Enforcement Assistance Administration

Criminal Justice Planning and Management Series

Volume 2

Criminal Justice Analysis Course:

Text

79357

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ACKNOWLEDGEMENTS

Good analysis is indispensable to the development and implementation of effective programs for improving criminal justice and reducing crime. Practitioners know that they must rely on analysis of crime and the criminal justice system problems they face to design programs and policies and that the chances for a rational allocation of the system's scarce resources are enhanced when the relevance of the data to the problem at hand is clearly apparent. A powerful tool at the practitioner's disposal is the data collected, analyzed and utilized throughout the decision-making process.

The expertise of analysts, planners, evaluators, statisticians, and of greatest importance, people who have had direct personal experience with state and local criminal justice analysis and planning processes have been tapped by the Law Enforcement Assistance Administration (LEAA) to develop and deliver a Criminal Justice Analysis Training Course.

LEAA has developed other training courses in Planning, Program Development, Evaluation and Management. The design of these programs of instruction is intended to form a comprehensive and complementary package for the assistance of state and local criminal justice agencies.

The purpose of this Text is to provide materials that complement and support the Analysis Course and that can be used as a reference by criminal justice students and professionals. The material presented is organized to parallel the sequence of the course modules.

The Criminal Justice Analysis curriculum is the product of over a four-year effort on the part of numerous practitioners, academicians, and professional organizations. This development process was divided into four phases. During the initial phase, the curriculum development effort was coordinated by Abt Associates. Five pilot offerings of the course were delivered by the State University of New York at Albany and were evaluated by the American Institutes of Research. Considerable assistance in the early planning stages of this project was provided by the National Conference of State Criminal Justice Planning Administrators, National Association of Criminal Justice Planning Directors, Criminal Justice Statistics Association, the National League of Cities/U.S. Conference of Mayors, and the National Association of Counties.

During this initial phase of course development, overall direction of the curriculum and delivery of the pilot offerings was a cooperative endeavor within LEAA. Primarily involved were the Office of Planning and Management, the National Criminal Justice Information and Statistics Service, and the Training Division of the Office of Operations Support. Leonard Oberlander of the Office of Planning and Management and Marianne Zawitz of the Statistics Division monitored the first phase of the project.

The second phase involved the course's revision and was directed by LEAA's Training Division, Office of Operations Support. Richard Ulrich, Director of the Training Division was project monitor during this revision phase with the support of John Moxley. The revision of the material was also assisted by the formation of an Advisory Group. This group of practitioners provided critical judgement in further developing and improving the curriculum. During this stage the revision was undertaken by Abt Associates with the assistance of the University of Southern California Criminal Justice Training Center under the supervision of Robert Carter who piloted the revised curriculum. Rebecca Wurzberger of the Criminal Justice Training Center at University of Southern California, coordinated its delivery. The preparation of the revised material was significantly aided by support and contributions made by the LEAA-sponsored Training Center system: in particular, Robert Stonek - University of Wisconsin at Milwaukee; H.G. Weisman, and Craig Fraser - Florida State University; Robert Galatti - Northeastern University; Robert Carter, Rebecca Wurzberger, and Tom Esensten - University of Southern California; and Theodore Heim, Lyle Newton, and Allen Beck of Washburn University.

The third phase of the project involved the assimilation and delivery of these materials by the five Criminal Justice Training Centers. The treatment of this material by additional faculties and repeated deliveries contributed significantly to the understanding of the course materials and the needs of the criminal justice community. This formed the basis for phase four of the project in which the final set of course revisions were made.

Phase four of the project proved to be a two and one half year effort under the leadership of the Washburn University Criminal Justice Training Center. The Project Director was Lyle Newton and the management and technical direction was provided by Allen Beck.

During this fourth phase, the "finalization" of what had then evolved into a major Criminal Justice research project, all five of the Criminal Justice Training Centers, their staffs, course participants, faculties, and a broad cross section of the nation's criminal justice analysts provided major contributions to the study. During this last phase LEAA monitorship was provided by Richard Waters at the Training Division, and major contributions to content and coordination were provided by Richard Ulrich.

From the beginning the person who conceived, labored and created the Criminal Justice Analysis Course was it's author, Seth Hirshorn.

INTRODUCTION

I. Purpose and Approach

The purpose of this text is to set forth the basic elements of criminal justice analysis in a manner useful to those who have direct responsibility for getting information to decision makers in a timely, accurate, and useful way. This text is an introduction to analysis. It presents, in a systematic framework, a set of skills, tools, and knowledge which has demonstrated application in criminal justice analysis.

The text does not focus on abstract statistical techniques or on theoretical nuances in the meaning and use of the concepts of criminal justice. It does focus on the use of anaylsis in criminal justice decision-making and covers the important technical and methodological problems which analysts face in practice. This text is designed so that the reader must consider, for each technique or method, how and at what point it fits into the larger analytic structure and process. Examples and graphics have been included to facilitate the reader in this task.

In this text the requirements of abstract analysis and those of real-world decision-making coalesce. "Doing" analysis that is useful to decision-makers involves decisions and compromise. One aim of this text is to clarify these decisions and issues that frequently arise in performing an analysis. Another aim is to promote an attitude of openness and candor about the strengths and weaknesses of the information products that result from analysis.

II. Audience

The text has been developed for staff of criminal justice agencies and students of criminal justice who are interested in or who are required to provide information in support of criminal justice decision-making. These are people at the state and local levels, in legislatures, executive agencies and courts who are responsible for developing and presenting data and information, reports and plans to criminal justice officials. Typical of this intended audience are:

- staff of criminal justice planning agencies preparing state and local plans and performing evaluations,
- police agency staff responsible for developing crime analyses,
- court planners who must analyze case flows and the costs of court operations, and
- research staff of correctional agencies who provide statistical studies of inmates, costs and facilities.

Such staff are clearly disparate in terms of their prior analytic education and criminal justice experience, and yet all share a need for a strong analytic foundation. This text has been designed to provide a reference to the basic analytic skills frequently used in criminal justice analysis for staff who do not have a strong methodological background. It also was designed to provide to experienced analysts, who are new to the field of criminal justice, an orientation and overview to some of the concepts and topics in criminal justice analysis.

III. Themes

The three themes which integrate the materials presented in this text are analysis as a process, analysis as a set of tools, and analysis as a set of skills. Theme one, analysis as process, involves four steps: 1) problem identification and specification; 2) data selection and collection; 3) extraction of information from data; and 4) persuasive presentation of information. This text emphasizes the generation of problem statements which are useful in the larger decision-making process. In this sense the process of analysis is neither abstract nor an academic exercise, but a significant influence on decision-making. The first step in the process of analysis, problem identification and specification, is critical to the achievement of this influence. Following are definitions of concepts which are central to this first step:

> Problem: Any present or future condition or situation which is unacceptable or which offers an opportunity for new achievement and is theoretically susceptible to planned intervention.
>
> Problem Specification: The identification of concerns; elaboration of concepts, variables, and measures; and postulation of hypotheses.
>
> Problem Statement: A written document or oral presentation which comprehensively describes the nature, magnitude, seriousness, rate of change, persons affected, and spatial and temporal aspects of a problem using qualitative and quantitative information. It identifies the nature, extent, and effect of system response; makes projections based on historical inferences; and rigorously attempts to establish the causes of the problem.

The process of moving from the identification of a problem to a well-reasoned and clearly presented problem statement is a major theme of this text and of importance to the criminal justice decision-maker. The quality, cost and timeliness of an analysis are among the factors that contribute to problem statements being perceived as valuable aids in decision-making. The process outlined in this text will, hopefully, be useful in their preparation.

The second theme of this text views analysis as a set of tools that a practitioner can use to collect and organize data and to interpret and present information. The text emphasizes the proper application and use of basic research and statistical tools.

The third theme focuses attention on analysis as a set of skills that are used by the practitioner to assist in meeting agency objectives within an organization's social, political and economic environment. These skills involve managing analyses in an efficient and effective manner. They include the ability to develop analysis plans and implement analyses that are timely, within resource constraints, and responsive to the needs of the decision-makers.

IV. Value of Analysis

Why do analysis? The ideal of an informed decision-making process is, in part, the rationale for the systematic application of analysis to criminal justice problems. Yet, decision-making involves more than the products of analysis--also involved are the subjective feelings of the decision-maker(s) and the political and ideological factors that weigh heavily in criminal justice decision-making. A premise of this text is that reducing the decision-maker's uncertainty and providing a strong, competing, alternative perspective to the subjective and political factors will improve the performance of the criminal justice system and contribute to the reduction of crime.

There are three components to the argument supporting the conduct of analysis:

- the unique tasks and procedures in criminal justice planning require analysis;
- analysis, and the role of the analyst, is a generic part of decision-making;
- federal and state statutes and guidelines require that analysis be performed.

A. Analysis and Planning

One definition of a "plan" is a detailed formulation of a program of action. As practiced across the U.S., criminal justice planning appears to have at least four major additional defining characteristics in that it is: 1) future oriented; 2) change oriented; 3) goal oriented; and 4) can be characterized as a process. Planning may be defined as the orderly, systematic, and continuing process of bringing anticipations of the future to bear on current decision-making.

Many times criminal justice planners receive a call or get a request for an immediate response to a question or problem. Such "crisis" planning often implies responding in an ad hoc manner to a natural or man-made disaster and, in criminal justice administration, usually involves dealing with the operational problems of line agencies.

More typically, however, planning is performed in a one-year time frame corresponding to the agency's or jurisdiction's budget cycle. One-year planning is usually closely tied to the on-going problems and projects of the jurisdiction and results in an Annual Report. Over time the process becomes increasingly repetitive and highly structured. In contrast, middle-range planning may involve a five to ten-year planning horizon while long-range planning may extend the planner's horizon beyond ten years and as far out in time as a specific problem, issue, or need may require.

A second characteristic of planning is that it is change oriented. There are two important dimensions of change appropriate to criminal justice: the size or magnitude of the planned change and the rate of

change. Incremental changes, such as a shift in labor resource allocations, require a different type of planning effort than do more massive and fundamental changes, such as the decriminalization of certain statutes. Nonetheless, given an existing situation and a proposed change, large or small, a planner's responsibilities include:

- formulating an accurate statement of the problem(s) facing a community;
- identifying preferred alternative remedies; and
- considering what specific impacts such alternatives might have on these problem(s) and the community's environment.

The rate of proposed changes is an equally important consideration. For example, crime reduction objectives are usually qualified by the rate considerations of "by when" or "how soon."

A third major characteristic of planning is that it is goal-oriented. The development and prioritizing of goals and objectives are important planning activities. For example, the Urban High Crime Reduction Program funded by the Illinois Law Enforcement Commission established three major goals for local projects:

1) To reduce burglary and stranger-to-stranger crime through rational analysis and systematic goal-oriented planning, development and implementation;

2) To evaluate the various approaches undertaken by the program and the possible replications elsewhere in the state; and

3) To increase coordination between police, courts, and corrections officials in policy development and decision-making at the local level.

A review of local, regional, or state criminal justice planning documents would reveal similar sets of goals. Making such objectives operationally meaningful and establishing priorities among these goals, however, are equally important activities.

Finally, as illustrated in Exhibit i-1, planning may be conceptualized as a process consisting of a sequence of more or less discrete activities and tasks. At the center of this process is a rationalistic view of criminal justice decision-making which involves a planning-action-evaluation sequence. The initial seven steps of the general planning process model--from preparing for planning through identifying alternative courses of action--comprise the "planning" steps of this process. Selecting the preferred alternatives, planning for implementation, and actually implementing the plans comprise the "action" component. Finally, monitoring and evaluating progress is the "evaluation" step in the process.

The relationship between planning and analysis is revealed in the following ways: 1) in the types of decisions to be made and 2) in the

completion of specific steps of the process model. The decisions which an agency has to make are decisions about which criminal justice problems merit attention, what the best approaches to treating these problems are, and who the appropriate agents are to carry out selected approaches. One contribution to structuring decisions which comes from analysis is the identification and statement of problems. Another contribution is the development of strategies for dealing with those problems. Indeed, analysis may play a role in virtually every step of the planning process because implicit in the formulation of strategies is some consideration of why--based on analysis of data--a strategy can reasonably be expected to work and what resources are needed to make it work.

B. Analysis and Decision-Making

Above all, analysis should be decision-oriented.[1] This link to criminal justice decision-making makes knowledge of analysis a basic job-related skill. Many students of government and public decision-making have commented on this fundamental relationship. John Dewey, for instance, perceived between "problem identification" and "solution," four successive steps decision-makers go through: 1) specification of difficulties and immediate pressures; 2) analysis of the problems and their basic dimensions; 3) a search for alternative solutions; and 4) consideration of the consequences of each alternative.[2] More recently, models of public decisions, while becoming more elaborate, have nevertheless continued to emphasize the central place of analysis in the decision-making process. Kepner and Tregoe defined the rational manager at least, in part, as a person who constantly screens his/her environment and assesses problems in terms of their perceived causes. Analysis is, again, central to the role of the rational manager.[3] Allan Easton has written that the first steps in decision-making are recognizing a need for change and diagnosing the problem. Diagnosis, according to Easton, is a ten step process requiring the analyst to:

1) Identify desired state and compare with actual,

2) Identify and enumerate symptoms and clues,

3) Diagram system - times and places of symptoms,

4) Review any recent changes in the system structure, process or environment,

5) Prepare state-of-affairs tables

   - What is happening?
   - Where?
   - When?
   - How much?
   - Are the symptoms stable or varying?

6) Prepare a list of tentative hypotheses,

7) Arrange hypotheses by simplicity and test them, simplest first,

8) Eliminate hypotheses, modify them with new evidence,

9) Continue until hypotheses fit all facts,

10) Test hypotheses for validity.[4]

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Many other authors have similiarly placed analysis at the center of decision-making and considered scientific method the foundation of analysis.

Such an applied methodology requires:

1) Reliance upon "an open, explicit, verifiable, self-correcting system." It is important that analysis be replicable by other analysts.

2) Objectivity, personality and other irrationalities have no room in analysis. "The truth of a scientific proposition is established by logical and empirical methods common to the profession as a whole."

3) Proper testing of hypotheses. There is no one method applicable to problems of both the physical and social sciences.

4) Appropriate use of quantification.5

Over the past fifteen years the use of analysis in decision-making-management science, operations research, systems analysis, policy analysis and program evaluation--has drawn considerable attention and criticism. Churchman has identified the critics as the "humanists" and the "anti-planners." Analysts, according to the humanist's view, are too narrow in their definition of problems, rarely capturing humanistic values in their search through the data. If the humanists do not believe the procedures of analysis can capture the human dimension, they at least place some value in the concept of analysis.

> "Not so the anti-planners.... The most common variety is 'Mr. Experience." He/she believes that experience in the organization, combined with natural ability, native intelligence and personal leadership beats (analysis) everytime. This may be true occasionally but, it would be a difficult contention to "prove" either way.
>
> A somewhat more serious version of anti-planning is held by the "Skeptic." The Skeptic is a relativist who asks if anything is really 'true.' While skepticism suggests good questions, it does not provide good answers.
>
> Still another proponent of anti-planning is the "Determinist." The Determinist argues that any system is the result of various, often unidentifiable, social forces. (Determinists) basically argue that systematic decision-making is not a reality in public bureaucracies and attempt to describe the policy-making process as it really is: incremental, fragmented, unanalytic, limited and disjointed. From this viewpoint, however, determinism is a statement of fact, not an argument against (analysis).6

Analysis, it seems, is one of many factors than inform and influence criminal justice decision-making. These factors effect specific decisions in various ways and with varying impacts. Because most decision-making is inherently uncertain and public decisions require a careful balancing of technical, political, and other factors, the responsibility of the bureaucrat, and specifically, of the analyst, is to see that timely, relevant, and understandable information is available to the decision-maker. This is the place of analysis in decision-making: a salient and competing influence. The role of the analyst in this context is to maximize the impact information has on decisions.

C. Analysis and Federal/State Funding Requirements

The Justice Improvement Act of 1979 eliminated the comprehensive planning requirement for funding and replaced it with a significantly different "application." As part of an "application" for federal funds, each applicant is now required, among other things, to prepare a "crime analysis." This latter term is not explicitly defined in the 1979 Act; however, section 402(b) states that an analysis of the criminal justice problems within the State, to be based on input and data, is required; and, further, that a total and integrated analysis of the criminal justice problems is to be prepared. A review of the crime analysis provisions of the 1979 Act concluded that the preparation of a "crime analysis" is a central feature of state and local applications.7

The content of formula grant applications under the 1979 Act, and specifically, the meaning of "crime analysis" is partially addressed in the published (draft) rules of the Formula Grant Program which appeared in the Federal Register, January 14, 1980 (pp. 2808-2827). Following is the relevant excerpt from these rules appropriate to the new state council activities:

> "(b) Identification of priority problems, (1) Analysis. (i) State Councils shall conduct an analysis of crime and delinquency problems and criminal and juvenile justice needs within the State. The State's analysis must be based upon input and data from all eligible jurisdictions, State agencies, the judicial coordinating committee, and citizen and neighborhood and community groups. It must address the problems and needs of all components of the criminal and juvenile justice system, and provide a clear and logical basis for the priority problems and programs set forth in the comprehensive State application.
>
> (ii) Entitlement localities also shall conduct an analysis of the crime and delinquency problems and criminal and juvenile justice needs within their jurisdictions. This analysis must be based upon input from all participating local governments and citizen and neighborhood and community groups. The entitlement analysis must address, at a minimum, the problems and needs of those aspects of the criminal justice system for which it has responsibility, and provide a clear and logical basis for the priority

problems and programs set forth in the entitlement application.

(iii) The product of the analysis is a series of brief written problem statements set forth in the application for those problems that are priorities and for which programs are proposed.

(2) Priorities. Priorities are problems that have been identified by analysis and ranked in terms of their importance or emphasis. As part of the application process, they are used to indicate those problem areas of greatest concern and to provide guidance for the submission of applications from State agencies, local governments, and non-profit organizations.

A similar process is to be performed by each entitlement jurisdiction:

(ii) Entitlement area priorities. (A) Priorities established by entitlement jurisdictions are to be consistent with State priorities unless good cause for inconsistency can be shown by analysis of local needs (see § 31.401).

(B) Inconsistency is defined here as the inclusion of a priority not established and published by the State Council or the inclusion of a priority substantively in conflict with a priority established by the Council.

(3) Product. (i) The product of the analysis is a series of brief written statements set forth in the application that define and describe the priority problems. These statements are to be organized by the 23 eligible Section 401 purposes or by any other scheme and cross-referenced to these purposes.

(ii) A problem statement, as used herein, is defined as a written presentation which comprehensively describes the magnitude, seriousness, rate of change, persons affected, and spatial and temporal aspects of a problem using qualitative and quantitative information. It identifies the nature, extent, and effect of system response, makes projections based on historical inferences and rigorously attempts to establish the origins of the problem.

Finally, the proposed format of the state application is as follows:

Standard format for Comprehensive State Application

Area: Key to purposes set forth in Section 401(a)
Problem statement: Statement of problem, including an indication of its priority
Program: Description of program developed to deal with the problem stated above
1. Title
2. Description
   a. Objectives
   b. Activities Planned
   c. Budget
   d. Relationship to Similar Programs
3. Explanation of Adherence with Effectiveness Criteria
4. Performance Indicators

Note--there may be more than one problem statement for each area. Similarly, there may be more than one program for each priority problem.

In many respects the process and products just identified are derived from and/or are consistent with the materials contained in this text. The reader will find in the text a comprehensive reference on what a problem statement is, how it should be prepared, and most importantly, how data analysis may effectively be used in preparing such statements. The skills, tools and information presented will, hoepfully, be used by state and local practitioners in the development of federal, state, and local funding applications, thereby helping to assure the identification of significant problems and relating policies and program designs to these problem statements.

V. Roadmap

The definition of analysis as a process to inform criminal justice decision-making is used to organize the text. Exhibit i-2 is a display of this process emphasizing: 1) a focus on the problem formulation applications of analysis as distinct from strategy development or evaluation applications; 2) movement from ambigious concerns to well-documented problem statements which are a product of the process; 3) the focus of the process on informing and influencing decision-makers.

Exhibit i-3 outlines the text relating each of seven chapters to different components of the analysis process. There is an eighth chapter, which concludes the text, covering the management skills required in planning and conducting analyses. The exhibit is constructed in the form of a flowchart, and such flowcharts are used at the conclusion of each chapter to summarize and review material. A flowchart is a graphic representation in which symbols are used to represent operations, decision points, direction of movement, etc. In Exhibit i-3 rectangles are used to present an instruction or information; diamond-shaped figures indicate decision points--places where the user must make choices; and arrows are used to indicate the direction of the flow.

EXHIBIT i-2

PROBLEM ANALYSIS

A PROCESS TO INFORM DECISIONS

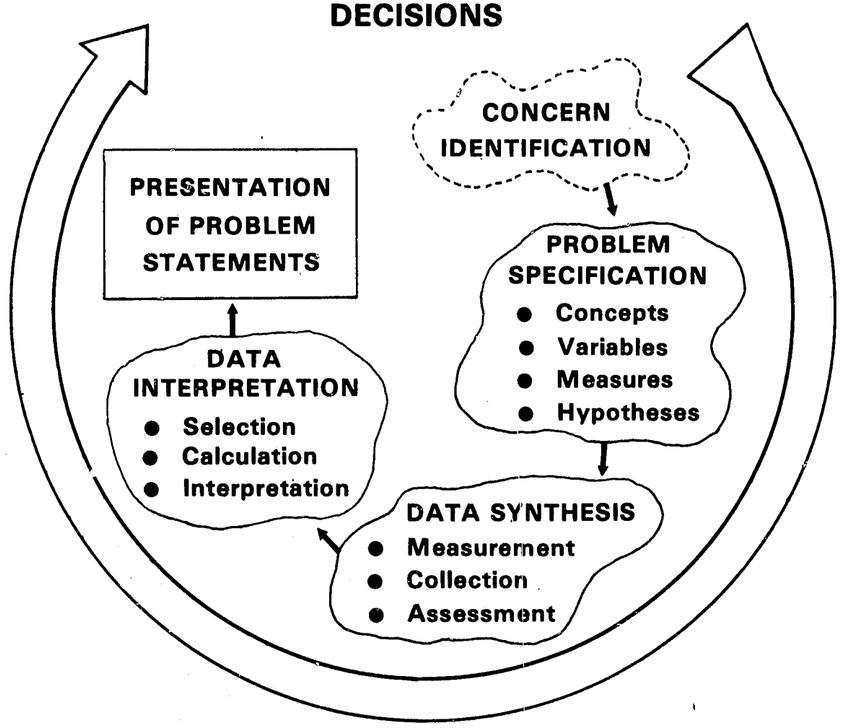
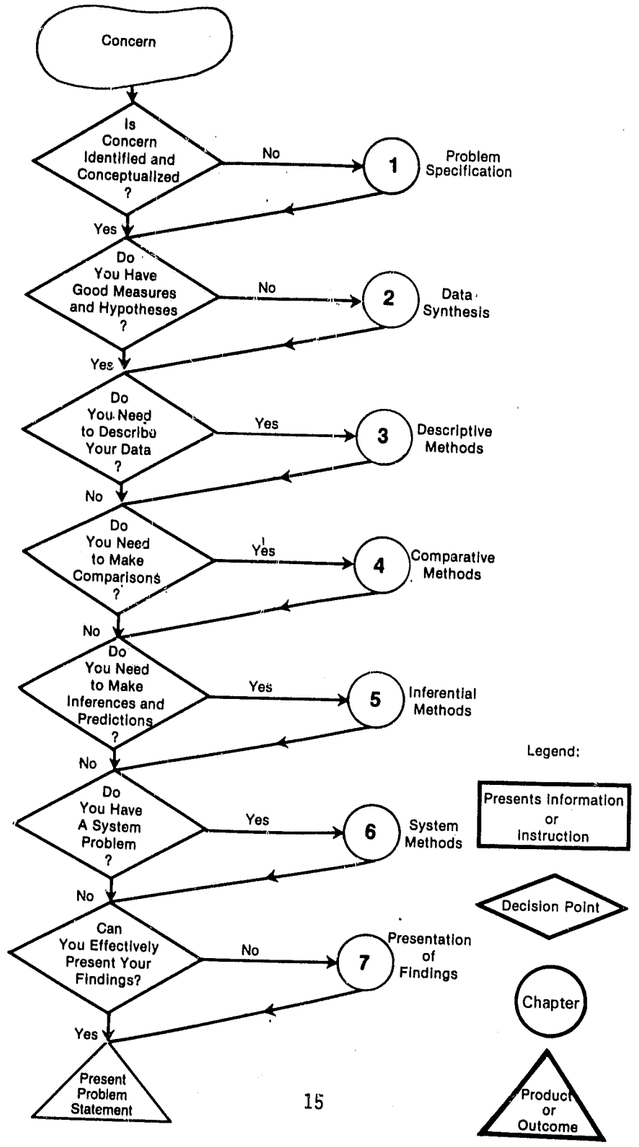


EXHIBIT i-3

ORGANIZATIONAL CHART: AN INDEXING OF CHAPTER CONTENT TO THE COMPONENT OF THE ANALYTIC PROCESS DISCUSSED



The Criminal Justice Analysis Text is divided into three parts. Throughout the text, the hypothetical community of Chaos City is used to provide examples of problems and to illustrate steps in the analysis process. Chaos City has a population of about 250,000 and though it is represented as a city which is typical of other cities of its size, there was no intention to depict precisely the conditions of any actual city.

Part One examines some of the basic considerations that are central to the conduct of analysis. Chapters 1 and 2 present an approach to analysis that has been developed out of the mainstream of our scientific traditions and the comparatively new field of study--the policy sciences. The reader will find in this material an organization, structure, and procedure for undertaking analyses and the systematic development of data sources in the criminal justice field.

Part Two presents, by example, descriptive, comparative, and inferential methods that have demonstrated wide applicability to criminal justice problems. Throughout this portion of the text the emphasis is on the selection of appropriate method(s) for a specified problem, the mathematics of the method(s), and the correct interpretation of results. In Chapter 3 a problem involving the analysis of robberies in the hypothetical community of Chaos City is introduced and used to illustrate the descriptive methods discussed in the chapter. Chapter 4 covers methods that are frequently used to compare two variables. These methods range from the construction of rates, indices and seriousness scales, to the development and interpretation of cross classification tables and scatter diagrams. Chapter 5 presents selected inferential statistics used to indicate association and relationship between variables. Also treated is the topic of least squares regression, a method frequently used for making point estimate predictions. Chapter 6 extends the discussion of methods to their application to system problems and system data: A number of techniques are examined for describing and comparing system data. A study of a hypothetical court backlog problem is used to focus the presentation.

Part Three of the Text treats the management and presentation skills that are essential if analyses are to make a difference. Chapter 7 explores the procedures and issues surrounding effective oral and written presentations. In the final chapter a management approach to planning and conducting analyses is discussed. This approach summarizes and draws upon the foundation provided in the preceeding chapters.

[1]Norman Beckman, "Policy Analysis in Government: "Alternatives to Muddling Through," Public Administration Review, (Vol. 37, No. 3) May-June, 1977 , pp. 221-22.

[2]Daniel Katz and Robert L. Kahn, The Social Psychology of Organizations 2nd Edition (New York: John Wiley and Sons, Inc., 1978), p.79.

[3]Charles H. Kepner and Benjamin B. Tregoe, The Rational Manager: A Systematic Approach to Problem Solving and Decision-Making, ed. Perrin Stayler (Princeton, New Jersey: Kepner-Tregoe, Inc., 1965).

[4]Allan Easton, Decision-Making: A Short Course for Professionals (New York: John Wiley and Sons, Inc., 1976).

[5]Alain Enthoven, U.S. Senate Subcommittee on National Security and International Operations, Planning Programming-Budgeting: Hearings, Washington GPO, 1967, in Robert D. Miewald, Public Administration: A Critical Perspective, (New York: McGraw-Hill, 1978) p. 172.

[6]Nicholas Henry, Public Administration and Public Affairs (Englewood Cliffs: Prentice Hall, 1975) pp. 132-133.

[7]Office of the General Counsel, LEAA, Reauthorization Meeting Issue Paper - Justice Improvement Act of 1979 (Louisville, Kentucky, Dec. 6-7, 1977), pp 12-13.

[8]Federal Register (Vol. 45, No. 9: Jan. 14, 1980), p. 2815.

[9]Ibid, p. 2816.

[10]Ibid, p. 2817.

[11]There are many useful references on flowcharting techniques mainly oriented to computer programming applications including: Thomas J. Schriber, Fundamentals of Flowcharting (New York: John Wiley and Sons, Inc., 1969) and Mario V. Farina, Flowcharting (Englewood Cliffs: Prentice-Hall, 1970). The development of flowcharts for this text was suggested by the application of flow charts developed by Thad R. Harshbarger in his book, Introductory Statistics: A Decision Map Approach, 2nd ed. (New York: Macmillan Publishing Co., 1977) and an excellent quick reference monograph developed at the Institute for Social Research, University of Michigan entitled A Guide for Selecting Statistical Techniques for Analyzing Social Science Data (Ann Arbor: ISR, 1975).

CHAPTER 1

PROBLEM SPECIFICATION

I. How Problems are Specified

A. Problem Specification Process

Analysis usually begins with a question or observation--yours or one that is given to you. These need to be challenged, explored and understood in terms of related issues and their probable consequences. While these may be raised by an inductive process, e.g., the observation of a dramatic change in the present situation or a significant shift in public opinion, the analyst uses deductive reasoning to develop an accurate and comprehensive explanation of the situation. The opening chapter presents a deductive approach to elaborating and refining such questions and observations into well specified problems.

Problem specification is the identification of related concerns; elaboration of relevant concepts, variables, and measures; and construction of hypotheses to help organize the analysis. In many respects these initial steps of analysis are the most confusing, time consuming, and important. They help to establish an understandable structure, to provide direction and to give meaning to subsequent analytic tasks. However, there is much wheel-spinning and many false starts during problem specification. After a great deal of consultation and deliberation, what initially appeared to be a critical problem may take on less importance and be replaced by a new set of issues. The problem specification approach described in the following pages is designed to make the analyst's initial encounter with a criminal justice problem as productive as possible, helping to reduce the inevitable frustrations of doing analysis, and hopefully resulting in products that get serious consideration in the decision-making process.

B. Identification of Concerns

How are decisions made about which issues are to be studied? What is an analyst's role in developing such an agenda for his/her agency? And why are some criminal justice problems not analyzed at all? Intuitive answers to such questions are usually of two types--the obvious and the complex. On the one hand, it seems obvious that most analysis agendas are established by the directives of an agency administrator or a political leader(s). On the other hand, decision-making processes in most criminal justice agencies are complex involving a variety of individual, organizational, and political influences. Consequently most criminal justice analysts tend to take a problem as given and are rarely involved in participating in setting their own agenda. In this section the process by which concerns are identified and the role of an analyst in developing his/her agency's analysis agenda are considered.

Statements of concern are the starting point in problem specification. A concern is the set of vague and frequently ambigious hunches and/or attitudes about aspects of crime and the criminal justice

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system. Typical of such hunches are statements such as:

- "It seems to me that there has been a substantial increase in crime in our city."
- "According to the newspaper, our senior citizens and handicapped residents are the most frequent victims of crime."
- "In my neighborhood people are scared to leave their homes at night."
- "The police in our city have done very little to combat the recent crime wave."

Such statements are usually undocumented, may be the result of a single incident or experience, and involve beliefs and intuition as much if not more than facts. These expressed concerns need to be elaborated by the analyst into a series of related questions. For example, the first statement about a rise in crime could be elaborated into the following questions:

- What are the trends in crimes in the city and in each neighborhood?
- How do these crime trends compare to other cities in the state and nationwide among comparable size cities?

The second statement concerning the victims of crime might be addressed by asking the following questions:

- Which groups in the population are most likely to be victimized?
- What is the relation between victimization and education, age, marital status, home ownership, and residential stability of the victims? Do these relationships vary by type of crime?
- Are people who are victimized by one type of crime more likely to be victimized by another type of crime?

The fear of crime hunch might be developed into these questions:

- How safe do residents believe their neighborhood and city are during the day and at night?
- Do residents believe their neighborhood and city are safer or more dangerous than other places?
- Have residents limited or changed their activities because they are afraid of crime?

- What types of individuals or groups are more likely to express fear of crime? Are the differences in fear large or small?
- Is fear of crime higher or lower among persons who own their homes rather than rent, or who have more or less education? Are these differences, if any, due to income differences?

The final statement concerning police performance could be elaborated into the following questions:

- How do residents of the city rate the performance of the local police?
- Do people who think that crime is getting worse seem to blame the police?
- Are victims more likely than non-victims to dislike the police? Does this vary by race and income?[1]

As a second example consider the following concerns identified during the Kansas City Preventive Patrol Experiment which "was designed to measure the impact routine patrol had on the incidence of crime and the public's fear of crime:"[2]

- The ability of police departments to conduct social experiments which address current and projected issues of concern.
- The ways in which existing resources (time, manpower, finances, etc.) can be identified and used in developing new police strategies and, specifically, ways in which manpower can be developed and employed to the best advantage.
- The ways of accurately assessing what police officers do in the field and of measuring the impact of their activities upon the community.
- The development, at the line level, of criteria by which police officers can measure work performance.
- The ability of police departments to define their roles in both the criminal justice system and the communities of which they are a part, and to communicate these roles accurately to the various publics the department serve.
- The relationship of police effectiveness to these issues.

In contrast to the previous set of concerns, these are expressed in a more objectified manner--as statements of need. In this case, needs for various types of information. Still these concerns lack specificity and are implicitly based on attitudes or hunches about police work.

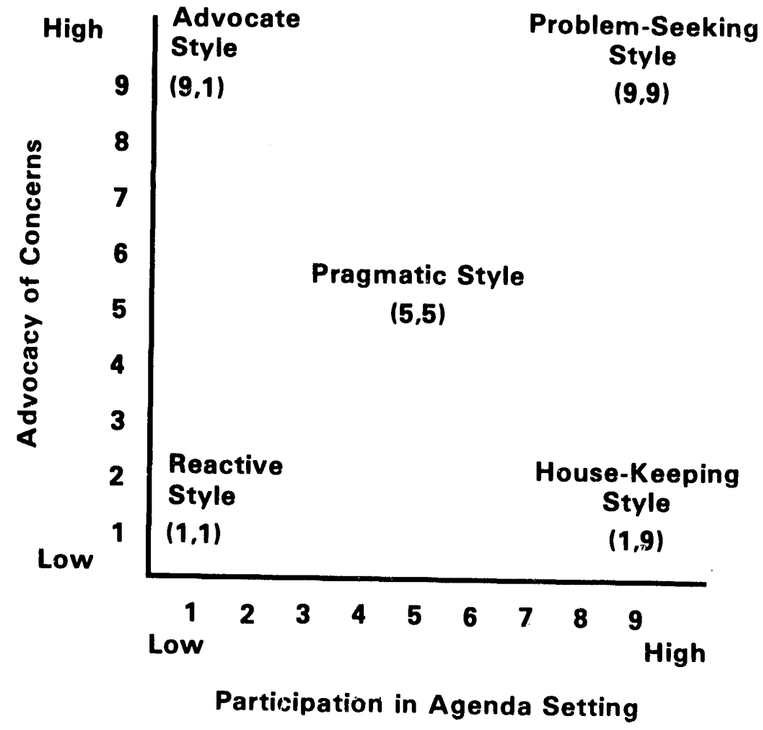
There is a second important characteristic of most concerns in criminal justice. The process of generating such concerns usually results in differing conclusions, points of view and even political conflict. Such conflict means that if analysis of concerns is to occur, they must be placed on an "analysis agenda." This agenda consists of "the (concerns) receiving active and serious consideration by (the analyst)."[3] The source of new concerns and the process by which the analysis agenda is developed are major issues, since all concerns cannot be analyzed and prioritizing of concerns must occur.

At any particular point in time the analysis agenda will consist of mostly "old" concerns, perhaps one or two new issues, and is usually more in the minds of the analyst and agency administrator than in a formal document. The "old" concerns are those topics which, because of some process such as budgeting or planning, routinely become the focus of attention. Old concerns may arise also from the periodic swing of the crime statistics or of the criminal justice pendulum. New concerns must fight for a place on the agenda and consequently are more often the result of unanticipated events which have the appearance of requiring immediate attention.

Within the context of new and old concerns and the setting of the analyst's agenda, style takes on importance. Analytic styles may be identified by behavior of the analyst in regard to (1) advocacy of concerns and (2) participation in agenda setting.[4] A variety of styles may be described by the interaction of these two factors. (See Exhibit 1-1). One type of analyst avoids controversy and the advocacy of issues. Reactors (1,1 style), when confronted with a high risk issue expressed by a superior in the organization, generally indicate the problematic aspects of doing an analysis, preferring to focus on the softer issues. They are consequently inoffensively unresponsive. A Reactor would prefer to have no analysis agenda at all. Problem-seeking (9,9 style) analysts assume that because of their specialized and technical skills they are more knowledgable about the criminal justice concerns facing the community. They also have a great deal of autonomy in their work. Consequently Problem Seekers are heavily involved in setting their own agendas and in advocacy of concerns. Advocates (9,1 style), in contrast, may be avoided or blocked from participation in agenda setting either informally due to personal conflicts or formally by the rules and regulations of the organization. Advocates emphasize the elaboration and expansion of the administration's statements of concern. They tend to view themselves as agents of these decision-makers and their primary responsibility as implementation and not the development of new analytic topics. Housekeeping Analysts (1,9 style) are setters of their own agendas; however they avoid controversial issues and advocacy. Housekeepers tend to be removed from the major decision-making process and organizationally isolated from the leadership of an agency, focusing on the routine and required "housekeeping" tasks, such as preparing the Annual Report.

EXHIBIT 1-1

A SUMMARY OF ANALYTIC STYLES



Source: Adapted from Robert R. Blake and Jane S. Mouton, The Managerial Grid (Houston: Gulf Publishing Company, 1964) p. 10.

CONTINUED

10 OF 14

In the middle is a pragmatic style (5,5 style) in which the analyst has a major part in setting the agenda and does not avoid advocating new concerns. However, the extent and type of participation and advocacy is heavily influenced by other participants and by the pragmatist's assessment of each situation.

These styles are not suggested in a prescriptive manner. Most analysts exhibit characteristics of more than one type, but the analytic style may play a significant part in identifying concerns and establishing the agency's analytic agenda. Once such an agenda exits, the next step is to elaborate each statement of concern into its component concepts, variables, and measures.

C. Generation of Concepts

A concept is defined as a distinguishable component found or expressed within a statement of concern. Exhibit 1-2 is a statement about crime trends in Chaos City. The concern expressed in this statement is that violent crimes are increasing in the community at an alarming rate. Within this concern and expressed in the statement are several concepts, including (1) "incidence of violent crimes" and (2) "rate of change in the incidence of violent crimes." This statement also illustrates an alternative definition of the term concept, i.e. "a concept expresses an abstraction formed by generalizations from particulars."[5] The concept "incidence of violent crimes" is developed by generalizing from the specific homicide, assault, and robbery rates. (See Chart in Exhibit 1-2)

These two definitions are examples of the difference between an inductive and deductive approach to analysis. Inductive reasoning is initiated by examination of the data and the particulars and from these developing a sense of patterns, trends, and relationships. In contrast deductive reasoning begins with an understanding of a concern and involves examining presumed patterns, trends, and relationships against data.[6]

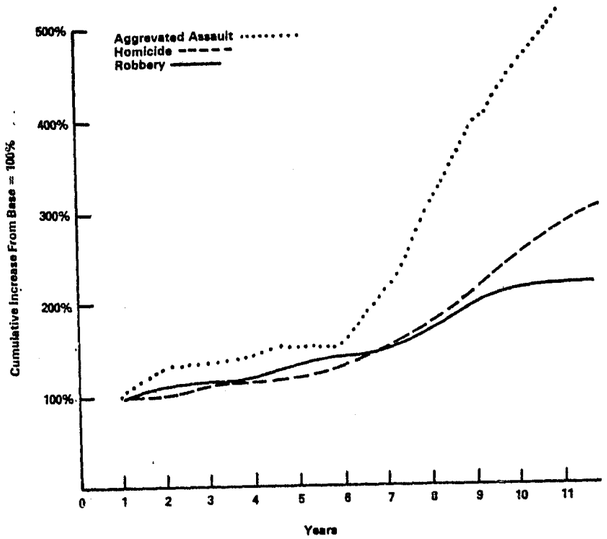
Additional examples of concepts are implied in the questions pertaining to the fear of crime presented in section B above. Specifically, the questions about the police involve the concept of police operations and perceptions of police operations. The questions about residents' fear of crime pertain to the concepts of (1) "perceptions of neighborhood safety," (2) "groups that are affected by fear of crime," and (3) "the consequences of fear of crime."

EXHIBIT 1-2.

CONCERNS AND CONCEPTS: STATEMENT OF CRIME TRENDS IN CHAOS CITY

Historically, aggravated assault and homicide rates in this area have been relatively low, and these crimes have not been considered serious problems. By contrast, the rate of robbery has always been quite high; more observers have consistently identified robbery as the jurisdiction's most serious crime problem. Analysis of recent trend data, however, indicates that the city's assault rate has shown dramatic increases over the last several years. The significance of this trend is exacerbated by recent signs that the homicide rate is now responding to the increase in assaults. Fortunately, the assault increase has, according to police statistics, come primarily in assaults which involve knives and blunt instruments. Since these are less often fatal than firearm assaults, the homicide rate has not yet risen as rapidly as the assault rate. Should firearm assaults resume their traditional proportional role, however, the city is likely to suffer a very substantial increase in homicides.

PROPORTIONAL INCREASES IN ASSAULT, HOMICIDE AND ROBBERY IN CHAOS CITY BY YEAR



Year One = 100%

The following list of concepts have broad applicability in development of many criminal justice concerns:

- Magnitude: Size, extent and/or importance of a problem.
- Rate of Change: Comparison of a problem in an earlier period of time to a later period.
- Temporal Aspects: Cyclical nature or seasonality of the problem.
- Seriousness: Amount of harm a problem inflicts on a community or person.
- Persons Affected: Considerations of the Victim, Offender and/or Public related to the problem.
- Spatial Aspects: The geography of the problem.
- Administration: The organization, policies, goals and standards of the relevant criminal justice agencies.
- System Operations: The inputs, performance and outputs of the relevant criminal justice agencies.

Consider the statement in Exhibit 1-3. Identified in the margins are some of the concepts from the above list. The concern expressed by the statement is that there is a need to address the rape problem in Chaos City.

EXHIBIT 1-3.

CONCERNS AND CONCEPTS: RAPE IN CHAOS CITY

Social agencies have always given too little attention -- and too little understanding -- to the victims of rape. The results have been both that many, perhaps most, rapes are never reported to law enforcement agencies and that victims, scared by the callousness of the system, are unwilling to testify in court, thereby minimizing the possibilities of convicting the offender. Chaos City recently witnessed a series of grotesque and highly publicized rapes. Although the overall rate of reported rapes does not seem high for the city, these specific incidents have galvanized citizen interest and have led to the formation of a citizen law enforcement task force; already this group has raised sufficient funds with the community to give it some stability and to allow it to formulate a series of pilot proposals. Thus, the city presents an excellent environment for testing innovative approaches for improving the treatment of rape victims and increasing the conviction rate in the prosecution of rape offenders.

Persons Affected

Current System Operations

Magnitude

Administration

System Response

The difficulty in moving from concerns to concepts is a major barrier in the conduct of analysis. The field of criminal justice has not yet reached a point in development where there are well-defined and standardized concepts. The debates over the meaning of recidivism, delinquency, deterrence, and performance are indicators of this problem. Nevertheless, the careful development and use of concepts is an important objective. Precision in the use of concepts greatly enhances communication and the transmission of knowledge. (In Chapter 6 a set of system-related concepts are defined and used in conducting an analysis of court backlog problems.)

Concerns and their related concepts are familiar to the criminal justice administrator and to politicians with an interest in criminal justice. Most legislation and administrative regulations are written at this level of problem specification. Most political debates over criminal justice issues occur at the conceptual level. It is the analyst's responsibility, in addition to elaborating and bringing some precision to these terms, to operationalize concepts into their respective variables and measures. This topic is the subject of the next section.

D. Elaboration of Variables

Analysts do not study concepts directly; what analysts essentially study are variables. A variable is a characteristic, trait, attribute, or event having more than one possible value. For example, type of weapon can take on three possible values -- knife, gun, or none; sex offender may take on two possible values; -- male or female; while age of offender may take on a large number of different values. Variables are often directly observable while concepts are not. Presented in Exhibits 1-4 and 1-5 are data that have been collected as a result of a concern over robberies in Chaos City. In Exhibit 1-4, three concepts related to this concern are identified: characteristics of the offender; characteristics of the crime; and characteristics of the victim. Fifteen robberies are displayed, ten that occurred in August and 5 in September. In Exhibit 1-5, the first column presents a list of 15 variables -- six related to offender characteristics, five related to crime characteristics, and three related to victim characteristics.

EXHIBIT 1-4.

CONCEPTS AND VARIABLES: ROBBERY DATA SET

Concept: Characteristics of Offenders

Variables:
- Age
- Sex
- Race
- Education
- Employment Status
- Prior Record

Concept: Characteristics of the Crime

Variables:
- Type of Weapon
- Time of Day
- Place of Arrest
- Type of Robbery
- Place of Occurrence

Concept: Characteristics of the Victim

Variables:
- Age
- Sex
- Value of Stolen Property

EXHIBIT 1-5.

VARIABLES AND MEASURES: ROBBERY DATA SET

Variable	Measure -- Description and Codes
Age	Age of Offender at Arrest
Sex	Sex of Offender M. Male F. Female
Race	Race of Offender W. White B. Black I. Indian
Education	Last year of school completed by Offender
Employment Status	Employment Status of Offender U. Unemployed at time of arrest E. Employed at time of arrest
Prior Record	Offender has prior criminal record Y. Yes N. No
Type of Weapon	Type of Weapon K. Knife G. Gun N. None
Time of Day	Time of day robbery occurred (A=A.M., P=P.M.)
Place of Arrest	Part of metropolitan area Offender was arrested S. Suburban area C. Central City
Type of Robbery	Type of Robbery 1. Robbery and attempted robbery with injury 2. Robbery without injury 3. Attempted robbery without injury
Place of Occurrence	Type of place where robbery occurred 1. Highway 2. Commercial House 3. Gas or Service Station 4. Chain Store 5. Residence 6. Bank 7. Miscellaneous
Age of Victim	Age of Victim
Sex of Victim	Sex of Victim M. Male F. Female
Value of Stolen Property	Dollar Value of Stolen Property

These examples illustrate an important distinction between variables that is useful in specifying a problem. Variables may simply categorize behavior or traits; they may rank categories in the order of their seriousness or desirability; or they may quantify the trait or behavior. The first type of variable simply divides behaviors or traits into categories which are exhaustive and mutually exclusive. This type of variable is called a categorical variable or a nominal measure of the trait or behavior.[7] (The relationship of measures to variables is elaborated in section 5, below.) In Exhibit 1-5, each offender is classified as either male or female, and a single offender cannot be both sexes. Other categorical variables in Exhibit 1-5 include race of offender, employment status, prior record, type of weapon, place of arrest, place of occurrence, sex of victim, and time of day. The second type of variable simply rank orders the categories of nominal measure. Type of robbery, in Exhibit 1-5, is a variable in which categories of robbery are ranked from the most serious type of robbery, with a value of 1, to least serious type, with a value of 3. A third type of variable is a continuous variable which "orders values over a specified range"[8], but in this case the values are quantifiably comparable to each other. In the rank ordered variable, for example, though robbery of type 1 is more serious than robbery of types 2 and 3, the numbers are used only to differentiate one category from another. In a continuous variable, however, like age of the victim, a category with a value of 36 is twice that of a category with a value of 18. Other examples of continuous variables in Exhibit 1-5 are age of the offender and the dollar value of stolen property.

Problems of basic interest in criminal justice analysis are those indicated by the following variables: type of crime, unacceptable rates of crime, fluctuations in crime rates, etc. Frequently, an analyst is concerned with the ways in which certain crime variables fluctuate from time to time or from place to place in his/her city. It may be noted that over the period of several years, some crimes have higher rates during certain months of the year--such crimes as auto theft--while other crimes, such as commercial robberies, appear constant throughout the year. Why do these crimes either vary or remain constant?

In criminal justice analysis, variables relating to the types and rates of crime are typically considered dependent variables; that is, the value which a (dependent) crime variable assumes is thought to be influenced by the values assumed by other kinds of variables--such as season of year, climate, unemployment rate, population growth, or the changing age composition of the population.[9] The other variables which seem to influence the types and rates of crime are called independent variables. Independent variables help to explain or to predict the values which are likely to be assumed by dependent variables.[10]

To summarize: A single concept may be made observable through one or more variables. A single variable may have a level of measurement which is categorical, rank-ordered, or continuous. That same variable may also be either independent or dependent. (And as will be noted in greater detail in section F, below, a variable which is independent may also be classed in a third way--as descriptive or causal.)

E. Elaboration of Measures

A measure is defined as an observable qualitative or quantitative indicator used as a standard for description or comparison. Measures of the variables in the Robbery Data Set were presented in Exhibit 1-5. Measurement is the procedure of classifying "cases" (the unit being analyzed, be it "robberies" as in Exhibits 1-4 and 1-5, or "respondents" as in a victimization survey) into well defined categories of a variable. Exhibit 1-6 presents the specific values of each variable identified in Exhibit 1-5.

There are, generally, two types of problems associated with measurement: the accuracy of the measures used in an analysis and the meaning of the classifications selected. Measurement accuracy is considered in Chapter 2. Assigning meaning to the classifications used requires the adoption of a rule by the analyst. "A rule is a guide, a method, a command that tells us what to do." An example of a measurement rule which rank orders is: "Assign the numerals 1 through 5 to individuals according to how nice they are. If an individual is very, very nice, let the number 5 be assigned. If an individual is not nice at all, let the number 1 be assigned. Assign to individuals between these limits numbers between these limits."[11] In Exhibit 1-5 the rule used to measure the variable "employment status" was: "Assign a 'U' to all offenders who are unemployed at the time of their arrest and an 'E' if they are employed." The validity of the measure U or E, of course, depends upon how employment or unemployment are defined. Just as there are "good" and "bad" definitions of employment, for example, there are good and bad measurement rules and good and bad measures. Validity will be discussed in greater detail in Chapter 2.

EXHIBIT 1-6.
VARIABLES AND VALUES: DATA SET OF 15 ROBBERY INCIDENTS OCCURRING IN AUGUST AND SEPTEMBER

	August										September				
Robbery Incidents	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Selected Offender Variables															
Age	25	26	32	41	24	16	21	19	31	27	27	30	17	19	20
Sex	M	M	F	M	M	M	M	M	M	M	M	F	M	M	M
Race	W	W	W	W	B	B	B	B	I	W	W	W	B	B	W
Education	8	10	12	12	6	10	7	6	6	0	12	12	10	12	12
Employment Status	U	U	E	E	U	E	E	U	U	E	E	E	U	U	E
Prior Record	Y	Y	N	N	Y	N	Y	N	N	N	Y	Y	Y	N	N
Selected Crime Variables															
Type of Weapon	K	G	N	G	K	K	G	G	N	G	G	N	G	K	K
Time of Day	7p	8p	5p	5p	1a	10p	2a	2a	1a	3a	3p	1a	2p	1a	8a
Place of Arrest	S	S	S	C	C	C	C	C	C	C	C	S	C	C	S
Type of Robbery	2	2	3	1	1	1	1	2	2	2	2	2	2	1	3
Place of Occurrence	3	2	3	4	4	3	2	3	6	2	3	5	2	1	1
Selected Victim Characteristics															
Age	30	41	45	22	61	72	49	81	25	35	62	65	35	72	60
Sex	M	F	F	M	M	M	F	F	M	M	M	F	M	M	F
Value of Stolen Property	100	350	0	100	na	0	75	25	4000	150	75	600	1500	65	0

*For explanation of variables and values see Exhibit 1-5
Source: Hypothetical data.

In specifying a problem the analyst should be aware of these issues and work toward developing measurement procedures that are based on sound measurement rules, that are consistently applied, and that have measures which are fully defined. A central element of problem specification is that for a single concept there will usually be several variables to select from and that for each variable there are many possible measures. The analyst's work is to identify these alternatives and to make choices most appropriate to the nature of the problem.

F. Postulating Hypotheses

Hypotheses are statements asserting a relationship between two or more concepts, variables, or measures. A major distinction between a concern and a hypothesis is that hypotheses are testable and consequently, may be an effective tool of the analyst. Questions (concerns) such as "are older people more likely to be robbed than young people?" and "do burglars strike at the homes of the wealthy more often than at the homes of the poor?" are not directly testable. The analyst must develop and test one or more hypotheses implied by such questions. For example, the analyst might test to see if the robbery rate is higher among the elderly than among younger residents, and if burglary rates are higher in wealthier areas of the city than in poor areas.

One way of describing the relationship between the variables in a hypothesis is by indicating which are independent and which are dependent, as noted briefly in section D above. The relationship is more precisely defined if one can further categorize the independent variables as descriptive or causal. Thus, if burglary rates (the dependent variable) vary in association with the wealth or poverty of areas of the city (the independent variable), it is important to know that the independent variable, in this hypothesis, is considered descriptive rather than causal.

Many hypotheses in criminal justice analysis are of a descriptive type in which no causal relationship is implied. Such statements as "crime has increased in Chaos City between 1975 and 1979" and "the crime rate in Chaos City is higher than in Gotham City" are descriptive hypotheses. The former is a statement relating crime and time, while the latter relates crime and areas. They are subject to empirical verification, i.e., they are testable. However, it is a severe stretch of the imagination to suggest that either the passage of time or geography produces crime; rather a change in time and place (the independent variables) may be merely associated with a change in the pattern of crime.

Causal hypotheses, in contrast, do assert that a change in one variable produces or results in a change in another variable. Consider the following conclusions of three evaluation studies:

- A study of intensive police patrol in the evening indicated that the crimes inhibited by the patrol were displaced to the afternoon.
- A study of the installation of burglar alarms in the commercial area of one city indicated that the installation led to a decrease in commercial burglary but a simultaneous increase in residential burglary.
- A study of the effect of improved street lighting showed that night robberies decreased as a result of improved lighting, but the data suggested that street crime moved to new geographic locations and into residences and commercial establishments.[12]

Implied in the first statement is the causal hypothesis that intensive police patroling reduces the incidence of crime. In the second statement the implied causal hypothesis is that the installation of burglary alarms in commercial facilities reduces commercial burglary. The last statement implied the causal hypothesis that improved street lighting reduces crime in an area. All three studies imply another causal hypothesis: localized and targeted crime prevention efforts displace rather than prevent crime.

Causal thinking is a complex but an important aspect of analysis. As Robert Dahl puts it, "policy-thinking is and must be causality thinking."[13] Formal conditions under which causality may be considered have been identified by Mario Bunge. These standards have been developed to address the question as to when it is reasonable to apply causal hypotheses. That is, when is the use of causal relations valid? These conditions include:

(1) That the process in question can be regarded as isolated.
(2) Reciprocal actions do not exist.
(3) That the antecedents and the consequents be uniquely connected to each other, i.e. when each effect can be considered as following (not necessarily in time) uniquely from a fixed cause.[14]

Such conditions are viewed more as ideals; in practice, causal hypotheses often deviate from these standards without great harm.

> "Strict and pure causation works nowhere and never. Causation works approximately in certain processes limited both in space and time -- and, even so, only in particular respects. Causal hypotheses are no more (and no less) than rough, approximate, one-sided reconstructions of determination; they are often entirely dispensable, but they are sometimes adequate and indispensable.
>
> To put it otherwise: in the external world there is always a wide class of processes the causal aspect of which is so important in certain respects and within limited contexts that they can be described as causal--although they are never exactly and exclusively causal."[15]

Blalock presents an interesting summary of the major objections to such causal thinking. These objections include:

(1) Causal relations are essentially working assumptions or tools of the (analyst) rather than verifiable statements about reality.
(2) Causal relations are really only applicable to completely isolated systems.
(3) There seems to be no systematic way of knowing for sure whether one has located all the relevant variables. Nor do we have any foolproof procedures for deciding which variables to use.
(4) And that no two events are ever exactly the same.[16]

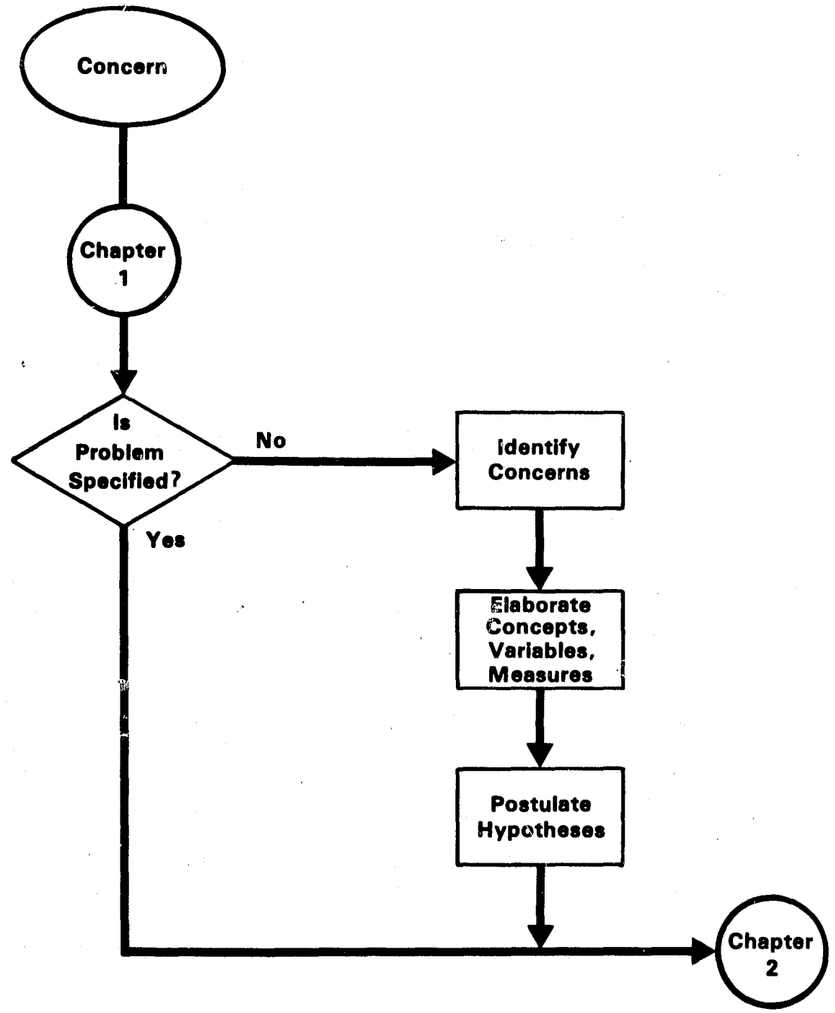
Each of these objections, and indeed many others, to causal thinking indicate the importance of the analyst -- his or her own views of reasonableness and completeness. The rules and procedures identified in this chapter for specifying a problem are an aid in causal thinking, as are many of the statistical procedures which follow. However these "techniques do not solve any of the common-sense difficulties about making causal inferences. Such techniques may help organize or arrange the data so that the numbers speak more clearly to the question of causality -- but that is all (these) techniques can do. All the logical, theoretical, and empirical difficulties attendant to establishing a causal relationship persist no matter what (technique) is applied. 'There is,' as Thurber moralized, 'no safety in numbers, or in anything else'."[17]

II. Summary

In this opening chapter the logical foundations and central concept of analysis have been presented. Problem specification has been defined as essentially a deductive process involving (1) identification of major concerns, (2) elaboration of related concepts, variables, and measures, and (3) the generation of hypotheses. Exhibit 1-7 summarizes this process.

EXHIBIT 1-7

CHAPTER 1 SUMMARY: PROBLEM SPECIFICATION



Problem specification depends on an analyst's style and his/her ability to develop hypotheses pertinent to real concerns. Hypotheses are a powerful tool that provide direction and focus to our analyses and, through observation and measurement, are directly testable. Other approaches to knowledge such as beliefs, intuition or the use of authority inform analyses but are not testable directly. The purpose of hypothesizing is not to stifle creativity, nor are hypotheses suggested as an alternative to beliefs, intuition and authoritative pronouncements. These compliment each other and interact in the conduct of analysis.

The differences between and uses of inductive and deductive reasoning are rarely obvious to the analyst. Let a model be defined as a simplified representation of the real world. Consider the following description of the model-building process:

> Step 1: Observe some facts.
> Step 2: Look at the facts as though they were the end result of some unknown process (model). Then speculate about the processes that might have produced such a result.
> Step 3: Then deduce other results (implications or consequences or predictions) from the model.
> Step 4: Then ask yourself whether these other implications are true and produce new models if necessary.18

The first three steps exemplify inductive reasoning. Step 4 applies deductive logic to validate the model. Discovery in this instance, and good analysis generally, involves both inductive and deductive reasoning. A criminal justice analyst might begin an analysis with a set of questions posed by a decision-making group, generate the implied hypotheses, and elaborate the concepts, variables, and measures. After collecting and examining data and testing his/her hypotheses, some of the hypotheses may be rejected, a few accepted and most reformulated for testing. In reformulating and subsequently retesting the hypotheses based on observations and data, the analyst has shifted from deduction to inductive reasoning.

An analyst's ability to measure and to obtain data to be used in testing hypotheses is essential to the conduct of an analysis. The process for elaborating concerns into concepts, variables, and measures is difficult. In practice, it is the quality of the measures used that is of greatest importance. Good measures are relevant and adequate expressions of the concerns which initiate the process of problem specification. In the next chapter, the issue of what constitutes an accurate measure is considered, as are the sources of data typically used in criminal justice analyses and methods of collecting data.

[1]These statements and research questions are adapted from Wesley O. Skogan and William R. Klecka, The Fear of Crime (Washington D.C.: The American Political Science Association, 1977).

[2]The Police Foundation, Kansas City Preventive Patrol Experiment: A Technical Report (Washington D.C.: The Police Foundation, 1974), pp. v, xiii-iv.

[3]George C. Edwards and Ira Sharkansky, The Policy Predicament: Making and Implementing Public Policy (San Francisco: W.H. Freeman and Company, 1978), pp 87-117.

[4]The discussion of analytic styles was strongly influenced by two sources: Robert R. Blake and Jane Srygley Mouton, The Managerial Grid (Houston: Gulf Publishing Company, 1964), p. 10, and Michael Mont Harmon, "Administrative Policy Formulation and the Public Interest," Public Administration Review (Sept./Oct., 1969): 486.

[5]Fred N. Kerlinger, Foundations of Behavioral Research, 2nd ed. (New York: Holt, Rhinehart and Winston, 1973), p. 9.

[6]Earl R. Babbie, The Practice of Social Research (Belmont, Calif: Wadsworth Publishing Company, 1975), pp. 30-35.

[7]Babbie, The Practice of Social Research, p. 89.

[8]Kerlinger, Foundations, p. 39.

[9]Herman J. Loether and Donald G. McTavish, Descriptive and Inferential Statistics: An Introduction (Boston: Allyn and Bacon, 1976), p. 26.

[10]Ibid. The issue of causality is more fully discussed in the section (If) on hypotheses. See also Hubert M. Blalock, Jr., Causal Inference in Non-experimental Research (Chapel Hill: University of North Carolina Press, 1964), pp 27-30.

[11]Kerlinger, Foundations, p. 428.

[12]National Advisory Committee on Criminal Justice Standards and Goals, Criminal Justice Research and Development Report on the Task Force on Criminal Justice Research and Development (Washington D.C.: Law Enforcement Assistance Administration, 1976), p. 104.

[13]Robert Dahl, "Cause and Effect in the Study of Politics" in Cause and Effect, ed. Daniel Lerner (New York: Free Press, 1965), p. 88.

[14]Mario Bunge, Causality (Cambridge: Harvard University Press, 1959), pp 335-338.

[15]Ibid.

[16]Blalock, Causal Inference, pp 11-14.

[17]Edward R. Tufte, Data Analysis in Politics and Policy (Englewood Cliffs: Prentice-Hall, 1974), p. 5.

[18]Charles A. Lave and James G. March, An Introduction to Models in the Social Sciences (New York: Harper and Row, 1975), pp. 19-20.

CHAPTER 2

DATA SYNTHESIS

Review of Problem Specification

The results of specifying a problem are the identification of concerns, the elaboration of concepts, variables, and measures, and a list of tentative hypotheses. In Exhibit 2-1 a preliminary specification is presented involving a concern raised about the rehabilitative effects of a vocational counseling program for ex-offenders. Part A identifies the concern; Part B elaborates some of the concepts, variables, and measures related to it; and Part C is a list of the initial hypotheses. As discussed in Chapter One, the logical relationships between concepts, variables, and measures involve important decisions made by the analyst. To organize the decision process, the charts presented in Exhibits 2-1 and 2-2 help make these choices explicit and facilitate a comprehensive assessment of the work product. In Chapter Two, several factors useful in refining and assessing the process of problem specification are discussed. These factors include: (1) the accuracy of the measures selected; (2) the adequacy of the selected hypotheses; and (3) the availability of data needed to test the hypotheses.

Criteria to consider in assessing the quality or accuracy of the proposed measures are presented in section I of the chapter. This involves a consideration of validity and reliability. Validity is the extent to which a measure is an adequate reflection of the concept being considered. The validity of crime statistics has been questioned because these statistics may not be one-to-one reflections of events.[1] Some of the factors that influence the validity of crime and criminal justice system measures are discussed, and methods of testing validity are noted. Reliability refers to the stability of a measure resulting from the use of the same measuring procedure at two different points in time or among groups of similar items at the same time. For example, in the problem specified in Exhibit 2-1, assume that a program participant is interviewed by several intake clerks on the first day of his/her participation and that "employment status" is ascertained by more than one clerk, though the same measure and procedures are used by the clerks to determine this information. There may be considerable variation in the participant's responses to the clerks, if his/her memory fails from one interview to the next or if he/she does not interpret the term unemployed in the same way each time asked about his/her status. The greater the variability in responses due to such factors, the less reliable the measure. Some of the factors that influence the reliability of a measurement process and practices to follow in measuring crime and the criminal justice system that will help reduce reliability problems are presented.

Exhibit 2 - 1
Problem Specification

Part A: Concern

Is vocational counseling contributing to ex-offenders' rehabilitation?

Part B: Elaboration of Concepts, Variables and Measures.

CONCEPTS	VARIABLES	MEASURES
Recidivism	Rearrests	Number of days between release and rearrest clearances on rearrests by crime type.
	Reconvictions	(To be developed)
	Reincarcerations	(To be developed)
Economic Security	Employment Status	No. of days unemployed since release. No. of jobs held since release.
	Income	(To be developed)

RELATING CONCEPTS	RELATING VARIABLES	RELATING MEASURES
1) Improved economic security reduces the risk of recidivism.	a) Improvement in employment status reduces the risk of rearrest	1) The more days unemployed since release the greater the frequency of rearrests among exconvicts
		2) The fewer jobs held since release reduces the frequency of rearrests among exconvicts.
	b) Improvement in income reduces the risk of reincarceration	1) (To be Developed)
		2)

A second consideration in improving a problem specification is the overall assessment of the hypotheses. Part C of Exhibit 2-1 identifies some hypotheses for the concern about vocational counseling. An assessment of these hypotheses should consider: (1) the accuracy of the measures selected; (2) the importance of each hypothesis to decision-makers; (3) the testability of each hypothesis; and (4) how comprehensive the set of hypotheses is in terms of the stated concern. These topics are covered in section II of the chapter.

A third consideration in revising and improving a problem specification is the availability of the required data. The feasibility of an analysis is, in large part, a determination that the required data exist and are accessible or they can be collected with available resources and in sufficient time to be useful to decision-makers. In most analyses, the data collection effort consumes more resources and time than any other component of the process. Consequently, the concluding sections (III and IV) of the chapter present: (1) an inventory of existing crime and criminal justice system data sources; (2) a discussion of data collection methods; and (3) guidelines for planning a data collection effort.

The outcomes of assessing measures, assessing hypotheses, and determining the feasibility of data collection may be substitute measures, reformulated hypotheses and, perhaps, a redefinition of the concern. These considerations are preceded in the analysis process by the development of a preliminary problem specification; they result in a detailed problem specification and the development of a related data base. These are the basic foundations for the conduct of analysis.

I. Measurement Accuracy

A. Validity

Assuming that a concept can be measured, the analyst needs to be able to assess the quality of the selected indicator. Such an assessment should consider the extent to which a measure is an accurate reflection of reality. For example, to what extent do the questions on a community survey questionnaire actually measure "fear of crime"? Does a supervisor's rating of an employee adequately measure job performance? Are official crime statistics good measures of its incidence? Many factors influence the validity of a measure; two that are particularly common in criminal justice studies are (1) the lack of agreement on operational definitions of concepts and (2) inadequate research designs.

Developing an operational definition requires agreement on the measurement rules and the method of observation. Such agreement may be confined to your office or involve the use of a state or national standard such as Uniform Crime Reports (UCR) definitions or those developed by LEAA for national data collection.[2] If the analyst and colleagues agree that "fear of crime" is to be defined as "the percentage of residents who believe their neighborhood is very unsafe," this is an operational definition. Many of the key concepts used in criminal justice analysis lack such definition and much work has been done and arguments entered into over definitions of recidivism, deterrence,

incapacitation, performance, and productivity. An effort at defining performance, productivity, and other concepts used in system analysis is presented in Chapter 7. The ability to agree on operational meaning for key measures influences perceived validity. "Without agreement, the analyst would be lost in a sea of conflicting value judgments populated by creatures of various uncoordinated private worlds."[3]

The selection of a research design also effects the validity of a study's findings. Perhaps one of the most provocative criminal justice studies in recent years was the work of Robert Martinson.[4] He assessed evaluations of many offender rehabilitation programs conducted prior to 1966. One criterion of his assessment was how valid the findings of each study were. Validity in the evaluation context is the degree of confidence an analyst has that it was the program that caused the observed impact on the offender population and that the value of this impact can be explained.[5] Martinson argues that the choice of research design directly affects a study's validity. Specifically, "true" experiments, in which the analyst has most control over the observation and measurement of behavior, and over the types and levels of treatment received, produce most valid measures. Ex Post Facto designs, in which observation and measurement occur only after exposure to the program, are the weakest design yielding the least valid measures. A simulated research design consisting of pre-tests on one group of subjects who have not participated in the program and post-tests on a second group of subjects who have not participated represents a middle ground. The lack of equivalence in the pre- and post-test groups and the lack of control exerted by the analyst cause simulated designs to produce less valid findings than "true" experiments according to Martinson. A high proportion of the evaluation studies reviewed by Martinson were not "true" experiments.[6]

There are many ways of testing the validity of a measure. Some tests are based on comparing an observed indicator to some standard of its "real" value. For example, face validation involves a subjective appraisal by the analyst of a measure's apparent consistency with the analyst's view of its "real" value. Does the measure make sense? Face validity can be enhanced by using multiple judges such as others in the office or a panel of experts.

A second test of validity involves comparing a measure with some other measure known to be valid. For example, in one study the analysts tested the validity of self-reported deviant behavior by comparing interview responses to polygraph findings.[7] In the following paragraph, a study is described in which self-reported narcotic addiction was validated using chemical analysis of a urine specimen for each respondent:

> In this investigation, noninstitutionalized addicts' responses to questions regarding a number of topics were obtained in a situation where, according to Ball (1967), interviews were conducted by a highly competent and experienced interviewer with considerable knowledge of the addicts' subculture and of lower-class slum neighborhoods, who made it clear to the addicts that nothing was to be reported to the police. These data (which Ball implies

were collected under maximally positive conditions) were then validated against such outside criteria as FBI records and urine specimens. The validation procedures revealed that about 20 per cent of the addicts reported their first arrests incorrectly and 30 per cent gave invalid reports of their criminal histories. Both of these reports were validated by FBI data, which may, of course, in themselves be inaccurate. However, the use of a chemical analysis of a urine specimen, which is regarded as the most valid physical means of ascertaining current opiate use, revealed that 29 per cent of those using heroin denied such to the interviewer.[8]

Such external criteria are frequently not available or are too costly to be used and alternative tests of validity are necessary.

A third test of validity is to compare the observed measure to measures of the same concept developed in other studies by different methods. Sellin and Wolfgang compared their index of crime seriousness to similar indexes reported in previous studies. By demonstrating the similarity of their index to these other measures of crime seriousness, they concluded that the index was a reasonably valid indicator of the concept.[9] A similar validation test involved a comparison of UCR data and victimization survey estimates of crime. The purpose of this study was to assess "the extent to which the Wes-Skogan Uniform Crime Report's 'crimes known' figures reflect the underlying distribution of victim-defined crime in local communities."[10] The validation test was, in part, to compare the UCR data in several cities to victimization data for the same cities on two crimes -- robbery and auto theft.

A fourth validity test is to compare intuitive, a priori assumptions about the measure to the observed values of the measure. For example, Sellin and Wolfgang assumed that crimes involving harm, loss, or damage would have higher seriousness scores than crimes involving no harm, loss, or damage. This assumption was confirmed by their survey findings.

A final test of validity is based on a perspective that the measure represents to a greater or lesser extent the concept being studied. Sellin wrote in 1931 that "the value of a crime for index purposes decreases as the distance from the crime in terms of procedure increases."[11] At that time the police furnished the most valid measures of crime according to this criterion.[12] Today, however, some researchers suggest that victimization surveys provide a more valid magnitude estimate of crime. Exhibit 2-2 presents victim-reported estimates and police-reported measures for selected offenses in eight cities of the U.S. The victim reported measure appears to be twice the magnitude of the UCR data.[13]

EXHIBIT 2-2

POLICE-REPORTED VERSUS VICTIM-REPORTED CRIME IN EIGHT CITIES

By Offense	Police-Reported[a]	Victim-Reported[b]
Rape	3,090	6,600
Aggravated assault	24,095	37,600
Robbery	34,274	78,100
Burglary	119,984	325,600
Larceny $50+	60,714	140,700
Larceny $50	101,085	259,500
Auto theft	65,966	65,700
Total, all offenses	409,208	913,800

[a]FBI Uniform Crime Reports
[b]LEAA National Crime Panel Survey
Source: LEAA Newsletter, U.S. Department of Justice, 3 (March, 1974), p.1.

However, similar comparisons presented in the National Academy of Science's assessment of the National Crime Surveys (NCS) concluded, in part, that even victim-reported crime measures such as those in Exhibit 2-2 only represent a portion of serious crime, for five reasons:

1. Certain serious crimes are not covered by the NCS, e.g. white collar crimes such as shoplifting and vandalism and violent crimes such as homicide and child molestation.
2. The different jurisdictional bases of the UCR and NCS data make inter-city comparisons difficult. (See the discussion of reliability.)
3. NCS estimates are affected by the exclusion of "series" offenses for certain crimes such as assault and personal thefts.
4. Sampling error and response bias limit the accuracy of the NCS. For example, young, black males are underrepresented in the NCS sample. (See the discussion of reliability.)
5. Certain crimes are significantly under-reported in the NCS, e.g. personal thefts and assaults.[14]

Consequently, it would appear that only a portion of all serious crimes are represented in either police-reported or victim-reported crime data. This type of validation, in which a measure represents only a portion of the underlying concept suggests that multiple indicators should be used to describe a particular concept.[15]

B. Reliability

The assessment of a measure's quality must consider reliability as well as validity. A particular measurement procedure or indicator is reliable to the extent it yields results which are consistent from one time to another or from one group to another. Bathroom scales and yardsticks are traditional measurement devices used to illustrate this issue:

> An ordinary wooden yardstick will give approximately the same length each time if the same object is measured with it a number of times. If the yardstick were made of an elastic material, its results would not be so reliable. It might say that a chair was twenty inches high one day, sixteen the next. Similarly, if it were made of a material that expanded or contracted greatly with changes of temperature, its results would not be reliable. On hot days it would say that the chair was shorter than on cold days. In fact, the choice of wood as a material for yardsticks is in part a response to the problem of reliability in measurement, a problem certainly not confined to the social sciences. Wood is cheap, rigid, and relatively unresponsive to changes in temperature.[16]

If an analyst wants to collect data on court backlog, a major problem that needs to be dealt with is incomparability; court backlog is determined in different ways in different jurisdictions. The data on court backlogs may be of dubious reliability since they are compiled in different ways, unless a statewide convention has been developed to report backlog. Typically, no such conventions have been developed.

A second source of incomparability may be the instability of the measure itself. For example, certain measures, such as a judge's workload, are not likely to vary much over time. Shifts of 30% or more in a single month would more likely indicate a change in measurement procedures than in workload. However, the seriousness of criminal cases before the court is likely to fluctuate considerably and rapidly, so that comparisons of case seriousness separated by a significant passage of time are not likely to be reliable.

A third source of incomparability may be substantial changes in reporting practices overtime. For example, the Uniform Crime Reports which have been published since 1933, have been affected by changes in police agency participation, by the way in which crime is recorded by local police departments, and by the manner in which crime is categorized and aggregated.[17]

Another type of reliability problem is the error that is inherent in any measurement process. Suchman identifies five major sources of reliability error in evaluation studies that are due to random or chance factors:

> 1. Subject reliability - the subject's mood, motivation, fatigue, and so on - may momentarily affect his physical and mental health and his attitudes and behavior in relation to

> public service programs. When such factors are of a transient nature, they may produce unsystematic changes in his responses.
> 2. Observer reliability - the same personal factors will also affect the way in which an observer makes his measurements. These observer factors will not only tend to affect the subject's reactions, but also the observer's interpretation of the subject's responses.
> 3. Situational reliability - the conditions under which the measurement is made - may produce changes in results which do not reflect "true" changes in the population being studied. If the variation in the evaluation situation is systematic, one could then, of course, make valid deductions about the effect of the evaluation situation upon one's measure. However, if such variation is random, then these situational factors will not generate any constant bias--which perhaps could be corrected to produce valid results, but rather will generate unsystematic responses which produce unreliable results.
> 4. Instrument reliability - all of the aforementioned factors will combine to produce an evaluative instrument of low reliability. However, certain specific aspects of the instrument itself may affect its reliability. Poorly worded questions in an interview, for example, especially those which are ambiguous or double-barreled (i.e., having two meanings), may lead to a random variation in responses.
> 5. Processing reliability - simple coding or mechanical errors when they occur at random or in an unsystematic manner also may lead to a lack of reliability.[18]

There are two tests often used to assess a measure's reliability. The "Test-Retest" procedure is based on the fact that a measurement procedure repeated under similar circumstances should yield similar results if the procedure and indicator are reliable. For example, the initial administration of a performance evaluation instrument in a police department results in a rank ordering of patrolmen. If the second, third and subsequent ratings tend to result in similar rank orders, then the instrument may be considered reliable. A second test of reliability is based on the assumed equivalence of two different sets of indicators used to measure the same concept. The "Split-Half" technique assumes, for example, that if the 20 traits identified on the performance evaluation instrument, can be divided into two groups of ten, each group would yield comparable results in terms of measuring performance. If the two groups of ten traits are equivalent, the measurement procedure is considered to be reliable.[19]

II. Assessing Hypotheses

After evaluating the accuracy of selected measures, a second step in reviewing an initial problem specification is to assess the list of

hypotheses that were developed. Each hypothesis should be examined in terms of the following:

- Can the variables be measured?
- Are the measures accurate?
- Is there data to support the measures?
- Is the hypothesis testable?
- Is the hypothesis important?
- Is the set of hypotheses comprehensive?

Following is a brief discussion of each of these issues.

A. Can the variables be measured?

A common problem in generating hypotheses is the inclusion of value statements in the initial problem specification. Such value statements are not measureable and should either be reformulated or eliminated from the list of hypotheses. Words to be on guard for include "should," "ought," "worse," and "better." For example,

- Juvenile felons are no better than adult felons.
- The county and city should consolidate their police departments.

These are value judgments and need to be rewritten into measurable hypotheses such as:

- Juvenile felons tend to be as dangerous as adult felons.
- A consolidated police department is less costly than the combined costs of the independent city and county departments.

While it may be difficult operationally to define "dangerous" and "costs," at least they lend themselves to measurement, and are therefore better hypotheses.

B. Are the measures accurate?

Each measure should be assessed in terms of its validity and reliability. If there is a choice, use indicators from standard sources which are comparable. Check the definitions being used for each measure against standard definitions from national sources or previous studies. Measures that have apparent reliability or validity problems should be tested, if possible, and substitute measures or multiple indicators developed from other sources should be used.

C. Are there data to support the measures?

There are two aspects to this issue: first, are there existing measures that are readily available which support the hypotheses; secondly, can data be collected with available resources and in sufficient time to be useful to decision-makers. The last two sections of this chapter cover these topics in depth. Clearly, hypotheses for which data do not exist, or for which data cannot be obtained should be eliminated or revised.

D. Is the hypothesis testable?

A hypothesis should be related to available techniques useful for testing the acceptability of the statement. Exhibit 2-3 illustrates some of the relationships between types of hypotheses, characteristics of the population being studied, and the appropriate types of statistical methods.[20]

EXHIBIT 2-3

TYPES OF TECHNIQUES FOR TESTING VARIOUS HYPOTHESES

	Single Case	Population or Census	Sample
One Variable Hypotheses	1. Measurement of one variable on one case.	2. Measurement of one variable and description only.	3. Measurement and inference concerning one variable.
Multi-Variable Hypotheses	4. Measurement and listing of two or more variables taken on a single case.	5. Comparison and inference about relationships among two or more variables.	6. Comparison and inference of relationships among two or more variables.

Source: Adapted from Philip J. Runkel and Joseph E. McGrath Research on Human Behavior. (New York: Holt, Rinehart and Winston, Inc., 1972) p. 29.

The first cell of Exhibit 2-3 requires only measurement and comparison. For example, hypotheses may be asserted as questions or statements:

(1) How much money was spent for law enforcement in Chaos City in 1978?
(2) What does the mayor feel is the most important criminal justice problem?
(3) Law enforcement expenditures increased in Chaos City between 1977 and 1978.

The first and second questions require only a single observation for one case. The measure in the first hypothesis is the law enforcement expenditure in 1978 and the single case is Chaos City. In the second hypothesis the measure is the perceived most important criminal justice problem and the mayor is the single case. The third hypothesis illustrates the change in a single case (Chaos City) on a single variable (law enforcement expenditure) over time (1977-1978). Hypotheses 1 and 2 simply require measurement, while the 3rd requires comparing two or more observations. Techniques for performing such comparisons are presented in Chapter 4.

The second cell represents hypotheses involving the measurement of all cases in a finite population on a single variable. A finite population could be counties in the state, states in the country, months in the years, offenders arraigned during the month of July or downtown businessmen in Chaos City. The "case" for each population would be counties, states, months, offenders, and downtown businessmen, respectively. While the number of cases may vary dramatically, e.g. 12 months, 50 states, 250 downtown businessmen, only one variable is measured for all the cases.
For example,

(4) How many narcotic addicts were arraigned in Chaos City Court during the month of July?
(5) Downtown businessmen in Chaos City feel that shoplifting is a major crime problem.
(6) What was the average total criminal justice expenditure for all states in 1978?
(7) What was the average monthly workload of the Chaos City court during 1978?
(8) The average total criminal justice expenditure for all states increased between 1977 and 1978?

In hypothesis #4 the variable of interest is the presence or absense of narcotic addiction among arraigned offenders. The case is the arraigned offender and the population is all arraigned offenders during the month of July in Chaos City. In hypothesis #5 the variable to be measured is the perceived magnitude of the shoplifting problem; the case is the downtown businessman; and the population is all downtown businessmen. The variables, cases, and populations are similarly defined for hypotheses #6 and #7. In each of these hypotheses the appropriate treatment of the data is with the descriptive methods presented in Chapter 3, e.g. measures of central tendency and variation. Hypothesis #8 requires the use of descriptive and comparative techniques presented

in Chapter 4. The variable in hypothesis #8 is total criminal justice expenditure between 1977 and 1978; the case is each state; and the population is all states.

Sampling and statistical inference are required to test the type of hypothesis entered in the third cell of Exhibit 2-3. These hypotheses involve making generalizations about a population based on a sample of cases rather than on all of the cases of the population. For example, one may want to know:

(9) What percentage of Chaos City residents indicate that they are very afraid of street crime?
(10) What is the average annual income of adult felons arrested in Chaos City?
(11) The percentage of Chaos City residents who were very afraid of street crime decreased between 1977 and 1978.

Obtaining a measure of each of the variables in these three hypotheses for every resident of Chaos City or for every adult felon arrested in Chaos City, would be too expensive and impractical. One way of obtaining the necessary information at lower cost is to select a sample of cases and use them to represent findings for the entire population of residents or of adult felons. In order for this approach to generate the quality of information needed, it is necessary to select the sample so that each case in the population sampled has known chance (probability) of being included in the sample and so that the procedures for deciding which case to include are unbiased procedures (such as flipping a coin). (Sampling is discussed in greater detail in section III, D of this chapter.) The information obtained from the cases included in the sample provide a basis for making inferences about what the findings would be for the entire population. If the sample is appropriately selected, it also will be possible to estimate the degree to which sample results are likely to differ from the results which would have been obtained if all the cases in the population had been included.

In hypotheses #9 the population to be sampled from is all Chaos City residents; a case is each resident respondent; the variable to be measured is the fear of street crime; and the sampling procedure might be to randomly select 500 residents from the city's telephone directory for a telephone interview. In hypothesis #10 the population is all adult felony arrestees in Chaos City; a case is each adult felony arrestee; the variable to be measured is their annual income; and the sampling procedure might be to select for measurement 1 in every 10 adult felony arrestees for the first week in each month for one year.

Chapter Five covers selected topics in statistical inference. However, it does not cover the estimation of a population parameter given a sample value of the parameter. (A parameter is, for example, an average or proportion).[21] Hypothesis #11 involves comparing an estimated population parameter at two points in time. Such a test of difference is not treated in Chapter 5 and usually requires the application of analysis of variance techniques.[22]

Multi-variate hypotheses are treated in the second row of Exhibit 2-3. In the fourth cell, there is only one case being examined for values of two variables. For example,

(12) The age of the Mayor of Chaos City is related to his or her perception of the most important criminal justice problem.
(13) Did the amount of total city expenditures and law enforcement expenditures in Chaos City increase between 1977 and 1978?

These, like hypotheses #1-#3 (cell 1), simply require measurement and comparison of two or more variables.

Hypotheses in the fifth cell involve assessing the nature and strength of relationships between variables. For example,

(14) What is the relationship between sentence length and crime seriousness for all convicted juvenile felons in Chaos City during July and August?
(15) There is a relationship between the total crime index and total law enforcement expenditures for all states in 1970 and 1978.

These hypotheses are similar to those in cell 2, except that it is necessary to develop information about the relationship between the measures. Comparative and inferential techniques for assessing such relationships are presented in Chapters 4 and 5.

The last cell of Exhibit 2-3 is similar to the 3rd cell with the exception that these hypotheses involve implied causal relationships between two or more variables. For example,

(16) The age of residents affects their fear of street crime.
(17) The average annual income of adult felons arrested in Chaos City seems to influence the seriousness of the crimes committed.
(18) Did prosecution expenditures have a declining or increasing effect on the incidence of serious crimes for all states change between 1971-1976?

Some techniques useful in assessing such relationships are introduced in Chapters 4 and 5. However, population estimation, analysis of variance and other multivariate methods go beyond the scope of this text.[23]

In judging the testability of a hypothesis, an analyst will have to determine whether a statement should be accepted or rejected on the basis of the information gained from the sample. The previous discussion is a partial guide for considering methods useful in aiding such decisions.[24] If a hypothesis does not relate clearly to any known testing technique, it should be revised or eliminated. If a hypothesis involves testing procedures that are unfamiliar to the analyst, expert assistance should be sought. If such assistance is not available, the hypothesis should be revised or eliminated.

E. Is the hypothesis important?

A final consideration in assessing a hypothesis is its importance. Importance here is used in reference to the decision-makers -- what will they be interested in? How central is the hypothesis to their concerns? Assuming that a finding should be accepted, what value has it for the decision-maker? Though the analyst may make subjective judgements about the interests of key decision-makers the key factor in determining the value of a finding is the analyst's ability to isolate and define variables which can be manipulated through programs and policies. It is of little use to demonstrate the relationship of a variable to the crime rate, if the independent variable cannot be manipulated through programs and policies. It is of little use to demonstrate a relationship to the crime rate, if the independent variable is not subject to planned change. Studies of the relationship between crime and either police discretion or sentencing policy, both of which may be influenced by decision-makers, are likely to be more effective than studies relating the crime rate to population density. Orienting hypotheses to be more tractable requires both a theoretical understanding of the concern and a knowledge of the decision-making process.

F. Is the set of hypotheses comprehensive?

Once each hypothesis has been scrutinized as just discussed and a revised list of hypotheses has been prepared, a final assessment should be performed. This means to review the list comprehensively, (not each hypothesis one at a time) and consider the scope and coverage provided. In conducting this review the seven concepts introduced in Chapter One (p. 6) should be considered. If an area such as system operations has been ignored, fill in the list with an additional hypothesis(es) involving this concept. If the list is unbalanced, i.e., has too many hypotheses in a specific area, eliminate duplicates and fill in with additional hypotheses in the other areas, if necessary. It should be emphasized that throughout the analysis process, a problem specification is subject to modification. For example, if data proves unavailable, or test results are ambiguous, the analyst should adapt the specification to this new information.

III. Data Sources

A. Alternative Data Sources

A wealth of data is available in the criminal justice field. However, the major problems facing the analyst are (1) how to select appropriate data from existing sources, (2) identifying what new data are needed, (3) designing an efficient and effective data collection procedure, and (4) assessing the quality of the obtained data. A useful way of organizing the mass of data available in criminal justice is to think of data needs in six major categories:

- Victim-Reported Crime Data
- Police-Reported Crime Data
- Public Opinion Data

- Demographic Data
- System Data
- Juvenile Data

Victim-Reported Crime Data, the first category, provides data to answer one of the questions most often asked, "How much crime is there in this community (or state)?" Such data are usually obtained from victimization surveys which ask citizens about recent situations in which they have been victims. Data on some crimes such as kidnapping (which occur too rarely to be effectively picked up by surveys) must come from official (i.e., Police-Reported) data sources such as the Uniform Crime Reports (UCR). Clearly, while such information is frequently referred to as "actual" crime data, the term is misleading since victimization surveys usually utilize samples rather than a complete census of the population of victims.

Police-Reported Crime Data provide measures of the volume and type of crime reported to law enforcement agencies. UCR crime data do not reflect all crimes which have been commited. For example, "in a 1973 national survey of crime victims, the reporting rate for simple larceny was only about 18 per cent."[25]

Public opinion data obtained from surveys and interviews are useful in answering questions such as "What crimes concern residents and businessmen most?" and "How well do citizens feel the criminal justice system is working?"

Demographic data help answer the question, "How many people or businesses of various types are victims of crimes and what are the characteristics of these victims?" Demographic data are used in calculation of crime rates and to analyze the correlates of crime.

Data on the criminal justice system are needed to answer questions such as, "How does the criminal justice system respond to reported crime?" and "Are system facilities and resources adequate to deal with the current level of offenses?"

Juvenile data are found in all the other data categories, but are treated in this text as a separate category because of laws requiring special handling of such data to ensure confidentiality. In addition, the juvenile justice system is normally separated from adult facilities, as is the data collection apparatus.

Data from each category also can be used in many different types of combinations to answer a broad range of general and specific questions. When combining different data sources, it is important to ask if the data sources are compatible. For example, do the data cover the same time period? Are the discrepancies between data sources so great as to make any findings questionable? The problem of compatibility is always troublesome when using different data sources, particularly in a field such as criminal justice where many different data bases are available.

These six types of data may be considered secondary data. Secondary data are data that have been collected in conjunction with other analyses and are currently available in easily usable form. For example,

published U.S. Census reports containing population data are secondary data. So is a report on a victimization survey for a locality, or an annual police department report summarizing crimes committed during the past year. Primary data are data which are not currently available in easily usable form. These data must be obtained through observation and collection by such methods as surveying or interviewing or by developing a new data set from administrative records.

B. Information Systems as a Data Resource

A major data resource in many jurisdictions is the existence of a criminal justice information system. An information system as used in this chapter refers to either (1) system designs which include specification of data elements (variables) which are not automated or (2) a system design that includes data elements and a series of computer programs, fully documented and available on request. An example of the former is the "State Judicial Information System" (SJIS) which represents a committee decision not to attempt to write a set of computer programs applicable to many states with varying information needs. Each of the participating states has arrived at its own solution, using as much of the SJIS system design as it desires. The National Trial Court Information System (GAVEL), like SJIS, is a system design which represents the ideas of a national committee of court administrators about which records are to be kept, about definitions of key variables, and about report formats. Various aspects of GAVEL have been incorporated into the Prosecutor Resource Management Information System (PROMIS) but there is no GAVEL software package. SJIS and GAVEL represent individualized system designs which are not suitable for transfer to other jurisdictions, nor are they necessarily a ready source of data.

In jurisdictions which have PROMIS, an excellent data source exists. PROMIS is a series of computer programs that serves a variety of functions in different organizational settings. It was developed specifically as a tool to (1) assist in allocating resources based on the importance of a criminal case, (2) to control scheduling and logistical problems, and (3) as a mechanism for monitoring the even-handness of discretion. It also is useful as a research and analysis tool, providing data and data manipulation capabilities where little or none existed prior to its implementation. PROMIS functions within the Court System in Tallahassee, Florida; it is the nucleus of the Rhode Island SJIS state Judicial Information System; the (JUSTIS) system of Milwaukee was built around PROMIS and serves the Court, the Prosecutor, the Sheriff, and the County Clerk. PROMIS is an operational system in over twenty cities and it is in various stages of transfer to over 100 other cities and states.[26]

Exhibit 2-4 illustrates these information systems. Also included are five nationally-sponsored data series that provide different types of data used in criminal justice analysis: the national victimization surveys, the Uniform Crime Reports, Offender-Based Transaction Statistics, Computerized Criminal History, and the Expenditure and Employment data series. The two systems identified that are operational are PROMIS and CMIS (formally known as OBSCIS-offender-based state correctional information system).

POSSE, a police information system for small size cities, and the Standardized Crime Reporting System (SCRS) are currently under development. SCRS indentifies specific data elements police need to collect. ABCR is a software program which classifies crime characteristics into UCR, state statute, (NCIC), or any other classification. These secondary data sources and information systems are discussed in greater detail in section 5d below.

C. Secondary Data Sources

(At the end of the chapter Appendix A is a comprehensive list of LEAA Statistics Division Publications (FY's 1971-1980). These are a substantial source of secondary data used in criminal justice analysis as discussed in this section.)

1. Victim Reported Data

The first national victimization survey was conducted in 1966. In 1972 the National Crime Surveys were initiated by LEAA and the U.S. Bureau of the Census. These surveys were designed to measure the extent to which persons age 12 and over, households, and businesses have been victims of certain types of crime, and to describe the nature of the criminal incident and the victims.[27] The National Crime Surveys consisted of four survey efforts:

(1) National Household Survey -- A sample of 60,000 households from throughout the U.S., each interviewed at 6-month intervals. This survey has been conducted continuously since July 1972.
(2) City Household Survey -- A sample of 10,000 households in each of 26 central cities was surveyed. In 1972-1973, surveys were conducted in the five largest cities -- New York, Los Angeles, Detroit, Chicago, and Philadephia -- and the eight impact cities -- Baltimore, Cleveland, Dallas, Denver, Newark, Portland, and St. Louis. In 1974, 13 different cities were surveyed -- Buffalo, Cincinnati, Houston, Miami, Milwaukee, Minneapolis, New Orleans, Oakland, Pittsburgh, San Diego, San Francisco, and Washington, D.C. The initial 13 cities were resurveyed in 1975. After that date the City Household Survey was discontinued.
(3) National Commercial Survey -- A sample of 39,000 establishments from throughout the U.S. which were interviewed at six month intervals beginning in July 1972. This survey was discontinued in 1978.
(4) City Commercial Survey -- A sample survey of establishments located in the same cities used for the City Household Survey varied from 1,000 to 5,000 establishments. This survey was also discontinued in 1976.

These victimization surveys were designed to achieve two principal objectives: (1) provide in-depth and dynamic descriptive measures of criminal victimizations and (2) provide measures that are useful for problem and policy-oriented analysis. The type of information contained

in these surveys includes:

- characteristics of victims failing to report crimes to police;
- risk of victimization related to demographic characteristics of victims such as race, sex, age, occupation, geographic location, and income;
- consequences of victimization -- injury, medical costs, financial losses due to property loss, extent of property recovery, days lost from work;
- characteristics of offenders such as age, sex, and race, number of offenders involved in the victimization, and the offender's relationship to the victim; and
- attitudes of respondents toward aspects of the criminal justice system and crime.

The uses of victim reported data in crime and criminal justice analyses are numerous. For example:

- Victim reported data provide a clearer picture of the magnitude of the crime problem and factors related to it, with subsequent implications for changes needed in the criminal justice system to control or reduce crime;
- Place and time of occurrence can suggest police operations strategies. For example, some geographic areas (e.g., downtowns) may have substantially more night-time crime and need additional police protection or street lighting.
- Reasons for not reporting can suggest special efforts to get victims to report, and can suggest areas in which increased system response may be necessary.
- The cost of crime can be more accurately calculated, permitting more accurate studies to be made of the true benefits and costs of existing or proposed programs and system responses.
- Victimization survey data can suggest additional elements of offenses that should be recorded in police offense reports.
- Victimization survey data can provide an important perspective on changes in rate of crime over time.

There has been much substantive and methodological criticism of the victimization surveys. Some of the limitations are that: (1) due to the time frame involved, recall of victims interviewed may not be accurate; (2) certain crimes are not covered; (3) small area analysis has not been practical due to both privacy restrictions and the nature of the samples used; and (4) sampling bias resulting in reliability and validity problems.

A major difficulty in obtaining accurate crime data based on victim reports is the need for recall. The recall problem was a focus of a study conducted in San Jose, California, where reverse record checks were conducted. In reverse record checks, persons who have reported crimes to the police are selected from police files and then are interviewed -- without being told how they have been selected -- to determine the accuracy of reported victimizations. The San Jose study

indicated that victimization data significantly underrepresent the actual amount of crime because of non-recall.[28]

The other three limitations described above are related to the survey procedure. Usually the number of respondents is too small to permit small-area (e.g., neighborhood level) analysis. Crimes which occur rarely such as kidnapping and skyjacking are not picked up accurately through sample surveys, and official reports must be used for this type of data.[29] (See Exhibit 2-5 for a summary of information on Victim Reported Crime Data.)

EXHIBIT 2-5

VICTIM REPORTED DATA, SUMMARY

TYPE	DEFINITION	SOURCES	USES	LIMITATIONS
Victim Reported Data	Indicators of types & magnitude of crime	• National crime surveys • Local victimization surveys	• True picture • Magnitude • Correlates • Implications for change • Place and time of occurrance • Operational strategies • Reasons for reporting • Costs of crime • Perspectives on data changes	• Forgetting • Sampling errors • Small Area limitations • No data on some rare crimes (e.g. kidnapping homicide) • Population at risks rates are difficult to obtain • Unreliable data on infrequent crimes (e.g. rape)

2. Police Reported Data

The data which are most readily available are based on police reported crime, or "crime statistics" as these data are sometimes called. Crime statistics are the official records of reported offenses and arrests. The sources for such crime data include:

- local police department reports;
- reports by Criminal Justice Planning Agencies or Statisical Analysis Centers;
- State Uniform Crime Reporting Programs;
- national data collected by the FBI available in the Uniform Crime Statistics (UCR) reports; and
- crime-orientated information systems -- SCRS and ABCR.

a. Local Police Department Reports

Reports summarizing local data may be the richest source of data on reported offenses and arrests. Many localities have developed their own reporting systems which record crimes of particular interest locally.

b. State/Regional Criminal Justice Planning Agency Data

The majority of states in the United States have one or more of the following state criminal justice-related agencies which collect statewide crime statistics: a state Criminal Justice Coordinating Council, a Statistical Analysis Center, or a UCR data collection program. These agencies will have the most complete crime data on a statewide basis.

c. State Uniform Crime Reporting Programs

In 1979 forty-five states had a State UCR program and three state programs were under development. UCR state programs serve particularly valuable functions including:

- assistance in enacting laws requiring local UCR participation;
- collecting more information than required by the national program;
- production of annual and some semi-annual publications; and
- responding to local requests for data.

Such programs have greatly increased reporting, through technical assistance and training from contributing agencies and through the enforcement of mandatory reporting laws. The outreach and audit capabilities of such programs have greatly improved the quality of UCR data. Such programs have produced more timely, frequent, and detailed analyses of the UCR data in their states than that available from the FBI. Many state programs capture much more than basic UCR data (i.e., the incident based systems of Oregon and South Carolina) which they feed back in analyzed form to contributors for use in management, planning, and evaluation.

d. National Uniform Crime Reports (UCR)

The only reasonably comparative and consistent national data on crime is collected by the FBI and published as the Uniform Crime Reports. This system was developed in 1930 under the auspices of the International Association of Chiefs of Police (IACP). The purpose of the UCR system is to obtain data on a national basis for comparing the incidence of serious crimes -- mainly those involving physical violence. Prior to the development of the UCR system in 1930, no comprehensive system or crime information on a national scale existed. This was primarily due to the fact that the criminal statutes varied so greatly from state to state in terminology used to define criminal behavior.

To overcome this problem, a set of definitions for specific criminal acts was devised, following a thorough examination of all the current state criminal statutes. To reduce the potential volume of reporting, only "serious" crimes were included. The crimes which meet the FBI definition of "serious" include:

- Criminal Homicide: (a) Murder and non-negligent manslaughter -- all willful felonious homicides as distinguished from deaths caused by negligence (excludes attempts to kill, assaults to kill, suicides, accidental deaths, or justifiable homicides). Justifiable homicides are limited to: 1) the killing of a person by a law enforcement officer in the line of duty; and 2) the killing of a person in the act of committing a felony by a private citizen. (b) Manslaughter by negligence -- any death which the police investigation established was primarily attributable to gross negligence of some individual other than the victim.
- Forcible Rape: The carnal knowledge of a female, forcibly and against her will in the categories of rape by force, assault to rape, and attempted rape (excludes statutory offenses where no force was used and the victim was under age of consent).
- Robbery: Stealing or taking anything of value from the care, custody, or control of a person by force or violence or by putting in fear, such as a strong-arm robbery, stickups, armed robbery, assaults to rob, and attempts to rob.
- Aggravated Assault: Assault with intent to kill or for the purpose of inflicting severe bodily injury by shooting, cutting, stabbing, maiming, poisoning, scalding, or by the use of acids, explosives, or other means (excludes simple assaults).
- Burglary -- Breaking or Entering: Burglary, housebreaking, safe-cracking, or any other unlawful entry of a structure with the intent to commit a felony or a theft (includes attempted forcible entry). The UCR definition does not include auto burglaries, burglary of moveables, or a wide variety of such incidents as included in some state statutes.
- Larceny -- Theft (Except Motor Vehicle Theft): The unlawful taking, carrying, leading, or riding away of property from the possession or constructive possession of another. Thefts of bicycles or of automobile accessories, shoplifting, pocket-picking, or any stealing of property or article which

is not taken by force and violence or by fraud (excludes embezzlement, "con" games, forgery, or worthless checks).
- Motor Vehicle Theft: Unlawful taking or stealing or attempted theft of a motor vehicle. A motor vehicle is a self-propelled vehicle that travels on the surface but not on rails. Specifically excluded from this category are motor boats, construction equipment, airplanes, and farming equipment.

In January 1979, Congress required that the UCR add Arson to this list of serious offenses. A second recent change in the UCR was the decision no longer to report dispositional data.

The UCR data have certain limitations. These include:

- incomplete reporting (not all jurisdictions participate in the reporting system, and not all participating jurisdictions supply all requested data);
- limited number of crimes reported;
- possible bias in individual locality data due to differing interpretations of reporting procedures or to changes in the local data collection system; and
- variable scoring practices and the lack of a clear relationship between arrest and offense data.

The major publications summarizing national UCR data are:

- a "quarterly report" giving trend information on the Crime Index offenses (comparison of percent change between current time period and same period of the prior year and a five-year trend);
- an annual report entitled Crime in the United States summarizing crime on a national basis by a number of different breakdowns; and
- Standarized Crime Reporting System (SCRS).

Crime reporting systems were initially developed by police agencies simply as investigative and prosecutorial aids. Use of police records and statistics has significantly expanded in recent years. Such data are used, for example, for management decisions concerning the distribution of law enforcement resources. On the other hand, utilization of crime/event report information by non-police criminal justice analysts has been minimal. This under-utilization of police reporting systems is largely the consequence of unfamiliarity with the range of data available and inadequate conceptualization and hypothesizing about relationships between crime/event report data and important current issues. The lack of analytic interest also was partly due, in the past, to concerns over the validity and reliability of data produced by police agencies. The data integrity problem, however, has been substantially reduced with the development of Standardized Crime Reporting System (SCRS).

SCRS is still in an early stage of development as a national system. A computer-aided SCRS system has been pilot-tested in a number of jurisdictions including the Durango, Colorado Police Department and the city of North Las Vegas. It has a significant potential for establishing

a basic data base on criminal occurrences, particularly when coupled with the concept of Attribute-Based Crime Reporting discussed below. The SCRS model is undergoing testing in five jurisdictions, four local police departments, and one state agency. The SCRS model includes these features:

- geocoding;
- alphanumeric identifiers for events and recording officers;
- easy-to-use forms;
- simplified paper flow;
- trained collectors, processors, and users of data;
- clearly-defined responsibilities for report review, approval, and audit;
- uniform criteria for report taking, property valuation, and offense classification;
- thoroughly tested standardized data elements; and
- case or event-oriented recordkeeping.

SCRS is in the process of establishing four basic report forms:

- complaint/dispatch report;
- crime/event report;
- follow-up investigation report; and
- arrest report.

Each form will contain data elements that allow it to be linked to other forms associated with the same crime or event. Such linkage is a critical component of SCRS, in that it allows ready access to all related records surrounding a criminal event. Furthermore, it supports the development of statistical information describing agency processing of cases.

A variety of output reports can be created from an SCRS data base. Most are intended to provide direct support to department management, but they also can be an important source of information for analysts. Included are offense, arrest, court disposition, property loss, and activity summaries.

f. Attribute-Based Crime Reporting (ABCR)

ABCR is a computerized methodology for categorizing crime based upon the unique characteristics of the criminal event. Using this methodology, the specific attributes of each event are recorded and become the basis for producing the crime classification required not only by the individual agency but also by others in the criminal justice community. Originally, ABCR was seen as a means to use a computer to assign events to the variety of crime classifications in use today (e.g., those of Uniform Crime Reporting, of the uniform offense classification used for NCIC/CCH, and of the appropriate state statutes). ABCR would allow for automatic translation from basic attributes to any of these crime classifications. In 1980, tests of ABCR are being conducted by the Oregon State Police and the local Police Departments in Sacremento and Davis, California. (See Exhibit 2-6 for a summarization of information on Police Reported Crime Data.)

EXHIBIT 2-6

ASSESSMENT OF POLICE REPORTED CRIME DATA

TYPE	DEFINITION	SOURCES	USES	LIMITATIONS
Police Reported Crime Data	Official "Crime Statistics" on reported offenses and arrests	• Local police department reports • State UCR programs reports • Data tapes state/regional planning agencies • Special study reports • Federal UCR program • SCRS • ABCR • CCH	• Detailed analyses of particular interest locally • Trend analysis • Workload analysis	• Local variations in citizen reporting • Incomplete reporting by agency • Scoring of offenses hierarchy • Comparisons of offenses with arrests or clearances

3. Public Opinion Data

The third major data category relates to public opinion or attitudes. Secondary sources containing this type of data are usually victimization surveys or public opinion polls which may include data on:

- the importance of crime relative to other problems;
- fear of crime and actions people take to protect themselves;
- ratings of criminal justice services; and
- ratings of possible solutions to crime problems.

Existing sources of public opinion data include:

- surveys from the major companies which specialize in public opinion polling;
- local studies financed through the Community Development Block Grant funds from the U.S. Department of Housing and Urban Development or through other agencies;
- local newspapers which may run surveys as part of an article or series;
- victimization surveys which often contain questions on public opinion;
- local business associations for business-related crime; and
- annual nationwide social surveys from university research centers such as the National Opinion Research Center (University of Chicago) and the Institute for Social Research (University of Michigan).

The use of a public opinion poll to "test" a new program or policy alternative is illustrated in the Michigan Speaks Out surveys.[30] A controversial issue in many states is the sentencing discretion given to criminal court judges by state statutes. Exhibit 2-7 presents the results of three surveys of Michigan residents who were asked their opinions on this topic. The data indicate a developing public sentiment in favor of mandatory sentences and reducing judicial discretion in sentencing. Exhibit 2-8 presents summary information on public opinion data.

EXHIBIT 2-7

RESIDENT ATTITUDES ON SENTENCING LAW ALTERNATIVES,
STATE OF MICHIGAN, 1974-1976

Question: THERE ARE VARIOUS WAYS OF SENTENCING CONVICTED CRIMINALS. WHICH ONE OF THESE WAYS COMES CLOSEST TO YOUR THOUGHTS ON SENTENCING?

	Total 1974	Total 1975	Total 1976	Change 1974-76
Basis 1*	45%	46%	52%	+7
Basis 2*	38	36	32	-6
Basis 3*	14	14	9	-5
Don't Know	3	5	7	+4
	100%	100%**	100%	
*BASES	(400)	(800)	(800)	

1 = The law should specify one single mandatory sentence, for each offense (crime or law breaking). This should get more severe for each offense after the first one. The judge would not be free to vary the sentence for different cases.

2 = The law should continue to specify minimum and maximum ranges of sentences for each crime.

3 = The judge should be free to impose any sentence he feels warranted (indeterminant sentencing).

** Does not total to 100% due to rounding.

Source: The Michigan Public Speaks Out on Crime (4th Edition) Office of Criminal Justice Programs, State of Michigan, 1976.

EXHIBIT 2-8

ASSESSMENT OF CRIME-RELATED PUBLIC OPINION DATA

TYPE	DEFINITION	SOURCES	USES	LIMITATIONS
Public Opinion Data	Perceptual or subjective indicators of crime or criminal justice services	• National polling companies • University research centers • Victimization surveys • Local newspapers • Political polls	• Measure opinions on relative importance of crime • Fear of crime • Ratings of criminal justice services • Possible solutions to crime problems • Comparisons of citizen vs. official priorities • Comparisons of actual vs. perceived crime problems	• Sampling errors • Instrument bias • Interviewer bias • Interpretation of results • Accuracy of data • Content

4. Demographic Data

The fourth major category of secondary data is demographic data. Demographic data refers to data on population, especially with reference to size, density, distribution, and vital statistics. Typical demographic measures used in criminal justice analysis include such population characteristics as age, sex, race, income, education, and place of residence. In addition, demographic data include social, economic, and political indicators of communities, neighborhoods, cities, states, and other geographical areas.

Demographic data are available from a wide variety of sources at the national, state, and local levels. Generally, the U.S. Census provides data of good quality and of sufficient detail to be useful to the analyst. However, Census data are limited because most specialized data are collected only every five years or more and rapidly become inaccurate, particularly in areas experiencing rapid population change. Recently it was decided that the population census will be taken every five years to solve some of these currency problems. On the state and local level, demographic data are useful in developing specific indicators (e.g., school vandalism rates per 1,000 school-aged children where the number of school-aged chidren is obtained from the local school system).

Demographic data are used for two major purposes in the analysis of crime: to calculate crime or population-at-risk rates and to examine the correlates of crime and system performance. Crime rates are normally calculated by dividing the number of reported offenses occurring over a one-year period by the number of people living within the jurisdiction. Thus, if 500 commercial burglaries are reported in a locality of 100,000 population, the commercial burglary rate is 0.5% or 500 per 100,000. Population-at-risk rates are a more refined measure which take into account the population most likely to be affected by a crime. For example, if the locality with 500 commercial robberies had 1,000 commercial enterprises in operation during that year, the population-at-risk rate would be 50% or 50,000 per 100,000. (See Chapter 3 for a more complete discussion of population-at-risk. See Exhibit 2-9 for summary of information on demographic data.)

EXHIBIT 2-9

DEMOGRAPHIC DATA, SUMMARY

TYPE	DEFINITION	SOURCES	USES	LIMITATIONS
Demographic Data	Population statistics which refer to size, density distribution and vital events	• U. S. Census Bureau • Reports • Data tapes • Special surveys • State census agencies • University population research centers • Local surveys • Local school systems • Local planning agencies	• Population-at-risk rates • Examination of correlaters of crime and system performance • Geographic comparisons • Offender/victim comparisons	• Currency • Small area limitations • Category breakdowns inadequate • Differing geographic boundaries for data

5. System* Data

Criminal Justice system data are obtained from several quite different sources. The expenditure and employment data series provides resource data that are national in scope. A second source of system data are offender-based transaction statistics (OBTS) and computerized criminal histories (CCH). OBTS provides an indication of workload and offender flows, while CCH records provide indepth qualitative indicators of a criminal career. There are, in addition, a number of quite different criminal justice information systems which, if available, are a rich source of system data. A wide variety of Management and Administrative Statistics (MAS) are a major data source of many system-oriented studies. These are data obtained from official or unofficial agency records and reports. Finally, the Uniform Parole Report and National Prisoner Survey provide information on corrections. Following is a discussion of these system data sources.

a. Expenditure and Employment Data

The national survey of expenditures and employment in criminal justice agencies dates back to FY 1967 in which a special study was conducted by the Bureau of the Census to identify police, judicial, and corrections data for large governments in the U.S. Between 1969 and 1971 several major changes in survey design and procedures were made, thus making pre-1971 data unreliable for most time-series analyses. In 1971 a new, enlarged sample of governments was identified for the survey. This panel includes the federal government, all state governments, and a representative sample of local governments in each state. For example, in 1976:

> "Data were collected for all county governments, for all municipalities having a 1970 population of 10,000 or more, and a sample of the remaining municipalities and townships with less than 10,000 population . . . The survey panel therefore included the Federal government, the 50 state governments, and 9,045 local governments (the 3,042 county governments, 4,305 municipalities and 1,698 townships). Two sets of reports have been produced: Annual Reports for FY 1967 - to the present, and Trends in Expenditure and Employment Data reports covering FYs 1971 - 1973, FYs 1971 - 1974, FYs 1971-1975 and FYs 1971 - 1976.[31]

b. Computerized Criminal Histories (CCH)

The criminal history chronicles each major contact that an individual has with the criminal justice process by documenting such events as arrests, dispositions, sentences, correctional commitments, and release status. This record is the information thread that weaves together the functions performed by law enforcement, prosecutors, defense, courts, corrections, probation, and parole. What is significant about a criminal

*System, as this term is customarily used in criminal justice analysis, is defined in Chapter 6.

history record is that it is relied upon by a wide variety of users, all performing different functions at different points in the overall criminal justice process. Among these are pre-arrest investigations by law enforcement officers and prosecutors; information for arrest and bail release decisions; plea bargaining, court case preparation, and witness verifications; juror qualification, and sentencing; post-trial corrections and probation/parole activities such as estimating the likelihood of escape and violence. If a CCH is complete, it is particularly valuable for looking at career criminal and recidivism issues.

Hence, computerized criminal history systems are, today, the most comprehensive source of data about the criminal justice process itself. Each of the major components of the system (law enforcement, courts, and corrections) relies upon specific reporting systems which collect data and provide information on the particular operations of that component. The UCR supports law enforcement; SJIS and OBSCIS application are designed to meet the respective informational needs of state judiciaries and correctional agencies. A computerized criminal history system coordinates them all.

Since criminal history records collectively can be manipulated in numerous ways, managerial uses of the data become spinoffs from normal operating systems. New state-level systems to collect, manipulate, and report this type of information are not necessary. Managerial needs can be met by manipulating existing data, available from operational computerized criminal history systems.

CCH provides only limited qualitative data for the analyst. However, with the inclusion of additional data elements and the support of an OBTS report generator program, good quantitative data may be obtained.

Typically criminal history records contain:

- personal descriptors (fingerprint classification, date of birth, sex, height/weight, aliases/nicknames, and residence locations and dates);
- arrest data (arrest charges, places, and dates);
- court/prosecution/probation data (charges: pleaded to, reduced and/or sentences; dispositions: charges, outcomes, probation terms); and
- corrections (where and how long incarcerated, parole/release, local/state/federal).

In 1979 30 states were developing CCH systems, 12 states were providing CCH records to NCIC, and three others were designing CCH systems.

c. Offender Based Transaction Statistics (OBTS)

One way of examining the rate and speed with which offenders are handled by the criminal justice system and the consequences of certain dispositions is to track individual offenders. This method is called offender based transaction statistics (OBTS). The data are "transactional" since the individual offender is the unit of count and

thus links each segment of the criminal justice system to the others.

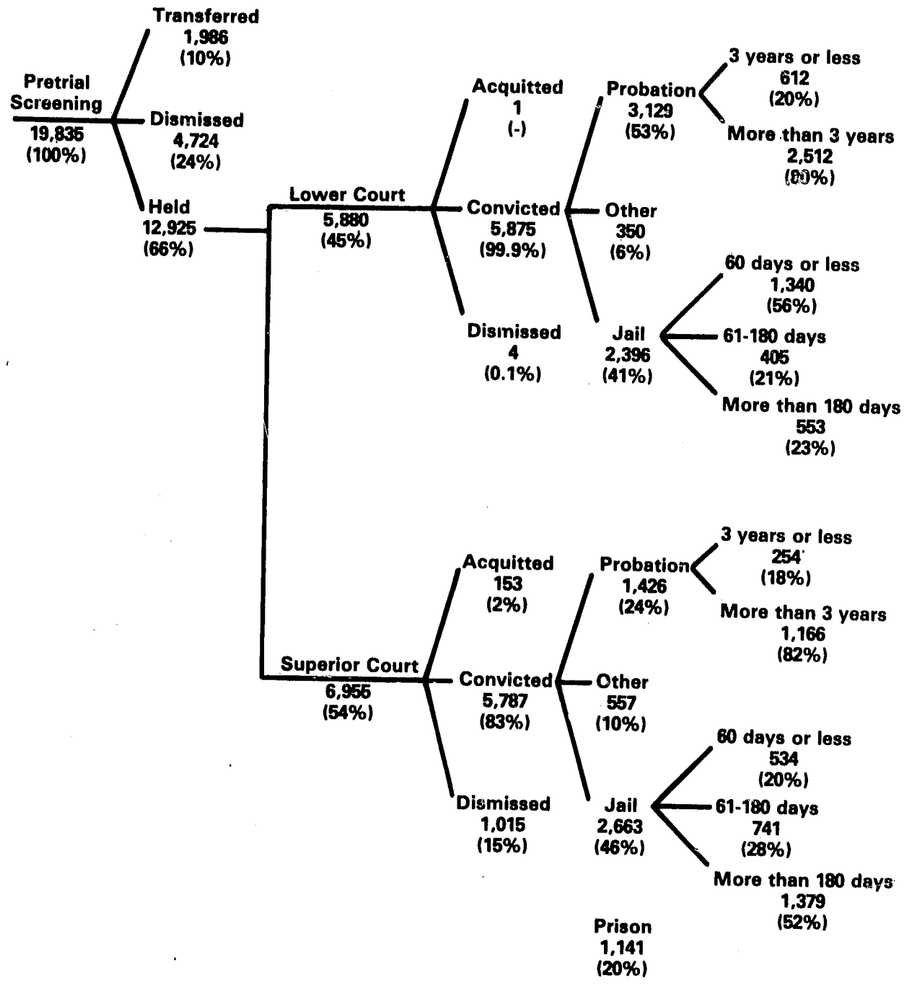
An example of an offender-based transaction data system at the state level is found in California.

Exhibit 2-10 is based upon a transaction data set and depicts the flow of adult felony offenders through various decision-making stages for urban counties. While the decision points depicted in this flowchart are limited due to the lack of correctional data and other pieces of information such as bail determination, they nonetheless give a fairly good approximation of a working OBTS model. It is interesting to note, for example, that approximately one fifth of both urban and rural arrestees have their cases dismissed prior to trial. What may account for these pre-trial case dismissals? Are such a high proportion of initial arrest decisions based upon evidence that cannot later support a conviction? Of those convicted at the superior court level, approximately one-fifth of all urban offenders receive a prison disposition. If one were to consider all convictions (at either the lower or superior court level) the percentage receiving a prison disposition is considerably lower -- around 10%. This is especially interesting when one considers that all original arrest offenses provided for a prison term of some kind.

Although the data used in this example are preliminary in that many stages in the processing of offenders are omitted, they nonetheless demonstrate the type of information that can be obtained when criminal data are recorded in a transactional format. It is possible to see at a glance the path along which offenders are traveling and the type of dispositions that are occurring. Decisions made at one stage can be related to those occurring at a later stage, a possibility that is precluded with agency-specific summary tables, such as those generated in the UCR.

EXHIBIT 2-10

SAMPLE OBTS FLOW CHART, FLOW OF CALIFORNIA FELONY OFFENDERS, URBAN AREAS, 1969-1971



Source: Carl Pope. Offender-Based Transaction Statistics: New Directions in Data Collection and Reporting. (Washington D.C.: LEAA, NCJISS) 1975, p. 20.

d. Information Systems

National Trial Court Information System (GAVEL)

In 1979 GAVEL was a project intended to:

- determine the information required to operate and manage a trial court,
- develop functional specifications for the GAVEL model, and
- identify existing automated trial court information systems, which may contain elements appropriate for inclusion in the model.

Determination of the information requirements of any system is normally based upon an analysis of the information needs of those who are expected to receive system outputs. In the case of GAVEL, trial court operational personnel and administrators are the most obvious users of system information, and they were being consulted during the system development process.

Prosecutive Management Information System (PROMIS)

PROMIS was originally developed by the Office of the U.S. Attorney for the District of Columbia. Subsequently, PROMIS was declared an Exemplary Project by LEAA, and it is currently being adopted by prosecutors and courts throughout the country. PROMIS was developed with four major goals:

- to allow expenditure of resources on the preparation of cases in a manner proportionate to their relative importance;
- to monitor and insure consistency in the exercise of prosecutorial discretion;
- to alleviate scheduling and logistical impediments to the adjudication of cases on their merits; and
- to analyze problems in the prosecution of criminal cases.

Exhibit 2-11 lists system functions in relation to the above goals. For this discussion, one particularly interesting feature of the model is providing a basis for ranking cases by "importance."

EXHIBIT 2-11

PROMIS GOALS AND CAPABILITIES

1. Allocate resources based on	• Uniform rating of crime gravity • Importance of Cases • Uniform rating of defendants prior record gravity • Calendar listings of pending cases in descending order of gravity
2. Monitor even-handedness	• Automation of reasons for discretionary decisions • Tracking of relationship between police charges and prosecution charges • Ability to conduct special studies relating disposition patterns not only to legal charges but also to gravity ratings
3. Control Scheduling	• Automated subpoena generation • Logistical problems • Display of reasons for prior postponements in each case • Automated alert when defendant has more than one case pending • Listings of fugitives from pending cases • Case aging lists • Case listings by assistant prosecutor
4. Research and Analysis Capability	• Periodic statistical reports on: - intake and screening - preliminary hearings and grand jury cases - misdemeanor and felony trials - disposition types - delay problems • Ability to perform special studies, e.g.: - geo-based studies of crimes and arrests - patterns of criminality - plea bargaining

PROMIS provides comparability among cases by rating each case according to two standard sets of criteria. One set measures the amount of harm done to society by the alleged offense, and the other set measures the gravity of the prior criminal record of the accused. Since these ratings are numerical, it is possible to compare one defendent to another, irrespective of the current charges against each, and to compare one crime to another whether or not both involve the same statutory offense. Based on these ratings, prosecution management can apportion its limited staff time to the intensive preparation of those cases on the day's calendar which involve relatively more important crimes and offenders. PROMIS prints out a copy of the court calendar for each date, but instead of listing the cases in the order the court will call them, e.g., oldest case first, alphabetically, or in ascending order by docket number, it lists them in descending order of importance according to the seriousness of the crime and the gravity of the prior record of the accused.

Crime gravity or "seriousness" is measured by a set of criteria developed by criminologists Marvin Wolfgang and Thorsten Sellin of the University of Pennsylvania (see Chapter 4). These criteria, which are applied to the case by the assistant prosecutor and the arresting police officer during intake and screening, assess the amount of harm done to society through a measurement of the amount of personal injury, property damage or loss, and intimidation.

The case's gravity is measured by a variation on a set of criteria developed originally for the California Department of Corrections to predict recidivism among parole candidates. These criteria pertain to the density of prior arrests and convictions, particularly for crimes against persons, and to the use of aliases.

State Judicial Information System (SJIS)

The SJIS program is the first multi-state effort to bring management information systems to state-level judicial administration. The model supports eight functions seen as being common to state court administration throughout the country:

- monitoring and supervision,
- resource allocation,
- planning,
- research and development,
- budgeting,
- legislative liaison,
- training and education, and
- state and local government liaison.

Note that planning has been specifically included and that several of the listed functions are closely related to analytical activities. A major responsibility of state-level court administration is analysis.

The SJIS data base is structured to allow flexibility in adapting the model to individual state needs while still supporting comparative studies. Each state has built its own system, yet there is a high degree of commonality.

Corrections Management Information System (CMIS)

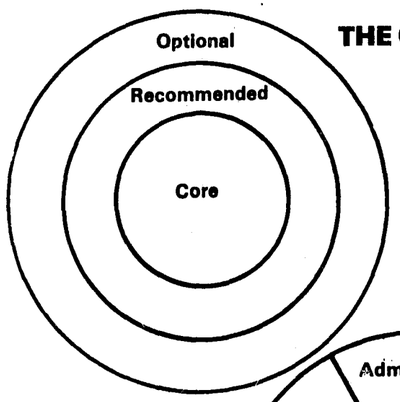
In 1974, SEARCH Group, Inc. launched the Offender-Based State Corrections Information System (OBSCIS) project. The goal of this project has been to identify practicial guidelines and uniform standards for the development of correctional information and statistical systems for use as a research and planning tool. OBSCIS involvement has grown from 10 states, initially, to 35 states as of 1979.

During phase I, the project produced a model (Exhibit 2-12) that attempted to satisfy the basic informational needs of correctional administrators while supporting the requirements of other criminal justice system designs such as Offender-Based Transaction Statistics/Computerized Criminal Histories (OBTS/CCH) and National Prisoner Statistics (NPS).

EXHIBIT 2-12

THE OBSCIS DATA BASE, APPLICATION AREAS AND MODEL

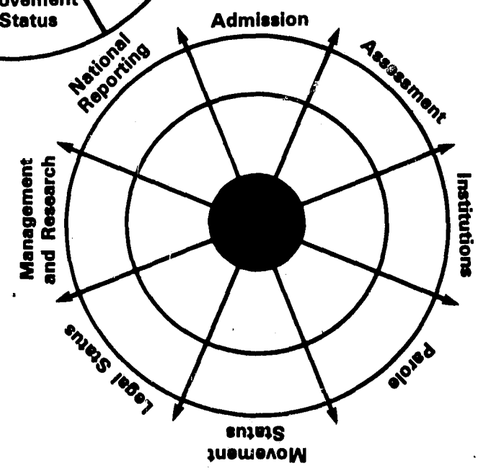
THE OBSCIS DATA BASE



THE OBSCIS Application Areas



THE OBSCIS Model



Source: Search Group, Inc. 1979.

The OBSCIS data base is structured into three strata of data elements. A minimum necessary to support all national corrections information programs is known as the Core level. Elements found in the Core level include basic offender items such as sex, birthdate, offenses, and sentence. Where applicable, a uniform coding structure has been developed to standarize the data among all states.

Extending beyond the Core is a recommended group of data elements which form the basis for a correctional information system at the state level. Some Core level elements are expanded and other elements not found at the Core level are added. Examples of added Core level elements include birthplace, alias, and parole board decisions.

At the outer perimeter of the data base are optional data elements for those states developing additional capabilities and features. This level encompasses those data elements found at the Core and Recommended levels but may include expanded definitions or more detailed coding. For example, in the standard list an offender's alias is specified with a yes/no indicator while in the Optional category, a list of all known aliases can be developed and collected. Thus, the OBSCIS data base can be expanded to meet the needs of a particular corrections environment.

In 1979 the OBSCIS system was renamed CMIS (Corrections Management Information System) to reflect the increased sophistication and comprehensiveness of application areas of this information system. Work is currently underway to develop application programs in the areas of personnel management, budget control, prison industries, food management, inventory control, transportation, and physical plant maintenance. In addition, inmate banking and visitor control applications also are under development.

e. Management and Administrative Statistics (MAS)

Much fragmented MAS information is available; however, because of varying formats, insufficient currency, and questionable accuracy, they are difficult to use. However, there are many sources of MAS data and depending on the analytic need, they may be quite useful. Some of these MAS sources are:

- budgets of units of state and local government;
- expenditure reports of units of state and local government;
- UCR reports on personnel;
- reports of agencies with licensing responsibilities (such as agencies which license residential facilities);
- mental health agency client reports (by source of reference and type of service provided);
- individual institution statistics, usually maintained in conjunction with whatever agency pays the costs;
- court statistics on arraignments, indictments, trials, dispositions, verdicts, sentencing, and referrals;
- agency or institution annual reports;
- Equal Employment Opportunity Commission EEO-4 forms (filed by all units of local government);
- information and management systems such as PROMIS;

- applications for funds made by units of state and local government (such as CETA, HUD, Title XX of the Social Security Act, etc.)
- State Statistical Analysis Centers; and
- state and local certification agencies.

The preceding system data sources are summarized in Exhibit 2-13.

EXHIBIT 2-13

ASSESSMENT OF SYSTEM DATA

TYPE	DEFINITION	SOURCES	USES	LIMITATIONS
System Data	Measures of the manner & rates of processing offenders	• Offender-based transaction • SAC • Agencies • Information Systems	• Dynamic System picture • Identify bottlenecks • Highlight interrelatships • Assess the "what," "where" and "when" of decisions • Suggest "why" questions	• Fragmentation • Interpretation • Arrests/dispositions • Disposition coding • Low frequency • Historical bias • Incomplete reporting
	Measures of resources include: • Budgets • Personnel • Equipment of both system agencies and community resources	Management & Administrative Statistics (MAS) • SAC • Agencies • Information systems • Expenditure and employment data • CJIS	• Develop more efficient & effective operations • Resources implications of proposed system changes • Cross jurisdictional comparisons	• Fragmentation • Incomplete reporting • Currency • Variable reliability

6. Juvenile Data

Juvenile data are treated separately in this text because the juvenile justice system (and the offense categories it involves) are not simply a junior version of adult crimes and systems. Juvenile and adult records are generally recorded differently and kept separately. Most juvenile record-keeping agencies are much more reluctant than agencies keeping adult criminal records to make juvenile information available to "outsiders," even to criminal justice personnel. (In some jurisdictions, in fact, juvenile records are completely destroyed once a juvenile reaches "adult" status.)

Juveniles are generally persons who have not yet reached their 18th birthday. They may come under the jurisdiction of the justice system for a rather wide range of behaviors which do not provide a basis for such jurisdiction in the case of adults. These are generally called "status offenses" (although the term "offense" is often inappropriate) because it is the age status of the individual which permits the claim of jurisdiction. Traditionally, such offenses have fallen into two major categories -- "dependency" and "neglect" -- although traditional terminology is changing. One recent survey identified 34 different status offense categories used in various states.

Most of these categories have to do with the relationship between parents and children, particularly authority relationships. Most common are runaways and "incorrigibles." Truancy is another common status offense. Laws mandate attendance at school up to age 16 in most jurisdictions. A 16-year-old can be arrested and subject to legal penalties if repeatedly absent from school; 17-year-olds cannot. (A basic legal distinction exists between "status" offense and "delinquency": a delinquent act would be a crime if committed by an adult; a status offense would not be.) The implications of status offenses for data analysis are that a large number of behavioral forms recorded in juvenile records would not be "criminal" if engaged in by an adult and therefore grossly inflate juvenile offense statistics. The implications for jurisdictional claims are that there is greater discretion by authorities as to whether or not to take legal action than in the case of adult crimes, and a larger percentage of juvenile "caseload" is under jurisdiction for quasi- or non-criminal behavior. (Technically, "juveniles" cannot commit "crimes," they can only be arrested/adjudicated for achieving a state of "delinquency.") A large part of the juvenile system is focused on preventing juveniles from subsequently committing "crimes" as adults. A measure of that concentration of effort is the fact that $41 billion or 98% of all Federal expenditures for youth in 1976 were for prevention programs while only $1 billion or 2% were for Federal enforcement/adjudication/corrections/diversion programs (Office of Juvenile Justice and Delinquency Prevention, 1979).

UCR juvenile arrest statistics may be obtained by a locality by asking the FBI or State UCR (preferably) directly for the data. However, a shortcoming in "official" data is that a very large proportion of juvenile offenses never find their way into official records, due to the reluctance of police to arrest, the difficulty in detecting perpetrators, and other factors. In Boston, for example, in over one-half of the cases

in which juveniles are contacted by the police and a record made, the juvenile is warned by the police and released, and in a far larger proportion of police contacts, no record of any kind is made. Neither "warnings" or unrecorded contacts figure in UCR statistics.

A second major source of juvenile data is the "Child in Custody" series which reports on a nationwide census of juvenile detention and a correctional facility census. This series reports on public residential facilities (in 1971 and 1973) and was expanded to cover private facilities, as well.

It is therefore useful for local and state-level personnel to have access to other juvenile data which provide a more accurate and comprehensive picture of the actual volume and forms of juvenile crime in their jurisdictions. The following list includes nine "populations" of offenders and/or offenses which can be used:

- offenses recorded through direct field observation in the community;
- complaints to police, including those where no official action is recorded;
- tabulations of total contacts and arrests recorded by police;
- tabulations of all juvenile arrests by crime, by police juvenile division, other police divisions, and as a result of referrals;
- recorded court arraignments (appearances, charges);
- court case records;
- probation caseloads, by offense-types;
- populations of institutions and other placement facilities (by basis of commitment); and
- parole/aftercare caseloads (by offense types).

Not all of these data sources will be available in all jurisdictions, but some or most are collected in many. Because these bodies of data are based on different selection criteria, each gives a different picture of the "shape" of juvenile offender population and offense patterns for the same jurisdiction. Comparisons among the several bodies of data provide a variety of useful kinds of information. An example of one kind of information included is the volume and kinds of unacted-on delinquency. Another example is the selection and attrition processes within the "flow" through the juvenile justice system.

There are, however, limitations to these data bases. For instance, court records provide detailed accounting of case processing and are computerized in some jurisdictions, making them easily accessible for analysis. In the case of juvenile case statistics, however, access may be severely limited due to the desire to protect the identity of a juvenile. Concern with the stigmatizing characteristics of contact with the juvenile justice system has recently reinforced the strong concern for confidentially in releasing juvenile records. Reseachers will need clearance from proper authorities in many jurisdictions to use juvenile justice case data. Comparable concern appears in the use of juvenile correctional system data.

When obtaining these types of data from sources, the analyst should

bear in mind that:

- the quality varies greatly from state to state and from community to community;
- the validity and reliability of the data must be assessed before a decision is made to use them; and
- the major limitations of the data can be traced to the fact that they were usually collected for purposes different from those of juvenile justice analysis.

The following section describes some of these data sources and identifies selected strategies for utilizing them.

a. Federally Required Reporting Data

Title XX of the Social Security Act
The Title XX state plans can be a useful source of data for assessing needs and resources for the juvenile justice system.

Comprehensive Employment and Training Act (CETA)
This locally planned and implemented program is a source of youth employment and training information.

Housing and Urban Development Grant Applications
These grant applications require detailed community and state profile data which can be used to avoid a duplicate effort.

b. Large National Sample Surveys

There are many national sample surveys that are sufficiently large so that the state and large city sub-samples could be analyzed with confidence. However, the sub-samples should contain at least 350 to 400 interviews or subjects. Following is a selection of available and relevant national surveys.

Class of '72 Longitudinal Youth Survey
Sponsored by the Office of Education, DHEW, this study involved 22,000 youth who were interviewed during their senior year and reinterviewed two years later. The study is particularly valuable in analyzing the problems that youth experience in the transition from school to work. The state sub-samples would be usable by all but the smallest states. Any political unit with two or more percent of the U.S. population can use the study.

U.S. Census Current Population Reports
These interdecennial reports based on very large samples of the populations contain a number of subject areas of interest to juvenile justice planners -- SES, minority populations, employment, and health are illustrated. While some are focused on youth, many

contain only very gross data on youth. LEAA has made special arrangements with DUALabs to make these data available to state and local planners.

National Alcohol and Drug Abuse Data
This national survey contains a wealth of information on alcohol and drug abuse in the population. It contains profiles of the population most at risk. Strategies for obtaining these data include utilizing the DUALabs service or purchasing the tapes and documentation of these data bases.

Child in Custody Series
A data source containing statistics on youth receiving federal and state institutional care.

c. Specialized Juvenile Data Sources

School Vandalism and Dropout/Pushout Data
Many school districts, state education agencies, and national associations gather these types of data. However, some are reluctant to share data because the data might reflect badly on their performance.

The relatively high volume of offenses, the relatively low number of serious offenses, and the special confidential characteristics of juvenile data qualify these data for special and separate treatment. Other special characteristics of juvenile data include:

- the collective (gang) nature of many crimes which cannot easily be detected from official data;
- the peaking of crime rates for different crimes at different ages indicates preventive programs can be aimed at specific "high-risk" age groups; and
- the special and complex nature of the juvenile criminal justice system with many "passes," "diversions," and "failures to impose sanctions" results in a high attrition rate within the system; it also may make offender-based tracking and the collection of useful MAS more difficult.

Juvenile Data Sources are summarized in Exhibit 2-14.

EXHIBIT 2-14

ASSESSMENT OF JUVENILE DATA

TYPE	DEFINITION	SOURCES	USES	LIMITATIONS
Juvenile Data	Data on forms of juvenile behavior including: • Criminal • Quasi-criminal • Non-criminal & associated system responses	• Juvenile department reports • Local police department reports • State child service agencies • Federal data • Schools • Juvenile court	• Assess kinds and volume of unacted upon delinquency • Assess selection & attrition processes • Define program target population groups • Assess "careers in crime"	• Definitions i.e. delinquent behavior • Confidentiality • Stigma • Age peaks by offense • Diversion • Failure to impose sanctions

D. Primary Data Collection

Primary data are data which must be collected for a particular analysis. There are several different methods of collecting such data and these modes of observation are the subject of this section. Specifically, six methods of collecting criminal justice data will be discussed. These are field research, content analysis, experiments, simulation/modeling, historical research, and surveys.[32]

Field research involves the direct observation of an agency, process, or procedure. In conducting field observations it is important to consider:

- your relation to the subject (should you be observable?);
- what to look at; and
- how to record your observation.

Keeping a journal, recording observations as they occur, and emphasizing unexpected or deviant cases are steps which are fundamental to this data collection procedure. Peter Manning's study of police work is based on field research.[33]

Content analysis involves the systematic sampling of some type of document or other communications medium (e.g., T.V. tapes). It is typically used in historical studies as well as in developing background material relating to an issue or problem. In performing a content analysis, the unit of study is usually a word, a phrase, a report, or some other form of communication.

A third data gathering procedure is the use of experiments. An experiment involves: (1) taking some action by changing a process, activity, or organization and (2) observing the consequences of such changes. An example of a major experiment in the criminal justice field is the Kansas City Preventive Patrol Experiment. In this experiment three controlled levels of preventive patrol were used. Reactive patrol areas received no preventive patrol and only calls for assistance brought patrols to the area. Proactive patrols resulted in police visibility being increased two to three times its usual level. The third strategy maintained normal levels in the area during the experiment. Five specific hypotheses were tested:

(1) crime as reflected by victimization survey and reported crime data would not vary by type of patrol;
(2) citizen perception of police service would not vary by type of patrol;
(3) citizen fear and behavior as a result of fear would not vary by type of patrol;
(4) police response time and citizen satisfaction with response time would vary by experimental area; and
(5) traffic accidents would increase in the reactive beats.[34]

Historical research, a fourth procedure, involves the reconstruction of prior events to explain specific consequences or outcomes. There are many examples of this type of research in the criminal justice

literature. One of the more provocative historical studies is Roger Lane's investigation of 19th century homicides in Boston.35

Simulation/modeling procedures may be useful in generating data. These techniques are based on knowledge of the criminal justice system and/or criminal justice behavior, the construction of a computerized version of the processes, and observation and modification of the model to analyze possible changes and their consequences. The JUSSIM model developed at Carnegie-Mellon University simulates the processing of defendants from arrest to release, by crime type groupings, through the criminal justice system. Using the model, various changes in policy and program can be considered and their consequences examined.36

The last data collection method to be considered is survey research. This is, perhaps, the most common data collection procedure used in criminal justice. The survey process consists of: (1) designing the survey; (2) preparing a sampling plan; (3) selecting a survey procedure and drafting questions; (4) conducting the survey; and (5) coding the results.

Design Consideration

The decision to use a survey to collect data is based on several factors. These include the nature of the hypotheses to be tested, the resources and time available to collect the data, the need for accurate measures, the feasibility of a survey design, and the acceptability of a survey to decision-makers and staff.

In assessing alternative primary data collection efforts, it is important to be familiar with the variety of methods available. Even if the jurisdiction uses a consultant to do all the data collection work, a decision must still be made by the jurisdiction or jointly with a consultant of what data to collect, how large and what type of sample is required, and how the data should be collected.

In answering these basic questions it is important to have the problems clearly stated. Selection of data collection and analysis methods is heavily dependent on problem specifications, and analytic efficiency is directly related to an effective data collection plan. Once the questions and uses to which the findings will be put are known, a review of methods should be undertaken.

Despite the availability of National Victimization data, a number of local (e.g., city, state) criminal justice agencies have conducted, or are planning to conduct, sample surveys of their own. These locally initiated efforts are scattered, and they vary tremendously in focus and quality. Although most of the local surveys have been concerned with the study of victimization, other information -- particularly in the realm of public attitudes -- is being generated.

NCJISS has undertaken several studies emphasizing the application of local as well as the national victimization data. For example, James Garofalo's study focuses on local victimization survey applications ("Local Victim Surveys: A Review of the Issues," Analytic Report SD-NAD-2).

There are a number of reasons why local agencies have chosen to devote resources to conducting local sample surveys. First, some local agencies find it desirable to develop sources of information that are independent of official processing. Even among local personnel who use the NCS and police-reported data, there is concern with the amount of "lag time" that occurs between data collection and dissemination. The results of locally sponsored surveys can be put to use as soon as the data are collected and analyzed. Secondly, many practitioners believe that it is easier to gain acceptance for programs developed on the basis of locally collected data rather than on the basis of results generalized from surveys that were conducted elsewhere. Finally, when trying to address issues with information generated by a survey that was not explicitly designed to address those issues, one often finds that questions were not asked in exactly the way one would have wished. This problem can be overcome when local personnel design their own surveys of problems and issues that are relevant to them.

Regardless of whether a sample survey is being conducted on a national or local level, it is imperative that the people planning the survey explicitly consider what information they wish to generate and how they intend to use the survey results. Survey methods are less applicable to some information needs than to others. For example, it would be wasteful to use a survey to gather data on which to base decisions about the allocation of police manpower within a city; actual calls to the police for service and reported crimes already provide good indicators of the need for police personnel in various areas of the city. On the other hand, if police officials are concerned with potential public response to a planned change in police practices (e.g., the abandonment of some existing service functions), then a sample survey could prove useful in estimating public attitudes.

Even when it is decided that a sample survey will be helpful in generating needed information, the particular goals set for the survey will determine what specific methods must be used and how much the effort will cost. Suppose, for example, that a goal is to estimate, from a sample, the number of robberies occurring in a city. Such a task requires a very large sample because robberies are relatively rare events. In addition, the goal requires that the sample used be representative of the population of the city.

Surveys of known victims can provide valuable information about citizen contacts and satisfaction with the criminal justice system, pointing to ways for system improvement. Because the target population can be defined to include only people who have been in contact with the criminal justice system, it is easier to construct a sampling frame, that is, identify respondents. Official records can be used for this purpose. Since all of the people in the sampling frame are known to have had contact with the system, the sample drawn for interviewing would not have to be anywhere near as large as in the usual victimization survey which tries to uncover victimizations in the general population.

There are several ways in which the NCS experiences can be useful to local agencies planning to conduct their own surveys. If the local agency wants to locate and interview victims in the general population,

the NCS findings can provide a rough idea of how many victims of various types of crime will be located in a sample of a given size in a certain type of area (e.g., urban, suburban, rural). With this estimate, the agency can decide on the approximate sample size it will need. Secondly, the interview schedules used in the NCS have been extensively pretested and refined. They can be quite useful as guidance for the agency in constructing its own instruments. Thirdly, the NCS pretests also have generated some very important findings about effective interviewing procedures in victimization surveys. Familiarity with these findings can help avoid needless errors and improve data collection quality. The Census Bureau has produced interviewer training and instruction manuals for the NCS program. These documents cover a variety of procedural points. For example, one section describes how each question of the interview schedule should be asked and when and how the interviewer should probe for answers. Finally, the Census Bureau's NCS documentation contains technical information on sampling, weighting factors, and estimation procedures useful for those involved in a local effort.

Sampling Procedures

It is generally not practical to collect data from an entire population because of time and cost considerations. In the usual case, it is more efficient to collect and study data from a sample of the population being considered. An analysis of the sample data should provide useful information about the population being studied. Two questions are usually addressed in considering a sample: how large a sample should be selected and how should the sample be drawn. Sampling procedures are discussed below, followed by a brief discussion of the problems in estimating sample size.

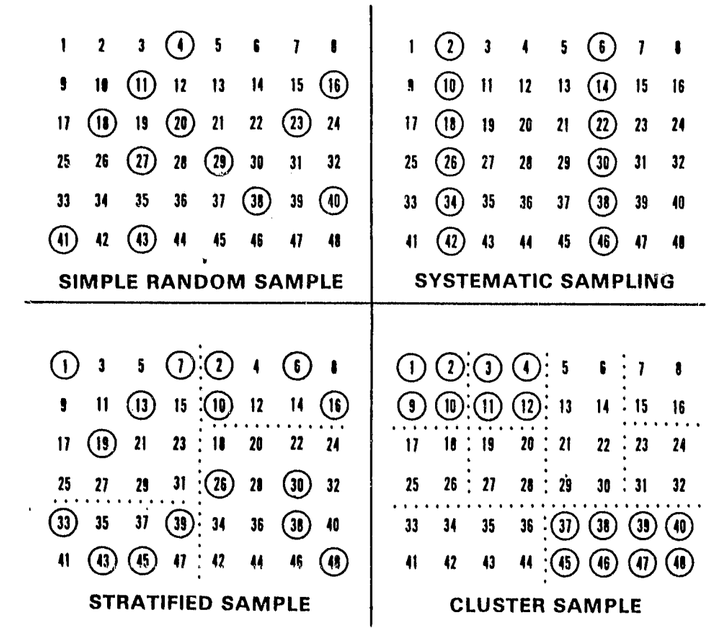
In order for the results obtained from the analysis of sample data to be applicable to the population from which they were drawn, it is necessary that the sample be representative. A representative sample is one which reflects the characteristics of the population being sampled in its true proportions. In actual practice, a representative sample can never be attained unless there is perfectly accurate and complete knowledge about the population being studied.

A representative sample is most likely to be obtained if the sample is drawn using a random selection procedure. Such a sample is called a random sample. A random sample is extremely important: methods of statistical inference used to generalize from the sample to the population of interest depend upon the representativeness of the sample. A random sample can be drawn only from a population if every item or person in the population has an equal chance of being drawn on each successive draw.

There are a variety of types of random samples that can be drawn from populations. Four types of random samples will be briefly discussed here: 1) simple random samples, 2) systematic samples, 3) stratified samples, and 4) cluster samples. (See Exhibit 2-15.)

EXHIBIT 2-15

FOUR TYPES OF SAMPLES



A simple random sample can be drawn from a list of all members of a population using any of a variety of simple devices (for example, drawing numbers from a hat or using a table of random numbers). In most practical research problems, a total list of all items or people in a population is rarely available. For example, there are no lists of all people living in New York City. Using a telephone book would include only those members of the population who had a telephone and who chose to be listed, for many purposes excluding important elements, e.g., low income groups, from the population of interest. The more the list from which the sample is drawn is not representative of the total population, the more the results of inference to the total population will be biased.

Systematic sampling is similar to random sampling. For systematic sampling, beginning with a randomly chosen person on the list, one can simply choose every kth person.

In a stratified random sample design, the total population is divided into relatively homogenous subpopulations. Random samples are then drawn from within each of these subpopulations. One reason it is often useful to stratify a sample is that different sources or lists may have to be used for each subpopulation. Another reason for stratifying a sample is that a smaller number of cases can be drawn to achieve the same level of accuracy. Selecting and sampling from strata reduces variability in the population. This reduced variability allows a smaller sample size to be used. This is an important consideration because the reduced sample size required by stratifying can result in substantially reduced costs. Examples of strata are: sex (male or female); age (20-29, 30-39, etc.); marital status (married, widowed, divorced, separated, never married).

In stratified sampling the population is divided into groups, and then a random sample is drawn from each group. In contrast, in cluster sampling, the population is divided into a large number of groups, and then samples are drawn from among the groups. For example, if all the census tracts in a city were considered to be organized in clusters, a certain number of census tracts would be selected for study. The objective of such a cluster analysis is to select clusters which exhibit great variation, but which at the same time are small in size, or located in such a manner as to minimize data collection costs, such as those involved in interviewers' traveling time.

Sample Size

A basic dilemma facing an analyst who must select a sample, is how large a sample should be chosen. It is a dilemma in the sense that various tradeoffs must be made in arriving at a reasonable decision. Backstrom and Hursh describe these tradeoffs as involving: (1) how homogeneous the population is; (2) the sampling procedure selected; (3) the number of categories to be analyzed; (4) time, money, and personnel available to collect the data; (5) the amount of error between sample estimates and population values that can be tolerated (tolerated error); and (6) the need for measurement accuracy (especially reliability)37. In general, if a population from which observations are to be collected is more varied -- heterogeneous -- a larger sample will be required to achieve a specified level of precision. Populations with more homogeneity -- less variation -- require relatively smaller sample sizes.

According to Backstrom and Hursh, in general, "Stratified samples require the least number of cases, the simple random samples somewhat more - for the same level of precision."38 Similarly, in certain sampling problems, cluster sampling may be a most efficient procedure, reducing sample size in comparison to other procedures, simplifying the selection of respondents, and reducing the cost of data collection.

The sample size selected must be feasible given the resources available to collect the data. It is impractical to interview 2000 city residents if you have to prepare a report within a one week period and have a staff of one -- yourself -- to do the interviews. The larger the number of analytic categories required of the data, generally, the larger the sample size required. Many inferential procedures assume a certain minimum count in each category; violations of these assumptions make their interpretation doubtful.

The concept of tolerated error may, perhaps, be best understood with an example. Suppose your sampling problem was to estimate the average number of victimizations in your city for the past year. Let's assume that the amount of allowed sampling error is 5%. If our sample of interviews (n = 300, N = 250,000) indicates an 8% victimization rate, we would estimate that the population rearrest rate is between 3% and 13%. If we need a more reliable estimate -- a smaller tolerated error, say 2% -- a smaller bound would be estimated, requiring a larger sample size, say n = 1000.

The last tradeoff in estimating a sample size is based on the occurrence of our sample estimate within the estimated range of tolerated error. Confidence that this will occur 95 samples in 100 requires a smaller sample size, than if 99 samples in 100 is required. The interrelationships between tolerated error, confidence units and sample sizes are illustrated in Exhibit 2-16. This exhibit is based on a city population of approximately 250,000 and lists sample size estimates for a simple random sample. For example, to obtain a 95% confidence limit and a tolerated error of 4%, a sample of 600 residents is required.

EXHIBIT 2-16

SIMPLE RANDOM SAMPLE SIZE FOR SEVERAL DEGREES OF PRECISION*

Tolerated Error	Confidence Limits	
	95 Samples	90 Samples
1%	9,604	18,587
2%	2,401	4,147
3%	1,067	1,843
4%	600	1,037
5%	384	683
6%	267	481
7%	198	339

*N≅250,000

Source: Backstrom and Hursh Survey Research (Evenston: Northwestern University Press, 1963) p. 33

Survey Procedures

There are two basic types of instruments in survey research: interview schedules and self-administered questionnaires. Interview schedules are forms from which interviewers read questions to respondents and on which replies are recorded. The major advantage of this kind of data collection procedure is that skilled interviewers can probe the respondents by asking a series of questions in order to clarify issues. In situations where a skilled interviewer can create a non-threatening situation for the respondent, increased cooperation on the part of the respondent may lead to more valuable results. Conversely, in a situation where interviewers are poorly matched with respondents, tension between the interviewer and respondent can seriously affect the quality of the data collected. An additional advantage of the interviewer method is that observational data or other kinds of data, e.g., environmental conditions, can be collected during the same session. In some instances, interviewers also may produce a higher response rate than would be attained using self-administered questionnaires.

The major disadvantage associated with interview schedules is the sharply increased costs as compared with using self-administered questionnaires. A second disadvantage is that the presence of an interviewer may result in potential response bias in some situations. For example, in situations where interviewers are not highly skilled, where respondents are suspicious; where there is a poor demographic match between interviewer and respondent, or where the material covered in the interview is personal or fraught with socially desirable answers -- responses recorded by the interviewers may be biased. In Exhibit 2-17 these three different survey procedures are compared: the personal interview; the telephone interview; and the mailed questionnaire.

Self-administered questionnaires are designed so that respondents can provide answers to the questions without any assistance. Clarity and appearance of the questionnaire are particularly important in designing self-administered survey questionnaires. A major advantage in using a self-administered questionnaire is cost. Self-administered questionnaires are much less expensive to administer than are interviews. They can be administered to people assembled in groups, can be distributed to people on location to be returned upon completion, or can be administered through the mails. For some topics, particularly when questionnaire responses are anonymous, respondents may be willing to answer questions concerning socially undesirable or illegal behavior. Measures can be included in questionnaires to account for socially desirable response bias as well as for random checking of responses, consequently reducing these two common sources of error.

The major problem with self-administered questionnaires is response rate. Although response rates can usually be increased substantially with follow-up reminders to respondents, the number of respondents not completing the questionnaire may be higher for self-administered questionnaires than the refusal rates in an interview situation. A lower response rate can have a serious limiting effect on conclusions drawn from a particular study because of the sampling bias introduced by non-respondents.

EXHIBIT 2-17

A COMPARISON OF ALTERNATIVE SURVEY PROCEDURES

CRITERIA	PERSONAL INTERVIEW	SELF-ADMINISTERED QUESTIONNAIRE	TELEPHONE INTERVIEW
Inexepensive	no	sometimes	yes
Random sampling generally	no	sometimes	with RDD*
Entire spectrum of the population potentially contactable	yes	no	no
Sampling of special populations	yes	with list	sometimes
Easy to cover large geographic area	no	yes	yes
Control over who is actual respondent	yes	no	yes
High response rate	sometimes	no	yes
Easy call-backs and follow-ups	no	no	yes
Long interview generally possible	yes	sometimes	sometimes
Explanations and probings possible	yes	no	yes
Visual materials may be presented	yes	yes	no
Nonthreatening to respondent	no	yes	yes
Interviewer can present credentials	yes	yes	no
Safe for interviewers	no	N.A.	yes
Easy Supervision of interviewers	no	N.A.	yes

*RDD - random digit dialing
Source: Tachfarber, Alfred J.; Klecka, William R.; Random Digit Dialing: Lowering the cost of Vicitimization Surveys; Police Foundation, 1976

Finally, it is important to consider the basic measurement issues discussed at the beginning of this module when designing a survey, as well as the necessity of pretesting your procedures and instruments to help assure useful and accurate data.

IV. Planning the Data Collection Effort

A Data Collection Plan is a valuable tool for organizing and outlining the sources and procedures to be used in obtaining data for an analysis. Such a plan is based on a Problem Specification and includes consideration of the following topics:

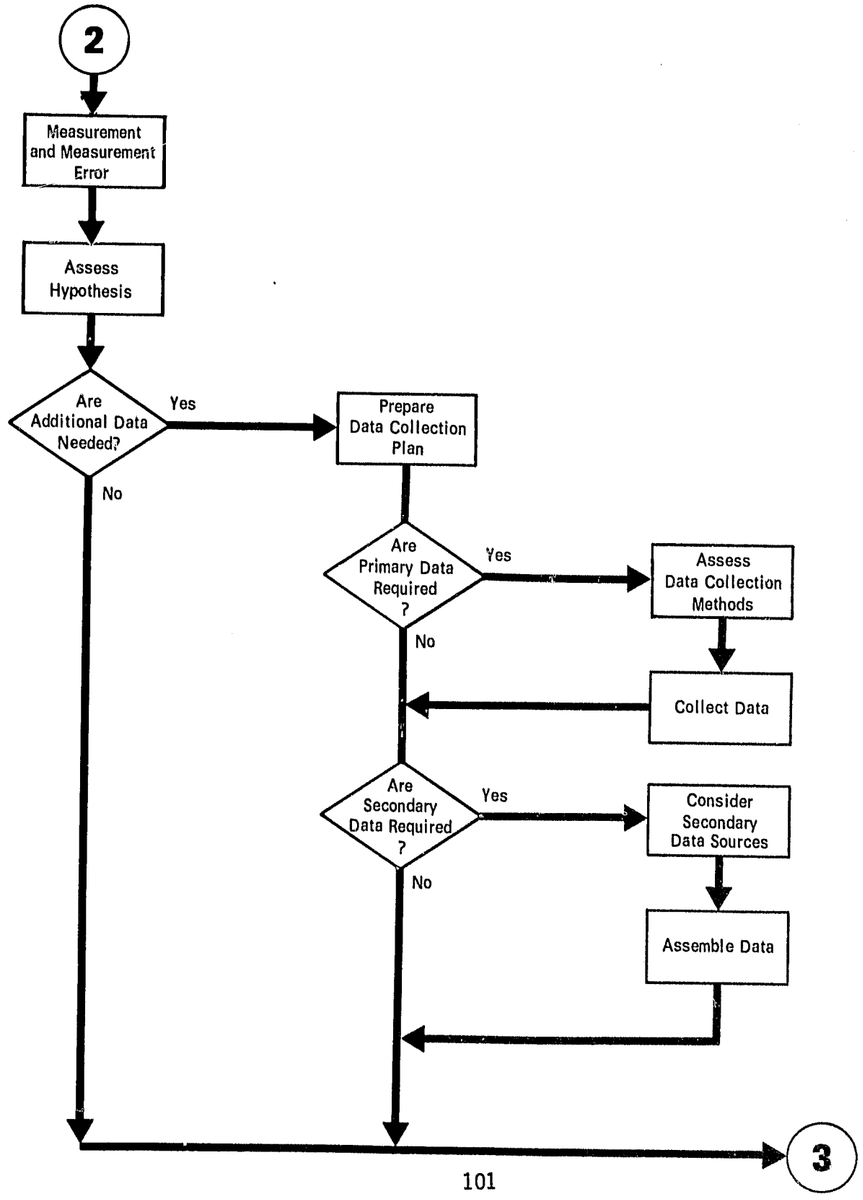
1. Determine measures to be used. (Review Problem Specification.)
2. Identify secondary data sources for each measure.
   a. Is appropriate data available? (If not, go to 3.)
   b. Will data permit adequate testing of hypotheses? (If not, go to 3.)
   c. Are the data sufficiently reliable and valid? (If not, go to 3.)
3. Identify primary data collection procedures.
   a. What type of data are required?
   b. Can the data be collected in time?
   c. What are the strengths and weaknesses of alternative data collection procedures?
4. Consider additional requirements.
   a. Identify authorization requirements.
   b. Identify coding requirements process.
   c. Develop sampling requirements.
   d. Develop instrument requirements.
   e. Develop data conversion requirements.

The process of deciding the appropriate data sources and collection procedures for a given set of hypotheses involves making difficult tradeoffs between measurement accuracy, time, and cost. Planning a data collection report is an important part of an overall plan for managing an analysis. Planning and managing the analysis effort is covered in detail in Chapter Eight.

The art and craft of using data effectively in analysis is learned through practice, error, and improvement. Data synthesis requires knowledge of the topics of this chapter, as well as an understanding of the initial Problem Specification and the statistical tests and methods to which the data will be applied. These descriptive, comparative, and inferential methods are the subject of Chapter 3 to 6. Exhibit 2-18 illustrates in a flow chart the major decisions and activities associated with Data Synthesis.

EXHIBIT 2-18

CHAPTER 2 SUMMARY CHART: DATA SYNTHESIS



[1]Wesley G. Skogan, "The Validity of Official Crime Statistics," Social Science Quarterly 55 (Jan., 1974): 25.

[2]U.S. Department of Justice, Federal Bureau of Investigation, Crime in the United States-1978: Uniform Crime Reports, 1974 and U.S. Department of Justice, Law Enforcement Assistance Administration, National Criminal Justice Information and Statistics Service, Dictionary of Criminal Justice Data Terminology, First Edition, 1976.

[3]R.L.D. Wright, Understanding Statistics: An Informal Introduction for the Behavioral Sciences (New York: Harcourt, Brace, Janovich Inc., 1976), p. 46.

[4]Robert Martinson, "What Works? Questions and Answers about Prison Reform" The Public Interest 35 (Spring 1974): 22-53. For a complete discussion of the Martinson report see National Council on Crime and Delinquency, Rehabilitation, Recidivism and Research, 1978.

[5]National Advisory Committee on Criminal Justice Standards and Goals, Criminal Justice Research and Development, A Report on the Task Force on Criminal Justice Research and Development (Dec., 1976), p. 122.

[6]Ibid., p. 121. For a good introductory discussion of research design see Philip J. Runkel and Joseph E. McGrath, Research on Human Behavior: A Systematic Guide to Method (New York: Holt, Rinehart and Winston Inc., 1972), pp. 81-118. Evaluation research designs are specifically treated in Edward Suchman, Evaluative Research (New York: Russell Sage Foundation, 1967), pp. 91-131.

[7]John P. Clark and Larry L. Tifft, "Polygraph and Interview Validation of Self-Reported Deviant Behavior," American Sociological Review 31 (1966): 516-523.

[8]John Ball, "The Reliability and Validity of Interview Data Obtained From 59 Narcotic Drug Addicts," American Journal of Sociology 72 (1967): 650-654, as reported in Derek K. Phillips, Knowledge From What: Theories and Methods of Social Research (Chicago: Rand McNally and Company, 1972), pp. 26-27.

[9]Thorseten Sellin and Marvin E. Wolfgang, The Measurement of Delinquency (New York: John Wiley & Sons, 1964), pp. 323-333.

[10]Skogan, The Validity of Official Crime Statistics, p. 29.

[11]Sellin and Wolfgang, The Measurement of Delinquency, p. 324.

[12]Michael D. Maltz, "Crime Statistics: A Historical Perspective," Crime & Delinquency No. 1, 23 (Jan., 1977), p. 34.

[13]For a similar validation study of UCR data see Michael J. Hendelang, "The Uniform Crime Reports Revisited," Journal of Criminal Justice 2 (1974): 1-17.

[14]National Academy of Science, Panel for the Evaluation of Crime Surveys, Surveying Crime (Washington D.C.: 1976), pp. 134-140.

[15]Dickenson McGraw and George Watson, Political and Social Inquiry (New York: John Wiley and Sons, 1976), p. 212.

[16]W. Phillips Snively, The Craft of Political Research: A Primer (Englewood Cliffs: Prentice-Hall, 1972), p. 51.

[17]Ted Robert Gurr, Politimetrics: An Introduction to Quantitative Macro Politics (Englewood Cliffs: Prentice-Hall, 1972), p. 51.

[18]Suchman, Evaluative Research, p. 118.

[19]Runkel and McGrath, Research on Human Behavior, pp. 152-158.

[20]This section is developed from a similar presentation in Runkel and McGrath, Research on Human Behavior, pp. 24-31.

[21]There are many excellent statistics texts that cover this problem of estimation quite well, particularly Hyman Ott, William Mendenhall and Richard Larson, Statistics a Tool for the Social Sciences, 2nd ed. (Belmont, Calif.: Wadsworth Publishing, 1978), pp. 187-213.

[22]These techniques are usually presented in intermediate and advanced statistics texts. One of the most thorough discussions of analysis of variance is in Thomas H. Wonnacott and Ronald J. Wonacott, Introductory Statistics, 3rd. ed. (New York: John Wiley & Sons, 1977), pp. 277-312.

[23]Two good sources covering multivariate regression and correlation are Fred N. Kerlinger and Elazar J. Pedhazur, Multiple Regression in Behavioral Research (New York: Holt, Rinehart and Winston, Inc., 1973) and N.R. Draper and H. Smith, Applied Regression Analysis (New York: John Wiley & Sons, Inc., 1968).

[24]A very handy guide to statistical methods based on the level of measurement (See Chapter 4) of the variables being considered and the number of variables in the hypothesis -- one, two or more than two -- is Frank M. Andrews et. al., A Guide for Selecting Statistical Techniques for Analyzing Social Science Data (Ann Arbor: Institute for Social Research, 1975).

[25]Wesley G. Skogan, "Dimensions of the Dark Figure of Unreported Crime," Crime and Delinquency No. 1, 73 (January, 1970): 49.

[26]Letter from Alvin Ash, Systems Specialist, Law Enforcement Assistance Administration, August 1979.

[27]U.S. Department of Justice, Law Enforcement Assistance Administration, Dictionary of Criminal Justice Data Terminology (1976): 64.

[28]American Justice Institute, Burglary in San Jose (Springfield, Va.: NTIS, PB# 211 789), 1974.

[29]For a complete summary of the state-of-the-art in victim surveys see the NAS report Surveying Crime.

[30]Michigan Office of Criminal Justice Programs, Michigan Commission on Criminal Justice, The Michigan Public Speaks Out on Crime, 4th ed. (Lansing: April, 1976).

[31]U.S. Department of Justice, Law Enforcement Assistance Administration and U.S. Bureau of the Census, Expenditure and Employment Data for the Criminal Justice System: 1976 (1978): 16.

[32]Two excellent overviews of these methods are Earl P. Babbie, The Practice of Social Research, 2nd ed. (Belmont: Wadsworth Publishing, 1979), pp. 202-353 and John B. Williamson, et. al., The Reseach Craft (Boston: Little, Brown and Company, 1977), pp. 131-317.

[33]Peter K. Manning, Police Work: The Social Organization of Policing (Cambridge: MIT Press, 1977). A good practical reference to field research is John Lofland, Analyzing Social Settings (Belmont: Wadsworth, 1971).

[34]George L. Kelling, et. al., Kansas City Preventive Patrol Experiment (Washington D.C.: The Police Foundation, 1974). A standard source of information on experiments is Donald Campbell and Julian Stanley, Experimental and Quasi-Experimental Designs for Research (Chicago: Rand McNally, 1963).

[35]Roger Lane, "Victimization and Criminal Violence in the Nineteenth Century: Massachusetts as a Test Case," Journal of Social History (Winter 1968): 156-163.

[36]Jacob Belkin, Alfred Blumstein and William Glass, JUSSIM, An Interactive Computer Program for Analysis of Criminal Justice Systems, Urban Systems Institute, School of Urban and Public Affairs, Carnegie-Mellon University (July 1971). JUSSIM II, a revised and improved version, is now available. For an overview of criminal justice models in use see Jan Chaiken, Criminal Justice Models: An Overview (Santa Monica: The Rand Corporation, 1974).

[37]Charles H. Backstrom and Gerald D. Hursh, Survey Research (Evanston, Ill.: Northwestern University Press, 1963), pp. 25-35.

[38]Ibid, p. 26.

[39]LAW ENFORCEMENT ASSISTANCE ADMINISTRATION, STATISTICS DIVISION, PUBLICATIONS, FY 1971 - FY 1980

FY 1971:

February 1971	EXPENDITURE AND EMPLOYMENT DATA FOR THE CRIMINAL JUSTICE SYSTEM, 1968-69.
May 1971	NATIONAL JAIL CENSUS

FY 1972:

July 1971	CRIMINAL JUSTICE AGENCIES IN THE U.S., 1970 (Summary)
February 1972	EXPENDITURE AND EMPLOYMENT DATA FOR THE CRIMINAL JUSTICE SYSTEM, 1960-70
May 1972	CRIMINAL JUSTICE AGENCIES IN ... (51 volumes)

FY 1973:

September 1972	SAN JOSE METHODS TEST OF KNOWN CRIME VICTIMS
February 1973	EXPENDITURES AND EMPLOYMENT DATA FOR THE CRIMINAL JUSTICE SYSTEM, 1970-71
March 1973	LOCAL JAILS: DATA FOR INDIVIDUAL COUNTY AND CITY JAILS

FY 1974:

February 1974	EXPENDITURE AND EMPLOYMENT DATA FOR THE CRIMINAL JUSTICE SYSTEM, 1971-72
February 1974	NATIONAL SURVEY OF COURT ORGANIZATION, 1971
April 1974	CRIME IN THE NATION'S FIVE LARGEST CITIES: National Crime Panel Surveys in Chicago, Detroit, Los Angeles, New York, and Philadelphia--Advance Report
May 1974	CHILDREN IN CUSTODY: A Report on the Juvenile Detention and Correctional Facility Census of 1971
June 1974	CRIMES AND VICTIMS: A Report on the Dayton-San Jose Pilot Survey of Victimization
July 1974	SOURCEBOOK OF CRIMINAL JUSTICE STATISTICS 1973 (1st edition)

FY 1975 continued:

July 1974	CRIME IN EIGHT AMERICAN CITIES: National Crime Panel Surveys in Atlanta, Baltimore, Cleveland, Dallas, Denver, Newark, Portland, and St. Louis--Advance Report.
September 1974	SURVEY OF INMATES OF LOCAL JAILS 1972: Advance Report
November 1974	CRIMINAL VICTIMIZATION IN THE U.S.: January-June 1973
February 1975	EXPENDITURE AND EMPLOYMENT DATA FOR THE CRIMINAL JUSTICE SYSTEM, 1972-73
February 1975	CRIMINAL JUSTICE AGENCIES IN REGION 9
May 1975	CRIMINAL JUSTICE AGENCIES IN REGION 7
June 1975	CRIMINAL JUSTICE AGENCIES IN REGIONS 1-6, 8, and 10
June 1975	CRIMINAL VICTIMIZATION SURVEYS IN THE NATION'S FIVE LARGEST CITIES: National Crime Panel Surveys in Chicago, Detroit, Los Angeles, New York, and Philadelphia (final report)
June 1975	CAPITAL PUNISHMENT 1973: National Prisoner Statistics Bulletin
June 1975	CRIMINAL VICTIMIZATION IN THE U.S.: 1973 Advance Report

FY 1976:

July 1975	PRISONERS IN STATE AND FEDERAL INSTITUTIONS ON DECEMBER 31, 1971, 1972, and 1973
July 1975	CRIMINAL VICTIMIZATION SURVEYS IN 13 AMERICAN CITIES: National Crime Panel Surveys in Boston, Buffalo, Cincinnati, Houston, Miami, Milwaukee, Minneapolis, New Orleans, Oakland, Pittsburgh, San Diego, San Francisco, and Washington, D.C.
August 1975	HISTORICAL STATISTICS ON EXPENDITURE AND EMPLOYMENT FOR THE CRIMINAL JUSTICE SYSTEM, 1971 to 1973
August 1975	THE NATION'S JAILS: A report on the Census of Jails from 1972 Survey of Inmates of Local Jails
September 1975	SOURCEBOOK OF CRIMINAL JUSTICE STATISTICS 1974 (2nd edition)
September 1975	CHILDREN IN CUSTODY: Advance Report on the Juvenile Detention and Correctional Facility Census of 1972-73

FY 1976 continued:

September 1975	CENSUS OF STATE CORRECTIONAL FACILITIES, 1974, ADVANCE REPORT: National Prisoner Statistics Special Report
November 1975	NATIONAL SURVEY OF COURT ORGANIZATION: 1975 Supplement to State Judicial Systems
November 1975	CAPITAL PUNISHMENT 1974: National Prisoner Statistics Bulletin
March 1976	EXPENDITURE AND EMPLOYMENT DATA FOR THE CRIMINAL JUSTICE SYSTEM: 1974
March 1976	ANALYTIC MONOGRAPHS:

Public Opinion Regarding Crime, Criminal Justice, Related Topics

New Directions in Processing Juvenile Offenders: The Denver Model

Who Gets Detained? An Empirical Analysis of the Pre-Adjudicatory Detention of Juveniles in Denver

Juvenile Dispositions: Social and Legal Factors Related to the Processing of Denver Delinquency Cases

Offender-Based Transaction Statistics: New Directions in Data Collection and Reporting

Sentencing of California Felony Offenders

The Judicial Processing of Assault and Burglary Offenders in Selected California Counties

April 1976	SURVEY OF INMATES OF STATE CORRECTIONAL FACILITIES, 1974
	ADVANCE REPORT: National Prisoner Statistics Special Report
June 1976	AN ANALYSIS OF VICTIMIZATION SURVEY RESULTS FROM THE EIGHT IMPACT CITIES: Summary Report
June 1976	TRENDS IN EXPENDITURE AND EMPLOYMENT DATA FOR THE CRIMINAL JUSTICE SYSTEM, 1971-74
June 1976	CRIMINAL VICTIMIZATION IN THE U.S.: A Comparison of 1973 and 1974 Findings
September 1976	PRISONERS IN STATE AND FEDERAL INSTITUTIONS ON DECEMBER 31, 1974: National Prisoner Statistics Bulletin
November 1976	CAPITAL PUNISHMENT 1975

FY 1977:

December 1976	CRIMINAL VICTIMIZATION SURVEYS IN EIGHT AMERICAN CITIES: A Comparison of 1971/72 and 1974/75 Findings
December 1976	CRIMINAL VICTIMIZATION SURVEYS IN CHICAGO, DETROIT, LOS ANGELES, NEW YORK, AND PHILADELPHIA: A Comparison of 1972 and 1974 Findings
January 1977	SOURCEBOOK OF CRIMINAL JUSTICE STATISTICS 1975
January 1977	PRE-ADJUDICATORY DETENTION IN THREE JUVENILE COURTS
January 1977	DELINQUENCY DISPOSITIONS: An Empirical Analysis of Processing Decisions in Three Juvenile Courts
January 1977	EXPENDITURE AND EMPLOYMENT DATA FOR THE CRIMINAL JUSTICE SYSTEM, 1975: Advance Report
March 1977	EXPENDITURE AND EMPLOYMENT DATA FOR THE CRIMINAL JUSTICE SYSTEM, 1975
March 1977	CRIMINAL VICTIMIZATION IN THE UNITED STATES: 1973
March 1977	CENSUS OF PRISONERS IN STATE CORRECTIONAL FACILITIES, 1973
April 1977	PRISONERS IN STATE AND FEDERAL INSTITUTIONS ON DECEMBER 31, 1976: Advance Report
April 1977	CHILDREN IN CUSTODY: Advance Report on Juvenile Detention and Correctional Facility Census of 1974
April 1977	PRISONERS IN STATE AND FEDERAL INSTITUTIONS ON DECEMBER 31, 1975
May 1977	CRIMINAL VICTIMIZATION IN THE UNITED STATES: A Comparison of 1974 and 1975 Findings
May 1977	DICTIONARY OF CRIMINAL JUSTICE DATA TERMINOLOGY: Terms and Definitions Proposed for Interstate and National Data Collection and Exchange
May 1977	CAPITAL PUNISHMENT 1976: Advance Report
June 1977	THE PATTERNS AND DISTRIBUTION OF ASSAULT INCIDENT CHARACTERISTICS AMONG SOCIAL AREAS
June 1977	PATTERNS OF ROBBERY CHARACTERISTICS AND THEIR OCCURRENCE AMONG SOCIAL AREAS
June 1977	SOURCEBOOK OF CRIMINAL JUSTICE STATISTICS 1976
July 1977	TRENDS IN EXPENDITURE AND EMPLOYMENT DATA FOR THE CRIMINAL JUSTICE SYSTEM: 1971-75

FY 1977 continued:

July 1977	NATIONAL SURVEY OF COURT ORGANIZATION: 1977 Supplement to State Judicial Systems
August 1977	LOCAL VICTIM SURVEYS: A Review of the Issues

FY 1978:

October 1977	CRIMINAL VICTIMIZATION SURVEYS IN WASHINGTON, D.C.
October 1977	CRIME-SPECIFIC ANALYSIS: The Characteristics of Burglary Incidents
October 1977	CRIME-SPECIFIC ANALYSIS: An Empirical Examination of Burglary Offender Characteristics
November 1977	CRIMINAL VICTIMIZATION SURVEYS IN PITTSBURGH
November 1977	CRIMINAL VICTIMIZATION SURVEYS IN SAN FRANCISCO
November 1977	PUBLIC OPINION ABOUT CRIME: THe Attitudes of Victims and Non-victims in Selected Cities
November 1977	THE POLICE AND PUBLIC OPINION: An Analysis of Victimization and Attitude Data from 13 American Cities
November 1977	CHILDREN IN CUSTODY: Advance Report on the Juvenile Detention and Correctional Facility Census of 1975
December 1977	CRIMINAL VICTIMIZATION SURVEYS IN BOSTON
December 1977	CAPITAL PUNISHMENT 1976
January 1978	CRIMINAL VICTIMIZATION SURVEYS IN BUFFALO
January 1978	CRIMINAL VICTIMIZATION SURVEYS IN CINCINNATI
January 1978	CRIMINAL VICTIMIZATION SURVEYS IN HOUSTON
January 1978	CRIMINAL VICTIMIZATION SURVEYS IN MIAMI
January 1978	CRIMINAL VICTIMIZATION SURVEYS IN MILWAUKEE
January 1978	CRIMINAL VICTIMIZATION SURVEYS IN MINNEAPOLIS
January 1978	CRIMINAL VICTIMIZATION SURVEYS IN NEW ORLEANS
January 1978	CRIMINAL VICTIMIZATION SURVEYS IN OAKLAND
January 1978	CRIMINAL VICTIMIZATION SURVEYS IN SAN DIEGO

FY 1978 continued:

February 1978	EXPENDITURE AND EMPLOYMENT DATA FOR THE CRIMINAL JUSTICE SYSTEM, 1976 Advance Report
February 1978	CRIMINAL VICTIMIZATION SURVEYS IN THE UNITED STATES: A Comparison of 1975 and 1976 Findings
March 1978	CHILDREN IN CUSTODY: A Report on the Juvenile Detention and Correctional Facilitty Census of 1973
April 1978	PRISONERS IN STATE AND FEDERAL INSTITUTIONS ON DECEMBER 31, 1976
April 1978	SOURCEBOOK OF CRIMINAL JUSTICE STATISTICS 1977
April 1978	STATE AND LOCAL PROBATION AND PAROLE SYSTEMS
April 1978	AN INTRODUCTION TO THE NATIONAL CRIME SURVEY
May 1978	CRIMINAL VICTIMIZATION IN THE UNITED STATES: 1974
May 1978	EXPENDITURE AND EMPLOYMENT DATA FOR THE CRIMINAL JUSTICE SYSTEM, 1976
May 1978	CRIME-SPECIFIC ANALYSIS: An Empirical Examination of Burglary Offenses and Offender Characteristics
May 1978	PRISONERS IN STATE AND FEDERAL INSTITUTIONS on December 31, 1977: Advance Report
June 1978	CRIMINAL VICTIMIZATION IN THE UNITED STATES: 1975
June 1978	CAPITAL PUNISHMENT 1977: Advance Report
June 1978	SOURCES OF NATIONAL CRIMINAL JUSTICE STATISTICS: An Annotated Bibliography
July 1978	COMPENSATING VICTIMS OF VIOLENT CRIME: Potential costs and Coverage of a National Program
July 1978	STATE AND LOCAL PROSECUTION AND CIVIL ATTORNEY SYSTEMS
August 1978	TRENDS IN EXPENDITURE AND EMPLOYMENT DATA FOR THE CRIMINAL JUSTICE SYSTEM, 1971-1976
September 1978	EXPENDITURE AND EMPLOYMENT DATA FOR THE CRIMINAL JUSTICE SYSTEM: 1977 Advance Report
September 1978	FEDERAL CRIMINAL SENTENCING: Perspectives of Analysis and a Design for Research

FY 1978 continued:

September 1978	VARIATIONS IN FEDERAL CRIMINAL SENTENCES: A Statistical Assessment at the National Level
September 1978	FEDERAL SENTENCING PATTERNS: A Study of Geographical Variations
September 1978	PREDICTING SENTENCES IN FEDERAL COURTS: The Feasibility of a National Sentencing Policy

FY 1979:

October 1978	WASHINGTON, D.C.: Public Attitudes About Crime
October 1978	HOUSTON: Public Attitudes About Crime
October 1978	MYTHS AND REALITIES ABOUT CRIME: A Non-technical Presentation of Selected Information from the National Prisoner Statistics Program and the National Crime Survey
November 1978	OAKLAND: Public Attitudes About Crime
November 1978	PAROLE IN THE UNITED STATES: 1976 and 1977 Uniform Parole Reports
December 1978	SAN FRANCISCO: Public Attitudes About Crime
December 1978	STATE COURT CASELOAD STATISTICS: Advance Report, 1975
January 1979	CAPITAL PUNISHMENT 1977: National Prisoner Statistics Bulletin
January 1979	CRIMINAL VICTIMIZATION IN THE U.S.: A Comparision of 1976 and 1977 Findings, Advance Report
February 1979	MILWAUKEE: Public Attitudes About Crime
February 1979	MINNEAPOLIS: Public Attitudes About Crime
February 1979	STATE COURT CASELOAD STATISTICS: The State of the Art
April 1979	PITTSBURGH: Public Attitudes About Crime
May 1979	CENSUS OF JAILS AND SURVEY OF JAIL INMATES, 1978: Preliminary Report
May 1979	PRISONERS IN STATE AND FEDERAL INSTITUTIONS on December 31, 1977: National Prisoner Statistics Bulletin
May 1979	CINCINNATI: Public Opinion About Crime
May 1979	A CROSS-CITY COMPARISON OF FELONY CASE PROCESSING

FY 1979 continued:

June 1979	BOSTON: Public Opinion About Crime
June 1979	BUFFALO: Public Opinion About Crime
June 1979	TECHNICAL STANDARDS FOR MACHINE-READABLE DATA SUPPLIED TO LEAA
June 1979	PRISONERS IN STATE AND FEDERAL INSTITUTIONS on December 31, 1978: Advance Report
June 1979	CAPITAL PUNISHMENT 1978: Advance Report
July 1979	EXPENDITURE AND EMPLOYMENT DATA FOR THE CRIMINAL JUSTICE SYSTEM, 1977
July 1979	STATE COURT CASELOAD STATISTICS: Annual Report, 1975
August 1979	RAPE VICTIMIZATION IN 26 AMERICAN CITIES
August 1979	SOURCEBOOK OF CRIMINAL JUSTICE STATISTICS 1978
September 1979	CRIMINAL VICTIMIZATION IN THE U.S.: 1976
September 1979	CHILDREN IN CUSTODY: Advance Report on the 1977 Census of Public Juvenile Facilities
September 1979	STATE COURT CASELOAD STATISTICS: Advance Report, 1978

FY 1980:

October 1979	PROFILE OF STATE PRISON INMATES: Socio-demographic Findings from the 1974 Survey of Inmates of State Correctional Facilities
October 1979	PAROLE IN THE U.S.: 1978 Uniform Parole Reports
November 1979	CRIMINAL VICTIMIZATION IN URBAN SCHOOLS
November 1979	CRIME AGAINST PERSONS IN URBAN, SUBURBAN, AND RURAL AREAS: A Comparative Analysis of Victimization Rates
November 1979	CHILDREN IN CUSTODY: Advance Report on the 1977 Census of Private Juvenile Facilities
November 1979	CRIMINAL VICTIMIZATION IN THE U.S.: Summary Findings of 1977-78 Changes in Crime and of Trends Since 1973
November 1979	THE COST OF NEGLIGENCE: Lossess from Preventable Household Burglaries

CHAPTER 3

DESCRIPTIVE METHODS

Introduction

What is "data interpretation" as used in this text? Essentially it is the application of a set of tools used for converting data about crime and the criminal justice system into information valuable for decision-making. These tools include both quantitative techniques as well as qualitative methods.

The types of methods that are used to interpret data range from the application of graphs, charts, and maps to multi-variate modeling methods useful for understanding and predicting trends. This chapter concentrates on building skills involving basic quantitative tools -- descriptive statistics.

What are/is statistics? The question implies the answer, for statistics is a collection of numerical facts about ourselves and our environment as well as a set of tools used to deal with such numerical facts. It is this latter definition which is used as one of this text's themes, emphasizing the view that statistics is concerned with the collection, organization and interpretation of numerical facts or observations about crime and the criminal justice system.[1]

Descriptive statistics are used for two purposes. They are used to characterize what is "typical" about a set of data (e.g., how a crime is typically performed, where and when in the community it most frequently occurs, and who the average offender is). For instance, of the 975,630 estimated robberies in 1974, less than half involved the use of a weapon (47%). Of the robberies involving a weapon, the knife was the most frequently used weapon (43%). Sixty percent of all robberies took place on the streets or in parks; forty-six percent took place between the hours of 6:00 a.m. and 6:00 p.m. Finally, the "typical" suburban robber in 1974 was a white male between 25 and 29 years of age. It is assumed that the analyst has data on each crime, each offender, and each victim and wants to describe the principal characteristics of the crime, criminal activity in the jurisdiction, or the types of offenders and victims involved in specific crimes. The statistical measures used for such descriptions are the mean, mode, and median, known collectively as measures of central tendency.

A second purpose of descriptive statistics is to measure the variation in data. Variation refers to the differences among the various measured observations. Measures of variability are used to indicate how widely individual measurements vary from the central tendency in the data. Using the example of robbery again, the state with the lowest robbery rate per 100,000 inhabitants in 1977 was Iowa (10.1) while the state with the highest rate was New York (476.3). The minimum (10.1) and maximum (476.3) values of a distribution as well as the range for a distribution (476.3 - 10.1 = 466.2) are three statistical measures of variation. Such statistical measures of variation are discussed in this chapter.

CONTINUED

11 OF 14

In addition to these descriptive statistics, this chapter presents and illustrates various graphic techniques for describing data for a single variable. Sets of statistical measures by themselves do not convey the complete profile or description of a trend. They are enhanced and supported by carefully conceptualized graphics. In this chapter two categories of graphics are presented using crime data examples: those used to describe quantitative data -- frequency histograms and polygons; and those appropriate for describing qualitative variables -- charts and graphs. While most of the illustrations and examples used in this chapter involved crime data, system data may be treated in a similar fashion.

I. Measurement Levels

Exhibit 3-1 summarizes information and provides examples of the four measurement scales or levels that are used to classify data. Such a classification scheme is essential for the selection of methods appropriate for use with particular variables.

EXHIBIT 3-1.

MEASUREMENT LEVELS

COMMONLY USED NAMES	LEVEL	DESCRIPTION	EXAMPLES	STATISTICS FREQUENTLY USED
Discrete, Qualitative, Categorical	Nominal	Data are placed in mutually exclusive and exhaustive categories	Sex, Race, Type of Crime, Type of Weapon	Tables of Frequencies & (Rates, Mode, Pie Charts, Bar Graphs, Cross Tabulation tables Chi Square Seriousness Scales)
Discrete, Rank-ordered	Ordinal	Data are placed in mutually exclusive and exhaustive categories, ordered along according to a hierarchy	Socio-economic status Ranks in law enforcement agency	
Quantitative	Interval	Data are distributed along a continuum with established distances between points with no reference to an absolute zero	Temperature Intelligence	Mean Median Range Standard Deviation Statistical Maps Histograms Time Charts Rates
Quantitative, Continuous	Ratios	Data Are distributed along a continuum with established distances between points with an absolute zero	Age, Years of Education, Expenditures, Manpower	Pearson's r Regression Scattergrams Grouped data: All statistics for nominal & ordinal level variables

Every variable categorizes data, but the set of categories used for a given variable can itself be classed on the basis of the level of measurement it expresses. The four possible levels are nominal, ordinal, interval, and ratio. Both nominal and ordinal level variables are commonly called discrete variables, qualitative variables, or categorical variables. The nominal level variable classes cases (or observations) into exhaustive and mutually exclusive categories. For example, sex is a nominal variable which classes cases as either male or female but never as both male and female. The ordinal level variables both class cases into categories and rate the categories from the most to the least amount of some underlying characteristic. For example, type of robbery is a variable which has categories with the underlying dimension of the seriousness of the offense, where the "label" 4 is assigned to the most serious type of robbery and the "label" 1 is assigned to the least serious. However, the numbers used to rank the seriousness of robberies do not provide any information on how much more serious a robbery of category 2 is than a robbery of category 1. Nor is it clear that the difference in seriousness between robberies of category 1 and those of category 2 is the same as the difference in seriousness between robberies of category 2 and robberies of category 3. The numbers assigned to categories are used only to identify categories; any differences are qualitative rather than quantitative.

Both the interval and ratio levels of measurement imply quantification of the observations categorized by a variable. For example, temperature is an interval measure because it permits not only differentiation between 32 degrees and 33 degrees, the precision of measurement is such that it can be assumed that the difference between 32 degrees and 33 degrees is the same as that between 98 degrees and 99 degrees. However, it cannot be assumed that 99 degrees is three times as hot as 33 degrees. (Few examples of this level of variable are used in criminal justice analysis.) Dollar value of stolen property is a continuous variable because no matter what the labels assigned to categories, it is always possible to find a meaningful category between any two labelled categories. For example, between dollar values of $1,000 and $1,001 a value of $1,000.50 can be found and has qualitative (or substantive) meaning as well as quantitative meaning. Between the values of $1,000 and $1,000.50, a value of $1,000.33 can be found and has qualitative meaning as well as quantitative meaning.

Variables commonly used in criminal justice analysis are listed in column 4 of Exhibit 3-1, by level of measurement (in the third column). The last column indicates appropriate methods from Chapter 3-5 for treating variables of a given measurement level.

Many variables can be measured on more than one scale. For example, a ratio level measure such as age, may be grouped into categories and treated as an ordinal level variable. To explain the term "grouped data" it is necessary to discuss first the concept of a distribution.[2] Step one in creating a distribution is to count the number of observations or cases which fall in each category of a variable. This number denotes the frequency with which a category of observations occurs. In Exhibit 3-2, such counts are presented for two different types of variables, place of occurrence, a nominal level variable, offender's age, and a ratio level variable. The term "real limits" is a concept used to bound observations

in a manner so that values can be readily categorized. In the example, these bounds or limits extend one-half unit on either side of the apparent interval limits. Interval and ratio scale variables are generally referred to by their mid-points. In the case of "Offender's Age" the category mid-points are: 16.0, 17.0, 19.0, 20.0, etc. Grouping observations is done to focus attention on certain specific categories as illustrated by the grouped frequency distribution for place of occurrence; or grouping into fewer categories facilitates a presentation as with offender's age. Grouping data is a useful technique, however there are two potential problems: (1) the fewer the categories the greater the loss of detailed information; and (2) the potential measurement error caused by grouping the data. While the same descriptive statistics are used for grouped data, different formulas are applied to ungrouped and grouped variables.

EXHIBIT 3-2.

FREQUENCY DISTRIBUTIONS AND GROUPED DATA

1. Frequency Distributions

a. Place of Occurence

	Frequency of Cases in Each Category (f)
Highway	2
Commercial House	4
Gas or Service Station	5
Chain Store	2
Residence	1
Bank	1
Miscellaneous	0
	15

b. Offender's Age

	Real Limits	f
16	15.5 - 16.5	1
17	16.5 - 17.5	1
19	18.5 - 19.5	2
20	19.5 - 20.5	1
21	20.5 - 21.5	1
24	23.5 - 24.5	1
25	24.5 - 25.5	1
26	25.5 - 26.5	1
27	26.5 - 27.5	2
30	29.5 - 30.5	1
31	30.5 - 31.5	1
32	31.5 - 32.5	1
41	40.5 - 41.5	1
		15

2. Grouped Frequency Distributions

a. Place of Occurrence

	f
Commercial House	4
Gas or Service Station	5
Other	6
	15

b. Offender's Age

(Expressed Limits)	Class Mid-Point	f
15-22	18.5	6
23-30	26.5	6
31-38	34.5	2
39-46	42.5	1
		15

Source: hypothetical data

II. Statistical Methods

A. Measures of Central Tendency

A number of easily calculated measures are available to summarize numerical data for a single variable, and to facilitate comparison and interpretation of data. Central tendency is used here to describe the representativeness, typicality or centrality of a distribution. The idea is that data for a single variable, such as the age of offenders, tends to cluster around a central value which is between two extreme values of the variable being studied.

Locating a central value can be very useful in reducing a mass of data to easily understood quantitative values which in turn can be readily communicated to decision-makers, particularly when coupled with a description of the distribution of the data about the central point -- a subject covered in the following material. In addition to reducing masses of data, measures of central tendency simplify the task of drawing conclusions and making generalizations about the concerns. Following are definitions and examples of three common measures of central tendency: the mean, the median, and the mode.

1. Mean

The mean is the sum of all cases or observations for an interval or ratio scale variable divided by the number of cases or observations. Consider the distribution for the variable "dollar value of stolen property" from Chapter 1's Exhibit 1-4. First note that it is a continuous, ratio level variable. Second, there is one missing case, reducing the total number of cases to 14. In order to describe the "typical case," the distribution is summed (Σ , sigma, means to sum the distribution) and divided by the number of cases in the distribution (N). The resulting value, $502.86, is the mean, average or typical case. This calculation is presented in Exhibit 3-3.

EXHIBIT 3-3.

MEAN: DEFINITION AND EXAMPLE

1. Definition

$\overline{X}$ = mean

N = number of cases

$\Sigma = X_1 + X_2 + 111 + X_n = \frac{\Sigma X}{N}$

2. Example

a.

	Case	Dollar Value of Stolen Property
	1	100
	2	350
	3	0
	4	100
	5	missing
	6	0
	7	75
	8	25
N = 14	9	4000
	10	150
	11	75
	12	600
	13	1500
	14	65
	15	0
		ΣX = 7040

b. $\overline{X} + \frac{\Sigma X}{N} = \frac{7040}{14} = \$502.86$

Source: hypothetical data

Extreme values in a distribution, such as case #9 the $4,000 bank robbery significantly affects the value of the mean. If case #9 had been excluded from the calculation:

N = 13

ΣX = 3040

and $\overline{X}$ = $233.85

This is a substantial change in the "typical case." If a distribution has such extreme values, use of the mean may be misleading. Other central tendency measures, such as the median, would be preferrable.

The definition of the mean just provided is for the most frequently used mean -- the arithmetic mean. In criminal justice analysis the harmonic mean is particularly important. It is used to average ratios in which the numerator is held constant. Consider the robbery rates presented in Exhibit 3-4. These are robbery rates per 100,000 population for all cities in 1975 which had a population of between 250,000 and 400,000 including the hypothetical metropolis of Chaos City. These rates are calculated by first dividing the number of offenses by the total population and then multiplying the result by 100,000. The product is the number of robberies per 100,000 population. Using a rate instead of the number of offenses permits accurate intercity comparisons on the incidence of robbery standardized for population size.

EXHIBIT 3-4.

CHAOS CITY AND TWENTY-SEVEN
U.S. CITY ROBBERY RATES, 1977

CITY	ROBBERY RATE (Per 100,000) 1977
Akron	243.50
Albuquerque	269.86
Austin	170.02
Baton Rouge	131.12
Birmingham	357.98
Chaos City	450.91
Charlotte	218.18
El Paso	213.64
Fort Worth	315.88
Long Beach	594.75
Louisville	406.90
Miami	670.26
Minneapolis	436.91
Newark	943.26
Norfolk	220.44
Oakland	918.49
Oklahoma City	211.80
Omaha	217.79
Portland	477.39
Rochester (N.Y.)	411.34
Sacramento	489.22
St. Paul	316.95
Tampa	378.83
Toledo	494.76
Tulsa	147.41
Tucson	185.52
Wichita	481.69

Source: UCR, 1977 and City and County Data Book, 1977, and hypothetical data for Chaos City.

The mean robbery rate for these cities is 384 robberies per 100,000 population. The harmonic mean is 296. The formula for calculating the harmonic mean is:

$$\bar{X}_H = \frac{N}{\Sigma\ 1/x} \quad \text{or} \quad \frac{1}{N}\ \Sigma\frac{1}{X}$$

$$\bar{X}_H = \frac{1}{243.5} + \frac{1}{269.86} + \ldots + \frac{1}{481.69} = \frac{27}{.0913}$$

$$\bar{X}_H = 296$$

Note that the harmonic mean in this example is smaller than the arithmetic mean. It may be a preferred measure of central tendency when discussing crime rates or system flows, e.g. offenders per week. Using an arithmetic mean may introduce bias in the estimate of central tendency for an index number.

2. Median

The median is a special case of percentile ranks. That is, by definition, the median is the score at the 50th percentile, thus requiring that the categories of a measure be ordered. The median is determined so that half the observations are equal to or greater than the middle observation and half of the observations are equal to or less than the middle observation.

Exhibit 3-5 defines and provides an example of determining the median. In the example, $100 is the median dollar value of stolen property. If case #9 -- $4000 -- was excluded, N = 13 and the value of the median would be the average of the two middle values, $100 and $75, or $87.50.

EXHIBIT 3-5.

MEDIAN: DEFINITION AND EXAMPLE

1. Definition

The median of a set of numbers arranged in order of magnitude is the middle value or the arithmetic mean of the two middle values. (Data From Exhibit 1-4)

2. Example. (Data from Exhibit 3-3)

Case #	Rank	Value of Stolen Property	
9	1	4000	
13	2	1500	
12	3	600	
2	4	350	
10	5	150	(6 Scores Above)
4	6	100	
1	7	100	-Median
11	8	75	
7	9	75	(6 Scores Below)
14	10	65	
8	11	25	
15	12	25	
6	13	0	
3	14	0	

Source: hypothetical data

The average of the two middle cases is used if a distribution has an even-number of cases. The rank-ordering of cases is time consuming especially for samples or populations with large numbers of cases; however, it is an appropriate statistic for all variables that are ordinal, interval, or ratio level.

3. Mode

The last measure of central tendency considered here is the mode. The mode is a descriptive statistic used primarily for nominal and ordinal variables. It is the easiest of the measures to determine, yet it is not frequently used in criminal justice analysis. There are two explanations for the mode's lack of use:

a. It is not stable; adding a few additional observations can significantly change the modal value; and
b. a distribution may possess more than one mode, thus making it an ambiguous measure (i.e., a bimodal or multi-modal distribution).

Nevertheless, the mode is almost always found by simply inspecting a distribution for the value(s) which most frequently occur.

In Exhibit 3-6, the example uses the distribution of robberies by place of occurence, a nominal level variable. In this distribution, gas stations is the category which occurs most frequently and therefore it is the modal category.

EXHIBIT 3-6.

THE MODE: DEFINITION AND EXAMPLE

1. Definition

The mode for a set of measurements is the value(s) that occurs with the greatest frequency.

2. Example

Place of Occurrence	Frequency (f)	
Highway	2	
Commercial	4	
Gas or Service Station	5	Mode
Chain Store	2	
Residence	1	
Bank	1	
Miscellaneous	0	

Source: hypothetical data

B. Measures of Variation

The purpose of numerical description is to obtain a set of measures (one or more) that are useful in communicating a simple mental impression of one or more complex data distribution(s). Measures of central tendency only portray part of this impression; equally important is the relative distribution or spread of the measurements.

Measures of variation are companions to central tendency measures; that is, while measures of central tendency describe what is "typical," measures of variation can be used to describe how adequate the typical case is in representing a distribution. Specifically, measures of variation have two primary purposes: 1) to describe how well the central tendency measure represents the central tendency in the data distribution, and 2) to summarize the spread of observations throughout categories in a distribution.

1. Frequency Tables

Frequency tables present the percentage distribution and cumulative distribution of discrete variables and are an effective descriptive method. A frequency table includes the count of cases or frequency in each category and may include the percent or relative frequency and the cumulative percent. Exhibit 3-7 presents an example of a complete frequency table. In the example, 40% of the robbery victims in Chaos City during August and September were between the ages of 58-73. The value below which a percentage of cases falls is called a percentile. In the example, the 53.3 percentile is 57.5 (using the real interval limits), this means that 53.3% of the victims are under 57.5 years old. If the categories were rank-ordered from highest to lowest, the 46.7 percentile would be 57.5 yrs. -- 46.7% of all robbery victims were over 57 years of age. While it is traditional to construct frequency tables with categories ordered from lowest to highest, in certain circumstances reversing the order may better emphasize the point to be made in this example.

EXHIBIT 3-7.

FREQUENCY TABLES: DEFINITION AND EXAMPLE

1. Definition

A frequency table is appropriate for discrete variables only, and is used to organize data into either a frequency distribution or a percentage distribution.

2. Example (Data From Exhibit 1-4)

Victim's Age	Frequency f	Relative Frequency*	Percent**	Cumulative Frequency	Cumulative Percent***
1-15	0	0	0.0%	0	0.0%
16-31	3	.20	20%	3	20%
32-57	5	.333	33.3%	8	53.3%
58-73	6	.40	40.0%	14	93.3%
73	1	.067	6.7%	15	100%

*Relative Frequency = $\frac{\text{Frequency (in a category)}}{\text{N (total number of cases)}}$

Relative Frequency for "16-31" category = $\frac{3}{15}$ = .20 or 20%

**Percent = Relative Frequency X 100

***a. Rank-order categories from lowest to highest.
b. The percentage distribution are summed starting with lowest category and working to highest.
c. The highest category should total to 100%.

Source: hypothetical data

2. Range

In describing the variation in the distribution of a continuous variable, a different measure of association must be used than those just presented. The range is the difference between the largest and smallest values in a distribution. It is a measure of the span or spread of possible values within which observed values for a variable actually occur. Because only the maximum and minimum values are considered, the range provides no indication of the form of the distribution -- whether they are all clustered or evenly spread across the distribution.

Of the 27 cities included in Exhibit 3-4, Newark, N.J. had the highest robbery rate in 1977 -- 943.26 -- and Baton Rouge, La. had the lowest -- 131.12. This range of over 800 robberies per 100,000 population indicates substantial variation. Note that Chaos City is near the middle of this range.

EXHIBIT 3-8.

RANGE: DEFINITION AND EXAMPLES

1. Definition: Range = Maximum - minimum.

2. Examples:

a. (From Exhibit 1-4)

	Max - Min = Range
Offender's Age	R = 41 - 16 = 25 yrs.
Offender's Education	R = 12 - 0 = 12 yrs.
Victim's Age	R = 81 - 22 = 59 yrs.
Dollar/Value Stolen Prop.	R =$4000 - 0 = $4000

b. From Exhibit 3-4

Maximum Robbery Rate = 943.26 (Newark)

- Minimum Robbery Rate = 131.12 (Baton Rouge)

Range = 812.14 robberies per 100,000 population

Source: hypothetical data

The range is most frequently used in summarizing data to be made available to the public, in highlighting data by emphasizing extremes, and for describing the variation in small samples. Like the mode, the range is an unstable statistic; change in either the maximum or minimum results in changes in the range. The range's dependence on extreme values in a distribution also creates problems of interpretation.

3. Standard Deviation

One of the most commonly used measures of variation for continuous variables is the standard deviation. This statistic describes how far individual items in a distribution depart from the mean. In Exhibit 3-9, the formula for calculating the standard deviation is presented (various formulas exist, the one used in the exhibit is for ungrouped data with a small N).

Notice that in Exhibit 3-9 the sum of the deviations from the mean equals zero. This should always be true. Like the mean, the standard deviation is sensitive to extreme values in a distribution. Recall that the mean for the dollar value of stolen property (excluding the $4000 bank robbery) is $233.85. The standard deviation for this distribution with the bank robbery excluded is $482.06.

EXHIBIT 3-9.

STANDARD DEVIATION: DEFINITION AND EXAMPLE

a. Definition

$$S = \sqrt{\frac{\Sigma (X-\bar{X})^2}{N}}$$

Where:

S = Standard Deviation
X = Mean
N = Total number of cases

b. Example:

1. Dollar Value of Stolen Property (From Exhibit I-4)

(X)	X-$\bar{X}$	$(X-\bar{X})^2$
100	-402.86	162296.18
350	-152.86	23366.18
0	-502.86	252868.18
100	-402.86	162296.18
0	-502.86	252868.18
75	-427.86	183064.18
25	-477.86	228350.18
4000	3497.14	12229988.18
150	-352.86	124510.18
75	-427.86	813064.18
600	97.14	9436.18
1500	997.14	994288.18
65	-437.86	191721.38
0	-502.86	252868.18
7040	Σ = 0.0	Σ = 15250985.72

2. $\bar{X} = \frac{\Sigma X}{N} = \frac{7040}{14} = \$502.86$

3. $S = \sqrt{\frac{15250985.72}{14}} = \$1043.72$

Source: hypothetical data

Many calculators, such as the TI-55, and software packages, such as SPSS, calculate the standard deviation using the formula:

$$S = \sqrt{\frac{\Sigma(X - \bar{X})2}{N - 1}}$$

The N-1 is preferred for sample data while the N is used on data for entire populations. Using the N-1 formula, the standard deviation for the value of the stolen property is $1117.24; for the robbery data in Exhibit 3-4, the standard deviation is $211.52 robberies per 100,000.

Several techniques are appropriate for interpreting the standard deviation. The following discussion focuses on how it may be used in examining the shape of a distribution and, by transformation into a standard score, used to assess differences between an individual case and a sample or population.

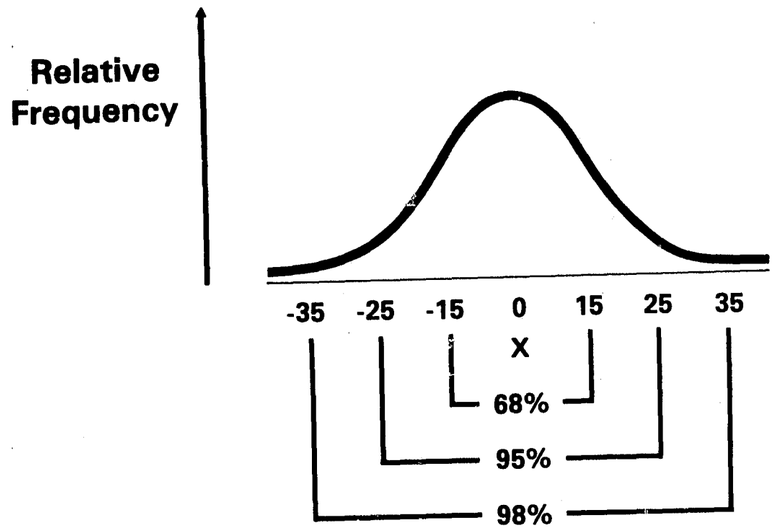
a. The Empirical Rule

A significant application of the standard deviation is to use it in describing the expected percentage of cases that fall within a specified distance from the mean. This use is only appropriate for continuous variables that have a "bell-shaped" distribution as illustrated in Exhibit 3-10. According to the Empirical Rule a "bell-shaped" distribution should have 68% of all observations falling within one standard deviation of the mean, 95% within two and nearly all within three standard deviations. In Exhibit 1-6 the mean and standard deviation of victim's age are, respectively, 50.3 and 18.7. According to the Empirical Rule, if the distribution is bell-shaped, about 68% of the cases will fall within the interval 50.3 years, plus or minus 18.7 years (from 31.6 years to 69 years). In fact 9 victims or 60% of the observations are less than 15 years of age and there are 15 or 100% of the observations less than 25 years of age (50.3 + 37.6 or 12.7 to 87.9).

The bell-shaped distribution (sometimes referred to as a normal or Gaussian curve) together with the Empirical Rule are powerful tools for describing the variation or shape of a distribution for a continuous variable.

EXHIBIT 3-10

PERCENTAGES UNDER A BELL-SHAPED DISTRIBUTION



b. Standard Score

The standard deviation is a useful statistic for describing how far a particular case departs from the mean of a sample or population. Consider the cross-sectional data presented in Exhibit 3-11. These are the same cities used in Exhibit 3-4. Summary statistics for each variable are presented in Exhibit 3-12 (including the robbery rate data from Exhibit 3-4):

EXHIBIT 3-11.

SELECTED CHARACTERISTICS FOR TWENTY-SEVEN CITIES

CITY	City Population 1977 CITY POP	Population Density* 1975 POP DEN	Per Capita Income($) 1974 PCI 74	Law Enforcement Employees 1977 POL 77	Crime Index 1977 CRI 77	Robberies 1977 ROB 77
AKRON	251,750	4645	4614	511	17689	613
ALBUQUERQUE	279,400	3150	4544	705	23955	754
AUSTIN	301,150	3147	4379	678	23536	512
BATON ROUGE	294,390	6146	4187	651	21402	386
BIRMINGHAM	276,270	3345	4023	834	24975	989
CHAOS CITY	330,000	4714	5120	566	33011	1488
CHARLOTTE	281,420	2596	4926	713	22296	614
EL PASO	385,690	2418	3479	830	24621	824
FORT WORTH	358,360	1569	3479	876	36743	1132
LONG BEACH	335,600	6699	5652	940	26669	1996
LOUISVILLE	335,950	5599	4302	938	20312	1367
MIAMI	365,080	10644	4416	1033	34099	2447
MINNEAPOLIS	378,110	6813	5161	909	32298	1652
NEWARK	339,570	14450	3348	1741	30313	3202
NORFOLK	286,690	5450	4233	734	19443	632
OAKLAND	330,650	6192	5034	1031	39713	3037
OKLAHOMA CITY	365,920	576	4731	862	27970	775
OMAHA	371,450	4586	4887	661	22020	809
PORTLAND	356,730	3815	5192	878	36821	1703
ROCHESTER (N.Y.)	267,170	7280	4335	783	26510	1099
SACRAMENTO	260,820	2778	4765	660	26998	1276
ST. PAUL	279,530	5355	4931	699	21403	886
TAMPA	280,340	3318	4362	788	25606	1062
TOLEDO	367,650	4528	4571	835	30965	1819
TULSA	331,730	1871	5173	751	24449	489
TUCSON	296,460	3236	4385	694	29645	550
WICHITA	264,900	2778	4765	660	26998	1276

*people per square mile
Source: UCR, 1977 and City and County Data Book, 1977 and hypothetical data for Chaos City.

EXHIBIT 3-12.

DESCRIPTIVE MEASURES, TWENTY-SEVEN CITY DATA SET

VARIABLE	N	MINIMUM	MAXIMUM	MEAN	STD DEV
City Pop 77	27	251,750.00	385,690.00	317,510.00	41,860.00
Pop Den 75	27	560.00	14,450.00	4,729.60	2,875.40
Per Cap Income PCI 74	27	3,348.00	5,652.00	4,555.30	552.71
Law Enf Employ Pol 77	27	511.00	1,741.00	813.37	226.76
Crime Index CRI 77	27	17,689.00	39,713.00	27,054.00	5,684.30
Robberies ROB 77	27	386.00	3,203.00	1,236.70	744.91
Robberies Per 100,000 pop ROB Rate	27	131.12	943.00	384.25	211.52

Source: UCR, 1977 and City and County Data Book, 1977.

The typical city in this group had about 1236 robberies, a total crime index of 27054, employed 813 people in law enforcement and had an average annual per capita income of $4555.

Focusing attention on Chaos City reveals that it is below the mean on population density, per capita income, and law enforcement personnel, but above the mean on the crime index, on number of robberies, and on the robbery rate. Another method for making such comparisons, based on the standard deviation, involves calculating standard scores. A standard score is the number of standard deviations above or below the mean a case happens to be. Exhibit 3-13 defines and gives an example of calculating a standard score. The standard scores for all 27 cities for the variables per capita income, law enforcement personnel, and number of robberies are presented in Exhibit 3-14. A Z-score is not expressed in the original units, i.e. dollars, personnel, and robberies, but in "standard" units. This facilitates accurate comparison of one city across all variables. For example, while Chaos City is about 1 standard unit above the mean on per capita income, it is 1 standard unit above on police and .3 standard units below on robberies. Akron, like Chaos City is more than 1 unit below on police. Note that Newark is 4 standard units above the mean on police and more than 2 units below on per capita income.

EXHIBIT 3-13.

STANDARD SCORE, DEFINITION AND EXAMPLE

a. Definition:

$$Z = \frac{(X_i - \bar{X})}{S}$$

Where:

Z = Standard Score or Z-Score
X_i = A particular case
S = Standard deviation of a discrete or continuous variable

b. Example: Z for Chaos City number of robberies

$$Z = \frac{(1488 - 1236.7)}{744.91}$$

$$Z = .3374$$

Source: hypothetical data

EXHIBIT 3-14.

STANDARD SCORES, PER CAPITA INCOME,
LAW ENFORCEMENT PERSONNEL, AND NUMBER OF ROBBERIES, TWENTY-SEVEN CITIES.

Standard Scores

CITY	PER CAPITA INCOME (1974)	LAW ENFORCEMENT EMPLOYEES (1977)	NUMBER OF ROBBERIES (1977)
AKRON	.106140	-1.333400	- .83724
ALBUQUERQUE	- .020505	- .477910	- .64795
AUSTIN	- .319030	- .596980	- .97283
BATON ROUGE	- .666410	- .716050	-1.14200
BIRMINGHAM	- .963140	.090976	- .33248
CHAOS CITY	1.021600	-1.090900	.33740
CHARLOTTE	.670640	- .442630	- .83590
EL PASO	-1.947400	.073336	- .55398
FORT WORTH	-1.947400	.276190	- .14051
LONG BEACH	1.984200	.558430	1.01940
LOUISVILLE	- .458350	.549610	.17497
MIAMI	- .252090	.968560	1.62480
MINNEAPOLIS	1.095800	.421720	.55756
NEWARK	-2.184400	4.090800	2.63970
NORFOLK	- .583190	- .350020	- .81173
OAKLAND	.866040	.959740	2.41690
OKLAHOMA CITY	.317830	.214450	- .61976
OMAHA	.600070	- .671950	- .57412
PORTLAND	1.151900	.285010	.62603
ROCHESTER (N.Y.)	- .398640	- .133930	- .18481
SACRAMENTO	.379340	- .676360	.05280
ST. PAUL	.679680	- .504370	- .47075
TAMPA	- .349790	- .111880	- .23448
TOLEDO	.028345	.095386	.78175
TULSA	1.117500	- .275050	-1.00370
TUCSON	- .308180	- .526420	- .92181
WICHITA	.378340	- .676360	.05280

Source: UCR, 1977 and City and County Data Book, 1977 and hypothetical data for Chaos City.

In summary, measures of variation, like the standard deviation and range are powerful descriptive methods for summarizing the variation in a distribution. Analyzing the shape or form of a distribution requires consideration of the Empirical Rule, while comparing an individual case across several variables to a sample or population is facilitated by calculation of standard scores. Central tendency and variation are two related properties of distributions of data. The specific method(s) used depends on the type of variables being considered and the kinds of questions being asked. In general, when reporting on the description of a distribution, both central tendency and variation should be covered.

C. Selecting A Sample Size

In Chapter 2, several factors were discussed that influence the size of a sample for a particular problem. Following are two problems illustrating basic statistical approaches to selecting a sample size; both assume a simple random sampling procedure is used.

The Chief of the Chaos City Police Department wants an estimate of the average amount of money stolen in robberies during 1979. No statistic on all robberies is within a $1000 range. If there were 8,000 robberies (N = 8,000) in 1979 and the tolerated error for our estimate is $50, the following procedure could be used to estimate sample size required.[3]

1. Since the population variance, σ^2, is unknown, we may estimate it by assuming the range is equal to 4 standard deviations:

$$\sigma = \frac{\text{range}}{4} = \frac{\$1000}{4} = \$250$$

2. $\sigma^2 \simeq \$250^2 = \$62{,}500$

3. The formula for estimating, n, the sample size for this type of problem is:

$$n = \frac{N\sigma^2}{(N-1)D+\sigma^2}$$

where $D = \frac{B^2}{4} = \frac{\$50^2}{4} = \frac{\$2500}{4} = \$625$

(B is the error which can be tolerated in the calculations.)

4. By substitution

$$n = \frac{8000(62{,}500)}{(8000-1)625 + 62{,}500}$$

$$n = 99$$

5. Approximately 99 random observations of the dollar value of stolen property are necessary to estimate the population mean (μ), with a bound on error of estimation of $50.

As a second example consider a survey of city residents (N = 250,000) designed to estimate the percentage of residents that perceive crime as the community's number one problem. The tolerated error (B) on this survey is only 0.01, and, since no prior survey has been conducted, no good estimate of the proportion is available.

1. The Chief of Police assumes that, p, the proportion of residents who believe that crime is the city's number one problem is 20% (p = 0.2).

2. $D = \frac{B^2}{4} = \frac{0.01^2}{4} = \frac{0.0001}{4} = 0.000025$

3. Substituting

$$n = \frac{Npq}{(N-1)D + pq}$$

Where p is the estimated proportion of the community who perceive crime to be the number one problem and q is the proportion that does not.

$$n = \frac{250{,}000(0.3)\ (0.7)}{(250{,}000-1)0.000025 + (0.3)(0.7)}$$

$$n = \frac{52500}{6.46}$$

$$n = 8127$$

4. The cost and time required to survey 8127 residents is, for the Police Department, prohibitive. Therefore, the Chief agrees to a tolerated error (B) of 0.05. Consequently, the reestimated sample size is:

$D = \frac{B^2}{4} = \frac{0.05^2}{4} = \frac{0.0025}{4} = 0.000625$

and

$$n = \frac{Npq}{(N-1)D + pq}$$

$$n = \frac{250{,}000(0.3)(0.7)}{(250{,}000-1)0.000625 + (0.3)(0.7)}$$

$$n = \frac{52500}{156.45} \simeq 336$$

5. Three hundred thirty-six residents would be needed in a sample random sample, if the acceptable tolerated error is 5%, a substantial saving in resources compared to a 1% tolerated error sample size of 8127.

III. Graphical Methods

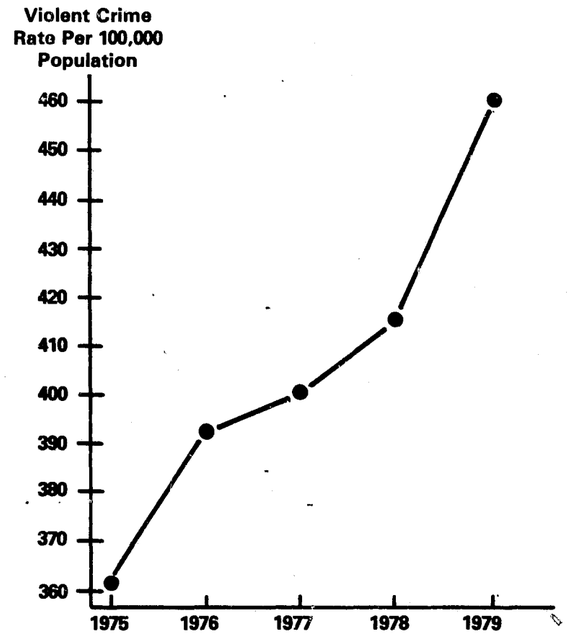
Crime and criminal justice system problems may be described using the statistical methods presented in the previous section as well as by applying graphical techniques to data. In this section various graphical tools, including Pie Charts, Bar Graphs, and Frequency Polygons are presented.

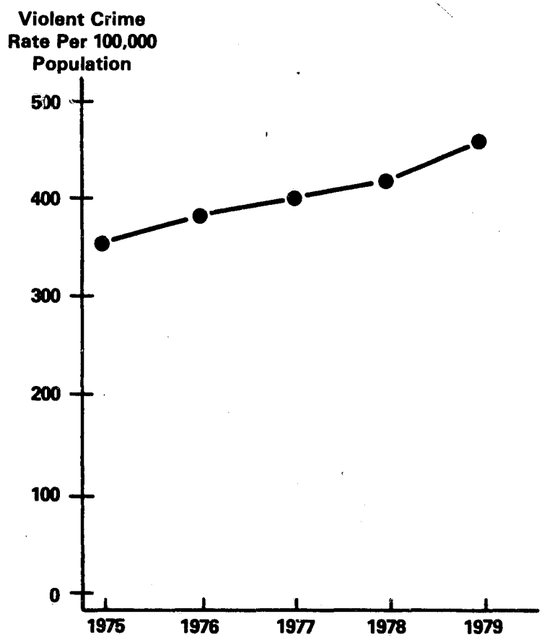
Graphical methods complement statistical treatment of data. They are used to facilitate description of problems by 1) clarifying the informational content of the data; 2) highlighting certain aspects of the information; and 3) making contrasts and comparisons more vivid. Graphics also help to focus questions about the causes of problems and the consequences of planned actions.

Graphs are snapshots of reality, framed by the picture-taker. Varying interpretations of the data will depend, in part, on how the data is portrayed. Exhibit 3-15 illustrates two different graphical presentations of the same data. Clearly, the application of graphical tools involves not just a knowledge of the tools, but also the associated skills necessary for developing a presentation style that minimizes distortions, deceptions, or misrepresentations.

EXHIBIT 3-15

USE OF THE "OH, BOY" CHART TO EXAGGERATE DIFFERENCES





Source: Adapted from Darrell Huff. How to Lie with Statistics. (New York: N.W. Norton, 1954)

A. Pie Charts

Pie Charts are illustrated in Exhibit 3-16. Each circle represents the total of some characteristic, such as the total number of persons arrested and victims of robbery in August and September in Chaos City. These charts depict two demographic characteristics: gender and age. Note the problem in fully interpreting these images: for instance, how comparable are these percentages to the characteristics of all robberies in Chaos City.

Note how in Exhibit 3-16 each "pie" is divided into "slices" with each slice representing a portion of the whole. Thus, for victims, 60% were males and its "slice of the pie" is represented by 216 degrees (1% = 3.6 degrees).

In Exhibit 3-17, reasons stated by the District Attorney of Chaos City for not prosecuting felony cases are listed. Evidence problems -- such as inadmissable evidence, unavailable physical evidence, and insufficient physical evidence -- clearly are the most significant. Notice that both the shifts in reasons over the two time periods and the total magnitude of DA refusals is represented in the two pie charts.

An interesting variation of the pie chart is the coin chart which is frequently used to present expenditure data graphically. Exhibit 3-18 presents fiscal year 1974 expenditures by jurisdiction -- federal, state, and local -- for the three components of the criminal justice system -- police, courts, and corrections -- using the coin chart method.

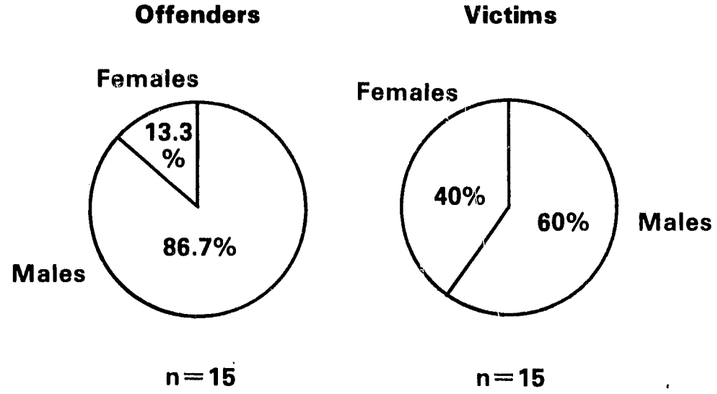
Some studies have indicated that of the many different graphical techniques available, the pie chart is read more accurately and as rapidly as the other types of graphics. In addition, pie charts may be used for all measurement scales. In constructing a pie chart follow these rules:[4]

- Minimize the number of categories (slices). Too many categories make the chart difficult to interpret.
- When possible display the categories (slices) in ascending/descending order.
- Avoid displaying the data or numbers in each category; use instead percentage figures whenever possible since these are easier to interpret.
- Always indicate the size of total sample or population used.

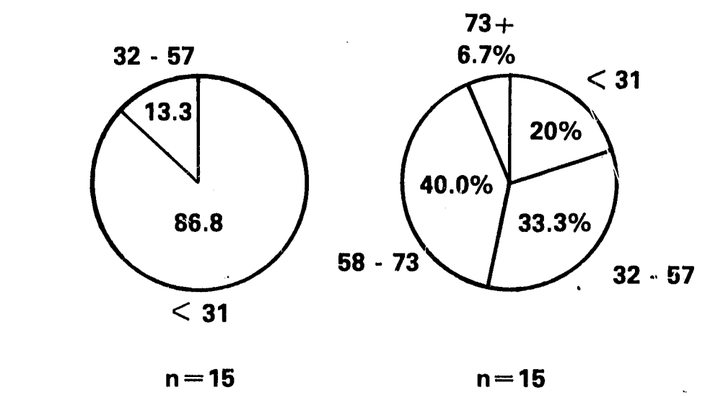
EXHIBIT 3-16

PIE CHART EXAMPLES OF CHARACTERISTICS OF OFFENDERS AND VICTIMS OF ROBBERIES, CHAOS CITY, AUGUST AND SEPTEMBER

GENDER



AGE



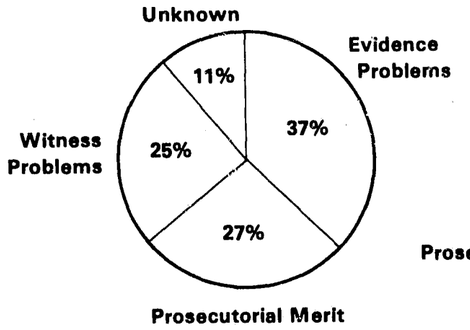
Source: Hypothetical Data

EXHIBIT 3-17

PIE CHART EXAMPLES, REASONS FOR DA CASE REFUSALS, CHAOS CITY, 1973 AND 1977

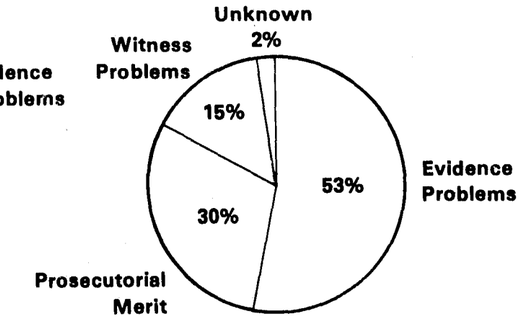
Reason for Refusals	1973	%	1977	%
Evidence Problems	764	37%	2,397	53%
Witness Problems	516	25%	680	15%
Prosecutorial Merit	558	27%	1,356	30%
Unknown	227	11%	91	2%
TOTAL	2,065	100%	4,524	100%

1973



n=2,065

1977



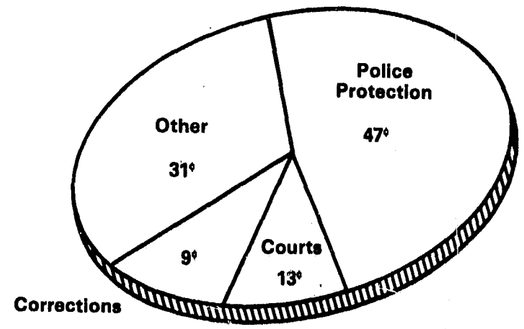
n=4,524

Source: Hypothetical Data

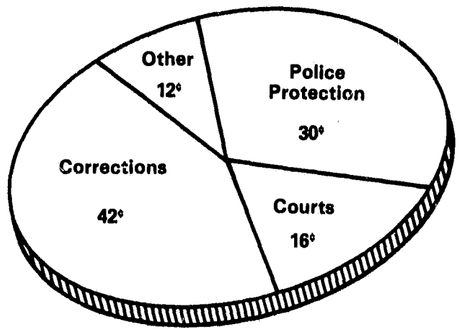
EXHIBIT 3-18

CRIMINAL JUSTICE EXPENDITURES, BY JURISDICTION AND FUNCTION, FY 1974 COIN CHART EXAMPLE

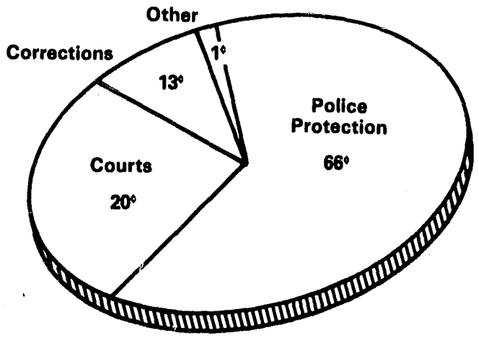
FEDERAL



STATE



LOCAL



Source: Sourcebook, 1976

B. Bar Graphs

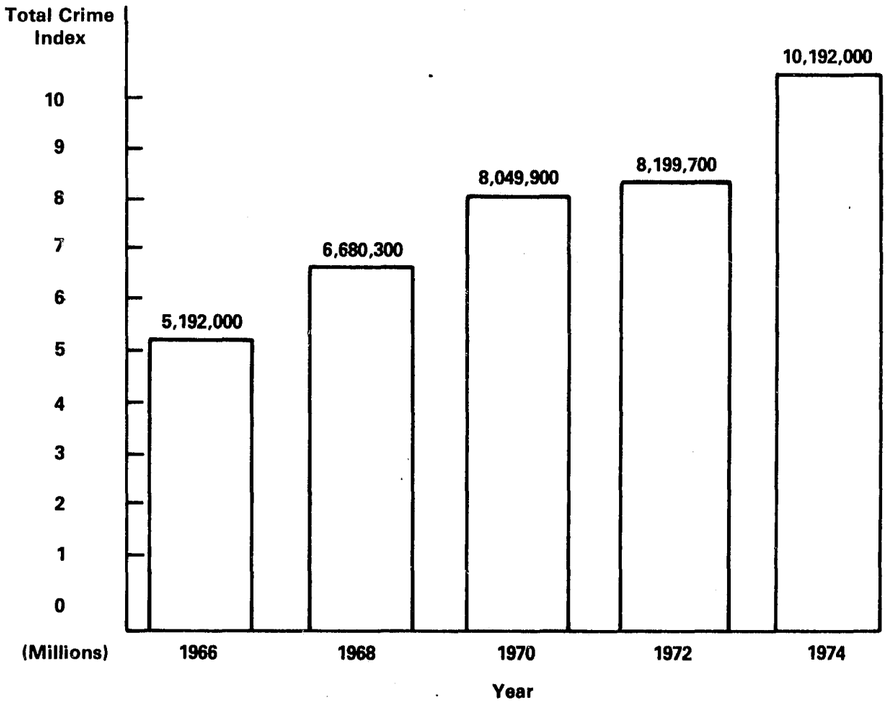
A bar graph, illustrated in Exhibit 3-19, is used to display qualitative data. A vertical or horizontal bar represents the number of observations or values in a particular category. The bar graph emphasizes the categories of a variable; as in Exhibit 3-19, the emphasis is on year. In this application each bar represents the total crime index nationwide. Note the steady increase in the index over this eight-year interval illustrated by the graph.

A second application of the bar graph is presented in Exhibit 3-20. In this bar graph, each bar is the same length, representing 100% of the cases in each crime category. The unshaded portion of the bar indicates the percentage of a specific crime that had been cleared, the shared portion indicating those crimes for which no arrest had been made. It is obvious from this graph that violent crimes are much more likely to be cleared than are property crimes. Following are some rules to follow in constructing bar graphs:[5]

- Place categories along the horizontal axis; frequencies on the vertical axis.
- For clarity of presentation, leave a space between each category bar.
- Keep bars uniform in width and avoid an excessive number of categories.

EXHIBIT 3-19

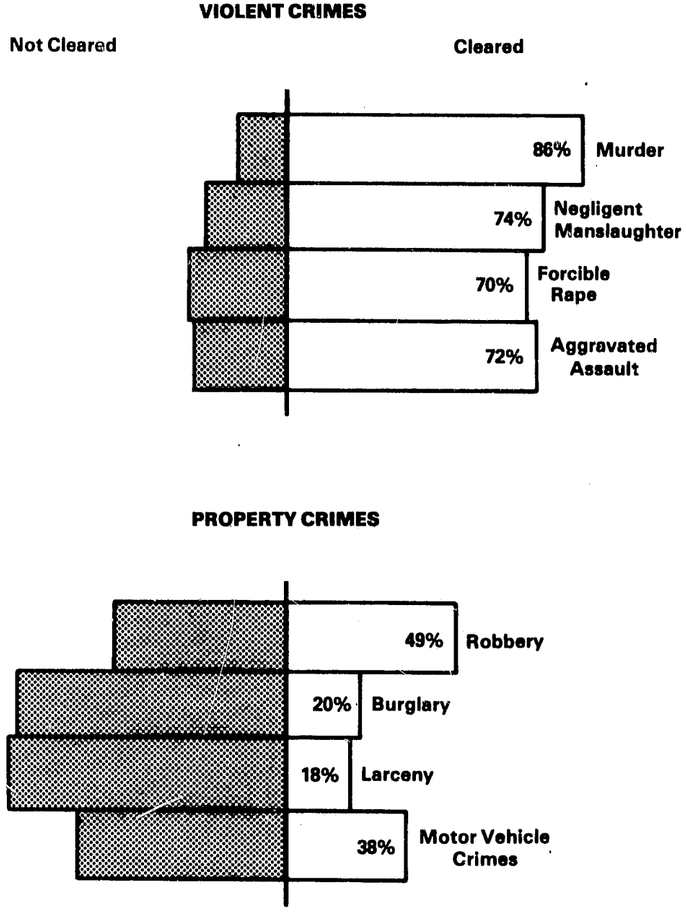
BAR GRAPH EXAMPLE
TOTAL CRIME INDEX, U.S., 1966-1974



Source: Uniform Crime Report for the United States, 1974.

EXHIBIT 3-20

BAR GRAPH EXAMPLE
CRIMES CLEARED BY ARREST, UNITED STATES, 1974



ce: Sourcebook, 1976, p. 555 and adapted from Loether and McTavish, Descriptive and Inferential Statistics, Boston, Allyn & Bacon, 1977.

C. Histograms

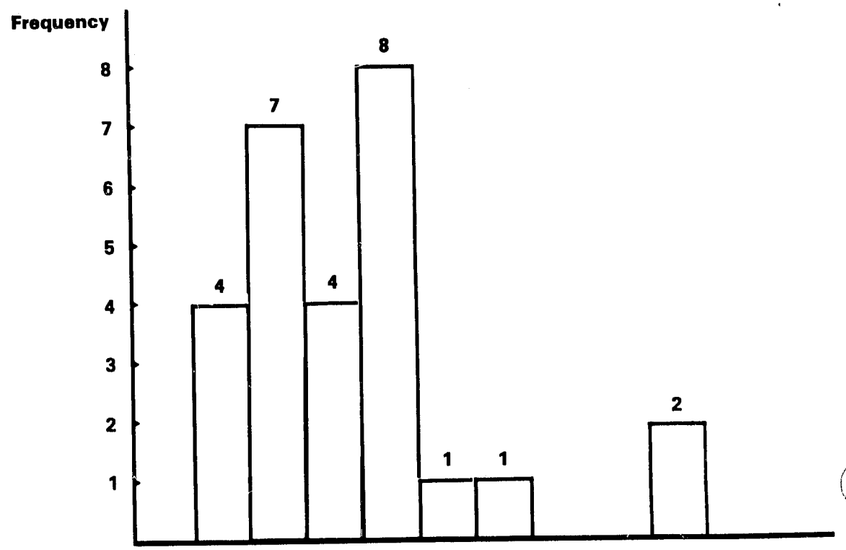
Perhaps the most useful graphic techniques are employed to interpret frequency distributions. Two tools are used to visualize frequency distributions: histograms and polygons. A frequency histogram is the quantitative variable counterpart to the bar graph just described. Exhibit 3-21 illustrates the use of the histogram on the robbery rate data for the twenty-seven cities (Exhibit 3-4). A second technique used to visualize frequency distributions is the frequency polygon. These are constructed by simply connecting with straight lines the mid-points of the histogram bars. A frequency polygon using the same data as in Exhibit 3-21 is presented in Exhibit 3-22.

EXHIBIT 3-21

FREQUENCY HISTOGRAM EXAMPLE, ROBBERY RATES, TWENTY-SEVEN CITY DATA

Robbery Rates

Rate	F
0-100	0
101-200	4
201-300	7
301-400	4
401-500	8
501-600	1
601-700	1
701-800	0
801-900	0
901-1,000	2

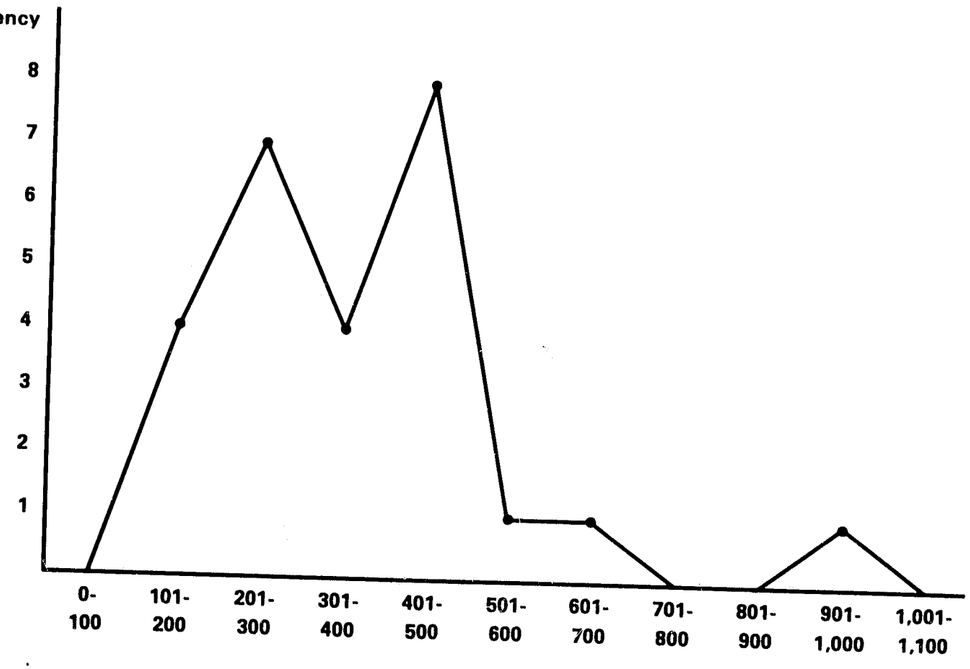


Source: See Exhibit 3-5

EXHIBIT 3-22

FREQUENCY POLYGON EXAMPLE, ROBBERY RATES, TWENTY-SEVEN CITY DATA

Robbery Rates		
Rate	F	Med Point
0-100	0	50
101-200	4	150
201-300	7	250
301-400	4	350
401-500	8	450
501-600	1	550
601-700	1	650
701-800	0	750
801-900	0	850
901-1,000	1	950
1,001-1,100	0	1,050



Source: See Exhibit 3-5

Both techniques are particularly effective in reducing a large number of data points into easily understood and communicated information. The examples in Exhibits 3-21 and 3-22 utilize only 27 data points (one data point for each city) yet still are useful in clarifying the central tendency and dispersion of the robbery rates for these cities.

These graphical methods may be used to provide a clear comparison between two or more distributions. The emphasis in interpreting a frequency polygon or histogram is on the shape of the distribution. Notice that grouping the data is usually required in developing these graphics.

The characteristics of such frequency distributions are of particular importance in interpreting data. Explanation of the factors that influence the shape of the distributions (where they are high or low) is a major purpose of statistical inference. A number of statistical measures have been developed to describe the shape of frequency distributions. Readers interested in such measures should consult the footnote references at the end of this chapter for additional information on this subject.

IV. Time Charts and Percentage Change

Time is an important dimension in analyzing most problems. As was indicated in chapter one, the temporal aspects of a concern should be carefully considered in developing a problem specification. Exhibit 3-23 presents time series data from Chaos City for eight offense categories covering the period 1971-1977.

EXHIBIT 3-23.

CHAOS CITY, REPORTED CRIME DATA, 1971-1977

CRIME CATEGORY	1971	1972	1973	1974	1975	1976	1977
Residential Burglary	4100	4000	4900	6000	5800	6800	7000
Commercial Burglary	540	600	650	700	1000	1500	1800
Commercial Robbery	250	300	360	500	550	600	700
Street Robbery	300	350	450	600	850	1000	1200
Assault (Incl. Rape)	2600 (101)	2800 (98)	3100 (97)	3500 (110)	3500 (92)	3400 (120)	3600 (150)
Auto Theft	3800	3700	4000	4100	3900	3800	4000
Total	11,590	11,750	13,460	15,100	15,600	17,100	18,300

Source: Chaos City Police Department, 1978, hypothetical data.

One method for treating such data in Exhibit 3-23 is to calculate percent change (Δ). A formula for percent change is:

$$\frac{\text{Value in Later Period - Value in Earlier Period}}{\text{Value in Earlier Period}} \times 100 = \%\Delta$$

For example, the percent change in residential burglaries between 1971 and 1977 was:

$$\%\Delta = \frac{7000 - 4100}{4100} \times 100 = 70.7\%$$

Exhibit 3-24 lists the percent change for each offense category. During this period street robberies increased by 300% while auto thefts increased by only 5.3%.

EXHIBIT 3-24.

PERCENT CHANGE IN REPORTED CRIME, CHAOS CITY, 1971-1977

Reported Crime	Percent Change 1971-1977	Average Annual Percent Change 1971-1977
Residential Burglary	70.7%	8.89%
Commercial Burglary	233.30%	23.30%
Commercial Robbery	180.00%	19.10%
Street Robbery	300.00%	26.30%
Assaults	38.50%	5.70%
Rapes	48.50%	8.10%
Auto Theft	5.30%	1.00%
TOTAL	57.90%	8.00%

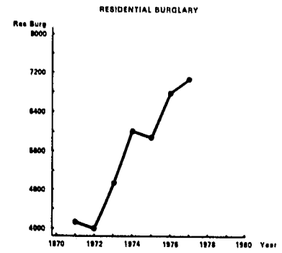
Source: hypothetical data

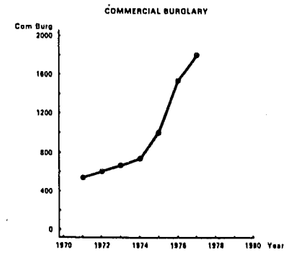
Time series data also may be presented graphically to facilitate the visual examination of the data. Exhibit 3-25 contains time charts for each of the variables of Exhibit 3-21. Displays such as these are particularly useful for identifying unexpected fluctuations in a trend as evidenced for auto thefts and assaults.

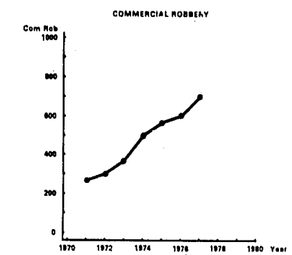
Such time charts focus attention on the pattern of increase or decrease in a variable over a period of hours, days, months or, as in this data set, years. In constructing a time chart, developing a suitable scale for the variable being examined is an important step. Notice the different scales used in the time charts of Exhibit 3-25. Direct comparisons of these charts, particularly in terms of the magnitude of certain offense categories could be misleading. To facilitate comparisons between offense categories, a single scale may be developed and two or more variables plotted on a single time chart. Exhibit 3-26 illustrates this technique for residential and commercial burglary, commercial and street robbery, and auto thefts. The single scale used is between 0 and 10,000 offenses; notice how readily this chart permits comparison between offense categories.

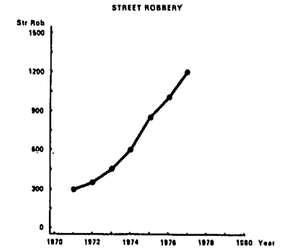
EXHIBIT 3-25

TIME CHARTS, REPORTED CRIME, CHAOS CITY, 1971-1977

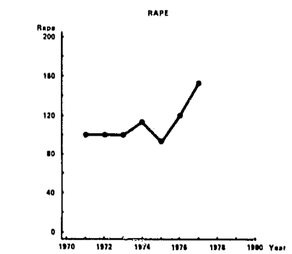


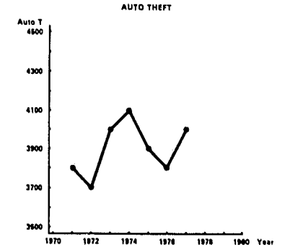










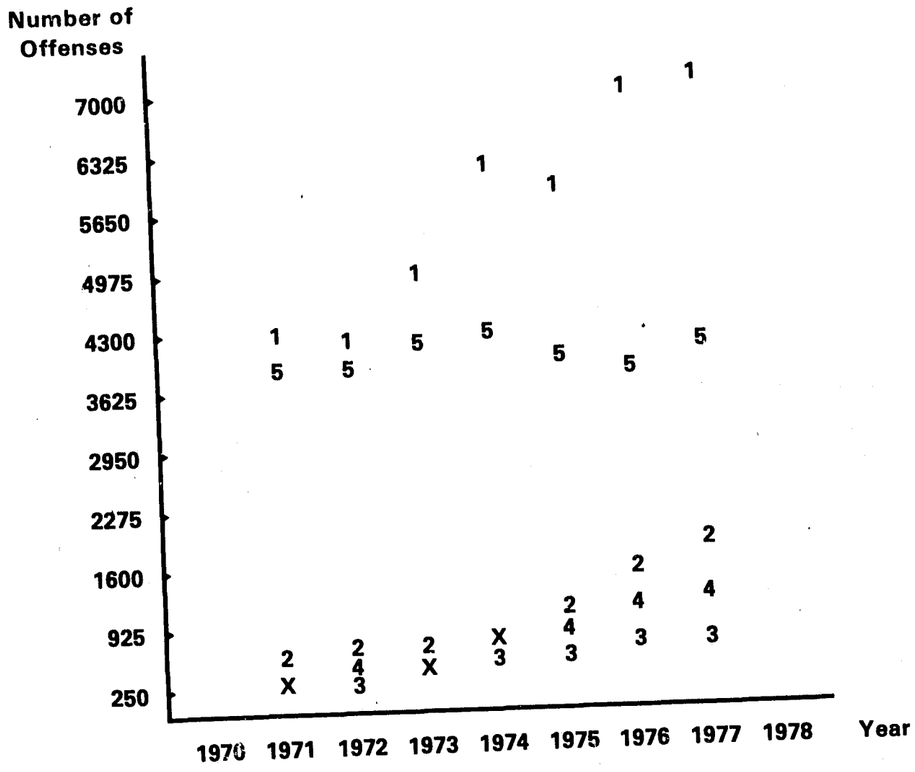




Source: Hypothetical Data

EXHIBIT 3-26

TIME CHART, COMPARISON OF FIVE OFFENSES, CHAOS CITY, 1971 - 1977



(1) Res Burg (2) Com Burg (3) Com Rob (4) Str Rob (5) Auto T

Source: Hypothetical Data

Time charts and percent change provide a method for adding an important historical perspective to an analysis. Cross-sectional data sets (such as Exhibit 1-4, the robbery data set and Exhibit 3-10, and the twenty-seven city data set) provide a snapshot impression of a problem (the two months in the robbery data set are not here considered as a time series). Such snapshots are useful, but since most problems are dynamic and not static, time series analysis is a most powerful complement to the descriptive methods previously covered in this chapter.

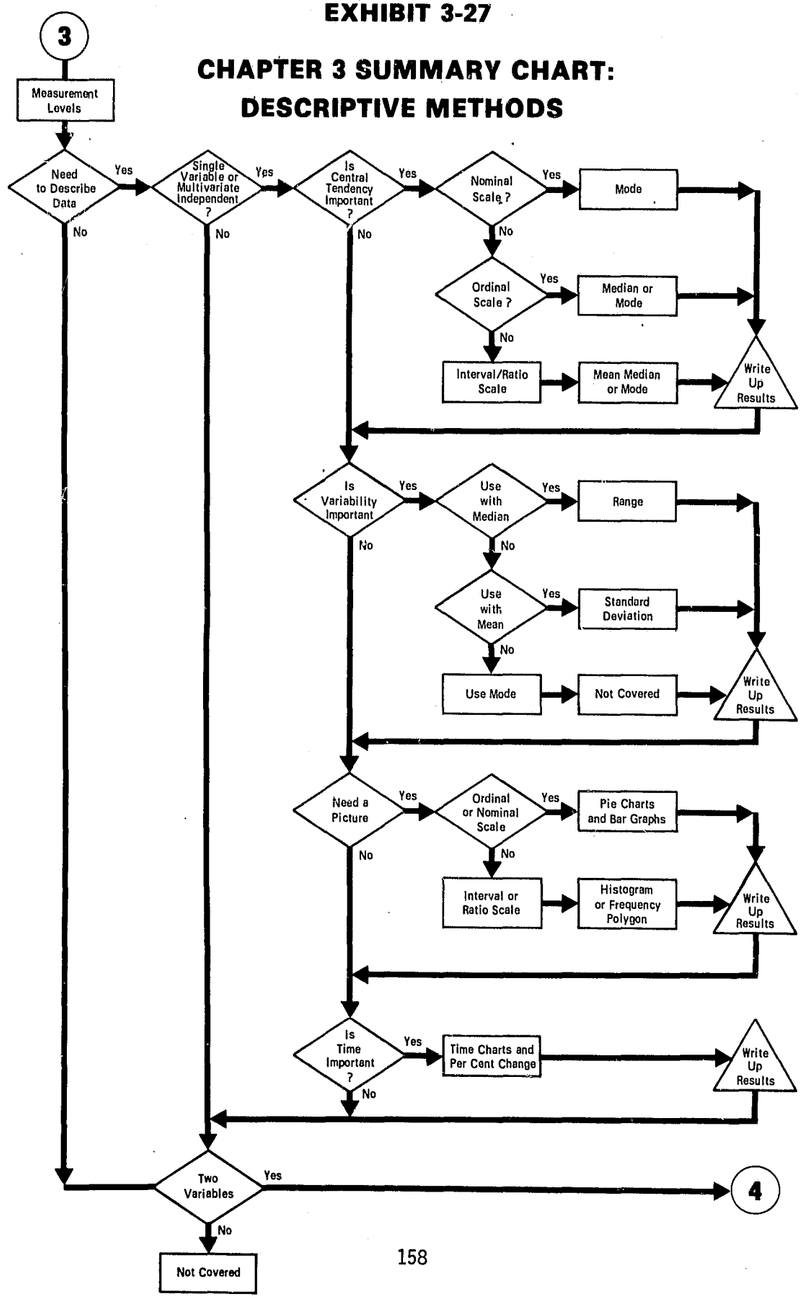
Interpretation of trend data presents particularly difficult issues. Consider the apparent random fluctuation in the number of reported auto thefts over a seven year period. If an analyst only considered the period 1976 to 1977, one would conclude that with a 5% increase, auto thefts should be a major concern in Chaos City. However, placed in perspective of the seven year time series, it would appear that the increase in 1976-1977 is not part of a long term trend, and that the variation is quite small (range is only 400 offenses) considering the amount of auto theft in 1971. Consequently auto theft would not be an offense to be particularly alarmed about. Contrast this trend to the time series for commercial burglary which appears to have significantly increased during the period 1974-1977 (a 157% change). These examples should reinforce the importance of developing a time series data set long enough for identifying significant trends, thus avoiding misinterpretation of short term fluctuations.

V. Conclusion

Descriptive methods are used to summarize and display data. The choice of method is both a measurement scale issue and an issue of obtaining maximum emphasis relevant to the hypothesis under consideration. Exhibit 3-27 illustrates the logic of such selection. In the next chapter various techniques for comparing two or more variables are presented. Descriptive methods should, however, be first applied to any data set before moving on to higher-order techniques.

EXHIBIT 3-27

CHAPTER 3 SUMMARY CHART: DESCRIPTIVE METHODS



[1]Audrey Haber and Richard P. Runyon, General Statistics, 3rd ed. (Reading: Addison-Wesley), p. 6.

[2]Herman J. Loether and Donald G. McTavish, Descriptive and Inferential Statistics (Boston: Allyn and Bacon, 1976), pp. 54-64.

[3]Problems and approach adapted from Richard H. Scheaffer, William Mendenhall, and Lyman Ott, Elementary Survey Sampling (North Scituate: Duxbury Press, 1979) pp. 42-50.

[4]William Mendenhall, Lyman Ott and Richard F. Larson, Statistics: A Tool for the Social Sciences, 2nd ed. (North Scituate: Duxbury Press, 1978), pp. 42-92.

[5]Ibid.

CHAPTER 4

COMPARATIVE METHODS

Introduction

A number of statistical tools are available to describe the relationships between two or more variables. In this chapter five such methods are presented: the use of rates and index numbers, a crime seriousness weighting system, cross-classification tables, scattergrams, and statistical maps.

Comparative analysis is a powerful approach for three reasons. First, comparison of "similar" jurisdictions can give the analyst a clearer idea of the significance of particular data and trends and a better perspective in interpreting shifts in these measures. Second, attention should be given to the ways in which roughly similar jurisdictions differ from each other in terms of their demographic characteristics and their respective systems of justice. Relating these differences to differences in the levels and intensity of crime may result in clearer insights into the sources of crime and possible prevention strategies; insights which should be at the heart of program design. Third, comparisons of jurisdictions, census tracts or other units of analysis, may give criminal justice decision-makers moderately objective standards for allocating limited resources. While the severity of a problem may be an "absolute measure" in the eyes of a local resident, decision-makers with limited resources must compare different problems and assess different levels of severity in determining the allocation of resources.

I. Rates and Index Numbers

The concept of rates is familiar to most criminal justice practitioners and has been discussed briefly in this text: crime rate, arrest rate, clearance rate, conviction rate, recidivism rate, and so forth. In fact most of these notions are so familiar that analysts often fail to question the way that a particular rate is constructed, or to examine carefully what a rate or index really measures and how they should be interpreted.

For example, crime rate is commonly distinguished from crime incidence in that the former represents a standardized version of the latter. That is, crime counts within a geographic unit are divided by the population of the unit (thus arriving at a rate per capita), and the result is multiplied by 100,000 or some other scaling factor to make the interpretation of the result somewhat easier. In this way, geographic units of different population size are made more comparable through a standardizing process.

Deriving crime rates as described above represents one way of achieving comparability. When this method is used for specific crimes, however, the meaning of rate varies. If a rate is to be interpreted as a "risk" of victimization, then greater care must be taken in choosing the denominator which is used to calculate the rate. For example, in calculating the rate of forcible rape as a risk of being the victim of

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such a crime, the number of rapes reported should be divided by the number of females (in the age group where the event would be legally defined as rape) residing in the geographic unit of interest, rather than by the total population. Similarly, the risk of auto theft should be estimated by dividing the number of autos stolen by the number of autos that could be stolen (e.g., the number of registered autos). Thus while there is nothing inherently "wrong" in dividing the incidence of different types of crime by population (or area) to arrive at a rate, analysts should always be cognizant of what the result really means and how it is to be interpreted.

Exhibit 4-1 presents selected characteristics of Chaos City for each year between 1971 and 1977. These may be combined with the incidence data presented in Exhibit 3-23 to produce appropriate rates for each of these offense categories. For example, dividing the incidence of residential burglary in 1971 by the number of dwelling units (the population-at-risk) in 1971 and multiplying by 10,000 produces a residential burglary rate expressed as the number of offenses per 10,000 dwelling units, i.e., (4100/90000)10000 = 455.6 residential burglaries per 10,000 dwelling units.

In Exhibit 4-2 the percent change between 1971 and 1977 in incidence and rate is compared for the seven crime categories. Not only is the percent change in rate substantially less than the percent change in incidence, controlling for the populations-at-risk reveals that assaults and auto thefts declined during this period. Exhibit 4-3 is a time chart of the incidence data, while Exhibit 4-4 is a chart of the rate data. The sharp increase in incidence of residential burglary is not evident in the rate chart, while the rate chart clearly indicates the decline in auto thefts. Different patterns emerge by examining the rates and comparing them to the incidence data, suggesting different relationships and problem areas.

EXHIBIT 4-1.

CENSUS DATA FOR CHAOS CITY, 1971-1977

CATEGORY	1971	1972	1973	1974	1975	1976	1977
Population	250,000	270,000	300,000	310,000	330,000	340,000	350,000
Housing Units	90,000	100,000	115,000	120,000	135,000	140,000	150,000
Commercial Establishments	5,300	5,800	6,300	7,300	8,000	8,600	9,000

Source: See Exhibits 4-1 and 3-23.

EXHIBIT 4-2

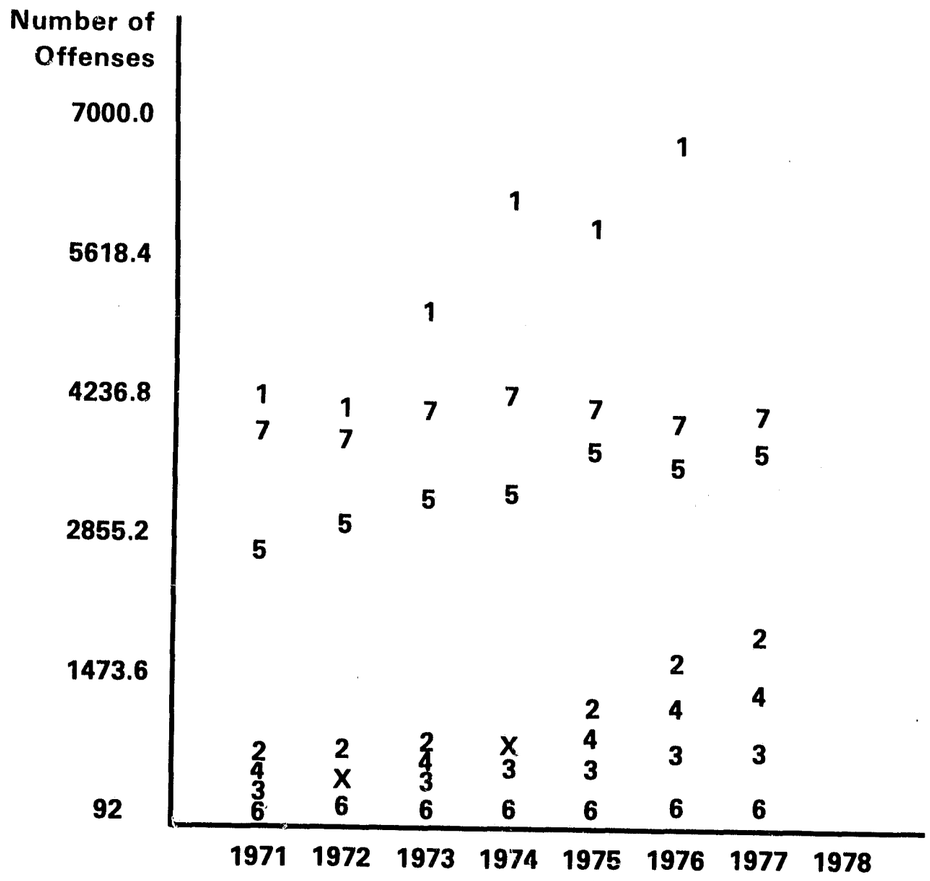
PERCENT CHANGE IN INCIDENCE AND RATES,
SEVEN CRIME CATEGORIES, CHAOS CITY, 1971-1977

	Percent Change, 1971-1977	
	in Incidence	in Rate
Residential Burglary	70.7%	2.4%
Commercial Burglary	233.3%	96.3%
Commercial Robbery	180.0%	64.9%
Street Robbery	300.0%	185.7%
Assault	38.5%	-1.1%
Rape	48.5%	6.1%
Auto Theft	5.3%	-24.8%

Source: See Exhibits 4-1 and 3-23. Percent change was calculated using 1977 and 1971 data only. (hypothetical data)

EXHIBIT 4-3

INCIDENCE OF CRIME CHART, SEVEN CRIME CATEGORIES, CHAOS CITY 1971 - 1977



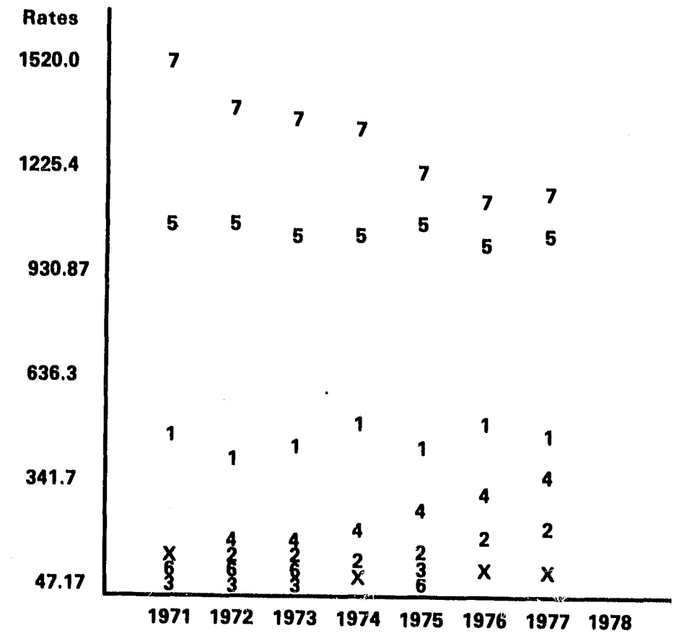
(1) Res Burg (2) Com Burg (3) Com Rob (4) Str Rob

(5) Assault (6) Rape (7) Auto T

Source: Hypothetical Data

EXHIBIT 4-4

CRIME RATES CHART, SEVEN CRIME CATEGORIES, CHAOS CITY, 1971 -1977



(1) Res BR = Residential Burglaries Per 10,000 Dwelling Units.
(2) Com BR = Commercial Burglaries Per 1,000 Commercial Establishments.
(3) Com RR = Commercial Robberies Per 1,000 Commercial Establishments.
(4) St RR = Street Robberies Per 100,000 Population.
(5) As Rate = Assaults Per 100,000 Population.
(6) Rape R = Rapes Per 100,000 Females.

$$= \frac{\text{Rapes}}{\text{City Population/2}} \times 100{,}000$$

(7) Auto R = Auto Thefts Per 100,000 Population.

$$= \frac{\text{Auto Thefts}}{\text{City Population/2}} \times 100{,}000$$

Source: hypothetical data

It is particularly useful to standardize size in the comparative analysis of crime trends because changes in population size are generally thought to be part of broader social trends and not susceptible to local control. Crime rate allows the analyst to characterize crime in ways that may be more suggestive of local remedial action.

Frequently, an analyst wants an annual crime rate per 100,000 population but has crime incidence data for only part of the year. An annualized figure can be estimated using this formula:

$$\frac{\text{\# of incidents reported to date}}{\text{population of jurisdiction}} \times 100{,}000 \times \frac{12}{\text{\# of months for which data are reported}}$$

Such a formula does not, of course, account for possible seasonal variations or for trends in crime which might alter or change the crime level within a given year. Multiplying the part-year crime rate by the reciprocal of the proportion of months studied will provide an annualized figure which can more readily be used in comparisons across jurisdictions.

Following are two qualifications to be aware of in using crime rates to analyze time trends:

a. Certain data, e.g., population size, are normally collected only every ten years by the Bureau of the Census. Estimation methods are used to determine population size between decennials.
b. Population size is not the at-risk factor for all crime categories. There are more meaningful rates for certain crimes. In the previous examples, the population-at-risks selected were, commercial units, dwelling units, and females (population/2). Since the number of registered vehicles was not available, population size was used as the at-risk population in calculating an auto theft rate.
c. Monthly adjustments.

The following section expands the discussion of rates to include four different types of index numbers applicable to criminal justice analysis. These four are: (1) density index; (2) concentration index; (3) distribution index; and (4) index of unit share. Exhibit 4-5 presents selected characteristics for the five neighborhoods of Chaos City as of 1977. This data will be used to illustrate these index numbers.

EXHIBIT 4-5.

NEIGHBORHOOD CHARACTERISTICS, CHAOS CITY, 1977

CHARACTERISTICS	CITY TOTAL	NEIGHBORHOOD				
		CENTRAL	WESTSIDE	UNIVERSITY	PARK	WASHINGTON
Population	350,000	65,000	90,000	50,000	80,000	65,000
Geog. Size	70 sq. mi.	5	22	10	18	15
Housing Units	150,000	25,000	40,000	25,000	36,000	24,000
Commercial Establishments	9,000	3,000	2,000	1,000	2,500	500
Median Income Households	11,400	9,000	12,900	14,200	6,800	21,500
% Minority	30%	54%	1%	2%	86%	1%
% Under 18	22%	10%	19%	21%	24%	18%
Residential Burglary	7,000	800	2,400	700	2,100	1,000
Commercial Burglary	1,800	500	500	200	400	200
Commercial Robbery	700	200	100	50	300	50
Street Robbery	1,200	500	200	100	300	100
Assault (Rape)	3,600 (150)	600 (20)	900 (18)	400 (75)	900 (18)	800 (19)
Auto Theft	4,000	2,000	400	400	1000	200
Juvenile Offenders*	1,060	300	250	200	200	110

*For these offense categories, neighborhood denotes place of arrest.
Source: hypothetical data

A. Four Types of Index Numbers

1. Density Index

A density index reflects population counts per unit area. For example, the visualizing of cities versus rural areas represents an intuitive perception of density. Density is particularly important for aggregate statistics because it standardizes for size of area. Thus, political or administrative areas (e.g., states, counties, cities, police districts, and census tracts), which rarely exhibit uniformity of size, can be converted to comparable units by means of a density index.

The density for a particular offense is calculated by dividing the number of arrests for that offense by the size of the jurisdiction. (See Exhibit 4-5 for data.) For example, the density of residential burglaries (RB) in Central and Westside, respectively, in 1977, is:

$$\text{RB Density (Central)} = \frac{\text{800 Residential Burglaries}}{\text{5 Square Miles}} = \frac{\text{160 Residential Burglaries}}{\text{Per Square Mi.}}$$

$$\text{RB Density (Westside)} = \frac{\text{2400 Residential Burglaries}}{\text{22 Sq. Miles}} = \frac{\text{109 Residential Burglaries}}{\text{Per Square Mi.}}$$

Exhibit 4-6 compares the incidence, rate, and density of residential burglary for each neighborhood in Chaos City. While Westside is ranked highest in incidence and rate, it is third highest in density. The Central area, fourth highest in incidence and rate, is first in residential burglary density.

EXHIBIT 4-6.

DENSITY, INCIDENCE AND RATE COMPARED FOR RESIDENTIAL BURGLARY, BY NEIGHBORHOOD, CHAOS CITY, 1977

Neighborhoods	Residential Burglary Incidence	Residential Burglary Rate**	Residential Burglary Density***
Central	800.00(4)*	320.00(4)	160.000(1)
Westside	2400.00(1)	600.00(1)	109.090(3)
University	700.00(5)	280.00(5)	70.000(4)
Park	2100.00(2)	583.33(2)	116.670(2)
Washington	1000.00(3)	416.67(3)	66.667(5)

* Rank
** Residential Burglaries Per 10,000 dwelling units
*** Residential Burglaries Per sq. mile

Source: hypothetical data

Density indices are particularly useful since they control for the size of a jurisdiction when conducting a comparative analysis. The analysis of the problems related to criminal justice require such spatial "standardization." As an extreme example, in a sample of juvenile delinquent males, a different action would certainly be taken if the number of juveniles involved, say 200, reside in an area of one square mile, than if they resided in a hundred square miles. It also is possible that the nature of police operations would depend on the density of target groups (e.g., juveniles or male juveniles).

2. Concentration Index

Concentration indices are most appropriately described as the ratio of two measures related to the same phenomenon, where a particular attribute of the phenomenon is captured in the numerator or denominator, but not in both. It is perhaps, the easiest type of index to construct because all the elements usually come from the same data source. For example, one might need to know about the residence of male juveniles in developing a special diversion program for male delinquents in a metropolitan area. Using Probation Department files, the concentration index for each census tract can be computed by dividing the number of male juveniles against whom delinquency petitions have been filed and whose residence is within that tract, by the total number of juveniles residing in that tract against whom such action has been taken.

As another example of a concentration index consider the question: in the central neighborhood what is the percent of all offenses that are committed by juveniles? In order to answer this question data on the total number of offenses in 1977 and the number of juvenile offenders is required. These are available in Exhibit 4-7. By using the following formula, a concentration index, reflecting the concentration of juvenile offenders in each neighborhood, may be calculated:

$$\text{Concentration Index (Central)} = \frac{\text{Number Juvenile Offenders in Central}}{\text{Number of Offenders in Central}} \times 100$$

$$\text{CI (Central)} = \frac{300}{4600} \times 100$$

$$\text{CI (Central)} = 6.5\%$$

In Exhibit 4-7 the first column presents this concentration of juvenile offenders for each neighborhood. University has the highest concentration of juvenile offenders with 10.8% of all offenders in 1977 and Washington had the lowest concentration.

EXHIBIT 4-7.

CONCENTRATION INDEX, DISTRIBUTION INDEX, AND INDEX OF UNIT SHARE, JUVENILE OFFENDERS BY NEIGHBORHOOD, CHAOS CITY, 1977

Neighborhoods	Concentration Index*	Distribution Index**	Index of Unit Share***
Central	6.5%	4.6%	28.3%
Westside	5.4%	1.5%	23.6%
University	10.8%	1.9%	18.9%
Park	4.0%	1.0%	18.9%
Washington	4.7%	.9%	10.4%

* Number of juvenile offenders/number of offenders.
** Number of juvenile offenders/number of juveniles.
*** Number of juvenile offenders in each neighborhood/ number of juvenile offenders in Chaos City.

Source: hypothetical data

3. Distribution Index

A "distribution index" is useful for assessing the degree of a problem within the context of a larger population that could be involved with the problem. The numerator would be some aspect of interest to criminal justice as compared to a "population-at-risk." The risk population can be persons (e.g., juveniles), places (e.g., liquor stores), or things (e.g., autos). This kind of measure is often useful for resource allocation and/or long-range planning. Consider another example concerning male juveniles. A distribution index would not be based on a comparison of male delinquents to all delinquents. Rather, the denominator of the index would be the total numer of male juveniles, and the numerator would be the number of delinquent male juveniles. Note that two data sources may have to be consulted to construct this index; one from which male juvenile delinquency data can be obtained, and one from which the male juvenile population can be estimated.

An example of a distribution index is presented in Exhibit 4-7. This index was calculated using the following formula:

$$\text{Distribution Index (Central)} = \frac{\text{Number Juvenile Offenders}}{\text{Number of Juveniles}} \times 100$$

$$\text{DI (Central)} = \frac{300}{(65{,}000 - .10)} \times 100$$

$$\text{DI (Central)} = 4.6\%$$

In the Washington neighborhood less than 1% of all juveniles were arrested, while in Central over 4.6% of the juvenile population was arrested.

4. Index of Unit Share

This index refers to the proportion of a phenomenon which occurs in a large area. It is frequently used by analysts to contrast the share of crime in an area to that area's share of the population. For example, in the previous discussion, the number of juvenile offenders was used as the greatest share of juvenile delinquency, within Chaos City. This can be calculated by dividing the count of juveniles who were arrested in each neighborhood by the total number of juvenile offenders in the city.

An index of unit share is calculated as follows:

$$\text{Index of Unit Share (Central)} = \frac{\text{\# juvenile offenders in Central}}{\text{\# juvenile offenders in Chaos City}} \times 100$$

$$\text{IUS (Central)} = \frac{300}{1060} \times 100$$

$$\text{IUS (Central)} = 28.3\%$$

The third column of Exhibit 4-7 is an Index of Unit Share of delinquency for each neighborhood. Note that these percentages should add to 100% (but may not due to rounding error). The greatest proportion of juvenile offenders is in Central followed by Westside. Only 10% of all juvenile offenders lived in Washington during 1977.

B. Comparative Analysis Using Index Numbers

Comparative analysis is typically used to assess many variables for many different jurisdictions. It can be done for jurisdictions within a state or, as in the previous examples, neighborhoods within a local jurisdiction. It can be extended by comparisons with figures for regional groupings of states or with nationally aggregated data of similar-sized jurisdictions, such as cities 250,000-400,000 in population or suburban counties.

Comparative analysis of crime indices often is extended in three directions. First, victimization data may be introduced. These data allow the analyst to factor in a rough city-to-city adjustment for levels of crime reporting. Second, comparative measures can be combined with time series data, a very powerful combination which remedies several of the weaknesses of each individual technique. Third, maps displaying the values of each different indices with various degrees and kinds of shading provide an excellent visual comparative framework and clearly demonstrate the differences in the meanings of the index numbers. This mode of presentation of index numbers is excellent for managers and decision-makers whose time constraints preclude their examining extensive statistical tables.

The strengths of comparative analysis of index numbers are: 1) its emphasis on describing levels and changes of a phenomenon and, 2) the use of indices to establish patterns or trends. The weaknesses of the technique, at least in its basic forms, include: 1) a failure to account for differences in measurement among jurisdictions which might influence the reliability of comparisons, 2) a lack of historical perspective which may encourage misleading interpretations of trends, relative rankings, and other comparisons, and 3) the development of a conceptually ambiguous analysis based on multiple indices using complex measures.

II. Seriousness Weighting

Weighting offenses according to their relative seriousness is basically an effort to identify those offenses that inflict a greater harm on the community. Many concerns about crime and the criminal justice system are linked to serious offenses; these are what decision-makers would like to do something about. Therefore, these crimes must be identified. A seriousness scale is an attempt at such identification.

A. Need for a Seriousness Scale

Identification of crime by category, e.g., robberies, burglaries, and assaults, conveys some information about the seriousness of the offense. However, crime types, by themselves, are not sufficient indicators of seriousness for three reasons:

a. Crime types are nominal scale data. Seriousness measures should be, at least, ordinal scale data.
b. Crime types do not sufficiently provide information which the community can use to determine the level of seriousness.
c. The UCR program relies on a scoring system in which multiple offenses and, with some types of crime, multiple victims are not recorded. Therefore, a great deal of detail is lost when classifying crime according to UCR rules.

A scale is needed that places all offenses on one continuum of seriousness, regardless of crime type -- violent or property. All the elements of the offense should be considered in a seriousness scale. A ranking method is needed to indicate how much more serious incident X is than Y. Such a method requires the development of seriousness weights for each offense. Intuitively, homicides are more serious than auto theft, and auto theft more serious than loitering. However, is a robbery of $1000 more serious than assault resulting in hospitalization; or is the burglary of $250 more serious than the theft of a '68 Volkswagen beetle? To answer such questions requires knowledge of the degree of seriousness; a ranking of seriousness is required so that such distinctions may be made. These ranks must be consistent with intuition (face validity) and must be uniform so that the degree of difference between offenses may be noted.

B. An Example Of A Seriousness Scale: The Sellin-Wolfgang Index

Several seriousness scales have been developed; one of the new widely used scales involves a weighting system for crime that can be used to measure changes in the seriousness of crime over time or among jurisdictions created by Thorsten Sellin and Marvin E. Wolfgang.[1] This scale may be used to determine where in a city the rates of serious crime are increasing and where they are decreasing. It may be used as an aid in determining budget allocations, assessing manpower requirements, and identifying the need for special programs such as block patrols or security programs.

The Sellin-Wolfgang index has three important characteristics:

a. It can be disaggregated down to the smallest geographical and temporal unit.
b. It is based on data normally collected by local police departments; thus costs in establishing the system are minimized; also, there is likely to exist a sufficiently long time series for trend analysis.
c. It is a measure of the amount of harm inflicted on the community.

A survey was used by Selling and Wolfgang, requesting respondents to describe the seriousness of specific crimes. These responses were aggregated to estimate the magnitude of seriousness for specific crimes. Scaling techniques were then used to convert responses to scale values (scores) for the components of a crime. These components and scale values, the Sellin-Wolfgang Index, are presented in Exhibit 4-8.

EXHIBIT 4-8.

SELLIN-WOLFGANG SERIOUSNESS
COMPONENTS AND SCORES

I.	Number of victims of bodily harm	
	(a) Receiving minor injuries	1
	(b) Treated and discharged	4
	(c) Hospitalized	7
	(d) Killed	26
II.	Number of victims of forcible sexual intercourse	10
	(a) Number of such victims intimidated by weapon	2
III.	Intimidation (except II above)	
	(a) Physical or verbal only	2
	(b) By weapon	4
IV.	Number of premises forcibly entered	1
V.	Number of motor vehicles stolen	2
VI.	Values of property stolen, damaged, or destroyed (in dollars)	
	(a) Under $10	1
	(b) $10 - $250	2
	(c) $251 - $2,000	3
	(d) $2,001 - $9,000	4
	(e) $9,001 - $30,000	5
	(f) $30,001 - $80,000	6
	(g) Over $80,000	10

Source: Sellin, Thorsten, and Marvin E. Wolfgang. The Measurement of Delinquency. New York: Wiley, 1964.

To apply this index (1) a crime must be divided into its specific components; (2) each component must be given a score; and (3) the scores must be totaled and an aggregate estimate of the crime's seriousness determined. For example, if an offender breaks into a retail store while no one is there, without a weapon, and steals $500, the seriousness of this offense would be assessed as follows:

Store entered	=	1
Dollar Value of Stolen Property	=	3
		4 Total

If the same offender had entered the store with a shotgun and had shot the proprietor and his wife who were subsequently hospitalized, the seriousness of the crime would be assessed as follows:

Store entered	=	1
Two Hospitalized Victims	=	14
Intimidation	=	4
Dollar Value of Stolen Property	=	3
		22 Total

Both of these examples would equal "1" in the Uniform Crime Reports.

In Exhibit 4-9 seriousness scores have been applied to drug arrest data for Chaos City by neighborhood. There is a significant variation in the seriousness score and the incidence of these crimes in two of the neighborhoods. In Westside the crimes are more serious than reflected by the incidence, while in Park it is less serious than the frequency of drug crimes would initially indicate.

EXHIBIT 4-9.

APPLICATION OF SERIOUSNESS SCALE, DRUG ARRESTS BY
NEIGHBORHOOD, CHAOS CITY, 1977

Neighborhood	Drug Arrests[1]	Percent of Incidents	Total Seriousness[2]	Percent of Seriousness
Central	30	6.1%	60	6.6%
Westside	42	8.6%	142	15.7%
University	125	25.6%	250	27.7%
Park	240	49.1%	300	33.1%
Washington	52	10.6%	152	16.8%
Total	489	100%	904	100%

[1]In a one year period, 1977
[2]Sum of all Seriousness Scores for each neighborhood.

Source: hypothetical data

C. Uses of Seriousness Scale

One application of the seriousness scale was in the Watts Model City Area, using Los Angeles Police Department data. The project demonstrated that seriousness per 100,000 population and the crime rate are related and may even be negatively correlated.[2]

Heller and McEwen in reporting on the application of the Sellin-Wolfgang Index to crime data provided by the St. Louis Metropolitan Police Department concluded:

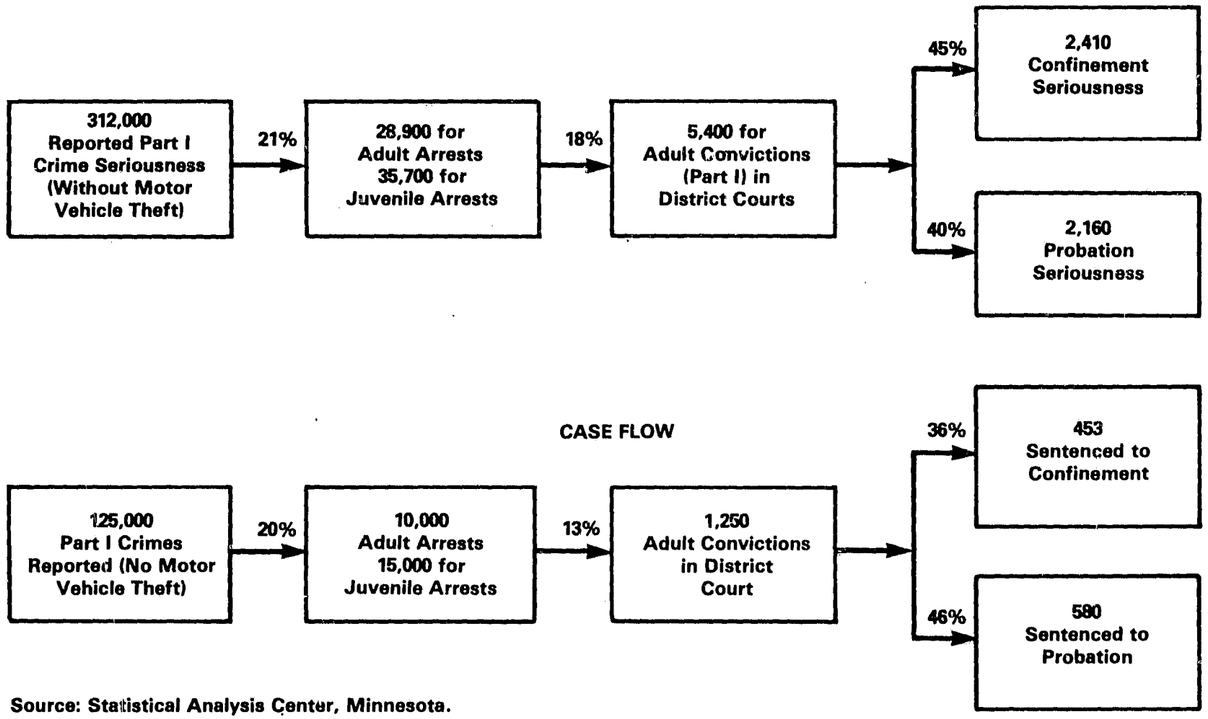
- The average seriousness of a crime against the person was four times as great as the average seriousness for a crime against poverty.
- Crimes against the person in St. Louis accounted for 12.5% of the incidents but 37.5% of the seriousness.
- Two-thirds of the harm from crime may be attributed to property loss, and one-sixth each to physical injury and mutilization.
- The injury and property loss occurring in the average traffic accident is over fifty percent more serious than that occurring in the average Part 1 offense.[3]

Another application of the seriousness concept is illustrated in the following quotation from a report prepared by the Minnesota Statistical Analysis Center and Research Unit. This application involves using a seriousness score to describe and assess criminal justice system operations.

> One problem in analyzing or evaluating the criminal justice system is that knowing the number of crimes, the crime rate, or the number of people arrested does not give us much information about the seriousness of crimes. If the criminal justice system had sufficient resources to give equal attention to all types of crime, the seriousness of crime would not be a particular issue. But we know that the system exercises great discretion in who will be arrested, prosecuted, and sentenced to prison; this is shown by the funneling down of the numbers of people at successive stages of the system. We might expect that if the system must choose between prosecuting crimes of varying seriousness, those most serious will get the most attention. On the other hand, we do not expect less serious crimes to be totally disregarded, so that they might be committed with impunity. Thus, how the system handles crimes, as measured by their seriousness, can be one measure of how the system is working. We can, specifically, compare the funneling by quantitative numbers of people to the funneling by seriousness of the associated crimes.
>
> Comparing the seriousness flowchart with the strictly numerical flowchart in (Exhibit 4-10) we make these observations. The two flowcharts are most alike when arrests are compared as fractions of reported Part I crime. Adult arrests account for 8 percent of reported Part I crimes (excluding motor vehicle theft); the percentage is 20 percent if juvenile arrests are included. For seriousness the comparable percentages are 9 percent and 21 percent. So we find only a slight predisposition in the system toward the arrest of the more serious offenders. At the district court level the margin of seriousness increases over the numerical: 13 percent of the adults arrested are convicted, and this accounts for 18 percent of the seriousness of the crimes of arrest. For district courts 46 percent of those convicted are placed on probation and 16 percent confined. In terms of seriousness of convictions those percentages are 40 percent and 45 percent. Thus, seriousness becomes a more decisive factor as one moves through the system, although the margin is not especially great. Note also that one effect of plea negotiation is to reduce the observed level of crime seriousness processed by the court subsystem.[4]

EXHIBIT 4-10

COMPARISON OF SERIOUSNESS AND CASEFLOW FOR PART I OFFENSES (EXCLUDING MOTOR VEHICLE THEFT) STATE OF MINNESOTA, 1973



Source: Statistical Analysis Center, Minnesota.

III. Cross-Classification Tables

The procedure for grouping data into classes for descriptive purposes was discussed in chapter three. In this section percentage comparison of such classes or categories is presented as a technique for describing one variable and for examining the relationship between two or more nominal or ordinal scale variables.

A. One-Way and Two-Way Tables

A one-way table consists of categories, cell counts, and percentages for a single variable. In Exhibit 4-11 the one-way table displays both in absolute and relative terms the significance of different crimes in Chaos City for 1977. Residential burglaries accounted for 7,000 of the 18,300 crimes or 38.2% of the total. Auto thefts represent 21.9% of the total crimes.

In developing a two-way table, the two variables should be part of a hypothesis with an independent and dependent variable*. The dependent variable should be the column or vertical variable and the independent variable should be the row or horizontal variable. In Part B of Exhibit 4-11, "neighborhood" has been added as an independent variable. From the percentages it is apparent there is a major difference in the distribution of crimes by neighborhood. For example, 43.5% of the crimes in Central were auto thefts in 1977 while auto thefts accounted for only a small percentage of the crimes in Westside (8.7%), Park (2%), and Washington (8.5%). Some of this variation may be explained by neighborhoods and other factors. Uses of rates and indices as a companion to such a two-way table would help to identify some of these other factors.

The analysis of such cross-classification tables involves both the description of the individual variables involved (i.e., in Exhibit 4-11, crime and neighborhood) as well as making a determination concerning the relationship between the variables (i.e., does the incidence of crime vary significantly across geographical areas of the city).

* These were terms defined and discussed in Chapter One and are included in the glossary.

EXHIBIT 4-11.

ONE-WAY AND TWO-WAY TABLES ILLUSTRATIONS,
NEIGHBORHOOD CRIME DATA SET,
CHAOS CITY, 1977

A. One-way Table: Incidence of Crime, Crime Type, Chaos City, 1977

	Total	Residential Burglary	Commercial Burglary	Commercial Robbery	Street Robbery	Assault	Rape	Auto Theft
Total	18300	7000	1800	700	1200	3450	150	4000
Percent	100%	38.2%	9.8%	3.8%	6.6%	18.9%	.8%	21.9%

B. Two-way Table: Incidence of Crime, Crime Type by Neighborhood, Chaos City, 1977

	Central	%	Westside	%	University	%	Park	%	Washington	%
Residential Burglary	800	17.4%	2400	52.2%	700	37.8%	2100	4.2%	1000	42.6%
Commercial Burglary	500	10.9%	500	10.9%	200	10.8%	400	8.0%	200	8.5%
Commercial Robbery	200	4.35	100	2.2%	50	2.7%	300	6.0%	50	2.1%
Street Robbery	500	10.9%	200	4.3%	100	5.4%	300	6.0%	100	4.3%
Assault	580	12.6%	882	19.2%	325	17.65	882	17.6%	781	33.2%
Rape	20	.4%	18	.4%	75	4.1%	18	.4%	19	.8%
Auto Thefts	2000	43.5%	400	8.7%	400	21.6%	100	2.0%	200	8.5%
TOTAL	4600		4600		1850		5000		2350	

Source: hypothetical data

B. Percentaging A Two-Way Table

The assessment of relationship between two nominal or ordinal scale variables (or grouped interval or ratio scale variables) should begin with a percentage comparison. Percentaging a two-way table means dividing and percentaging the observations according to the independent variable. Exhibit 4-12 presents a four-step procedure for conducting a percentage comparison.

EXHIBIT 4-12.

FOUR STEP PERCENTAGE COMPARISON OF
A TWO-WAY TABLE,
EFFECT OF INCOME ON RECIDIVISM

Step 1: Identify Hypothesis and Dependent and Independent Variables.

Hypothesis: Recidivism is related to income.

(Dependent Variable) (Independent Variable)

Recidivism Status	Average Annual Income During Follow-up Period: Less Than $4000	$4001 - $8000	More Than $8000	TOTAL
Rearrested	68	43	9	120
Not Rearrested	68	47	15	130
TOTAL	136	90	24	250

Step 2: Percentage the Dependent Variable

(Dependent Variable) (Independent Variable)

Recidivism Status	Average Annual Income During Follow-up Period: Less Than $4000	$4001 - $8000	More Than $8000	TOTAL %
Rearrested				48.0%
Not Rearrested				52.0%
TOTAL				100.0%

Step 3: Percentage the Dependent Variable For One of the Independent Categories

(Dependent Variable) (Independent Variable)

Recidivism Status	Average Annual Income During Follow-up Period: Less Than $4000	$4001 - $8000	More Than $8000	TOTAL
Rearrested	50%			48%
Not Rearrested	50%			52%
TOTAL	100%			100%

Step 4: Percentage the Dependent Variable for the Remaining Independent Categories

(Dependent Variable) (Independent Variable)

Recidivism Status	Average Annual Income During Follow-up Period: Less Than $4000	$4001 - $8000	More Than $8000	TOTAL
Rearrested	50%	47.8%	37.5%	48%
Not Rearrested	50%	52.5%	62.5%	52%
TOTAL	100%	100.0%	100.0%	100%

The first step consists of identifying the hypothesis in terms of an independent variable (columns) and the dependent variable (rows). The data are then appropriately distributed into each cell of the table. In the example, the hypothesis being examined is that an ex-offender's recidivism status is positively related to his/her annual income. The greater the income, the less the probability of being rearrested. The data presented in the table consist of a title, headings for the row and column variables, category labels for the two variables, cell counts, and row and column totals. The latter are sometimes referred to as the "marginals."

Step two requires percentaging the marginals for the dependent variable. Forty-eight percent of the ex-offenders were rearrested, while 52% were not. Step three involves percentaging the dependent variable for one of the independent categories. Fifty percent of the ex-offenders who earned less than $4000 were rearrested; not 50% of those rearrested earned less than $4000. The fourth step completes the percentaging for the remaining independent categories. Note that there appears to be some evidence of a positive relationship between the independent and dependent variables: income appears to be related to recidivism.

Exhibit 4-13 presents the same table as in Exhibit 4-12, with the addition of column and total percentages. The row percentages are interpreted: 56.7% of the recidivists earned less than $4000 and only 7.5% earned more than $8000. The column percentages are interpreted: 62.5% of those who earned more than $8000 did not recidivate. The total percentages are interpreted: 27.2% of the sample earned less than $4000 and were recidivists. There is some evidence in the column percentages to suggest a positive relationship between income and recidivism.

EXHIBIT 4-13.

ROW, COLUMN AND TOTAL PERCENTAGES FOR A TWO-WAY TABLE, EFFECT OF INCOME ON RECIDIVISM

(Dependent Variable) (Independent Variable)

Recidivism Status	Average Annual Income During Follow-up Period: Less Than $4000	$4001 - $8000	More Than $8000	ROW TOTAL %
Rearrested	68.0* 56.7%** 50.0%*** 27.2%****	43.0 35.8% 48.3% 17.2%	9.0 7.5% 37.5 3.6%	120 48%
Not Rearrested	68.0 52.3% 50.0% 27.2%	47.0 36.2% 52.2% 18.8%	15.0 11.5 62.5 6.0%	130 52% 52%
Column	136.0	90.0	24.0	250
TOTAL	54.4%	36.0%	9.6%	100%

Source: hypothetical data

*N
**Row %
***Column %
****Total %

A second example of a two-way table is presented in Exhibit 4-14. Using the twenty-seven-city data set (Exhibit 3-4) the mean values for the variables "total crime rate" and "population density" were used to create two categories for each variable: cities below the mean -- low density and low crime rate -- and cities above the mean -- high density and high crime rate. The twenty-seven-city data was then distributed and percentaged into the two-way table of Exhibit 4-14. The percentages are interpreted: 57.1% of the low crime rate cities have low population densities and 30.8% of the high crime rate cities have high population densities while only 40.0% of the high density cities had high crime rates. This latter finding suggests that lower density cities have higher crime rates for cities with populations between 250,000 and 400,000 population.

EXHIBIT 4-14.

TWO-WAY TABLE, EFFECT OF POPULATION DENSITY ON CRIME RATE*
TWENTY-SEVEN CITIES, 1977

Dependent Variable	Independent Variable: Low Density (Min - 4729)	Independent Variable: High Density (4730 - Max)	TOTALS
Low Crime Rate (Min - 1527)	8**	6	14
	57.1%	42.9%	51.9%
	47.1%	60.0%	
	29.6%	22.2%	
High Crime Rate (1528 - Max)	9	4	13
	69.2%	30.8%	48.1%
	52.9%	40.0%	
	33.3%	14.8%	
TOTALS	17	10	27
	63.0%	37.0%	100.0%

Source: Exhibit 3-4

* Total Crime Index per 100,000 population
** The four numbers in this cell represent:
N
Row %
Column %
Total %

IV. Scattergrams

A. Definition

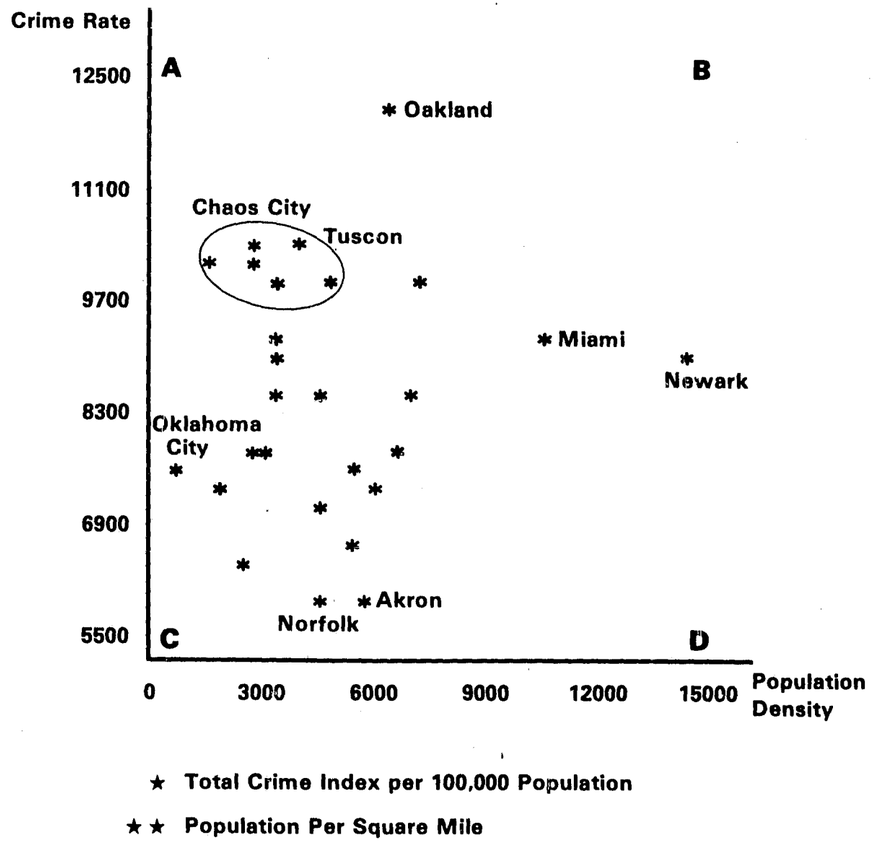
A scattergram (scatter diagram or scatter plot) is a graphical method used to examine the relationship between two or more interval scale variables. In a bivariate (two variable) scattergram the vertical axis is the dependent variable and the horizontal axis is the independent variable. Each point represents the value of both variables for a single case. The pattern of points is then interpreted.

B. Construction and Interpretation of Scattergrams

In the previous section, a two-way table was used to examine the relationship between the grouped total crime rate (crimes per 100,000 population) and population density data. In this section a scattergram is used to examine the same relationship using the original, ratio scale variables. This scattergram is presented in Exhibit 4-15. It is constructed so that each dot represents one city. Selected cities have been highlighted with labels and the horizontal and vertical axes have been proportionately scaled and labeled.

EXHIBIT 4-15

SCATTERGRAM, EFFECT OF POPULATION DENSITY★★ ON THE CRIME RATE★, TWENTY-SEVEN CITIES, 1977



★ Total Crime Index per 100,000 Population

★★ Population Per Square Mile

Source: Exhibit 3-4

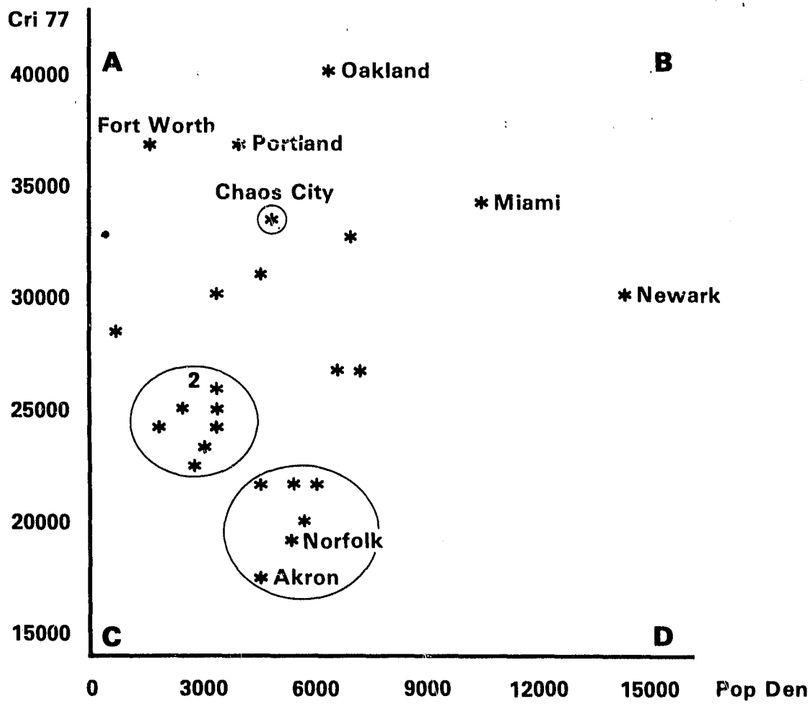
There are three general approaches used to interpret a scattergram. First, the plot should be examined for any clear pattern or trend in the relationship. In this set of data no such pattern emerges. Second, clusters and outliers should be identified and described. One such cluster of lower density, higher crime cities has been circled on the scattergram. Cities in this cluster include Tucson, Fort Worth, Portland, Sacramento, Wichita, and Chaos City. Further analysis of these cities may lead to identifying a descriptive label for the group and an understanding of the reasons for their clustering. Outliers in this scattergram are cities with extreme values such as Oklahoma City (lowest density), Oakland (highest crime rate), Newark (highest density), and Norfolk and Akron (lowest crime rates). An interpretation may be enhanced by discussing and speculating on the reasons for such extreme values.

A third approach involves dividing the scattergram into four or more quadrants as indicated. Each quadrant may then be described. For example, more cities are plotted in quadrant C than in the others. Quadrant C contains cities generally having lower population density and a lower crime rate. Only Miami and Newark are in B Quadrant -- high crime rate and high density, and no cities in this sample had high population densities and low crime rates in 1977.

Exhibit 4-16 presents a scattergram of the total crime index (frequency not rate) and population density for the same cities. A very similar pattern can be observed: again Newark, Akron, Oakland, and Oklahoma City are the outliers. Two clusters, however, appear to emerge -- both in the low density-low index quadrant (C). Most of the cities are in quadrant C, none of the sampled cities have higher densities and a lower index (quadrant D). Both scattergrams suggest that lower density and higher crime incidence and rates may be related for cities of this size (250,000-400,000 population).

EXHIBIT 4-16

SCATTERGRAM, EFFECT OF POPULATION DENSITY ON CRIME INCIDENCE, TWENTY-SEVEN CITIES, 1977



Source: Exhibit 3-4

As a last example consider the hypothesis that cities with higher crime rates have to employ more law enforcement personnel. Two variables that may be used to assess this relationship are: (1) crime rate (total crime index per 100,000 population) and (2) police rate (law enforcement personnel per 100,000 population). Data for these two variables for the 27 cities are presented in Exhibit 4-17. A scattergram of this relationship (Exhibit 4-18) indicates that most cities in the sample have lower police rates and lower crime rates. However, the clustering of cities and the presence of outliers such as Oakland and Newark make the plot difficult to interpret. Two approaches to solving these problems are (1) removing the outliers from the sample and rescaling the axes; and (2) logarithmic transformations of the variables. Exhibit 4-19 is identical to Exhibit 4-18 except the outliers of Newark and Oakland have been removed and the axes have been rescaled. A slight bottom-left to top-right trend is visible suggesting that higher police rates may be associated with higher crime rates.

EXHIBIT 4-17.

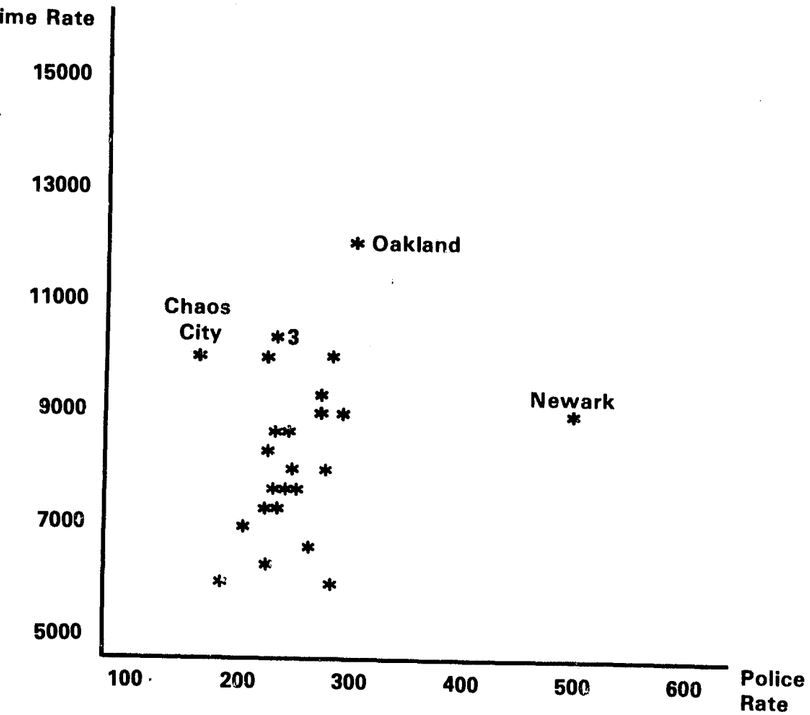
TOTAL CRIME INDEX PER 100,000 POPULATION, LAW ENFORCEMENT PERSONNEL PER 100,000 POPULATION AND THEIR LOGARITHMICS, TWENTY-SEVEN CITIES, 1977

CITY	A Law Enforcement Personnel Per 100,000 Pop	B Total Crime Index Per 100,000 Pop	Log 10 A	Log 10 B
AKRON	202.98	7026.5	5.3131	8.8574
ALBUQ	252.33	8573.7	5.5307	9.0565
AUSTIN	225.14	7815.5	5.4167	8.9639
B ROUG	221.13	7269.8	5.3988	8.8915
BIRMIN	301.88	9040.0	5.7100	9.1094
CHAOS	171.52	10303.0	5.1447	9.2107
CHARLO	253.36	7922.8	5.5348	8.9775
EL PASO	215.20	6383.6	5.3716	8.7615
F WORTH	244.44	10253.0	5.4990	9.2353
L BEAC	280.09	7946.0	5.6351	8.9805
LOUISV	279.20	6046.1	5.6319	8.7072
MIAMI	282.95	9340.1	5.6453	9.1421
MINNEA	240.40	8541.9	5.4823	9.0527
NEWARK	512.71	8926.9	6.2397	9.0968
NORFOL	256.02	6781.8	5.5453	8.8220
OAKLA	311.81	12011.0	5.7424	9.3935
OKLA C	235.57	7643.8	5.4620	8.9417
OMAHA	177.95	5928.0	5.1815	8.6874
PORTLA	246.12	10322.0	5.5058	9.2420
ROCH N	293.07	9922.4	5.6804	9.2026
SACRAM	253.05	10351.0	5.5336	9.2449
ST PAU	250.06	7656.6	5.5217	8.9433
TAMPA	281.09	9133.9	5.6387	9.1197
TOLEDO	227.12	8422.4	5.4255	9.0387
TULSA	226.39	7370.2	5.4223	8.9052
TUCSON	234.10	9999.8	5.4557	9.2103
WICHIT	249.15	10192.0	5.5181	9.2293

Source: U.S. Department of Justice, Federal Bureau of Investigation. Uniform Crime Reports, 1977.

EXHIBIT 4-18

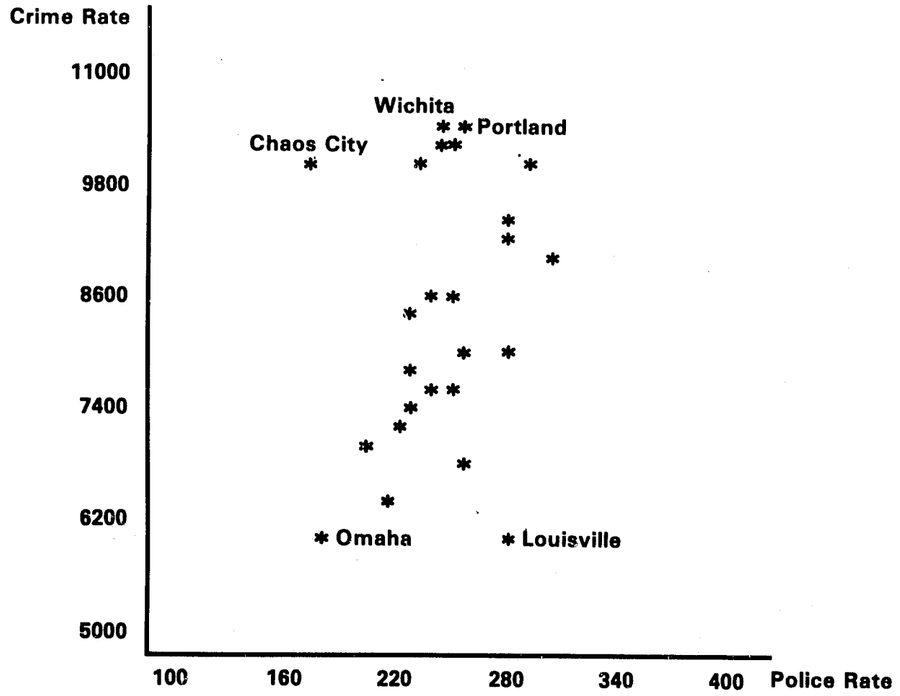
SCATTERGRAM, EFFECT OF POLICE RATE★ ON CRIME RATE★★, TWENTY-SEVEN CITIES, 1977



Source: Exhibit 3-4

EXHIBIT 4-19

SCATTERGRAM, EFFECT OF POLICE RATE ON THE CRIME RATE (OUTLIERS REMOVED), TWENTY-SEVEN CITIES, 1977

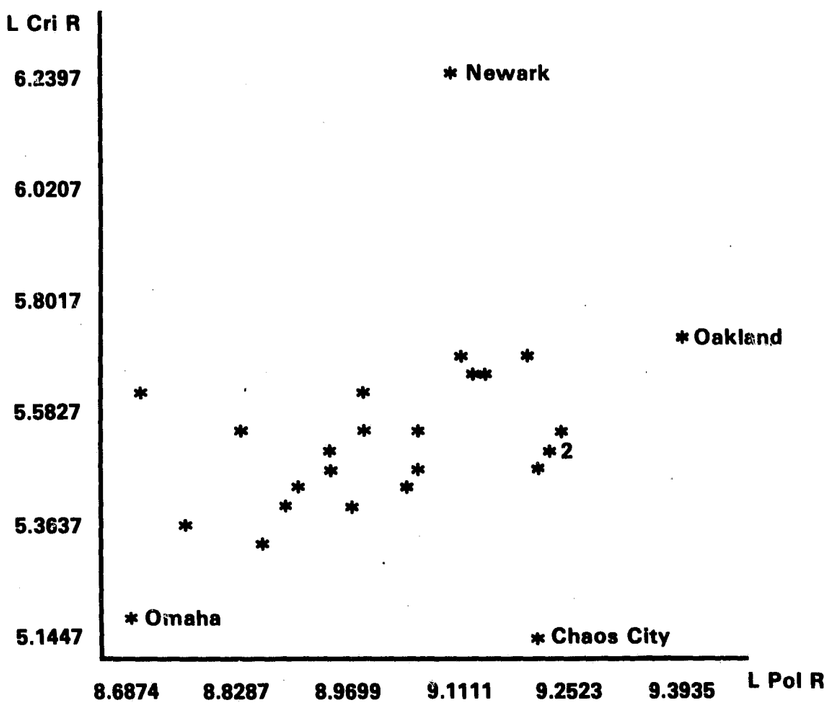


Source: Exhibit 3-4

Logging the variables has the effect of pulling outliers toward the middle of the distribution and spreading the clustered values out. In Exhibit 4-20 the $\log_{10}$ of both the police rate and the crime rate are both plotted. The logarithim for Akron to the base$_{10}$ is $\log_{10}$ 7065.5 = 8.8575 because $10^{8.8575}$ = 7065.5. The logged scattergram provides clearer evidence in support of the hypothesis that crime rate and police rate are positively related.5

EXHIBIT 4-20

SCATTERGRAM, EFFECT OF POLICE RATE ON CRIME RATE (BOTH VARIABLES LOGGED), TWENTY-SEVEN CITIES, 1977



Source: Exhibit 3-4

V. Statistical Maps

Spatial analysis is important in criminal justice analysis because it fits many of the operational problems, such as deployment of police, jury selection in courts, and isolation of crime and/or victimization and related social problems. Furthermore, program funding is rarely applied to individuals. Rather, funds are applied to problem areas, such as neighborhoods and communities. Therefore, it is important to be able to utilize tools that provide ways of aggregating individual cases or transaction statistics into spatial summaries.

Two different approaches to development of statistical maps are presented in this section. Exhibit 4-21 illustrates the product of a hand-drafted statistical map while Exhibits 4-22 and 4-23 are computer-made statistical maps. Regardless of the approach taken there are two basic rules-of-thumb to use in preparing such maps:

- Minimize the number of categories and shades to facilitate reading of the map.
- Select appropriate geographical units to present.

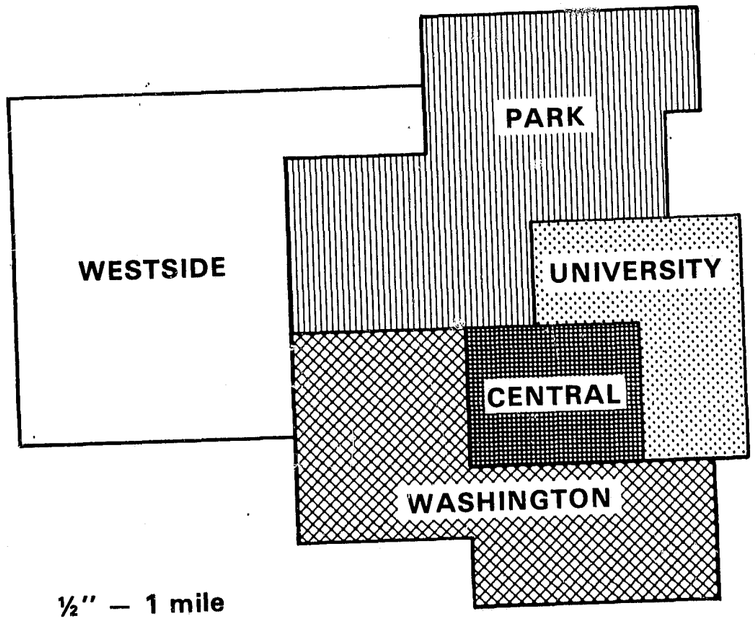
In general, statistical maps are prepared by selecting appropriate shading for different classifications of a variable and a proper unit to analyze. In Exhibit 4-21 the unit of analysis is the neighborhood and the darker shading indicates a higher number of assaults per 100,000 population. Note two deficiencies of such a map; shading does not adequately reflect the differences between neighborhoods in terms of the assault rate; and specific sites of assault incidence are not identified.

Computer-made maps can overcome these problems.6 For example, the Pin Map of assaults in the central neighborhood distinguishes between four types of assaults and locates, by street, major sites with higher incidence. (See Exhibit 4-22).

A Grid Map is displayed in Exhibit 4-23 using the same data as presented in Exhibit 4-22. Shading is used to indicate the relative intensity of assaults in a specified area. Note the corridor visibly present along the main avenue of Chaos City. This corridor phenomenon is also evident in Exhibit 4-24 which is a contour map of the assault data.

EXHIBIT 4-21

HAND DRAFTED STATISTICAL MAP, ASSAULTS PER 100,000 POPULATION, BY NEIGHBORHOOD, CHAOS CITY, 1977



½" — 1 mile

	Assaults Per 100,000	Rank	Shade
Central	10154.0	1	
Westside	1000.0	4	
University	800.0	5	
Park	1125.0	3	
Washington	1230.8	2	

Source: Hypothetical Data

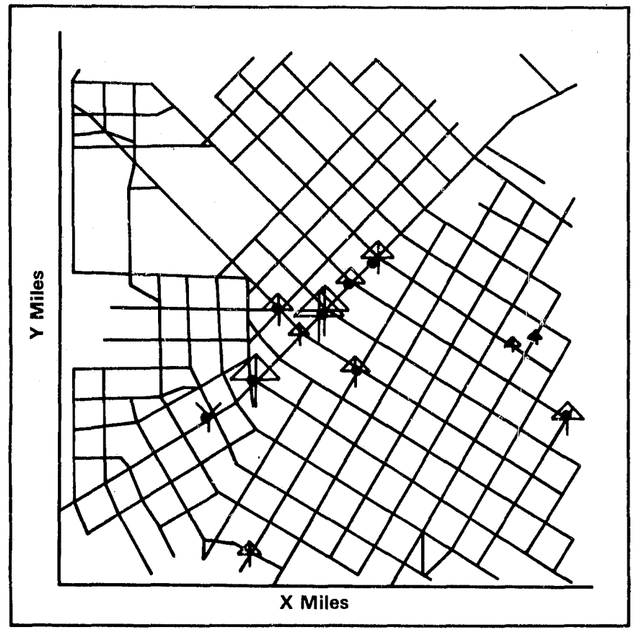
EXHIBIT 4-22

COMPUTER MADE PIN MAP, ASSAULTS IN CENTRAL NEIGHBORHOOD, CHAOS CITY, 1977

Crime Symbol Key

Size Increases With Number of Crimes

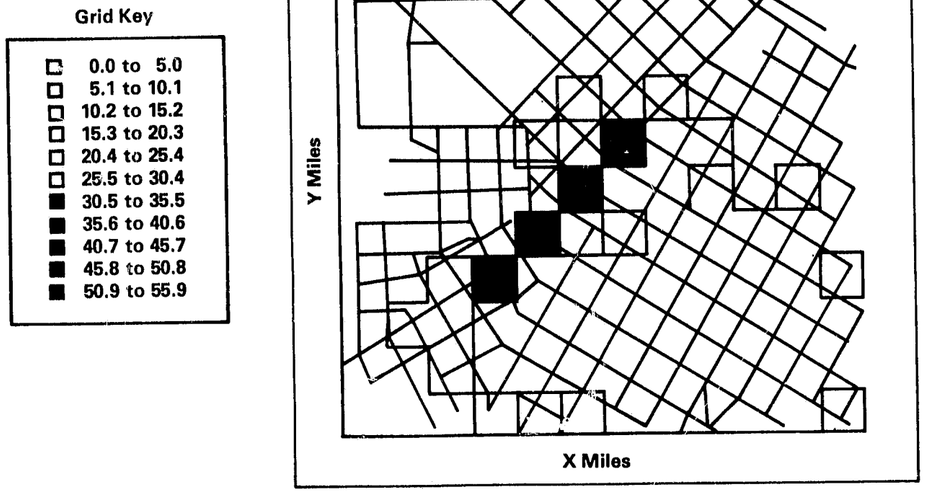
X . Assault-Sexual
♠ Assault-Stranger
Y Assault-Nonstranger



Source: Used by permission: © 1978 Minnesota Crime Prevention Center
2344 Nicollet Avenue, Minneapolis, Minnesota 55404, (812)870-0780
Adapted for Chaos City

EXHIBIT 4-23

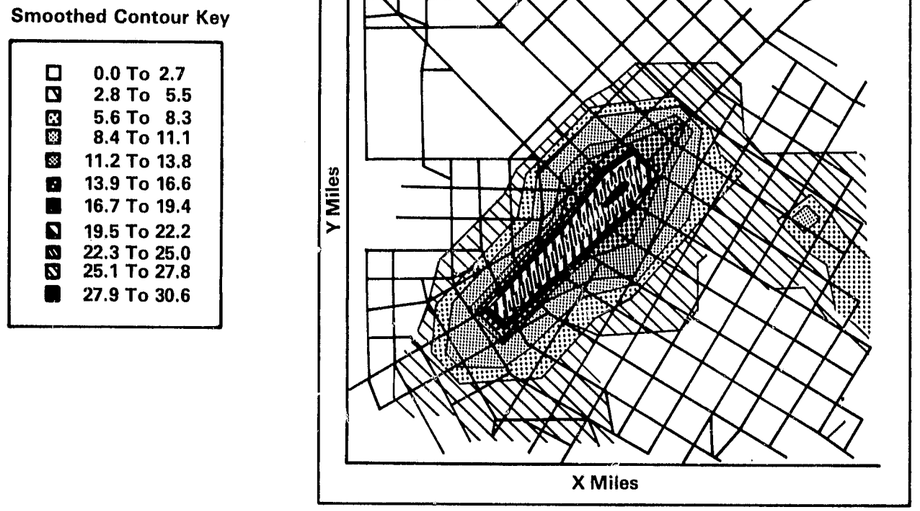
COMPUTER MADE GRID MAP, ASSAULTS IN CENTRAL NEIGHBORHOOD, CHAOS CITY, 1977



Used by permission: Minnesota Crime Prevention Center, 2344 Nicollet Avenue, Minneaplois, Minnesota 55404 (812)870-0780.
Adapted for Chaos City.

EXHIBIT 4-24

COMPUTER MADE CONTOUR MAP, ASSAULTS IN CENTRAL NEIGHBORHOOD, CHAOS CITY, 1977

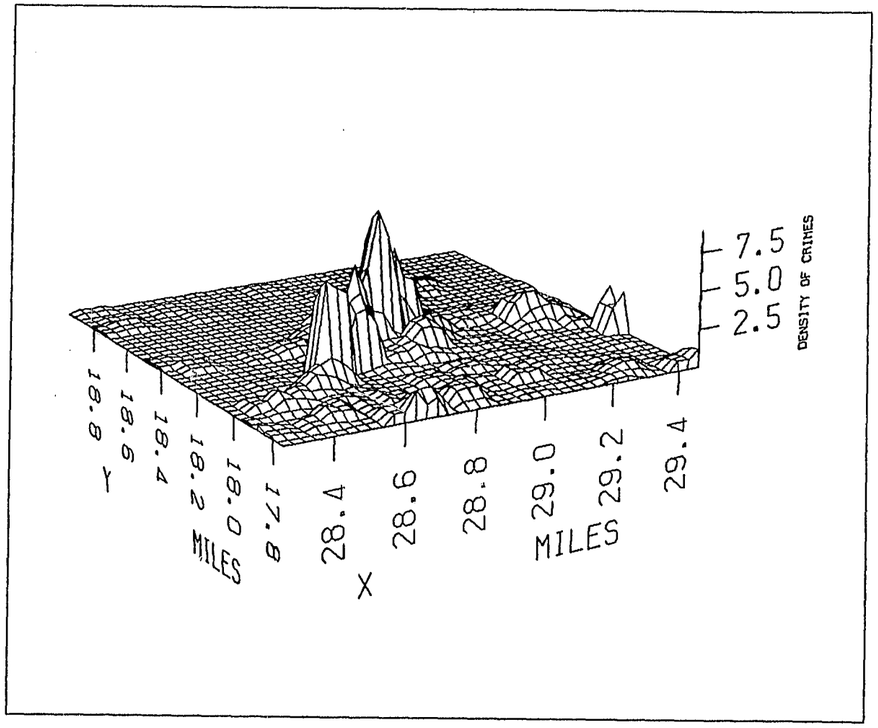


Source: Used by permission:
Minnesota Crime Prevention
2344 Nicollet Avenue
Minneapolis, Minnesota
(812)870-7780
Adapted for Chaos City

The last computer made map, Exhibit 4-25, presents a density plot of assaults in Central. Peaks in the map indicate "hot spots" -- locations of the greatest incidence of assault. The highest peak on this map is the location of the T. Doos' Cafe in downtown Chaos City.

EXHIBIT 4-25.

COMPUTER MADE DENSITY MAP,
ASSAULTS IN CENTRAL NEIGHBORHOOD,
CHAOS CITY, 1977



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CONTINUED

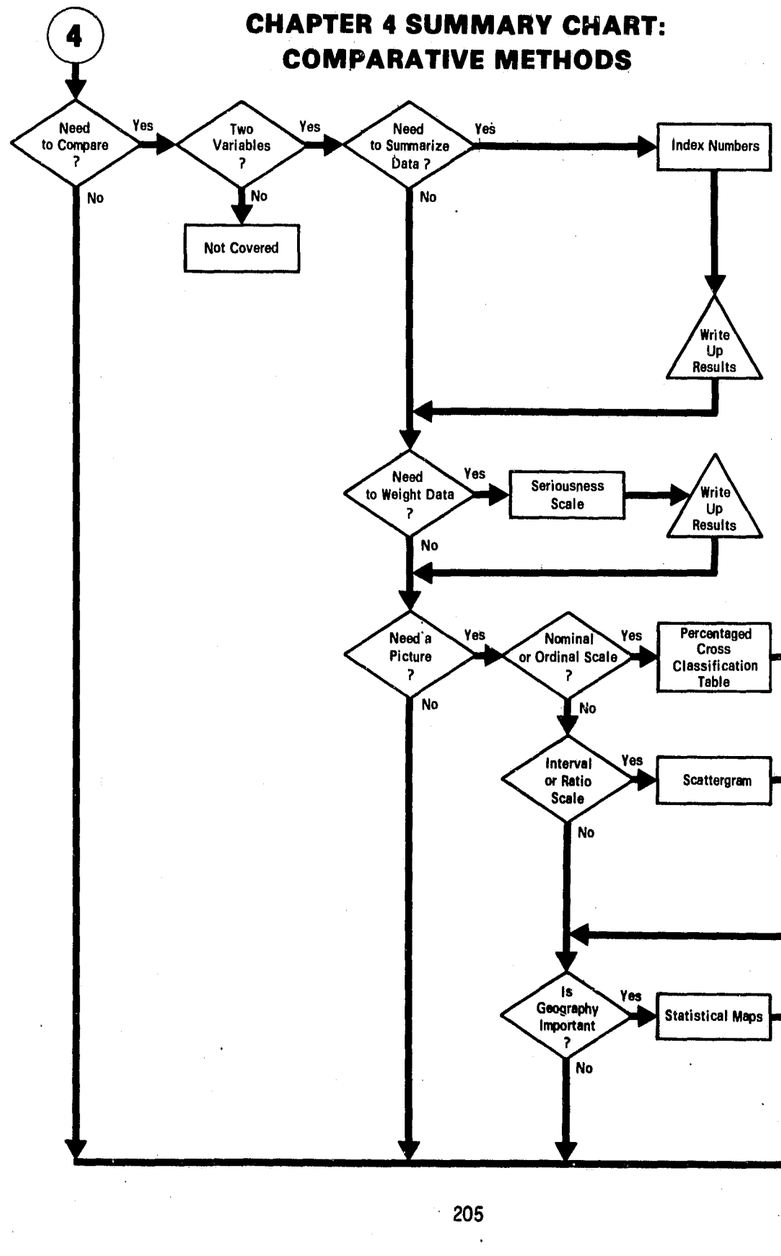
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VI. Conclusion

Comparative methods covered in this chapter are useful in examining and suggesting relationships between two or more variables. Exhibit 4-26 summarizes these methods and is a guide to their selection. In the following chapter, inferential statistics is briefly covered and methods for testing relationship are considered.

EXHIBIT 4-26

CHAPTER 4 SUMMARY CHART: COMPARATIVE METHODS



[1]Thorsten Sellin and Marvin E. Wolfgang, The Measurement of Delinquency (New York: John Wiley & Sons, 1964), pp. 274-318.

[2]Heller and J.T. McEwen, "Applications of Crime Seriousness Information in Police Departments," Journal of Research in Crime and Delinquency 12 (Jan. 1975), pp. 44 - 50.

[3]Ibid.

[4]Stephen Colman, An Analysis of Minnesota's Criminal Justice System, a Report prepared by the Governor's Commission on Crime Prevention and Control, Statistical Analysis Center, June 1976, pp. 17 - 21.

[5]Edward R. Tufte, Data Analysis For Politics and Policy (Englewood Cliffs: Prentice-Hall, 1974), p. 108.

[6]Adapted from a report prepared by the Minnesota Crime Prevention Commission, "Computer Display Techniques For Research Social Issues." 2344 Nicollett Avenue, South Minneapolis, Minnesota 55504, September 1978.

CHAPTER 5

INFERENTIAL METHODS

Introduction

A major objective of statistics is to reduce large quantities of data to a form which is easy to manage, to understand, and to communicate. The descriptive and comparative methods presented in Chapters Three and Four are used for this purpose. A second objective of statistics is to assist in making inferences or generalizations based on incomplete information and usually with some consideration to the uncertainty of the conclusions. Three issues are central to a discussion of inferential methods: (1) the type of hypotheses being analyzed; (2) the incompleteness of the data to be used in making generalizations and drawing conclusions; and (3) how confident it is necessary to be in the conclusion.

Inference involves two different types of hypotheses: statements of difference and statements of association. Statements of difference involve comparing groups to see if they are similar or dissimilar. For example, Chaos City analysts may be interested in the effect of gender and age on criminal victimization. Their hypothesis is that female senior citizens are more prone to street crimes than the general population. To evaluate this statement victimization rates for subpopulations, particularly for female senior citizens, are compared to the city victimization rates for selected crimes. Tests of difference are used to aid in the determination of whether observed differences are significant or the result of chance and/or of sampling error.

Measures of association are used to summarize the relationship between two or more variables. They should not be regarded as a substitute for logic or common-sense. Inferential methods are used only to help identify whether a relationship appears to exist between variables. For example, in Chapter Four, scattergrams were used to examine the relationship between population density and the incidence and rate of certain crimes. As a second example consider the statement, "well lit streets may reduce the fear of crime." A recent study concluded:

- Well lit streets may reduce the fear of crime, but there is no statistically significant evidence that street lighting reduces crime itself.
- Evidence is unclear as to whether better lighting reduces the number of crimes or merely displaces crime.
- The rate of crime in certain well-illuminated areas actually increases; this increase might on the one hand be accounted for by car thieves, as an example, being better able to see what they are doing, and on the other, by more crime being reported because residents can better see incidents taking place.
- The "uniformity of lighting" is perhaps the most important element in reducing fear of crime. This is due, in part to reducing the apparent darkness of one street, as compared to a brighter adjacent street.[1]

Such findings were based on interviews with personnel in 60 street lighting projects, and on-site visits to 17 projects. In this study, as in most, a sample of street lighting projects was used as the basis for making generalizations about the effects of all street lighting projects.

As discussed in chapter Two it is often impossible, impractical, and/or unnecessary to observe an entire group of individuals or projects. Instead of analyzing data for the entire population of interest, a small portion of a population is observed. This small portion is called a sample. The robbery data set (Exhibit 1-4) is a small sample (n=15) of all Chaos City robberies in 1977. Inferential methods are designed to facilitate discussion of populations of interest based on sample data.

Finally, inference involves the use of probability in stating conclusions. Sampling requires that conclusions be carefully qualified. There is always a chance, when generalizing from a sample to a population, of being wrong in your conclusions. Assignment of a level of significance to conclusions is an important aspect of inferential methods, and usually is most critical in terms of proper interpretation of findings.

This chapter begins with a general discussion of the process and concepts of statistical tests which is followed by a consideration of four such tests: the t-test, chi square goodness-of-fit test, chi square test of independence and the correlation coefficient. The first two tests are used to address questions of difference, while the latter two may be used to assess a relationship. A discussion of time series methods and least squares regression as used in estimating trends and for prediction concludes the chapter. The prediction problem is treated as an extension of the logic of testing causal relationships and of correlation methods. A major premise of least squares regression is that the past and future are related, and estimates of some future state may be based on past trends. Predicting the robbery rate for Chaos City in 1982, for example, requires a method of estimating the predicted numerical value for the 1982 robbery rate, as well as determining how wrong the prediction is likely to be. An example of the use of least squares regression in causal models concludes the Chapter.

I. Statistical Testing

A statistical test is a step-by-step procedure that is used to help organize the various factors that must be considered to assess a hypothesis with a set of data. It assumes that a preliminary problem specification has been prepared, that data have been collected, and that descriptive and comparative methods have been applied. It is a central aspect of all inferential methods and consists of seven sequential steps:

1. State the null hypothesis
2. State an alternative hypothesis
3. Select a statistical test
4. Determine the level of significance
5. Calculate the test statistic

6. Compare the test statistic to its table value
7. Interpret the findings

Following is a discussion of the first four steps. The section that follows focuses on the calculation and interpretive steps.

A. State the Null Hypothesis

In chapter 1, descriptive and causal hypotheses were discussed. In the introduction to this chapter, two types of causal hypothesis were defined: statements of difference between groups and statements of relationship between variables. A null hypothesis (H_0) is a statement asserting no difference or no relationship. Examples of such null hypotheses are:

H_0: No Difference (or change)
- There is no difference in the mean age of black robbery offenders and white robbery offenders in Chaos City.
- There is no difference in the mean incidence of robbery in Mid-Western Cities and Southern Cities.
- There was no change in Chaos City residents' evaluation of the police between 1975 and 1977.

H_0: No Relationship
- There is no relationship between where a person lives and his fear of crime in Chaos City.
- There is no relationship between fear of crime and evaluation of police services in Chaos City.
- There is no relationship between population density and the crime rate.

B. State Alternative Hypothesis

The alternative hypothesis (H_a) is usually the motivating concern behind an analysis. It is the affirmative statement of the null hypothesis; e.g., population density has a positive effect on the robbery rate and police evaluations improved between 1975 and 1976. The reason for specifying both a H_a and a H_0 is that statistical tests are generally based on "proof by contradiction; that is, we try to support the (alternative) hypothesis by showing that the null hypothesis is false."[2]

C. Select the Appropriate Statistical Test

A statistical test is used for determining the statistical significance of the difference and/or association between two variables. It is a test in that a calculated statistic (from the data) is compared to a predicted value of the statistic (obtained from tables of such statistics). What is being tested is whether the observed difference or association could reasonably be attributed to chance and/or sampling error.

Three criteria used to select an appropriate test statistic are: (1) the type of question being asked (difference or association); (2) the measurement scale of the variables; and (3) the size of the sample. The

chapter chart (Exhibit 5-45) at the end of the chapter is a useful guide in selecting the methods discussed.[3]

D. Determining the Level of Significance

The level of significance is interpreted as the probability of an association or a difference having resulted from chance or sampling error, i.e., if the level of significance is set at .05, it would indicate the probability of the observed difference or association having resulted from sampling error or chance was 5 in 100. This means that if a population were sampled 100 times, only 5 times would the observed results occur as a result of chance alone.

William Hays in a brief essay on "Significance Tests and Common Sense" made the following points:

> "... all that a significant result implies is that one has observed something relatively unlikely given the hypothetical situation, but relatively more likely given some alternative situation. Everything else is a matter of what one does with the information. Statistical significance is a statement about the likelihood of the observed result, nothing else. It does not guarantee that something important, or even meaningful has been found."[4]

E. General Considerations

Problems in utlizing statistical tests usually result from the improper statement of the null hypothesis, a misunderstanding of the underlying assumptions of such tests, and the misinterpretation of the findings. Perhaps the greatest danger in applying inferential methods is what is referred to as a "spuriousness". For example, a conclusion is spurious when either there are illegitimate inferences of causation or when two variables are related only by a third:

> Studies have indicated a high correlation between poverty and delinquent behavior. Children of poor families naturally tend toward crime and delinquency.

The point here is that the existence of a correlation does not prove the causal connection. As an example of the second problem, consider the earlier discussion of the relationship between density and the crime rate. The model implied here is:

higher density
higher crime rate

which apparently has some merit. However, population density does not directly cause crimes to occur. Instead, there must be some intervening factors such as reduced police visibility which results in the higher crime rates:

higher density
less police visibility
higher crime rate

A final problem in making inferences is suggested by the scattergrams in Chapter Four. In these scattergrams only cities with populations of between 250,000 and 400,000 are presented. What would the scattergram look like if all U.S. cities were plotted? Could the same inferences be drawn about the relationship between law enforcement and crime incidence? Measurement error, sampling error, and logical errors must be carefully considered in evaluating the results of a statistical test.

II. T-Test

A. Assumptions

Do black robbery offenders differ from white robbery offenders with regard to their mean age? Does the mean elapsed time for felony case dispositions in the Chaos City Police Department exceed the standard of five working days? The first question involves making an inference about a difference from two samples. The second question involves testing the significance of a single mean. However both questions may be analyzed using a t-test if the test's assumptions and conditions are met. These include:

(1) the sample(s) is independently drawn;
(2) the population is normally distributed and its mean(s) and variance(s) are unknown;
(3) the variable-of-interest is an interval or ratio scale measure; and
(4) the sample is small (less than 30).

The assumption that the underlying distribution of a variable is normal (i.e., bell-shaped) is important to many inferential methods including the correlation and regression techniques discussed at the end of the chapter. Several methods are used for checking this assumption, the most direct being an inspection of the histogram. If it appears bell-shaped, has only one mode, and not many outliers, one may reasonably assume a normal distribution. Fortunately, the practical necessity of a normal distribution or the need for a particular sample size is not great in a t-test and many of the assumptions can be violated without great risk.[5]

B. A One-Sample Problem

Chaos City analysts have been asked to assess the Police Department's compliance with a standard established by the state legislature that felony cases--from the point of arrest to police disposition--should be processed in less than four working days. The analysts observed the disposition of the first nine felony arrests in 1978 and recorded the elapsed times. These were (in days): 1, 2, 2.5, 3, 1, 2.5, 3.5, 4.5, 4.0, and 6.0. The null hypothesis is that the mean elapsed time is greater than or equal to the four day standard. This may be expressed as:

$$H_0: \bar{x} \geq 4$$

The alternative hypothesis is that the mean is less than four days, or

$$H_A: \bar{x} \quad 4$$

This problem requires that the sample mean and the standard deviation be calculated and, based on these, a t-statistic determined. Exhibit 5-1 presents these calculations. The calculated value of the t-statistic is 2.02. The analysts decide on a significance level of .05 and since the number of degrees of freedom is equal to (n-1) or 10-1 = 9, the table value of t may be found in Exhibit 5-2 to be 1.833. In this exhibit the columns correspond to levels of significance--.10, .05, .025--and the rows to degrees of freedom--8 to 25. Since the calculated t (2.02) is greater than the table t (1.833), there is sufficient evidence to reject the hypothesis and conclude that the mean time is less than four days. However, the six day maximum value in the sample should be a concern, and a larger sample might be developed to confirm the conclusion.

EXHIBIT 5-1.

T-TEST, CALCULATIONS OF t-STATISTIC,
ELAPSED TIME FELONY CASE DISPOSITION,
CHAOS CITY POLICE DEPARTMENT, 1977

1. Calculate Mean and Standard Deviation

Variable	N	Min	Max	Mean ($\bar{X}$)	Standard Deviation(s)
Elapsed Time	10	1	6	3.00	1.5635

2. Calculate the t-Statistic

$$t = \frac{\bar{x} - (\text{value})}{s/\sqrt{N}} \qquad \text{where 4 = value}$$

$$t = \frac{3.0 - 4}{1.5635/\sqrt{10}}$$

$$t = 2.02$$

Source: hypothetical data

EXHIBIT 5-2.

CRITICAL VALUES OF t-STATISTIC

d.f.*	$t_{.10}$	$t_{.05}$	$t_{.025}$
8	1.397	1.860	2.306
9	1.383	1.833	2.262
10	1.372	1.812	2.228
11	1.363	1.796	2.201
12	1.356	1.782	2.179
13	1.350	1.771	2.160
14	1.345	1.761	2.145
15	1.341	1.753	2.131
16	1.337	1.746	2.120
17	1.333	1.740	2.110
18	1.330	1.734	2.101
19	1.328	1.729	2.093
20	1.325	1.725	2.086
21	1.323	1.721	2.080
22	1.321	1.717	2.074
23	1.319	1.714	2.069
24	1.318	1.711	2.064
25	1.316	1.708	2.060

*d.f. = degrees of freedom

Source: William Mendenhall, Introduction to Probability and Statistics 3rd Ed. (Belmont: Duxbury Press, 1971), p. 419.

C. A Two Sample Problem

Chaos City analysts are also interested in learning if the mean age of white robbery offenders is greater than the mean age of black robbery offenders. Using the data from Exhibit 1-4, they propose a t-test of the null hypothesis that the mean age of the white offender group is equal to or less than the black group. This may be expressed as:

$$H_o: \bar{x}_1 \leq \bar{x}_2$$

Where x_1 = mean age, white robbers and
x_2 = mean age, black robbers

The alternative hypothesis is the mean age of the white group is greater than that of the black group. This may be expressed as:

$$H_a: \bar{x}_1 > \bar{x}_2$$

The next step in performing a t-test is to calculate, first, the sample means and standard deviations for the two groups; second, calculate a "pooled-variance" statistic based on both samples; and third, using the "pooled-variance" statistic, calculate the t-statistic. These calculations are presented in Exhibit 5-3.

EXHIBIT 5-3.

t-TEST, CALCULATIONS OF t-STATISTIC,
MEAN AGE OF BLACK AND WHITE ROBBERY OFFENDERS,
CHAOS CITY, 1977

1. Calculate Group Means and Standard Deviations.

DESCRIPTIVE MEASURE No. 1 of RACE: WHITE

Variable 1	N_1	Minimum	Maximum	Mean($\bar{X}_1$)	Std Dev(S_1)
OFF. AGE	8	20.000	41.000	28.500	6.1644

DESCRIPTIVE MEASURE No. 2 of RACE: BLACK

Variable 2	N_2	Minimum	Maximum	Mean($\bar{X}_2$)	Std Dev(S_2)
OFF AGE	6	16.000	24.000	19.333	2.8752

2. Calculate the "pooled variance".

$$S^2 = \frac{(n_1 - 1)S_1^2 + (n_2 - 1)S_2^2}{n_1 + n_2 - 2}$$

$$S^2 = \frac{(8 - 1)38 + (6 - 1)8.27}{8 + 6 - 2}$$

$$S^2 = 25.61$$

3. Calculate the t-statistic

$$t = \frac{\bar{x}_1 - \bar{x}_2}{S\sqrt{1/n_1 + 1/n_2}}$$

Where $S = S^2$

$$t = \frac{28.5 - 19.3}{5.06\sqrt{1/8 + 1/6}}$$

$$t = 3.367$$

Source: hypothetical data

In a two sample test the number of degrees of freedom is equal to $n_1 + n_2 - 2$ or in this problem (8 + 6-2) or 12 d.f. Using a level of significance of .05, the table t-statistic is 1.782. Since the calculated t-statistic (3.367) exceeds the critical value of t (1.782), there is sufficient evidence to reject the null hypothesis and conclude that the difference in mean ages (28.5 versus 19.3) is significant.

Exhibit 5-4 is a standard output of a MIDAS program used to calculate a t-statistic for the data just described. In column #1 of the output is the label of the variable being tested and the total sample size. In column #2, the mean, variance, and sample size for white robbery offenders only is printed. In column #3 is printed the same descriptive statistics for the comparison group--black robbery offenders. The calculated t-statistic is presented in column #4. Note that the output t-statistic is slightly smaller than the calculated t-statistic. This is due primarily to rounding error. The degree of freedom is presented in column #5. Column #6 is the "attained significance level" which is the smallest significance value for which the t-statistic calculated leads to a rejection of the null hypothesis. With the attained significance equal to or greater than .0057, including .05, it is very likely that the mean age of black robbery offenders is less than the mean age of white robbery offenders. The practical significance of such a finding, of course, must be related to programmatic or policy alternatives under consideration.

EXHIBIT 5-4.

t-TEST, MIDAS OUTPUT,
MEAN AGE OF BLACK AND WHITE OFFENDERS,
CHAOS CITY, 1977

Column #1		#2	#3	#4	#5	#6
VARIABLE	RACE	WHITE	BLACK	TEST STATISTIC	DF	SIGNIF
1.	MEAN	28.500	19.3330	T = 3.3539	12	.0057
OFF AGE	VAR	38.000	8.2667			
(TOTAL=14)	N	8	6			

Source: hypothetical data

III. Chi Square Goodness-of-Fit Test

A. An Example

A second test of difference is used to compare the distribution of a categorical variable against an expected distribution. A survey was conducted of Chaos City residents 12 years of age or older. One of the questions was, "How would you rate the performance of the Chaos City Police?" Respondents were given three choices: good, average or poor. It was expected that about 1/3 of the residents would evaluate performance as poor, 1/3 as good and 1/3 as average. The Chi Square Goodness-of-Fit test may be used to compare this expected distribution to the survey results presented in Exhibit 5-5.

EXHIBIT 5-5.

EVALUATION OF POLICE PERFORMANCE,
PUBLIC OPINION SURVEY,
CHAOS CITY, 1977

Evaluation of Police Performance	n	%
Good	561	37.7%
Average	680	45.7%
Poor	246	16.5%
TOTAL	1487	99.9%*

* does not total 100% due to rounding error.

Source: hypothetical data

In this example, the null hypothesis is that there is no difference between the category proportions. The alternative hypothesis is that at least one of the category proportions is not equal to 1/3. The percentages indicate that the null hypothesis is false but, to be sure, a statistical test is performed. The first step in calculating a chi square statistic is to determine the expected cell counts based on the hypothesized proportions of 1/3 in each cell. The second step is to calculate the chi square statistic using the formula indicated in Exhibit 5-6. The calculation of both the expected cell counts and the chi square statistic are presented in this exhibit.

EXHIBIT 5-6.

CALCULATION OF χ^2,
GOODNESS-OF-FIT STATISTIC,
POLICE PERFORMANCE RATINGS,
CHAOS CITY, 1977

1. Calculate the Expected Cell Frequencies

Evaluation	Observed (O)	Expected (E)
Good	561	1487 (1/3) = 495
Average	680	1487 (1/3) = 495
Poor	246	1487 (1/3) = 495
TOTAL	1487	

2. Calculate Chi Square Statistic

$$\chi^2 = \Sigma \frac{(O - E)^2}{E}$$

Where E = expected category frequency
O = observed category frequency

$$\frac{(561 - 495)^2}{1487} + \frac{(680 - 495)^2}{1487} + \frac{(246 - 495)^2}{1487}$$

$$= 2.93 + 23.02 + 41.70$$

$$= 67.64$$

Source: hypothetical data

The table value of χ^2 is determined by first setting a level of significance, and, second, determining the number of degrees of freedom associated with the problem. As with a t-test, a .05 level of significance will be used. To calculate the number of degrees of freedom (K - 1) used, where K equals the number of categories. The number of degrees of freedom in this problem is equal to 3-1 or 2 d.f. Critical values of the chi square statistic are presented in Exhibit 5-7. The table value of χ^2 for a = .05 and 2 d.f. is equal to 5.99. Since the calculated value (203.19) exceeds the table value (5.99) there is sufficient evidence to indicate the "fit" is not good at all and the null hypothesis is rejected. This evidence supports the clear impression, drawn from simple inspection of percentages give, that the majority of Chaos residents favorably evaluate their police services.

EXHIBIT 5-7.

CRITICAL VALUES OF CHI SQUARE

	DEGREES OF FREEDOM	5%	1%
	1	3.84	6.63
	2	5.99	9.21
VALUES OF	3	7.81	11.34
CHI SQUARE	4	9.49	13.28
AT 5% & 1%	5	11.07	15.09
LEVELS OF	6	12.59	16.81
SIGNIFICANCE	7	14.07	18.48
	8	15.51	20.09
	9	16.92	21.67
	10	18.31	23.21

Source: Robert Parsons, Statistical Analysis: A Decision-Making Approach (N.Y.: Harper and Row, 1974), p. 824.

B. Assumptions

The χ^2 goodness-of-fit test is only appropriate under the following conditions and assumptions:

(1) The variable-of-interest is either nominal or ordinal or is a grouped interval or ratio level measure.
(2) Category assignments are mutually exclusive and exhaustive.
(3) The outcomes are independent.
(4) Sample size is large ($n > 30$).
(5) Expected category counts are greater than 5.

C. Use in Assessing Change

As a second example, consider an analysis of the changing pattern in the community's evaluation of police services. Two years prior to the 1977 Chaos City survey, an identical community survey had been conducted and the same evaluative question was asked. The percentage distribution by rating for both surveys is presented in Exhibit 5-8. The percentages indicate a general improvement in the evaluation but, to be sure, the analyst decides to test if the current rating is identical to the one of two years ago. The null hypothesis, therefore, is that there was no change in resident evaluations of the police. The alternative hypothesis is that the evaluation of police performance in 1977 was different than in 1975.

EXHIBIT 5-8.

EVALUATION OF POLICE PERFORMANCE, CHAOS CITY, 1975 and 1977

Evaluation	Percent 1975	Percent 1977
Good	36.2	37.7%
Average	44.1	45.7%
Poor	19.7	16.6%
n	145.0	148.0%

Source: hypothetical data

Exhibit 5-9 presents the calculation of, first, the expected category frequencies, and second, the chi square statistic. In this problem the 1975 category percentages are used to derive expected category counts. The comparison of observed category counts and expected category counts is the test of difference and the hypothesis is that the 1977 distribution is the same as two years ago.

EXHIBIT 5-9.

CALCULATION OF χ^2 GOODNESS-OF-FIT STATISTIC,
CHANGE IN POLICE PERFORMANCE RATINGS,
CHAOS CITY, 1975-1977

1. Calculate the Expected Cell Frequencies

Evaluation	Observed (1977)	Expected (1977)
Good	561	1487 (36.2) = 538
Average	680	1487 (44.1) = 656
Poor	246	1487 (19.7) = 293
TOTAL	1487	

2. Calculate Chi Square Statistic

$$\chi^2 = \sum \frac{(O-E)^2}{E}$$

$$\chi^2 = \frac{(561-538)^2}{561} + \frac{(680-656)^2}{680} + \frac{(246-293)^2}{246}$$

$$\chi^2 = .94 + .84 + 8.98$$

$$\chi^2 = 10.76$$

Source: hypothetical data

The number of degrees of freedom is equal to K - 1 where K is the number of categories or in this problem 3-1 or 2 d.f. Assuming a level of significance of .05 from Exhibit 5-7, the table value of χ^2 is equal to 5.99. Since the calculated value exceeds the table value, the conclusion is that the null hypothesis of no change may be rejected at the .05 level, and as the percentages indicate, some improvement has occurred.

D. Use in Making Comparisons Between Jurisdictions

As a last example consider the distribution of selected crimes in Chaos City as compared to the state distribution of these same crimes. The percent distribution by crime is presented in Exhibit 5-10 for both Chaos City and the state of Paradise. These percentages indicate that Chaos City is very similar in its profile to the statewide experience in these crime categories. As a check on this impression, a test of the null hypothesis of no difference between the two is made; that is, a test of whether the Chaos City crime distribution is identical to the Paradise crime distribution is made. The alternative hypothesis is that the two distributions are different.

EXHIBIT 5-10.

PERCENT DISTRIBUTION FOR SELECTED CRIMES,
CHAOS CITY AND STATE OF PARADISE, 1977

Category	Percent Distribution 1977 Chaos City	State of Paradise
Residential Burglary	38.2%	38.0%
Commercial Burglary	9.8%	10.0%
Commerical Robbery	3.8%	4.0%
Street Robbery	6.6%	7.0%
Assault	18.9%	18.5%
Rape	.8%	.8%
Auto Theft	21.9%	21.7%

N = 18,300
Source: hypothetical data

Exhibit 5-11 presents the calculation of the expected cell frequencies based on state percentages and the chi square statistic. With the number of degrees of freedom equal to 7 - 1 or 6 d.f. and the level of significance equal to .05., the table value of χ^2 is equal to 12.59. Therefore, the null hypothesis can not be rejected (12.59 > 9.05), and it can be concluded that the two profiles are, indeed, similar.

EXHIBIT 5-11.

CALCULATION OF χ^2 GOODNESS-OF-FIT STATISTIC,
COMPARISON OF CRIME IN CHAOS CITY
AND THE STATE OF PARADISE, 1977

1. Calculated Expected Values

Category	Observed	Expected
Residential Burglary	7000	18300 (38%)* = 6954
Commercial Burglary	1800	18300 (10%) = 1830
Commercial Robbery	700	18300 (4%) = 734
Street Robbery	1200	18300 (7%) = 1281
Assault	3450	18300 (18.5%) = 3385
Rape	150	18300 (0.8%) = 146
Auto Theft	4000	18300 (21.7%) = 3971
	18300	

*State of Paradise percent distribution

2. Calculate Chi Square Statistic

$$\chi^2 = \sum \frac{(O-E)^2}{E}$$

$$\chi^2 = \frac{(7000-6954)^2}{6954} + \frac{(1800-1830)^2}{1830} + \frac{(700-734)^2}{734} + \frac{(1200-1281)^2}{1281} + \frac{(3450-3385)^2}{3385} + \frac{(150-146)^2}{146} + \frac{(4000-3971)}{3971}$$

$$\chi^2 = .30 + .49 + 1.57 + 5.12 + 1.25 + .11 + .21$$

$$\chi^2 = 9.05$$

Source: hypothetical data

IV. Chi Square Test of Independence

The chi square statistic may also be used as a test of association to help interpret cross-classification tables. The test indicates the degree of independence of two classifications. For example, Chaos City analysts have produced a cross-classification of police evaluation by neighborhood and have percentaged this data in Exhibit 5-12. Substantial variation is evident: for example, 67.7% of the Washington residents evaluated police services as good but only 13.1% of Park residents felt the services were good. No Washington residents evaluated performance as poor but 33% of Park residents rated service as poor. The analysts suspect that there is an association between neighborhood residence and citizen evaluation of police performance.

EXHIBIT 5-12.

PERCENTAGED CROSS-CLASSIFICATION,
POLICE EVALUATION BY NEIGHBORHOOD,
CHAOS CITY SURVEY, 1977

EVALUATION	NEIGHBORHOOD					
	Central	Westside	University	Park	Washington	TOTALS
Good	64 25.8%	197 49.0%	98 39.2%	47 13.1%	155 67.7%	561 37.7%
Average	122 49.2%	161 40.0%	130 52.0%	193 53.9%	74 32.3%	680 45.7%
Poor	62 25.0%	44 10.9%	22 8.8%	118 33.0%	0 0.0%	246 16.5%
TOTALS	248 16.7%	402 27.0%	250 16.8%	358 24.1%	229 15.4%	1487

Source: hypothetical data

A. Assumptions

The chi square test of independence is used to test a null hypothesis of independence between two classifications. In this example the null hypotheses is that evaluation of police performance is independent of neighborhood. The alternative hypothesis is that a respondent's attitude about police services depends on their place of residence. A chi square test requires, at a minimum:

(1) two nominal or ordinal variables that have been cross-classified,
(2) a large sample size (if too large, however, chi square statistic is not very useful),
(3) outcomes which are independent, and categories that are mutually exclusive and exhaustive, and
(4) expected cell counts which are greater than five.

Since the first three requirements are met in this problem, the Chaos City analyst proceeds to use a chi square statistic.

B. Calculations and Interpretation

Calculations of expected values for this cross-classification are presented in Exhibit 5-13. These values represent the cell counts one would expect to find assuming the null hypothesis is true. Once the expected values have been determined, the chi square statistic can be calculated. This calculation is presented in Exhibit 5-14.

EXHIBIT 5-13.

CALCULATION OF EXPECTED CELL COUNTS*, POLICE EVALUATION BY NEIGHBORHOOD, CHAOS CITY SURVEY, 1977

Good, Central	E_1	=	$\frac{(561)(248)}{1487}$	= 94
Good, Westside	E_2	=	$\frac{(561)(402)}{1487}$	= 152
Good, University	E_3	=	$\frac{(561)(250)}{1487}$	= 94
Good, Park	E_4	=	$\frac{(561)(358)}{1487}$	= 135
Good, Washington	E_5	=	$\frac{(561)(229)}{1487}$	= 155
Average, Central	E_6	=	$\frac{(680)(248)}{1487}$	= 113
Average, Westside	E_7	=	$\frac{(680)(402)}{1487}$	= 184
Average, University	E_8	=	$\frac{(680)(250)}{1487}$	= 114
Average, Park	E_9	=	$\frac{(680)(358)}{1487}$	= 164
Average, Washington	E_{10}	=	$\frac{(680)(229)}{1487}$	= 105
Poor, Central	E_{11}	=	$\frac{(246)(248)}{1487}$	= 41
Poor, Westside	E_{12}	=	$\frac{(246)(402)}{1487}$	= 67
Poor, University	E_{13}	=	$\frac{(246)(250)}{1487}$	= 41
Poor, Park	E_{14}	=	$\frac{(246)(358)}{1487}$	= 59
Poor, Washington	E_{15}	=	$\frac{(246)(229)}{1487}$	= 38

*Expected Value = $\frac{\text{(Row Total) (Column Total)}}{\text{TOTAL}}$

Note that all expected cell counts are greater than five, thus, this problem meets one of the requirements for applying the chi square statistic.

EXHIBIT 5-14.

CALCULATION OF CHI SQUARE STATISTIC,
POLICE EVALUATION BY NEIGHBORHOOD,
CHAOS CITY SURVEY, 1977

Use the following formula to calculate chi-square:

$$\chi^2 = \Sigma \frac{(O - E)^2}{E}$$ where: O = Observed cell counts
E = Expected cell counts

Using the observed cell count data from Exhibit 5-13 and the expected cell counts from Exhibit 5-14 a chi square statistic can be calculated:

$$\chi^2 = \frac{(64-94)^2}{94} + \frac{(197-152)^2}{152} + \frac{(98-94)^2}{94} + \frac{(47-135)^2}{135} +$$

$$\frac{(155-155)^2}{155} + \frac{(122-113)^2}{113} + \frac{(161-184)^2}{184} + \frac{(130-114)^2}{114} +$$

$$\frac{(193+164)^2}{164} + \frac{(74-105)^2}{105} + \frac{(162-41)^2}{41} + \frac{(44-67)^2}{67} +$$

$$\frac{(22-41)^2}{41} + \frac{(118-59)^2}{59} + \frac{(0-38)^2}{38}$$

$$\chi^2 = 9.57 + 13.32 + .17 + 57.36 + 0 + .72 + 2.88 + 2.25 + 5.13$$

$$+ 9.15 + 357.09 + 7.90 + 11.8 + 84.9 + 38$$

$$\chi^2 = 600.24$$

Source: hypothetical data

The next step in performing a chi square test is to determine a table value for the chi square statistic. This requires deciding on a level of significance and determining the degrees of freedom associated with the problem. The concept of degrees of freedom as applied to a cross-classification problem is illustrated in Exhibit 5-15. In the diagram, assume that all the marginals have been assigned values, that is Row Total 1, Row Total 2, Column Total 1 through Column Total 6 are all specified. The consequence is that only the checked cells can be assigned values freely. Once these cells have been assigned, the remaining cells of the table must take on specified values. In this context the number of degrees of freedom is equal to the number of freely specified cells which is equal to five. In the police performance problem there are three rows and five columns; therefore the number of degrees of freedom is equal to (3-1)X(5-1) or 8. The table value of χ^2 for 8 d.f. and a level of significance of .05 (from Exhibit 5-7) is 15.51. Since the calculated value of chi square (278.43) exceeds the table value (15.51), the null hypothesis is rejected. The analysts conclude that resident attitudes about police performance do depend on the neighborhood in which they live and, in particular, residents of Washington and Westside rate police services favorably while residents of Park and Central tend to be less favorably disposed toward the police.

EXHIBIT 5-15

DEGREES OF FREEDOM IN A CROSS CLASSIFICATION TABLE

Degrees of Freedom are determined by multiplying the number of rows minus one times the number of columns minus one.

(Rows – 1) (Columns – 1) = Degrees of Freedom

	CT1	CT2	CT3	CT4	CT5	CT6	
✓ = Freely Specified	✓	✓	✓	✓	✓	O	RT1
O = Not Freely Specified	O	O	O	O	O	O	RT2

2×6

(2 – 1) (8 – 1) = 5 Degrees of Freedom

C. A Second Example

A second question on the Chaos City survey asked residents if they were limiting their activity due to a fear of crime. Respondents could answer 'yes' or 'no'. Analysts tested the null hypothesis that the limiting of activity did not depend on neighborhood. Exhibit 5-16 is the MIDAS output for this cross-classification, including the expected cell counts (expected), and the chi square statistic. Some variation is evidenced in the dependent variable (limited activity) across the columns (i.e., across the categories the independent variable neighborhood), e.g., the column % varies from 41.2% in University to 56% in Central for the percent of respondents who answered 'yes'. The table value of χ^2 with d.f.= 4 and a level of significance equal to .05 is 9.49. Since the calculated χ^2(15.36) exceeds the table value (9.49) there is sufficient evidence to conclude that the percent of Chaos City residents who limit their activity does depend on neighborhood.

EXHIBIT 5-16.

CROSS-CLASSIFICATION AND χ^2 MIDAS OUTPUT,
LIMIT ACTIVITY BY NEIGHBORHOOD,
CHAOS CITY SURVEY, 1977

LIMITED ACTIVITY		NEIGHBORHOOD				
		Central	Westside	University	Park	Washington
N		248	402	250	360	229
Total %		16.7	27.0	16.8	24.2	15.4
Yes	685	139	181	103	169	93
Expected		114	185	115	166	105
Total %	46.0	9.3	12.2	6.9	11.3	6.2
Row %		20.3	26.4	15.0	24.7	13.6
Column %		56.0	45.0	41.2	46.9	40.6
No	804	109	221	147	191	136
Expected		134	217	135	194	124
Total %	54.0	7.3	14.8	9.9	12.8	9.1
Row %		13.6	27.5	18.3	23.8	16.9
Column %		44.0	55.0	58.8	53.1	59.4

Total = 1489
Chi Square = 15.360

Source: hypothetical data

D. General Considerations

To summarize, the Chi Square test may be used to indicate the degree of independence of two classifications thus aiding in the interpretation of cross-classification tables. Chi Square requires categorical data, assumes that outcomes are independent, and assumes that there is a minimum expected cell frequency of at least five for each cell. The test does not preclude spurious relations nor does it indicate the presence or absence of intervening factors. Finally, the Chi Square test of independence should be used in conjunction with percentage comparisons of a cross-classification table, thus enriching the interpretation of the categorical data.

Problems in utilizing tests of association, such as chi square, usually result from an improper statement of the null hypothesis, a misunderstanding of the underlying assumptions of such tests, and/or a misinterpretation of the findings. Perhaps the greatest danger in applying tests of association is the problem of imputing a causal relationship when none, in fact, exists. Such spurious relationships are made when either there are illogical inferences of causation or when two variables are related only by a third (an intervening variable). In the two previous examples an intervening variable may be the age composition

of the neighborhood, i.e., a higher proportion of senior citizens live in Central and Central has the highest proportion of respondents who limit their activity due to a fear of crime. Such factors need careful attention in performing this type of statistical test.[7]

V. Correlation Coefficient

A. Characteristics

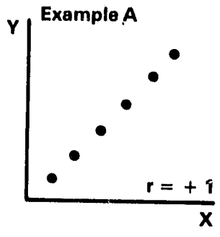
The correlation coefficient (r) is a measure of association which is used to describe the degree to which one interval or ratio scale variable is related to another. It is a frequent companion to descriptive and comparative methods, particularly scattergrams.

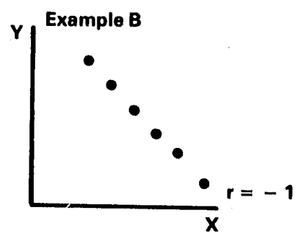
Values of the correlation coefficient range between -1 and +1. High positive correlations reflect distributions in which high values of the independent variable (x) are associated with high values of the dependent variable (y) and small values of x are associated with small values of y. As an example there is a positive correlation (+.69) between the number of police per 100,000 population and the robbery rate in the 27 city data set (Exhibit 3-4): i.e., the higher the robbery rate, the higher the police rate, generally. A negative correlation indicates that high values of the independent variable (x) are associated with low values of the dependent variable -- an inverse relationship. The correlation between the age of victims and the dollar value of stolen property for the robbery data set (Exhibit 1-4) is -.44; older victims tend to have less property stolen from them (although r is not significant at the 5% level). Section D discusses the testing of the significance of r.

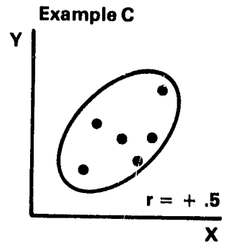
Scattergrams of five different relationships and their associated correlation coefficients are presented in Exhibit 5-17.

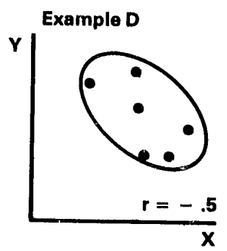
EXHIBIT 5-17

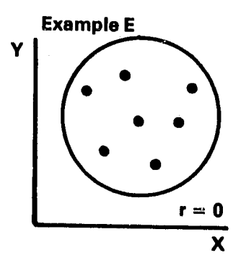
SCATTERGRAMS AND CORRELATION COEFFICIENTS











The direction of a correlation (positive or negative) can be seen instantly by whether the scattergram slopes up (Examples A and C) or down (Examples B and D) from left to right. The fatter the scatter (Example E) the smaller the r, the extremes being r = 1 (then the scattered points fall exactly on a straight line) and when r is 0.8

B. Calculation and Interpretation

To illustrate the calculation of a correlation coefficient, seriousness scores for each of ten offenses have been determined by Chaos City analysts. These seriousness scores are correlated with the elapsed time from arrest to police disposition. (See Exhibit 5-1 which calculates a t-statistic for the elapsed time.) Exhibit 5-18 presents the formula and calculation of the correlation coefficient between seriousness (x) and elapsed time (y). A strong positive correlation of .84 indicates that as the seriousness of a felony offense increases so does the police processing time. The practical significance of a correlation coefficient varies from a slight relationship (0 to +.24), some relationship (+.25 to +.49), moderate relationship (+ .50 to + .74), to a strong relationship (+.75 to +1.).9 Note that a correlation coefficient should not be interpreted as a percentage, e.g., .83 is not 83.6%.

EXHIBIT 5-18.

CALCULATION OF CORRELATION COEFFICIENT,
EFFECT OF SERIOUSNESS ON PROCESSING TIME,
FELONY ARRESTS, CHAOS CITY, 1977

1. Prepare Matrix

	(Elapsed Time) Y	(Seriousness) X	XY	Y^2	X^2
	1.0	3	3	1.00	9
	2.0	5	10	4.00	25
	2.5	4	10	6.25	16
	3.0	7	21	9.00	49
n = 10	1.0	17	17	1.00	289
	2.5	14	35	6.25	196
	3.5	18	63	12.15	324
	4.5	34	153	20.25	1156
	4.0	24	96	16.00	576
	6.0	42	252	36.00	1764
	30.0	168	660	112.00	4404

2. Calculate Correlation Coefficient

$$r = \frac{n(\Sigma xy) - (\Sigma x)(\Sigma y)}{n\sqrt{\Sigma x^2 - (\Sigma x)^2}\ \ n\sqrt{\Sigma y^2 - (\Sigma y)^2}}$$

$$r = \frac{10(660) - 30(168)}{10\sqrt{(4404) - 168^2}\ \ 10\sqrt{(112) - 30^2}}$$

$$r = \frac{1560}{1865}$$

$$r = .836$$

Source: hypothetical data

C. Testing the Significance of r

The correlation coefficient, like the mean and standard deviation, is a descriptive statistic for a population of interest. However, for a sample such as the ten case example just presented, if it can be assumed that such a sample represents a random sample from a larger population of offenses, then the correlation coefficient calculated is an estimate of the unknown population coefficient. In such problems, the null hypothesis to be tested is that (rho) -- the population correlation coefficient -- is equal to zero. If the null is true, then there is no relationship. The alternative hypothesis is that the correlation coefficient is not equal to zero, and that a relationship exists.

Exhibit 5-19 presents table r values for specified degrees of freedom and two levels of significance. The number of degrees of freedom is equal to n-2: in this problem (10-2) or 8 d.f. Assume that $\alpha = .05$, the table value of r is equal to .576. Since the calculated value of .836 exceeds the table value, there is sufficient evidence to reject the null hypothesis and conclude the two variables are positively correlated. Thus, as seriousness increases in offenses, police and prosecutors may predict an increase in the processing time required to dispose of a case.

EXHIBIT 5-19.
CRITICAL VALUES OF r

d.f.*	Level of Significance .05	.01
3	.878	.959
4	.811	.917
5	.754	.874
6	.707	.834
7	.666	.798
8	.632	.765
9	.602	.735
10	.576	.708
11	.553	.684
12	.532	.661
13	.514	.641
14	.497	.623
15	.482	.606

* degrees of freedom = n-2

Source: Snedecor, George W. & Cochran, William G. Statistical Methods. 6th Edition. University Press, 1974 p. 557. Ames, Iowa State.

Exhibit 5-20 presents: (1) descriptive statistics for elapsed time and seriousness; (2) a scattergram of these two variables; and (3) correlation statistics. The correlation statistics provided are: (1) the number of cases, (2) the degrees of freedom (n-2), and (3) the critical values of r at two significance levels -- .05 and .01. This MIDAS output indicates that for the sample of nine offenses, the calculated value of r should exceed .6319 in order to reject the null hypothesis of $\rho = 0$ at the 5% level of significance and exceed .7646 (which it does) at the 1% level.

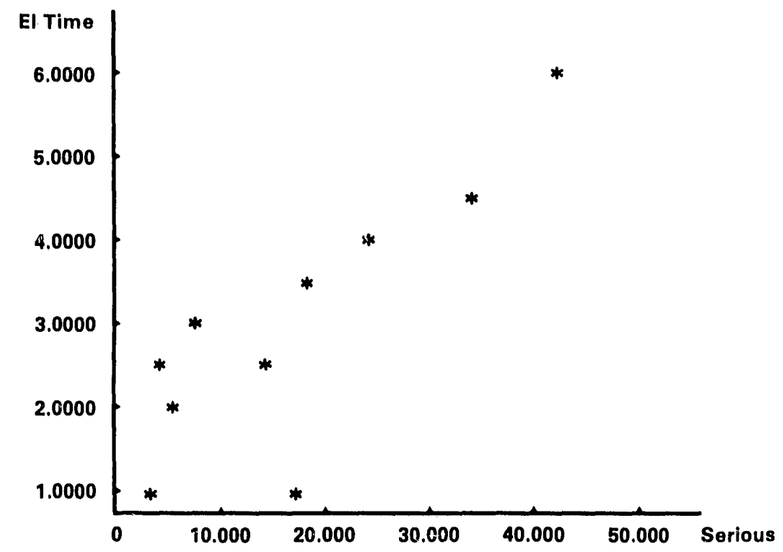
EXHIBIT 5-20

MIDAS OUTPUT, EFFECT OF SERIOUSNESS ON ELAPSED TIME, FELONY ARRESTS, CHAOS CITY, 1977

1. Descriptive Measures

Variable	N	Minimum	Maximum	Mean	Std Dev
1. El Time	10	1.0000	6.0000	3.0000	1.5635
2. Serious	10	3.0000	42.000	16.800	13.256

2. Scattergram



3. Correlation Statistics

N = 10 DF = 8 RC .0500 = .6319 RC .0100 = .7646

Correlation between 1. El Time and 2. Serious = .8363

Source: Hypothetical Data

C. State-Level Example

In Exhibit 5-21, data for the fifty states are presented on three variables: general local government expenditures in 1970, current operation police expenditures in 1971, and current operation police expenditures in 1976.[10] Exhibit 5-22 presents a MIDAS output that describes and relates local government expenditures and the 1971 police expenditure. A strong, positive correlation (.9353) significant at the 1% level is evidenced; i.e., states with high local government expenditures tend to have high police expenditures. Exhibit 5-23 describes and relates the local expenditure with the 1976 police expenditure. Note the significant increase in police expenditures -- from an average of about $1.6 million to over $3 million. The reduced correlation between general and police expenditures -- from .93 in 1971 to .89 in 1976 -- may not be significant. Finally, the increased range and standard deviation indicate greater variation, generally in 1976 police expenditures relative to 1971 levels.

EXHIBIT 5-21.

COMPARATIVE STATE DATA SET

STATE	GEN LOC*	POL E71*	POL E76*
ALABAMA	7077	99.54	227.89
ALASKA	880	85.05	196.68
ARIZONA	4859	119.37	279.81
ARKANSAS	3501	52.21	103.59
CALIFORNIA	83063	1229.60	2214.00
COLORADO	6566	85.47	153.73
CONNECTICUT	7996	131.50	212.56
DELAWARE	1533	49.61	101.87
FLORIDA	16450	276.56	451.09
GEORGIA	10197	121.88	302.61
HAWAII	1254	2.67	12.91
IDAHO	1670	36.96	51.83
ILLINOIS	29186	393.16	608.84
INDIANA	13131	188.17	336.37
IOWA	8143	142.85	181.19
KANSAS	6729	79.07	121.72
KENTUCKY	5694	138.22	289.53
LOUISIANA	8688	146.82	375.81
MAINE	1839	49.89	84.60
MARYLAND	11606	168.19	416.69
MASSACHUSETTS	17802	158.54	375.55
MICHIGAN	22708	351.67	650.41
MINNESOTA	13300	80.45	215.32
MISSISSIPPI	4703	100.65	186.08
MISSOURI	11142	145.01	239.15
MONTANA	1809	27.85	44.89
NEBRASKA	4170	52.22	103.59
NEVADA	1870	24.14	61.49
NEW HAMPSHIRE	1543	28.18	53.01
NEW JERSEY	21401	314.43	539.34
NEW MEXICO	2676	64.09	114.53
NEW YORK	84902	695.26	1073.20
NORTH CAROLINA	10319	224.19	391.70
NORTH DAKOTA	1694	13.57	27.27
OHIO	27466	282.59	447.45
OKLAHOMA	5350	96.43	198.94
OREGON	6249	118.99	200.14
PENNSYLVANIA	27601	506.67	1131.50
RHODE ISLAND	1982	31.86	63.24
SOUTH CAROLINA	4021	104.96	227.56
SOUTH DAKOTA	1701	26.00	52.72
TENNESSEE	9032	102.34	157.83

TEXAS	25797	268.66	788.28
UTAH	2685	40.48	99.81
VERMONT	937	34.58	57.99
VIRGINIA	9692	252.28	519.45
WASHINGTON	9681	147.57	250.81
WEST VIRGINIA	2946	62.44	128.91
WISCONSIN	14873	108.57	218.10
WYOMING	1112	16.35	47.28

*in $100,000, GEN LOC = Total General Local Expenditures, 1970, POL E71 = Police Operating Expenditures, 1971, POL E76 = Police Operating Expenditures, 1976.

Source: Employment and Expenditures 1976 and U.S. City and County Data Book, 1972.

EXHIBIT 5-22

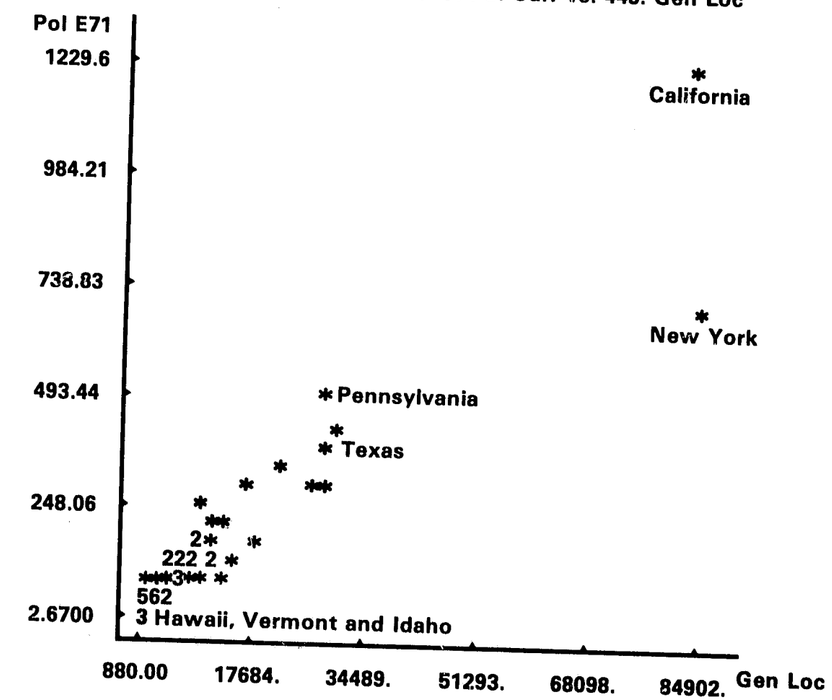
MIDAS OUTPUT, EFFECT OF GENERAL LOCAL EXPENDITURES ON POLICE EXPENDITURES, 1971

1. Descriptive Measures

Variable	N	Minimum	Maximum	Mean	Std Dev
7. Pol E71	50	2.6700	1229.6	161.56	203.87
445. Gen Loc	50	880.00	84902.	11724.	16892.

2. Scatter Plot

N = 50 out of 50 7. Pol Curr vs. 445. Gen Loc



Source: Exhibit 5-21

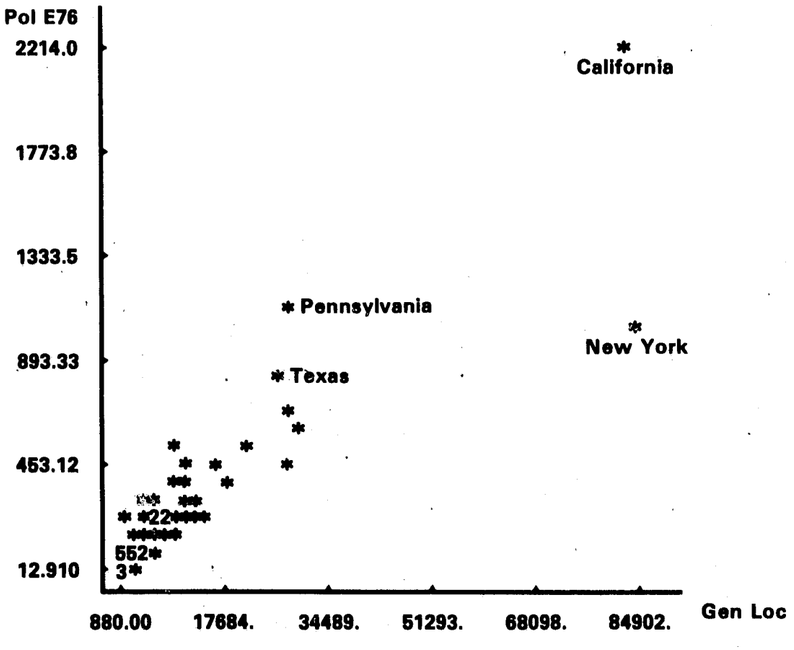
EXHIBIT 5-23

MIDAS OUTPUT, EFFECT OF GENERAL LOCAL EXPENDITURES ON POLICE EXPENDITURES, 1976

1. Descriptive Measures

Variable	N	Minimum	Maximum	Mean	Std Dev
277. Pol E76	50	12.910	2214.0	307.78	368.91
445. Gen Loc	50	880.00	84902.	11724.	16892.

2. Scatter Plot N = 50 out of 50 277. Pol Curr vs. 445. Gen Loc



3. Correlation Matrix

N = 50 DF = 48 RC .0500 = .2787 RC .0100 = .3610

Correlation between 277. Pol Curr and 445. Gen Loc = .8970

VI. Least Squares Regression

An inferential method widely used for prediction purposes is least squares regression. In this section the discussion of regression is focused on its application to time series data, although it has a much wider range of application as demonstrated by the example that concludes this section. The section first discusses characteristics of time series data, then introduces descriptive methods of trend analysis and then concludes with a discussion of least square regression. Throughout this section the prediction problem and the treatment of time series data are highlighted.

The systematic analysis of patterns over time is an essential aspect of criminal justice analysis because of the following:

- Prevention of crime is one basic goal of the criminal justice system.
- Criminal justice resources are limited; crime prevention priorities and system actions that are responsive to local remedial action must be identified.
- Evaluation of existing crime prevention programs and assessment of the likely consequences of future crime prevention strategies are most effectively accomplished through the analysis of past and present data.
- There is continually greater reliance on more systematic techniques for analyzing crime trends and predicting crime as the criminal justice system acquires more and better quality data, installs computer facilities, and, statistical techiques are refined and mastered.

Time series analysis involves techniques for categorizing and studying movements in time series data (that is, movements in data consisting of successive values of a variable at monthly, yearly, or other regular time intervals). All types of data, e.g., UCR, victimization, system performance, system resources, and juvenile justice, are amendable to such analyses.

What is the value of time series analysis? Change over a short time period -- most notably that from one year to the next -- can be misleading. Longitudinal data enable the analyst to conceptualize patterns and also facilitate further analyses. This has relevance for the following:

- Putting statistics in historical perspective -- a static picture does not say much about long term trends that may carry into the future.
- Assessing the relationship between existing programs and crime conditions -- for example, a sharp increase in reported rape between 1977 and 1978 after eight years of slow but steady increases might suggest that a program implemented in 1978 making it easier and less embarrassing for women to report a rape has had a desired impact.

- Estimating current condition -- for instance, UCR data often are not published for almost a year after they are collected. Time series analysis makes it possible to use data from past years to develop estimates of the current crime situation. A locality's crime profile for the current year can be constructed from these estimates for planning and evaluation.
- Determining the need for remedial actions -- for example, a planner may discover that the proportion of juvenile felons in Chaos City increased significantly in 1978, a fact that might encourage consideration of a range of programmatic responses. A review of trends for the prior ten year period might disclose that the proportion of juvenile felons is susceptible to large proportional changes -- both increases and decreases -- but has, in fact, changed relatively little since 1969. The analyst could then reasonably conclude that the increases in 1978 do not represent a fundamental shift.
- Forecasting -- an analysis of past system expenditures may permit one to make certain assumptions about future workloads and resource requirements. Based on these assumptions one can employ certain statistical techniques to predict systematically future resource needs.

A. Estimating a Trend

In chapter four the technique of preparing a time chart was described. This section covers procedures used to describe a time series data set. Specifically, short and extended time series are considered, as is the problem of seasonal or other regular fluctuations in a time series.

1. Short versus extended time series

Generally, it is easier to understand a current problem and predict future conditions on the basis of extended time series than on the basis of shorter ones. Short time series have a tendency to mask general trends. For example, a three-year series of annual robbery data might look like Exhibit 5-24. A longer ten-year series might reveal a very different trend, as seen in Exhibit 5-25. To minimize the error in description and prediction, it is sometimes helpful to use as long a time series as is available.

EXHIBIT 5-24.

THREE YEAR TIME SERIES OF ANNUAL ROBBERY DATA, CHAOS CITY, 1971–1974

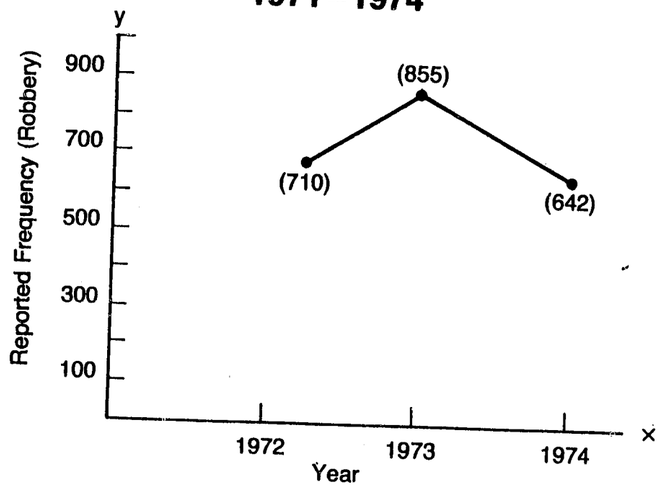
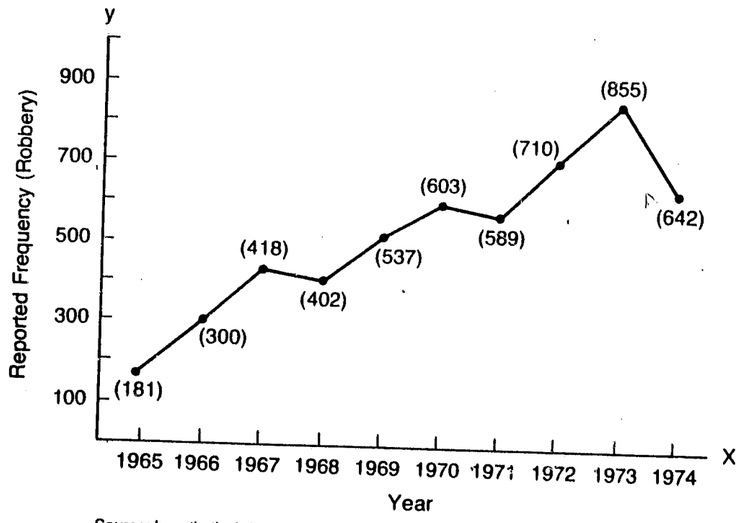


Exhibit 5-25.

TEN YEAR TIME SERIES OF ANNUAL ROBBERY DATA, CHAOS CITY, 1965–1974

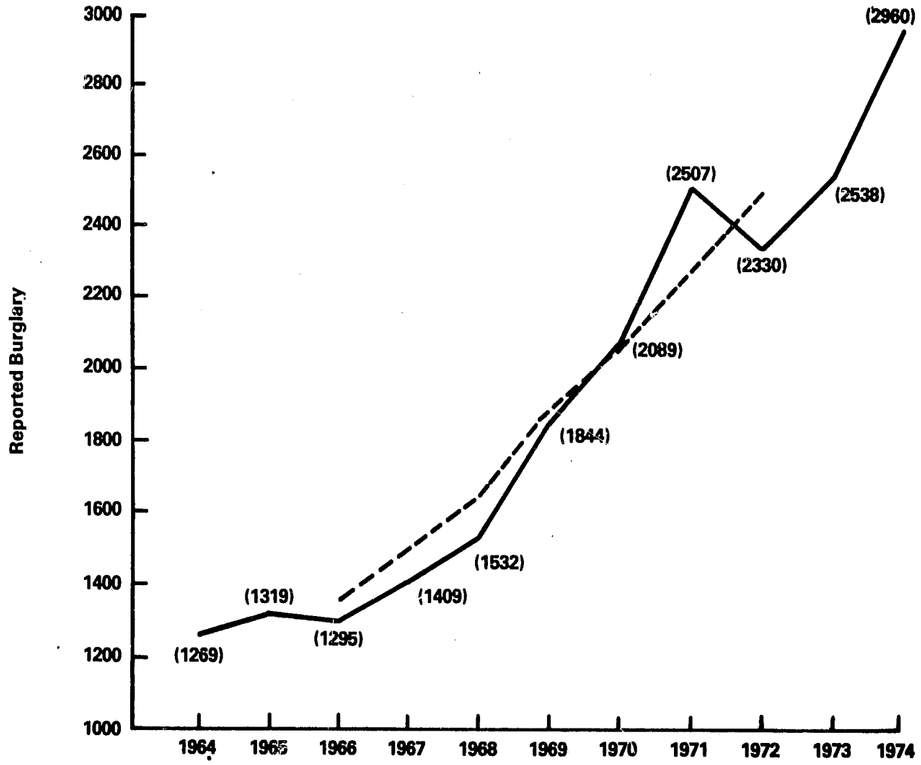


Source: hypothetical data

Extended time series lend themselves to comparative analysis, especially between different jurisdictions. Exhibit 5-26 is an eleven year time series of reported burglaries in Chaos City which clearly have been on the increase. This trend is compared to the burglary trend in four other cities in Exhibit 5-27. Also presented in the exhibit is the U.S. burglary trend. This required a second scale which is on the right side of the time chart. The change in scale between Exhibits 5-26 and 5-27 produces a marked de-emphasis of the importance in the increase of burglaries displayed for Chaos City.

EXHIBIT 5-26.

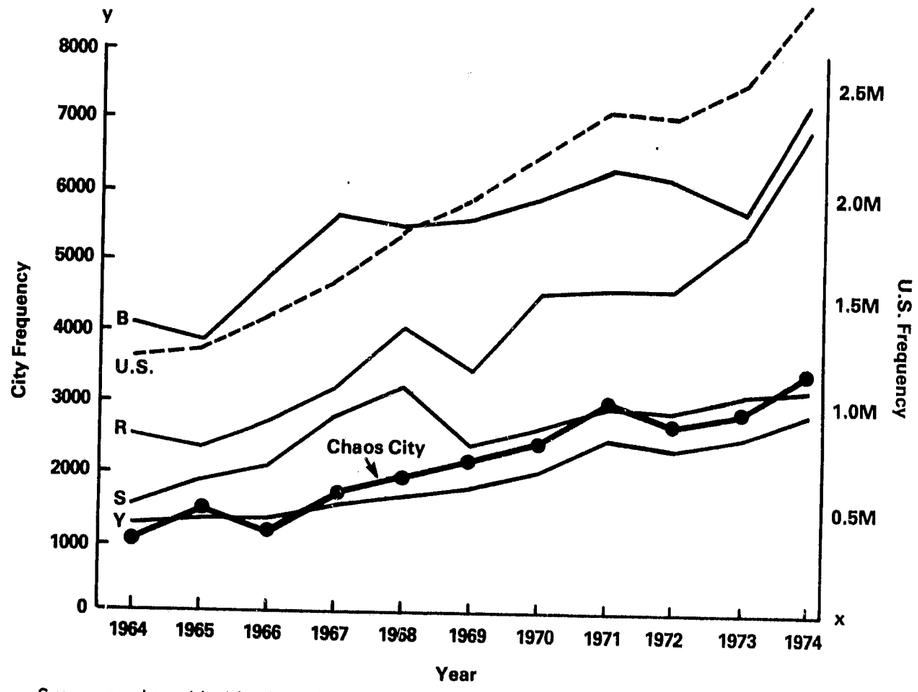
ELEVEN YEAR TIME SERIES OF ANNUAL FREQUENCY OF REPORTED BURGLARY, CHAOS CITY, 1964-1974



Source: hypothetical data

EXHIBIT 5-27

ANNUAL FREQUENCY OF REPORTED BURGLARY FOR UNITED STATES, CHAOS CITY AND FOUR OTHER CITIES, 1964-1974

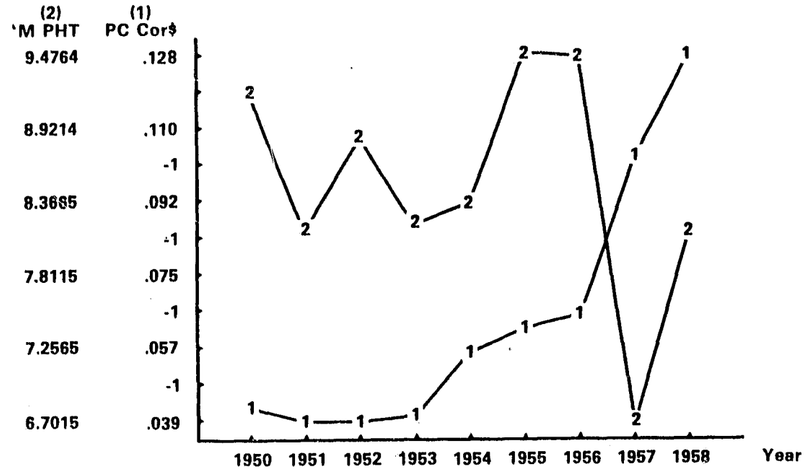


Source: hypothetical data.

As a last example of a short and extended time series, examine the two trends presented in Exhibits 5-28 and 5-29 which plot the variables -- per capita expenditure for jails in Chaos City (PS Cor $, in cents) and the number of murders per hundred thousand population (M PHT). In Exhibit 5-28 the period 1950-1958 is covered. Note the fluctuation in the murder rate and the steady increase in the expenditure figure. Exhibit 5-29 extends this series over a thirty year period. As may be seen, the nine year period 1950-1958 was the end of a relatively constant pattern in both variables which was followed by a dramatic increase between 1958-1973. The slash marks in the year scale indicates years excluded due to missing or unreliable measures. The parallel increase in the murder rate and jail expenditures is quite clearly illustrated in this time chart.

EXHIBIT 5-28

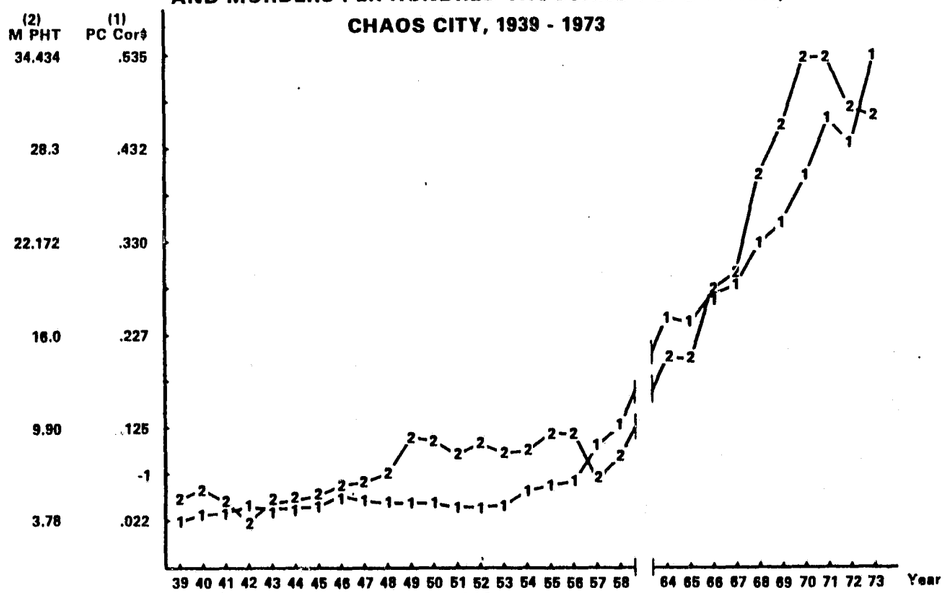
NINE YEAR TIME SERIES, PER CAPITA JAIL EXPENDITURES AND MURDERS PER HUNDRED THOUSAND POPULATION, CHAOS CITY, 1950-1958



Source: Hypothetical Data

EXHIBIT 5-29

THIRTY YEAR TIME SERIES, PER CAPITA JAIL EXPENDITURES AND MURDERS PER HUNDRED THOUSAND POPULATION, CHAOS CITY, 1939 - 1973



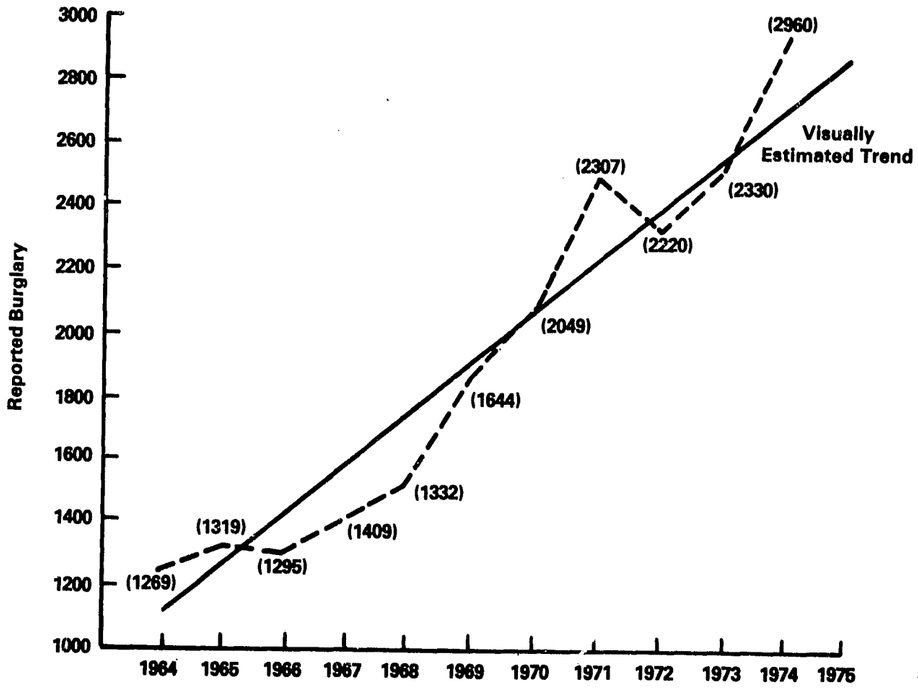
Source: Hypothetical Data

2. Estimating a trend using a moving average

There are several different methods for estimating a trend in an extended time series. Examining the plot and visualizing a line or curve that "best fits" the data is one such method. Such a visually determined trend line is presented in Exhibit 5-30. Using this trend line it is possible to develop rough point estimates of the incidence of burglary over this ten year period. For example, the estimated incidence of burglary in 1970 is about 2100. Precision of a visually estimated trend line generally decreases if a time series exhibits irregularities and cyclical functions, or if only a few data points are available. A major disadvantage of a visually estimated trend is its dependence on the visual acuity and subjective judgment of the analyst.

EXHIBIT 5-30.

VISUALLY ESTIMATED TREND, BURGLARIES, CHAOS CITY, 1964-1975



Source: hypothetical data

A less subjective method of estimating a trend is to use a moving average. A moving average is calculated by first deciding the time interval over which the moving average will be determined; second, summing the values of the variable over this time period (the moving total); and third, dividing the moving total by the number of intervals being used. The robbery data in Exhibit 5-30 contains two components: a smooth component, representing the general long-term trend; and a fluctuating component which indicates regular changes, such as annual, seasonal, or hourly variations. The moving average method, by reducing such fluctuation, helps to identify the long-term trend. A five year moving average is calculated and plotted in Exhibit 5-31 for the ten year burglary data.

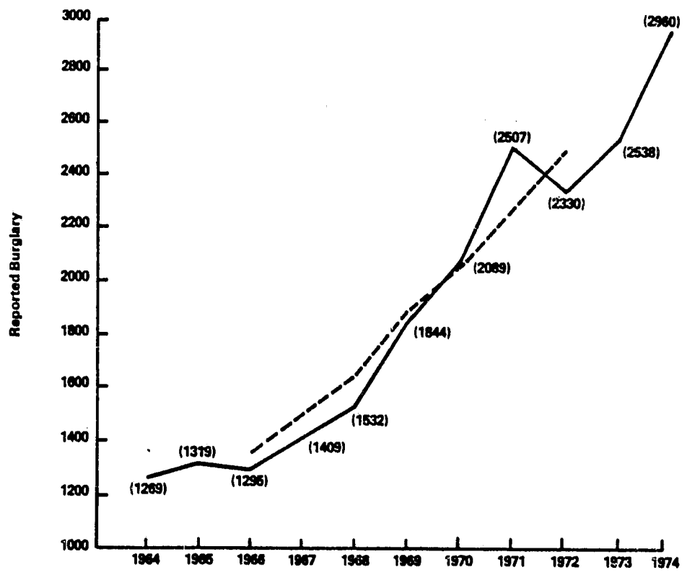
EXHIBIT 5-31.

CALCULATION OF A TEN YEAR MOVING AVERAGE,
BURGLARIES, CHAOS CITY, 1964-1974

1. **Calculate Ten Year Moving Average.**

Year	Burglaries	Five Year Moving Total	Five Year Moving Average
1964	1269		
1965	1319		
1966	1295	6824	1365
1967	1409	7399	1480
1968	1532	8169	1634
1969	1844	9361	1876
1970	2089	10302	2060
1971	2507	11308	2262
1972	2330	12424	2485
1973	2538		
1974	2960		

2. **Plot Ten Year Moving Average.**



Source: hypothetical data

3. Seasonal Variations in a Time Series

Cyclical variations in time series play a significant part in understanding the causes of criminal justice problems, and in studying the impacts of programs and policies on these problems. Changes in the residential burglary rate, may simply be seasonal, i.e., the result of recurring seasonal factors such as weather, outdoors activities, vacations and increased hours of darkness, or they may be the result of other irregular or random factors. One method for identifying the seasonal component of a time series involves the calculation of an index which reflects the cyclical variation.11

Chaos City analysts have collected monthly data on residential burglaries for the period 1975 through 1977. This data is reported in the first column of Exhibit 5-32. In working with monthly data it is often useful to adjust each month's value according to a "30 day month." For example, there are 31 days in January but only 28 days in February. If there is a ten percent decline in residential burglaries during this two month period, is it because February was colder than January or because February has ten percent fewer days? By adjusting each month to a 30 day estimate, improved month-to-month comparisons may be made in the following examples; however, no such adjustment is made in the monthly residential burglary total. The first step in calculating a seasonal index is to calculate the 12 months totals for each possible midpoint (i.e., 6 months prior and 6 months past). Since the data in column two are arrayed at the mid-points between months, a twenty-four-month moving total is calculated in column three; this centers the data on specific months.

EXHIBIT 5-32.

CALCUATION OF SEASONAL INDEX, RESIDENTIAL BURGLARIES BY MONTH, CHAOS CITY, 1975-1977

Year and Month	(1) Burglaries	(2) 12 month Moving Total	(3) 24 month Moving Total	(4) 12 mo. Centered Moving Average	(5) Seasonal Index	(6) Ave. S.I.
1975						
Jan	221					
Feb	241					
Mar	210					
Apr	200					
May	238					
June	330	3083				
July	402	3034	6117	254.9	157.7	
Aug	393	2957	5991	249.6	157.6	
Sept	301	2915	5872	244.7	123.0	
Oct	237	2903	5818	242.4	97.7	
Nov	120	2893	5796	241.5	49.7	
Dec	190	2857	5750	239.6	79.3	
1976						
Jan	172	2773	5630	234.6	73.3	67.2
Feb	164	2703	5476	228.2	71.9	76.8
Mar	168	2672	5375	224.0	75.0	76.3
Apr	188	2582	5254	218.9	85.9	84.2
May	228	2598	5180	215.8	105.7	104.8
June	294	2556	5154	214.8	136.9	128.5
July	309	2522	5078	211.6	145.0	156.9
Aug	332	2503	5025	209.3	158.6	158.1
Sept	270	2468	4971	207.1	130.4	126.7
Oct	147	2421	4889	203.7	72.2	85.0
Nov	136	2372	4793	199.7	68.1	58.9
Dec	148	2282	2654	193.9	76.3	77.8
1977						
Jan	138	2191	4473	186.3	61.1	
Feb	145	2077	4268	177.8	81.6	
Mar	133	2038	4115	171.5	77.6	
Apr	141	2065	4103	170.9	82.5	
May	179	2067	4132	172.2	103.9	
June	204	2149	4086	170.3	119.8	
July	218					
Aug	231					
Sept	169					
Oct	174					
Nov	138					
Dec	130					

Source: hypothetical data

The third step is to divide each of the twenty-four month totals by 24 to obtain the 12 centered moving average. The last value in Column 4 -- 170.3 for June 1977 -- represents the average monthly incidence of residential burglary for the 12 month period centered at June. The last column is calculated by dividing the actual monthly incidence by the corresponding moving average; e.g., for June 1977, 204 divided by 170.3 times 100 equals 119.8. This is interpreted as meaning that June was 120% as great as the average incidence for the twelve month period centered at June. These seasonal indices help isolate the seasonal changes in the time series. Clearly the months May - September have seasonal indices greater than their averages, indicating a strong seasonal variation in residential burglary incidence in Chaos City during the summer months. The last column simply is an average of two seasonal indices calculated for each month. This average may then be used to deseasonalize the time series.

It is frequently useful to estimate the deseasonalized values of a time series in order to examine changes in light of estimated seasonal influences, i.e., whether the observed changes in the incidence in residential burglaries is greater than or less than values based on seasonal factors alone. Deseasonalized values of the residential burglary data are presented in Exhibit 5-33. These are calculated by dividing the monthly incidence by the seasonal index expressed in decimal form, e.g., Jan. 1975 = 221/.672 = 328. These 328 robberies represent the deseasonalized or seasonally adjusted incidence of residential burglaries. By multiplying each of these deseasonalized monthly values by 12 a seasonally adjusted annual incidence may be estimated, e.g., 328 x 12 = 3936 incidents.

EXHIBIT 5-33.

DESEASONALIZED TIME SERIES, RESIDENTIAL BURGLARY BY MONTH, CHAOS CITY, 1975-1977

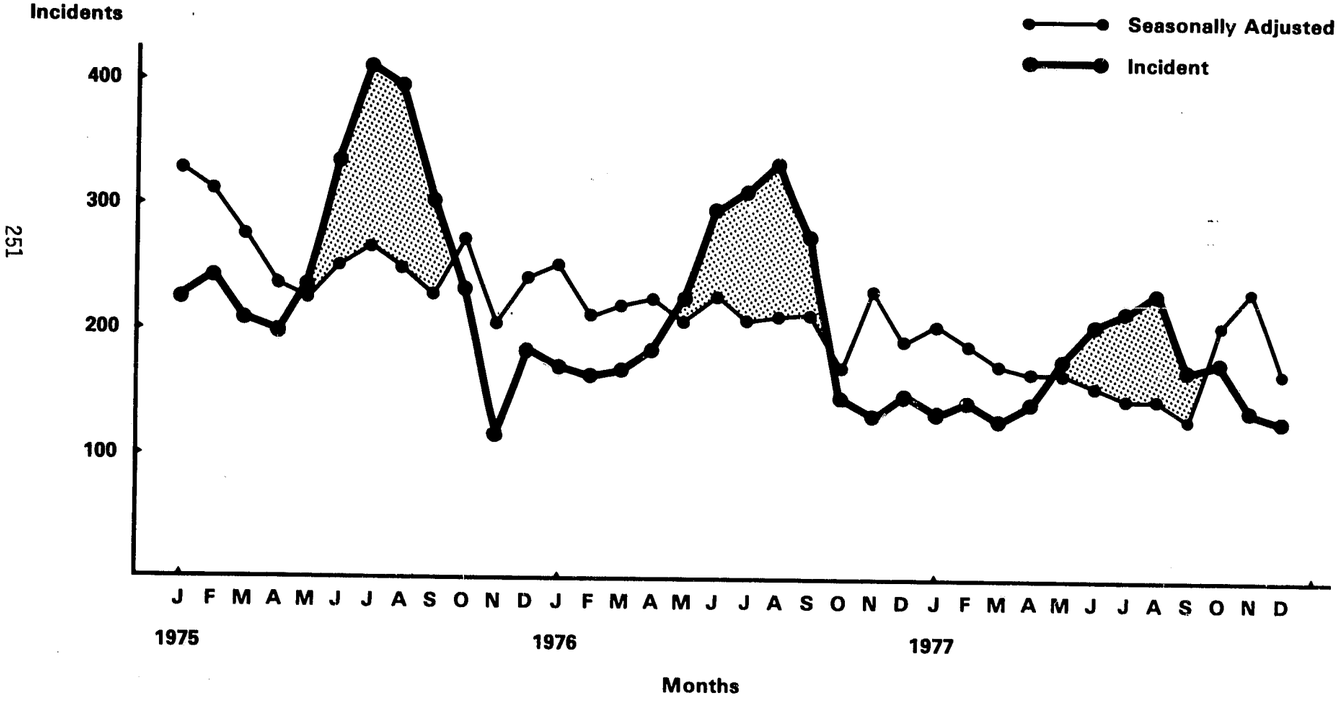
1975	Burglaries	Deseasonalized Incidence
Jan	221	328
Feb	241	313
Mar	210	275
Apr	200	238
May	238	227
June	330	257
July	402	264
Aug	393	249
Sept	301	238
Oct	237	278
Nov	120	204
Dec	190	244
1976		
Jan	172	256
Feb	164	213
Mar	168	220
Apr	188	223
May	228	217
June	294	229
July	309	203
Aug	332	210
Sept	270	213
Oct	147	172
Nov	136	231
Dec	148	190
1977		
Jan	138	205
Feb	145	189
Mar	133	174
Apr	141	167
May	179	171
June	204	159
July	218	144
Aug	231	146
Sept	169	133
Oct	174	205
Nov	138	234
Dec	130	167

Source: hypothetical data

Exhibit 5-34 plots the incidence and the seasonally adjusted incidence of residential burglaries. Comparing the two trends indicates the significant seasonal fluctuation in residential burglaries. The shaded area on the graph indicates the months for which the actual incidence was greater than the deseasonalized incidence. Such comparisons are useful in analyzing past or current performance and conditions to determine an appropriate course of action, and in developing operational forecasts, schedules and goals for the future.[12]

EXHIBIT 5-34

COMPARISON OF INCIDENT AND SEASONALLY ADJUSTED TREND IN RESIDENTIAL BURGLARY, CHAOS CITY, 1975 - 1977



B. Regression in Time Series Analysis and Causal Models

There are three main elements of any forecast. First, the analyst must decide on a time frame for the specific prediction. Changing the points in time for the prediction could effect both the specific tool to be used as well as the final product. Second, many forecasting procedures rely on the past and specifically use relevant historical data to make predictions. This assumes the past, or some portion of the past, is a good predictor of the future. The third element is that forecasts are characterized by uncertainty which will inevitably produce errors in the analyst's predictions.

There are basically three types of forecasting methods, two of which will be presented in this section. Time series models utilize historical data of the variable to be forecast in making a prediction. This method assumes that the trends that occurred in the past are stable and will recur in the future. Such models are unable to account for significant policy changes, or environmental changes and, hence, are limited in measuring the impact of proposed actions. Their major use is in establishing a baseline prediction which assumes maintaining current conditions and trends.

The second type of forecasting method is the causal model. This technique utilizes closely associated variables to make a prediction of a dependent variable. That is, population growth is a good indicator of index crime change, and so the analyst uses readily available population projections to model and to predict the crime rate. Causal models, in addition to being difficult to develop, require more historical data than do time series models, and require an ability to accurately predict the independent variables (e.g., population). However, causal models can more readily incorporate policy or environmental changes.

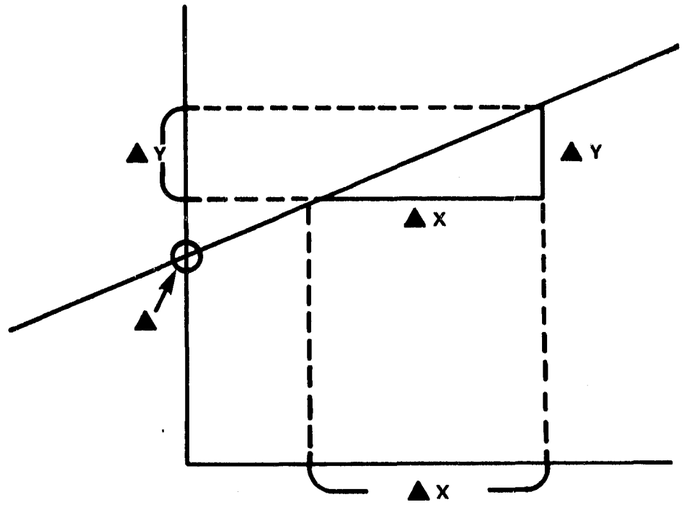
The third type of forecasting method depends primarily on individual or group judgments about the future. These qualitative approaches range from the Delphi method to visionary forecasting. The central components of such methods are subjective judgments and rating schemes.[13]

1. Purpose and Approach

Least squares regression is a prediction method that is used to determine future estimates of a dependent variable given information about the independent variable(s) it is related to. As used in bivariate (two variable) problems, the regression line is the "best-fit" of a line to the data. Exhibit 5-35 presents the basic concepts associated with determining such a regression. Any line displayed on an x-y grid is defined by two factors: (1) the location on the y-axis of its intercept (A in the exhibit) and (2) its slope (B in the exhibit). Least squares regression is a procedure used to estimate values of the slope and of y-intercept for a set of data consisting of two interval or ratio scale variables. Exhibit 5-36 contains the steps and formula used to estimate the slope (B) and y-intercept (A).

EXHIBIT 5-35

SLOPE AND Y-INTERCEPT



Source: hypothetical data

EXHIBIT 5-36.

FORMULA FOR REGRESSION COEFFICIENTS

Step 1: Calculate Sums

Step 2: $$B = \frac{N\Sigma XY - (\Sigma X)(\Sigma Y)}{N\Sigma X^2 - (\Sigma X)^2}$$

Step 3: $$A = \frac{\Sigma Y - B\Sigma X}{N}$$

Step 4: $$\hat{Y} = A + BX$$

2. Application

Following is the calculation of the slope and y-intercept for the burglary data presented in Exhibit 5-26. Note in Exhibit 5-37 the x variable (year) is renumbered for ease of calculation. The first step is to calculate the required summations as indicated in step 1. Next, the appropriate substitutions are made into the formula for the slope--step 2. For this problem the slope of the line is equal to 174 burglaries per year, i.e., an increase of one year results in an increase of 174 burglaries. The third step is to calculate the y-intercept (A) by substituting the appropriate values into the formula. The y-intercept is interpreted as the value of y (burglaries) when x (year) is equal to zero. The intercept is 871 burglaries. With these two pieces of information the regression line can be plotted. This line is the "best-fit" to the data and is graphed in Exhibit 5-38. To graph the regression line, first anchor the line at the y-intercept; second count over 1 unit on the x-axis and either up or down the number of units indicated by the magnitude and sign of the slope -- place a dot. In this example the slope is positive so the count is up 174 units. Finally connect the intercept and the dot and extend the line.

EXHIBIT 5-37.

CALCULATION OF REGRESSION COEFFICIENTS,
INCIDENCE OF BURGLARY, CHAOS CITY, 1964-1974

Step 1: Calculate Sums

Year	X	Y	XY	X2	Y2
1964	1	1269	1269	1	1610361
1965	2	1319	2638	4	1739761
1966	3	1295	3885	9	1677025
1967	4	1409	5636	16	1985291
1968	5	1532	7660	25	2347024
1969	6	1844	11064	36	3400336
1970	7	289	14623	49	4363921
1971	8	2507	20056	64	6285049
1972	9	2330	20970	81	5428900
1973	10	2538	25380	100	6441444
1974	11	2960	32560	121	8761600
Σ	66	21092	145741	506	44040702

$\Sigma N = 11$
$\Sigma X = 66$
$\Sigma Y = 21,092$
$\Sigma XY = 145,741$
$\Sigma X^2 = 506$
$\Sigma Y^2 = 44,040,702$

Step 2: $b = \frac{N\Sigma XY - (\Sigma X)(\Sigma Y)}{N\Sigma X^2 - (\Sigma X)^2} = \frac{(11)(145741) - (66)(21,092)}{N(506) - (66)^2}$

$= \frac{1,603,151 - 1,392,072}{5566 - 4356} = \frac{211079}{1210}$

$= 174.45$

Step 3: $a = \frac{\Sigma Y - b\Sigma X}{N} = \frac{21092 - (174.45)(66)}{11} = \frac{21,092 - 11,513.7}{11}$

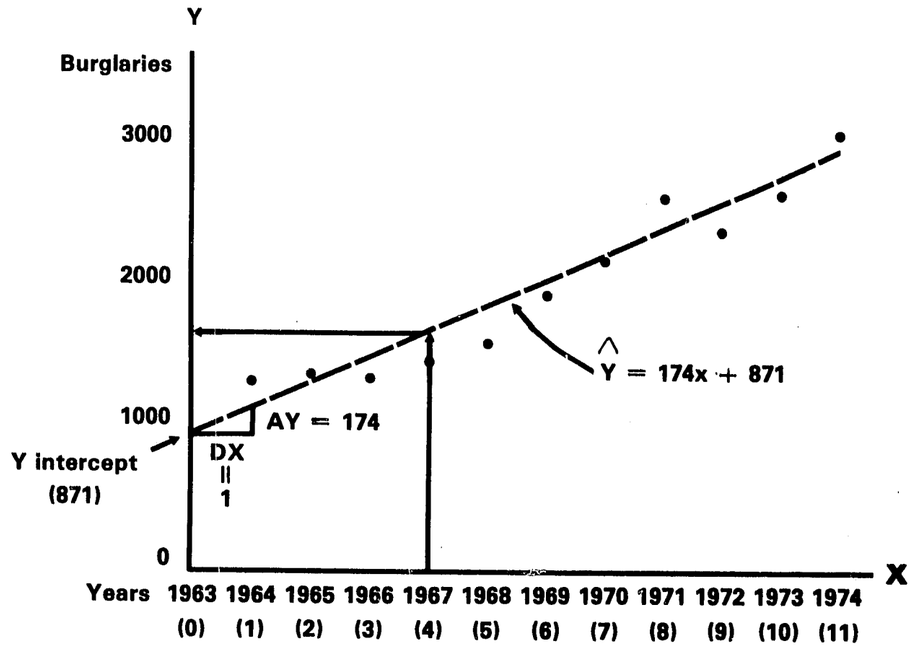
$= 870.75$

Step 4: $\hat{Y} = 174.45X + 870.75$

Source: hypothetical data

EXHIBIT 5-38

REGRESSION LINE, INCIDENCE OF BURGLARIES, CHAOS CITY, 1964 - 1974



Source: Hypothetical Data

The estimated values of the number of burglaries for different years can be directly read off the chart; e.g., the estimated number of burglaries in 1967 is obtained by reading up to the line at 1967 and over to the Y-axis. The 1967 value is about 1600. A more accurate estimated value may be obtained by substituting 4 (for 1967) into the regression equation; e.g., $Y_{67} = 174x + 871$ or $Y = 174(4) + 871 = 1567$ burglaries. By substituting the values of 12 to 22 one at a time into the equation, a set of predicted values can be obtained for the incidence of burglary. These are presented in Exhibit 5-39. They represent a prediction of the number of burglaries in Chaos City for the period 1975-1985 based on the actual incidence between 1964-1971.

EXHIBIT 5-39.

PREDICTED INCIDENCE OF BURGLARY, CHAOS CITY, 1975 - 1985

Year	Predicted Burglaries
1975	2964.1
1976	3138.6
1977	3313.0
1978	3487.5
1979	3661.9
1980	3836.4
1981	4010.8
1982	4185.2
1983	4359.7
1984	4534.1
1985	4708.6

Source: hypothetical data

3. Assessment of Prediction

There are a number of statistics used to assess the accuracy and usefulness of a regression. Three such statistics are the standard error, the coefficient of determination and the estimation of a prediction interval. These are based on the simple premise that the higher the correlation between X and Y the more accurate will be the prediction. The accuracy of a prediction may be assessed by, first, calculating the differences between the predicted and actual Y values, and then summing the squares of these differences. The differences between predicted and actual Y values are called the residuals. The higher the correlation, the smaller the residual value.

A statistic which incorporates the residual value is the Standard Error of Estimate (SE). The SE is the standard deviation of the residuals. Its formula is:

$$SE = \sqrt{\frac{\Sigma(Y - \bar{Y})2}{n - 2}}$$

If the SE is relatively large compared to the standard deviation of the dependent variable, the prediction of Y on the basis of X is unreliable. The smaller the SE, generally, the better the prediction. For example, the calculation of the standard error is presented in Exhibit 5-40. Step one requires calculating: (1) predicted values using the regression equation; (2) calculating the residuals by subtracting the actual from the predicted value for each year; and (3) squaring and summing the residuals. Step two involves substitution into the formula for the standard error. The SE for this time series is equal to 167 burglaries. This may be interpreted as meaning that if two parallel lines are drawn one standard error in distance from the regression line, about 68% of the sample should be enclosed between these lines; and 95% within two standard errors. In this example, five or 50% are within one standard error and all eleven or 100% are within two standard errors. Also note that the standard error of 167 is small in comparison to the standard deviation of 599.81 burglaries. These indicate the regression may be a good "fit" and predictor.

EXHIBIT 5-40.

CALCULATION OF STANDARD ERROR,
BURGLARY INCIDENCE,
CHAOS CITY, 1964-1974

Step 1:

Year	Burglary Incidence	Predicted Incidence	Residual	Residual Squared
1964	1269.0	1045.2	-223.770	50074.00
1965	1319.0	1219.7	- 99.327	9865.90
1966	1295.0	1394.7	99.118	9824.40
1967	1409.0	1568.6	159.560	25461.00
1968	1532.0	1743.0	211.010	44525.00
1969	1844.0	1917.5	73.455	5395.60
1970	2089.0	2091.9	2.900	8.41
1971	2507.0	2266.3	-240.650	57915.00
1972	2330.0	2440.8	110.790	12275.00
1973	2538.0	2615.2	77.236	5965.50
1974	2960.0	2789.7	-170.320	29008.00
				250317.81

n = 11

Step 2:

$$SE = \sqrt{\frac{250317.81}{9}} = 166.8$$

Source: hypothetical data

A second check of the regression is the coefficient of determination (r^2). This statistic, based on the correlation coefficient, ranges in value from 0 to +1 where high values indicate the amount of improvement in prediction the least squares regression offers over the mean value. This is frequently interpreted as the amount of variation in the dependent variable "explained" by variation in the independent variable. The coefficient of determination may be calculated by first estimating the correlation coefficient and then squaring it. These calculations are performed in Exhibit 5-41 using the eleven year burglary data. The coefficient of determination, r^2, is + .93 which is interpreted as meaning only 7% of the variation in burglaries is unexplained and that the regression is a very useful prediction model for this data.

EXHIBIT 5-41.

CALCULATION OF THE COEFFICIENT OF DETERMINATION,
INCIDENCE OF BURGLARY, CHAOS CITY, 1964 - 1974

Step 1: r = Person's Correlation Coefficient

$$r = \frac{N\Sigma XY - (\Sigma X)(\Sigma Y)}{\sqrt{[N\Sigma X^2 - (\Sigma X)^2][N\Sigma Y^2 - (\Sigma Y)^2]}}$$

Step 2: $N\Sigma XY - (\Sigma X)(\Sigma Y) = 211{,}079$

$N\Sigma X^2 - (\Sigma X)^2 = 1{,}210$

$N\Sigma Y^2 - (\Sigma Y)^2 = 11(44{,}640{,}702) - (21092)^2$

$= 484{,}447{,}772$

Step 3: $r = \frac{211{,}079}{\sqrt{(1210)(39{,}575{,}258)}} = \frac{211{,}079}{\sqrt{47{,}886{,}062{,}180}}$

$r = \frac{211{,}079}{218{,}830}$

$r = \pm .9645$

Step 4: r^2 = Coefficient of determination

$r^2 = .9645^2 = .93$

Source: hypothetical data

A third procedure used to assess a regression equation is to estimate a prediction interval for each predicted value of the dependent variable. For example, the predicted incidences of burglary in 1975 and 1985 using the regression equation of $Y = 174.45X + 870.75$ are 2964 and 4709 burglaries, respectively, (substitute 12 for 1975 and 22 for 1985). To estimate a 95% prediction interval for these two estimates, i.e., the range of predicted values in 1975 and 1985 that we could be 95% likely to contain the actual incidence, the following formula is used:

$$PI = Y \pm (t_{n-2,.05})\ SE \sqrt{1 + \frac{1}{n} + \frac{(x-\bar{x})^2}{\Sigma(x_i-x)^2}}$$

Exhibit 5-42 presents the calculation of these two prediction intervals: the interval in 1975 is 1594 to 3334 burglaries; the interval in 1985 is 4136 to 5282 burglaries. The prediction interval gets larger, at an increasing rate, the farther a predicted value is from the actual data. This widening of the prediction interval's minimum and maximum values is represented in Exhibit 5-43. As the interval widens the likelihood of error in the prediction increases. Consequently, in time series regressions, the farther out in time from the base period, the more likely an error in the prediction. As long as prediction intervals stay reasonably small, as in 1975 for the burglary data, the prediction accuracy is likely to be high. However, the size of the 1985 prediction interval should caution the analyst from being confident in the predicted value.

EXHIBIT 5-42.

CALCULATION OF PREDICTION INTERVALS,
INCIDENCE OF BURGLARY,
CHAOS CITY, 1975 AND 1985

Step 1: Given the formula, sample size, and date to be predicted, calculate the basic statistics.

Formula: $PI = Y + (t_{n-2}, .05)\ SE\sqrt{1 + \frac{1}{n}\frac{(x-\bar{x})^2}{\Sigma(x_i-x)^2}}$

Sample Size: n = 11

Year to be Predicted: x = 12 (1975)

Calculate:

$\bar{x} = 5.5$
$(x_i-x)^2 = 112.75$
1975 = 2964
SE = 167

Step 2: Substitute the basic statistics into the formula

$1975\ PI = 2964 \pm 1.833\left[167\sqrt{1 + \frac{1}{11} + \frac{(12-5)^2}{112.75}}\right]$

$= 2964 \pm 1.833\ (202)$

$= 2964 \pm 370$ burglaries

Step 3: Repeat this procedure to estimate prediction interval for 1985

Given: n = 11
x = 22 (1985)

Calculate Y = 4709

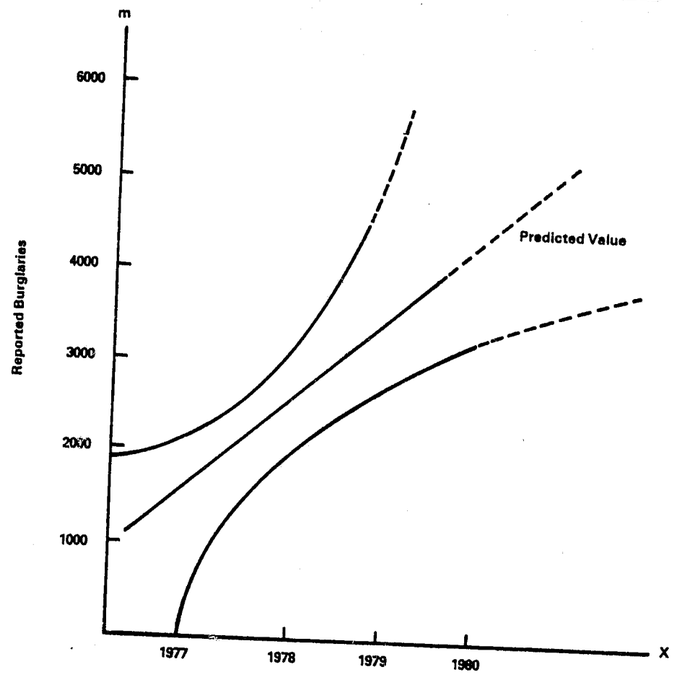
$1985\ PI = 4709 \pm 1.833\left[167\sqrt{1 + \frac{1}{11} + \frac{(22-5.5)2}{112.75}}\right]$

$= 4709 \pm 573$ burglaries

Source: hypothetical data

EXHIBIT 5-43

UPPER AND LOWER LIMITS OF PREDICTION INTERVALS FOR ESTIMATED VALUES OF THE DEPENDENT VARIABLE



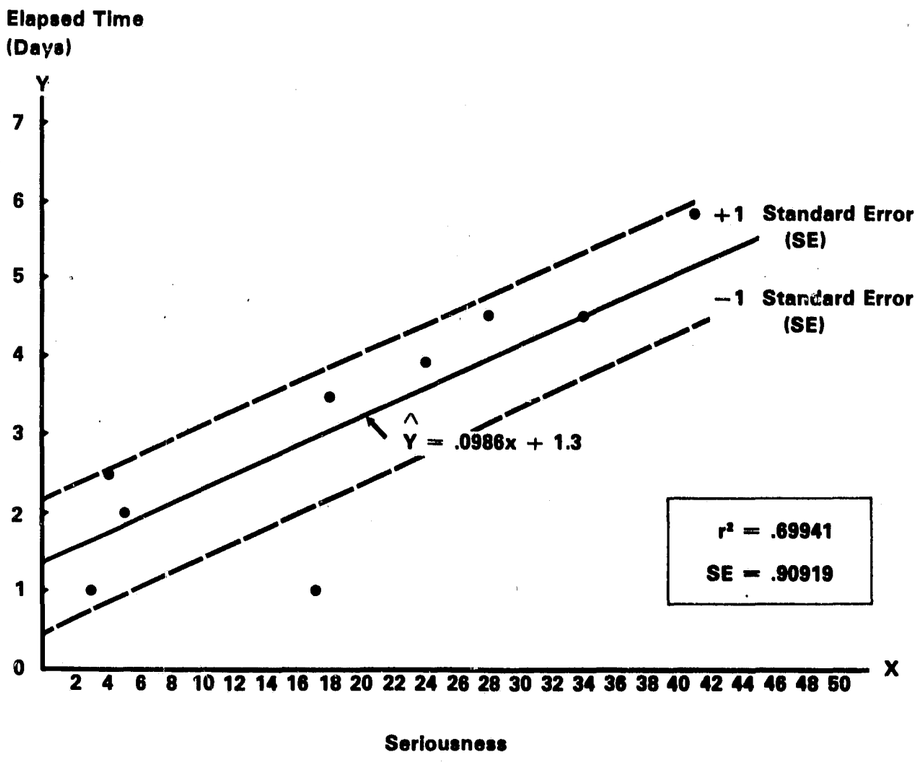
Source: hypothetical data

4. Regression in Causal Models

Prediction of a dependent variable may be based on other independent variables besides the passage of time. Such models are referred to as causal models since there is an implied causal relationship. Consider the problem of predicting the processing time necessary for the police to dispose of a felony case with a seriousness score of 15. Exhibit 5-44 presents descriptive statistics for nine felony cases on two variables -- elapsed time and seriousness. The scatterplot and correlation of seriousness and elapsed time is also displayed in the exhibit. There is evidence of a strong positive relationship, i.e., the more serious the felony case, the longer the processing time required.

EXHIBIT 5-44

REGRESSION LINE AND STANDARD ERROR, EFFECT OF SERIOUSNESS ON ELAPSED TIME, FELONY CASES, CHAOS CITY POLICE DEPARTMENT, 1977



The calculation of a regression equation in which the dependent variable (y) is elapsed time and the independent variable (x) is seriousness results, in a slope equal to .0986 and a y-intercept of +1.3 days. (This latter value is the elapsed time for a felony case having a zero seriousness score, a theoretically significant but practically irrelevant fact.) These may be expressed in equation form as $\hat{Y} = .0986x + 1.3$. The standard error is .909 and r^2 is equal to .70 indicating the usefulness of the equation for prediction. Finally, the predicted elapsed time for a felony arrest with a seriousness score of 15 is determined by the equation $y = .0986 (15) + 1.3$, and is equal to 2.8 days. The 95% prediction interval is between 1.0 and 4.5 days (a large interval due to the scatter of the plot).[14] Exhibit 4-44 presents the graph of this regression and also plots the lines indicating one standard error. Note that 80% of the values are within one SE and 100% are within two SE indicating a good-fit of the regression to the data.

VII. Summary

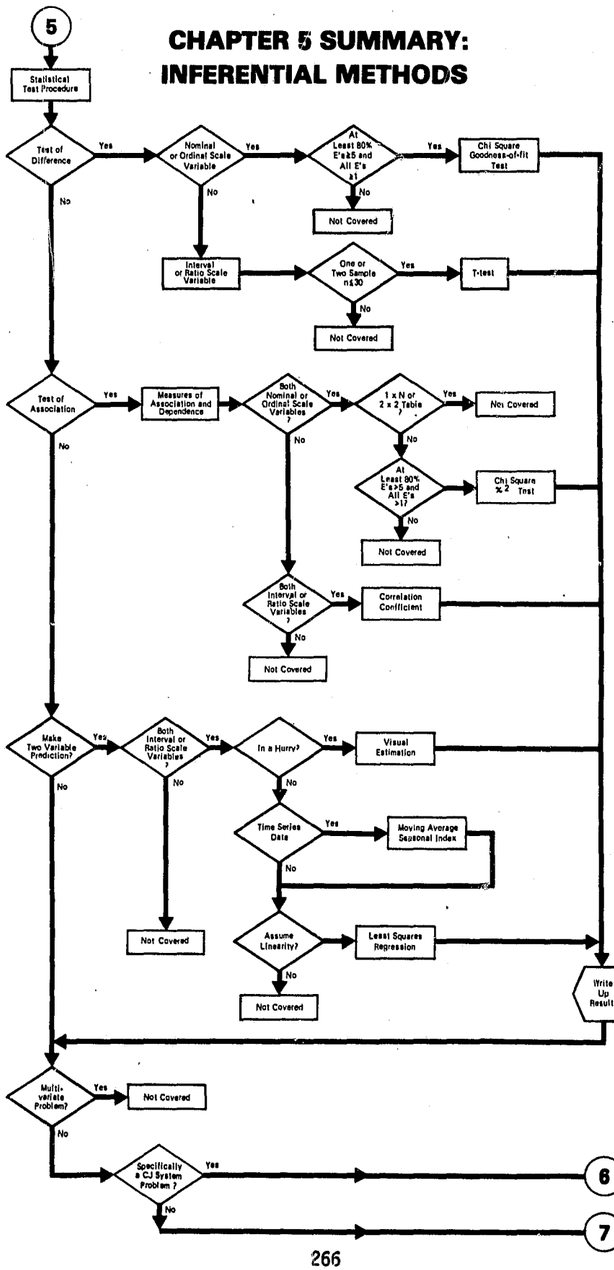
Least squares regression as applied to time series data or in causal models is a powerful predictive tool based on the assumption that all relevant factors will continue to operate as they have in the past. Small standard error values and high coefficients of determination indicate the usefulness of the method in making a prediction. Large standard errors and low r^2 values indicate that a regression should be used with caution. Similarly, small prediction intervals indicate a "good fit" of the regression line and the data.

Least squares regression builds upon problem specification and descriptive and comparative analyses. The analyst should first describe each of the variables of interest in terms of the identified hypotheses. The data should next be evaluated for possible comparative analysis including the development of indices, scattergrams, or cross-classifications; inferential methods should be considered to enrich and expand the descriptive and comparative analyses.

This chapter has examined a range of inferential methods organized, in two parts: (1) tests and measures of association and difference, including the t-statistic, chi square and the correlation coefficient; and (2) least squares regression and time series methods. A flow chart guide to inferential methods and to the chapter is presented in Exhibit 5-45.

EXHIBIT 5-45

CHAPTER 5 SUMMARY: INFERENTIAL METHODS



[1]U.S. Department of Justice, "Lights Reduce Fear of Crime," LEAA Newsletter 8, No. 6 (June/July 1979): 1

[2]Lyman Ott, William Mendenhall and Richard Larson, Statistics: A Tool for the Social Sciences, 2nd ed. (North Scituate: Duxbury Press, 1978), p. 228.

[3]A good introductory statistics text organized, in part, on the basis of selecting the appropriate statistic is Thad R. Horshbarger, Introductory Statistics: A Decision Map Approach, 2nd ed. (New York: MacMillan Publishing Company, 1977). A useful and easy-to-follow guide to inferential statistics is: Frank Andrews, et. al., A Guide for Selecting Statistical Techniques For Analyzing Social Science Data, (Institute for Social Research, Ann Arbor, Michigan: 1974).

[4]William L. Hays, Statistics For the Social Scientist, 2nd ed. (N.Y.: Hold, Rinehart and Winston, 1973), pp. 384-386.

[5]Statistical Research Laboratory, University of Michigan, Elementary Statistics Using MIDAS, 2nd ed. (Ann Arbor, Michigan: 1976), pp. 253-276.

[6]Ibid, p. 125. A further assumption of the t-test is that the sampling variances are equal. An F test is the standard check of this assumption. For the offender age data the F statistic equals 4.5968 with an attained significance of .0561.

[7]Herman J. Loether and Donald G. McTavish, Descriptive and Inferential Statistics (Boston: Allyn and Bacon, 1976), pp. 259-300.

[8]R. L. D. Wright, Understanding Statistics (New York: Harcourt, Brace, Jovanovich, Inc., 1976), p. 244.

[9]J.P. Guilford, Fundamental Statistics in Psychology and Education (New York: McGraw Hill, Inc., 1956), p. 145.

[10]Sources for these data were: Employment and Expenditures, 1976 and the U.S. City and County Data Book, 1972.

[11]John Neter, William Wasserman and G.A. Whitmore, Fundamental Statistics For Business and Economics, 4th ed. (Boston: Allyn and Bacon, Inc., 1973), pp. 699-719.

[12]Ibid, pp. 700-701.

[13]John C. Chambers, Satender K. Mullick and Donald Smith, "How to Choose the Right Forecasting Technique," Harvard Business Review (July-August 1971): 49.

[14]$$PI = 2.78 \pm 1.860 \left[.9091 \sqrt{1 + \frac{1}{10} + \frac{(15-16.8)2}{1581.6}} \right]$$

CHAPTER 6

DATA INTERPRETATION SYSTEMS

Introduction

There are several orientations that may appropriately be used to study criminal justice organizations. In this chapter a systems approach is defined and outlined. A system in this context consists of a regularly interacting or interdependent group of agencies forming a unified whole. Criminal justice agencies include:

> Any court with criminal jurisdiction and any other government agency or subunit, which defends indigents, or of which the principal functions or activities consist of the prevention, detection, and investigation of crime; the apprehension, detention, and prosecution of alleged offenders; the confinement or official correctional supervision of accused or convicted persons; or the administrative or technical support of the above functions.[1]

The five major types of organizations encompassed by this definition are law enforcement agencies, prosecutional agencies, public defender's offices, courts, and correctional agencies. These agencies perform an enormous variety of complex operations; however their collective activities may be characterized as: (1) goal oriented and (2) organized in a sequential manner.

The purpose of the criminal justice system is to deal with crime and delinquency. While each agency or component pursues specific objectives that may or may not be consistent with other agencies of the system, broad goals such as crime reduction, just and speedy dispositions, and cost-efficient operation are, generally, shared among agencies. In addition, the agencies and the activities of the criminal justice system are organized in a sequential manner in response to problems created by the commission of criminal acts. The President's Commission on Law Enforcement and Administration of Justice referred to this sequence as a continuum or orderly progression of events in which the agencies serve as filters through which cases are sifted: some move downstream to the next agency and decision point, while others remain and/or are disposed of.

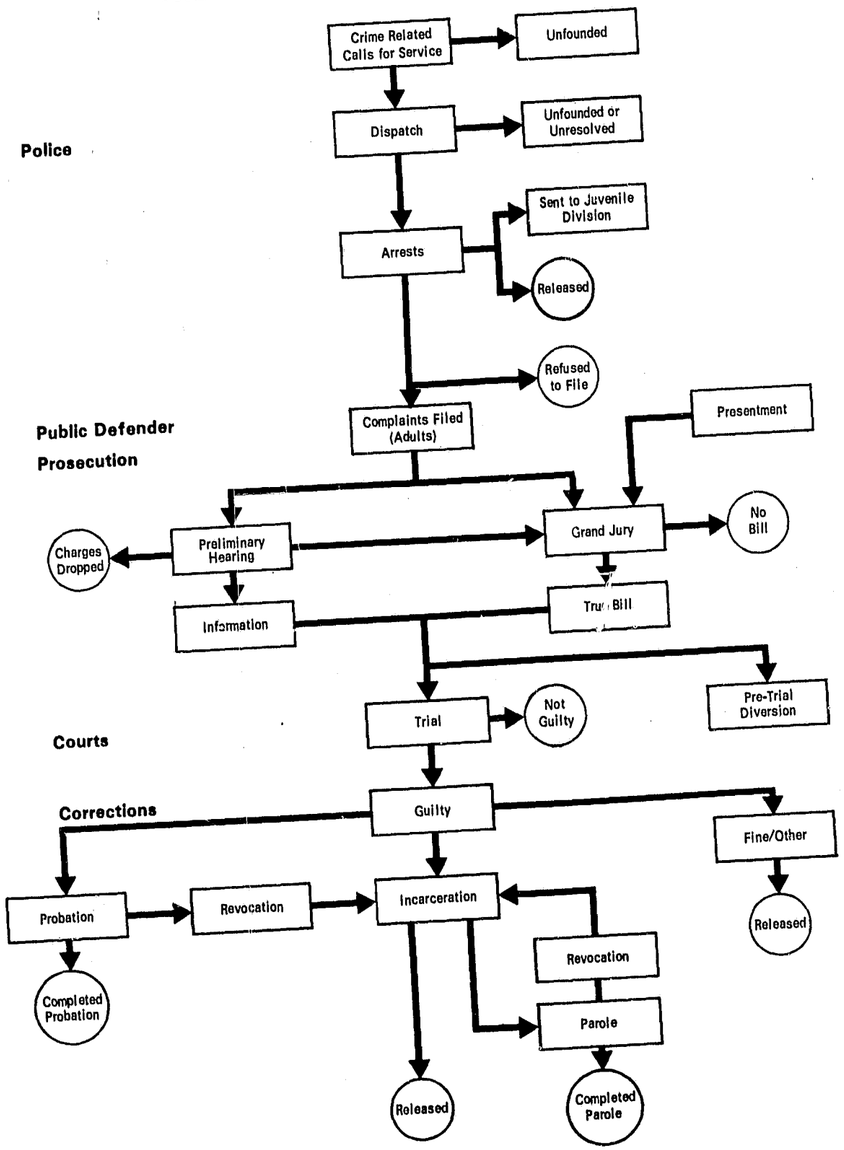
Exhibit 6-1 is a view of the criminal justice system emphasizing its constituent agencies. The agencies respond to criminal acts and interact in such a way that offender and case flows are established. The flow of cases is from top to bottom in the exhibit, with each circle signifying a release point or disposition. The overall structure and process in a jurisdiction may vary somewhat from the exhibit due to differences in the legal codes and statutes which provide a framework for the delivery of criminal justice services.

One tool used to help describe system-related concerns are flow charts. In the following section the use of flow charts and disposition trees is discussed. A second tool used to analyze a system is the input/output model. Following a definition of selected system variables, an example of input/output analysis concludes the chapter.

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EXHIBIT 6-1

THE CRIMINAL JUSTICE SYSTEM



I. Flow Charts

A major descriptive method used in system studies is flow charting. Flow charts help to identify problems and gaps in knowledge and tighten the logic of an argument about a system problem. Flow charts, like other graphic techniques, highlight and focus the attention of a reader or an audience.

There are five types of flow charts typically used in criminal justice studies. A process flow chart outlines the major components of a process, and in the case of Exhibit 6-1, the emphasis is on the movement of an offender from one stage in the process to the next. Operations charts illustrate the essential operational aspects of a system. Exhibit 6-2 is an operations flow chart for a patrol deployment decision-making system used by the Chaos City Police Department. Note that in the exhibit:

(1) a rectangle is used to present an instruction or information
(2) a diamond-shape is used to indicate decision points, or places where choices must be made
(3) circles, ovals or triangles are used to indicate products or end points in the flow, process or operation
(4) arrows indicate the direction of the flow, process, or operation.

This particular model emphasizes the interaction of crime analysis in deployment decisions.[2]

A third type of flow chart depicts dependency chains in a sequence of events. Examples of such dependency chains are the time charts presented in Chapters 3 and 5 and the Gantt and PERT Charts presented in Chapter 8. Perhaps the most common flow chart is the organization chart in which flows of authority and responsibility in an organization are displayed. Exhibit 6-3 is an organization chart for the Chaos City Regional Planning Unit. Generally, solid lines are used to indicate the lines of authority and dotted lines indicate "confer and advise" relationships. Issues of span of control, unity of command, chain of command, and the division of labor in an organization may be illustrated and diagnosed with organization charts.

EXHIBIT 6-2

OPERATIONS FLOW CHART: DEPLOYMENT DECISION MAKING SYSTEM

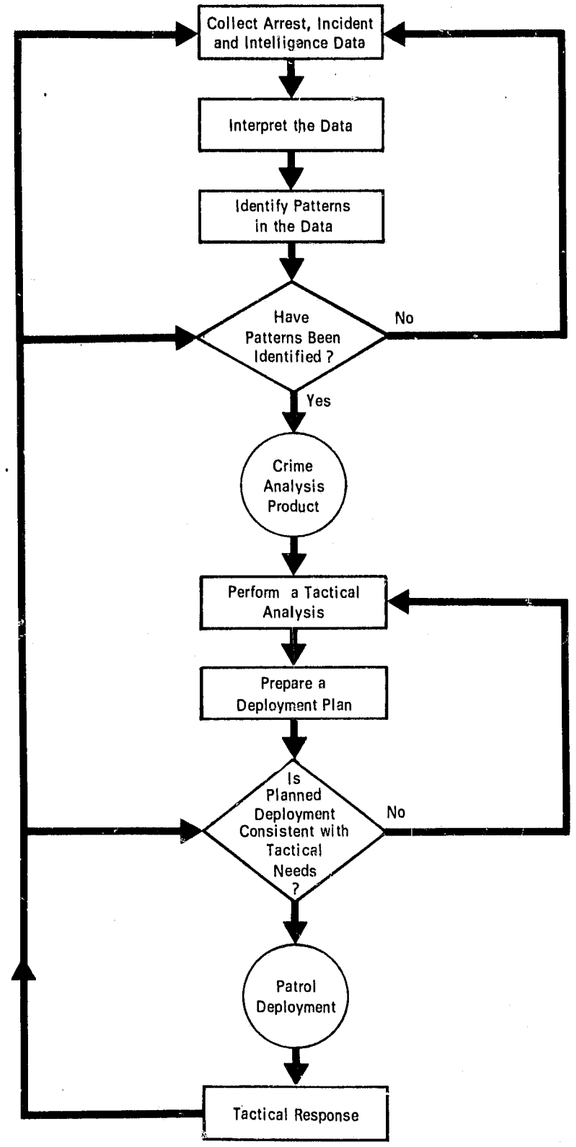
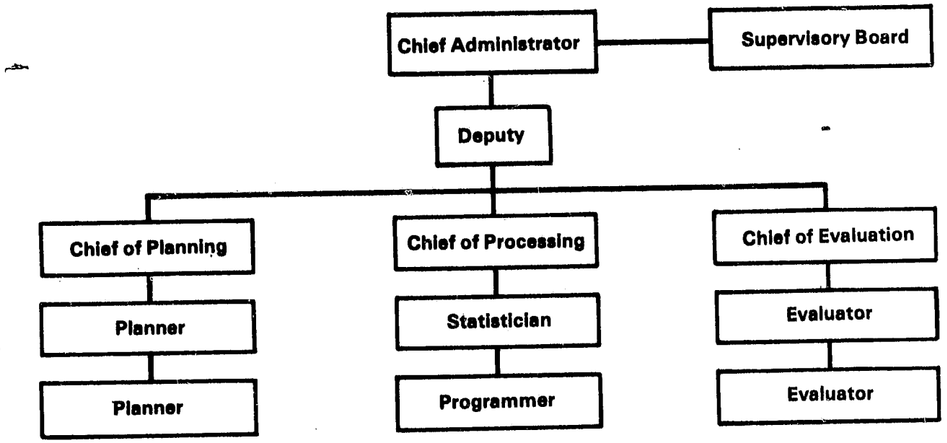


EXHIBIT 6-3

ORGANIZATION CHART, CHAOS CITY REGIONAL PLANNING UNIT, 1979

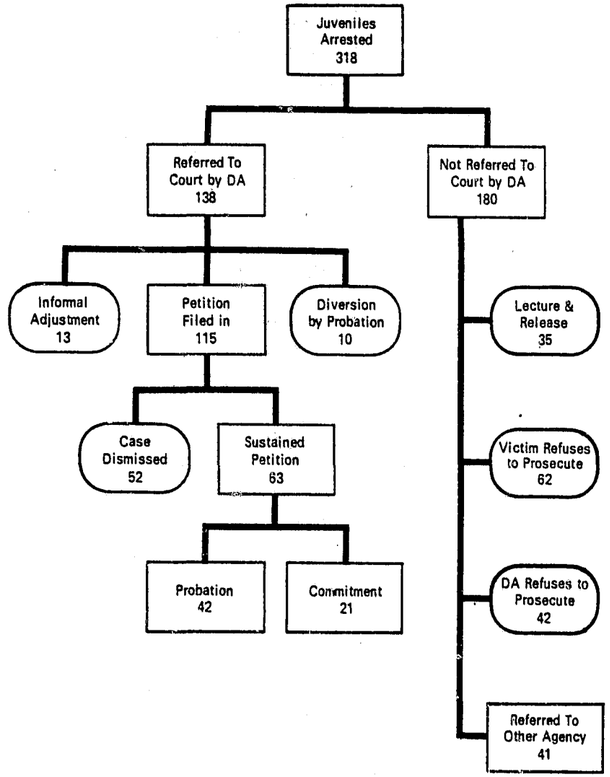


Source: Chaos City, Regional Planning Unit, 1977, hypothetical data

The fifth and final type of flow chart indicates the divergence or convergence of an offender flow to one of several possible outcomes. This is the principle of a disposition tree, a widely used method in criminal justice. Exhibit 6-4 is a disposition tree for the flow of felony offenders in the State of Paradise for 1977. Note that the tree is structured by agency and disposition, and that only a portion of the criminal justice system is covered.

EXHIBIT 6-4

DIVERGENCE FLOW CHART ASSAULT ARRESTS (JUVENILES ONLY) CHAOS CITY, 1977

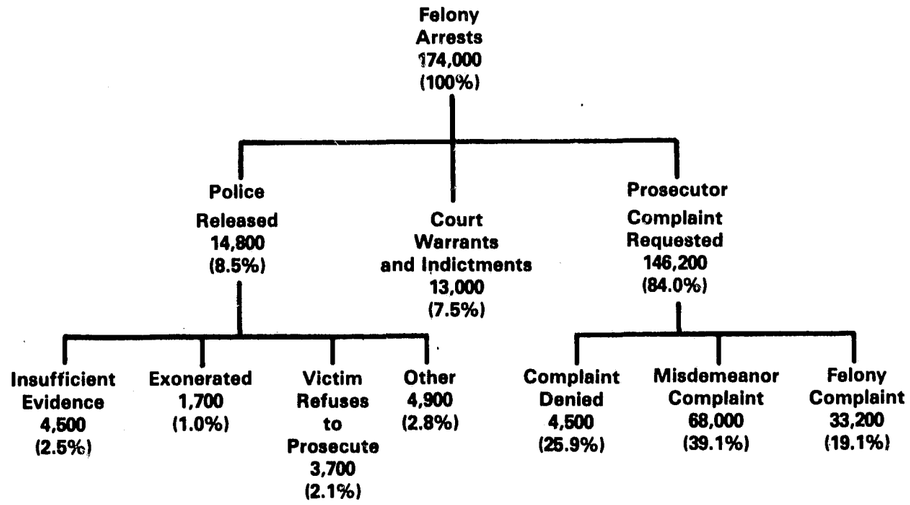


Source: Chaos City Regional Planning Unit, 1977.

Exhibit 6-5 covers the upper portion of the tree presented in 6-4: reasons for complaint denied are not included. Each limb of the tree represents a portion of all felony arrests. Note that felony complaints are requested for only 19.1% of all felony arrests. Input percentages are calculated by using felony arrests (174,000) as the denominator or base. Note also that 8.5% of all those arrested on felony charges are released by the police.

EXHIBIT 6-5

DISPOSITION TREE FELONY COUNT (WITH INPUT PERCENTAGES) STATE OF PARADISE 1977

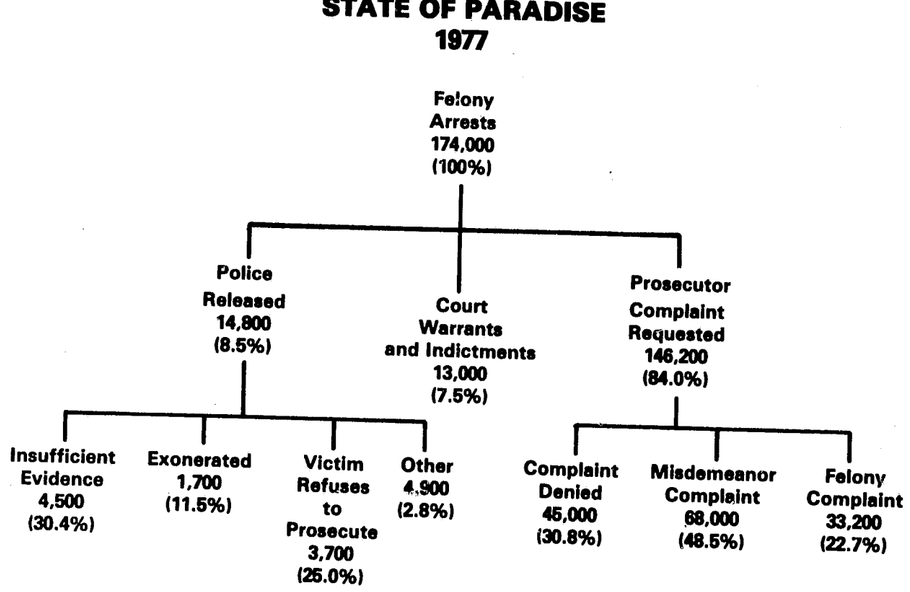


Source: hypothetical data

A second way of presenting the same data is by decision point percentages. These percentages are calculated by using the preceding stage, or decision point, as the denominator. Exhibit 6-6 presents decision point percentages for the disposition data of Exhibit 6-5. This format focuses the reader's attention on specific decisions made and their consequences, e.g., the consequence of the prosecutor's requesting complaints in felony arrests. Note the importance of insufficient evidence as an explanation of police release and the large percentage of felony complaints denied by the prosecutor. This is useful in identifying the consequences of decisions.

EXHIBIT 6-6

DISPOSITION TREE
FELONY COUNT
(WITH DECISION POINT PERCENTAGES)
STATE OF PARADISE
1977

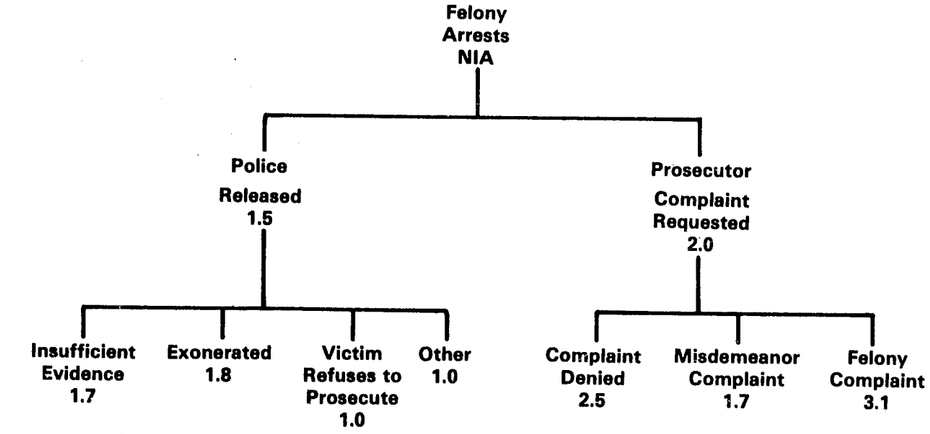


Source: hypothetical data

A third type of disposition tree is used to indicate elapsed time from the point of arrest to each specific type of disposition. Exhibit 6-7 presents the disposition of felony arrests in Paradise with the mean elapsed time indicated. Time is measured in days and includes weekends and holidays. An average of over three days elapsed before the Prosecutor issued a felony complaint and nearly two days elapsed on arrests in which insufficient evidence was found.

EXHIBIT 6-7

DISPOSITION TREE
FELONY COUNT
(WITH ELAPSED TIME)
STATE OF PARADISE
1977



Source: hypothetical data

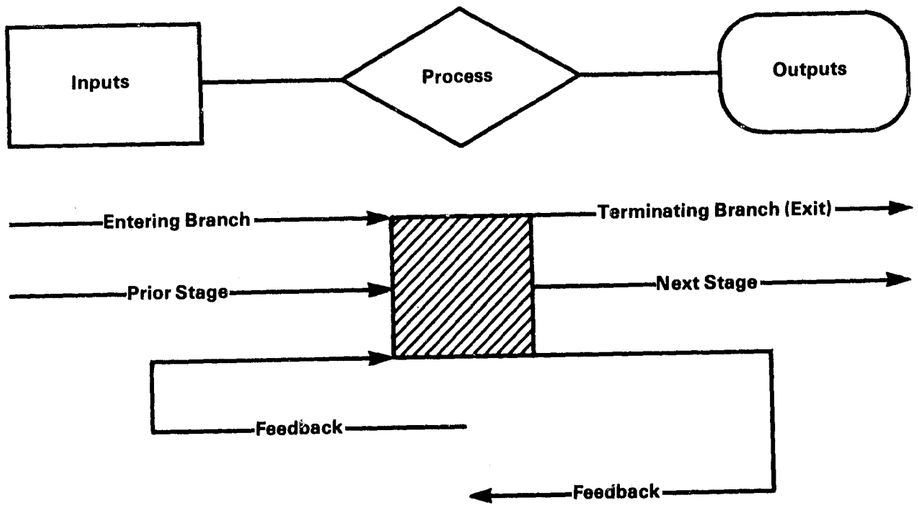
In summary, flow charts may be used to illustrate a wide variety of system characteristics ranging from procedural and organizational attributes to offender flows measured in the number of offenders, percentages, mean elapsed time, or mean cost. They are a valuable method of analyzing criminal justice system problems. Caution should be taken, however, to avoid excessive reliance on such charts. For example, dispositions trees are more effectively used to present small portions of large processes. When used to illustrate a complex system they have a tendency of becoming a "bushy mess" to the reader. Chapter seven discusses some common-sense rules to follow in developing and using graphics, such as flow charts, in a report or presentation.

II. Input/Output Analysis

Another tool that is useful in analyzing the criminal justice system is the input/output models illustrated in Exhibit 6-8. This model may be applied either at a "macro" level, e.g., the criminal justice system for Chaos City, or at a "micro" level for a particular decision making process of a particular agency such as felony trials in the Chaos Criminal Court. In this model inputs may come from three sources: an entering branch (felony arrests in the police department), a prior stage (complaints filed from Police to Prosecutor in Exhibit 6-1), or feedback (parole revocations). Similarly, there are three forms of output -- terminating branch (a disposition), next stage (transfer from one stage to the next), and feedback.

EXHIBIT 6-8

GENERAL SYSTEM MODEL



The application of this input/out model requires: (1) definition and measurement of the major system concepts and variables and (2) a description and comparison of these measures for a particular agency, jurisdiction, or process. The following section defines and gives examples of three major system concepts and their related variables. A case study applying input/output analysis to the problem of court backlog in Chaos City concludes the chapter.

A. System Concepts

There are three concepts used to analyze the criminal justice system: environment, administration, and system operations. The criminal justice system's environment consists of all external factors that influence the system. These include measures of crime (e.g., type, volume, location, rate, victim, and offender characteristics), its correlates (e.g., population change, unemployment attitude measures, family stability), and the activities and operation of related private and public agencies. An assumption of input/output analysis is that there are relationships among environmental factors, administrative decisions, and system operation. Change(s) in one may result in changes in the other. For example, shifts in public attitudes towards offenders may influence sentencing practices in the Chaos Criminal Court resulting in changes in the county prison population. Environmental factors also help to define the overall mission of the criminal justice system and establish the types and limits of publicly acceptable sanctions. In this sense the environment provides two types of inputs -- crimes to which the system responds and attitudes which help to shape the form of the response.

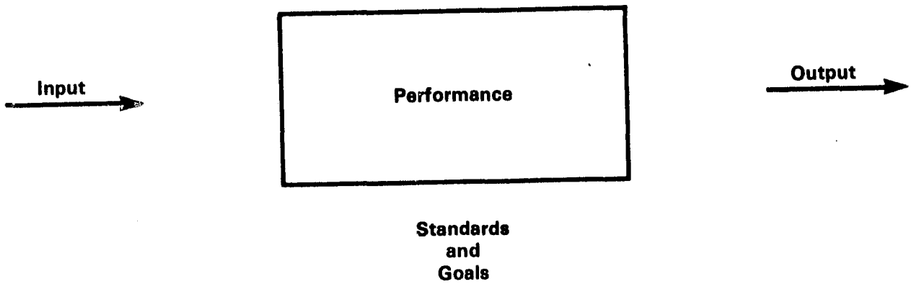
Administration is a concept that refers to agency and/or system goals and standards, the organization of activities and management of resources. The establishment of policies and regulations, administrative procedures, and the creation or reorganization of an agency can critically influence system operations and may affect the environment. The environment, administration, and system operation are interdependent and interactive. Input/output analysis while focusing on system operations should reflect this fact.

At the center of input/output analysis is an understanding of system operations, the third major system concept. System operations refers to the functions and activities of the criminal justice agencies. Exhibit 6-9 is an input/output model applied to system operations. Note that it is embedded in administration and the environment, and that crimes form the environment and goals and standards form administration or inputs to system operation.

EXHIBIT 6-9

SYSTEM OPERATION, INPUT/OUTPUT MODEL

The Relationship Among System Operation Variables

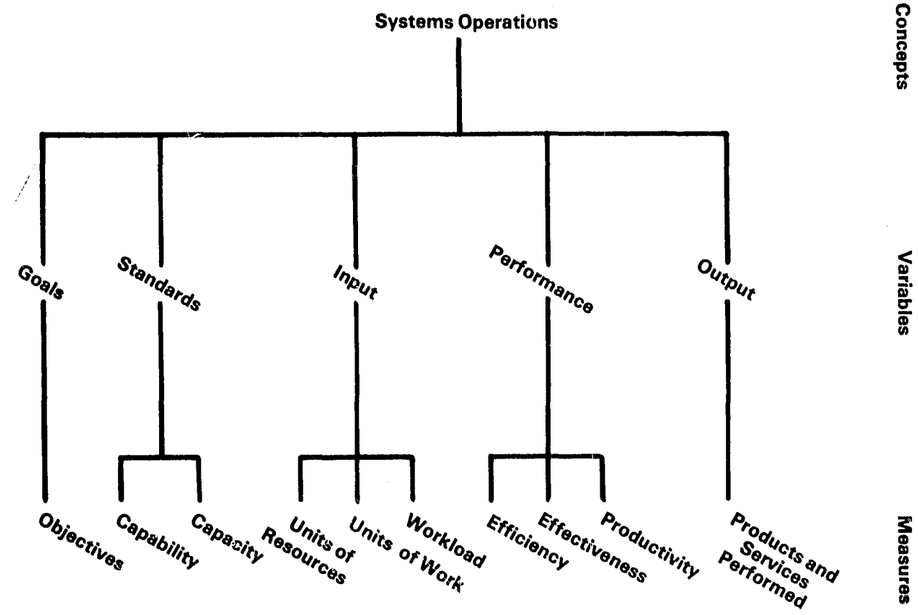


In Exhibit 6-10 the component variables used to analyze system operations are diagrammed. The following sections discuss each of these system operation variables and their related measures.

EXHIBIT 6-10

SYSTEM OPERATIONS, VARIABLES AND MEASURES

Elaboration of System Operations



1. Goals

In Exhibit 6-10, goals are measured by objectives. These are either explicit statements or implicit assumptions about the criminal justice system's operation. A goal is defined as a desired future state usually described in general terms. In contrast an objective is defined as a specific condition to be attained by a specific set of activities stated in time-limited and measurable terms. An example of a goal might be to reduce the cost of operating a vocational counseling program for ex-offenders. The objective might be to cut costs by 15% in three months.

2. Standards

A standard is an established criteria by which administrative decisions can be made. Typically such standards are based on professional experience and/or comparable national, state, or local jurisdiction standards. Two frequently used types of standards are capability and capacity. Capability (Ca) is the expected level of output at a planned level of productivity with a specified amount of resources in a given time period.

Ca = Resource Measure x Productivity Standard

For example, assume a productivity standard of 1,800 cases per judge per year. In a court with 15 judges a measure of the court's capability would be to process 27,000 cases per year:

27,000 cases per year = 15 judges x 1800 cases/judge

A second type of standard is capacity (Cp). This refers to the potential output when productivity is maximized with a specified level of resource in a given time period:

Cp = Resource Measure x Maximum Productivity Standard

For example, the minimum case cost during 1977 in the Chaos City Court was $210. This cost could be assumed to be a reasonable indicator of maximum productivity (i.e., minimum cost). Given a budget of $6.5 million and a maximum productivity standard of $210 per case, the capacity of the court would be to process 30,952 cases.

30,952 cases = $6.5 million/$210 per case

There are many other types of standards besides capability and capacity. However, most standards are explicit in their measurement and similar in their applications. Standards are important to the design and planning of programs and for evaluation purposes.

3. Resources

Inputs are defined as the work to be processed and the resources available to process work through the criminal justice system or its component agencies. Following is a list of some common resource measures

for criminal justice agencies:

Police	Prosecutors	Courts	Corrections
Officers	Attorneys	Judges	Officers
Weapons	Clerks	Courtrooms	Institutions
Vehicles	Office Equipment	Clerks	Equipment
Office Equipment	Time	Equipment	Budget
Budget	Budget	Time	Time
Time		Budget	

The resources for an anti-fencing unit in the Chaos Police Department might consist of (1) a budget of $61,000 per year; (2) five sworn officers and one secretary; and (3) three police cars plus equipment and office space. In measuring resources several distinctions are frequently important.

- staff and operational resources should be distinguished;
- operating and capital expenditures should be distinguished;
- fixed costs and variable costs should be distinguished; and
- direct and indirect costs should be distinguished.

Another measure of input is work. Work is defined as the type, amount, and importance of units to be processed through the criminal justice system or its component agencies within a specific time period. Examples of work units include:

Measures (weekly) of:

Police	Prosecutor/Courts	Corrections
Calls for service	Cases	Pre-Sentence investigations
Arrests	Hearings	Probationers supervised
Criminal investigations	Filings	Parolees supervised
Court Appearances		Inmates supervised

Generally work measures cannot be directly compared between different types of criminal justice agencies since different work measures are used.

A derived input measure that relates resources and work is workload. Workload is defined as the units of work to be processed per unit of resource. For example, the motor vehicle accident division of the Chaos Police Department has five officers (resource); they must investigate an average of 150 accidents per month (work). Therefore the workload is 30 investigations per officer per month. Workload is usually expressed as a rate that compares measures of work with measures of resources:

$$\text{Workload} = \frac{\text{Work Measure}}{\text{Resource Measure}}$$

As a second workload example, in January it is estimated that 600 convicted felons will be sentenced to a state prison which is expected to have 300 cells available. The expected workload is equal to two felons per cell:

$$\text{Workload} = \frac{\text{600 felons}}{\text{300 cells}}$$

Usually workload measures are restricted to rates of work per employee; however, as just illustrated, workload rates may be developed for other types of resources such as cells, courts, or dollars.

4. Performance

Performance is defined as the implementation of administrative decisions, the conduct of operations, and the accomplishment of tasks. There are three common measures of performance: productivity (P), efficiency (E), and effectiveness (Ef). Productivity is the amount of work that can be produced or processed with specified resources in a given amount of time. It is usually expressed as a rate that compares measures of output (described in the next section) with measures of resources consumed or budgeted.

$$P = \frac{\text{Output Measure}}{\text{Resource Measure}}$$

For example, the five person motor vehicle accident team investigated 80 accidents in December. The average productivity for each officer was 16 accident investigtions:

$$P = \frac{\text{80 investigations}}{\text{5 officers}}$$

Efficiency is the ratio of output to work, and it is usually expressed as a percent, percent change, or percent difference.

$$E = \frac{\text{output measure}}{\text{work measure}}$$

For example, in 1978 the Chaos Police Department followed-up on 10,989 out of a total of 46,560 reported larceny thefts. The efficiency of the police in the follow-up of larceny-theft reports is 23.6%:

$$E = \frac{\text{10,989 follow-ups (1978)}}{\text{46,500 reported larceny thefts (1978)}}$$

The analyst should be cautious in the development and interpretation of efficiency measures. They invite naive comparisons subject to significant measurement error, particularly when made between jurisdictions.

A third performance measure is effectiveness. This measure is defined as the extent to which objectives and standards have been achieved. Measures of effectiveness compare planned performance or output to the performance or output achieved:

$$Ef = \frac{\text{output or performance measure}}{\text{objective or standard}}$$

The Chaos Police Department has set an objective of a response time on all nonemergency calls of not greater than six minutes. During the past year a sample of 685 non-emergency calls was taken. Of these 620 had response times of less than six minutes. Therefore the Chaos Police Department was 90.5% effective in meeting its standard of less than a six minute response time.

$$Ef = \frac{\text{620 less than six minutes}}{\text{685 non-emergency calls}} = .905$$

There are several "traps" to avoid in using these definitions of efficiency and effectiveness. A police agency may be very efficient if it investigates every reported offense but would be ineffective if it made no arrests. Effectiveness relates to how well an agency accomplishes its goals and not just how efficiently it accomplishes its mission.

5. Output

The final variable used to describe system operation is output (O). This variable is measured in terms of work produced or services rendered in a specified time period. An example of an output measure for the Prosecutor's Office in product terms is the 36 complaints filed by the Prosecuting Attorney in Chaos Criminal Court during January. The 80 investigations by the motor vehicle accident team in December is an example of a service output.

Exhibit 6-11 illustrates the basic components used to analyze system operations. The rows and columns are directly observable measures of system operations. Each cell represents a different possible derived measure defined by combining the respective measures. Three analytic levels are indicated: measures may be obtained for individuals or small groups, for an organization or agency, or for a collection of agencies or a system such as criminal justice. An input/output analysis is performed in two steps. First system concerns are identified and a problem specification prepared that includes identification of the analytic level. Second, measures of objectives, resources, work, products, and services are collected and described. Third, derived measures of capability, capacity, work load, efficiency, effectiveness, and productivity are calculated and described. Finally, comparisons overtime of specific measures or between jurisdictions may be performed. Exhibit 6-12 summarizes the types of research questions appropriate to an input out analysis.

EXHIBIT 6-11

SYSTEM OPERATIONS MATRIX, DERIVED MEASURES AND APPLICATIONS

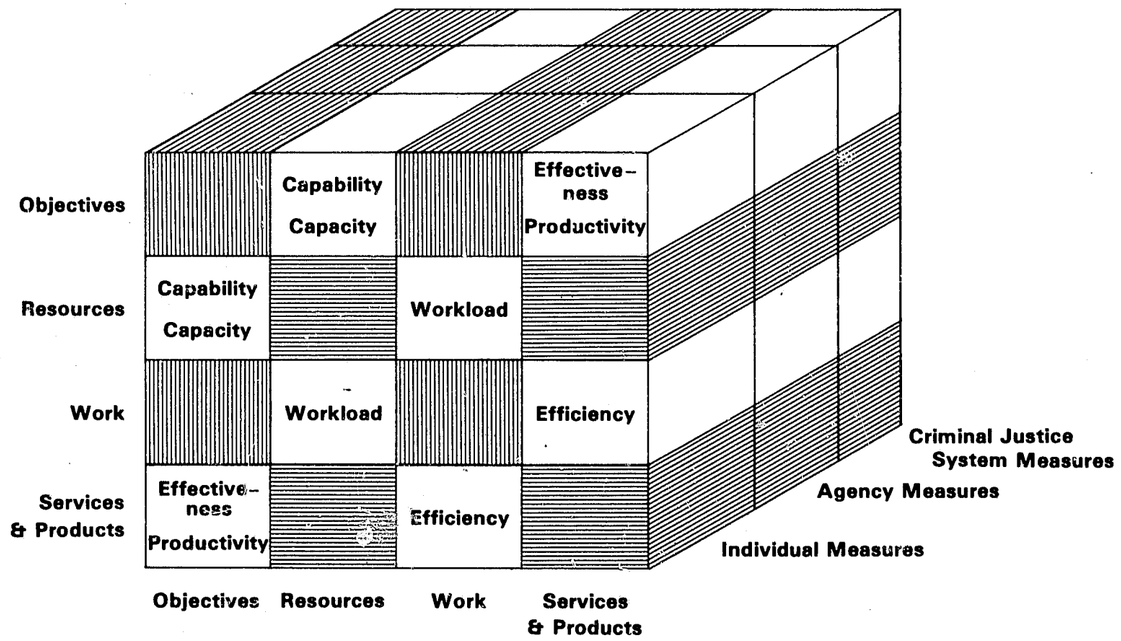


EXHIBIT 6-12.

SUMMARY OF SYSTEM CONCEPTS,
VARIABLES AND MEASURES

I. ENVIRONMENT:

What factors outside the system affect the system?

II. ADMINISTRATION:

How is the work to be organized and managed? What are the goals and standards?

III. SYSTEM OPERATIONS:

How does the system function and how do components within the system interrelate?

A. Goals and Objectives: What is expected?

B. Standards: What is ideal?

1. Capability: How much is expected to be done?

2. Capacity: How much can be done using maximum potential?

C. Input: What is to be done and what is available to do it?

1. Resources: What is available to work with?

2. Work: What is to be done?

a. Workload: How much work has to be done per unit of resources?

D. Performance: What are the results?

1. Productivity: What results are accomplished with the resources used?

2. Efficiency: How much of the work to be done is done?

3. Effectiveness: How does the result compare to goals, standards, objectives or estimates?

E. Output: What has been done?

In the following section an input/output analysis is used to analyze the Chaos Criminal Court. Concerns have been raised by the Chief Judge and other elected officials about the growing backlog of cases, the high cost of operation and, generally, inadequate performance during a period of rising community crime.

B. Chaos Criminal Court

In response to the Mayor's request for an analysis of the operations of the Chaos City Court, the Regional Analysis Group (RAG) has collected five years of data pertaining to the court. This data is presented in Exhibit 6-13. Following is an analysis of (1) the resource, work, output, and workload data; (2) system performance measures; and (3) the capability and capacity of the court. The concluding section examines alternative strategies for reducing court backlog.

Throughout this analysis several simplifying assumptions have been made. For example, the use of measures of central tendency and the treatment of all cases as alike from a processing perspective grossly simplifies reality. Separating the the caseload into groups by crime seriousness and/or crime type would significantly improve the following discussion as would the examination of the variation in case processing and not just the central tendencies. Similarly, backlog and caseload, are frequently examined in terms of individual judges and in elapsed time terms. For political reasons the Regional Planning Unit did not develop individual profiles. It was also determined that collecting elapsed time data would be prohibitively expensive and too time consuming. Finally, the aggregated nature of readily available data precluded the development of crime seriousness groups.

EXHIBIT 6-13.

CHAOS CRIMINAL COURT DATA SET, 1973-1977

	1973	1974	1975	1976	1977	% Change 1973-1977
Resources						
# Judges	12	13	13	15	15	25.0%
#Hrs/J/yr	1600	1600	1600	1600	1600	--
# Judges Hrs	19200	20800	20800	24000	24000	25.0%
Budget($)	3.1	3.6	4.0	5.6	6.5	109.0%
Expended($)	3.0	3.1	3.3	4.8	6.0	100.0%
Budget Share	7.4%	7.9%	8.4%	9.1%	9.4%	27.0%
Work						
# Cases	28000	28500	28200	29100	30000	7.1%
Arrests	18000	18900	19200	21500	22000	22.2%
New Trials	1200	300	400	700	1000	-16.6%
Pending Cases	8800	9300	8600	6900	7000	-20.5%
Output						
# Cases	15000	14000	15050	16000	20000	33.3%
Convictions	12750	12740	12943	12000	14000	9.8%
Acquittals	500	650	350	700	400	-2.0%
Dismissals	1750	610	1757	3300	5600	22.0%
Backlog	9300	8600	6900	7000	10000	7.5%

Source: hypothetical data

1. Input and Outputs

a. Resources

The data in Exhibit 6-13 indicate that during the 1973-1977 period there has been a significant increase in criminal court resources. The number of judges increased by 25% while the budget more than doubled going from $3.1 million in 1973 to $6.5 million in 1977. Not only has there been an absolute increase in resources, but the court's resources relative to other local criminal justice agencies also has increased. For each dollar budgeted for criminal justice in Chaos City, 7 cents went to the court in 1973 and over 9 cents in 1977. Finally, the court has had a surplus of unspent monies in each year during the period. This surplus ranged from $100,000 in 1973 to a high of $800,000 in 1976.

b. Work

There has been a gradual increase in the number of court cases involving new arrests. There also has been a pronounced change in the mix of cases before the court: a larger proportion of the caseload is new arrests and a smaller proportion is the previous year's backlog of cases. As a percentage of the caseload, new arrests increased from 64.2% to 73.3% between 1973 and 1977 while pending cases decreased from 31.4% to 23.3%.

The number of cases as used here refers to the number of cases filed in the Chaos Criminal Court during each of the specified years. It is a common work unit in Court studies. The case count is based on the number of defendants and includes active cases only. A case is concluded through court dispostion -- the final judicial decision terminating a criminal proceeding by a judgment of acquittal or dismissal or a specific sentence for a conviction. The pending case category is the number of cases filed but which have not been disposed of during the year.[3]

c. Output

Court output increased from 15,000 cases in 1973 to 20,000 cases in 1977.

Exhibit 6-14 indicates a significant drop in the conviction rate (number of convictions divided by the number of cases disposed of and a significant increase in the dismissal rate. The number of cases not acted upon due to insufficient time or resources during the year is referred to as the backlog. The backlog increased by 7.5% during the 1973-1977 period. Exhibit 6-15 (see next page) organizes the data on work and output into an input/output format for the 1977 data. Note that while there were 30,000 cases in 1977, the total output was only 20,000 cases resulting in a backlog of 10,000 cases.

EXHIBIT 6-14.

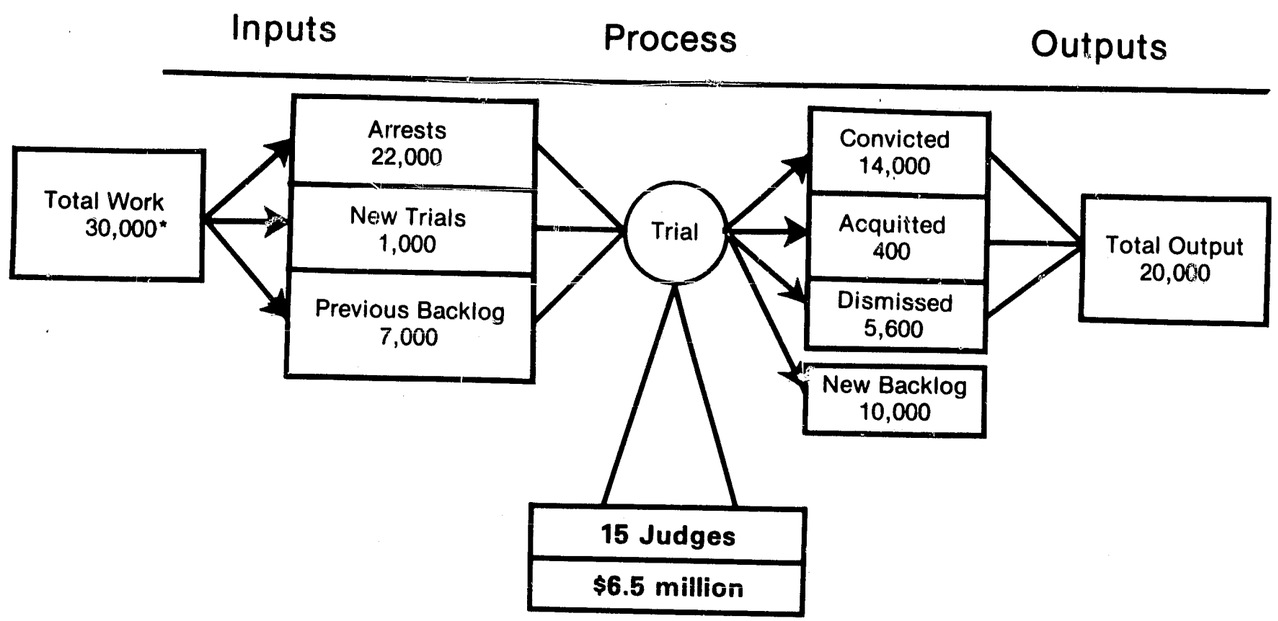
CONVICTION, ACQUITTAL AND DISMISSAL RATES,
CHAOS CRIMINAL COURT, 1973-1977

	1973	1974	1975	1976	1977	% Change
Conviction Rate	85.0%	91.0%	86.0%	75.0%	70.0%	-17.6%
Acquittal Rate	3.3%	4.6%	2.3%	4.4%	2.0%	-3.9%
Dismissal Rate	11.7%	4.4%	11.7%	20.6%	28.0%	139.3%

Source: hypothetical data

EXHIBIT 6-15

CHAOS CRIMINAL COURT, INPUTS AND OUTPUTS, 1977



*All measures are "cases"

Source: Hypothetical data

d. Workload

The 1977 the courts' workload was 2,000 cases per judge. There were also 48 judge minutes available for each case. Exhibit 6-16 presents the trend in these two workload measures. While the amount of time per case has increased from .68 of one hour (41 minutes) to .80 (48 minutes) the number of cases tried by each judge has declined from 2,333 cases per judge to 2,000. Consequently, both workload indicators suggest a significant decrease in court workload between 1973 and 1977.

EXHIBIT 6-16.

WORKLOAD MEASURES,
CHAOS CRIMINAL COURT, 1973-1977

Workload Measure	1973	1974	1975	1976	1977
Cases/Judge/Year	2333.3	2192.3	2169.2	1940	2000
Judge-Hrs/Case	.685	.729	.737	.824	.80

Source: hypothetical data

2. Performance

a. Productivity

Three productivity measures were derived from the data in Exhibit 6-13: (1) the number of cases tried per judge per year; (2) the average cost per case each year; and (3) the average judge hours per case each year. Note that a productivity index is constructed using resource and output measures: workload is calculated using resource and work measures. Thus the third productivity index is calculated using the total output of cases, while the comparable workload indicator is calculated using the caseload. Exhibit 6-17 presents these three productivity indicators for 1973-1977. No clear pattern or trend is apparent in terms of judge-hrs/case or cases/judge. Thus while workload has significantly decreased, productivity has remained about the same. However, there has been a marked increase in the average cost per case between 1973 and 1977 of over 50%.

CONTINUED

13 OF 14

EXHIBIT 6-17.

PRODUCTIVITY MEASURES,
CHAOS CRIMINAL COURT, 1973-1977.

Productivity Measures	1973	1974	1975	1976	1977
Cases/Judge/Year	1250	1076.9	1157.7	1066.7	1333.3
Cost/Case	$200.00	$221.43	$219.27	$300.00	$300.00
Judge-Hrs/Case	1.28	1.48	1.38	1.50	1.20

Source: hypothetical data

b. Efficiency

Several possible efficiency indicators may be derived from this data set. First, consider the relationship between output and work measures. For example, in 1977 there was an output of 20,000 cases compared to a caseload of 30,000 cases, or a 66.6% efficiency in processing cases. Exhibit 6-18 presents this efficiency measure for the 1973-1977 period. Note especially the improved efficiency of the court between 1976 and 1977. During this period there was an overall improvement of 24.5% in percentage of cases processed.

EXHIBIT 6-18.

EFFICIENCY MEASURE, CHAOS CRIMINAL COURT, 1973-1977

Efficiency Measure	1973	1974	1975	1976	1977	% Change 1973-77
Percent Cases Processed	53.5%	49.1%	53.4%	55.0%	66.6%	24.5%

Source: hypothetical data

A second type of efficiency measure may be derived by comparing two or more jurisdictions. For example, the mean caseload and output of 15 criminal courts in the State of Paradise during 1977 (excluding Chaos City) was 13,000 and 11,000 respectively. Thus, the average efficiency of criminal courts in the state in terms of processing cases is 11,000 divided by 13,000 or 84.6%. Chaos Criminal Court may be compared using the percent change (or difference) formula.

$$\text{Efficiency} = \frac{66.6 - 84.6}{84.6} = -21.3\%$$

Chaos Criminal Court in 1977 processed 21.3% fewer cases than the average of the other 15 criminal courts in the state.

c. Effectiveness

In 1972 the State Trial Judge Association determined that a reasonable productivity standard is 1,800 cases per judge per year. By comparing this standard to court productivity, a measure of effectiveness may be determined. In Exhibit 6-19, there is some improvement in the court's effectiveness, although the Chaos Criminal Court remains far from the statewide productivity standard.

EXHIBIT 6-19.

EFFECTIVENESS MEASURE, BASED ON PRODUCTIVITY STANDARD,
CHAOS CRIMINAL COURT, 1973-1977

	1973	1974	1975	1976	1977
Productivity (Cases per judge per yr)	1250.0	1076.9	1157.7	1066.7	1333.3
Productivity Standard	1800.0	1800.0	1800.0	1800.0	1800.0
Effectiveness	69.4%	59.8%	64.3%	59.3%	74.1%

Source: hypothetical data

A second type of effectiveness measure may be based on an objective of not increasing the previous year's backlog. For example, in Exhibit 6-20, between 1976 and 1977 the backlog increased from 7,000 cases to 10,000 cases. Assuming an output standard of not increasing the 7,000 case backlog, the court was only 70% effective. Note the decreasing effectiveness of the court in dealing with the backlog problem over this period.

EXHIBIT 6-20.

EFFECTIVENESS MEASURE BASED ON OUTPUT STANDARD,
CHAOS CRIMINAL COURT, 1973-1977

	1974	1975	1976	1977
Output	8600	6900	7000	10000
Output Standard	9300	8600	6900	7000
Effectiveness	108.1%	124.6%	98.0%	70.0%

Source: hypothetical data

3. Capability and Capacity

The development of capability measures also requires the setting of standards and objectives. Using the State Trial Judges Association productivity standard of 1,800 cases per judge each year, one measure of the court's capability in 1977 is 27,000 cases per year, i.e., 15 judges x 1,800 cases per judge. The first row of Exhibit 6-21 is this capability measure for the period 1973-1977.

EXHIBIT 6-21.

CAPABILITY MEASURES, CHAOS CRIMINAL COURT, 1973-1977

Capability Measure	1973	1974	1975	1976	1977	% Change
Cases per Year (Based on cases per judge)	21,600	23,400	23,400	27,000	27,000	25.0%
Case per Year (Based on $ per Case)	11,273	13,091	14,545	20,364	23,636	109.7%
Case per Year (Based on Average time per case)	19,200	20,800	20,800	24,000	24,000	25.0%

Source: hypothetical data

With a fixed productivity standard and an increase in the number of judges, the capability of the court to process cases also increased as indicated.

A second capability measure is derived from the $275 per case productivity standard also established by the Trial Justices. With a budget of $6.5 million in 1977, this means that the courts' capability is equal to 23,636 cases, i.e., $6,500,000/$275 per case. The second row of Exhibit 6-21 presents the cases per year for which funds have been budgeted assuming an average cost of $275/case. The final capability measure is determined by assuming a productivity standard of one judge-hour per case. If the average time per case in 1977 was equal to one judge-hour, the number of cases that could be disposed of would be equal to 24,000, i.e., 24,000 judge-hours x one judge-hour per case. Over this period, as indicated by all three measures, the court's capability to process cases increased.

Setting objectives and standards are an important part of studying system operations. Many times goals are stated in qualitative terms not readily translated into objectives and/or standards. Frequently external sources such as LEAA's Standards and Goals publications are a useful source of quantitative objectives and standards. Similar agencies in comparable jurisdictions also may have developed a useful set of standards. Where no such external source exists, intuition, experience, and common sense may prove useful in experimenting with standards and objectives in the conduct of this type of analysis.

Capacity is based on establishing a maximum productivity standard. For example, the minimum case cost during 1976 was $210. This figure is assumed to be a reasonable indicator of maximum productivity. If the average cost per case in 1977 was $210, 30,952 cases could have been processed. This is one estimate of the court's capacity in 1977. Assuming this $210 maximum productivity standard for the period results in capacity estimates of 14,762 cases in 1973, 17,143 cases in 1974, 19,048 cases in 1975, and 26,667 cases in 1976.

In summary the following findings are noted:

- Court resources have significantly increased; however, court spending has not kept pace with growth in budget.
- There has been a gradual increase in caseload with a greater proportion being new arrests.
- While court output has increased over this period, there has been a significant decline in the conviction rate and an increse in the dismissal rate.
- Court workload has significantly declined during this period.
- Productivity has declined in terms of costs per case (which has increased); the individual judge's productivity has not significantly changed over the period.
- The efficiency of the court in terms of the percentage of caseload processed has improved; however, in comparison to other criminal courts, the Chaos Court is significantly less efficient.
- The court has been less effective in recent years in dealing with the backlog problem.
- Court capability and capacity have both increased over this period.

Consequently, there appears to be a major gap between the court's capabilities and capacities on the one hand and its performance on the other. In a period of increasing resources and decreasing workloads, productivity has not kept pace. The consequences of decreasing effectiveness, increases in the average cost per case, and a growing backlog of cases are serious. This evidence, generally, supports the initial concerns of the Mayor. In the last section two alternative policies for remedying these problems are discussed: further increasing court resources and improving court productivity.

4. Considering Policy Options

Two options are considered for dealing with the backlog problem. Even though a significant increase in resources has been allocated to the Chaos Criminal Court, the result -- in the face of an increasing caseload -- has been negligible in terms of a growing backlog of cases. However, one possible strategy is to further increase the number of judges. For example, if productivity remained at 1.2 judge-hours per case and resources had been increased to 22.5 judges, there would have been no court backlog in 1977. An alternative strategy is to increase the average productivity of the court. For example, if resources were held constant at 15 judges and productivity was increased to .8 judge hours per case, the court backlog would have been eliminated in 1977.

Obviously trade-offs between resources and productivity are necessary to remedy the backlog problem. Increased resources are an added burden to the taxpayer and a political liability, while increasing productivity poses real threats to fair proceedings and may be unpopular with the legal community. Yet, the backlog itself, is expensive to the taxpayer and may be a hardship on the defendant. In Exhibit 6-22 a matrix is presented which indicates the size of the backlog in 1977 under different assumptions regarding court resources and productivity. A 7.4% increase in productivity results in a 17.5% decrease in the backlog: a 6.6% increase in resources results in a 13.3% decrease in the backlog. These "marginal utilities" are a useful method for assessing alternative policies.[3]

EXHIBIT 6-22.

EFFECT OF INCREASING PRODUCTIVITY AND RESOURCES ON COURT BACKLOG, CHAOS CRIMINAL COURT, 1977

Productivity Standard (PS) (Judge-Minutes Per Case)	Resources (Number of Judges)								
	15	16	17	18	19	20	21	22	23
72	10,000	8667	7333	6000	4666	3333	2000	666	0
67	8,507	7075	5642	4209	2776	1343	0	0	0
62	6,774	5226	3677	2129	580	0	0	0	0
57	4,737	3053	1368	0	0	0	0	0	0
52	2,308	462	0	0	0	0	0	0	0
47	0	0	0	0	0	0	0	0	0

Source: hypothetical data

The "marginal utilities" concept provides an index of the resultant change in values of performance indicators occurring from planned changes in resource levels. For example, how many more (or less) residential burglaries would be committed as a result of incremental changes to police patrol strength? Or, what difference would occur in criminal justice processing times with the addition of a new judge and/or changes in the facilities, equipment, and staff for that Judge? While these questions are difficult to answer, it is clear that answers would be invaluable toward making the most effective and efficient use of police officers, judges, parole officers, correctional facilities, or other resources.

Correlating agency-to-agency impacts of resource changes represents an important aspect of input/output analysis. For example, increasing court productivity and/or resources will increase output resulting in increased work for the corrections agency. A graphic illustration of this type of interaction and how it relates to input/output analysis is presented in Exhibit 6-23.

Effects can be gleaned from the respective "marginal utilities." Implications of changes in the value of an output indicator in one agency can be compared to the need for change in the value of a related performance indicator for another agency. An example may serve to clarify this concept.

Suppose that in 1978 one additional judge is provided, the court and the judges agree to an average productivity of 62 minutes per case. The caseload in 1978 is predicted, using least squares regression, to be 30,140. Sixteen judges could process, in 1978, at a productivity level of 62 minutes per case, approximately 24,774 cases. Assuming the

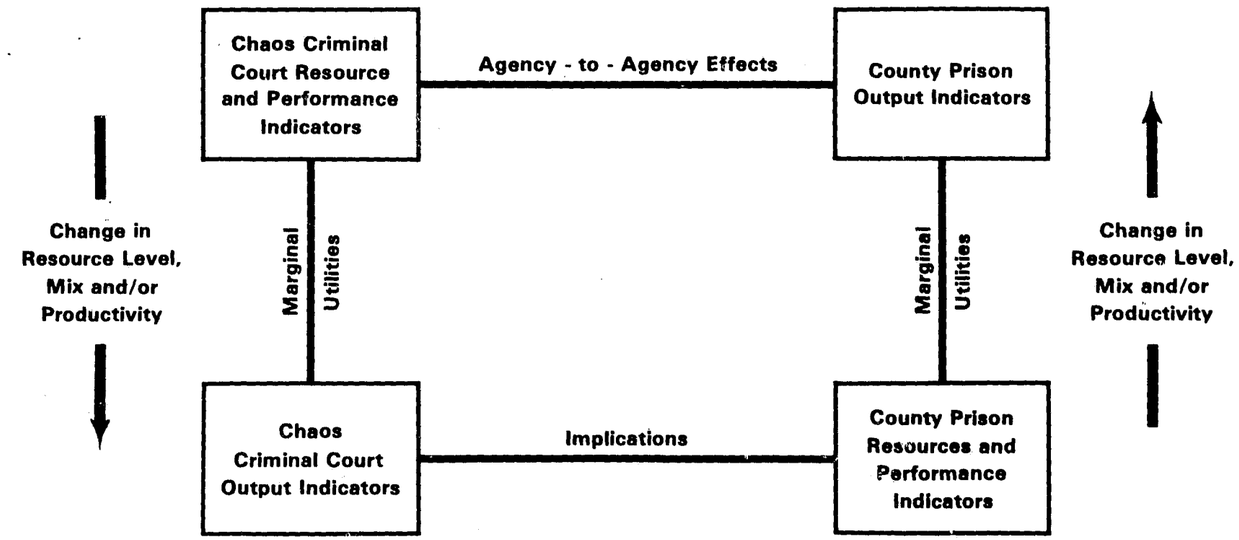
conviction rate is the same as in 1977, approximately 75% or 18,580 offenders are convicted. Of those convicted, approximately 30% or 5574 offenders are sentenced to terms in the county prison. (In 1977, of the 14,000 convictions, 4200 offenders were sent to the county prison.) This is an increase of 33% in the work or caseload of the county prison which must, consequently, adjust to the changed performance of the Chaos Court.

An analyst performing this type of analysis should be cautioned against taking too "mechanistic" a view of system operations. The criminal justice system rarely converts resource investments into benefits as directly as implied by marginal utility-type analysis. Adaptability may be a more appropriate term to use when describing the criminal justice system. "For example, the number of commitments to correctional institutions by the courts generally are greater than or equal to the amount of space. When more prison space is available, more offenders are sent to prison. Such action is probably due to the informal informational networks which exist. Because of this informality, such feedback and change is difficult to anticipate and measure but should be accounted for by the analyst."[4]

Exhibit 6-23 illustrates this interaction between changes in resources and/or performance in the Chaos Criminal Court and its downstream impact on the work of the County Prison. Changes in Criminal Court activity similarly impacts the Prosecutor and Public Defender caseloads and the work of police who must testify at the increased number of trials. These interactive costs also must be factored into a final policy recommendation on the input/output analysis for dealing with the backlog problem.[5]

EXHIBIT 6-23

MARGINAL UTILITIES AND INTERAGENCY EFFECTS OF CHANGING RESOURCES AND/OR PRODUCTIVITY, CHAOS CRIMINAL COURT AND COUNTY PRISON, 1978



Source: Hypothetical Data

III. Summary

This chapter began with a description of the criminal justice system and how flow charts are used to analyze it. As indicated in Exhibit 6-24, flow charts should be used along with the descriptive methods covered in chapter three to fully clarify the system problems being examined. Three concepts used to analyze systems were discussed. Particular emphasis was given to system operations which was elaborated into its component variables and measures. These were used to conduct an Input/Output analysis of the Chaos Criminal Court's operation during the 1973-1977 period. While few of the comparative or inferential methods were used in the example, as Exhibit 6-24 indicates, they may be appropriate in an Input/Output analysis for testing hypotheses and/or making predictions of system operations.

Finally, the study of criminal justice system operations might include consideration of each of the following functions:[6]

(1) Patterns and Trends in Operations

This includes the elaboration of input, performance, and output indicators over time and between agencies and/or jurisdictions; consideration should be given to the level, rate of change, and mix of these indicators.

(2) Administrative Profiles

The standards and objectives of the agencies and organizations under study are made explicit, as are the uses of such standards and objectives to monitor system operations and to prepare exception reports.

(3) Environmental Profiles

Demographic, crime, and other environmental variables that have a direct impact on criminal justice agency operations are discussed.

(4) Predicting System Operations

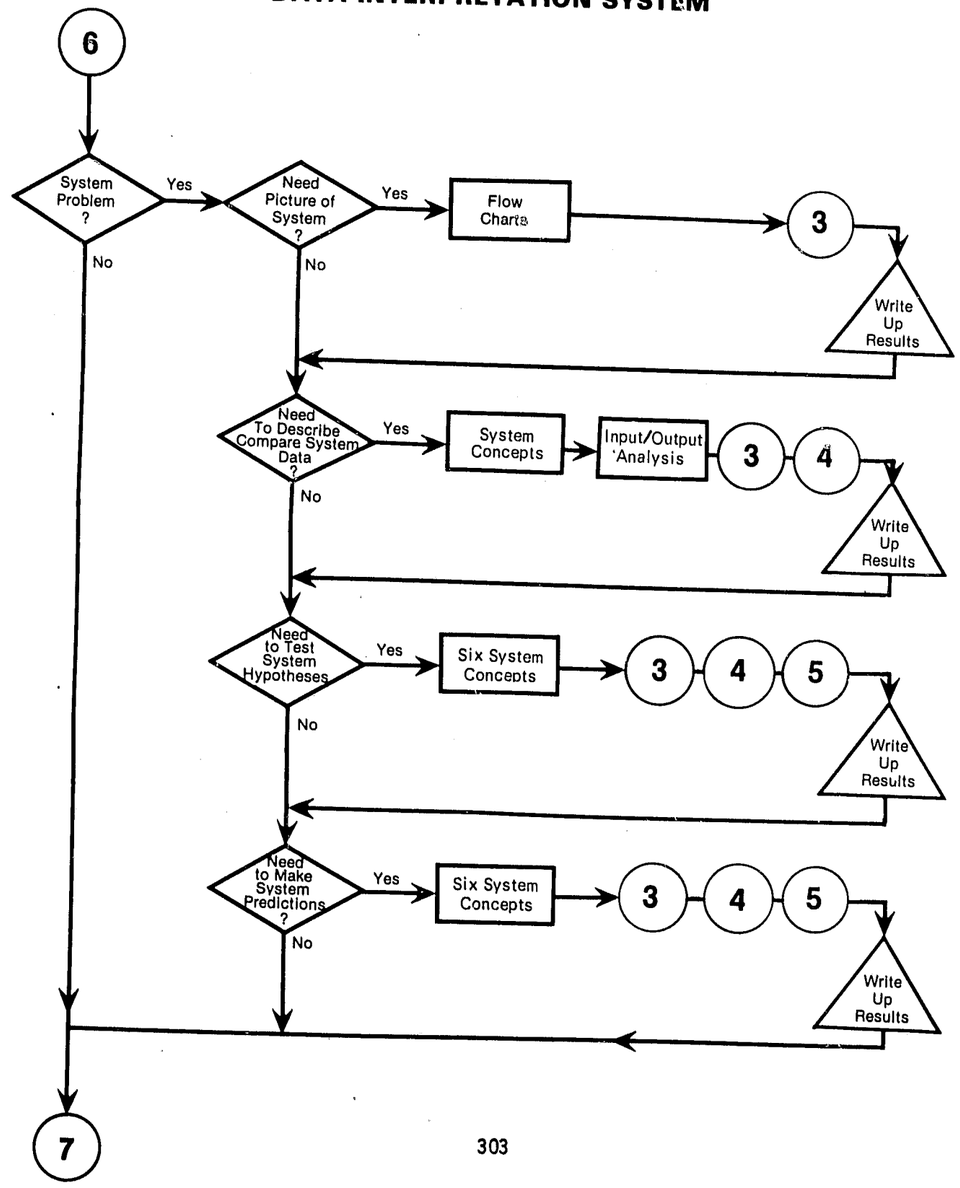
Forecasting caseloads, resources and output in light of changing levels of performance requires the use of inferential methods and input/output analysis. It may also require consideration of future crime volume by type of crime.

(5) Policy Options

Resource and performance issues in light of changing patterns in caseloads and output are discussed. Providing insight into the implications of resource allocation decisions and program and policy options for decision makers is a major theme of this chapter and of this text.

EXHIBIT 6-24

CHAPTER 6 SUMMARY CHART: DATA INTERPRETATION SYSTEM



[1]U.S. Department of Justice, National Criminal Justice Information and Statistics Service, Dictionary of Criminal Justice Data Terminology, A Report prepared by Search Group, Inc. SD-DCJ-1, 1976, p. 37.

[2]G. Hobart Reiner et. al. Crime Analysis Operations Manual, Integrated Criminal Apprehension Program, U.S. Department of Justice, LEAA, June 6, 1977, pp. 1-7 to 1-9.

[3]U.S. Department of Justice, Dictionary, pp. 20 and 40.

[4]Marianne Zawitz and Benjamin H. Renshaw, Memorandum to Richard Ulrich, Bureau of Criminal Justice Statistics (January 21, 1980).

[5]This chapter focuses on introducing an approach to analyzing system operations. Readers with interests and skills beyond those treated are encouraged to consider the developing literature in operations research and economics as applied to criminal justice. Following are selected publications that should be useful in this regard:

Alfred Blumstein and Richard Jarson, "A Systems Approach to the Study of Criminal Justice," Operations Research for Public Systems, Philip M. Morse ed. (Cambridge:, MIT Press, 1969).

Alfred Blumstein, "Management Science to Aid the Manager: An Example from the Criminal Justice System" Sloane Management Review 15 (Fall, 1973): 35-48.

Richard C. Larson and Jan M. Chaikin, "Methods for Allocating Urban Emergency Units: A Survey" Management Science 19 (Dec. 1972): 110-130.

Stuart Nagel and Marian Neef, "What's New About Policy Analysis Research?", Transaction/Society, 1978.

R. W. Anderson, The Economics of Crime (London: MacMillan Press, 1976).

Lee R. McPheters and William B. Strong, ed. The Economics of Crime and Law Enforcement (Springfield: Charles C. Thomas, 1976).

[6]Suggested by a similar list prepared by the International Association of Chiefs of Police. See Samson K. Change, et. al. Crime Analysis System Support: Descriptive Report of Manual and Automated Crime Analysis Functions. A Report prepared for the National Criminal Justice Information Statistics Service, LEAA, May, 1979.

CHAPTER 7

PRESENTATION OF FINDINGS

Introduction

This chapter suggests methods of making effective presentations both written and orally before an audience. The importance of a strong presentation cannot be stressed enough since all the products of analysis are useless if they are not persuasively presented to the proper individuals and organizations. The chapter is divided into three parts: (1) an introduction covering the factors that should be considered in preparing a presentation; (2) a discussion of the role of the analyst in making a presentation; and (3) guidelines for preparing improved written reports and oral presentation.

I. Considerations in Preparing a Presentation

The problem of organizing facts and opinions into an organized presentation is a major challenge in doing analysis. The preparation for presentation is necessary to develop a strong argument. When presentations are not properly prepared, essential facts and messages may be camouflaged, misinterpreted, or lost. There are several factors that the analyst should consider in preparing a presentation, these include: (1) the objectives and organization of the material; (2) the responsibilities of the presenter (or writer); and (3) the pitfalls of inadequate preparation.

A. Objectives

A well-written or presented problem statement develops in the audience a clear sense of the underlying concerns that motivated the analysis. At a minimum the statement needs to cover why the problem is important and in which areas the decision maker can effectively devote their attention. Not only should the analyst address the nature of the problem, but also should relate the message to the decision maker's authority.

A second objective is to organize the material effectively. "Sound organization is characterized by unity, coherence, relevance, conciseness, and comprehensiveness."[1]

Unity refers to the development of a central theme to which each component of the report or presentation may be linked. Making the theme explicit in a single clear statement or paragraph should have a high priority in preparing a presentation. Coherence is the overall structure or design of the report. In the concluding section of this chapter a recommended format for developing a written problem statement is presented. Using such a format, as well as providing links between sections of your presentation, should increase coherence.

The relevance of a presentation is, in part, a function of the analyst's understanding of his/her audience and the minimizing of

distracting anecdotes, opinions, and images which seem to be related to the subject. The analyst should weed out such excess material unless it can be tied convincingly to the theme and subject of the presentation.

The analyst should avoid repetitive and/or redundant information.

> A very common organizational fault is to deal with a topic, drop it, take up a second idea, perhaps a third, and then return to the first. The beginner is learning to be concise when (he/she) can cut his/her message into parts and paste it together again so that all of the statements about a given topic are clustered together.[2]

Another organizational consideration is comprehensiveness. All important concerns and hypotheses and the central theme need to be dealt with. The amount of detail and depth of a presentation varies, of course, by the audience's understanding and knowledge of the subject. Exhibit 7-1 is a technical checklist to use as a guide in reviewing the comprehensiveness of your analysis. A major purpose of a preparation is to familiarize yourself thoroughly with the material. When making a presentation, the analyst should assume ownership and responsibility for its content. By following this checklist, a quality control check is made, at the same time the analyst is reviewing the content of the material.

The conceptual foundation establishes the presentation's theme, must be clearly stated, and relate directly to the audience's concerns. The hypotheses should relate directly to the theme and be measurable, accurate, testable, and important. They should as well cover the magnitude of the problem, its rate of change, temporal aspect, seriousness, persons affected, spatial aspects, and the system's response to the problem. Measures used in the analysis should be correct, properly and fully interpreted and useful to the reader or audience.

B. Analyst's Responsibilities

The responsibilities of the analyst in preparing a presentation include: (1) making certain the information is transmitted clearly and succinctly; (2) assuring that the material is in a form and language that is meaningful to the audience or reader; and (3) "selling the product" and not just presenting a "problem statement." The relatively brief attention spans of most audiences means that rambling, prolonged, or confused presentations will "turn off" many individuals and alienate others. With few exceptions most of the problems criminal justice analyst's deal with are complex, impinging on other systems, other problems, and real people. These "others" may be of primary importance to the audience and a skilled presenter will build these interrelationships into the material.

The effort expended between a first draft of a presentation and its final form is usually significant. The process of revision and refinement involves several activities. These include:

- altering the approach and language to better suit the audience;

- reviewing the technical content;
- reconsidering the evidence used to support the conclusions; and
- reconsidering the arrangement of material.3

Refinement should be considered a continuous process. However, decisions must be made, deadlines occur and, unless the analyst is prepared, conventional wisdom, intuition, or worse will be the dominant influence on the decision-making process.

EXHIBIT 7-1.

TECHNICAL CHECKLIST

- Is there a well-stated conceptual foundation for the problem statement?
- Have the critical hypotheses been selected?
- Are the variables and measures reliable and valid?
- Are the statistical techniques used appropriately?
- Are the data used effectively and interpreted correctly?

II. Achieving Perspective

A major aspect of preparing a presentation is the development of an understanding about the intended audience and the analyst's role in decision-making. Three groups which usually comprise the audience for criminal justice analyses are elected officials, criminal justice administrators, and private citizens. Each has different interests and needs to which the analyst should try to respond.

For example, politicians tend to be pragmatic rather than idealogical. They frequently must work under the stress of a crisis and the demand for action. In dealing with conflict, politicians try to:

(1) anticipate public and interest group reactions
(2) make use of political symbols
(3) simplify issues
(4) personalize and particularize issues
(5) be solution-oriented

Criminal justice administrators, in contrast, tend to be program and agency-oriented. Their focus is frequently on issues of accountability and responsibility. Administrators are drawn into conflicts over the jurisdiction of problems, the criticism of performance or operations, or resource allocation. Aaron Wildavsky suggests several strategies taken by bureaucrats used to maintain or increase their allocation of the budget. Some of these include finding and cultivating clientele groups,

acting confident and cultivating trust from other decision-makers, and avoiding over-promising and under-performing.[4] Analysts need to consider such aspects of their environment if they are to be an influence.

Public and organized interest groups play an important part in criminal justice decision-making. The analyst should be sensitive to their perceptions, interests, and needs.

The issues of fear of crime and concerns over government costs are common to public discussion of criminal justice. The public, as do interest groups, uses a variety of methods for communicating their feelings and beliefs to decision makers. These range from letters-to-the-editor to public hearings and informal meetings. The analyst should monitor these expressed interests and consider them in preparing a presentation.

Another important element in achieving perspective is to understand fully your own role in the decision making process. Chapter 1 discussed this issue in some detail. One additional concept that may be useful is the distinction between the old and new expert presented in Exhibit 7-2. Reality rarely exists in terms of opposites as presented in the exhibit. However, the contrasts are useful in describing the orientation of this text in terms of the role analysts should play in decision-making. A second perception of the analyst's role is presented in Exhibit 7-3. Most of these role types are not mutally exclusive; that is, each analyst tends to integrate the consultant, trainer, and leader roles into a style that is suited to the situation and the individual's personality. Nevertheless, the emphasis is on the analyst being both responsive to the needs of the decision maker and a problem-seeker.

III. Guidelines for Effective Presentations

The following guidelines are relevant to both the preparation of a written report and the preparation and delivery of oral presentations. A basic theme running throughout these guidelines is that the analyst should stick to a priority message. An analyst cannot expect to convey all that is known about a problem or all the data collected and analyses performed; rather, the analyst must select and develop priority messages which are of major importance to the decision-maker. A related theme is that decision-makers have limited time to devote to the task of listening to or reading a staff report, regardless of the critical nature of the problem or of the effort devoted to the analysis. If the analyst doesn't maximize this opportunity, it will leave the audience with a blurred or incorrect impression. Following is a discussion of two factors that need to be considered in developing an oral or written presentation: (1) organization and (2) emphasis.

EXHIBIT 7-2.

CHARACTERISTICS OF THE OLD AND NEW EXPERT

Old Expert	New Expert
Solution Oriented	**Problem Oriented**
(defines a problem in terms of a solution) bounded emphasis on primary effects simplifying assumption accepting	(explores a situation to find the problem) unbounded secondary and tertiary effects complexifying assumption challenging
Question Answering Expertise	**Question Asking Expertise**
error denying surprise-free	error embracing surprise embracing
System Closing	**System Opening**
elitist technocratic comforting conflict masking product oriented	democratic public threatening conflict exposing process oriented
Organization Captive	**Boundary Spanning**
protected "hired gun" institutional client-oriented	exposed free floating personal issue-opportunistic
Politically Explicit	**Politically Ambiguous**
late in political process choice related well-defined expectations	early in political process issue formulating uncertain expectations

Source: R. Burco in Donald N. Michael, On Learning to Plan and Planning to Learn (San Francisco; Jossey-Bass Publishers, 1976), p. 1975.

EXHIBIT 7-3.

ROLES OF THE ANALYST

Role Type	Function
Conveyor	To transfer knowledge from producers (scientists, experts, scholars, developers, researchers) to decision makers.
Consultant	To assist decision makers in identification of problems and resources, to assist in linkage to appropriate resources; to assist in adaption to use: facilitator, objective observer, process analyst.
Trainer	To transfer by instilling in the decision makers an understanding of an entire area of knowledge or practice.
Leader	To effect linkage through power or influence in one's group, to transfer by example or direction.
Innovator	To transfer by initiating diffusion in the criminal justice system.
Defender	To sensitize the decision maker to the pitfalls of innovations, to mobilize public opinion, public selectivity, and public demand for adequate applications of analysis.

Source: Adapted from R. Havelock in Donald Michael, On Learning to Plan and Planning to Learn (San Francisco: Jossey Bass, 1977), p. 243.

A. Organization

There are many approaches to organizing a presentation. Following is a list of rules, suggested by David Ewing, that can be used to help select the particular facts and ideas that will be included in a presentation:

1. Consider how much background is necessary before you present ideas, directives, or recommendations for change.
2. Your credibility with your readers affects your strategy.
3. If your audience disagrees with your ideas or is uncertain about them, present both sides of the argument.
4. Put your strongest points last if the audience is very interested in the argument, first if it is not so interested.

5. Do not hope to change attitudes by offering information alone.
6. "Testimonials" are most likely to be persuasive if drawn from groups with which readers (or the audience) associate.
7. Be wary of using extreme or "sensational" claims, facts, or examples to support your message.
8. Tailor your presentation to the reasons for reader's (or audience's) attitudes, if you are pretty sure of them.5

Such a set of rules helps to identify the priority messages. It also makes clear the importance of the intended audience in developing and organizing a presentation.

A general pattern or framework should be used to integrate the different pieces of information. Some of the more common patterns are:

- time order (historical, or when giving directions, what is to done first, second, last);
- space order (geographical, left to right);
- classification (such as crime or system operation concepts);
- cause and effect (first outline causes, then discuss effects, useful in predicting future events);
- simple to complex (begin with descriptive analysis and introduce more complex analyses gradually);
- problem-solution (begin with analysis of problem, then suggest solution);
- proposition-support (state your case, then provide evidence);
- support-proposition (provide evidence then draw proposition as conclusion or allow audience to infer proposition);
- effect to cause (first discuss effects, then suggest possible causes -- useful in analyzing present problem);
- method of residues (list representative solutions, then object to and eliminate all but the last);
- climax order (list points in increasing order of importance); and
- anticlimax (list points in decreasing order of importance).6

B. Emphasis

Emphasis in a presentation is the consequence of organization as well as the methods used to clarify and interpret. There are three concerns in this regard: (1) the effective use of data; (2) the use of contrasts and comparisons; and (3) anticipating audience or reader questions and issues.

1. The Use of Data

The pupose of data in a report or presentation must be clearly understood by the analyst and the reader.

> In general, observations have most value when the investigator has examined them, made some interpretation, and arranged them to show some pattern. The average reader does not want raw data any more than he wants raw sugar cane. Both have value, but the refined product is usually the more palatable.7

Some general considerations in selecting data for a presentation are: (1) data must be consistent and supportive of the narrative; (2) selection of data should be based on their relevance, clarity, accuracy, and their assistance to the reader in understanding the problem; and (3) too much or poorly organized data can confuse a presentation. All tables, charts, and graphs used in a presentation should be fully labeled and correctly interpreted in the narrative. A good report or presentation does not leave the interpretation of the data up to the reader.

2. Contrast and Comparison

A well-prepared presentation makes use of silent contrasts and comparisons and powerful combinations to achieve emphasis. Problem statements should provide, if possible, a sense of the dynamics of a problem, i.e., its history, current status, and future consequences. The analyst should try to reinforce a presentation by comparisons and analogies with which the audience is familiar. Examples and illustrations drawn from neighborhood aspects of the problem or a specific incident of the problem are more easily understood by an audience than are conceptual arguments. The use of comparisons and contrasts the audience understands focuses and holds attention and helps people to remember the priority messages.

3. Audience Awareness

Emphasis also is based on the analyst's perception of his/her audience. The assumptions of a presentation should be made explicit. The presentation should be critiqued prior to its delivery to develop an awareness of what the weak points are and what questions may be anticipated. Rehearsal and editing should be from the audience or reader's perspective and responses to anticipated questions should be either edited into the presentation or planned for. Finally, the analyst should use terms important to the audience. While technical language is helpful if the audience knows it, it is not helpful if there are no technically trained people.

IV. Preparing a Written Report

A written report typically provides greater detail than an oral presentation, it may be used to supplement an oral presentation or stand-by itself, and it can be broadly disseminated. In developing a written report the author should avoid major omissions of evidence and/or interpretation. The importance of logical organization and consistency in form and content should be based on the reader's needs. Poorly organized reports have little impact. The use of an organizing framework is as important in a written report as it is in an oral presentation. In Exhibit 7-4 a recommended outline for a Problem Statement is illustrated.

EXHIBIT 7-4.

WRITTEN REPORT ORGANIZATION

Section 1.0	Introduction
	1.1 Statement of concerns
	1.2 Nature and source of concerns
	1.3 Scope of concerns
Section 2.0	Analysis Methodology
	2.1 Definition of terms used
	2.2 Measurement reliability and validity
	2.3 Data collection procedures used
	2.4 Statistical methods used
Section 3.0	Findings
	3.1 Conceptual Hypothesis #1 - Supporting variable and measurement hypotheses, results, interpretations, and conclusions
	3.2 Conceptual Hypothesis #2 - Supporting variable and measurement hypotheses, results, interpretations, and conclusions
	3.3 Etc.
Section 4.0	Discussion of findings in general
	4.1 Discussion of findings in relation to the concerns expressed
	4.2 Discussion of limitations
Section 5.0	Summary
	5.1 Highlights
	5.2 Conclusions
Section 6.0	Appendices

This format is consistent with the logic and procedures discussed throughout the text. A problem statement should include all of the indicated information. In many instances full information may not be available, or a special audience may not require all that is indicated. The analyst should always be aware of the audience to whom the statement is addressed and must balance and proportion the report accordingly. For example, one of the significant problems in communicating an analysis to a decision maker is how to convey important details. Special formats such as in Exhibit 7-4 or an Executive Summary can be instrumental in building interest, confidence, and directing attention to specific areas of the full report. Appendix A, at the conclusion of this chapter, is a fully developed problem statement prepared by Chaos City analysts.

A second important consideration in preparing a written report is the style of writing. Ewing identifies over a dozen different styles including:

- abstract, bloodless;
- elaborate, meticulous;
- excessive, redundant;
- figurative, metaphorical;
- logical, systematic;
- oratorical, flower; and
- plain, straightforward.

He suggests, in addition, some "do's and don'ts for any style:"

1. Vary the structure and length of your sentences.
2. Avoid the elongated-yellow-fruit school (i.e., house becomes an abode, habitat, living quarters, domicile, etc.).
3. Go easy on euphemisms (e.g., "eliminate with extreme prejudice" was a euphemism and historical dodge for the word "kill").
4. No matter how technical your communication, try to frame some thoughts in an active who-did-what-to-whom way.
5. Avoid excessive words (e.g., in the proximity of, near; resultant effect, effect; and advance planning, planning.)[8]

V. Conducting a Briefing

There are three factors to be aware of in conducting a briefing: (1) the materials used; (2) the manner of presentation; and (3) achieving proper emphasis and balance. Materials that may be used to support an oral presentation include a summary outline or report and visual aids. The analyst might develop a brief outline to distribute to the audience that succinctly covers the briefing's content and that highlights priority messages. The use of visual aides such as a flip chart, overheads, or slides can be effective if they are clear, neat, and informative. In developing visual aids for a presentation be sure they are relevant to the priority messages and integrated into the delivery. Don't assume that the audience will see in a particular chart the same meaning you give to it. By appropriately setting the stage for a visual aid and using proper commentary guiding the audience's interpretation,

employing visual aids can have significant positive effects on a presentation.[9]

The manner of presentation also is a significant factor. This includes specifying individual responsibilities if more than one person is involved, giving attention to the audience's needs, and paying attention to delivery style. Frequently a group will give a presentation in which specific assignments have not been made. The consequences are obvious to the audience and embarrassing to the presenters. In considering the audience make sure that the presenter: (1) faces them; (2) locates the visual aides in a manner so that they are easily read; (3) avoids "loaded" words and negative symbols; and (4) is responsive to their reactions and questions.

Finding a balance in an oral presentation requires the analyst to prepare a delivery that is both technically complete and has perspective on the problem. Problem specification, measurement, and data interpretation must be refined and adjusted to the interests and concerns of the audience.

VI. Conclusion

A well prepared Problem Statement, is a delicate balance between concepts, variables, measures, hypotheses, and data interpretation.[10] If too little emphasis is given to the conceptualization of a problem, the resulting hypotheses and data interpretation will suffer. (See Chart I of Exhibit 7-5). Typically, when too little thought is given to concepts, the result is massive "number crunching" without the production of much information. The analyst compares, graphs, contrasts, correlates, tabulates, and re-analyzes large volumes of data which result from an aimless searching when specific hypotheses are not constructed. Suppose a patrol commander were to ask for an analysis of the department's performance without reducing his vague concerns to specific concepts. The result would be dismay, ambiguity, an excessive number of analytic false starts, and the production of a confusing accumulation of answers without questions.

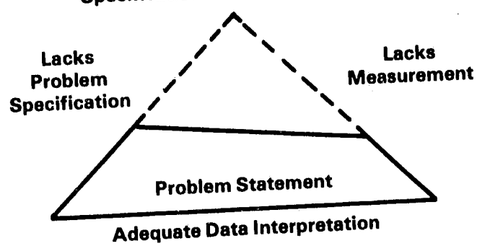
Another type of imbalance involves insufficient measurement. In this situation, concerns have been refined to specific concepts; but the process for securing data to analyze these concepts is haphazard, unscientific, superficial, or mismanaged. Not infrequently, the analyst is presented with specific questions; but, due to the pressures of time, inadequate preparation, or insufficient technical capability, the measurement of the concepts is insufficient or inadequate. The statistical procedures employed are superficial. Sampling procedures are inadequate. The amount of data gathered is too small or unrepresentative. tive. Computational errors are made, and inappropriate statistical procedures are applied. (See Chart II Exhibit 7-5).

For example, the analyst responds to the patrol commander's concerns about performance by examining only the calls for police service on Friday and Saturday nights, disregarding the other days of the week. Or imagine if the analyst doesn't take into consideration seasonal fluctuations and the effects of weather conditions on response time.

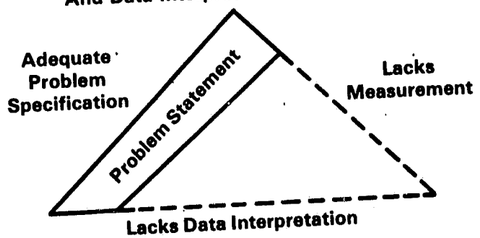
EXHIBIT 7-5

PROBLEM STATEMENT TRIANGLE

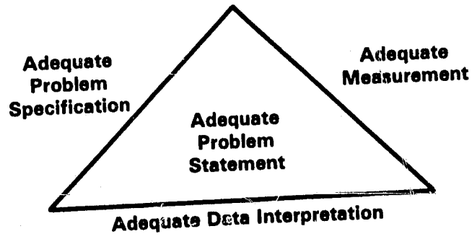
I. Analysis With Inadequate Problem Specification And Measurement



II. Analysis With Inadequate Measurement And Data Interpretation



III. A Well Balanced Analysis Produces Adequate Problem Statements

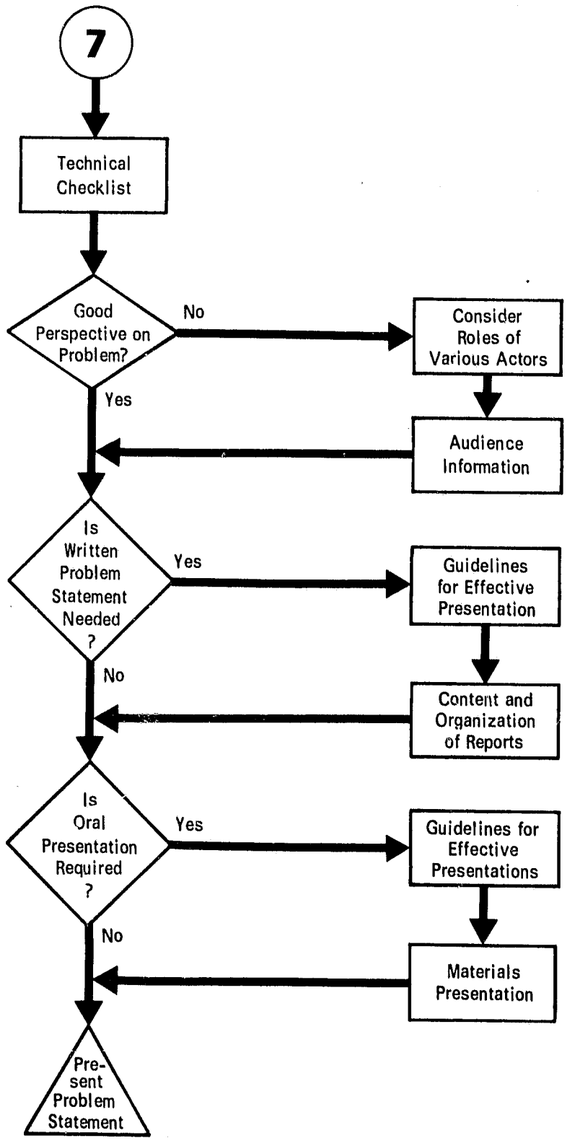


Supposing the analyst only uses graphic or statistical techniques with which he is familiar even though the data do not meet minimum assumptions. This type of imbalance results in problem statements which are superficial and unsubstantiated. The results of such analyses are difficult to replicate and do not lead to confident generalizations. Since this imbalance frequently results in superficial analyses, the resulting problem statements may include suggested alternatives which attack symptoms not problems. They address the transitory aspects of the problem and may not result in any long-term solutions.

A well-balanced Problem Statement consists of adequate problem specification, measurement, and data interpretation as illustrated in Chart III of Exhibit 7-5; also important are the organizational and delivery considerations discussed in this chapter. These are presented in the concluding chart -- Exhibit 7-6. Each aspect of an analysis -- from identification of concerns to delivering a report -- warrants attention to detail in its performance and presentation. In this manner the analyst may have a greater confidence in the accuracy and relevance of his/her work and a greater impact on decisions effecting criminal justice.

EXHIBIT 7-6

CHAPTER 7 CHART: PRESENTATION OF FINDINGS



[1]William Howell and Ernest Bormann, Presentational Speaking for Business and The Professions (New York: Harper & Row, 1971), p. 111.

[2]Ibid, p. 112.

[3]Donald H. Menzel et. al., Writing A Technical Report (New York: McGraw-Hill Book Company, 1961), pp. 15-20.

[4]Aaron Wildavsky, The Politics of the Budgetory Process, 2nd ed. (Boston: Little, Brown and Company, 1974), pp. 63-123.

[5]David W. Ewing, Writing For Results in Business, Government and the Professions (New York: John Wiley & Sons, 1974), pp. 72-90.

[6]Howell and Bormann, Presentational Speaking, pp. 120-121.

[7]Menzel, p. 37.

[8]Ewing, Writing For Results, pp. 364-411.

[9]Howell and Bormann, Presentational Speaking, p. 268.

[10]The ideas in this summary were suggested by Charles Friel, San Houston State University.

CHAPTER 8

MANAGING ANALYSIS

Introduction

The management problems associated with doing analysis include: (1) maintaining the technical quality of the products by monitoring procedures and tasks; (2) using available staff effectively; (3) controlling expenditures; and (4) ensuring the products developed are responsive to the decision makers' needs. In this chapter management skills and tools particularly useful in planning an analysis are covered. These include identifying tasks and procedures, establishing a schedule, labor allocation, and budget. These are presented in the context of an Analysis Plan which is a written document or oral presentation which systematically outlines and describes a sequence of events and procedures for conducting an analysis.

I. Analysis Plan

The structure of this text closely parallels the components of an Analysis Plan. These components include:

I. Analysis Objectives.

   A. Questions to be Answered.
   B. Problems Specification.

II. Analysis Procedures.

   A. Elaboration of Measures.
   B. Data Collection Plan.

III. Analysis Methods.

IV. Presentation and Dissemination Plan.

V. Work Plan

   A. Tasks and Schedule.
   B. Labor Allocation.
   C. Budget.

Establishing the objectives of a proposed analysis has several important dimensions that were discussed in some detail in chapters one and two. The statement of objectives should be convincing in terms of the importance of the proposed analysis and clear in terms of what is to be included and what has been left out.[1] In addition, the problem specification should identify good hypotheses easily linked to the objectives and questions the analysis is to address.

The second part of an Analysis Plan presents a discussion of the sources of data and data collection procedures to be used. The analyst should make explicit the specific data to be collected, where and how

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this data is to obtained, and the instruments to be used (e.g., questionnaires, interview protocols), if any. Chapter 2 covered many of the techniques and issues central to preparing a Data Collection Plan. However, an important subject area in this section of a plan, not covered by this text, is of research design. The quality of criminal justice analysis depends, in large part, on the design choice, particularly in doing evaluative studies.[2]

The third part of an Analysis Plan indicates the methods that will be used in examining the data for each hypothesis. In preparing this section be sure to check the assumptions and appropriateness of the methods selected.[3] Should the need arise for unfamiliar multivariate or advanced methods, experts should be consulted to ensure appropriate selection and application.

An important component of an Analysis Plan is a description of the expected products. A detailed outline of the final report might be included and a discussion of the methods for distributing information about results presented. A central issue in this section is the identification of the primary and secondary audiences for the information and the methods of communication to be used to reach these audiences.

The last component is the Work Plan which is the major focus of this chapter. This portion of an Analysis Plan outlines the tasks and activities of the analysis, identifies major events and milestones, and establishes a schedule. It is important that this schedule and description of tasks be consistent with the prior sections of the plan and provides sufficient time for each of the critical tasks such as data collection or report writing. Also included in the Work Plan is the labor collection or report writing. Also included in the Work Plan is the labor allocation which identifies, by position, the time necessary to complete each task. The last part of the Work Plan is the budget. This is a translation of the preceeding sections into a statement of resource requirements. Typically, the rationale for all budgeted items is included in an accompanying narrative. Finally, there should be a clear correspondence between the budget, labor allocations, and schedule. In Exhibit 8-1 the different components of an Analysis Plan are identified and are linked to the respective chapters in this text which treat each topic.

Analyses, like most administrative activities, require some degree of prior planning. Formal written Analysis Plans are the exception in most criminal justice work; most prior planning involves more of an intuitive mental checklist done more or less spontaneously when necessary. The degree of formalization in planning an analysis depends on several factors including the scale of the proposed study, the amount of resources involved, and the need to form a consensus about aspects of the analysis. In general, a more formal Analysis Plan is not required on small-scale studies, "crisis" studies, studies requiring confidentiality, studies not needing a consensus on what the problems are or how they should be analyzed, low-priority studies, and studies that are exploratory and which require significant innovation as they proceed.

EXHIBIT 8-1

ANALYSIS PLAN DEVELOPMENT, COMPONENTS, AND USES

STAGES DEVELOPING AN ANALYSIS PLAN	State concern for which analysis is needed	Specify concepts, variables, measures, hypotheses	Assess measures and hypotheses	Identify & select data sources	Select analysis techniques	Perform analysis	Identify audience and use for findings	Select presentation format & dissemination procedure	Determine manpower, equipment, time and funds needed
ANALYSIS PLAN COMPONENTS	Questions to be answered	Problem specification	Prioritized list of hypotheses	Data collection plan	Selected analysis techniques	Interpretation of findings	Audience identification & use for products	Presentation and dissemination	Tasking, Labor allocation, and costing
USE (WHAT EACH STAGE TELLS THE ANALYST)	WHY	WHAT	WHAT	HOW	HOW	WHO WHAT WHEN WHERE WHY	FOR WHOM	FOR WHOM	WHEN, BY WHOM & HOW MUCH
MODULE REFERENCE	MODULE 1: PROBLEM SPECIFICATION		MODULE 2: DATA SYNTHESIS		MODULES 3,4,5,6 METHODS OF ANALYSIS		MODULE 7: PRESENTATION OF FINDINGS		MANAGING ANALYSIS

Formal Analysis Plans are used to help assure accurate results produced in a cost-effective manner. By forcing the analyst to think through each of the components, potential sources of error may be eliminated and efficiencies achieved. The lack of analysis planning frequently results in missed opportunities, overspending, and inferior products. Such efforts, characterized as "data grubbing," are usually based on vague understandings of concerns and are subject to criticism for being erroneous in their conclusions, are of poor technical quality, and are over-priced.

Finally, there are many occasions when a formal Analysis Plan may be required. Frequently budget requests and grant applications must be accompanied by an Analysis Plan. Federal, state, and private funding agencies usually require a detailed outline of a proposed analysis before authorizing funds to cover its cost. The outline in Exhibit 8-1 covers the types of issues raised by decision-makers about proposed studies.

There are obviously many possible ways of organizing an Analysis Plan, but the major components generally are similar. The process of preparing such a plan follows the logic of the text. Following the Chapter Summary Charts presented in this text, in sequence, should be a useful guide. However, new information or insights may result in changes to the original hypothesis or the data collection efforts. The lack of available data or the complexity required to analyze certain hypotheses may result in a revised problem specificaton. Similarly if the data collection effort is estimated to cost more than the available budget, changes in the plan must be made. However, it is important to work through each stage, and to link each component to all components, so that inconsistencies may be avoided, gaps in logic or design eliminated, and a strong structure for conducting an analysis established.

II. Work Plan

The Work Plan is one of the most important aspects of analysis, since scheduling and resource allocation are needed to ensure that the analysis tasks actually get done, are completed on time, and the results are of high quality. A number of management tools are available to assist in this effort. These tools are used to aid in determining:

(1) the tasks and sequence of tasks necessary to complete the analysis
(2) the types and amounts of manpower required and special skills needed to peform each task
(3) major milestones and target dates
(4) a time schedule for use of resources to perform tasks

Following is a discussion of each part of a Work Plan. These include the tasks and schedule, labor allocation, and budget.

A. Tasking

Tasking refers to the identification of tasks and activities, establishment of milestones, and the development of a time schedule. By

breaking an analysis effort into its component tasks, a better understanding of the overall project should be obtained. Frequently the outline of tasks and time schedule presents to the reader or audience the first coherent structure of planned analysis. It should be obvious that the outline of tasks must be consistent with the preceding sections of the plan. Following is a discussion of two techniques used to help organize the tasks of an analysis.

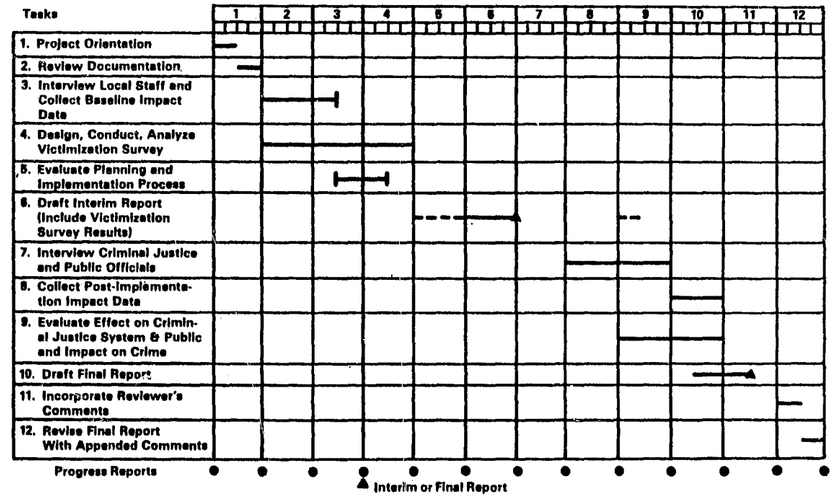
1. Gantt Chart

Henry Gantt developed a scheduling chart in 1917 that has become widely used and known as the Gantt Chart. The Governor of the State of Paradise has requested an analysis by the Criminal Justice Analysis Center of the impacts, if any, which state-funded local crime reduction programs are having. A Gantt Chart prepared by the Center's staff for this evaluation is presented in Exhibit 8-2.

EXHIBIT 8-2

STATE ANALYSIS OF LOCAL CRIME REDUCTION PROGRAM IMPACTS BY MONTH

GANTT CHART



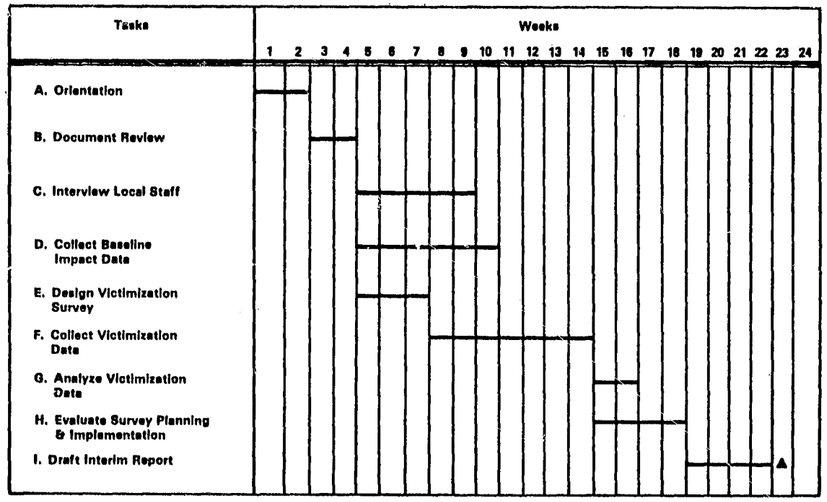
Source: hypothetical data

In the exhibit the rows are used to indicate activities or tasks. These should be discrete to avoid overlapping. In the proposed study there are 12 tasks identified. The analysis has been broken into four stages: (1) initial project orientation; (2) collection of pre-project data including interview data, official crime data, and victimization data; (3) collection of postproject data (including same items as in 2); and (4), preparation of a final report.

The columns of this exhibit are used to indicate months of the project. Products are indicated by triangles, and lines indicate the starting time, duration, and completion data for each task. Task 4, the victimization survey, is scheduled to begin during the second month and conclude by the end of the fourth month. Note that in the sixth and eleventh months of the chart no scheduled activity is planned. These gaps are used to allow for slippage in the schedule. However, using the month as a time interval builds in an additional four week slippage automatically (4 x 12 = 48 weeks). To correct for this as well as to provide greater detail in scheduling, the preferred time interval of a Gantt Chart is the week. Exhibit 8-3 presents a Gantt Chart for the first six tasks of Exhibit 8-2 (through drafting the interim report). Greater task detail is provided in the weekly Gantt and the automatic slippage is avoided.

EXHIBIT 8-3

GANTT CHART
STATE ANALYSIS OF LOCAL CRIME REDUCTION PROGRAM IMPACTS, BY WEEK



Source: hypothetical data

2. PERT Chart

A limitation of the Gantt Chart is that it does not indicate which activities must be completed before others can begin or which sequence of tasks should be given highest priority. These problems are particularly significant in large and/or complex analysis projects. The PERT (Program Evaluation and Review Technique) technique was developed in the 1950's by the U.S. Navy for coordinating and controlling complex projects involving a large number of geographically dispersed contractors. In its application to analysis planning and management, PERT allows the analyst to examine the interrelationships of tasks over time. In turn, this information permits an estimate of the duration of those tasks which are expected to take the longest and which are crucial to completion of the project on schedule.

Nine activities or tasks are identified in Exhibit 8-3. Exhibit 8-4 converts each of these activities into its component events. For example, the Project Orientation (A) consists of two events: (1) start project and (2) complete orientation. In this manner 18 events have been identified for the nine activities. In the PERT Chart, events are indicated by numbered circles. Arrows between circles indicate activities that link events and the direction or flow of these activities. The duration of each activity is indicated above the solid arrows. For example, the duration of activity I -- Draft Interim Report -- is four weeks. Dotted arrows indicate a relationship but no required activity time, e.g., between (16) victimization data analyzed and (17) start interim report.

In this report three tasks may be accomplished simultaneously: staff interviews, baseline data analysis, and victimization survey. These separate tasks are indicated by the branching at event (4) into three paths. By adding the times along each possible path in a PERT Chart, the longest or critical path may be determined.

Path 1: A, B, D, H, I = 18 weeks
Path 2: A, B, C, H, I = 17 weeks
Path 3: A, B, E, F, H, I = 22 weeks
Path 4: A, B, E, F, G, I = 20 weeks

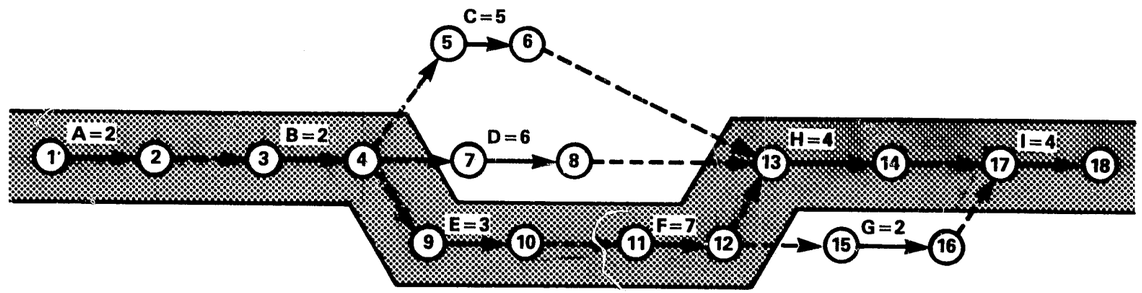
The critical path in this project is path 3 and it is indicated on the exhibit with shading. Delays of three, four and two weeks might be tolerated during the project along the other three paths without affecting the completion of the Interim Report. Any delays along the critical path would jeopardize completing the Interim Report on schedule.

In an actual application, the PERT network could be specified in more detail. The classic PERT technique also contains procedures for estimating activity times where uncertainty is involved. Estimates are obtained for the "most likely" time or subtask manager; the person directly responsible for the work is reponsible for both the estimates and task completion.

PERT is most useful for large-scale and complex problems such as scheduling and tracking the tasks a large metropolitan or state criminal justice planning agency undertakes over a year period. However, PERT can also be useful on a more informal basis for smaller projects as well

EXHIBIT 8-4

PERT NETWORK WITH CRITICAL PATH INDICATED FOR ANALYSIS PROJECT (TASK = TIME IN WEEKS)



Events

1. Start Project
2. Complete Orientation
3. Begin Document Review
4. Finish Document Review
5. Start Staff Interviews
6. Finish Staff Interviews
7. Collect Baseline Data
8. Baseline Data Collected
9. Design Victimization Survey
10. Survey Design Completed
11. Collect Victimization Data
12. Victimization Data Collected
13. Evaluate Survey
14. Complete Evaluation
15. Analysis of Victimization Data
16. Victimization Data Analyzed
17. Start Interim Report
18. Finish Draft Report

Key
- O Event
- --- Relationship
- → Sequence of events
- A=2 Time between events showing number of weeks

Project managers who have used PERT techniques say that its advantages are that it facilitates:

- understanding the relationships and precise nature of the constraints during the development of an Analysis Plan;
- monitoring progress and slippage during implementation;
- identifying priorities for resource reallocation through use of the critical path as the highest priority; and
- reminding individual task managers of their schedules and progress.

Software programs for computerized PERT charting and monitoring are available. An example of the type of output available from a software package is shown in Exhibit 8-5. This exhibit shows information, for one of the task managers, during week 9 of the Analysis Tasks outlined in the PERT Chart in Exhibit 8-4. A major advantage of this system is that it provides an automatic reminder to task managers about the status of the work for which they are responsible. This computerized system removes the onus from the project managers for reminding staff of their schedule commitments and the standardized reporting system similarly relieves managers of ongoing manual data collection.

In summary, Gantt Charts are a useful means for indicating the weekly time line for each task. They are easy to construct and easy to understand. However, they fail to show the interrelationship of tasks. PERT Charts are used to identify precedent and concurrent relationships between all activities and events. They help to identify priority tasks and to assess the probability of meeting deadlines. However, they are more useful for large, complex projects which are infrequently undertaken in criminal justice analysis.4

B. Labor Allocation

Once target dates and milestones, based on preliminary estimates of staff workloads and performance, have been identified on a Gantt Chart, a labor allocation chart can be developed. Knowing how many person-hours to assign each activity requires that the analyst has completed similar tasks. A safety margin should be built in to each estimate since many managers tend to under-estimate the actual time necessary to complete analytic tasks.

The first step in developing a labor allocation chart is to select a particular position associated with the project, i.e., Project Director or Interviewers, and indicate on the Gantt Chart the personnel requirements for the project. For example, in Exhibit 8-6 each weekly column indicates the planned allocation of the Project Director's time for each task. No more than 40 hours is allowed in each column; thus in week nine the Director is allocated 30 hours to interview local staff, five hours to help collect baseline data and five hours to help in the victimization data collection. The final column indicates the amount of the director's time planned for each task and the total time required of the director (880 hours). Approximately 17% of his/her time is planned for interviewing local staff and 18% for drafting the Interim Report.

EXHIBIT 8-5

PERT REPORT
STATE ANALYSIS OF LOCAL CRIME REDUCTION IMPACTS, 2/3/77

Page 1

Component: Local Programs Overall Responsibility: John Buchanan Phone: 5364

Office	Person Responsible	Action Step Description	Start Date	Time Est.*	Time Used*	Status	% Compl	Pland Compl	New Compl	Documentation for Verification
Analysis Design	James McPherson	Design Interviewing Instrument	1/3	5	5	C	100	1/7		Interview Instructions
Analysis Design	James McPherson	Training Interview Staff	1/10	2	2	C	100	1/11		Interview Assignments
Analysis Design	James McPherson	Conduct Interviews	1/12	18	20	I	95	2/3	2/8	Weekly Completion Checklists
Analysis Design	James McPherson	Conclude Interviews				S	00	2/4	2/9	Completions Interview Checklist

* (in Days)

Signature

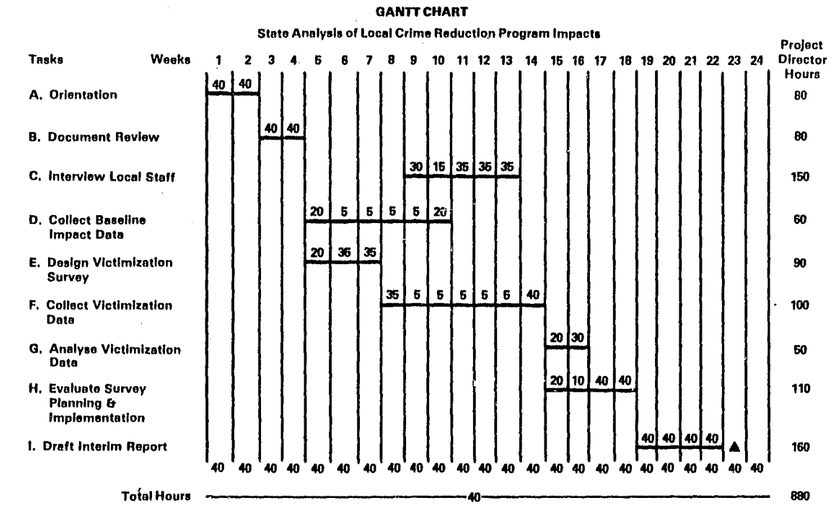
This report lists each of the action steps for which you have primary responsibility. Please report current status of these activities in the following manner.

1. Check the information under status (STA.). "S" means that the action step is scheduled but not yet begun. "I" means that the action step is in progress. And "C" means that the action step is complete. The space under VERIFICATION lists the documentation required to verify completion of the action step. A "V" in the status column indicates that the documentation has been received and recorded by the AIDP Office.
2. Examine the information under the percent complete (% COMPL) and status (STA.) headings. If the information presented is no longer correct, line through the incorrect information and place the correct information in the space above.
3. If you must request a completion date later than the date listed, write this new estimated completion date in the new completion date (NEW COMPL.) column. This request will be reviewed by the person responsible for your component.
4. Sign the report in the space provided and return the form to Dr. Buchanan's office.

Source: hypothetical data

EXHIBIT 8-6

PROJECT DIRECTOR, LABOR ALLOCATION ON GANTT CHART



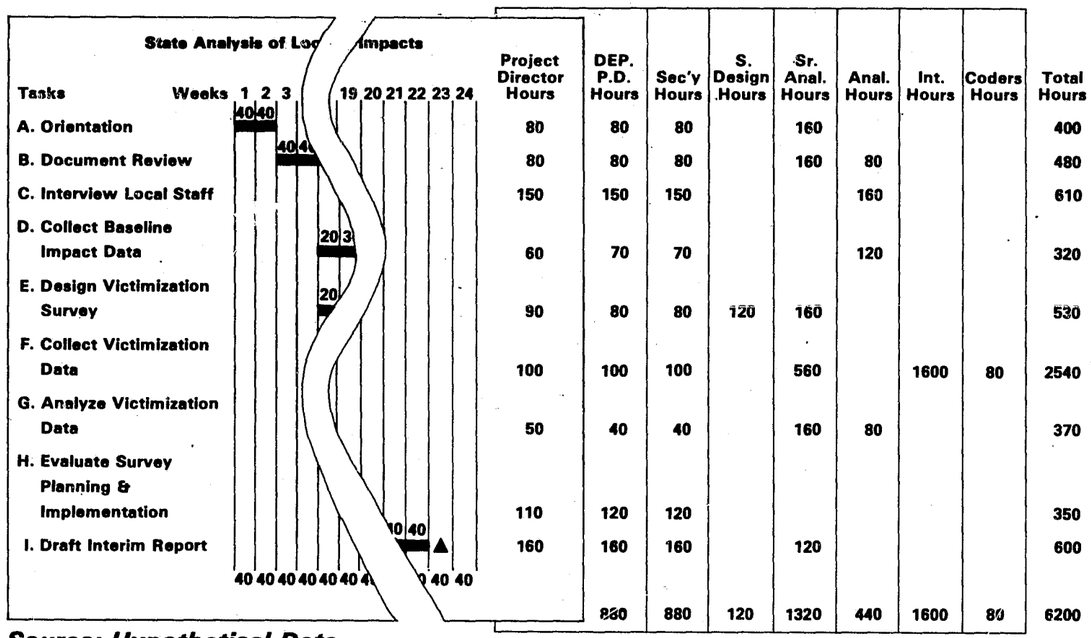
Source: hypothetical data

The same procedure is followed for each position required to perform the proposed analysis. These Gantt Charts give a clear picture of weekly assignments of staff to tasks by position. By consolidating the Gantt Charts as indicated in Exhibit 8-7, using only the total hours column for each Gantt Chart, an estimate of total task hours and the labor requirements of an entire project may be developed. The consolidated Gantt Charts are, then, directly transferred to the labor allocation chart in Exhibit 8-8. The labor allocation indicates the heavy emphasis given to the victimization survey and the need for part-time assistance to help in the victimization survey effort.

EXHIBIT 8-7

CONSOLIDATED GANTT CHARTS

Labor Allocation Chart - Obtained by Consolidating the Gantt Charts for Separate Positions



Tasks	Project Director Hours	DEP. P.D. Hours	Sec'y Hours	S. Design Hours	Sr. Anal. Hours	Anal. Hours	Int. Hours	Coders Hours	Total Hours
A. Orientation	80	80	80		160				400
B. Document Review	80	80	80		160	80			480
C. Interview Local Staff	150	150	150			160			610
D. Collect Baseline Impact Data	60	70	70			120			320
E. Design Victimization Survey	90	80	80	120	160				530
F. Collect Victimization Data	100	100	100		560		1600	80	2540
G. Analyze Victimization Data	50	40	40		160	80			370
H. Evaluate Survey Planning & Implementation	110	120	120						350
I. Draft Interim Report	160	160	160		120				600
	880	880	880	120	1320	440	1600	80	6200

Source: Hypothetical Data

EXHIBIT 8-8

LABOR ALLOCATION CHART

Tasks	Proj. Dir.	Dep. Proj. Dir.	Secretary	Survey Designer	Sr. Analysts	Analyst	Interviewers	Coders	Total Hours
A. Orientation	80	80	80		160				400
B. Doc. Review	80	80	80		160	80			480
C. Int. Local Staff	150	150	150			160			610
D. Collect B. Data	60	70	70			120			320
E. Design V. Survey	90	80	80	120	160				530
F. Collect V. Data	100	100	100		560		1600	80	2540
G. Analyze V. Data	50	40	40		160	80			370
H. Evaluate V. Survey	110	120	120						350
I. Interim Report	160	160	160		120				600
Total	880	880	880	120	1320	440	1600	80	6200

Source: hypothetical data

C. Budget

The last component of the Work Plan is the budget. Assessing the cost of a proposed analysis should be straightforward once the Gantt and Labor Allocation Charts have been prepared. A sample budget is provided in Exhibit 8-9 for the victimization survey tasks of the project (activities E, F and G of the labor allocation chart). Three major budget categories are included: (1) salaries and wages; (2) direct expense items; and (3) indirect costs. Salaries and wages are based on an hourly rate for each position and the estimated hours required. Also included are the fringe benefits for these employees. The direct expenses include the costs of equipment and purchased services such as keypunching.

EXHIBIT 8-9.

SAMPLE BUDGET FOR
PROPOSED VICTIMIZATION SURVEY

SALARIES & WAGES	HOURLY RATE	HOURS	COST
Project Director	12.21	240	2,930
Deputy Proj. Director	10.54	220	2,319
Secretary	5.64	220	1,241
Survey Designer	8.65	120	1,038
Senior Designer	8.03	880	7,066
Analyst	5.17	80	414
Interviewers	3.50	1600	5,600
Coders	5.00	80	400
Total S & W			21,008
Fringe 30% of S & W			6,302
TOTAL DIRECT LABOR			27,310
EXPENSES			
Computer			1,467
Printing			1,000
Telephone			8,400
Keypunch/Verification			1,250
Total Expense			12,117
TOTAL DIRECT COSTS			39,427
*INDIRECT (70% of S & W)			14,706
TOTAL COSTS			54,133

*Negotiated percentage only applicable for a grant or contract application. Not used in operational budget.

Source: hypothetical data

The costs of the direct expenses have been estimated based on the assumption of 5,000 telephone interviews to be completed in a six week period. The last category of indirect costs include overhead costs for such items as office space, heating, and lighting. Normally in an operational agency budget, this category is not included.

In developing a cost estimate, the analyst should assess the scope of each task, costs of alternative approaches to performing the task, and the consequences of reduced cost alternatives on the project schedule, on products, and on management. The basis for costing an alternative may be professional judgment, cost experience in comparable activities, ceilings set by available resources, a pre-test, and/or pure guestimates. For example, if only $40,000 (74% less) was available for this phase of the project, a revised budget could be prepared based on proportionate ceilings within each category: $20,180 would be available for salaries and wages; $8,954 for direct costs, and $10,866 for indirect costs. If resources will not stretch to cover all costs, a significant scaling down of activities and products should be built into the Work Plan.

Rationales need to be developed in this budget for each expense item. Computer costs are based on a contract with Paradise University's Computing Center that includes computer time and one terminal for an estimated $177.25 per month for 12 months. Printing costs are based on twenty copies of two reports, each 200 pages in length (2.5¢ per copy including printing, collating, and binding). Telephone charges are based on a service contract with the telephone company for six watt lines for a three month period to conduct the victimization survey as well as $50 per month for miscellaneous phone charges. The keypunch and verification estimate is based on a per record charge of 20¢ and an estimate of 6,250 records.

In preparing a budget narrative the analyst must be aware of areas in the budget which either comprise a large portion of the budget (e.g., survey costs), are weak in their justification (e.g., the computer charge does not specify the amount of computer time allotted), or are potential cost-reduction items. In a review of the budget these will likely be focused on by a funding source.

All costs of the analysis project should be identified in the budget. If different sources of funds are to be used, the distribution of expenses by funding source should be indicated. In summary, in developing a budget, the following should be considered:[5]

- All other components of the Analysis Plan and, particularly, the Work Plan must be prepared prior to drafting a budget.
- The budget should have the same detail as other components of the Analysis Plan and should be prepared by the person most knowledgeable about the tasks of the project.
- A record of all budget calculations, assumptions, and/or rationales should be kept for future reference and for monitoring of expenses.
- All expenses included in the budget should be well documented in the Work Plan, either in the budget narrative or in appendices,

e.g., the service contracts. It may be desirable to reference budget items to other components of the Analysis Plan that justify the proposed expenditure.

III. Benefits of Planned Analysis

From the perspective of the city manager, mayor, or taxpayer, Analysis Plans help to ensure that a useful product will result from a proposed project. Such planning permits a wider participation in the setting of analytic priorities by citizens, interest groups, and decision makers within the jurisdiction who may be interested or have a need for the results of the analysis effort and whose support may be essential for its funding. From the manager's or supervisor's perspective, preparing Analysis Plans has several advantages. This perspective:

- helps provide staff direction and organization while reducing the uncertainty and risk of analysis efforts
- gives the manager information necessary for establishing a realistic and cost-effective analysis agenda
- facilitates staff and agency performance evaluation in that a clear plan exists by which conduct may be compared
- facilitates early agreement by key participants on the problem(s) and desired products
- provides the manager with concrete proposals for analyses to be performed should additional funds be made available

Of course, the detailed planning of a major analysis effort is expensive. Time spent in preparing and writing such a document is a real expense. The relative effort spent by staff in planning an analysis must be carefully determined by the manager.

Ernest Allen conducted an analysis of the shortcomings of disapproved Analysis Plans submitted to DHEW. While the data are close to 20 years old, Allen's findings still are a useful checklist for planning an analysis effort:[6]

Problem Specification

- The problem is of insufficient importance or is unlikely to produce any new or useful information.
- The proposed research is based on a hypothesis that rests on insufficient evidence, is doubtful, or is unsound.
- The problem is more complex than the investigator appears to realize.
- The research as proposed is overly involved, with too many elements under simultaneous investigation.
- The description of the nature of the analysis and of its significance leaves the proposal nebulous, diffuse, and without clear purpose.

Methods

- The proposed tests, or methods, or scientific procedures are unsuited to the stated objective.
- The description of the approach is too nebulous, diffuse, and lacking in clarity to permit adequate evaluation.
- The over-all design of the study has not been carefully thought out.
- The statistical aspects of the approach have not been given sufficient consideration.
- The approach lacks scientific imagination.
- The data the investigator proposes to use is unsuited to the objectives of the study or is difficult to obtain.
- The number of observations is unsuitable.

Analyst

- The analyst does not have adequate experience or training, or both, for this project.
- The analyst appears to be unfamiliar with recent pertinent literature or methods, or both.
- The analyst proposes to rely too heavily on insufficiently experienced associates.
- The analyst is spreading himself too thin; he/she will be more productive if he/she concentrates on fewer projects.
- The investigator needs more coordination with colleagues.

Management

- The requirements for equipment or personnel, or both, are unrealistic.
- It appears that other responsibilities would prevent devotion of sufficient time and attention to this analysis.
- The institutional setting is unfavorable.

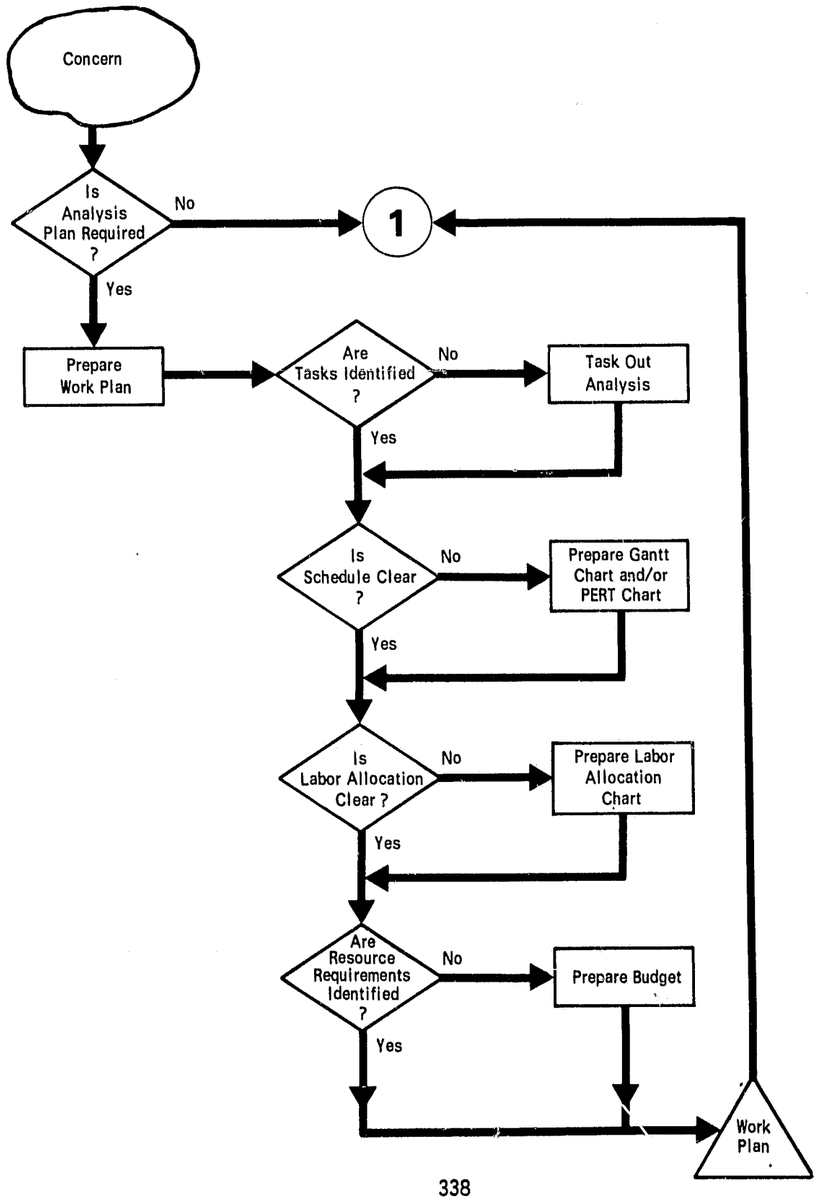
IV. Conclusion

Effective analysis projects must be carefully planned and well managed. In this chapter, the outline of an Analysis Plan and the management tools used to organize an analysis have been presented. The steps to follow in preparing a Work Plan are indicated in Exhibit 8-10.

Uncertainty and risk are inherent in the role of a criminal justice analyst who is actively involved with the decision-making process. By giving more attention to planning analyses formally, as described in this chapter, some of these uncertainties and risks may be dealt with. It is expected that, consequently, the analyst will play a larger and more constructive part in criminal justice decision-making.

EXHIBIT 8-10

CHAPTER 8 SUMMARY CHART: MANAGING ANALYSIS CHART



[1]David Krathwohl, How to Prepare a Research Proposal (Syracuse University, School of Education, 1966), pp. 7-10.

[2]Several excellent sources on research design are available. These include: Donald T. Campbell and Julian C. Stanley, Experimental and Quasi Experimental Designs for Research (Chicago: Rand McNally and Company, 1963); Thomas D. Cooke and Donald Campbell, Quasi-Experimentation: Design and Analysis Issues for Field Settings (Chicago: Rand McNally, 1979); particularly good introduction to research design is presented in John B. Williamson et. al., The Research Craft (Boston: Little Brown and Company, 1977).

[3]Krathwohol, Research Proposal, p. 13.

[4]Additional information on PERT may be found in Desmond L. Cook, Program Evaluation and Review Technique, U.S. Office of Education, 1966. See also Harry F. Evart, Introduction to PERT (Boston, Allyn and Bacon, 1964).

[5]Mary Hall, Developing Skills in Proposal Writing (Corvallis Office of Federal Relations, Oregon State System of Higher Education, 1971), p. 164.

[6]Ernest M. Allen, "Why are Research Grant Applications Disapproved?" Science (Nov. 25, 1960): 1533.

* U.S. GOVERNMENT PRINTING OFFICE : 1981 O - 349-845 Vol.2

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