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ISSUES IN CRIME ANALYSIS IN SUPPORT OF PATROL

A REVIEW AND ASSESSMENT OF THE LITERATURE

Submitted To:

The National Institute of Law Enforcement and Criminal Justice
Law Enforcement Assistance Administration
United States Department of Justice

by

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The Foundation for Research and Development in Law Enforcement and Criminal Justice, Inc. under Grant #75-NI-99-0066 prepared this review and assessment of the literature on "Crime Analysis in Support of Patrol" as part of the National Evaluation Program of the National Institute of Law Enforcement and Criminal Justice, Law Enforcement Assistance Administration. This report, ISSUES IN CRIME ANALYSIS IN SUPPORT OF PATROL: A Review and Assessment of the Literature, is based primarily upon an extensive review of the available secondary source literature. Points of view and opinions stated in this document are those of the authors and do not necessarily represent the official position or policies of the U.S. Department of Justice.

PREFACE

Grant #75-NI-99-0066 from the Law Enforcement Assistance Administration's LEAA National Institute of Law Enforcement and Criminal Justice (NILECJ) to the Foundation for Research and Development in Law Enforcement and Criminal Justice, Inc., calls for the Foundation to ascertain the "State of the Art" concerning crime analysis operations in support of patrol within police departments throughout the United States, to report concerning its findings, to describe and report the actual results accomplished by crime analysis projects, and to develop evaluation strategies which might be employed to evaluate on-going crime analysis projects. Crime analysis is considered in two broad aspects: 1) deployment of patrol personnel in relation to the short-term immediate crime problems, and 2) allocation of field personnel to meet the longer term needs of crime prevention, apprehension of criminals and provision of miscellaneous patrol services.

This paper 1) identifies and discusses the primary issues involved in police use of crime analysis to convey what we have thus far learned about the subject, and 2) assesses the "State of the Art" of crime analysis as reflected in the available literature and critically reviews the validity of what is presented there.

To accomplish these purposes, an extensive review of the literature has been accomplished. To identify and obtain relevant documents, the following reference sources were utilized:

-- The National Criminal Justice Reference Service and its related services.

-- The Grants Management Information System of the NILECJ.

-- National Technical Information Service.

-- Indiana University Library, its branch facilities, and the inter-library loan service.

-- Input of knowledgeable individuals, and of LEAA, state planning agencies, and various police department staff members to identify crime analysis-related projects, published and unpublished reports, and working and position papers.

Problems arose in obtaining current documents because of two factors. First, the primary source of leads to unknown documents, the NCJRS Search and Retrieval Abstract documents, had not been updated much beyond 1973. Secondly, several documents known to exist were unobtainable from their publishing organizations for various reasons (such as the exhaustion of a limited number of copies prior to request).

With a few exceptions, the literature search on crime analysis for deployment has not been a rewarding experience, although there has been a considerable amount of discussion of resource allocation in the literature. Because of the lack of documents having police crime analysis systems or operations as the principal subject, and the absence of bibliographies having crime analysis as an indexed subject, a wide variety of literature was obtained and reviewed, much of which was determined to have little or no relevance to the subject at hand. Many documents contain information

about crime analysis but are not concerned with its incorporation into police work. Others contain direct reference to police use of crime analysis but discuss its use only briefly, often treating it as a routine procedure. For instance, a typical document may concern description of a special crime control project and contain the statement that crime analysis was used in identifying target areas, or aiding in deployment, or in some other support role, leaving to the reader's imagination just what type of analysis occurred, what was the data base, how the information was disseminated, etc. In other words, leaving unanswered essential questions about the crime analysis operations in support of deployment.

Other difficulties in developing an adequate body of reference also presented themselves. In the literature which did address the subject of police use of crime analysis, more material was found on proposed or incipient operations or projects than on completed or established ones. These documents raised more questions than they answered, as they dealt with capabilities and potential, rather than performance. Another problem is the self-serving nature of many of the documents, authored by a representative of the participant agency. Their purpose has been more to publicize and idealize operations and performances of a police agency than to report objectively about a supposedly innovative and successful program.

Perhaps the main problem encountered was the fact that most of the material is outdated. Because of 1) the fact that many of the documents reported on temporary projects which no longer exist, 2) the ever changing and developing nature of the subject area and 3) the fact that much of the information was in the form of proposals for programs which were altered once implemented, material more than one or two years-old could not be considered representative of the current situation. Thus, although we can report to an extent on the capability and potentials of crime analysis, some aspects of it which have been used, and its conceived role in various police departments and agencies throughout the country, the literature is quite inadequate for assessing the state of the art of crime analysis for deployment and allocation in 1975.

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1.0 INTRODUCTION

1.1 Scope of the Study

The purpose of the study is to examine crime analysis in support of patrol, patrol having been grouped into three categories: 1) traditional patrol, 2) specialized patrol, and 3) team policing. As the literature review progressed, it became evident that there were several possible approaches to dealing with issues of evaluation of crime analysis in support of patrol. In the narrowest sense, crime analysis is concerned only with identifying short-term patterns of criminal behavior or events and associated characteristics.[1] In the broadest sense, crime analysis has been considered as the total process of management decision-making throughout the entire criminal justice system and related agencies.[2] The mandate to National Evaluation Program grantees is to retain a sufficiently narrow outlook on the subject to assure meaningful examination and a workable evaluation scheme. It became evident that an evaluation scheme constrained to the framework identified within the Police Crime Analysis Unit Handbook would be too restrictive, yielding little useful information for assessing the value of crime analysis in support of patrol. Nearly all measurements would be in terms of subjective reaction to the immediate output of the crime analysis unit, such as crime bulletins, M.O. pattern reports, etc. Likewise, an attempt to deal with the entire spectrum of decision-making would require time and resources beyond

the scope of this project.

Discussion with NILECJ/NEP personnel resolved the scope of the project to include the issues surrounding the allocation and deployment of patrol personnel resulting from crime analysis and related analytical activities. The project, therefore, examines crime analysis as an integral part of the decision-making process for: 1) deployment -- the tactical* movement and actions of personnel directed at specific crime problems; 2) allocation -- the strategic assignment of personnel by function, geography and tour of duty to deal generally with crime and other police responsibilities. Deployment is the tactical response to event and suspect patterns identified through the daily analysis of crime, arrest and related information. Allocation is the strategic response to periodic analysis of the distribution of crime, hazard and service problems and workloads and the need for new approaches to dealing with the basic responsibilities of the police.

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*For the purpose of clarity, the following definition will serve to show the distinction between tactical and strategic as used throughout this report: Tactical: ". . . involving actions or means of less magnitude or at a shorter distance from a base of operation than those of strategy." G. & C. Merriam Co., Webster's New Collegiate Dictionary. 1975: Springfield, Massachusetts, p. 1186.

These decisions are characterized by the organizational level at which they are made. Tactical decisions are action-oriented and are made close to the level of execution whereas the strategic decisions are policy-oriented and are made at the highest command levels of the agency.

The distinctions are further clarified in Figure I-1, which is an abbreviated list of program elements.

The allocation and deployment decisions resulting from analysis actually include much more than patrol. The entire staffing function of the police agency is affected by these decisions. Again, because of the mandate to retain a sufficiently narrow scope to the study, this report will focus on those decisions involving the assignment and functions of the patrol force, although the investigative function will be included when it is seen as a necessary adjunct to a patrol allocation/deployment decision. This is in no way intended to minimize the importance of allocations for other police functions but results solely from the need to retain a meaningful focus that can be shown to be productive within the scope of time and resources available for this study.

For the purpose of this discussion, the decisions which are supported then by crime analysis, regardless of the level of sophistication of the analytic process, are:

1. Allocations of resources by function (response, prevention, investigation), geography and time within the traditional concepts of police structure and assignments, e.g., patrol beats; specialized patrol programs and team policing.

2. Short-term crime-oriented (preventive, apprehension and investigative) deployment and tactical actions of individual officers and specialized units.

3. New program development intended to provide innovative approaches to solving problems that fall within the scope of police responsibility. These decisions also may include redefinition of the scope of police responsibilities and the police role.

FIGURE I-1

	ALLOCATION	DEPLOYMENT
Data Input	calls-for-service (CFS) crime arrest social/demographic special interests geographic	crime arrest field contact reports (FCR) special interests personal awareness
Analysis Types	workload distribution crime types volumes and change arrest types and distribution miscellaneous hazard distribution social/demographic indicators of need epidemiology of crime and service needs	crime pattern collation suspect pattern collation crime-related hazard patterns
Analysis Outputs	monthly and yearly crime statistics workload imbalance figures projected CFS beat structuring information simulation model outcomes of sector redesign	daily and weekly crime incident reports frequency distributions by time and area M.O. intelligence reports vehicle description reports
Distribution Decisions	organizational assignments, by tour of duty to: investigation patrol districts and beats specialized/preventive patrol units neighborhood teams special programs	tactical assignments and method of operation of the allocated resources directed to: crime concentration patterns, suspect patterns, and crime-related hazard patterns
Intermediate Objectives	optimal sector design balanced workload of patrol units standardized priority ranking of CFS shortened queuing of CFS optimal CFS response time including emergency responses	improved emergency response time/space coincidence of patrol units and criminal acts (or creation of an impression of high probability of such coincidence) crime pattern disruption
Ultimate Goals	crime prevention arrest property recovery citizen satisfaction increased police morale non-criminal regulation hazard and citizen problem solution	crime prevention arrest property recovery

1.2 The Framework of Decision-Making

Decision-making, as the focus of the review of crime analysis, raises several issues. The decisions vary from those of relative certainty -- allocation for called-for-services; to those that are based on a high degree of uncertainty -- allocation for prevention. In any case, however, there is a common process involved. The literature offers several alternatives to structuring this process. The scientific method, systems analysis and management by objectives are examples of methodologies that can be considered; however, in any case we are constrained by the need to develop a structure that has meaning in the real-world of allocation and deployment of police resources and will provide a basis for structuring useful evaluation designs. We are cautioned that not only rigorous scientific experiments are difficult to develop and maintain within the context of an operating agency, but even evaluative research is difficult. For example, Caro states:

> Conflict between research and service goals may interfere with the collection of data called for by research designs. When a research design calls for action inconsistent with immediate service goals, practitioners may disregard research needs in favor of providing services. Compounding the problem, practitioners may "neglect" to inform evaluators that clients have been shifted from a control or comparison group to an experimental group.[3]

Odiorne suggests the steps in the process of decision-making, as related to management by objectives, to be:

-- Have an objective in mind before you start.

-- Collect and organize all of the pertinent facts.
-- Identify the problem (the differences between what actually exists now and your objectives), and its causes.
-- Work out your solution and some options to it.
-- Screen these options through some decision criteria.
-- Set up some insurance actions to prevent failure in the form of controls.[4]

Larson has identified the "classical steps" of analysis as:

1. Define the problem.
2. Specify the objectives.
3. Define criteria relating to the objectives.
4. Specify alternatives.
5. Analyze alternatives.
6. Compare alternatives.
7. Present results.[5]

Larson's application of these steps is more restrictive in that he is primarily concerned with the analysis of alternatives and only presenting the results of the analysis to the decision-maker through the focus on:

> . . . the development and interpretation of mathematical models of operation."[6], which ". . . necessarily limit ourselves to aspects of operation that are quantifiable and conducive to abstraction. This obviously directed focus is not sufficient when implementing changes. For instance, command judgment, which derives from many years of experience as a police officer, is not likely to be replaced by any mathematical formalism.[7]

Suchman provides a framework of evaluation as follows:

1) Identification of the goals to be evaluated.
2) Analysis of the problems with which the activity must cope.
3) Description and standardization of the activity.
4) Measurement of the degree of change that takes place.
5) Determination of whether the observed change is due to the activity or to some other cause.
6) Some indication of the durability of the effects.[8]

Each of these has a different focus on the decision process, but we find in all of them certain common elements. The following is a synthesis from the above lists.*

a) Need for goals and objectives (may be explicit or implicit).

b) Identification and definition of a problem (failure to achieve the objectives and goals and determination of why they have not been achieved).

c) Refinement of goals and objectives -- explicitly stated.**

d) Identification of alternative courses of action.

e) Selection of the most desirable alternative through analysis of relative values of the alternatives in relation to achievement of the objectives and goals.

f) Implementation of the selected alternative and measurement of the degree of attainment of the objectives and goals.

g) Feedback of results and, when appropriate, recycling through the process.

We will use this sequence of decision-making/problem-solving to establish the framework for allocation and deployment decisions, utilizing the techniques of crime analysis, for further development of this paper. See Figures I-2a - I-2f.

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*This is a much abbreviated list which is expanded upon in subsequent sections of this report.

**Unfortunately, in practice, the goals and objectives frequently remain implicit.

Every community has a certain amount of crime that occurs within it. Figure I-2a below is an illustration of crime in a community. It should be kept in mind that at least 50 percent of the crime in a community is probably unreported. Many crimes are completely undetected.[9] Between 40 and 60 percent of the crime that is reported occurred in situations where they would not have been visible to the police patrol.[10] Crime discovered by the police patrol has been estimated to be approximately one percent of all reported incidents.[11] It is significant that the more serious the incident is the less visible it is.[12]

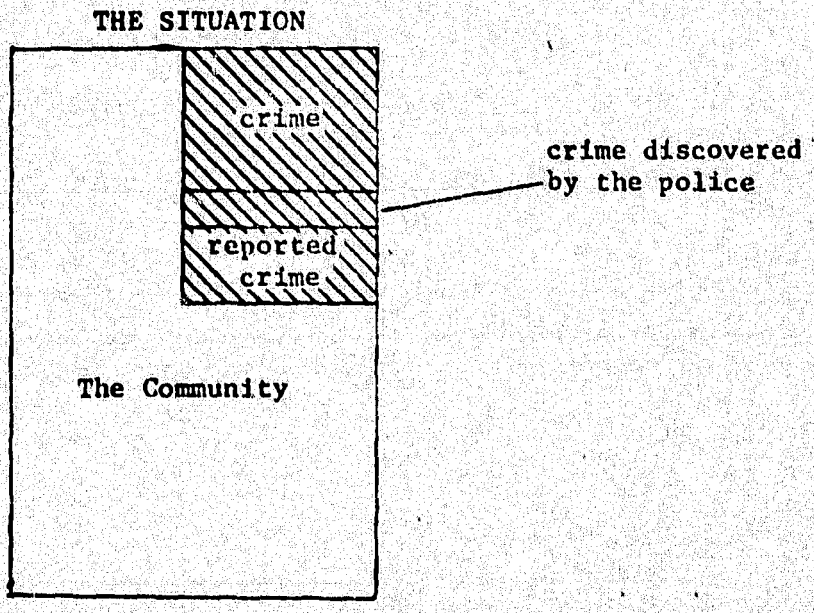


FIGURE I-2a

The police also deal with a large number of calls that are for non-crime related matters. Figure I-2b below is an illustration of those incidents, both criminal and non-criminal, that are reported to the police. These incidents are classified together as calls-for-service (CFS).

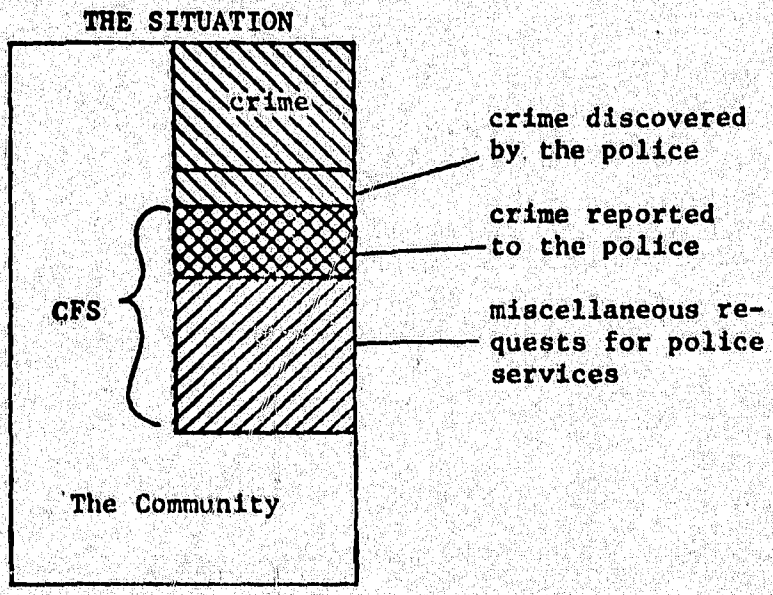


FIGURE I-2b

The entire area of calls-for-service breakdown into about 83 percent service calls and 17 percent crime-related calls.[13] If one adds to the calls-for-service the crime discovered by police, the patrol is responsible for initiating only about one percent of all the known incidents.[14] Given this situation,

Figure I-2c below illustrates the relationship of known incidents to the police patrol. It should be kept in mind that these figures are not drawn to scale.

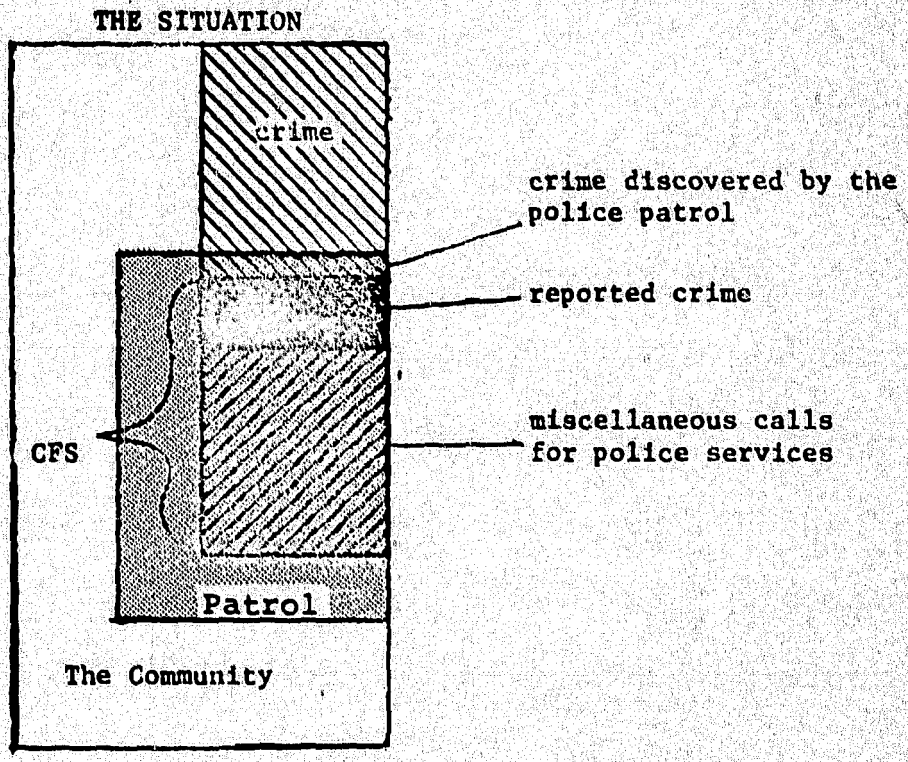


FIGURE I-2c

Figure I-2d presented on the following page is an illustration of police patrol in terms of the amount of time spent in various police functions. As it illustrates, the patrol spends only about 15 percent of their time dealing with reported incidents.[15] The vast majority of a patrolman's time seems to be spent in unstructured patrol time.[16]

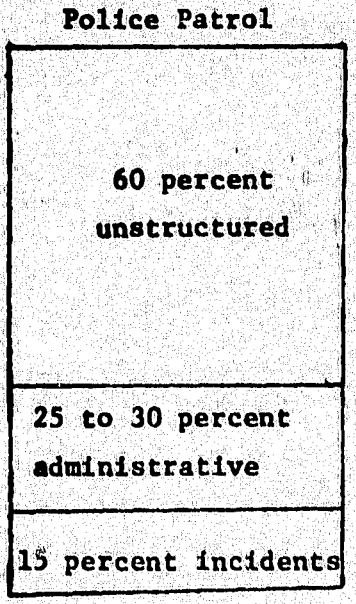


FIGURE I-2d

As Figures I-2a through I-2d have illustrated, there is an area of overlap between crimes and requests for police service. The area labeled "CFS" (calls-for-service) and the small portion labeled "crime discovered by police" comprise a substantial part of the data base for crime analysis. The crimes discovered by the police are also called on-view situations. There is one other area that crime analysis may take data from, but this is so small in proportion to the other areas that it was not placed in the figures regularly; this is a small percentage of data that may come from detectives and informants. This data can be used in crime analysis.

Placing the crime analysis data base into a relationship to the patrol function gives an indication that routine patrol

actually deals with services and crime a very small percentage of the time. The next step is placing the patrol into the community situation, and this indicates that the actual crime in the community is much greater than that small portion that the patrol deals with. Figure I-2e below is an indication of the context within which calls-for-service, police patrol and crime are related to crime analysis.

Figure I-2e is a representation of the total situation from which the allocation and deployment decision making process, the support role in this process that crime analysis plays, and the patrol context operate. This situation is shown in conjunction with the decision making process in Figure I-2f.

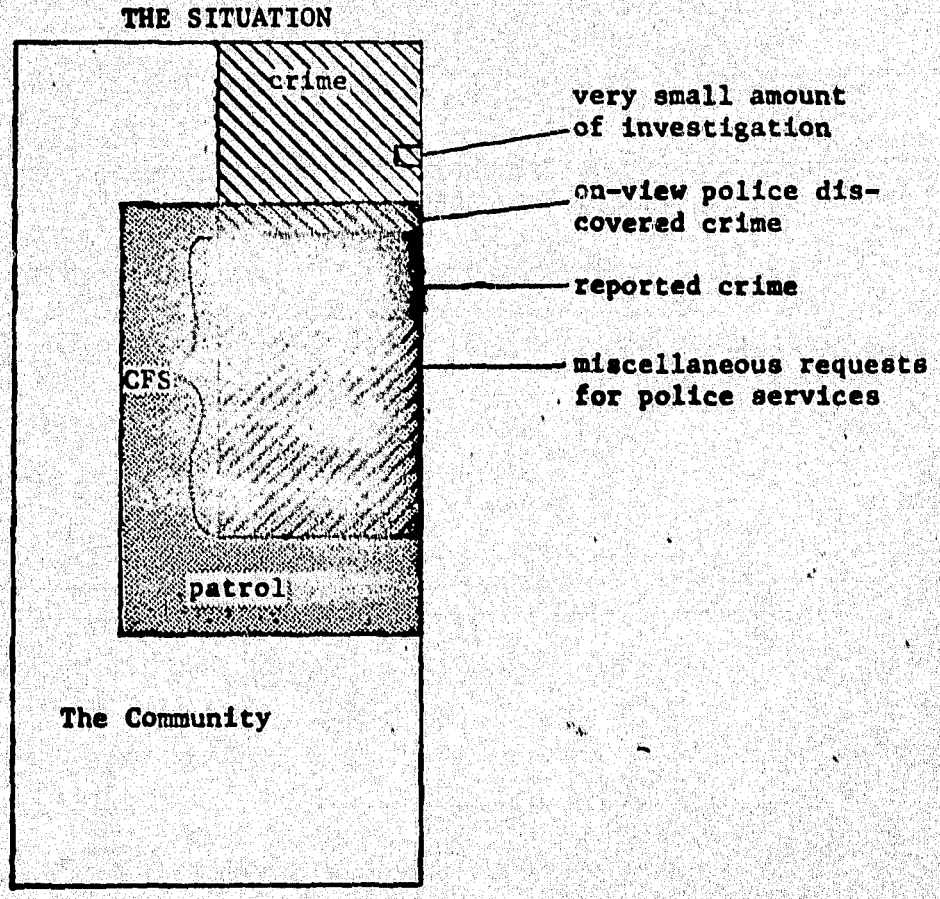


FIGURE I-2e

The final figure, Figure I-2f (on the following page) places crime analysis in the context within which it occurs and attempts to illustrate the decision-making process with relation to this context. The reader can see the cyclical feedback nature of the entire process.

A point that should be mentioned is that the data base from which crime analysis draws its information and subsequently aids in allocation and deployment decisions does not include all knowledge about patrol, crime and the community. The situation requires basing allocation decisions on less than complete knowledge.

In any case, it is important to understand that in this process the feedback is continual and occurs at virtually all stages. The data are collected according to guidelines set up by the goals of the department which are influenced by the community, which in turn affects the allocation decisions based on the data. The police department hierarchy influences every stage of this process; the final decisions influence the community; and the community ultimately dictates the police department policy in terms of goals and objectives.

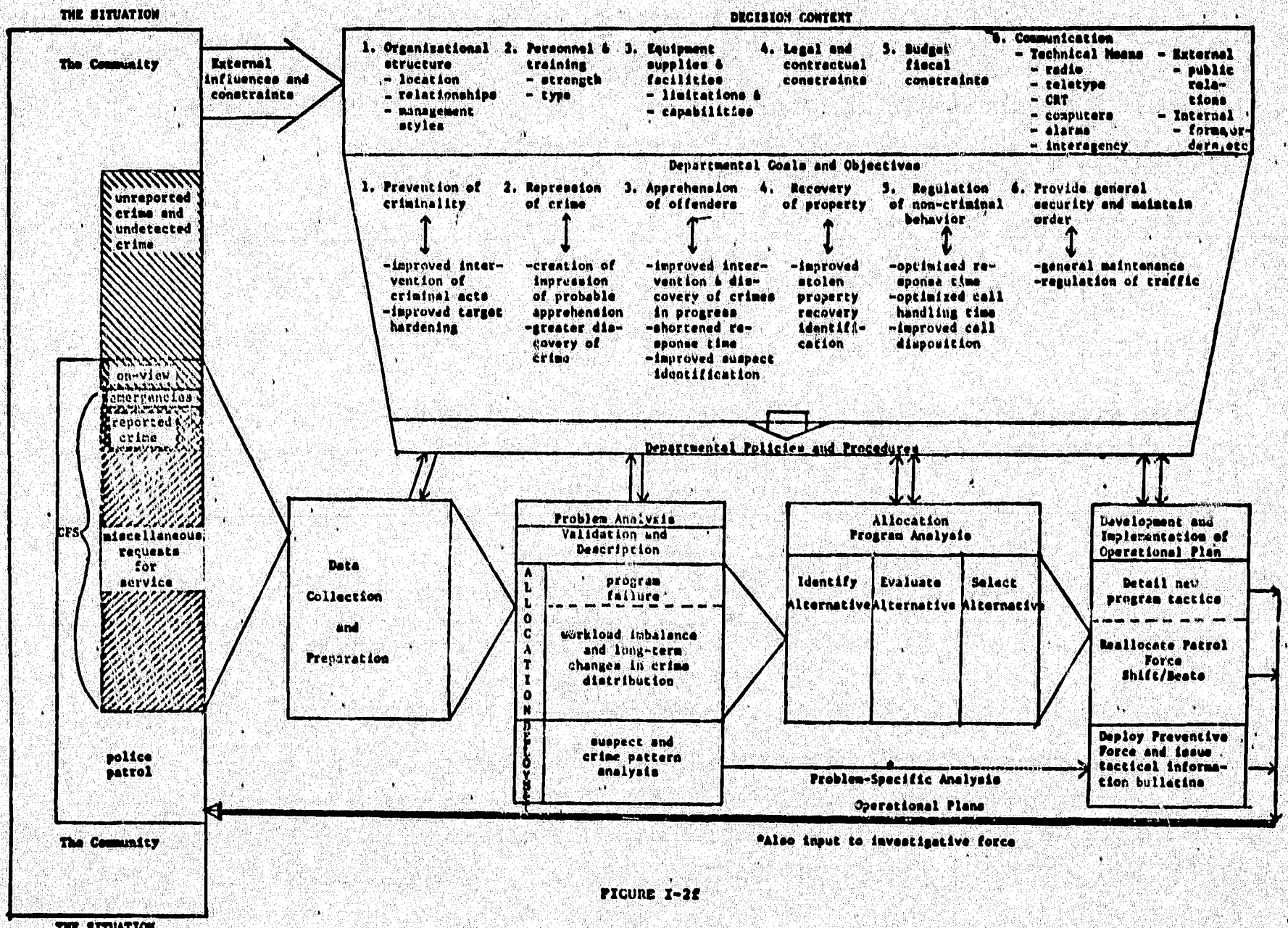

THE SITUATION
The Community
External influences and constraints
DECISION CONTEXT
1. Organizational structure - location - relationships - management styles
2. Personnel & training - strength - type
3. Equipment supplies & facilities - limitations & - capabilities
4. Legal and contractual constraints
5. Budget/ fiscal constraints
6. Communication - Technical Means - radio - teletype - CRT - computers - alarms - interagency - External - public relations - Internal - forms, orders, etc
Departmental Goals and Objectives
1. Prevention of criminality
-improved intervention of criminal acts
-improved target hardening
2. Repression of crime
-creation of impression of probable apprehension
-greater discovery of crime
3. Apprehension of offenders
-improved intervention & discovery of crimes in progress
-shortened response time
-improved suspect identification
4. Recovery of property
-improved stolen property recovery identification
5. Regulation of non-criminal behavior
-optimized response time
-optimized call handling time
-improved call disposition
6. Provide general security and maintain order
-general maintenance
-regulation of traffic
unreported crime and undetected crime
on-view emergencies
reported crime
miscellaneous requests for service
CFS
police patrol
The Community
THE SITUATION
Departmental Policies and Procedures
Data Collection and Preparation
Problem Analysis
Validation and Description
ALLOCATION
RECOVERY
program failure
workload imbalance and long-term changes in crime distribution
suspect and crime pattern analysis
Allocation Program Analysis
Identify Alternative
Evaluate Alternative
Select Alternative
Development and Implementation of Operational Plan
Detail new program tactics
Reallocate Patrol Force Shift/Beats
Deploy Preventive Force and issue tactical information bulletins
Problem-Specific Analysis
Operational Plans
*Also input to investigative force

FIGURE I-2f

As can be seen in Figures I-2a - I-2f, the framework is extremely complex. This complexity is seen as a function of the relationship of patrol to the community and myriad services provided by patrol. These services range from dealing with the relatively minor problems of barking dogs and lockouts, to assistance in emergency situations, to prevention and deterrence of crime, to criminal investigation and arrest. Whatever these services may be in a particular community is established through a mix of community expectations (frequently represented by special interest groups) and the judgment of police of the proper role of the police. Constraining the decisions are requirements as may be imposed by law, limitations of fiscal resources, management style, labor contracts and similar limitations. However these factors may be combined in a given community, they are ultimately expressed as goals of the police department which are supported by assumptions that certain organizational structures, distributions of personnel and other resources and methods of operation will achieve subordinate goals or objectives which in turn will contribute to achievement of the ultimate goals.

1.3 Evaluation Context

The purpose of this project is to ascertain the state of the art concerning crime analysis operations in support of patrol within police departments throughout the United States, to report concerning its findings, to describe and report the actual results accomplished by crime analysis projects, and to develop evaluation strategies which might be employed to evaluate ongoing crime analysis projects. To accomplish this task, a research strategy must ultimately be selected.

The basic aim of research has been variously defined as "an attempt to explain naturally occurring phenomena,"[17] "a systematic approach to ascertain the relationships among natural phenomena,"[18] and a method to ". . . establish general laws covering the behaviors of the empirical events or objects . . . thereby enabling us to predict events as yet unknown."[19]

From some of the above definitions it can be seen that the functions of research vary in degrees of specificity from explanation, to relationship discovery, to predictive ability. Research in general can be aimed at the discovery of the relationships between variables for the purpose of hypothesis testing in the sense of determining cause and effect relationships, to the evaluation of existing programs in terms of effectiveness with regard to stated objectives, which may in themselves be based on assumptions and hypotheses.

Because this report constitutes the initial product of an

ongoing effort, as described above, it would be inappropriate at this stage to draw firm conclusions as to the evaluation design that should be applied to the crime analysis-allocation/deployment decision-making process. It is appropriate, however, to discuss what appears to be the most useful approach.

The distinction between evaluation and research in general has never been a clear one. Some researchers draw a sharp distinction between evaluation and research while others insist that evaluation is a form of research.[20] Other writers draw many distinctions that vary from "practical" to "theoretical" research.[21] One of the most common distinctions is the breakdown of research into "basic" research and "descriptive" research. Basic research is defined as the type of research that deals with simplistic units or elements in highly controlled settings, and tries to discover the "truth" that has only the slightest bearing on practical problem solution. As stated by one author, "Basic research is knowing more and more about less and less."[22] One of the distinctions that is commonly placed in opposition to basic or "pure" research is called action research.[23] "Action" research is the on-the-job investigation of activities which is conducted by those persons who will make use of the information gathered. This methodology allows the researcher to be both participant and observer. The list of distinctions between various types of research goes on and on; but it is generally conceded that there is some distinction between

evaluative research and other types. According to one author, evaluative research represents only one form of action research.[24] Evaluation research has a limited potential for generality; but a great potential for immediate utilization. The easiest, and probably the most useful distinction would be to distinguish evaluative research from basic research, since this can be easily done using applicability as a distinction.

There are many different research methodologies designed for the evaluation of programs. These different methodologies are all bound by certain criteria and processes of evaluation. Evaluation is needed for two basic reasons: one, the increasing expenses encountered by budget makers necessitates the justification of programs based on factual evidence; two, the exact effects of a program must be known so that its strong points will be clear to the decision-maker.[25] Evaluation research differs from other types of research primarily in the process and the applicability of its findings. Evaluation research tends to be what is commonly called "action or descriptive research" as opposed to "pure" research, i.e., research for the sake of fact gathering. "Descriptive" research or evaluation allows the researcher to both evaluate the existing program and the changes that may result from the research. Evaluation research must assess the program's effects apart from the effects of other forces that may be working simultaneously with the program; and it must assess the effectiveness of the program

in terms of its stated objectives.[26] Evaluation must follow the basic guidelines of scientific inquiry and attempt to maintain principles of research as closely as possible. The major problem with the process of evaluation is that, unlike other types of research, evaluation research is operational in the real-world; consequently, there are countless possible external forces that may be effecting the outcome of a certain phenomena. Evaluation research is generally thought to consist of six basic steps; these steps must be followed if the researcher is to avoid many methodological hazards to which evaluation research is prone. These six steps are listed below:

1. The identification of the goals to be evaluated.
2. Analysis of the problems with which the activity must cope.
3. Description and standardization of the activity.
4. Measurement of the degree of change that takes place.
5. Determination of whether the observed change is due to the activity or to some other cause.
6. Some indication of the durability of the effects.[27]

These steps in evaluation dictate that the evaluation process be as close to the scientific method as possible. All too often the evaluation research fails to follow these steps and confuses empirical research with one of the first three of the four "methods of knowing" outlined by Charles Peirce: 1) the method of tenacity,

i.e., something is true because someone believes it to be and if he believes it is true then it is; 2) the method of authority, it is true because some authority said it was; 3) the a priori method which rests on a set of assumptions that are self-evident and therefore true; and 4) the scientific method which hypothesizes on a set of assumptions and then tests the truth of the assumptions. The scientific method must have self correction and objectivity.[28] Evaluation research is based on the scientific method.

The main emphasis of evaluation research is in the testing of the "success" or "failure" of an ongoing program. Obviously the process of evaluation must differ in some way from the tight research commonly called pure research. In particular, in the evaluation of a program such as crime analysis it is difficult, if not impossible, to follow the methodology of control group, pre-test, post-test, etc. The researcher of evaluation must follow basic steps; but these tend to be broader than the variables most often encountered in pure research.

In conjunction with the six steps that good evaluative research must follow, there are four categories of criteria that the researcher must follow. Suchman[29] lists these categories as: 1) <u>effort</u>, which is the evaluation of the quantity and quality of the activity that takes place. (This category may be compared to the operationalized variables that must be defined in pure research.); 2) <u>performance</u>, which is the measurement of the effect(s) of the

program as opposed to the program itself; 3) the adequacy of performance which measures the degree of effectiveness relative to the total needs. Here is an important distinction between other types of more pure research and evaluative research; instead of defining a specific research hypothesis, one has to define the goals and objectives of the desired program results in order to test the program for effectiveness; and 4) process, which is really an examination of the reasons for a program's success or failure.

It is the examination of process that is particularly crucial if one is to gain a true understanding of the program. Evaluative research must analyze the process if the information is to be of use to the decision-makers. This paper views crime analysis as a process, therefore, the evaluation of process is crucial.[30] The evaluation of process must consider four main dimensions:[31] 1) the attributes of the program itself; 2) the population exposed to the program; 3) the situational context within which the program takes place; and 4) the different kinds of effects produced by the program. For the optimal evaluation of the process of crime analysis one has to examine these four dimensions, the criteria categories, and place these in the six steps of good evaluative research.

The evaluation researcher must first isolate the goals and objectives of the crime analysis program. It is the goals and

objectives of a program that it is measured against for success or failure, just as the pure researcher measures the results of his experiment in order to accept or reject his hypothesis.

One's first step in the evaluation of the crime analysis process would be to isolate the objectives. As it will become clear in this paper, isolation of useful objectives is not easily accomplished and is often quite confusing. The evaluation of the crime analysis process must define the population that the program is to affect, i.e., patrolmen, criminals, administrators. It must also recognize the effects that the program is to achieve, in this case the reduction of crime, the quickening of response time, etc. These should follow the goals and objectives of the program. The researcher must also specify the attributes of the program itself.

Perhaps the most difficult part of evaluation of the crime analysis process is analyzing the situational context within which the crime analysis process takes place. This becomes very complicated. In this paper the crime analysis process is first placed within the context of the decision-making process which in turn is placed in the broader framework of the police function. For a true evaluation of crime analysis, it becomes necessary to examine the decision-making process, the information base of crime analysis, the method of analysis, the dissemination of the information made available by crime analysis, and the effects of the crime analysis information on resolution of the problems.

Because of the nature of crime analysis and the situational context that it is found in, it appears that a process evaluative research orientation rather than a theory testing, hypothesis orientation will be most useful. The process evaluative research seems appropriate also, because the program must be analyzed in terms of ongoing situations, broad goals and objectives, and loosely defined variables.

An important qualification of these statements is that some crime analysis allocation/deployment decisions have certain intuitive appeals to the more sophisticated aspects of measurement; for instance, comparisons of mathematical models of patrol response forces which are necessarily modified by judgmental input regarding preventive force allocation, and alternative workload, hazard formula methods. Most of the mathematical modeling reported in the literature is not proven superior to the alternatives in the sense that the models are essentially laboratory-like examinations of abstractions of the real-world.

1.4 Objectives and Assumptions

As indicated in Section 1.2, the organization, distribution of resources and related methodology are based on assumptions that certain combinations of these three elements will contribute to the ultimate goals of the police/community. It is the purpose of this section to outline the major departmental goals and the relationship of the patrol function to these goals. The areas covered in this section logically point to allocation and deployment decisions, and their relationship to crime analysis.

The goals of the police have been expressed in a wide variety of ways but a generally accepted set is found in Municipal Police Administration by the International City Managers' Association:

1. The prevention of criminality;
2. Repression of crime;
3. Apprehension of offenders;
4. Recovery of property;
5. Regulation of non-criminal conduct; and
6. Performance of miscellaneous services.[32]

Another broader and also generally accepted statement of police goals is:

1. Preservation of the public peace;
2. Protection of life and property;
3. Prevention of crime;
4. Enforcement of the laws;
5. Arresting of offenders and recovery of property.[33]

Other goals that are frequently added are:

-- Provision of services and referrals necessary for solving non-criminal problems;

-- The provision of a sense of security and confidence in the police.[34]

While these goal statements set the stage for examinatio of objectives and underlying assumptions pertinent to resource allocation and deployment decisions, they may not in themselves provide a proper base for studies regarding these decisions. This is certainly true of allocation decisions. Chaiken states "One reason for this situation is the unavailability of suitable measures of the degree to which some of the objectives, such as citizen satisfaction, are being met. But more important is the lack of reliable methods for estimating the effect of changes in patrol allocation on any of the objectives."[35]

Before dealing with the topic of patrol allocation, it is necessary to discuss the objectives of patrol in relationship to the police goals. In general, it can be stated that the objectives of the patrol are the same as the goals of the police. Here again, however, there is a measurement problem and for this reason more specific patrol objectives must be formulated. It is important to keep in mind the possible measurement problems of broad goals and objectives. Crime, for example, cannot be measured directly in terms of how much was prevented, because the true extent of crime is unknown to begin with.[36] Some of the factors that generate crime are unknown and an increase in crime cannot necessarily be laid at the feet of the police nor can they

take the credit for a decrease.[37] Some of the goals such as property recovery lend themselves better to measurement, but even here there are factors operating beyond the control of the police such as a delay in reporting the incident.[38]

The methods of distributing police patrol personnel are discussed in Section 4.1.1. Each of these methods is oriented in some way toward all of the goals; however, specialized patrol tends to focus on crime prevention and deterrence and apprehension. Rather than discuss in detail the primary goals of the police, we will restrict our discussion to the objectives of the allocation and deployment methods and the relationship of analysis to those methods.*

The following list is a composite derived from the literature review.

These objectives are:

1. Balanced workloads of patrol units.
2. Improved emergency response.
3. Optimal response to non-emergency calls-for-service -- includes reducing or eliminating queuing of calls-for-service and establishing priority rankings of calls-for-service.
4. Crime pattern disruption.

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*The reader is referred to Figure I-1 for a graphic presentation of the following list.

5. Time/space coincidence of patrol units and criminal acts, or creation of an impression of a high probability of such coincidence (omnipresence).

These objectives are assumed to be achieved by patrol through the following decisions:

1. Organizational assignments, by tour of duty to:

   a. Patrol districts and beats.
   b. Neighborhood teams.
   c. Specialized/preventive patrol units.

2. Strategies and tactics to be employed by the assigned resources directed to:

   a. Crime concentration patterns.
   b. Suspect patterns.
   c. Crime-related hazard patterns.
   d. Community/citizen problems.

The above decisions are supported by analysis products as follows:

1. Workload/hazard imbalance projections.

2. Regular crime statistics.

3. Beat structure designs.

4. Modus operandi, crime incident patterns, including:

   a. Descriptive information.
   b. Frequency distributions by time and location.

These products are derived from the following analysis activities:

1. Workload distribution by type, time and location.

2. Crime analysis by type, time and location.

3. Arrests by type and distribution.

4. Miscellaneous hazards.

5. Social/demographic indicators of need.

6. Epidemiology of crime and service needs.

7. Crime pattern collation.

8. Suspect pattern collation.

9. Crime-related hazard patterns.

The entire process incorporated in the above lists and depicted in Figure I-2f, is based on the singular assumption that good analysis (better knowledge) will result in better decisions (more intelligent choice) in allocation and deployment of patrol resources. That this assumption is too broad as a working base for evaluation of analysis programs can be seen in the variety of decisions that are subsequently discussed. Another concern is that what is better knowledge for one administrator may not be considered "better" by a different administrator. We have attempted to outline many of the factors that influence the decision-making process in Section 4.1.3 but perhaps the over-riding problem is that the assumptions underlying the bulk of the patrol effort in meeting the primary goals are untested or at least unproven. We find, therefore, that police administrators are constantly shifting priorities and operational methodologies in an attempt to achieve the goals.

We do not discuss here in detail all of the assumptions and objectives of analysis and the resulting allocation and deployment decisions. They are better understood within the context of the particular analysis methods and decisions as discussed elsewhere in this report.

There are, however, certain characteristics of police-related demands that appear to be proven and which merit comment here. These are:

1. Demands (calls-for-service and crimes) will occur with regularity over time and location if both time periods and locations are reasonable in size (2-6 hours, day of week, etc.) (areas several city blocks in size).[39]

2. Demands for police services (calls-for-services) will be generated randomly with a poisson distribution.[40]

There are certain other characteristics of patrol that are assumed to exist but have not been proven or about which there is some doubt or even proof that they are not true.

1. Equal workload distribution by application of a hazard or workload formula, by beat, will result in equal workload for police units. Both actual practice and simulation models disprove this assumption.[41]

2. Preventive patrol by beat patrol officers will reduce crime or result in on-view arrests.[42]

3. Shortened response time in general will result in more arrests. (The basis of this assumption is discussed later.)

4. Shortened response time will result in improved citizen satisfaction. This is in doubt.[43]

5. Beat geography should be as close to square as possible (to minimize response travel time). Larson has shown that factors such as differential travel speeds on different streets may have more influence on response time.[44]

Response Time as a Factor in Arrests

Patrol response time to service dispatches is considered here because of its major influence on much of the technical activities in the field of resource allocation. Two major contributions to research in the area of the effect of response time on arrests have been found. The first of these has been utilized as a basis for much of the resource allocation modeling that has been undertaken, including that by Larson and others. In general, response time is that period of time between the commission of the crime and the arrival at the scene by a police officer. This particular subject is explored in detail because of the significant impact the results of one of the two known studies has had on further activity within this general area.

A primary objective of resource allocation schemes is to minimize patrol units' response time to calls-for-service. The response time is a function of several factors involved in the processing of a request for service and dispatching of the patrol unit. The resource allocation concern regards the availability of a patrol unit to respond and the period of time it takes for the patrol unit to travel from the point of receipt of notification to the scene of the incident. In the ideal situation, the notification to arrival time would be zero, in that the patrol unit would happen upon the crime in progress during normal patrol

and take appropriate action at that moment. The probability of this occurring is very small. Therefore, response time becomes a critical factor for consideration in allocation schemes.

One of the earliest studies cited regarding the relationship of response time to arrest is found in V. A. Leonard, Police Communications Systems, 1938.[45] Leonard defines the response time as being comprised of four well-defined divisions. These are:

1) The time between commission of the crime and the moment when some person lifts a telephone receiver to call the police;
2) The time between the lifting of the receiver and the beginning of actual conversation between the person calling and the police department;
3) The time between this conversation and a broadcast of the report to police radio patrol cars; and
4) The running time of the patrol cars from the point at which they receive the broadcast to the scene of the crime.[46]

Assuming that the crime was not discovered by a police patrol officer, the concern in this report is on the availability of a patrol unit to respond to a call and the running time of that unit to the scene of the call. This is not to say that the other three elements of response are unimportant; however, they are not germane to the actual allocation concerns. They do lend themselves to systematic study and reduction given appropriate alternatives such as alarm systems, proper and adequate staffing at the dispatch and complaint clerk levels, sufficient RF (radio frequency time), etc.

Isaacs[47] identifies eight elements or response time increments,

beginning with the time the event occurs to the time that the unit arrives at the scene. Two of these, "citizen places call" and "complaint officer receives call," are functions of discovery of the event, the action taken by the citizen and the communication media that is available to the citizen for notifying the complaint officer. Five of these increments are functions of communication center delay. These are: the decision to commit a unit; the address location translation; the selection of an available unit; the transmission of the message to the unit; and acknowledgement by the patrol unit of receipt of that message. The eighth element is the time between acknowledgement of receipt of the message and arrival at the scene. A certain ambiguity exists in the time increment between the transmission of the message and acknowledgement of arrival at the scene because in emergency situations, units other than the assigned unit may respond to the call without notification to the dispatcher. As with the Leonard categorization, the concern is with the last time increment -- the travel time between receipt of the call and arrival at the scene.

Leonard in 1938 advocated an average of two minutes for the running time of a patrol unit on a dispatch. He stated that an average beyond two minutes raised serious questions regarding the profitability of the radio equipment investment. He supports his assertion by citing a 90-day study conducted on eight patrol units in the Detroit Police Department.[48] The study showed an

extremely high probability of arrest (about 85 percent) on runs of 15 seconds dropping to about 18 percent on runs of two minutes. While the results seem impressive, there is no discussion of the methods used in conducting the study. It does appear, however, that the study was based only on those runs that resulted in an arrest and runs that did not involve an arrest probably were not included in this particular study. Therefore, one cannot infer what the percentage of arrests was on all radio runs.

For comparison purposes, Leonard includes a graph of the performance of radio-equipped cars in the 41 districts of Chicago for February 1931.[49] In only one district was the average less than two minutes. Another district averaged about four and one-half minutes, while most districts averaged between two and three minutes.

In 1966, a study was made for the President's Crime Commission[50] which dealt with the issue of the impact of response time on arrests. It should be noted that this was only one part of the study and, in fact, this issue becomes somewhat confused because of limited data and the inclusion of arrest factors beyond response time which are difficult to sort out. While the study methodology is reported in more detail than the Detroit study, it leaves much to be desired in terms of being definitive.[51] (Many of the study limitations are related to such things as data collection, coding error, etc., and are recognized by the authors of the

study.) The study was not undertaken in the context of research, but rather in the context of an examination or analysis of existing data more as a method of identifying areas of potential research than to develop definitive conclusions regarding the relationship of response time to arrests.

The analysis was apparently performed exclusively on operating data which were recorded prior to undertaking the analysis and a considerable effort was required to put it into a form useful for the study. Of particular concern is the fact that field response time data were available for only 265 of the 4,376 total dispatches studied (six percent). No reason is given to believe the sample has any statistical validity and, therefore, generalizations are inappropriate -- yet, the findings are used frequently to justify response time models and projects. The team attempted to investigate only ". . . all calls for service where a possible crime was involved."[52] The communications message logs were supplemented by officers' field activity reports. Overall, the aim was to identify those dispatches which seemed probably to have involved a crime regardless of whether subsequent investigation substantiated that assumption. Looking beyond the difficulties in generalizing from the study results because of sample selection problems, there are other problems in the use of the results. Among others, there seemed to be buried somewhere within the data what appear to be on-view arrest situations ". . . 91 cases involved observations by

the patrol officers of some suspicious activity."[53] If these are included within the field response time data (or some portion of them are), they would have significant impact on the probability of arrest for short response times. Another problem addressed by the report is the impact of named suspects, as an independent variable, on the probability of arrests. For instance, in one effort to sort out the variables, it was determined, based on a special sample of 69 cases, that 70 percent of the at-the-scene arrests involved either the naming of the suspect by the victim or a witness or private security officer or citizen arrest.[54] In an effort to remove the bias of named suspects on the conclusions about the relationship between response time and arrest, the named-suspect cases were eliminated, leaving a sample of only 34 cases. It is claimed that the original conclusions were reinforced because: ". . . of the 34 total cases, eight arrests were made, seven of these in cases with two-minute response time or less."[55] Unfortunately, there is no information provided on the response time distribution for the 26 cases in which there was no arrest. It seems reasonable to ask how many of the remaining 26 had two-minute or less response times. The answer to this question is not provided. The study leaves several unanswered questions that raise considerable doubt regarding the use of the findings upon which to base other programs. (This is to say only that the study does not substantiate the commonly held beliefs re-

garding the need or desirability for reduced response time.) The major difficulty with the issue of response time is that while it appears intuitively desirable to reduce the response time, there is no real evidence that reductions resulting from various allocation formulas ipso facto will result in more arrests.

While citizen satisfaction is also suggested to be a key output of shortened response time, it is difficult to see how a reduction of 30 to 60 seconds, especially within a framework of existing three to five minute responses on emergency dispatches, would be cost-effective in improving citizen satisfaction. Even Leonard modified his thinking in 1970. In 1970 he suggested that ". . . the closer running time approaches a minimum limit of three minutes, the greater becomes the apprehension capability of the force."[56]

In general then, there are only two known studies dealing with the probability of arrest given short response times. While it is intuitively correct that shortened response time for calls on crimes-in-progress would result in higher probabilities of arrest, these represent only a small percentage of calls-for-service. This raises a serious question about the cost-benefit of an allocation method that places highest priority on shortening response time.

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2.0 HISTORICAL PERSPECTIVE

Crime analysis as a formal effort in deployment and allocation does not have a long or deeply involved history in American law enforcement. In 1930 one researcher made the following comment:

> Although the police are only partly responsible for crime, they should have complete information about such conditions if they are to perform their part of the battle effectively. It is therefore surprising that few departments, less than a dozen in fact, have maintained accurate compilations of known crimes.[1]

It was at this time that the International Association of Chiefs of Police (IACP) initiated the Uniform Crime Reporting program in an effort to provide standardized crime classification and reporting.[2]

The Wickersham Commission of 1931 stated similarly that:

> The statistics section is rarely the effective tool in police work into which it can be made. Executives in general have not appreciated the strategic value of the vast amount of information which lies dormant around police departments.[3]

One study has cited as the forerunners of crime analysis the systematic classification of modus operandi developed by the English and introduced to the United States by August Vollmer, and the principles of traffic analysis developed at the Northwestern Traffic Institute in the late 1930's.[4] To these sources may be added other innovative programs and concepts of the advanced police thinkers of the first half of the century, most notably Vollmer and O. W. Wilson. Vollmer is

credited with being the first police executive to institute not only modus operandi classifications, but a modern records syste and beat analysis as well.[5] He was the guiding hand behind the Wickersham Commission's Report on the Police which recommended that police records should be used in the formulation of strategic plans.[6] In a 1933 speech Vollmer explained his ideas about basing patrol allocation on the analysis of police records of past occurrences. The following statement demonstrates his recognition of the concept of crime analysis and its implications for police operations.

> On the assumption of regularity in crime and similar occurrences, it is possible to tabulate these occurrences by areas within a city and thus determine the points which have the greatest danger of such crimes and what points have the least danger.[7]

He also introduced the idea of using "spot maps" to pinpoint areas of greatest danger.[8]

In his works Wilson continually stressed the importance of maintaining and using accurate police records.[9] In addition, he considerably advanced the field of thought in allocation of patrol resources with the development of hazard formulas, setting forth the factors to be considered and their relative weights in distributing patrol forces.[10]

Despite the influence of Wilson, Vollmer and others, the adoption of hazard formulas and other forms of more advanced crime analysis was not extensive by 1958 when Deputy Chief Frank

Walton of the Los Angeles Police Department stated that ". . . the assignment of police manpower in relation to police problems, in terms of day of week, time of day, and area . . . is by no means widespread."[11]

It was not until the mid-1960's that the ideas of the above-mentioned innovators regarding planning and information analysis began to catch on to any great degree, with crime analysis finally being recognized as a distinct entity concommitant with development of more refined allocation methods. The first mention found of the term "crime analysis" was in the second edition of Wilson's Police Administration (1963).[12] A comparison of the 1950, 1963, and 1972 editions of the book provides a graphic reflection of the development of the concept of crime analysis. In the first edition, the stress on the uses of analysis is illustrated in the following statement: "Police Records reveal significant changes in criminal and other activities requiring police attention; prompt analysis of the records guide the police official in meeting such unusual needs."[13] While this statement clearly implies the importance of crime analysis, there is still no recognition of the need for, or desirability of, a formal analysis capability. It is considered strictly an administrative duty.

In the second edition, the crime analysis section is conceived of as a component of a planning division in a large police department. Its duties are to study "daily reports of serious crimes

in order to determine the location, time, special characteristics, similarities to other criminal attacks, and various significant facts that may help to identify either a criminal or the existence of a pattern of criminal activity."[14]

By 1972 crime analysis was considered important enough to devote several pages to it, with quite detailed attention given to organizational factors, activities and duties, including a full page exhibit of a crime analysis bulletin.[15]

Since Wilson's 1963 publication, there has been a growing body of literature recommending the use of crime analysis and providing guidelines, models and potential methods for crime analysis development. Recent commission reports recommend its utilization in crime control and patrol operations.[16] Standard 4.2 of the National Advisory Commission on Criminal Justice Standards and Goals, Criminal Justice System, entitled "Crime Analysis Capability" is as follows:

> Every police department should improve its crime analysis capability by utilizing information provided by its information system within the department. Crime analysis may include the utilization of the following:
>
> 1. Methods of operation of individual criminals;
> 2. Pattern recognition;
> 3. Field interrogation and arrest data;
> 4. Crime report data;
> 5. Incident report information;
> 6. Dispatch information; and
> 7. Traffic reports, both accidents and citations.
>
> These elements must be carefully screened for information that should be routinely recorded for crime analysis.[17]

Other documents, involving program planning for future law enforcement needs, incorporate a crime analysis capability into the police information system.[18] Still others present research into possible avenues of analysis based on readily available information such as that contained in police reports, and attempt to demonstrate their utility as a tool in increasing police effectiveness.[19] In contrast are documents suggesting innovative or hypothetical programs using more complex methods and detailed data, requiring cost and expertise factors beyond the present capabilities of most police agencies.[20]

The point being made is that only recently has there grown up a body of thought regarding crime analysis and that a trend toward increasing awareness and adaptation of it is present. The reasons for this late-blooming recognition of crime analysis as a concept and as a useful tool for the police and the accompanying adaptation of it into the actual operations of many agencies are discussed in the following paragraphs.

One of the biggest spurs to crime analysis development has been the influence of the Law Enforcement Assistance Administration and its forerunner, the Office of Law Enforcement Assistance. These agencies have contributed in several important ways, four of which are identified below:

1. Because of their requirements for submission of plans justifying Federally sponsored programs,

police agencies have had to develop the capability of analyzing in a systematic, defensible way the nature and scope of the problem areas where they are seeking help. Program evaluation requirements have also created the need to apply analysis methods to crime occurrences.

2. The vastly increased funding made available to police agencies has allowed in many cases for the creation or expansion of planning, research, and information gathering, retrieving, analysis and dissemination capabilities and in a few cases the creation of a crime analysis unit.

3. By sponsoring research such as that currently being carried out in this project and disseminating information about crime analysis and its value, the NILECJ had contributed to the general awareness of the function and its application and provided guidelines for those agencies interested in creating a crime analysis program.

4. The switch by the LEAA from system improvement efforts to crime-specific projects within the last three years has had significant influence on crime analysis, as outlined in an LEAA position paper.[21]

The importance of crime analysis is stressed in the crime-specific approach and it is explicitly recognized as an essential component in the sponsored projects. As the author, Richard Glynn, stated it:

> A planning process which accepts the reduction of specific crimes as its objectives must begin with an analysis of those particular offenses. This analysis must be concerned with the basic elements common to any offense: the event itself, the victim or target, and the offender. It is necessary to discover all we can that is relevant about the crime in question from the point of view of each of these three elements, so that appropriate strategies and tactics can be developed which will result in a balanced and comprehensive attack on the problem.[22]

Glynn later concludes that:

> . . . [T]he plan itself will be a plan for system improvement and change, but the recommended changes will result from a comprehensive analysis of crime itself and what the criminal justice system must do to reduce it.[23]

Perhaps the best-known and most ambitious LEAA-sponsored crime-specific project has been the High Impact Anti-Crime Program. In addition to the initial problem analysis undertaken by the NILECJ, each city was required to develop and utilize its own crime analysis operation.[24]

The advances in computer technology and related applications, e.g., data processing, system modeling and simulation, resulted in an upsurge of interest in more sophisticated approaches to analysis and resource deployment and allocation. R. Dean Smith, in 1961,[25] was among the first to advocate application of computers to police work, specifically in the area of allocation and beat design, although punched card applications were used as early as 1948 for statistical processing and suspect identification.[26] 1971 and 1974 surveys of police use of computers revealed substantial percentages of contacted departments using computers.[27] However, many of those surveyed were not using computers to any significant degree in crime analysis-related areas, although some had plans for such capabilities in the future.[28] Along with increased efficiency and capacity in many areas of police operations, one benefit of computer technology is in reducing the problem of providing timely information. A major drawback to crime analysis

effectiveness has been the lack of timeliness in analyzing and disseminating manually sorted data.[29]

Another benefit has been the part played by computers in developing new concepts and methods in resource allocation.

Sophisticated allocation efforts were undertaken in the mid-sixties when computers became more generally available to police. As computers became more available to police departments, the disciplines common to operations research, which originated during World War II, began to be applied to the study of police systems both within the police agencies and by others. The first documented application within a police agency occurred in St. Louis in 1966,[30] and dealt specifically with the problem of availability of patrol units to respond to calls-for-service. The program was based on work done by Shumate and Crowther in applying queuing theory to analysis of demands for services that occur irregularly but predictably in time.[31] Concurrently, Richard C. Larson and others were applying simulation theory and mathematical modeling to the dispatch and patrol operations of police departments.[32]

The St. Louis work led to development of the commercially available Law Enforcement Manpower Resource Allocation System (LEMRAS)* which has been used in several departments but neither

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*An IBM Proprietary software package.

of these applications seems to have received the continued use originally anticipated for them.[33]

The efforts by Larson and Elliott have, for the most part, been restricted to studying alternative allocation methods (particularly beat design and emergency response) including the issues surrounding the probability of the police intercepting a crime in progress given the length of time it takes to commit a crime, the miles of travel of a patrol unit in covering its beat and the average speed of the unit.[34] The work by Elliott led to creation of "Crime Control Teams" in Syracuse, New York.[35] The work by Larson is reported to have been in use or used by several departments,[36] however, there is no independent substantiation of these assertions found in the literature.

Paralleling and building upon these original efforts, work has been done in Chicago,[37] Edina, Minnesota,[38] and San Francisco,[39] among others, to apply the concepts of modeling and crime/calls-for-service prediction for allocation and deployment of response forces, but these also appear to have been discontinued. Other efforts have been directed toward development of epidemiological and etiological models that could be used in allocation and deployment and developing new approaches to dealing with crime. These efforts have also not been proven in application.[40]

In the same category of contributions to crime analysis are the recently escalating trends in police work toward professional-

ization, education and the adaptation of social science and business methods such as program planning and budgeting and system analysis. These trends have served to raise the consciousness of police executives and line personnel towards the benefits of increased operational knowledge such as gained through crime analysis and eased the distrust of innovative programs. It should be noted that the LEAA has played a big part in promoting these advances through funding of developmental and implementation efforts.[41]

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3.0 SUMMARY

Resource allocation and deployment have been acknowledged as important ever since the recognition that the job of policing cities was becoming more complex as new responsibilities were given to the police and as movement of both the criminals and police became more flexible. The first assignments were based on the military practices of establishing posts that could maintain direct contact with each other.[1]

When Vollmer mobilized his beat officers on bicycles in 1909, he laid out beats in accordance with the number of calls anticipated from each part of the city.[2] The development of motorized beats and the advent of radio communications provided greater flexibility in assignment and increased the number of indirect citizen contacts (telephone requests for service and notification of criminal events).

3.1 Allocation

The complexities of performing the patrol function forced acknowledgement of the need for more sophisticated methods of assigning officers to areas according to need and resulted in development of equalized workload/proportional deployment/hazard formula approaches, generally categorized under the heading of Hazard Formulas, to quantifying the various aspect of patrol for assigning personnel according to need for police service. For the use of the formulas, the patrol function was frequently divided into three components: 1) service provided at the request of citizens (including initial reporting of crime), 2) measurable workloads in dealing with hazards that generate crime, and 3) an unmeasurable function usually referred to as a general patrol.[3] Variations of these formulas remain the most frequently used quantitative method for allocating patrol forces. Originating in the 1960s, more sophisticated approaches based on mathematical techniques have been attempted to provide more realistic distributions of patrol forces. In every case, however, they are restricted to working with quantifiable aspects of patrol (basically, response to citizen requests for service) and have been of little assistance to the police administrator in the area of preventive patrol. There is no evidence in the literature that they have actually been implemented in any police department. Larson, in 1970, specified the two broad categories of patrol service as:

(1) responding to requests for police service and (2) performing 'crime preventive' patrol."[4] He, among others, has criticized the hazard formulas as being too imprecise to afford satisfactory allocation as well as being based on false assumptions.

The "hazard formulas" are criticized for not considering the impact on response time and cross-sector (beat) dispatching, among other factors in design of beats which frequently result in just the opposite of the intended objectives of equalizing workload and providing preventive patrol time in beats with the most crime.

One attempt, the St. Louis Resource Allocation project,[5] addressed the issue of assuring immediate response to 85 percent of all calls-for-service, thus generating the concept of the split force, i.e., response force and preventive force. Although the project achieved its intended objective, the allocation procedure was eventually discontinued except on request of district commanders,[6] and the distinction between the response force and the preventive force was also dropped. Other attempts to demonstrate the advantages of the split force concept[7] have resulted only in temporary application and the discontinuance at the end of the project term. The current project in Wilmington, Delaware, is the latest attempt to develop a viable split force concept. A general extension of the St. Louis allocation methodology, modified to accept a policy decision on the desired amount of preventive time (time uncommitted to calls-for-service) for beat patrol units was available commercially for several years, but eventually was withdrawn from the market, partly because ". . . only a small number

of departments had ever used it."[8]

Even more esoteric examinations of allocations through application of economic analysis and cost-benefit analysis have been reported on[9] but again there is no evidence that these concepts have been applied in the real world of police allocation decision-making.

The reasons for failure of these more sophisticated methods of allocation (modeling, simulation, economic analysis, etc.) to be implemented are not clear, however, there are some indications as to why this may be true. Colton, reporting on his 1974 follow-up study of computer applications, including resource allocation, concludes:

> What all this means then, is that any resource allocation system is obviously based on some basic set of criteria or decision rules which are used to deploy police forces. If a police department is not careful, they may select a set of rules which are not conducive to their basic objectives and a police department may buy a resource allocation package from a vendor which relies on what to the department is an essentially unknown set of decision rules. The result will be to place a special emphasis on the criteria for that purchase, such as responding to calls for service--a choice which the department really may not want to make.[10]

Another possibility is that the impact of patrol on crime is unknown. Studies on allocation and deployment for prevention/deterrence and arrest are either inconclusive or indicate a low probability of impact on these goals. The work by Elliott[11] and

Larson[12] indicate a very low probability of patrol intercepting a crime in progress. The President's Crime Commission reported the probability of a patrol officer observing a robbery in progress as being once in every 14 years.[13] It would appear that police administrators are either unwilling or unable to make policy decisions that appear to have relatively low payoff which would be incorporated into a sophisticated mathematical technique for allocating personnel who are expected to perform both service and prevention functions, as occurs in traditional patrol allocation.

An interesting dichotomy exists in the literature in relation to the split force concept. Bottoms states in a study of the Chicago Police response system, "The conclusion that virtually the only preventive patrol that occurs is the effort contributed by the Patrol Division Task Force and the District Tactical Units is inescapable."[14] In one sense, we are led to believe that the split force concept is new, yet specialized patrol units (like those in Chicago and St. Louis) have been in existence for several years. Intuitively, police administrators have apparently recognized the inadequacy of the dual function of the traditional patrol system[15] and created the specialized patrol units to improve the deterrence/apprehension potential of the department. These decisions have been fortified with the support of LEAA for crime-specific programs. This simply adds to the concern about

why administrators do not take advantage of response force modeling to increase the available personnel for specialized prever ive patrol.

Development of new approaches to the patrol function, e.g., team policing, have not benefited from the more sophisticated allocation analysis techniques either, although there may very well be potential areas of application. All allocations to teams have been based on the equalized workload methodology with adjustments for anticipated increases in workload resulting from redefined responsibilities and the addition of community oriented tasks.[16]

In allocation it appears that police administrators are either unwilling to commit themselves to sophisticated methods of allocation and prefer to retain the less complicated workload/hazard formulas, if they employ quantitative methods at all, or it may be simple ignorance of the alternatives that are available for allocation.

Measurement of the quality of allocation methods is somewhat an open issue. Proponents of the use of sophisticated models almost universally condemn the use of "hazard" and "equalized workload" formulas as not achieving the desired objectives. The continued use of these formulas, however, would indicate that there may be a substantial set of non-quantifiable or unstated objectives influencing the administrative decision-making process. Chaiken suggests that it is quite possible that issues such as

community support, control of crime and labor-management relations and the context of decision-making, which includes ". . . both implicit and explicit administrative, legal, and political constraints."[17] may well outweigh any considerations of efficiency that arise from viewing the patrol function in a narrow technical or mathematical sense. "Mathematical methods and models . . . [will not] . . . tell them the 'best' solution to whatever problem their department faces."[18]

Finally, while condemning "Hazard Formulas" as being completely unsatisfactory: "The use of hazard formulas cannot be recommended for any purpose,"[19] Chaiken discusses the difficulties of using workload formulas but concludes:

> If all these difficulties are kept in mind, successful applications of workload formulas are possible. An important point is not to accept the formula blindly, but rather to make appropriate adjustments after determining the effect of the proposed allocation on performance measures.[20]

3.2 Deployment

As discussed in other sections of this report, deployment analysis is intuitively accepted as desirable. The literature does not provide much guidance, however, in the methods of creating analysis systems and the techniques to be employed. The definitive document in this area is the Prescriptive Package: Police Crime Analysis Unit Handbook.[21] It discusses such issues as 1) basic elements of crime analysis, 2) data base, 3) data analysis techniques and statistical methods, 4) dissemination and utilization of crime analysis information, 5) evaluation, and 6) model crime analysis systems.

As stated elsewhere, the balance of the literature does not treat deployment oriented crime analysis in such depth. There is no set of documents that provides a comprehensive picture of crime analysis in its more traditional setting of support for patrol deployment and investigation. Therefore, Figure I-2f (page 1-15, Section 1.0) was constructed to provide a conceptual picture that might be useful in giving a perspective of all of the elements of the decision-making process, including analysis.

In addition to the limited documentation describing the crime analysis process, there are few instances of documented results of crime analysis. An Evaluation of the Dayton Crime Analysis Team [22] was made in a "process" oriented manner as described by Suchman.[23] The evaluation findings were that it is

". . . judged to be a highly successful project."[24] The problem with this particular project, however, is that it is related to a Pilot City program and was more concerned with program development than resource deployment.

An evaluation of the Criminal Information Center (C.I.C.) of the Special Operations Division Task Force of the Kansas City Police Department[25] based on ". . . the assumption that police officers would not use the C.I.C. if they were not able to obtain information of value"[26] relied on the use of the center as its measure of effectiveness. It was concluded that in eight months ". . . it has made a great deal of progress toward accomplishing its goals."[27] The goals were:

> . . . to collect information [and use it] as an aid to solve crimes that have occurred. . . . Make more officers aware of criminals that they should know and to provide a place for officers to obtain current information about their respective areas of assignment. . . . [and] to make the facilities available for use by specialized elements of the department to target on specific problem people or problem areas."[28]

Seaside, California,[29] considered the crime analysis operation to be a factor in successfully reducing burglary, but the evaluation of the crime analysis component was directed at the process of analysis and information dissemination. As a result of the first year of operation, changes were made in the computer prediction output to make it easier to read and the prediction calculations were made more frequently during the second year as well

as on a priority basis, i.e., primary, secondary and tertiary targets, to provide more flexibility in the deployment.[30] Th three specific goals for the second year were:

1. Simplification of data entry.
2. Making the computer more responsive to the patrolmen.
3. Simplification of data interpretation and the subsequent decision-making process.[31]

Each of the objectives was reported to have been met. Other isolated examples of evaluation or reaction to crime analysis operations in support of deployment are mentioned elsewhere in this report. The Police Crime Analysis Unit Handbook[32] provides guidelines for internal and external evaluation, but as a prescriptive package, it does not shed any light on the success or failure of existing crime analysis projects. It addresses the issues in normative terms and assumes the overall value of the crime analysis activity. Whether or not, or in what way, crime analysis actually best supports deployment decisions will require further research.

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4.0 ISSUES IN ANALYSIS FOR ALLOCATION AND DEPLOYMENT

4.1 Decision Context

In this section the issues concerning the decisions for allocating and deploying patrol resources are discussed in detail. Because these decisions are not isolated from other decisions it is appropriate to briefly provide the particular context within which patrol allocation and deployment decisions are made.

Resource allocation is an inherent function of management. Whether deciding that a tenth officer must be added to a nine-officer department so that the night shift will be covered seven days a week or assigning the patrol strength of thousands of officers among several districts, the police administrator is making resource allocation decisions. Resource deployment is a lower order decision made on the basis of short-term problem solving, given the resources that have been made available as a result of the allocation decisions.

The primary purpose of allocation decisions is to determine the amount of resources required to perform each of the functions in a balanced manner. It is not possible for the police to assure one hundred percent fulfillment of all objectives; therefore, the allocation process is a continual effort to balance the resources in an optimal fashion to accomplish the best possible set of objectives, given constraints on the amount of resources available, the strategies or tactics to be employed by those resources and

political and social pressures to accomplish conflicting objectives.

Resource allocation analysis, in an ideal situation, would establish the absolute resource requirements for performance of the total police function. While there is concern for a universal formula to assist in determining the total resource requirements for any given municipality, none will be found. While statistics are used in comparing police strengths of different cities, usually expressed as ratios, they are of little assistance in evaluating the actual resource requirements for any specific city. Perhaps the most realistic assessment of the situation is given by Wilson:

> In the great majority of American Cities, this determination [of the appropriate level of operational manpower] is made by a subjective process which may range from (a) guesswork through (b) comparison of police strength with other cities to (c) a calculation based on the number of men to be added to compensate for an increase in crime.[1]

Among the factors limiting the ability to establish the universal formula are the unknown affects of police action on preventing and deterring crime and conflicting judgments on which non-crime tasks are properly within the scope of police responsibility. Even the most sophisticated mathematical approaches to allocation problem solving require judgmental inputs as to the amount of time that is appropriate for preventive/deterrence patrol activity. In Kansas City allocation in 1972 was based on a commitment of 75% to non-calls-for-service availability.[2] The IACP

formula provides for one third preventive patrol time[3] and other ratios range between 40 to 50 percent called-for-service commitment of traditionally assigned beat patrol units.[4] In short, it is possible for the police administrator to quantitatively analyze some of the resource requirements of his department, but final determination of the total strength will depend upon police judgment of the non-quantifiable needs, budgetary restrictions, political influences and community expectations. Even at the level of patrol allocation Chaiken cautions:

> Thus, planning officers and patrol commanders who are concerned with patrol allocation must address operational questions in a context of both explicit and implicit administrative, legal, and political constraints. They cannot expect mathematical methods and models, . . . to tell them the 'best' solution to whatever problem their department faces, and they must be prepared to use all such methods with caution, imagination, and common sense.[5]

The issues discussed in subsequent sections do not address allocation of resources for support services of the department, even though some of these may be important determinants in the ability of the department to meet the objectives normally ascribed to patrol. For example, response time is considered an important measure of the ability of the department to make apprehensions and provide emergency services. Delays resulting from inadequate staffing of the dispatch operation or too few radio frequencies may have a significant impact on response time independent of the resources available for patrol response to

the dispatch. There are methods for measuring these functions with considerable precision[6] and we will assume, for purposes of this report that resources for these functions have been property allocated.

The balance of Section 4.0 discusses issues in analysis in support of patrol allocation and deployment decisions and is organized as follows:

4.1 The decision context, or framework, to include:

- 4.1.1 Scope of Decisions;
- 4.1.2 Frequency of Allocation and Deployment Decisions; and
- 4.1.3 Constraints on the Decision-Making Process.

4.2 The analysis context.

- 4.2.1 Crime Analysis Resources and Organization.
- 4.2.2 Data Collection.
- 4.2.3 Analysis Techniques and Tools.

Each of these is discussed in terms of its operational characteristics, the organizational context within which it occurs and an assessment of the quality of the findings.

4.1.1 Scope of Decision

Resource distribution decisions have been categorized arbitrarily for purposes of this report as:

> **Allocation:** the strategic response to periodic analysis of the distribution of crime, hazard and service problems, workloads and the need for new approaches to dealing with the basic responsibilities of the police.
>
> **Deployment:** the tactical response to problems related to event and suspect patterns identified through the daily analysis of crime, arrest and related information.

In Chapter IV of Aids to Decisionmaking in Police Patrol, Kakalik and Wildhorn have identified three basic types of decisions in patrol program management:

> 1. The size of patrol force necessary to provide satisfactory levels of service and protection to the public.
> 2. The [assignment] of a given number of patrolmen by time and place.
> 3. The operational rules, tactics, and command control hardware to be employed by the patrol force. Examples are priority policies and "stacking" rules for calls for service and costs and benefits of car location systems.[7]

Regardless of the style or method of patrol distribution, these three types of decisions must be made.

As stated earlier, there is no satisfactory formula for making the first decision.[8] Kakalik goes on to say:

> All of these decisions depend on the definition of a satisfactory level of protection and service; a useful working definition cannot now involve effectiveness measures such as true crime rates, number of crimes prevented, or the total social and economic impact of crime since none of these quantities is easily measurable,

nor is the relation of patrol force levels and tactics to these quantities known.[9] (emphasis added)

Allocation decisions, therefore, usually involve the distribution of a given number of personnel resources according to the prevailing belief in how best to achieve the desired levels of any one or combination of the objectives. The allocation may take the form of a traditional beat structure, specialized patrol operation or team policing. Unfortunately, the variations and overlapping of these three basic methods of performing the patrol function are extensive, making it impossible to deal explicitly with all of the variations. However, there are distinctive aspects of each of these three allocation methods which set them apart from each other.

We have, then, a range of assignment strategies which are related to varying mixes of priorities of goals and objectives and the underlying assumptions of how best to achieve them.

Traditional Patrol

Traditional patrol is concerned in some way with the achievement of all of the stated goals of the police department, i.e., crime prevention, provision of services, etc. To the extent that patrol officers' involvement in activities directed toward those goals is limited by department policy, it is generally in the area of follow-up investigation of crimes which is left to the detectives. In the traditional patrol structure the personnel are distributed geographically by command and patrol beat

and, in time, by shift. The most frequent shift structure three shifts of equal time (eight hours) although occasionally a fourth shift will overlap during the times of highest activity, either of calls-for-services or crimes. Infrequently there are greater numbers of shifts and more flexibility in shift changes.

Chaiken raises six issues related to patrol allocation:

1. How many patrol units should be on duty?
2. How many patrol units should be assigned to each geographic command?
3. Design of patrol beats.
4. Dispatching policy.
   a. How many patrol units will be sent to each reported incident? (This policy may include screening out certain types of unimportant calls for which no patrol unit will be dispatched.)
   b. Which particular patrol unit(s) will be dispatched?
   c. When will calls be queued (stacked, backlogged)?
   d. Priority structure. (Choice of which calls will be dispatched first given more than one call awaiting dispatch.)
5. Redeployment policy. (Reassignment of patrol units to different beats or commands as unavailabilities [of patrol units] develop.)
6. Manpower scheduling.[10]

Chaiken does not suggest that all of these questions can be easily answered, nor does he suggest that answers to these questions assist in allocation decisions for specialized patrol or team policing. Rather he states:

> . . . analysis of patrol allocation must rest on limited information about performance (whatever can be calculated reliably), together with informed judgment.[11]

In fact, it is suggested that the measures that are practical

to calculate and relevant for patrol allocation are limited to: 1) Response time (comprised of dispatcher's processing delay, queuing delay, and travel time); 2) Fraction of dispatches that take a unit outside its assigned patrol beat; 3) Time available for other activities; and 4) Cost.[12] Each of these measures is directly related to traditional patrol allocation.

Traditional patrol is further characterized as having as a primary purpose responding to citizen initiated requests for service which are generally weighted toward non-crime requests. Estimates of the ratio between non-crime and crime-oriented requests vary but most commonly fall close by within the range of 85 percent non-crime, 15 percent crime-related.[13] Traditional patrol forces have been distributed on the basis of discretionary command decisions, hazard formulas and equal workload formulas and more recently there has been a considerable amount of effort in devising more sophisticated methods utilizing mathematical modeling and simulation techniques to provide more specific information for use in distribution, beat design and scheduling.[14]

A basic assumption in traditional patrol allocation is that the patrol units should have some time available for performing preventive/deterrence activities. There are several issues raised regarding this. There is serious question about whether the undirected patrol time contributes to either prevention or

deterrence.[15] Another difficulty is illustrated by the variance in availability of beat patrol units to perform such patrol activities. The 1972 Kansas City allocation program was intended to commit only 25 percent of a beat officer's time to calls-for-service leaving 75 percent of his time available for other patrol activities.[16] At the other extreme is the Cambridge police officer's quoted statement, "Everytime I'm free, I'm being sent to some place else in Cambridge on another assignment."[17]

The literature does not deal explicitly with the issue of who makes the allocation decisions. The impression is that they are made at the "highest levels" of command, which is consistent with the categorization used in this report that allocation decisions are strategic and tend to be stable over long periods of time. There is some contradiction to this in the literature, however. Rodgers reported in 1961, when reviewing walking beats in the City of Chicago that ". . . there was no standardization of walking beats even in the individual districts. Seldom would the watch commanders in a district use the same walking beats."[18]

The issue of deployment of traditionally allocated patrol officers against short-term crime problems is difficult to pin down in the literature. The usual situation appears to be that the individual patrol unit/officer is expected to use his own judgment, supplemented by whatever information he may receive

from his peers, superior officers and formal crime analysis reports, to direct his method of operation against identified crime and other hazard problems. Accepted principles of non-directed patrol are randomness and unpredictableness, cultivation of a sense of omnipresence and inquisitiveness.[19] The patrol officer is usually restricted by department policy to performing these activities within the boundaries of his predesigned beat.* Occasionally a supervisor will have the discretion to move beat units to deal with specific crime problems;[21] however, this discretion appears to be relatively infrequent.

It is apparent that traditional patrol methods have received the greatest amount of attention in the development of allocation tools. This is a logical process evolving from the days when traditional patrol was the universal method of distribution and hazard formulas were developed to support the allocation decisions. It also is the form of allocation that is the most amenable to the application of the more sophisticated allocation models that require precise measures of activity and results for them to function at all.

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*The beat structure may be exclusive to a single patrol unit, it may involve overlapping beats or several units may share a single beat.[20]

Team Policing

It is important at the outset to make clear that the is no single organizational structure or method of operation that distinguishes team policing from other methods of allocating police patrol resources. However, in an early study of team policing three common areas of emphasis were found in all but one of seven cities studied: "geographic stability of patrol, maximum interaction among team members, and maximum communication among team members and the community."[22] If there is any single distinction between the team policing approach and the traditional patrol approach it is in the allowance for greater latitude in operational decisions to be made at the lowest level of the patrol organization in team policing. This is in contrast to the organization and operation of police departments along quasi-military lines with strict supervision and emphasis on command decision-making for allocation and deployment,[23] characterized by the more traditional patrol methods.

Team policing is similar to traditional patrol in its total concern for police services in a particular area. The primary differences are the larger geographical area of concern and greater concern for the social needs of the residents of the team area. The statement made in relation to the implementation of team policing in Richmond, California was ". . . change

in policy from the concept of one individual officer responsible for one beat to a concept of group responsibility for a large area."[24] This statement summarizes another of the main distinctions between traditional policing and team policing. It is one of responsibilities (both area and function), which are based on changing concepts in the role of the patrol officer. One of the characteristics common to team policing is the latitude and considerable degree of responsibility for making day-to-day decisions about hours of assignment and problems to be worked on. If crime analysis information is available it will be used, but it will be supplemented by other information usually collected by the team as a regular part of its responsibilities. Resource allocation principles are applied at the inception of the program, but no information was found that indicated any regular assessment of the need for reallocation. One can assume that workloads will be reviewed in a manner similar to that used in traditional patrol reallocation, but there is no evidence at this time of how often or just what form reallocation might take.

The determination of the resources to be allocated among the teams is generally arrived at by calculating the percentages of the total workload in each team area and assigning the proportional number of team resources to the area. In those cities where the team policing concept does not give the discretion for determining hours of work to the team, the team members may

be assigned to hours according to calculations of the relative hourly workloads. Resource allocation in team policing is then basically accomplished at the inception of the program utilizing an equalized workload/proportional distribution formula. In some situations efforts are made to allocate so that only a certain percentage of an officer's time is consumed by service calls. In Los Angeles the percentage of free time for community interaction was set at 50 percent. Cincinnati set the consumed time at 35 percent. It is unknown from the literature how frequently the allocation is reviewed and changed.[25]

Depending upon the particular approach of a given city to team policing, personnel normally considered to be non-patrol may be integrated into the team. Examples are community service officers and investigators.

Deployment of team members in relation to crime and other problems is essentially determined at the team level through team conferences. Crime analysis for deployment appears to usually be a function of each team. In some cases, as in Cincinnati, centralized crime ". . . collators maintain a picture file, name and a modus operandi file and are responsible for dissemination of crime information to the teams."[26]

Specialized Patrol

For the purpose of this study, specialized patrol is any patrol activity which is organized and conducted separately from either traditional patrol or team policing, as previously described, and is directed against crime problems which are normally considered to be amenable to either prevention, deterrence or arrest as the result of such patrol. Wilson identifies this type of unit through its essential characteristic of flexibility.[27] Specialized patrol activities take many forms. Some of them are: decoy operations[28] (presentation of potential "person crime" target with backup personnel to make arrests); suspect oriented patrol operations (surveillance of potential criminals on the chance of observing them committing a crime);[29] crime specific patrol programs;[30] and tactical units capable of being moved in sufficient strength and employing appropriate tactics to combat a variety of crime problems.[31]

LEAA has played a significant role in the increasingly wide spread use of crime-specific programs which utilize specialized patrol tactics through development of guidelines and funding of programs.[32] The National Commission on Criminal Justice Standards and Goals also supports the use of tactical squads for ". . . flexible, highly mobile, and rapid deployment against special crime problems."[33]

The literature review does not provide any guide to the

method of determining the number of personnel resources which should be assigned to specialized patrol activity. It appears that the decisions are based upon one of two factors: 1) the number of personnel that can be supported under an LEAA funded grant; and/or 2) the number of personnel that can be spared from other assignments whose workload and resource requirements are more easily measured, e.g. called-for-services.

The split force concept, first conceived in the St. Louis resource allocation program[34] and further reviewed under the Chicago Operations Research program,[35] were based on determining first the level of resources required to handle calls-for-service (under specified response criteria) - the response force - using the left-over district patrol personnel as the preventive force, which for purposes of this study is considered to be a specialized patrol force.

The only generalized recommendation found in the literature is that of Wilson which states that the tactical force should be organized in military fashion, with squads supervised by sergeants and that the size of the force is dependent upon the number of squads to be utilized.[36]

It is the nature of the specialized patrol programs that they are deployment oriented in carrying out their assigned responsibilities. It is this method of patrol that is most highly supported by what might be called crime analysis. The fact that

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the focus of specialized patrol forces is on crime prevention, deterrence and arrest makes it dependent upon crime analysis to identify and define crime problems, and suggest methods of combatting the problems.

The decision to create a specialized patrol force and determination of the number of personnel resources to be allocated to the force are apparently made at the highest command levels, although this is only implied in the literature. In those few cases where the split-force concept is in effect the decision is ipso facto the obverse of the decision on the number of resources required for the response force.* Crime analysis supports these decisions in a strategic sense by identifying major crime problems that are not responding to the more traditional patrol strategies.

Deployment decisions are executed usually at the unit command level based upon the latest available crime analysis information and intuitive judgment. The frequency of these decisions is discussed subsequently.

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*For example see Larson, Richard C., Urban Patrol Analysis, p. 133: "Thus, this St. Louis experiment [split-force] is a specific example in which the level of preventive patrol is determined by the resources remaining after allocating for calls for service."

Intermediate Decisions

The previous discussions centered around the characteristics of decisions derived from crime analysis in terms of various patrol structures. It is appropriate to briefly mention other decisions that support the allocation and deployment decisions previously discussed. These particular decisions derived from crime analysis can be grouped into three categories.

The first of these is the design of special programs. This is appropriate since crime analysis is frequently referred to in its role as a support component for special projects.[37] To justify its cost and to develop the proper means of implementation, crime analysis is used prior to the implementation of a program to identify the nature and magnitude of a crime problem.[38] After the program begins, crime analysis can be used to assess the effects of the program and to evaluate alternative programs with regard to the variable impacts on the crime problem.

The second of these supporting decisions is the detailing of tactics and strategies. Crime analysis can provide information which may help to develop the appropriate strategy or tactic to be used in general operations or in problem specific operations. One method that can be utilized to accomplish this is to identify the overriding problem of a specific area. Means can then be directed towards the problem in terms of the most effective versus the least effective alternatives.[39] Pre-

diction methods can often be used to identify the most likely target areas of crime, and the best tactics to apply to the problem in terms of stake-outs, more concentrated patrol, or other target specific strategies.[40]

The third supporting decision is concerned with planning and budgeting. In this instance the decisions may be applicable not only to patrol, but to other types of police activity as well. Crime analysis has the potential for aiding in the planning and budgeting decisions in estimating future resource needs. This can be accomplished in a number of ways; by predicting the probable future crime rates, by assessing the impact of patrol techniques on crime, and by projecting future levels of other service needs.[41]

In summary then, it might be said that there are two basic functions for which patrol resources are allocated and deployed -- providing services to the public and combatting crime. The particular patrol methodologies employed by allocated and deployed resources are not nearly as clearly delineated as one might expect. The allocation policies for traditional patrol will affect the number of personnel available for deployment in specialized patrol. Organizational and operating policies will affect the type, value, and use of crime analysis regardless of the particular patrol structure or methodology.[42] These are issues we will attempt to deal with in subsequent sections.

4.1.2 Frequency of Allocation and Deployment Decisions

By definition, allocation decisions are made less frequently than deployment decisions. As the term is used in this report allocation decisions result in distribution of personnel resources by function, geography and time on a relatively stable basis. In patrol these decisions result in assignment of personnel to traditionally organized command and beat structures by shift; to neighborhood teams; and to specialized patrol units. Deployment decisions are made more frequently in order to direct the efforts of personnel to combat problems, especially crime problems, that shift in time and location. The frequency of these decisions may be hourly, daily, weekly, or monthly.

Allocation

The early history of allocation, as reported by Fosdick in 1920 [43] and others, indicates that review of the distribution of personnel by beats occurred infrequently, often remaining unaltered for years; and that even though the problems during the nighttime were distinctly different from those of the daytime the posts were often policed in exactly the ". . . same way during all hours of the day and night." [44] As recently as 1967 McLaren, then Director of the Field Operations Division, IACP, deplored the ". . . inadequate distribution of resources [as] a great problem in itself - one that affects a great many departments - perhaps a substantial majority of them." [45] Larson

reported in 1974 that the Cambridge, Massachusetts sector plan had not been redesigned for more than 20 years.[46] Such extended periods of time between allocation decisions do not appear to be the norm, however. Although the literature does not clarify the issues of frequency of allocation decisions or the triggering mechanisms for the decisions, they appear to be triggered by one of several factors: 1) an increase in the personnel strength available for allocation to patrol, 2) marked imbalances in workload or crime resulting in unacceptable queuing of dispatches, and 3) awareness of particular crime problems that are not amenable to resolution by the existing allocation of resources. As indicated earlier, funding available through LEAA and private foundations also plays a role in initiating decisions to develop new programs and reallocate resources.

The National Advisory Commission on Criminal Justice Standards and Goals recommends yearly review of allocation of personnel to geographic commands (divisions or precincts) and quarterly review of shift, day of week, beat configurations, and personnel complements.[47] The Los Angeles Basic Car Allocation is reported to be reviewed annually to determine whether reallignment is necessary.[48] Another author suggests that the distribution should be reviewed monthly.[49] Chicago is reported to reallocate semi-annually for summer and winter beat configurations.[50] St. Louis, which was among the leaders in developing

a sophisticated method for measuring calls-for-service workload and allocating response personnel accordingly, is reported now to reallocate very infrequently[51] (four years after implementing the system city-wide). Edina, Minnesota, implemented a demonstration program which provided for random deployment of patrol units within their beats every fifteen minutes,[52] but abandoned the program at the conclusion of the demonstration program in 1969.[53] A report on the Mission District in San Fransisco in 1968 stated that ten years had elapsed since the last change in patrol sector boundaries and foot patrol beats. During that period the personnel strength of the district had been increased by 10.2 percent.[54] We were unable to find any source that indicated the 'usual' frequency of allocation decisions.

The basic issue in frequency of traditional patrol allocation is the rate at which the factors used in determining allocations change in type and location over time. It appears that service demands and other concerns of the patrol force are highly predictable and stable from year to year. Bottoms reported:

> Demands for police service in Chicago as well as in other large cities are predictable. In each geographic area of Chicago, strong correlation is observed between levels of activity in any given week of the year with the activity one year ago, two years ago, etc. . . . This seasonal correlation and a similar repeated ratio between weekday and weekend activity has made it possible

> to forecast demand for service using merely the level last year and the observed upward trend. Agreements with reality have been within 5 percent.[55]

The earlier work done in St. Louis resulted in the same conclusion.[56] Both of these studies confirm the statement made by Vollmer in 1933:

> Studies have indicated that crimes and other events of which the police must take cognizance occur with great regularity. Consequently, the distribution which has prevailed in the past may be expected to continue in the future.[57]

Obviously, there are factors which may intervene in the issue of the stability of crime and service demands. For example, urban renewal programs have resulted in sudden population shifts which necessitated reallocation of traditional patrol forces.

As indicated previously, nothing has been found to indicate the frequency of reallocation of team policing resources or allocation to specialized patrol resources except at the initiation of the programs.[58] Richmond, California, which used equalized workload in the original allocation to teams, further validated the stability of workload distribution when comparing 1963 and 1967 workload data: "The percentages of work in each sector, the smallest geographical reporting area, were not significantly changed although the overall activity had increased."[59] The annual review of the Los Angeles Basic Car distribution does not give us a clue if we accept the position taken by the authors of the Neighborhood Team Policing Prescriptive Package that the Basic Car Plan is not a

neighborhood police team program.[60]

Deployment

As indicated, deployment, by definition, requires relatively frequent decision-making. The frequency is dependent upon the nature of the problem against which the resources are being directed. The Commission on Standards and Goals recommends:

> . . . that police departments in major cities establish tactical squads for flexible, highly mobile, and rapid deployment against special crime problems. The tactical squads should be deployed on the basis of current crime pattern analysis and projected criminal activity.[61]

Not all tactical or specialized units are used on a totally flexible basis. Omaha, Nebraska reported that its Strike Force was deployed in a district usually for 30 days.[62] In most cases, however, it appears that the frequency of deployment decisions is governed by the nature of the problems against which the resources are directed. This is certainly true of team policing units. The very nature of the team concept involves team members in routine review of problems in their team area with deployment and use of tactics directed at specific problem targets.[63]

4.1.3 Constraints on the Decision Making Process

Thus far, the decision-making context of police allocation and deployment has been discussed in terms of frequency, scope, and assumptions and objectives. In any application of this decision-making process in the real world, there are number of constraints, or limiting factors in operation.

The purpose of this section is to address the various limiting factors in the decision-making context in order to give the reader a realistic view of the actual realm within which these decisions are made. The most basic constraints in the decision-making process are geographic, time, labor, capital, and management constraints. Within each of these factors are a variety of more specific issues that the allocation and deployment decisions may be limited by. These constraints are factors that cannot be overlooked in the decision-making process.

Geographic Constraints

The first category of limiting factors are those geographic considerations that cannot be avoided by the decision-maker. Within the modern urban setting, the police administrator is faced with an operating theatre that is far from being ideal. There are a great many factors existing in the cities that physically impede the optimal allocation and deployment of police manpower. The old expression "the other side of the tracks" is more than a saying for the police; it is often a

reality. The police patrol cannot move without regard for railroad tracks, factories, and many other barriers that are both natural and man-made. These barriers have a direct influence on allocation and deployment practices of urban police patrol.

The first important category of limiting geographic factors is that of natural and man-made barriers. These barriers may range anywhere from mountains to man-made ravines. In designing police beats and sectors for allocation purposes, geographic factors must be considered if the decision-maker is to hope to achieve his objectives. It has been recognized that "In actual urban environments a responding patrol unit may encounter travel impediments such as barriers (for example rivers or railroad tracks) and one way streets."[64] Considering the physical barriers makes the optimal square sector design suggested by Wilson impossible in many situations.[65] Ideally, the geographical considerations of physical barriers could be minimized in designing sectors. This may occur when the factors indicating a need for optimal sector design outweigh the trouble involved in designing sectors around these barriers. This sentiment is summed up by the following recommendations to police planners: to design sectors as "squares," "circles" or as "straight lines along particular streets."[66] This statement indicates that where possible the police planner should consider the advantages of an optimal sector design far greater than the cost and trouble involved in designing these sectors.

It should be recognized, however, that many cities are faced with situations where sector design cannot ignore the geographic surroundings. An example of this situation is Manhatten, where the difference in travel time between going east to west and going north to south is so great that it is a factor that the sector designer cannot ignore.[67] St. Louis similarly cannot ignore the fact that the Mississippi River makes rectangular sectors in certain areas completely impossible.[68] Some geographic factors are significant enough to necessitate the use of unique patrol techniques, and the effect of this on allocation and deployment is obvious. In some instances, particular barriers may require that the police allocate and deploy manpower using boats, or even ice skates.[69] Other geographic barriers, along with temporal considerations have prompted many police departments to resort to the use of helicopters and airplanes.[70]

Travel time has already been mentioned in an indirect way, but it is mentioned again because of the relative importance of this factor in the determination of so many allocation formulas. Travel times are significantly affected by one-way streets as well as by the physical barriers that have already been discussed.[71] In general, the cause and effect relationship between travel time and its effect upon many measures of effectiveness are unknown; however, for many issues it is simply assumed that travel time

is an important factor. For this reason, any geographical differences in travel times should be taken into consideration by the decision-maker.

The second factor of geographic consideration is the variable service needs required of the police by different areas of a city. In most cities there are certain areas that place extremely heavy demands on the police while other areas place almost negligible demands on the police. It must be kept in mind, however, that even in those areas that have low demands for police service, there must still be police units allocated to respond to those demands that do arise. The key guideline to be followed is generally that ". . . the patrolmen should be distributed by areas in proportion to the amount of work to be done."[72] Following this basic principle, ". . . the size of beats tends to gradually increase from the center of the city."[73] This is because of the concentration of demands for police in the central city.

An issue that is hand in hand with the demands for police services is the incidence of crime in an area. Both of these factors taken together constitute an overall need for the police, and these factors heavily influence the allocation and deployment of police manpower. Generally speaking, the demands for the police are generated largely from the central city areas.[74] This rule, however, does not always hold true as indicated by the results of a study conducted in Washington, D.C. that com-

pared crime rates between an inner-city ethnic ghetto and an affluent predominantly white section of the city.[75]

The reasons for the disparity between different geographic areas within a city in terms of demands for police service and crime rates are found in certain characteristics of the areas themselves. Although the exact cause and effect relationship between these characteristics and the different demands for the police are not fully understood, the literature indicates with a significant amount of consistency that there is such a relationship. Some of these characteristics are correlated by specific crimes and others by demands in general. For the crime of burglary, for example, it has been found that the largest demands for service come from areas that are characterized by high unemployment, poor housing conditions, unstable family conditions, and high concentrations of ethnic minorities.[76] Other factors generally considered influential in affecting crime rates and calls-for-service are the proportion of retail establishments in an area, the percentage of industries in the area, the number of warehouses, and the population density.[77] Some of the specific data on high crime neighborhood characteristics point towards factors including land usage, age of residents, and the length of time that the people have lived in the neighborhood.[78]

Most crime data indicate a very strong relationship between crime rates and the number of calls-for-service, and the geo-

graphic and demographic characteristics of the area. The effects of these differing rates by areas is substantial in the distribution of police manpower, primarily because of the rule that dictates police be distributed by need.[79]

Important constraining factors in the decision making process are the mores and traditions of subcultures throughout a city. This is a very complex subject area, but the topics are essential for the allocation and deployment of personnel. The men that the administrator sends into a certain area should have some understanding of the culture of the people in the area.

The police cannot operate effectively without the support of the public; for this reason community norms must be understood.[80] The mores and traditions of all of the different ethnic groups must be considered as well as the mores and traditions of the entire community. This is an area that is intimately related to individual police discretion; however, the concern here is the effect of traditions and mores on the allocation and deployment of personnel.

The administrator who knows that a particular ethnic group celebrates a holiday on a certain day of the year and usually in a boisterous manner would be wise to deploy some extra manpower into the neighborhood. Similarly, if the community always has a parade on St. Patrick's Day, the police administrator must

consider this.

There are more subtle forms of influence in terms of selective enforcement of the laws. Gambling, for example, may be tolerated to some extent in certain areas of the community because the police know that to the people of the area, the behavior is a tradition. This would limit allocation and deployment decisions to some extent. Perhaps the best statement concerning the effect of subcultural mores and traditions on police activity is as follows:

> Various neighborhoods and subcultures have their own levels of tolerable disorder: what may appear to be weaker norms are only different norms . . . . Justice is not an absolute; it can be rationed, providing more or less of one kind rather than another to different neighborhoods.[81]

The particular characteristics of the neighborhoods in terms of variable needs are only part of the limiting factors in the decision-making process. Within this geographical context there are also important limiting factors found in the expectations of the police for demands for their service; however, one study has shown that the difference may not be as great as perceived by the public.[82]

Time of Occurrence and Demand

Temporal differences in activity must be considered by the decision-maker. These time differences and the seasonal variations strongly influence the demands on the police.[83] According to one author, "[Crime] Hazards may vary according to the hour

of the day, the day of the week, and the season."[84]

Temporal variations have been a well recognized factor in police manpower distribution schemes for a long time. Wilson, for example, listed police workloads in terms of the time of the day of the occurrence. Using this distribution one can see many distinct variations in workload; for example, only 13 percent of the workload occurred between the hours of 1:00 a.m. and 7:00 a.m.[85] To allocate a large number of resources during these hours would seem to be irrational.

Using the temporal variations in activities, Wilson originally designed optimal shifts for the police administrator. These were shifts that would end at 12:00 p.m., 8:00 a.m., and 4:00 p.m. He later advocated the overlapping of shifts to compensate for the decrease in activity in a patrolman's final hours of his tour of duty.[86] In any case, there are definite differences in the time of occurrence of most incidents. Many of these differences exist for specific incidents and they also exist on a broader scale of unit workloads.[87] The effect that these variations would have on allocation and deployment decisions should be clear; the decision-maker would have to consider such factors if his allocation programs were to have any rational basis and if the programs were to be at all effective in the attainment of the goals of the police.

Another factor that is important in terms of calls-for-

service and crime rates that has been briefly mentioned is the difference in incident occurrence by the day of the week. It was found, for example, that in one area of a city the workload of the night shift on Saturday was 51 percent higher than that on Monday and 35 percent higher than that on Tuesday.[88] The sharp increase during the weekend is a significant factor in allocation and deployment strategies.

An ofteh overlooked, potentially limiting factor in the allocation decision context is the seasonal variations in crime and workload that are commonly found.[89] Inclusion of seasonal variations might result in a profile generally described as,

> . . . the needs for police services are consistently heavier during the hot summer months than the cold months of winter, at four in the afternoon than at four o'clock in the morning, and on Friday than Tuesday.[90]

In addition to the short term temporal considerations and the geographic differences are the long range trends that must be taken into consideration. St. Louis is one department that was expecting the number of Part I crimes that would occur to increase from 1968 to 1975 by more than 18,000 and the number of calls-for-service to increase by 200,000.[91] Other cities expected similar increases. The important point to keep in mind is that the long range expectations must be strongly considered since they will influence all of the other areas mentioned.[92]

The wise administrator would know not only that there were most likely to be certain proportional increases in most areas,

but also that in certain areas the proportions would be likely to increase drastically (for instance in an area that was in a demographic transition stage).

Labor Constraints

Another set of constraints in the decision context of allocation and deployment decisions is the area of labor considerations. In recent years this has become particularly important since the issue of police unions has once again become a factor in decision-making of police administrators.[93] The categories of factors within labor constraints may be classified as psychological, contractual, and legislative.

Psychological labor constraints are the psychological factors affecting the patrolmen, and the possible cause and effect relationships between these factors and various allocation techniques. There are always underlying psychological constraints on the patrolmen in general about which administrators should be aware.[94] These are not the primary concerns of this section since the problems are not within the scope of allocation and distribution as much as they are in the nature of police work in general. The scope of this discussion is to deal with those psychological factors that are directly influenced by the specific allocation and deployment programs that the officer is working under. These areas that may commonly cause some psychological stress to the officer as a direct result of allocation are hours, shift rota-

tion, beat assigned, and the duties of the officer according to a particular allocation or deployment strategy.

One of the most important considerations of the psychological factors affecting policemen in terms of their distribution is their shift assignments. The various effects of working nights and changing shifts periodically are factors that can and do affect the individual policeman.

One of the ways that the working hours and the shift changes affects the policeman is in terms of isolation. There are a number of problems faced by today's policeman in terms of his relative isolation from other occupational groups in our society; consequently, the aggravation of this problem by unusual working hours is a factor that must be considered.[95]

Another consideration of shift designs and working hours is the relative effect of rotating schedules on the police officer. A set of considerations is given below.

1. Continuity of service and attention to current problems is enhanced by permanent platoon assignments.
2. The physical and domestic welfare of the officer requires that he work regular hours. Regularity of hours contributes to good family relationships and to superior physical and mental efficiency.[96]

The general conclusion drawn is that "The highest quality of patrol service is obtained when officers are permanently assigned to their beats."[97]

The exact nature of the effects of the unusual working hours

and the rotation of shifts is unknown, but it is recognized that this is an important consideration in allocating police resources. The area of primary concern to the police decision-maker is the effect of shifts on officer morale.[98] The decision-maker is constrained in assigning men for optimal allocation and deployment with regards to one objective, e.g. crime control, by the counter effect on the objective of maintaining officer morale. The balancing of desired goals must seriously consider all of the possible side-effects of a particular program in terms of the psychological well being of the personnel.

Another important psychological constraint is the beat that the officer may be assigned to. This issue is ultimately related to the various sets of conflicting roles experienced by police officers.[99] An important consideration here is the type of beat that the officer is assigned to and the behavior that he most frequently finds himself displaying with regards to preconceived roles. If the expected behavior is in conflict with the actual behavior, the psychological result may be very damaging. The essence of this issue is that if a man is assigned to a particularly "rough" beat for too long, his perceived police role may change to an entirely "crime-fighter" orientation.[100]

Another issue that is particularly important today is the psychological effect of the assigned duties of the officer. In one split force program an unfortunate orientation that de-

veloped was that the officers perceived their role as being limited to a single duty.[101] This factor indicated that the police role perception is an important determinant of police behavior, and that any allocation decision must clearly define police roles so that the policeman's orientation is in accordance with the particular allocation scheme being used.

Another important labor constraint in police allocation and deployment is in the field of contractual constraints. Recently, the rise of interest in police unions has brought this issue into the limelight.[102]

The police unions and organizations are concerned with the same factors that other collective interest employee groups have: salary considerations, better working conditions, overtime, and pensions. In this respect, contractual constraints are related to the psychological constraints because the unions and organizations are concerned with these issues, as well as others. An agreement between the Boston Patrolmen's Association, Inc., and the City of Boston outlines in detail the scheduling procedure that the city will follow.[103] This document also deals with overtime issues.

The specific constraints resulting from an organized labor group in the police field differ depending on the city or police agency that is represented. In any case, these collective bargaining groups have gained considerable strength in many police

departments and the resulting constraints on allocation decisions cannot be minimized. The agencies, by and large, must weigh scheduling, salary, and pension issues in terms of the organization's demands and contractual obligations. The overall effect of this is more in some cities than in others, but any allocation decision-maker must consider the power of the collective bargaining organizations and the effects that they might have on the allocation scheme. If, for example, a particular allocation scheme called for redesigning shifts so that the men would be on duty from 10 p.m. to 6 a.m., the decision might be dependent on the agreements of the administration with the patrolman's organization.[104] The debate in police circles over the advisibility of recognizing police unions still continues; it will suffice to say that they cannot be ignored.

Tempering both the police administration and the police collective organizations are legislative constraints.[105] These are statutes that are enacted by law and may dictate an allocation or deployment decision with regard to specific issues. The unions, for example, in New York were made possible only by the so-called Taylor Law.[106] Similarly, no police department could devise and implement an allocation scheme that violated certain labor laws. One could not for example, schedule men to work 60 hours per week if the state laws prohibited this. In the same vein, if the legislation dictates that a particular administrative command is perfectly legal, the unions may have a diffi-

cult time combating the decision. It will suffice here to simply say that the decision-maker is guided by legislation; he cannot violate the statutes, and he must therefore consider any poss ble conflicts in his selection of alternative schemes.

Capital Constraints

The third major area of limitation in the allocation and deployment context is budgetary. In today's complex bureaucracy, capital constraints face every agency. Without the proper funding, no allocation or deployment decision can realistically be expected to achieve its purpose. Similarly, the administrator must take into consideration his budget to see if the allocation alternative he had in mind is feasible.

The first consideration of capital is the personnel budget. Since usually fully 90 percent of a police budget is for salaries, one can see the importance of this constraint.[107] Given the magnitude of the police budget that is consumed by personnel salaries, an allocation program should consider the advantages of operating one man patrol cars as opposed to two man patrol cars, an alternative that may then be constrained by a labor contract.[108] The fact that the police must operate within a given budget is hardly debated. The fact that one man cars are economically cheaper to operate will be an important consideration in an allocation decision.[109]

Another consideration that is important in police manpower

distribution is the payment of overtime wages to policemen. In this case overtime may be defined in different ways depending on the particular police agency in question, but the administrator must be aware of overtime payments. This payment may be of two general kinds: regular overtime and court time.[110] The administrator should be aware of both the hours and the payment involved in overtime work.

A second important capital constraint is in the area of operational equipment. In this area are included those items of equipment that are used in patrol operations, such as vehicles, radios, and surveillance equipment. The decision-maker will be limited in his allocation and deployment strategies if the department does not have the specific equipment needed. In many cases, larger police departments spend great sums of money on operational equipment. The budget, then, is a constraint on allocation decisions which would require equipment that may not be provided in the existing budget. If special radio equipment is available then the decision-maker may allocate or deploy his men with this in mind; if not, then the decision-maker must find an alternative solution.

That operational equipment is generally a high priority of the police departments has been accepted for many years.[111] Sophisticated equipment certainly seems to be necessary in today's urban setting.[112] As the criminals become more sophisticated and the demands for police services increase, their operational

equipment becomes an important part of the service strategy. Other support equipment used by the police may be more difficult to justify. Data processing equipment, forensic laboratories, and sophisticated dispatching equipment are all receiving more emphasis in modern police departments. These items are generally quite expensive, but may provide many benefits in the long run. A complex dispatching technique for example could influence allocation and deployment decisions very significantly. The availability of data processing equipment also influences the allocation decisions.[113] But even those expenditures for data processing services that seem minimal to the outside observer may be restricted. For example, the Edina allocation program was discontinued because the city council would not appropriate approximately $13,000 annually for computer services.[114]

Probably the single most important determinant in the issue of support equipment is the evaluation of their cost effectiveness. These issues are largely unresolved; however, they are not the primary concern of this project.[115]

Management

The final issue area in limiting factors on allocation and deployment decisions is management constraints. Within this category are many factors that are quite subjective in nature. These items must nonetheless be mentioned since they are factors that operate in the real world as limitations on the allocation

and deployment process.

The first important area is the initiative of the management. Quite obviously if the top management has no initiative to reallocate it probably will not be done. This is particularly true because of the quasi-military organizational structure that police departments often work within.[116]

Since the command of the police departments is usually well defined, it is imperative that the top level commanders be receptive to change and initiate activity in the direction of improving police services.[117] One of the factors that is hoped to be a great impetus to the top level initiative is the so-called professionalization of the police. The aims of professionalization are to attract and keep the forward thinking commander who will take the initiative to attempt to improve his police department. Unfortunately many qualified people do not choose public service careers.

> . . . consider how many college graduates today receive degrees in some form of business administration and how few receive at least an equivalent preparation for careers in public administration. This imbalance between the quantity and variety of people and skills prepared for the public, as opposed to the private, sector is but one of the reasons why we have so few people with understanding of what an urban or state government may be, what powers, responsibilities and revenue are found at particular levels, and the processes by which public decisions eventually happen.[118]

A second management constraint is the goal related priorities of the management personnel. This factor is subjective just as

initiative was. The importance of this factor is that the priorities of the management, for whatever reason, will strongly influence allocation and deployment decisions.

As an example of the management priorities affecting the decision-making process consider the police management that, in response to a sensational series of crimes, is particularly concerned with the specific crime of armed robbery. In this situation it is entirely reasonable to assume that the deployment of personnel would be aimed at the reduction of armed robbery. One has only to look at the literature of what has been done to see that any program is dependent on the priority goals of the administrator.[119]

A third constraint on the decision-making process is the management style of the department. There is an interesting interplay between the allocation and deployment decision-making process and the style of the management; on one hand the style limits the decision context, and on the other hand the style is influenced by the decisions. If the style of the police management is very autocratic it would be less likely to find that the department would be decentralized or would have team policing than if the management style were democratic.[120] In this sense the style of the management will limit the choices of allocation strategies. On the other hand, if team policing should be introduced, the management style would necessarily have to change to accommodate this. Unfortunately, in some cases team policing

was introduced and the management styles did not subsequently change to a more democratic form, the result being that the team policing program failed.[121]

An issue that is of importance in style of management is the supervision of patrol personnel. Officers tend to be supervised through a complex system of bureaucracy; however, there are important variations in the methods of supervision.[122] It is generally thought that direct line supervision, or one man reporting to one supervisor is preferable to all patrolmen reporting to all sergeants.[123] A variation in this pattern was experimented with in "operation 25" where higher ranking officers were placed in direct supervision positions in the field. The limitations of differing supervisory techniques may be an important consideration in the allocation and particularly in the deployment of manpower. Deployment situations may often be more emergency oriented and well defined lines of supervision become necessary.

Another constraining factor on the allocation and deployment decision-making process is the political milieu in which the police function. In the sense it is used here, political milieu refers to all of the external forces that may influence allocation and deployment decisions. It is generally agreed that the political milieu is a factor that the decision-makers have to take into consideration. A commander may, for example, know that he

could deploy the personnel necessary to quell a disturbance by some pressure group, but given the overall circumstances within which the police must function the choice might be not to deploy the men.[124] In these cases the advantages of being able to deploy the men to stop the demonstration may be far outweighed by the disadvantages that might possibly be caused by the antagonism towards the police.

Another consideration which is important is the possibility of law suits. Recently, class action suits have been brought against police departments because of perceived unequal police protection.[125] The allocation of manpower must insure that the poor people feel that they are getting adequate protection, but at the same time the political motivations of the police administrators would dictate that they pay attention to the more affluent sections of town also.[126]

Another important management constraint is the relationship with the media. In recent years the role of the press has changed dramatically and the police must consider media factors in their allocation of manpower. The role of the media could be particularly important in the implementation of an allocation program such as team policing. The positive publicity that the press is capable of giving to the police could greatly enhance the acceptance of a new program.[127] Similarly, cooperation by the press could possibly be used as an effective deterrent to certain crimes

by using the media as an educational, informational transmittor to the public.[128] In any case, an uncooperative or hostile press is a problem facing police administrators.[129]

There are also some negative factors of the press and the police that the administrator should consider in allocation and deployment decisions. Of special interest here is the idea that tactical squads may be less well received by the public than other policemen.[130] If this is true, the large scale deployment of such men might be taken very negatively by both the media and the public. In these cases the administrator should be knowledgeable, in terms of weighing the possible alternative deployment tactics against the negative publicity that might arise as a result of such a program.

The overall importance of the management personnel in the success or failure of implementing allocation and deployment programs cannot be overstated. Without a high quality of leadership, police departments will be very limited in their programs. Wilson states that a good police administrator must think in terms of "ideas and concepts, in energy and enthusiasm, and in high principles and integrity."[131] Without a leader in the sense that Wilson uses the term, police programs will not progress; rather, the police will show attitudes like those described by Colton; ". . . in their own mind they've been supervising the district's units successfully for years without the benefit of such data."[132] Colton was describing some of the

problems involved in acceptance of computer data by the patrol supervisors. The matter of good police management and the allocation of resources can be summed up by the following statement made in reference to computers but applicable to any new program: ". . . these benefits [from computers] if not properly controlled or planned may result in misuse, unintended consequences, wasted resources, and unmet expectations."[133]

The good leader will view allocation processes from an operational research point of view; consequently, he will calculate how one course of action may maximize one factor and another may minimize another factor or both things will happen with one action.[134] The good administrator will be concerned with all of the alternatives.

Unfortunately, the decisions made by police administrators are often thwarted by traditions within the police departments. Some of the reasons for the overall slow development of innovations in governmental agencies are:

1. Long heritage and a set of very strong traditions;
2. A lack of advanced education and training resources, which limits the speed with which modern technical methods can be understood, used effectively and transferred from one activity, discipline or geographical area to another;
3. There are no government run research facilities.[135]

Faced with the problems described below and the additional problems caused by the personal unwillingness to change by line supervisors,

the administrator may be severely limited in his allocation decisions.[136] All too often the simple perception of their goals by the officers will inhibit certain allocation decisions from being implemented effectively. If the men hold fast to the "crime fighter" orientation, and the supervisor is unwilling to change, the result might be to make certain programs impossible. The biggest problem is often ". . . trying to get first level supervisors to understand what the system offers them and to take advantage of it. The men in the field aren't a problem; it's the supervisors."[137]

FOOTNOTES

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3. McLaren, Roy C., "Allocation and Distribution of Police Patrol Manpower." Law Enforcement Science and Technology, Vol. I, edited by S. A. Yefsky. Proceedings of the First National Symposium on Law Enforcement Science and Technology. 1967: Thompson Book Company, Academic Press, London.

4. For instance see Chapman, Samuel, Police Patrol Readings. Second Edition. 1970: Charles C. Thomas Publisher, Springfield, Illinois, p. 287.

5. Chaiken, Jan M., Patrol Allocation Methodology for Police Departments. September 1975: The New York City Rand Institute, Rand, Santa Monica, California, p. 1.

6. For example see Larson, Richard C., "Hourly Allocation for Complaint Clerks, Dispatchers, and Radio-Dispatchable Patrol Personnel." Law Enforcement Science and Technology II, edited by S. I. Cohn. Proceedings of the Second National Symposium on Law Enforcement Science and Technology. 1968: IIT Research Institute, pp. 247-254.

7. Kakalik, James S., et al., Aids to Decisionmaking in Police Patrol. February 1971: New York City-Rand Institute, New York, p. 53.

8. Chapman suggests "It is reasonable that the numerical strength be kept approximately proportional with increases in population and preferrably be somewhat ahead of it." One of the issues raised in this regard is that effective police strength may be lessening because of shorter work weeks, longer vacations, etc., even though the total number of personnel may be increasing. From Chapman, op. cit., pp. 288-289. See also St. Louis, Missouri Police Department, Allocation of Patrol Manpower Resources in the Saint Louis Police Department, Vol. II. July 1966: St. Louis, Missouri Police Department and the Inter-

national Association of Chiefs of Police, Table 6, p. 9 which shows the changes in "equivalent personnel" for the City of St. Louis for each year from 1948 through 1966. There were fluctuations upward and downward but the years at the extreme end illustrate the point. In 1948 there were an actual 1,851 commissioned members of the department with an equivalent figure (using the year 1958 as a base) of 2,092. In 1966 the actual number of commissioned personnel was 2,035 but the equivalent figure was only 1,811.

9. Kakalik, et al., op. cit., p. 53.

10. Chaiken, op. cit., pp. 2-5.

11. Ibid., p. 6.

12. Ibid., pp. 7-8.

13. Reiss, Albert, "Policing Everyday Life." Issues in Police Patrol: A Book of Readings, edited by Thomas J. Sweeney and William Ellingsworth. 1973: Kansas City, Missouri Police Department, Table 2.2, pp. 92-93 shows an 83 percent/17 percent split during the fourth reporting period of 1966 in the Chicago Police Department.

14. Larson, Richard C., Illustrative Police Sector Redesign in District 4 in Boston. Preprint to appear in Journal of Urban Analysis, PP-01-73. November 1973: Operations Research Center, Massachusetts Institute of Technology, Cambridge, Massachusetts; Larson, Richard C., Models for the Allocation of Urban Police Patrol Forces. Technical Report No. 44. November 1969: Operations Research Center, Massachusetts Institute of Technology, Cambridge, Massachusetts; Larson, Richard C., "On Quantitative Approaches to Urban Police Patrol Problems." Journal of Research in Crime and Delinquency, Vol. 7, No. 2, July 1970; Larson, Richard C., Urban Police Patrol Analysis. 1972: MIT Press, Cambridge, Massachusetts; Cushman, Robert C., "LEAA's 'Pilot Cities' -- A Model for Criminal Justice Research and Demonstration." The San Diego Law Review, Vol. 9, No. 4, June 1972; Bennett, Wayne and John R. DuBois, The Use of Probability Theory in the Assignment of Police Patrol Areas. Final Report. Undated. Edina, Minnesota Police Department and the North Star Research and Development Institute, Minneapolis, Minnesota; Chicago, Illinois Police Department, Allocation of Resources in the Chicago Police Department. Final Report, Vol. 1. November 1969: Operations Research Task Force, Chicago, Illinois; Kakalik, James S., Optimal Dynamic Operating Policies for a Service Facility. Technical Report No. 47. October 1969:

Operations Research Center, Massachusetts Institute of Technology, Cambridge, Massachusetts; St. Louis, Missouri Police Department, Computerized Scheduling of Police Manpower. Vol. II. March 1973: St. Louis, Missouri; Heller, op. cit.

15. For example see Kelling, George L., et al., The Kansas City Preventive Patrol Experiment: A Technical Report. 1974: The Police Foundation, Washington, D.C. Also Elliott, J. F. and T. J. Sardino, Time Required to Commit Crime. June 1971: General Electric Electronics Laboratory, Syracuse, New York; Elliott, J. F. and John F. O'Connor, "The Detection and Interception Capability of One and Two Man Patrol Units." Police, Vol. 14, November - December 1969: and Elliott, J. F., "Random Patrol." Police, Vol. 13, November - December 1968. See also Larson (1972), op. cit., Chapter 4, "Models of Preventive Patrol," pp. 131-148.

16. Urban Institute, op. cit., pp. 106-108.

17. Larson (November 1973), op. cit., p. 90.

18. Rodgers, T. J., consultant, A Review of Foot Patrol Utilization and Distribution in the Chicago Police Department. May 10, 1961: Chicago, Illinois, p. 1.

19. Wilson and McLaren, op. cit., p. 344.

20. Chaiken, op. cit., p. 2.

21. Information obtained in an interview with supervisors of the Birmingham, Alabama Police Department, June 19, 1975.

22. Sherman, Lawrence, W., et al., Team Policing: Seven Case Studies. 1973: The Police Foundation, Washington, D.C., p. 3.

23. Wilson, James Q., in the Forward of Sherman, et al., op. cit., pp. ix-xii. The manuals of rules and regulations of most police departments are based on the militaristic, strong command structure and sense of need to spell out the do's and do nots for each rank and assignment. For example of one such set of rules and regulations see "Patrol Functions, Organization, and Duties," reprinted from the Police Rules and Regulations,

Duty Manual, and General Police Procedures of the Portland, Maine, Police Department, in Chapman, op. cit., p. 132. For descriptions of contrasting organizational structures and methods of operation see, among others, Bloch, Peter B. and David Specht, Neighborhood Team Policing. Prescriptive Package. December 1973: Law Enforcement Assistance Administration, National Institute of Law Enforcement and Criminal Justice, U.S. Department of Justice, Washington, D.C.; and Sherman, et al., op. cit. See also Chapman, op. cit., Chapter IV: "British Team and Unit Beat Policing," pp. 374-453 for background information on the early concepts that influenced the development of team policing in the United States.

24. Phelps, Lourn and Robert Murphy, "Patrol Methods: The Team Patrol System in Richmond, California." The Police Chief, Vol. 36, No. 6, June 1969, pp. 48-51.

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26. Ibid., p. 38.

27. Wilson and McLaren, op. cit., p. 436.

28. Ibid., p. 437; and St. Louis, Missouri Police Department, St. Louis Metropolitan Police Department 1974 Annual Report. 1975: St. Louis, Missouri, p. 11. St. Louis claims credit for being the first in the nation to institute a Decoy Squad in 1961. Also see Harper, Edward W. and Bruce M. W. Shaw, "Crime Prevention with the Operative Deployment System." Paper submitted to Police, October 1961.

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4.2 The Analysis Context

This section discusses in detail the context of crime a alysis. operations. This material lays the groundwork for identification and discussion of the major issues surrounding the crime analysis function; issues which form the core of the attempt to understand what is needed to develop and implement effective crime analysis. The term crime analysis may be used whether referring to analysis in general or the an lysis of crime specifically.

An analytical framework has been developed which categorizes crime analysis programs along important variables. Within each category, issues will be identified and discussed. The extent of the knowledge gained through the literature survey and preliminary field contacts about the category and the issues will be presented.

The three areas are: 1) resources and organization, 2) data collection, and 3) analysis techniques and tools.

4.2.1 Crime Analysis Resources and Organization

The resources and organization of an analysis program provide the framework for the operation and play a crucial role in determining its success. In approaching this area we have used four primary questions as a guide.

1. What are the organizational placement and relationships of the analysis unit?

2. How is the analysis staffed?

3. What facilities, equipment and supplies are used in the analysis?

4. What is the cost of the analysis?

The importance of these issues is in their effect on the quality and quantity of the analysis product and on the dissemination of the product to the users and acceptance and application of the product.

Organizational Placement and Relationships

The placement of the function varies due to the organizational structure of the police department, the conceived role played by analysis, and budget and personnel constraints, as well perhaps, as several other reasons, none identified in the literature.

It is in the Planning and Research Division in Dallas, the Detective Division in Phoenix, in the Intelligence Section of the Denver Police Department and in the Field Operations Division in Sacramento. In the case of crime-specific or other special projects, the crime analysis operation may be placed within an assigned task force, or the duty may be an organized collective enterprise on the part of the field personnel.[1]

In Police Administration, third edition, Wilson reports on an IACP study of the Chicago Police Department in 1970 where it was recommended that the analysis function be separated into two categories of tasks:

1. Long-range or strategic operation analysis intended

to predict criminal trends and probable manpower and resource requirements;

2. Short-range or tactical operations analysis, including preparation of crime analysis bulletins and spot maps for day-to-day use.[2]

The first activity was to be placed in the Research and Development Division, the second in the Bureau of Field Operations.

Wilson states that there is dispute whether crime analysis should be placed in a planning unit, but it is often assigned to one because:

> . . . the use of the scientific method as a problem-solving device and from the fact that planning personnel are often the most familiar with the methods used in sophisticated statistical sections.[3]

In smaller departments, Wilson remarks that crime analysis can be assigned to a report-review officer who subjectively determines crime patterns and trends and produces maps, bulletins and other reports.[4]

The authors of the Police Crime Analysis Unit Handbook recognize the number of variations and the fact that each placement has potential advantages and disadvantages. They conclude only that crime analysis should be placed where it works best. They present a list of placement considerations including access to user, physical location, availability of resources, quality of personnel and others.[5]

In his monograph titled Police Planning and Analysis Office, Diggles incorporates a crime analysis section in the office along with a Systems and Procedures section, a Mid and Long Range

Planning section and a Policy and Written Communications section.[6] Galvin suggests "Activity and Crime Analysis" are proper functions of a planning unit in medium sized police departments.[7]

Organizational placement is not generally recognized as a significant issue in the literature. Thus, as with most of the issues discussed in the report, it must be concluded that the resolution of this requires further research.

Two elements of the organizational relationship need to be considered. One is the relation of analysis personnel to the departmental administration and the other is their relation to patrol and investigation personnel and other potential users, relationships that are not solely determined by whether the decision is related to allocation or deployment.

The active support of administrative personnel is considered necessary to promote user confidence in the analysis program. As a recent and not well established addition to many departments, often dependent on Federal funds, the very life of the operation may depend on executive approval.

Various methods may be used to promote better relations with field personnel. In Kansas City each of the three patrol divisions is allocated a uniformed crime analyst ". . . responsible for providing information of a tactical nature to address the needs of a particular division."[8]

A 1972 proposal for a crime analysis unit in Denver provided for the director of the unit, a sergeant, to devote 20 percent

of his duties to liaison activities.[9] He should participate ". . . in crime review meetings to present current criminal data to other units . . . and confer with supervisors in field divisions in order to exchange information."[10] In addition, he should maintain contact with personnel from other agencies and jurisdictions to exchange relevant information.

In the Atlanta high-impact crime program, the crime analyst was instructed to meet with program personnel on a regular basis (at least once a week) to insure good communications.[11] As it existed until this year when extensive changes, described elsewhere, were instituted weekly meetings were also an element of the Dallas crime analysis program, in this case, between the crime analysts and representatives of the Criminal Investigation Division, the Tactical Section, the Community Services Division, the Intelligence Division and the Helicopter Division[12] (no explanation was given as to why patrol was excluded).

It is logical to assume that the organizational placement of the unit would have a direct influence on the user acceptance of the information generated by the unit. This seems to be substantiated by the research in the field of social psychology. One writer concluded that the decision makers should give as much responsibility as possible to the people who will be most affected by the decisions.[13] Another writer stated that the proximity in space and chain of command is essential to the acceptance of decisions, noting that the closer the decision making unit was to

the user groups, the better the lines of communication and subsequent acceptance by the user groups.[14]

While the program descriptions demonstrate a recognition of the importance of communication and effective liaison, provisions and procedures alone do not insure good relations between user groups and the analysts. The elements that need identification are not only those involved with communication procedures, but those of the personal characteristics of the users and the analysts, the significance of the administration's attitude, and other interpersonal and interorganizational factors of significance. Research of this sort is not found in the literature dealing with police crime analysis units except in those few instances when the analysis function is tied to the planning function.[15]

Personnel

We have little information from the literature as to how analysis operations are staffed. From the Police Crime Analysis Unit Handbook we have a model for methods of staff selection for crime analysis which should probably be considered very idealistic:

> . . . crime analysis units should be staffed with representatives of each of the user groups . . . the officers selected for crime analysis duty (should) be rotated from the unit after a maximum period of three years . . . It is also important that crime analysis duties not be categorized as a 'dead end' or a 'retirement job.' Essential qualities to look for in screening applicants are imagination and perceptiveness. Candidates must also have the ability to identify problems, isolate the contributory elements and use good judgement to reach reasonable conclusions.[16]

These observations are reinforced by the statement: "The factor which most determines the success or failure of a crime analysis unit is its personnel."[17] In addition to these comments a list of essential, highly desirable and desirable criteria for judging potential staff members is presented. These are generally and imprecisely defined traits such as integrity, high intellectual capacity and flexibility.

It is doubtful that any current operation actually extends the consideration toward selection recommended in the Police Crime Analysis Unit Handbook. In any situation the ideal must be tempered by reality. For instance, manpower and budget constraints may prevent optimal staffing. Crime analysis may be seen as a routine procedure with no special care needed in personnel selection, or the necessary interest may not be present in many departments to have more than cursory attention paid to staffing the operation. An unexplored yet conceivable issue is whether the qualities contributing to effective analysis are consonant with qualities required for other types of police work. Are persons with necessary mathematical and analytical skills present in police departments or presently recruitable? Intuitively the answer is yes but this may not be a valid assumption. This issue raises the further unanswered question of what skill levels are necessary for effective analysis?

In the 1973 proposal for a crime analysis section in the Denver Police Department, the plan was to appoint officers pre-

viously assigned to collecting reports and information from patrol districts and exchanging and coordinating information with other divisions, thus assuring some level of experience and training in handling and analyzing information. Also, their ties with the districts and divisions were seen as promoting effective liaison. Skills required were a "sound knowledge of police operations, excellent analytical ability and ability to maintain effective working relationships with field units."[18]

In some departments civilians perform the analysis function. The High Impact Program has provided for LEAA-funded civilian crime analyst positions in some cities (Atlanta and Portland are two examples). Although use of civilians increases the possibilities of recruiting technically qualified people, two problems are immediately evident. One is the increased difficulty for the civilian in developing good relationships with user groups and the other is the likely absence of a sound knowledge of police operations. If the analyst is to function to any degree in translating information analysis into program recommendations this latter problem is an extremely serious handicap. In Pueblo, Colorado the problem of the civilian analyst is not as troublesome. There, although the crime analyst has never been a police officer, he has a sound basis of experience in police work, both in the Army and in other police departments.[19] Unfortunately, individuals with this type of background as well

as the analytical skills and motivation are probably hard to come by. The Pueblo situation may be rather unusual in that respect.

Perhaps the best approach is the one recommended in the Police Crime Analysis Unit Handbook, that of a combined officer-civilian unit. This can only be done, however, where the budget allows for it and the nature of the problem justifies it. This was the apparent case in Dallas where the crime analysis unit existing from 1968 to early 1975 consisted of two officers and two civilian analysts.[20]

The command structure of the crime analysis operation does not appear to be a significant issue. As the crime analysis unit is usually small in number, higher ranking officers generally do not become involved on more than a part-time basis. In Dallas, for the unit referred to in the previous paragraph, the commander was a lieutenant. Usually the officer in charge is of the rank of sergeant. As noted, civilians sometimes supervise, or entirely comprise, an operation. In Seaside, California a relatively small jurisdiction, the crime analysis unit established in conjunction with an anti-burglary program is staffed by two officers of the rank of patrolman.[21] In special circumstances a higher ranking officer may become involved. In Phoenix, a program was established in 1973 where special crime prevention units headed by captains were charged with conducting some crime analysis as a basis for their activities.[22] In Birmingham,

Alabama a captain in charge of a detective unit with a background in college math voluntarily performs crime analysis and disseminates the resulting data throughout the department.[23] Our tentative conclusion on this issue is that the command structure is not as important as the skills, motivation, administrative support and other factors comprising the makeup and functioning of the crime analysis unit. If higher ranking officers within the unit create more acceptance and support then that would be a desirable situation. However, there is no evidence that this improvement would be the case.

Facilities and Equipment

Rather than dwell on detailed description this section is concentrated more on simply identifying those elements of facilities and their location and equipment that significantly affect the crime analysis function, and discussion of why the affect is present. With few exceptions (the use of computers being the main one) issues have not been raised concerning these subjects.

One factor which has not received sufficient attention is that of facility location. The issue of organizational relationships has been discussed here already. Spatial relationships are also significant in promoting effective communication. However, indications are that crime analysis is more often placed according to the criterion of available space than that of establishing optimal communication opportunities. Another factor

identified as a potential issue in the initial site visits is that of inadequate space to perform efficiently being allotted to the crime analysis section.

The findings thus far indicate that the matter of location of crime analysis units is given very little thought. The units are usually assigned a location more on the availability of space than on any other considerations. This is not simply a matter of neglect on the part of the planners, but apparently reflects a situation where available facilities dictate the decision of location of the units.

Computers. Perhaps the biggest division among crime analysis operations is between manual and computerized systems. Computers are heralded as the key to vast improvements in crime analysis capabilities. They have attained wide usage in the past few years, especially in larger departments. There is no argument that computers greatly improve the functioning of any information-using activity through efficient handling of routine tasks. Computers are "ideal for the storage of and rapid access to large amounts of information," and ". . . they are valuable aids in achieving efficient operations and rapid processing of routine activities."[24] O. W. Wilson stated that:

> Although crime analysis appears to be an effective operational device, the function is time-consuming and costly when performed manually. In large agencies the personnel cost can be considerable, so departments are advised to consider utilizing computer technology to

generate crime- or traffic-analysis patterns.[25] However, Wilson believed that crime analysis could be conducted by physical examination of crime reports in small departments.[26]

In Dallas the primary purpose of the automated Real-Time Tactical Deployment (RTD) project implemented earlier this year was to achieve faster deployment on acute crime problems.[27] It was said that since local crime patterns change quickly, normal manual procedures were inadequate. Because of the time involved in gathering and correlating problem-related information such as street address, vehicle description, suspect description, etc., analyzing the data and typing up reports for dissemination, it took the manual crime analysis system personnel three to five days to identify a crime problem, not soon enough to meet the objective of immediate deployment of the tactical force. The stated objectives of the project are to:

-- minimize the time required to detect a crime problem;

-- minimize the time required to process the data related to a detected crime problem;

-- minimize the time required to provide the department's Tactical Section with information needed to respond to the crime problem;

-- improve both the quality and quantity of information made available to tactical units about a given crime problem.[28]

It is suggested that a computer-based system is essential to an effective modus operandi analysis operation.[29] One study reached this conclusion because of the need:

> . . . 1) to adequately handle large amounts of data; 2) for efficient file organization; 3) for rapid information access; 4) to resolve space limitations; 5) for file maintenance; and 6) for manageable output.[30]

This list could easily be applied to other types of analysis as well. Colton, without explanation, has reported that there is some skepticism among police over the utility of M.O. analysis.[31]

One of the potentially most useful benefits of computerized systems is the ability to sort and present a wide range of specific information reports upon request. According to the System Development Corporation, developers of the Law Enforcement Analysis and Deployment System (LEADS), their system has the capacity of providing such reports as "All armed robberies of convenience stores occurring on weekends for the past six weeks where shotguns were used" or "Burglaries involving on-site construction equipment, occurring on Saturday and Sunday in the northeast sector of the city."[32] It can identify "hot beats" for selected crimes and is applicable to specialized needs such as reports on hot beats for crimes visible from the air for helicopter patrol operations.[33]

Another area where computers have been used is in predictions, not only of future service or response needs but of specific criminal events by area or time.[34] Whether or not such prediction efforts are justifiable in terms of cost is an unresolved issue.[35].

Whether the capabilities described above are effectively

used or not is also another question. The availability of great amounts of statistical information without accompanying interpretation may be of no value to users unable to translate the figures into meaningful illustrations of crime problems. There may be a resistance by officers to foregoing reliance on intuitive judgments or more informal means for data analysis. Addressing a very basic issue, present in computer or manual systems, the potential user may not be in a position to implement decisions based on the available crime information, or unwilling to take the responsibility. Except in special tactical squads, reactions to information on specific crime problems often means deviations from normal procedures.[36] Computers by themselves do not necessarily ensure the success of a crime analysis program. However, they do appear to have the potential to significantly advance the state of the art of crime analysis.

Looking to the future, one writer believes that,

> . . . the computer's real potential remains untapped and one day its use will be greatly expanded to assist in the decision-making process of the criminal justice system. For instance, the computer may provide projections of patterns of criminal behavior in conditions which harbor such behavior. In the future, computers will be able to develop individual patterns of persons having trouble functioning in society, assist the analysis of land usage to avoid development of unfavorable environment conditions that promote and foster crime and predict future trends in social problems. They will also be able to create systems to deal with unacceptable behavior patterns before crimes are committed, and analyze treatment and correctional programs to determine their success.[37]

Whatever the course use of computers takes, the relevance of

the following statement will remain. The computerized system ". . . simply puts sophisticated tools in the hands of senior police officers; it will in no way replace good police decision-making judgements."[38] Thus the success of computer-assisted crime analysis will be determined as much or more by human factors than the potential capabilities of automated systems.

The issues surrounding the use of computers for allocation decisions would appear to be at about the same stage of resolution. The Directory of Automated Criminal Justice Information Systems (1972)[39] leads one to believe that a substantial number of police departments are using computers in determining appropriate allocations of personnel resources. The works by Colton,[40] however, raise serious questions about the extent to which computers are actually used in making allocation decisions. In 1961[41] Smith pointed the way for use of computers in designing beats and the allocation work done in St. Louis in 1966,[42] Chicago in 1967-69,[43] and Edina, Minnesota in 1968[44] all laid encouraging groundwork for applications of computer processing to making allocation decisions. Further work by Larson,[45] Chaiken[46] and others laid the groundwork for use of computerized models to aid the decision-maker in evaluating decision alternatives before trying them out in actual practice. Yet the later literature and our preliminary site visits fail to show the increased use of these computerized applications which the original de-

velopers anticipated. Colton reports in 1974 that his survey revealed: "Resource allocation was the only category whose growth since 1971 [the year of his earlier survey] exceeded the predicted rate. . ."[47] This statement is qualified by Colton, however, when he examines the way in which the computer is used. Of the 147 departments that responded to the request to characterize their resource allocation process,

> . . . 48% indicated that they used no mathematical technique in making decisions on how best to deploy their patrol force . . . 34% indicated that they did rely on some version of a hazard or quantitative formula for distributing resources. Only 27 of the responding departments, or 18%, claimed to be using what was termed 'an advanced mathematical method,' such as a computer simulation or other computer aided resource allocation approach.[48]

As reported earlier, even St. Louis had discontinued regular use of its allocation model[49] and Chaiken reports that LEMRAS*, which was based on the St. Louis model, was withdrawn from the market at the end of 1974 because only a small number of departments had ever used the program and it was not compatible with the operating systems then being marketed by IBM.[50] Apparently there was not enough interest in the application to warrant investing in redesign and reprogramming of the package. Colton concluded that 1) the majority of departments reporting that they did not use mathematical methods, did use computers for

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*An IBM proprietary software package.

storing and processing information and that,

> . . . there is strong evidence to suggest that many of them actually are using quantitative information for decision-making but in a more informal context;[51]

and 2) in the case of those departments reporting the use of advanced mathematical methods,

> Such methods often look good on paper and may work for short periods, but in reality they are extremely difficult to maintain and utilize in the long run and usually are abandoned, at least in part.[52]

Costs. The fourth primary question listed at the beginning of this section on resources and organization concerned the cost of crime analysis. This question is only briefly considered in the following sentences for two reasons. First, there is very little information on the subject except for personnel costs (which are, however, the predominant expense item; for example, over two-thirds of the budget of the proposed unit in Denver was for salaries[53]). Usually, crime analysis costs are calculated either as part of total program costs where the operation supports special projects or as part of the larger division of the department to which it belongs.

Secondly, although some figures are available, it seems pointless to give them out of context. Without knowledge of a department's needs, objectives, size, budget, Federal funding support and other relevant factors, the base figures mean little.

Perhaps no other issue illustrates so clearly the frustration of the literature search. The lack of material directly concerned with crime analysis and its contribution to the total police agency program precludes any exploration of the cost issue at this time.

4.2.2 Data Collection

This section is concerned with the types of data which are collected and available for use in crime analysis. The particular concerns are: data sources, categories and classifications of data, availability of data on a timely and consistent basis, and reliability, accuracy and validity of the data. As might be expected, there are some distinctions to be made between data which are used in allocation and those which are used for deployment.

Data Sources*

In the following list are examples of sources of data used in allocation and deployment decisions:

Dispatch Records
Incident/Offense Reports
Arrest Reports
Field Interview (Contact) Reports
Miscellaneous Crime Information Reports (Soft Intelligence)

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*Most of the data sources discussed in this section are thoroughly discussed in the literature. For the reader who is interested in details, a list will be found under footnote 54.

Beat Surveys and Profiles
Officer Activity Reports
Census Reports
Victimization and Attitude Surveys
Land Use Reports
Miscellaneous Data Sources

Dispatch Records. Dispatch records, variously called radio log, radio tickets, dispatch tickets, radio cards, etc., are a primary source of data for allocation decisions. Depending upon the sophistication of the records system, they vary from a simple chronological log of dispatches (small departments) to a separate document for each dispatch that is subsequently filed or converted to computer input, to on-line interactive computer input as part of a sophisticated command and control system. The common data categories recorded on dispatch records are:

- Type of call
- Location of call
- Name and address of person
- Time request received at dispatch center
- Time of dispatch
- Time of arrival of dispatched unit (frequently omitted or recorded under exceptional circumstances)
- Patrol unit dispatched
- Assist units dispatched
- Time unit cleared or completed call
- Disposition of call (as reported by patrol unit) including:
  - unfounded
  - report to be prepared
  - arrest.

Incident/Offense Reports. The basic sources used in crime analysis for deployment are the routine police reports such as the incident or offense reports, supplemented by investigation and arrest reports, dispatch records, etc. While there are many

examples of programs using other sources, some of which are discussed in this section, no agencies have documented the fact that this occurs on a regular basis or in conjunction with routine activities.

It is not difficult to understand why police reports play the predominant role. Primarily, they are the only source supplying the basic information on the victim and suspect, methods of operation (sometimes), and the type, time and location of events upon which crime analysis is conducted. In addition, they are the only source of information which is routinely and quickly available to be used in short-term tactical analysis. Other sources described in this report are generally useful only for longer term planning, are usually collected infrequently or on a one-time basis or in conjunction with special programs, and do not provide information on patterns and descriptions of specific events.

The National Advisory Commission on Criminal Justice Standards and Goals recommends in Standard 4.6 of The Criminal Justice System that every reported criminal incident should include the following information as a minimum:

1. Incident definition, including criminal statute violated and UCR offense classification;
2. Time, including time of day, day of week, month, and year;
3. Location, including coded geographical location and type of location;
4. Incident characteristics, including type of weapon used, method of entry (if applicable), and degree of intimidation or force used;

5. Incident consequences, including type and value of property stolen, destroyed, or recovered, and personal injury suffered;
6. Offender characteristics (each offender), including relationships to victim, age, race, sex, residency, prior criminal record, criminal justice status (on parole, etc.), employment and educational status, apparent intent, and alcohol/narcotics usage history;
7. Type of arrest (on view, etc.); and
8. Witnesses and evidence.[55]

An example of data categories found in Allocations of Resources in the Chicago Police Department by the Operations Research Task Force of the Chicago Police Department is given below:

A. Record document number.
B. Street address and rectilinear coordinates of place of occurrence.
C. Beat of occurrence.
D. Day of week.
E. Date.
F. Time.
G. Time Police Communications Center was notified.
H. Time beat car was dispatched.
I. Time beat car arrived to interview victim(s) and witness(es).
J. Time Detective Division was notified.
K. Time assigned.
L. Dollar value of the articles (or cash) taken from the victim(s).
M. Number of offender(s) participating in each robbery and victim(s).
N. Race(s) of offender(s) and victim(s).
O. Sex(es) of offender(s) and victim(s).
P. Estimates age(s) of offender(s) and victim(s).
Q. Number arrested.
R. If arrest(s) made, the branch of the Department which [made] the arrest; for example, beat car, task force, detective.
S. Type of arrest; for example, on view, result of flash message.
T. Arrest delay time from occurrence.
U. Location of the robbery, whether street, vehicle, business or residence.

V. Armed or strong-armed.
W. If armed robbery, type of weapon employed.
X. If arrest was not made, type of escape; such as foot, private vehicle, taxi.
Y. Whether or not the victim(s) required medical treatment.
Z. Whether or not the victim(s) had been drinking.
AA. Occupational status of the victim(s).
BB. The type of occupation of the victim(s) if related to the robbery; for instance, newsboy, insurance collector.[56]

Even if the police report is as comprehensive as is suggested in these examples, and there is no indication that serious deficiencies exist on a widespread basis, there is no guarantee that the information is of use. Often the information is not recorded in such a manner to be useful to the analyst, especially where it is not contained in a simple form for ease in handling large numbers of reports or coding for the computer. For example, a program of analyzing burglary in Tulsa, Oklahoma, conducted in 1973, had to be postponed until an essay-type reporting format was replaced.[57] Also, the crime analyst may not have the motivation, time or skills to exploit information beyond simple tabulation of basic data and identifying the basic trends as to types, times and locations. However, literature does exist containing examples of how information known to the police can be used for more complex analysis.[58]

As indicated above, it appears that most police reporting systems provide for the availability of sufficient information to fulfill the requirements for most levels of crime analysis.[59]

Far more important issues appear to be the diligence of police personnel in filling out the forms, the accuracy of the reports, the validity of the statistics (discussed later in this report), ease in extracting the pertinent information and the skills and motivations of the analysts.

An interesting dichotomy regarding incident reports is revealed, however, by the Rochester "solvability" oriented report and the new Kansas City Investigation Report due for implementation in January 1976. The Rochester report appears to be investigatively oriented in regards to each specific incident and the Kansas City report appears to be oriented toward analytical capabilities in terms of modus operandi. Factors that may have influenced these different orientations are: 1) Kansas City has a strong centralized analysis capacity and enormous computer facilities; and 2) Rochester has a centralized investigative coordination mechanism and limited computer resources.

Arrest Reports. Arrest reports may include, in addition to basic personal descriptors and arrest charges, detailed personal descriptions and circumstances of arrest as well as accomplices and basic method of operation of the individual. As well as providing investigative leads, the arrest history can identify prime targets for suspect oriented patrol deployment. Circumstances of the arrest, particularly resisting and armed, etc., related to

type and location may be used for identification of hazardous beats which warrant two-man patrol units in departments that otherwise use one-man patrols.[60]

Field Interview (Contact) Reports. These reports are useful as investigative leads, but in addition they may be used to identify group associations, which can be used in a suspect oriented patrol deployment.

Miscellaneous Crime/Suspect Information Reports. These reports vary in form and content depending upon the agency and the nature of the information. Generally, they are useful as investigative leads and for deployment, e.g., stake outs, concentrated patrol, against suspects or targets specifically identified in the report.

Beat Surveys and Profiles. As early as 1933, Vollmer identified the value of having patrolmen prepare detailed descriptions of the characteristics of their beats for use in allocation.[61] A recently completed study in San Diego implemented the "Community Profile" as a:

> . . . method and a perspective to guide patrol officers' exercise of discretion, and encouraged the development of innovative officer-initiated strategies based on the officers' growing area knowledge and critical self-evaluation of the effects of their police work in the community.[62]

Officer Activity Reports. These reports, which normally are a chronological log of the work performed by individual officers or a team of officers in a patrol unit, are frequently the source of workload information used for allocation in the smaller departments that do not maintain a written dispatch log. In some instances, the activity report is also used to record hazards requiring special attention for the purpose of deployment of preventive/deterrence resources, e.g., tactical or vice control units.

As reported by Hanna and Kleberg, several of the purposes served by the daily activity report are:

(1) A brief description and record of activity of each officer
(2) A record of the various types of activity of each officer during a shift
(3) A record of the exact time required for the performance of specific activity
(4) A supervisory tool in regard to man hours, overtime and shift activity
(5) A source of information for manpower assignments, periodic reports, public information and budget [strength] justification.[63]

A cautionary note is in order here, however. Unless there is an independent quality control capability, the officer may be inclined to report activity expected of him rather than what he actually did.[64]

Census Reports. Census reports are used in some instances to identify projected total police strength requirements for a

community. In some cases the allocation among geographic commands is based on population distribution, but this is generally regarded as an unsatisfactory method of allocation.[65] In a few instances census data have been used in correlative studies to learn the relationship between crime and population characteristics.[66]

A major difficulty in the use of census data is that it is about one to two years after the census that detailed information becomes available and, unless a special census is conducted, there is a span of ten years between censuses.

Victimization and Attitude Surveys. Perhaps the major drawback to information obtained from police reports is that the data base is limited to events known to the police as opposed to total incidents. Thus, police activities directed against crime, which are based on crime analysis, are only attempting to deal with patterns of known incidents, which may or may not represent true crime patterns, or the most serious crime problems of a community. Victimization surveys in various localities have established that much crime, the majority in many categories and localities, does not appear in police records.[67] In a survey done in the Metropolitan Minneapolis-St. Paul area, it was reported that only four of 10 serious incidents in a central city area were reported to the police, and only one of the four was reported in police records. In a suburban area, four of 10 were reported and three of the reported four were recorded.[68]

Four main factors influenced the victim's decision to inform the police: 1) closeness of the victim-offender relationship, 2) severity of the incident, 3) loss of property, and 4) age of the victim.[69] In another study, the most frequently cited reasons for not reporting an incident were that it was not important enough, no material loss or physical harm was suffered and that nothing could be done about it by the police.

It may be that victimization surveys should be incorporated as an appropriate research tool for crime analysis.[71] Such surveys can be used to collect information beyond merely ascertaining accurate rates of crime occurrence. It is said that they can be used to gain knowledge in the following areas:

a. The location and characteristics of those populations having a high risk of victimization for specific crimes; these data in turn, can be utilized for more efficient police deployment and for constructive crime prevention programs tailored specifically for given target populations.

b. The reasons for non-reporting of crimes and the characteristics of those who do and do not report offenses.

c. The nature and extent of victim-offender relationships in violent personal crimes.

d. Citizen attitudes towards police, crime and the fear of crime.[72]

The Minneapolis-St. Paul victimization study identified several policy implications.[73] One concerned the development of crime control programs. Since it was found that crime rates varied much more between the suburban and central city areas than is indi-

cated in police statistics, it was suggested that a reconsideration of resource allocation might be appropriate. Also, since it was found that victims are most often selected at random, with the geographic area being the important variable, crime prevention programs should be focused on the area or community rather than individuals.

Another set of policy implications was in the area of police data collection. Although it was not fully understood why so much reported crime went unrecorded, it was concluded that the legal code should be revised to fit the community and police definition of crime and that responsibility for collecting data on crime occurrences should be shifted to an independent agency not subject to the same pressures as the police, such as the use of crime rates in determining effectiveness.

Very real problems with victimization surveys are the time and money costs as well as the training or expertise involved in conducting a proper survey. This is offset somewhat by the fact that it may be valid over a period of a few years, at least for most purposes.[74] Another problem that arises is that even victimization surveys may not accurately reflect the crime problem. Victims may forget incidents, misrepresent them or lack understanding of the criminal law.[75] While a substantial proportion of police activity is directed at victimless crimes, the survey would fail to measure these occurrences. Nevertheless, while it remains

an untested and unresolved issue, the victimization survey may provide substantial benefit toward improving the contribution of crime analysis to police efficiency, if not on a day-to-day basis, at least in the areas of long-term planning for program development and allocation and other policy decisions for meeting future needs.

An issue that has not been found addressed in the literature is whether victimization surveys can be used as a means of validating a relationship between "actual" crime and "reported" crime, given accurate processing of all reports received by police. Characteristic of the intentional avoidance of this issue is the caution included in the National Crime Panel survey reports that it is inappropriate to compare the survey results to data published annually by the Federal Bureau of Investigation.[76]

It would be interesting to know whether there is a consistent range of difference between accurately reported and actual crime, given certain demographic and other characteristics of a community. If such a relationship could be discovered it would be useful in allocation and deployment decisions and in evaluation measurement that was dependent upon accurate knowledge of a change in the crime rate. For instance, surveys conducted over a period of time in selected small areas might establish the range of change in reporting by citizens (when the "actual" crime rate has not changed) which is affected by such factors as confidence in the

police, more police available for response, etc. Knowledge of this range of change could then be used in identifying the amount of change in the "actual" rate of crime, based on reported crime in other areas, other cities and with different programs. While such concentrated studies may be expensive they might well be more useful to the police in making decisions than the more general knowledge that there is a gap, and the general size of the gap between victimizations and reported crime.

Land Use Reports. In a few instances, most notably the University City PREWARNS project,[77] land use data was collected for the purpose of measuring the correlation of different land use types (commercial, industrial, single and multiple family residence) with different demographic characteristics and crimes. The findings were used to develop predictions of developing problems and workload. Although the project was terminated after three years and not used to any great extent within the police department, the correlations and projections were reported to have been useful to other city departments, most notably the Department of Human Resources.[78] The Philadelphia study included similar information but most of it was related to census data.[79]

Miscellaneous Data Sources. Other data sources and types of information are used for various purposes:

1) To establish reliable predictor variables other than rates and patterns of criminal events in supporting daily patrol

operations. Weather information has been used as a factor n the Edina, Minnesota patrol area assignment experiment.[8] An experimental program initiated in 1967 in Philadelphia was intended to develop a prediction model capable of "predicting crime occurrences hour-by-hour and sector-by-sector.[81] Thirty-five factors were selected as predictor variables including weather, housing, employment, economic and education factors. However, the majority of prediction experiments would appear to be based on information gleaned from police reports describing historical events.

2) Other sources are also used in situations where the focus of police attention shifts from events to specific crimes, areas, victim or offender population groups or targets. The High-Impact Anti-Crime Program is an effort to combat the crimes of burglary, robbery, and street assaults. In conjunction with this program, it is stated that "crime-specific planning focuses on three basic elements of a criminal act: the offender, the victim, and the crime setting."[82] In order to gain the necessary information, the High-Impact program in Cleveland used several sources beyond police records. Court records, interviews with suspects arrested for Impact crimes, as well as census data and interviews with a sample of population were among these sources used to discover such factors as job history, education, and motivation of offenders as opposed to the general population, relevant characteristics of victims

and economic characteristics of the areas of the city.[83] Recognizing the difficulties of obtaining many of the relevant data, especially within the resource capabilities of criminal justice agencies, it was suggested that police reports should be revised and expanded.[84]

The University City, Missouri Police Response Early Warning System (PREWARNS), is an attempt at a "multi-dimensional approach to crime prevention."[85] Included in its goals are: to provide police with immediate information on crime patterns, to identify the possible suspects for a crime, to aid in tracing offenders and aiding the police in establishing effective beats and patrol patterns.[86] Included in the data base in addition to population, land use, crime and juvenile arrest are family crisis and school attendance data obtained from census reports, police reports, school attendance records, and planning, land use and zoning maps.[87]

The Directed Patrol program in Kansas City, Missouri is aimed at developing a new concept of patrol. ". . . it proposes to design and implement area tailored strategies in which patrol activities will be defined in a matrix of crime-specific problems and police related objectives."[88] The first stage of the project has been devoted to problem analysis. Attention was given to ". . . the ecology of the criminal act, the victims and offenders, and the institutional responses to the serious crimes . . ."[89]

While departmental files have provided the most data, especially offense reports, demographic, economic and socio-cultural information has been obtained from census counts, market research results and land usage information.[90] Unique to police analysis programs reviewed for this report is the use of a literature search by the Kansas City Police Department, especially for the subject of community and institutional responses to crime problems.[91]

Thus, information analysis beyond the examination of police sources has been tried in different programs for several different reasons. Unfortunately, there is no body of knowledge concerning the effectiveness or the necessity of incorporating these types of analyses into police crime analysis programs. Besides, collection and analysis of data from other sources is probably beyond the capabilities of most police crime analysis operations (except perhaps on a one-time basis) even if the motivation to do so is present. This problem was recognized in the Cleveland Impact program where it was recommended that data collection and analysis should be done by an outside research organization because of the limitation to the abilities and resources within the criminal justice system.[92] In addition, there is little follow-up information on whether the results of analyses such as those described here are actually used for the intended purposes. A cautionary note has been sounded concerning the use of social and demographic

data in crime analysis for police purposes. As it has been stated,

> There would seem to be little practical value in discovering, for example, that the incidence of burglary correlates positively and strongly with poverty, unless the objective is to appeal to the legislature to eliminate crime by eradicating poverty. If the conclusion is that poor people are the most frequent victims, the implication for the police is that they should focus their resources on that part of the population, at the expense of protecting the more politically active and influential segments of the population. No sensible police chief would be willing to do this on any significant scale. . . It would make better sense to take as the object of a crime incidence study those factors which genuinely relate to police work.[93]

While this position seems overstated, there is one very significant point contained in the message. That is that those conducting analysis must consider the real world use of their output. It does little good to generate sets of figures without consideration of the constraints on their use.

Finally, another important source of influence on resource allocation decisions are referred to as external sources. This type of information source may be in the form of political pressure, intradepartmental discussions, public pressure, or broad administrative value judgements as to what the priorities are.

It should be concluded that any analysis operation must still rely substantially on police records. One of the best recommendations on the subject of data sources is that police reports should be revised where feasible to incorporate needed

or desired information rather than relying on outside sources.[94] For now, most other information sources besides police records remain only potential tools of crime analysis.

Categories and Classification of Data

In the following list are examples of classes of events and activities of most concern to the allocation/deployment analysis process.

Events: Crime - Part I*
- Homicides
- Rapes
- Robberies
- Aggravated Assaults
- Burglaries
- Larcenies
- Auto Thefts

Crime - Part II*
- Vandalism/Destruction of Property
- Non-aggravated Assaults
- Forgery and Fraud
- Buying, Receiving, Possessing Stolen Property
- Prostitution and Commercialized Vice
- Narcotics
- Gambling
- Drunks

Non-criminal Enforcement

Service Related Events
- Family Crisis/Disturbances

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*See the Federal Bureau of Investigation Uniform Crime Reporting Handbook: How to Prepare Uniform Crime Reports for definitions and classification procedures for Part I and Part II crimes.[95] Also see footnote no. 54.

Non-criminal Regulation
Nuisances
Miscellaneous Service Dispatches
Accidents and Other Emergency
Service Needs

Activities: General Patrol
Crime Prevention/Deterrence
Investigations
Preliminary
Follow-up
Arrests
Community Action Coordination

Conditions: Demographic Characteristics*
Hazardous Conditions
Personal and Physical Security
Personal Safety Hazards
Nuisance Attractions

Knowledge of the data that are collected for analysis and decision-making is an important step in understanding the situational context of crime analysis and the outputs of the crime analysis process. Basically, the data base of crime analysis is calls-for-service data and reported crime data, although there is a potential for increasing this base. Calls-for-service and crime clearly overlap. Also, the data universe for crime analysis information does not include the entire area of crime. This is because it is generally accepted that the police, and particularly the police patrol, do not deal with many types of crimes. "White collar crime" and "corporate crime" are two of the most obvious areas that the police patrol are not normally involved with.[96]

*The Bureau of the Census publishes guidelines for classifications and availability of census data.

There are other crimes that are not dealt with for a variety of reasons, some of these are discussed below.

There is a frequent distinction drawn between crimes with victims and the so-called victimless crimes. It is not within the scope of this research to debate the issue itself; but rather, to recognize that this distinction is often made, and because of it many crimes are not dealt with by the police patrol.[97]

Another distinction that is made is that between crimes considered to be respectable or non-respectable. This is a fairly difficult distinction; and it seems as if its primary impact is upon the police in terms of their energy, or enthusiasm in attempting to enforce the particular statute. An example of respectable crime might be the friendly neighborhood poker game as compared to the alley crap game. In one case, there would be little effort on the part of the police to do anything about the crime and in the other there may be. The current issue regarding enforcement of marijuana laws is an example of ever-changing concepts of respectability and its affect on discretion to enforce or not enforce.

There is also a common distinction drawn between violent crime and crime that is strictly for profit. This is undoubtedly the most common distinction between types of crime; the violent crimes being almost universally considered as more serious than crimes that are simply for profit.[98] This opinion seems to be

shared not only by the police but by the public as well. The implications of this distinction on police patrol in terms of deployment and allocation are very important. Public sentiment may be an influential factor affecting such decisions; and because of this crime analysis may tend to deal with only specific categories of crime, e.g., robbery or rape, that the public is most aware of or incensed by.[99]

Sometimes there is also a distinction drawn between "victimless" crimes and "retreatist" crimes. The retreatist crimes are generally those "victimless" crimes that have no profit motive whatsoever; only a behavior indicative of a desire to escape reality. The effect that this distinction has on the data base of crime analysis is largely unknown. In some cases these crimes might be all but ignored, and in others the police and the public may spend a great deal of effort towards eliminating the behavior.

An area that overrides all of the above distinctions is the social impact of crimes. The key issue here is the group who measures the social impact, and the criteria used for this measurement. If the criterion is economic loss, then the current police priorities are badly in need of revision;[100] however, social impact seems to be calculated more frequently in terms of revulsion (in the case of violence) and fear. In the latter instances, which hold generally true, the police efforts are coordinated in line with the priorities set by the public and the administrators.[101]

The impact of this distinction on crime analysis is to limit the data base for analysis to those crimes that are perceived as having the "worst" social impact.

Thus far, the overall picture indicates that crime analysis deals with only a portion of crime. The final distinction is the difference between reported and unreported crime. Crime analysis deals only with reported crime; however, the relationship between reported and unreported crime is unknown, as was discussed earlier.

An important point to make is that crime analysis deals with only a portion of crime; but, in addition, crime is only a portion of the information used in the decision-making process. Calls-for-service, which are not limited to crime and "hazards" are important data categories for decision-makers in the area of allocation.

It seems generally true that the deployment tactics are based primarily on subjective knowledge and the information provided by crime analysis. These decisions are made at the lower level in the police hierarchies. Thus, the process of decision-making with regards to resource deployment is frequently much different than the decision-making process in resource allocation. In deployment, analysis of crime is the primary source of information. In allocation schemes analysis of workload demands is the primary source of information for decision-making.

With few exceptions, although the degree of definition or detail about each event may vary, the UCR code[102] forms the basis for classifying crimes. The crime report used in an experimental program in Syracuse, New York, was "designed to classify crimes as specific police problems rather than using the legal or FBI Uniform Crime Report definition."[103] The given examples are where assaults resulting from a family dispute are separated from other assaults, thefts are classified by the target and where purse snatches are classified as such rather than as some other type of theft. (Another unique feature of this report is provision of space to indicate if the crime would have been detected in the normal course of patrolling.)[104] The developers of PREWARNS also developed a crime classification system which they claimed was unique:

> . . . [C]rimes against persons and property are divided into sub-classes based on the actual criminal behavior, the victim and/or target, the location, the time, and the degree of seriousness involved in each reported incident.[105]

They argue that "This in turn provides a more accurate picture of criminal activity in the community and permits a more effective and efficient response by the police department and other concerned agencies."[106]

Several problems in crime classification have been discussed in this section; but most of them are not widely used for resource allocation purposes. The dichotomy frequently drawn between

crimes that are socially revolting and those that are not is, however, mentioned several times in the literature, usually referencing the Sellin-Wolfgang seriousness scale.[107] This is in contrast to use of the UCR classifications which assume that all index crimes are equally as reprehensible to the people, a point in conflict with the Sellin and Wolfgang scale. The Sellin and Wolfgang scale ranks delinquency acts, according to subjective responses, into an overall seriousness of crime scale.

Using this seriousness scale is a questionable method for allocation purposes for two reasons: 1) seriousness of a crime and service time is often an inverse relationship,[108] and 2) it has been found that the seriousness of a crime and the visibility of a crime are inverse, i.e., the more serious the crime, the less visible,[109] and therefore the less amenable to police prevention or deterrence action. Utilizing actual service time information would take into account the amount of resources required for handling the case regardless of the perceived seriousness, but weighting schemes are used in hazard formulas to account for allocation for prevention. This is not to say that a seriousness measure would not be useful for consideration of alternative approaches, i.e., new programs, to deal with those crimes that are of most concern to the community.

Considering the general lack of implementation of the more sophisticated classification schemes, it is questionable whether these classifications other than detectable or undetectable by

patrol, are really an important issue for deployment. While it may be more efficient and convenient to have events readily classified for analysis, presumably the analyst can take UCR classified events and manipulate categories according to the accompanying report information anyway.

Other means of classification are by time, location, and methods of operation. The main problems with time classification are discussed later. Events and activities may be located by block, beat, district, census tract or command area.[110] Generally, for crime analysis purposes, attempts are made to classify by the smallest area for which significant patterns and trends may still be identified.[111]

Some common categories of modus operandi (M.O.) data are listed below:

-- Unusual events (funeral, sports, etc.)
-- How attacked (beating, fire escape, etc.)
-- Means of attack (tools, weapons, etc.)
-- Object attacked (cameras, grudges, etc.)
-- Weather
-- Lighting
-- Neighborhood
-- Type of building
-- Place of entry
-- Transportation of suspects
-- Unusual actions or statements
-- Personal descriptors.

The objectives of an M.O. capability are 1) to establish a list of suspects for an unsolved crime, 2) to develop a series of crimes which may have been committed by an individual arrested for some particular crime, and 3) to develop series of unsolved crimes,

which appear to have been committed by the same unknown crimi al.[112] One study found that the third objective was one which wa- not given much priority in the surveyed departments.[113]

M.O. analysis is most often done on a request basis rather than as a regularly conducted operation. An officer puts in his requests for a lead or verification of a suspected pattern and the analyst then uses his experience and skills to identify any relevant patterns.[114] The complexity of criminal behavior is cited as a reason why the crime analyst should intervene in an interpretive role in answering user requests.[115] The complexity of the data used inspires the recommendation that an automated system is necessary.[116]

Data Timeliness, Reliability and Validity*

During the collecting and processing stage, three issues are of primary importance: 1) timeliness, 2) reliability and accuracy, and 3) validity.

1) Timeliness. Timeliness is of concern in both tactical and strategic applications. Differing approaches to data collection, processing, storage and retrieval within manual, automated or semi-automated systems can be expected to affect timeliness as

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*The importance of these issues is discussed in many publications, particularly those about research, which is not dissimilar to the basic processes of analysis.[117]

well as reliability and validity. For programs depending on immediate access to crime analysis information, with the assumption that the patterns of events respond to weekly, daily or even hourly change, the question of how soon information is transmitted to the analyst becomes crucial (as well as how quickly it is analyzed and disseminated). It has been suggested that where the crime analysis operation has access to a computerized information system, the issue is largely resolved.[118] The major reason for the establishment of the Dallas automated Real-Time Tactical Deployment project this year was to provide a more timely means of analyzing information.[119] With manual processing, three to five days were needed to identify crime problems. It was believed that this was too long to allow for effective deployment of tactical forces.[120]

Assertions in the literature are contradicted by evidence from some of the site visits conducted in conjunction with this study, where manual processing systems have allowed for more direct routing of information reports to crime analysis sections, thus enabling speedier analysis and dissemination.

Recently, during a study concerning field and statistical reporting in a large metropolitan police department, the observation was made that, though the data reported on the field reporting form were being entered and classified in data processing, most of the crime analysis personnel spent their time taking the

resulting printouts and hand-shuffling them to compile statistical comparisons. The result was that the results of data comparisons, performance tabulations, crime trends, and so on, were being disseminated considerably later than one month after the data were first recorded. This was proving far too late for whatever statistical inferences were reported to catalyze results in the field and that, as a result, the crime analysis personnel were having minimal effect in terms of money expended, time spent, and results achieved.[121]

This issue diminishes in importance when crime analysis is linked to less pressing program support, such as in planning, designing experimental programs or in supporting longer term allocation for deployment of tactical and patrol forces. The question is raised as to whether a manual processing analysis operation or a computerized one not specifically designed for immediate transmittance of information can function effectively in this area.

The possibility of problems of timeliness cannot be ignored, however, even in long-range planning. For instance, the problems arising from the 10-year gap between decennial censuses were previously mentioned. Long-term planning, sampling procedures for surveys and similar analytically oriented activities suffer from this, the degree of accuracy of the data diminishing with each year until the next census.

2) Reliability and Accuracy. The issue here is whether there is consistency in the way the data are recorded and processed. As noted, police reports, which are filled out by different individuals under many different circumstances, are the major source of data for crime analysis. Thus, there is an unavoidable inconsistency built into the process of data collection. Of the various ways of controlling for this problem, one might be to emphasize the importance of following report writing procedures during training or establishing strict guidelines for report writing and attempting to see that they are followed.

Perhaps more important would be focusing on the composition of the report form. The more allowance for subjective conclusions, the more inconsistent the results. The essay form of report would be particularly harmful in this regard. The formula for the most consistency would probably be to have the simplest form possible which would still contain the necessary information items. In one project, it was suggested that items needed for analysis be identified and incorporated into the report form in a checklist.[122]

There may be several reasons for errors in classifying or ommitting incidents.[123] For example, field officers may have no incentive to report accurately and may have incentive not to report accurately. If effectiveness judgments are made on the basis of clearance and arrest ratios, there may be motivation to under-report. Very subtle factors have also been suggested as

influences on crime reports. For instance, making complainants come to the station house will probably reduce the number of reported crimes as will the expansion or revision of reporting classifications.

A study of robbery in Albuquerque based on case reports filed by the police department revealed that the reports were often erroneous in one or more regards.[124] Radio call cards were also used as a source of data. In their case, some were missing from the file, others were misfiled and 407 contained wrong district or sub-district assignment.[125]

In Tulsa, the introduction of a new reporting format in July 1973 led to error and omission difficulties due to the initial unfamiliarity of the officers with the new form.[126] It was recommended that a crime analysis team be formed in the Tulsa Police Department with duties to include reviewing data for completeness and accuracy and providing necessary feedback in this regard, and providing feedback to officers on who is making good reports. In conjunction with an anti-burglary campaign it was recommended that a burglary prevention program include in-service training on what information is needed in a useful burglary report.[127]

Colton reports on the impact of report design on reliability (consistency of reporting) of an Automated Field Interview System in Los Angeles in which the redesign of the interview form was

responsible for almost losing the system. At the time of implementation, the program was an immediate success, but later redesign of the report form, which made it less convenient for the officer to carry it in his pocket, resulted in the officers not carrying the forms with them ". . . and it was only when the old form was reissued that the system began to function again."[128]

In Denver, a stated objective of the proposed crime analysis unit was "To develop within the department a more standardized and effective 'Report Review' function for the purpose of enhancing the quality of investigative information contained in the offense reports."[129] Because of the reception of reports by crime analysis before being sent to data processing, it was stated that the reports would undergo examination by a police officer rather than by civilian coders and keypunchers.

Another method that a department may use to deal with both issues of reliability and validity is to conduct periodic audits of the reporting system. An inspections division of the Atlanta Police Department is responsible for making spot check audits of the crime reporting system. Within two days of a report being made, a staff member interviews the persons involved. If a reporting error has been made, it will be corrected and the erring officer instructed in proper reporting procedures.[130] Although recognition is given elsewhere to the importance of this practice, there is little indication that it is a widespread one.[131] For

the most part, crime analysis rests on the assumption that incoming data contain enough accuracy for making dependable conclusions. Some police departments regularly conduct audits of their reporting systems and the International Association of Chiefs of Police has designed a manual for departments that would like to implement an audit program.[132]

One additional accuracy issue is that of determining the time offenses are committed. For property crimes, especially, this poses a substantial problem. Ignorance of time patterns hampers programs aimed at in-progress discovery of the events. In some cases, although there is recognition of the problem, the analysts resign themselves to working with the times of reporting.[133] Another way of handling the problem is to establish time intervals as units of measurement rather than pinpointing specific times. In any case, establishment of reliable time patterns with regards to certain crimes appears to be an unfeasible task.

3) Validity. Do the data actually reflect what they purport to reflect? The issue of reported crime vis-a-vis actual crime was discussed under "Victimization and Attitude Surveys" of this report section. There is no need to repeat the discussion here, but the unknown qualities of the relationship between reported crime and unreported crime should be determined as long as reported crime is the only crime information consistently

available for analysis.

Problems arising from classification have also been discussed. The important issue here is the question of whether the patrol and investigative officers understand which classification scheme is being used and the rationale for selection of the particular scheme. The UCR classifications, which are almost universally used for crime analysis, may differ considerably from the statutory (legal) classifications used for criminal prosecution. Although not addressed in the literature, it appears to have potential for creating confusion within the department as to just what is being called a burglary or robbery or larceny.

4.2.3 Analysis Techniques and Tools

Analysis is that part of the decision-making process that identifies and defines problems, examines alternatives and presents the results to the decision-maker. (See Larson's list of the "classical steps" of analysis, page 1-7 in Section 1.2.) Because of the variable nature of crime analysis in supporting allocation and deployment decisions, there is no clear-cut description that can be given of the analysis process. The decisions may be made at any level of the organization based upon varying sets of objectives and assumptions.

At the highest command levels, the decisions involve allocation of resources according to function and, in traditional

patrol and team policing to geographic areas (commands and beat or team areas and times of duty). At the lowest levels, the decisions involve day-to-day deployment of resources to deal with short-term crime and other problems. The nature of these decisions has been discussed in Section 4.1.1. This section is devoted to a discussion of the methods of performing the analysis, and related issues, that support the decisions previously discussed.

Because deployment decisions are made within the context of previously executed allocation decisions (decisions which provide resources for subsequent deployment), this discussion will first address analysis for allocation and then discuss analysis for deployment. The reader is reminded that these distinctions are arbitrary. There is no clear line that can be drawn between some of the applications of a particular analysis method.

Allocation Analysis

The basic objectives of patrol allocation, as discussed in Section 1.4, are to distribute ". . . a given number of [officers] by time and place. . . .[and establish] the operational rules and tactics . . . to be employed by the patrol force."[134]

In a traditional patrol setting this includes:

-- Determining the number of patrol units to have on duty in each of the department's geographical commands; this may vary by time of day, day of week, or season of the year.

-- Designing patrol beats.
-- Developing policy for dispatching and redeployment of patrol units.
-- Scheduling manpower to match the variations in the number of units needed on duty.[135]

In the team policing setting it involves the first of these four at least to the extent of determining the number of personnel to be assigned to the team and defining the team's geographic area of responsibility. In the specialized patrol setting it involves determining the number of personnel to be allocated to the specialized patrol unit.

The tools that are available for allocating patrol resources vary from informal, unstructured command discretion and judgment to sophisticated, computerized models based on precise objectives which require voluminous data and employ complex analytical techniques. A quantitative approach to allocation is reported to have been undertaken by Vollmer as early as 1909.[136] Any discussion of these tools, however, must first organize them into groups according to common characteristics.

The literature does not provide a grouping of the methodologies that is useful for our purposes. Kakalik, et al.,[137] comes closest with the groupings of 1) Command Discretion, 2) Hazard Formulas, 3) The Phoenix Method, 4) The St. Louis Method, 5) The LEMRAS Method, 6) Deployment Analysis and Allocation Method, and 7) Simulation of Patrol Deployment. Categories number 6 and 7 are similar. The Simulation of Patrol Method differs from the Deploy-

ment Analysis and Allocation Method in that it has the ". . . ability to investigate the implications of rather complicated allocation and deployment strategies and tactics by use of a computer before extensive field tests are begun."[138]

We have selected five categories we believe facilitate this discussion. Distinctions between some of these groupings are subtle, however, each grouping has characteristics that merit discussion in a particular context. There is no single set of factors that distinguish one group from another. One group may have a common analysis technique; another, while having the same basic technique, will have a dissimilar application. Conversely, two groups having similar applications may have differing objectives or assumptions. The groupings are:

1. Equalized workload/proportional distribution method.
2. Response availability method.
3. Allocation analysis and simulation methods.
4. Next incident forecast methods.
5. Problem analysis methods.

We have deliberately avoided the Command Discretion model of Kakalik. It is generally acknowledged that allocations which are based exclusively on command discretion and judgment are undesirable and cannot be justified. Furthermore, they are treated in the literature in only the broadest context and it is impossible to provide useful descriptions of the applications. The earliest

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writers on manpower distribution noted the prevalency of these types of decisions and deplored them as being entirely inadequate and unjustified given the ease of collecting and analyzing at least some of the data that could improve the objectivity of resource allocation decisions.[139] Their opinions are echoed by later writers.[140]

Command discretion and judgment, however, are necessary to some degree in all allocation decisions. Even with the most sophisticated tools, judgment and discretion play a role in setting objectives of deployment and allocation.[141] As discussed previously, the effect of various allocation strategies on organizational goals, such as reduction of crime, apprehension and citizen satisfaction are unknown. Furthermore, factors incidental to the primary goals will influence the decision-maker's allocation objectives. For instance, certain political factors or other priorities that cannot be quantified, but which have to be taken into account, such as certain minimum allocation constraints like foot beats, and coverage of areas without significantly measurable workloads, etc., may be specified by the decision-maker. It is also true that personal knowledge about a particular area, e.g., hazard characteristics or geographical features, may be important and influence the decision process.

None of the allocation methods found in the literature deal directly with determination of the number or size of command

districts.* In all cases, they apparently assume that the district boundaries are correct. The boundaries are usually located along neighborhood lines, natural barriers, e.g., rivers, mountains, or major thoroughfares. The factors establishing the number of districts seem to be: 1) travel time to outlying beats, 2) neighborhoods and 3) command size. Not infrequently, the district structure is a carry-over from when most patrol officers were assigned foot beats and required transportation from the station house to the beat.[143] Many police departments have reorganized their patrol districts by elimination of stations and redrawing beat boundaries. Most of these decisions have been directed to reducing the patrol overhead which is required to maintain and staff the district station house. These changes were made possible by centralized dispatch facilities that lessened the importance of locating police buildings close to the geographic areas generating requests for police service, as well as the increase in motorized patrol as distinct from foot patrol. Not all of these changes have remained in effect, however. A station house that was closed down in 1963 by the St. Louis Police Department was re-opened in 1966 at the urging of district residents.[144]

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*The interactive feature of Larson's Hypercube Model, however, permits the decision-maker to examine the impact of changing district boundaries on several system outputs by reallocating reporting area "atoms" to different beats under a variety of dispatch constraints.[142]

Some of the district stations closed in Chicago by O. W. Wilson in the early 1960s have been recently reactivated to restore neighborhood identity.

Equalized Workload/Proportional Distribution. This is the most widely used quantitative method of allocating patrol resources. As mentioned earlier, Vollmer is reported to have used proportional workload as the basis of assigning the Berkeley, California, patrol force as early as 1909.[145] Chapman reports that the concepts of Vollmer were further elaborated on by Elmer Graper, Raymond Fosdick, Bruce Smith and O. W. Wilson.[146] Walton[147] reports further historical development of what he called "Selective Distribution" through WPA projects in Cincinnati and Wichita and Wilson's use of the term "Proportionate Need" which he applied to a survey and redistribution of the patrol force in San Antonio, Texas, in 1939. Wilson's pamphlet, Distribution of Police Patrol Force,[148] was published in 1941 by Public Administration Service setting forth the factors to be considered in determining the distribution of the patrol force. Walton further discusses several different sets of factors and weighting schemes that have been used at different times in various departments for establishing equalized or proportional distribution schemes.[149] We will not attempt to elaborate on the details of any specific scheme for equalized or proportionately distributing workloads --

the basic processes suggested by Wilson and used by the IACP in 1967 are described in Appendices "J" and "K" of Police Administration, Third Edition, Wilson and McClaren, 1972.[150] We will, however, discuss the general methodology and the basis of the formulas.

The basic premise of these formulas is that "Patrolmen should be distributed in proportion to the need for police service. The essence of the distribution problem lies in measuring the proportionate need."[151] This premise is underlying all allocation decisions. The distinction between these formulas and those discussed later is the attempt to build subjective responses to defining "need" into a single formula for use in allocating all patrol resources except specialized patrol; particularly within a traditional patrol structure in which each beat officer is expected to perform response and prevention functions.

Another basic premise of these allocation schemes is that crimes and other events about which the police must be concerned occur with great regularity. Therefore, the distribution which prevailed in the past will continue in the future.[152]

The ideal allocation of time between response and preventive commitments is an open question. They range from the planned 25 percent commitment to calls-for-services in Kansas City[153] to Chapman's ". . . assumption that about one-half of a motor patrol officer's time should be spent in routine preventive patrol.[154]

Both Wilson and the IACP formula suggest one-third on calls-for-service, one-third to allow for queuing characteristics of calls and one-third on "inspectional services" (Wilson)[155] or "repressive patrol activity" (McLaren).[156] The formula proposed by Wilson provides only for a proportionate distribution of personnel. The formula used by the IACP ". . . includes a basis for overall manpower allocation, as well as for distribution."[157]

It appears that it is through Wilson's statement "The need for patrol services derives from police hazards."[158] that the general use of the term "Hazard Formula" has come into use. The list of factors included in the formulas, which varies from city to city, often includes crime, arrests, radio calls, business and other locations requiring attention, area, population and road miles.[159] In some agencies, the factors are weighted on a scale according to the seriousness or relative importance of the factor. This weighting is arrived at arbitrarily according to the judgment of the decision-maker. Not infrequently, as is possible with the use of the IACP formula,[160] the weights are built into the formula and the administrator may or may not influence them. Weights typically range in value from "4"[161] or "5"[162] for serious crimes to "1"[163] or "4"[164] for miscellaneous police services and radio calls respectively. However, there are instances in which all factors are given equal weight.[165]

The obvious difficulty with "Hazard" formulas is the wide

variation of value or importance given to the different factors. There is clearly no generally accepted weighting scheme.

Some applications of the proportional distribution method[166] incorporate an additional component which determines how many personnel will be available for daily street assignment by computing an assignment/availability factor.[167] This factor is the number of employees required to have one person available for duty seven days a week for an entire year. It is computed by dividing the actual total days available after subtracting the total days lost for all reasons (days off, vacation, sickness, etc.) from the total potential man-days available (number of equivalent full-time employees x 365 days). This figure, which is the total actual man-days available, is then divided into the total potential man-days available. The quotient is the relief or assignment/availability factor and is usually expressed as a ratio. The ratio may then be used to calculate either the actual number of personnel who will be available for patrol duty or, given a projected resource requirement, can be used to determine the number of personnel that will be necessary to provide that level of on-duty personnel.

The equalized workload/proportional distribution methodologies range in sophistication from simple aggregation of a small number of factors to complex computations of percentages of several

weighted factors accumulated to a single percentage for each g - graphic or time component of concern.

The underlying assumptions of all of these applications, however, are the same. It is assumed that workload can be equitably distributed by measuring relative need.[168] An absolute measure of need in terms of minutes of service is not required. Wilson gives five reasons that an absolute measurement is impractical -- 1) an absolute measure of time needed for routine preventive patrol, in which most of a patrolman's time is spent, has not been developed, 2) an optimum patrol strength standard has not been developed, 3) even if an absolute measure of needed time and an optimum patrol strength were established, it would still require proportional distribution, 4) whenever a proportional distribution is made, the proportional need is the same whether expressed in terms of proportional number of incidents or proportional amount of time needed to deal with them, 5) an absolute measure of the required patrol time must be based on complete data.[169] The fact that the methodology of proportional distribution cannot account for unusual situations and may need to be temporarily abandoned is also mentioned,[170] however, this would seem to be true of most allocation methods. The method developed by Wilson[171] assumes equal value for each of the factors (all Part I crimes, Part II offenses, Miscellaneous Reports, Accidents and Arrests). Although time required to handle any factor is not considered either directly

or indirectly through weighting of the factors in the formula, intuitive adjustments are made in the final processing to account for variations in relative significance of certain hazards of certain times of the day.

The method used by the IACP further refines the approach developed by Wilson in applying weights to the factors used in measuring the workload.

Type of Incident	Relative Weighting
Part I Crimes Criminal Homicide Forcible Rape Robbery Aggravated Assault Burglary Auto Theft	4
All Other Offenses	3
Arrests for Part I Crimes	2
Arrests for All Other Offenses	2
Arrests for Drunkenness	1
Arrests for Disorderly Conduct	2
Arrests for Vagrancy	2
All Other Arrests (including those for outside departments)	2
Traffic Accidents	2
Miscellaneous Police Services	1

The weights are judgmental and are ". . . partly based on the time required to handle these various incidents, and partly on the seriousness of the event."[172]

Both the Wilson and IACP methods use geographic subdivisions smaller than the patrol beat. Wilson suggests ". . . approximately 150 small districts for each 100,000 population." It is further suggested that "These small districts should not be of equal area but should contain approximately equal number of incidents that

are evidence of the need for police service."[173] McLaren's illustration of an application of the IACP method used quarter section sized reporting areas. In other IACP studies, the divisions have been made so that there were about two reporting areas for each 1,000 population.[174]

Using the weighted data, statistics were calculated to show "(1) the number of incidents . . . in each reporting area by shift; (2) workload by day of week; (3) totals by time of day in hours; and (4) 'within shift' variations in workload."[175] The IACP method goes further than Wilson's in that it applies an average call handling time factor. (In the illustration, 45 minutes are used on the basis of previous IACP studies; however, if actual times had been available, they would have been preferred.) The time factor is used to calculate the total time required to handle the called for services. An equal amount of time is used as a buffer factor and another equal amount of time is added for routine patrol. The buffer factor is a rule of thumb to allow for queuing of calls-for-service.[176]

The assignment of weights to factors used in computing equalized workloads or proportional distribution serves to manipulate the relative amount of patrol officers' time available to handle the work represented by each of the weighted factors. Two times are critical in this issue. One time about which the administrator must be concerned is the time it takes to handle a

request or involves the preliminary investigation of a crime. The other time is that which is necessary to prevent the crime or other incident. There is no clear indication that these times ve actually been used as a basis for the several weighting schemes found in the literature. The variations among the schemes suggest that it is a matter of local judgment. Furthermore, the IACP scheme is supplemented both with time calculations and a preventive patrol time factor independently of the weightings. R. D. Smith,[177] in 1961, calculated service weights on the basis of approximately three weeks of data that ranged from a high of seven for robbery to a low of four for malicious mischief, prowler, etc. Clearly, weighting schemes that assign all Part I crimes a single weight do not take into consideration differences that might exist between the different crimes. When Smith developed an arbitrary set of "preventive-need" weights and added them to the service-need weights, the range was from a high of "15" to a low of "5". When the calculated weights are converted to the lowest common denominator, a logical step overlooked by Smith, the range is "1" to "3", not very different from most schemes found in the literature.

In general, the Equalized Workload/Proportionate Distribution (Hazard Formulas) are attacked as being insufficient on several bases. Larson suggests four reasons for their inadequacy:

1. The inherently linear form of a hazard formula precludes description of the highly nonlinear and complex interactions among system components that are often seen, for example, in police systems. Such a formula also attempts an overly simple deterministic depiction of a system in which many of the variables are probabilistic and often highly interdependent.
2. . . . a hazard formula does not relate meaningful measures of system effectiveness to operational policies.
3. . . . comprising a subjectively weighted sum of quantities, does not provide a police administrator with such policy-relevant information as the response time of the patrol force, or the probability that a patrol car will intercept a crime in progress, or any of a number of other operational quantities. In addition, a police administrator would want to know the effect on each of these variables of a possible alternative strategy or allocation level.[178]
4. Hazard formulas may indicate a need that is actually a function of the personnel assigned to an area. More personnel will produce more arrests and perhaps even generate a higher level of crime reporting.[179]

Another point made by Larson challenges the equal workload premise stated by Wilson that the workload of a patrol unit is related to the workload of the beat. Larson's models, as well as actual experience, indicate:

> . . . the amount of intersector dispatching currently prevalent with most radio-dispatched patrol forces, the fact that one sector generates twice the calls for service as another does not imply that one patrol unit works twice as hard as the other. In fact, because of intersector dispatching, they may both work about equally hard.[180]

Larson further mentions an example (not identified) in which calls-for-service received an inordinately low value of five percent

which hardly reflected the real need.[181]

Further criticism is found regarding the program in Chicago which allocated on the basis of hazard formulas.[182] In this system weights of 4, 3, and 1 were given to all categories of Part I crimes, misdemeanors, and general public services respectively. This study was severely criticized by Bottoms for the following reasons. The first criticism of the Chicago hazard formula was that the weightings 4, 3, and 1 bear no relationship to the service time expended in 1969 in the Part I, Part II and miscellaneous service calls. Another problem with this formula, according to Bottoms, is that the city-wide motorized beat structure that results from the weighted workload based design does not reflect the annual trend in calls-for-service that has been increasing at the rate of eight to 10 percent per year.

Bottoms also complains that the Chicago program used a hazard formula that provided for a beat structure that ignores heavy fluctuations in the calls-for-services which overload the capabilities of the beats. In short, the use of this hazard formula makes the use of the "concept of equal distribution of response and preventive patrol meaningless." In this respect, "the goal of preventive patrol is handicapped by duty time consumed by patrol units in routine administrative tasks and in giving assists to other patrol units . . . [183]

Kakalik and Wildhorn also challenge the use of hazard formulas:

> The additive weighted combination of the many hazard factors can reflect neither the highly complex interactions among the factors nor focus individual attention on any single factor. As typically used, hazard formulas reflect past conditions for a district rather than predicted future conditions for day, shift, and district. More importantly, existing hazard formulas do not relate meaningful measures of effectiveness to operational policies. Also, hazard formulas are not relevant to determining the total size of a patrol force required to satisfy certain service-level criteria.[184]

There is no obvious basis for the questioning of the hazard formulas in regard to reflecting past conditions rather than predicted future conditions. It would appear that there is a base in the literature to illustrate that the dynamics of change in demand for police service are such that the historical pattern is adequate for projections of six months to a year of future requirements, given no significant changes in the characteristics of the service area, e.g., population change resulting from urban renewal, etc.

Kakalik and Wildhorn are not alone in this assessment of the inadequacy of hazard formulas on the basis of not relating meaningful measures of effectiveness to operational policies, such as response time and availability of patrol units for response to calls. Larson and others make the same observation.

Phoenix is cited by Kakalik and Wildhorn as having taken an

innovative and helpful approach to the utilization of hazard formulas by considering the basic hazard to be elapsed time as defined "as the delay plus travel plus service times for all response to calls during a given time period in a given place. The three constructive innovations are (1) the use of predicted calls rather than calls actually experienced in the past, (2) the use of elapsed time rather than just volume of calls, and (3) an allocation simultaneously by day, shift, and district rather than by district alone." [185]

Even here, however, Kakalik and Wildhorn find deficiencies in that preventive aspects of patrol are not addressed and that delay, travel and service times for all types of calls are given equal weight. Interestingly, the IACP allocation formula would appear to take all of these factors into account plus at least a subjective provision for the preventive aspects of patrol, an issue that stands unresolved as being amenable to useful quantitative measurement under any alternative allocation method.

The hazard formulas are not without their good points. They are relatively easy to use and do not require sophisticated equipment. They are flexible with regard to the complexity that can be incorporated in them. A very simple formula may be used if that is all that is desired or it can be made more complex to fit the situation.

Response Availability Method. The Response Availability Method of allocation was the first to extend, in an operational setting, the concepts and theories of mathematical analysis beyond the basic counting and percentage calculations used in the Equalized Workload/Proportional Distribution (hazard formulas) methods. This method of distribution is based on measurement and projection of calls-for-services in time and space. The stated purpose of this method is to provide an accurate estimate of measureable workload, i.e. calls-for-service, utilizing historical data. This effort was pioneered in St. Louis in 1966* under a grant from the Office of Law Enforcement Assistance, the predecessor to LEAA utilizing the concept of exponential smoothing of one to two years historical calls-for-service data to project expected calls-for-service workloads.

The St. Louis application identified the number and percentage of the estimated calls-for-service for which a car could be immediately dispatched given varying numbers of patrol units assigned to a district. The department arbitrarily designated 85 percent of the calls for immediate response as an acceptable cost benefit tradeoff. (The marginal utility of additional patrol

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*For a complete review of the methodology and evaluation of the St. Louis program see Allocation of Patrol Manpower Resources in the Saint Louis Police Department, Volumes I and II.[186] For a discussion of expansion of the use of the method in St. Louis see the Supplementary Report, 1969.[187]

units could be determined, at least as far as the response function was concerned.) The residual district patrol personnel were assigned to preventive patrol duties at the discretion of the district commander.

The computerized allocation system produced a series of reports for use in review of the predictive quality of the model and for use in designing response patrol beats:*

-- SYMAP** (flat tone)

-- SYMAP (contour)

-- Selected Part I Crimes Report

-- Radio Event Maps for Predictions

-- Radio Event Maps for Actual Occurrences

-- Queuing Table of Service Levels

-- Summary Queuing Table by Day of Week

-- Car Activity Report, By Car

-- Chronological Car Activity Report

-- Time Analysis Report

-- In Beat/Out Beat Report

-- Activity Summary Report

They are listed here because, as stated, "An interesting charac-

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*See pages 2 and 3 of Allocation of Patrol Manpower Resources in the Saint Louis Police Department, Volume I for more detailed description of these maps and reports.[188]

**"Synagraphic Mapping (SYMAP) is a general computer mapping technique developed at Harvard University under the direction of Mr. Howard T. Fisher, who heads the Department of Computer Graphics.

teristic of the information they contain is that it is applicable to any type of patrol plan."[190] The St. Louis model was used as the basis for development of the LEMRAS,* which was reported in 1971 to be in use in several departments.[191]

The Response Availability models share the following characteristics:

1. They use historical calls-for-service data, typically one to two years.

2. Utilizing an exponential smoothing technique, which takes into account weekly and seasonal variations, the call-for-service workload is predicted for each geographic area by day and four-hour time period.

3. They provide a listing of the predicted queuing of radio calls (the number and percent of calls that will have to wait for dispatch) that will occur given various quantities of patrol units.

4. They forecast the number of patrol cars needed to immediately answer, without dispatch delay, some specified percent of incoming calls-for-service. LEMRAS is reported to have the single advantage over the St. Louis application of allowing for priority service for certain types of calls.[192] St. Louis specified a minimum response capability of 85 percent.[193] Los Angeles specified a capability of 95 percent immediate response.[194]

While it was conceded that the predictive quality of this method was good (Los Angeles experienced 95.5 percent accuracy),[195] the method does not deal with the issue of preventive patrol.

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*LEMRAS is a proprietary software package of International Business Machines which was available through lease to police departments.

Therefore, while the original application in St. Louis actually created a split-force program (reactive/preventive), later in the implementation of the resource allocation model in additional districts the split-force concept was abandoned, resulting in the use of the Response Availability model as a sophisticated means of proportional distribution.[196] Colton reports that subsequently the use of the method is limited to a request by a district commander, which occurs infrequently.[197] Chaiken reports that LEMRAS was withdrawn from the market at the end of 1974 ". . . because only a small number of departments had ever used the program . . ."[198] Another difficulty encountered in the use of Response Availability models is illustrated by the experience in Los Angeles. Los Angeles found that use of its modified version of LEMRAS, called ADAM (Automated Deployment of Available Manpower), was in conflict with the premise of the Basic Car Plan which was intended to develop a neighborhood identity and working relationship between the Basic Car officers and neighborhood residents.[199]

Following upon the St. Louis project, the Chicago Operations Research Task Force examined alternative methods of allocation which resulted in the recommendation for a split-force approach. This was tested in one district for a short period in 1969. Several results of the experiment are cited:

> -- Although a 30-second increase in average response time to emergency calls was recorded, this was not deemed significant even though the average response time remained below five minutes.

> -- Deferral and stacking of non-emergency calls to increase police availability was shown to be feasible and acceptable to the community.
>
> -- Scheduling of units to the response function was flexible, and there were no reports of outage during the demonstration period.
>
> -- Results from the preventive patrol function were disappointing because there was little discernable increase in filing arrests or reducing the reported felonies; however, an increase of about 100 per cent in the actual effort applied to preventive patrol was seen. This increase was even greater during times associated with high crime, and this result underscores the conclusion that major effort should be devoted to crime-specific preventive patrol. (A similar experience was reported by St. Louis.)
>
> -- An increase in police morale was an unexpected result, occasioned by giving patrol officers more responsibility to make operational decisions. . .
>
> The result was the creation of a Strategic Patrol Force, using police units made available by reducing the demand for police service during specific time periods.[200]

Apparently, with the discontinuance of the Operations Research Task Force, no further attempt was made by the department to use the findings of the experiment.

The reasons for such limited efforts in the use of the Response Availability model are not readily apparent. Colton, however, suggests:

> . . . there is no simple set of criteria which can be used to allocate police resources. As a result, there can be no one ideal mathematical model. . . . implementing such unstructured applications the organizational and behavioral factors become especially important.[201]

Another factor may very well be the stability of occurrence in space and time of events about which the police are concerned. Finally, it seems highly possible that the police commander wishes to retain maximum flexibility in allocation decisions

in order to react to community and other demands which are not necessarily related to the quantifiable aspects of police work.

Allocation Analysis and Simulation Models. These models are the most sophisticated tools available for allocating patrol resources. For the most part, they are concerned with the distribution of personnel within district or precinct commands. These models are an outgrowth of the application of sophisticated mathematical techniques dating from about the time of World War II which generally fall under the term "operations research." The efforts of R. Dean Smith in 1961[202] presaged an upsurge in examination of potential applications of these techniques during the later 1960s, both within the police community and by persons in private and academic situations.

The use of less sophisticated techniques like exponential smoothing in St. Louis and other agencies have been discussed in the preceding section. These additional models represent even more sophisticated techniques.

Through a series of developmental efforts, issues concerning optimum distribution of beat patrol personnel have been addressed through applications of mathematical formulas incorporated into algorithms which manipulate certain measurable characteristics of police activities in relation to beat design. The best known efforts are those of Larson[203] and others who have

expanded on his work, such as Campbell,[204] Chaiken,[205] and Chelst.[206] Heller, working from the original St. Louis resource allocation program, examined the potential for incorporating ". . . an even balance of the 'crimeload' among the beats, where crimeload is determined by historical data or forecasts."[207]

In 1971 Kakalik and Wildhorn reported that they had not found any of these more ". . . systematic quantitative methods currently in use,"[208] however, they suggested ". . . the simulation method as a valuable aid to decision making on new patrol operational policies, tactics and command and control systems."[209] The latest comment (Chaiken, 1975) on use of sophisticated models suggests:

> When used with appropriate care, mathematical models provide several benefits to the planner. First, they can help identify deficiencies in current allocation policies by calculating performance statistics that were not previously available to the department. Second, they permit the planner to consider and analyze numerous alternative allocation policies, whereas only one or two alternatives can be considered seriously if tedious manual calculations are required. Third, some of the models will suggest alternatives that may be preferable to any of the ones that were initially under consideration.[210]

These optimistic observations are dampened somewhat by the survey findings of Colton, reported in October 1974, that only a small percentage (18 percent or 27 of 147) of responding departments were using "an advanced mathematical method" or other computer aided approach to resource allocation.[211] Furthermore,

he reported:

> Such methods often look good on paper and may work for short periods, but in reality they are extremely difficult to maintain and utilize in the long run and usually are abandoned, at least in part.[212]

As of the time of preparation of this report, nothing has been found in the literature that any of the more sophisticated models have been actually implemented and that results of such implementation are available. Furthermore, all of the descriptions and discussions of the advantages and disadvantages of these modeling and simulation techniques are authored by non-police personnel.

The reader is referred to the various publications footnoted in this section for details of the formulas and algorithms utilized in these models. Perhaps the most comprehensive discussion of the issues that should be considered in allocation of patrol resources will be found in Larson's Urban Police Patrol Analysis[213] and later work by Larson, particularly Decision-Aiding Tools in Urban Public Safety Systems (1972-1973),[214] A Hypercube Queuing Model for Facility Location and Redistricting in Urban Emergency Services (June 1974)[215] and Illustrative Police Sector Redesign in District 4 in Boston (July 1974).[216] While these models are not reported as having been fully tested, Larson provides considerable insight into the characteristics of the police response system, particularly in the July 1974 article. We take the liberty of reporting these in some detail because we believe they

are extremely important issues that are apparently either ignor or not recognized by most police administrators. The issues are organized according to 1) Objectives in Sector Design, and 2) Useful Rules of Thumb.

Objectives in Sector Design are:

1) There should not be marked disparities in workloads among the radio-dispatched units. . . .
2) The sector [beat] design should not be such that the average command-wide travel time is markedly above the minimum possible . . .
3) To the extent controllable by sector designs, there should not be marked inequities in accessibility to police service in various parts of the command . . .
4) To the extent controllable by sector design, the number of cross-sector dispatches should be minimized.[217]
5) Considerations less conducive to measurement but perhaps equally important are a) preservation of neighborhood integrity, b) minimum deviation from an existing sector plan to reduce the amount of time required for operating personnel to learn the details of the new plan.[218]

The Rules of Thumb are:

1) Relationship between sector area and sector travel time . . ." Prior modelling established that "average travel time within a sector grows with the square root of the area of a sector. [219]

This raises a potential conflict between an equalized workload method and a method (such as this) whose design strategy is to equalize average intrasector travel time. The reader is reminded that in the equalized-workload method intuitive judgment is applied to certain minimum

requirements for patrol coverage. The same intuitive judgment is required in using Larson's model. The difference is that Larson's model can incorporate this judgment and provide information to the decision-maker on its impact on overall objectives prior to finalizing the beat design.

2) Compactness of Sectors. [It is suggested that] . . . average intrasector travel time is not very sensitive to the exact sector geometry, as long as the sector is reasonably compact. [220]

3) The effect of differing travel speeds. [221]

A study of relative travel speeds along different types of streets may affect the design of sectors when travel time is a factor in beat design.

4) Relationships between number of cross-sector dispatches and amount of time busy on calls for service . . . As overall call-for-service volume within the district increases, it is more likely that a patrol unit will service calls outside of his "own" sector because the car assigned to the sector of the call was busy on a previous call at the time of dispatch. . . . for low to moderate workload levels the district-wide fraction of dispatches that are cross-sector dispatches is at least as great as the average fraction of time that units are busy servicing calls. [222]

5) A patrol unit's workload is not equal to its sector workload . . . Among other points, the model calculations will indicate that a unit's sector can generate below average workload and yet the unit can incur an above-average fraction of time busy servicing calls. [This would tend to disprove the assumption of the equalized-workload models that] equalizing sector workloads results in equalizing patrol unit workloads. [223]

6) The burden of central location. A unit whose

> sector is situated centrally in its command will be a prime candidate for cross-sector dispatches. . . On the other hand, a unit assigned to an outlying or remotely-positioned sector is not likely to be a good candidate for cross-sector dispatches. [224]

This is not an easily resolved issue because adjusting sector boundaries to change the inequalities of cross-sector dispatches results in other cross-sector/travel time problems.

The actual operation of the model will not be discussed here, but it is important to note that it requires as input the operational characteristics of the system as well as sets of constraints such as minimum/maximum travel times, maximum queuing allowed, number of patrol units and intuitively designed sector boundaries. The model then tests or simulates the operation of the system for some set time period (hours) and produces the results of the operation in reports as if the system had been in operation on the street. It is interactive requiring the administrator to make a decision; the model tests the results of the decision.

In his September 1975 report on Patrol Allocation Methodology for Police Departments,[225] Chaiken reviews the state of the art in application of mathematical modeling methods for allocating patrol resources. He suggests the key issues are:

> -- Determining the number of patrol units to have on duty in each of the department's geographical commands; this may vary by time of day, day of week, or season of the year.

-- Designing patrol beats.
-- Developing policy for dispatching and redeployment of patrol units.
-- Scheduling manpower to match the variations in the number of units needed for duty.[226]

Chaiken addresses the following issues:

1. How many patrol units should be on duty?
2. How many patrol units should be assigned to each geographical area?
3. Design of patrol beats.
4. Dispatching policy.
   a. How many patrol units will be sent to each reported incident?
   b. Which particular patrol unit(s) will be dispatched?
   c. When will calls be queued (stacked, backlogged)?
   d. Priority structure? [Which calls will be dispatched first if calls are queued?]
5. Redeployment policy.
6. Manpower scheduling.[227]

He has limited the issues ". . . because we wish to emphasize the use of mathematical models that have been designed to suggest or analyze answers to the questions raised."[228]

The difficulties he raises in use of primary objectives of the patrol function as a basis for studying patrol allocation have already been discussed. As an alternative he suggests the following measures as both practical to calculate and relevant for patrol allocation:

1. Response time.
2. Fraction of dispatches that take a unit outside its assigned patrol beat.
3. Time available for other activities. [The judgmental factor again.]
4. Cost.[229]

These measures are not unlike those considered in all

allocation schemes, except that, as with Larson and others, he discusses the use of more sophisticated mathematical formulas to derive the allocation design. He also describes the limitations of the hazard, equalized workload formulas and suggests that "Performance Measures" should be used in the allocation. Yet even the use of performance standards requires intuitive judgment in application of the allocation models. As he states in the Introduction:

> Indeed, issues that should and do occupy the attention of police administrators -- such as community support for the police, control of crime, and relations between labor and management -- may well outweigh any considerations of efficiency that arise from viewing the patrol function in any narrow technical or mathematical sense. Thus, planning officers and patrol commanders who are concerned with patrol allocation must address operational questions in a context of both explicit and implicit administrative, legal and political constraints. They cannot expect mathematical methods and models, such as those described in this report to tell them the "best" solution to whatever problem their department faces, and they must be prepared to use all such methods with caution, imagination, and common sense.[230]

The evidence from the literature and preliminary site visits suggests that police administrators are not prepared to accept mathematical modeling as an important decision-aiding tool, regardless of the high hopes of the developers of such tools.

Drake suggests the underlying reason for this lack of acceptance and use: ". . . a formal model is an <u>explicit abstraction</u>. . . . No formal model is a precise representation of reality."[231]

Larson suggests that:

> Such an algorithm should have the properties that (1) administrators cannot find significant fault with the objective function and the constraints and (2) computed outputs are physically meaningful and intuitively appealing. Given such a tool, police resources can be allocated on a rational basis that offers clear advantages over sheer intuition or subjective hazard formulas.[232]

The evidence suggests that police administrators do not find the sophisticated models (abstractions) to possess sufficient improvement over the simpler workload formulas and intuitive judgment.[233] It should also be pointed out that at first glance these models appear to be restricted to performance measures that are applicable only to traditional patrol. As more and more departments move toward the concepts of neighborhood team policing, a re-examination of the potential of the models may very well demonstrate a utility for analyzing certain response characteristics that would improve such things as beat integrity and response time within the context of team policing objectives. This is suggested by Chaiken in describing team policing plans as various forms of overlapping beats, a scheme that substantially reduces out-of-beat policing.[234]

There has been other work in developing models similar to those discussed here. Some of these are Kakalik,[235] Jarvis,[236] and Mitchell.[237] For a review of different allocation schemes, see Carlen and Moodie.[238]

In general, there has been little evaluation of the models

in increased arrests or improved deterrence. Elliott introduces the concept of the "offensively deployed patrol force."[243] Th- concept evolved from the question "What strategy would be mo - effective in reducing crime? How might this strategy be implemented within reasonable budget and manpower constraints?"[244] In resolving these questions, three specifications were set:

> (1) A unit of the force must pass by every point in the city on the average of once every ten minutes.
> (2) The patrol must not be sent on a complaint, unless the complaint can be disposed of in less than ten minutes, or there is a crime or equivalent emergency situation in progress. If a unit does become involved, its territory must be covered by adjacent patrol units.
> (3) The force must be deployed with due regard for the expected type and location of crime, based on an analysis of previous criminal activity for the particular season of the year, day of the week, hour of the day, etc.[245]

The concepts on which the suggested specifications were developed are based on the theories of random search. Subsequently, Elliott conducted research on "The Time Required to Commit Crime"[246] to further develop the random patrol program. In the report on that effort, he used test data collected from the Crime Control Team to obtain estimates of the actual time intervals between visits to every location in the team area. He arrived at a figure which had a range of between 44-88 minutes. Utilizing the available data and estimating other parameters, Elliott arrived at probabilities that the police would detect a crime in progress.[247] This work was further developed and published in

equal probability that a crime or call-for-service would occur at any given time. The stated objective of reducing response time was achieved -- an average of 4.22 minutes, down from 7.05 before the program.[255] Two items are of interest in this "experiment." Equal reductions were achieved by both the experimental and control patrol units. Also, although the premise that reduced response time could be expected to result in more arrests, no arrest data are included in the results or evaluation. The only crime related influence is that while the crime rate in the rest of the county rose 17 percent, the crime rate in Edina only rose 11 percent.

Deployment Analysis

Overview. Deployment decisions are concerned with short-term crime oriented (preventive, apprehension, and investigation) deployment and tactical actions of individual officers and specialized units. Since this is the scope of deployment, the objectives of deployment are limited to crime prevention, apprehension, and some recovery of property.

To achieve the main objectives of apprehension and prevention, deployment analysis attempts to provide the decision-maker with a rational decision-making base for the purpose of improving emergency response, increasing the space/time coincidence of patrol units and criminal events, creating the impression of a high probability of space/time coincidence, and crime pattern

disruption. Through these intermediate objectives, greater apprehension capabilities and greater prevention capabilities are the expected outcomes.

Deployment differs from allocation in three basic ways; because of these differences, the deployment analysis also differs from allocation analysis. Deployment decisions are differentiated from allocation decisions by their frequency, the organizational level where they are made, and their goal orientation.

Frequency of Deployment Decisions. Given the objectives of deployment activities, one can see that the frequency with which these decisions must be made has to be greater than that of allocation decisions. Because of the objectives' primary focus on specific crime incidents, the deployment decisions not only must be made more frequently than allocation decisions, but they must also be made more quickly.[256]

Organizational Level of Decision-Maker. The second area of differentiation between allocation decisions and deployment decisions is the level of organization at which the decisions are made. Deployment decisions, primarily because of the time frame they operate within, tend to be made at lower levels in the organization.[257] The very nature of the deployment objectives practically mandates that the patrolmen and unit commanders (who implement the decisions) be the ones that make the decisions. The

organizational level of the deployment decision-maker will depend in part on the type of deployment analysis that exists. If there is very little formal analysis, the resulting decisions will, in all likelihood, be made by the subjective, intuitive feelings of the individual patrolmen. On the other hand in a department with a fairly formal analysis program, the decisions will most likely be made by unit commanders, and in some cases by higher officials.[258]

Another variable in the level of the decision-maker is the patrol structure in which the decision is made. In traditional patrol, for example, deployment decisions will frequently be made by the individual patrolman. In this situation, the organizational level is low. A specialized patrol unit, however, would be more likely to have unit commanders as deployment decision-makers. In this situation, the level of the decision-maker is fairly high; however, given the functions of specialized patrol, one can see the necessity of this. Team policing, because of its nature and philosophy, generally places the deployment decision responsibility on the entire team or the team commander.[259] This procedure is entirely consistent with the philosophy of team policing.

Orientation of Deployment Decisions. The basic difference between allocation decisions and deployment decisions in terms of orientation is one of specificity. Deployment decisions are only concerned with crime related objectives, while allocation decisions

are concerned with these and many others.

Deployment decisions are concerned with three areas. T' ese three distribution concerns provide the basis for the achievement of deployment goals. These areas are crime incident patterns, suspect patterns, and crime-related hazard patterns.

Due to the specificity of deployment decisions, the deployment analysis is also more specific than allocation analysis. The deployment decision-maker is concerned with three things -- apprehension of offenders, prevention of crime, and recovery of property. One can see the close relationship of special patrol and deployment by looking at the goals aimed at by each.

Analysis Differences. Because the orientation, the frequency, and the organizational level of the decision-makers differs from the allocation scope, the specific deployment analysis must also differ. There are a number of technical differences in the analysis techniques, however, the concern here is with the basic differences in analysis of orientation, type of problem and data usage.

To understand the differences, one must realize that allocation analysis can and does use much of the same data, the same analysis, and the same outputs as deployment analysis; the difference is in the manner that the outputs are used in support of patrol.

It was mentioned before that the deployment decisions are crime specific. Logically following the decision requirements, the deployment analysis methodologies are also crime specific.[260] Because of the primary objectives of prevention and apprehension, the crime specific problems that the deployment decision-maker and deployment analysis are concerned with must be chosen with care.

The first criterion that is used is that the crimes that deployment programs will attempt to affect must be suppressible.[261] Indianapolis listed weekly controllable offenses for the purpose of illustrating beats where crimes that could have been suppressed occurred.[262] In order for the police patrol to have an effect on any specific crime, that crime must be amenable to either deterrence or apprehension by systematic patrol techniques. This requirement limits the problems that deployment analysis deals with quite a bit by eliminating approximately 40 percent of the criminal incidents.[263]

The second criterion in problem selection is the probability of recurrence of the criminal incident.[264] Following these guidelines, many crimes are not dealt with because of the fact that they are most likely isolated criminal offenses that are not likely to be repeated. In this category could be placed both crimes that would not be repeated again by the offender and criminal incidents that simply would not be likely to be repeated

again in the near future.

The specific problems that are dealt with by deployment analysis are commonly isolated because of their suppressibility, the magnitude of their incidence, the social cost, and the public concern.[265]

The second difference in allocation and deployment analysis is the fact that deployment analysis is concerned not only with longer term trends but also with short-term problems. Both the deployment analysis and the deployment decision are geared toward the short-term problem alleviation. The fact that there may be a long-term discernible pattern, however, is not overlooked in deployment analysis.

The third area that distinguishes deployment analysis from allocation analysis is the concentration of deployment analysis on individual criminal events. This is a by-product of the problem specific orientation of deployment analysis. The analysis used in support of deployment decisions very commonly is concentrated on one or two specific criminal event types. Most commonly, for the reasons stated before, the deployment analysis is heavily geared towards the problems of robbery and burglary.[266] Deployment analysis can furthermore concentrate on specific criminal event trends. For example, in Cincinnati it was found that there was a trend of increasing robberies during Christmas.[267] This analysis revealed not only a long-term trend but also a very

specific crime problem of robbery.

The Techniques of Deployment Analysis. The techniques that deployment analysis utilizes in the attempt to achieve its objectives vary a great deal. In general, the information sources that deployment analysis utilizes are geographical, chronological, victim target descriptions, property loss descriptions, modus operandi information, suspect descriptions and vehicle descriptions.[268]

Using this information base, deployment analysis attempts to identify patterns of criminal events and suspect patterns and to predict in some cases the next probable occurrence of a specific event.[269]

Identifying and isolating suspect and event patterns are commonly attempted through various methodologies that deal with types of crime, locations of incidents, times of the incidents, modus operandi of the suspect, and other miscellaneous data sources that may or may not be available, such as vehicle descriptions.[270]

The availability of data is an important consideration in the examination of deployment analysis. The Police Crime Analysis Unit Handbook[271] gives the following breakdown of availability of data for several specific crimes: 75-100 percent high availability, 25-75 percent relative, and 0-25 percent low availability. Using the data from this source, it is possible to say that the avail-

ability of specific modus operandi factors in residential burglary incidents is relative. Similarly, for auto theft, the availability of property loss descriptors is very high. Some of the data categories are consistently high in availability, such as the classification of the crime and the geographic data. Other data criteria, such as time of occurrence, may be consistently high in personal crimes and usually relative in burglaries. Personal modus operandi patterns are typically not available in residential burglaries due to the similarity of the methods used by all burglars; in contrast to this, modus operandi information on armed robberies is usually available.

Data availability may severely handicap certain analytical methodologies; therefore, it is important to know the data characteristics before deciding on a crime specific priority. This is true because of the sophistication level that is required in some of the deployment methodologies. Data characteristics are also important in the analysis process areas, such as the collation stage of deployment analysis.

Collation. For the most part, the collation of data in the deployment analysis process is not difficult. The primary purpose of collating the information is so that the analysis may move quickly and time is expended for integrating only the relevant data. In suspect pattern analysis the collation stage may be of

particular importance because of the potentially large amount of useless information that may be found.[272]

Deployment analysis collates crime pattern data, suspect pattern data, and crime related hazard pattern data, i.e., target descriptors. The data input for this collation is from crime reports, arrest reports, field contact reports, special interests, and even personal awareness.[273]

Once the data has been collated, and the useless information has been "weeded out," the next stage in deployment analysis is the actual analytical methodology.

Deployment Analysis Methodology. The basic types of deployment analysis have been labeled crime event pattern analysis, suspect event pattern analysis, and crime hazard pattern analysis. Actually, the methodologies of these three analytical techniques are not different enough to warrant detailed discussion, but the more specific deployment analysis methodologies are undertaken with these in mind.

Another problem in discussing the deployment analysis is that the display of the analysis information is often the analysis itself. For this reason, the different methodological techniques for displaying and sometimes for analyzing are mentioned.

The major methods of displaying that may, in and of themselves, be analysis techniques are pin mapping, written reports,

and computer mapping.[274] The relationship of analysis methodologies to these display tools will be shown as the methodology is discussed.

a) Aggregation/frequency distributions. The use of aggregation and/or frequency distributions are by far the most common form of deployment analysis used by police departments. Typically, the aggregation or frequency distributions are simple crime specific analysis procedures. The methodology may call for very simple aggregations of robberies in the central city or it may simply compute burglary frequencies in the city.[275]

Aggregate analysis is closely associated with the use of pin maps, computer maps, and in some cases, written reports. The basic procedure is to map criminal incidents by type, time and location.[276] A complicating factor in aggregate and frequency distribution methodologies is that the analyses and their outputs are frequently incorporated into the outputs and analyses of other methodologies.

An aggregation methodology per se does not show any relationship between variables, nor does a simple frequency distribution. Both of these techniques simply show the incidence by location and time or frequency. Because of the relative simplicity of these techniques, they suffer from a lack of interpretation. The close association with pin maps often results in the analysis simply

being the aggregation of certain events on the pin map. The outputs of the analysis are then displayed and the low level decision-maker must intuitively base his deployment decision either on the analysis information and his subjective feelings, or simply on his subjective feelings.

The aggregation methodology and the frequency distributions have the advantage of being fast and easy to understand. The aggregation of specific crimes can also be used in suspect analysis, trend analysis and in long-term allocation analysis. In addition, aggregation methodology may be easily displayed to the user groups and supported by the patrolmen's observations and may be the best deployment criteria available. Both of these methodologies are also low-cost and do not require skilled technicians.

b) Percentages, ratios, and other statistical methodologies. These deployment analysis methodologies have the advantage of comparison. The outputs of these methods can be compared to other criteria so that the final decisions are based less on subjective factors than the aggregation and frequency distribution methodologies.

Percentages, ratios and other statistical techniques are closely associated with paper reports. These are relatively inexpensive methods of analysis and can be as complex as the administration wants them to be.

Percentages are usually crime specific figures, such as "robbery is up 10 percent this year over last year."[277] The e percentages may be calculated using any comparison point that the statistician wants -- last year, last week, the adjacent district, or even other cities of comparable size. As mentioned before, the advantage of this method is that the results give a base upon which the user can compare the figures.

Ratio analysis is very similar to percentage analysis. The outputs of ratio analysis are usually comparisons of crime rates per 1,000 population or arrest rates by race, etc. In any case, the products of this analysis may be a fairly good indicator of the general problems faced in a particular area. Once again, this method gives a point of reference to the user so that the data has a little more relevancy. Ratios were used in the Albuquerque robbery project to show a relationship between types of stores and robbery rates, thus showing a relationship between criminal event pattern analysis and crime-related hazard pattern analysis.[278]

Just as the aggregation and frequency distribution methodologies, these statistical methodologies are often encompassed in other more sophisticated analytical techniques.

c) Trend analysis. A method that often utilizes the statistical methodologies is referred to here as trend analysis. In this procedure the analyst looks at actual or percentage changes over a

period of time. In this way, a general trend is isolated and described. Products of this type of analysis may be found commonly in the Uniform Crime Reports and other crime analysis outputs.

Trend analysis often takes the form of monthly or yearly frequency distribution by location. Examples of the use of trend analysis are found in several programs, such as the Seaside burglary project, the Miami robbery control project and the Albuquerque robbery project.[279]

The support role of trend analysis in decision-making is two-fold. Primarily, trend analysis is a tool in allocation considerations, but the role that it plays in supporting deployment decisions is considerable. Trend analysis may also function in two different support capacities of programs. Firstly, by analyzing trends, the deployment decision-maker can get a good general picture of the crime situation in a specific area with regards not only to the type of crime but also to the type of offender. Secondly, the trend analysis can provide an effectiveness measure of sorts to the decision-maker.

An important asset of trend analysis is the flexibility in the kinds of trends that can be isolated. The flexibility and the complexity of the variables used in trend analysis depend a great deal on the equipment and the personnel that a department has at its disposal.

d) Correlational methodologies. The most complex and perhaps the most promising methodology in deployment analysis is probably the correlational methodologies. These methods can range from manually correlating two variables to multi-variate correlational programs run on computers. The strong point of these techniques is that they not only show a relationship between variables, but they also provide some insight into the nature of the relationship.

In deployment decisions, the correlational techniques are commonly simple two-variable methodologies such as correlating a rise in burglary with school vacations. By doing such simple correlations, the decision-maker may make logical inferences from the data thereby enabling him to deploy personnel for maximum efficiency. Just like trend analysis, correlational methods may also be used to determine police patrol effectiveness.

One example of a simple correlational technique was conducted to test the relationship of the visibility of crime with the seriousness of that crime. The results showed that by and large there was a negative correlation between seriousness and visibility by patrol.[280] The usefulness of this type of information to both allocation and deployment program decisions is clear.

One of the most helpful uses of correlational techniques is in the area of suspect pattern analysis, also referred to as modus operandi (M.O.) analysis.

e) M.O./suspect pattern analysis. Operating under the same criteria as criminal event pattern analysis, that the crimes committed by suspects are likely to be committed again and that these are susceptible to police suppression, suspect pattern analysis opens up an area that may be very important to deployment decisions.

Correlational methodologies are the most useful tool in this type of pattern analysis since these methods have the capacity to isolate relationships between suspects and incidents. M.O. analysis does more than usually correlate two variables to produce the most likely suspect for a particular crime. In complicated systems, such as the Dallas Tactical Deployment Project,[281] the crime analysis correlates not only criminal incidents by time, location, day of the week etc., but also with the suspects, suspect vehicles, and specified crime summaries by areas. This system is obviously very complex requiring a significant budget and considerable computer equipment.

Most M.O. analysis necessitates some correlation because of the requirement of tying together the suspect with the crime. In its most sophisticated form, correlational methods could use suspect information, arrest information, prison records, probation records, and incident reports to draw inferences between the suspect list and criminal incidents.

M.O. analysis or suspect pattern analysis often consists of many variables relating not only to the suspect description but

also to the method of operation used. Frequently, suspect analysi follows a procedure of correlating known or suspected offenders with prison records, court records, past M.O.s, and current crime incidents in an area.

The use of M.O. analysis in support of deployment tactics may range from stake-out information to special notice in preventive patrol. In specialized patrol, for example, M.O. analysis may yield information that indicates a number of probable targets for an offender or group of offenders. With this knowledge, the special units could strategically deploy themselves in areas where the suspect pattern analysis indicated the greatest probability of the next incident occurring.

Suspect pattern analysis could similarly direct the deployment of traditional patrol by alerting them to the probable target areas or by alerting them to the suspects themselves.

In team policing, the impact of suspect pattern analysis could be even greater since the team police would be more aware of an area and the people in the area. The suspect analysis would then alert the team police to probable targets and to the probable perpetrators when possible. The deployment decisions could then be based on more knowledge than simple criminal event pattern analysis.

Another impact that the suspect pattern analysis might have with regard to the deployment of team police would be the

increased likelihood of preventing the crime, either by target hardening or simply by deploying men to the area where the analysis indicated that a crime might occur.

f) Prediction Models. Given the primary objectives of resource deployment, the ultimate in effectiveness would be an analysis technique that would accurately predict criminal incidents. The implications of this in terms of increased police effectiveness are obvious.

Prediction models typically utilize some or all of the methodologies just described. Many of these projects have been attempted, but the usefulness in accurate prediction is unknown. The implications of an accurate predictive model on deployment are twofold: first, the police could be at the scene even before the criminal, and second, predicted target sites could be protected before the crime.

Of course, most prediction models are based on the assumption that completely accurate predictions are not possible, rather these models attempt to provide an illustration of the next probable occurrence.

The Seaside, California, anti-burglary project was based on the predicted occurrence of burglary by time and census tract.[282] This model also included a prediction of probable targets and the items that were most likely to be stolen.[283] A similar program

aimed at combating robbery was attempted in Phoenix.[284]

The specific procedure used in these programs is beyond the scope of the present effort; however, one program utilized a computer to normalize frequency distribution and some raw percentages in order to perform multiple regression analysis for the purpose of predicting selected crimes.[285] The exact utility of this model is not yet known but for deployment purposes it does appear to predict in a general way the areas and times that certain crimes (burglary, for instance) are most likely to occur.[286] In general, the tools used in predictive models fall into two broad categories. The first of these is where ". . . causes or covariants which connect the criminal with the victim or the victim establishment" are used to determine the probability of a crime occurrence.[287] This method is an attempt to isolate what connects offenders to victims or victim targets. In other words, this type of analysis is aimed at isolating both suspect patterns and crime related hazard patterns and correlating them in some way. The second category of predictive tools is the method of predicting probable crime occurrences by correlating historical trend data and assuming that the same factors that were operating are still operating.[288]

Since each particular analytical method has its weaknesses, a program will often utilize both of these techniques together in an attempt to ensure maximum accuracy.

The cost effeciency of predictive models is seriously questioned due to the complexity of the systems and the largely undocumented nature of the results. Dallas conducted a special project solely for the purpose of examining the feasibility of predictive models and concluded that ". . . a regularly used and reliable crime prediction capability can be developed only in a long-term and costly research project."[289]

Dissemination. Because of the time frame within which deployment decisions and analyses must operate and the organizational level of the decision-makers, the accurate, understandable and timely dissemination of the outputs of the analysis is an important area of consideration.

The dissemination of the information analyzed by crime analysis units is essential if the functions of crime analysis programs are to be fulfilled. There are many different methods used to disseminate crime analysis information, the three main categories being pin maps, written reports, and person-to-person contact, although the use of computer printouts is becoming more and more commonplace. Any one method may be produced regularly or on an infrequent basis, depending on the nature of the problem or the irregularity of user requests.

In police work, pin mapping (recently supplemented by computer mapping)[291] is one of the most widely used methods of disseminating

information besides verbal communication; it is also one of th- oldest.[292] One of the main reasons for the popularity of pi maps is that they can be displayed prominently and they tend to catch the eye. Another reason is that they provide ease in conceptualizing geographic patterns of events and serve to motivate individuals to delve into printed material.

Mapping may be a routine task of the crime analyst involving the simple correlation of events with their locations, or it may be a more complex one with the analyst developing narrative explanations and accompanying reports. Maps may illustrate the aggregate of events over a certain period of time or they may focus on one specific crime in time periods of a day, week or month. Maps may combine time and special variables by crime also. Maps have been used to plot the probability of future crime occurrences.[293] Such variables as the size of the map and the time periods covered undoubtedly contribute to the success or failure of the technique as a communication tool. The Dallas mapping procedure was described thus:

> Once the offense/incident reports were sorted into the proper categories, each offense was posted on a wall map. The posting consisted of placing a 1/4" round adhesive coding dot on acetate overlays covering large 6' x 7' wall maps of the City. A separate map existed for auto theft, business burglary, and robbery (half dots were used to distinguish robbery of individuals from business robberies). The coding dots were color coded by month, and the date of the occurrence of the offense was written on each coding dot. Although the acetate overlays were changed

> periodically, at least a two-month accumulation of offenses was always present on each wall map. When an overlay was removed, it was rolled and stored for future reference.[294]

Of course, as with any other means of dissemination, the success depends more on the motivation of the users than the communication tool.

The Police Crime Analysis Unit Handbook provides a discussion of the types of written reports which may be used in disseminating information. Included are the daily crime recap, daily information bulletin, known offender identifiers or suspect M.O. bulletins, weekly crime summary, monthly analysis section report, crime patterns identification bulletins, investigative leads or crime correlation report and specific major crime bulletins.[295] An important aspect of the reports is the tailoring of them to meet user needs.

Site visits and mail contacts conducted in conjunction with this study have produced many examples of crime analysis reports giving information such as monthly summations of total crimes for a district, comparisons between districts and the increases or decreases in crime rates over time. Such types of reports have little value in short-term deployment although they may serve to alert the administrator to the need for reallocation of resources. They have no relevance for planning of deployment or strategy except assignment of tactical forces to large geographic areas

for rather long periods of time because they do not specify the situations in a manner that allows the police to respond with specific programs. Still, the reports described above are referred to as crime analysis by many departments.

Even if information is directly applicable to the user needs, provision of it alone may not be sufficient. A study of user acceptance of crime analysis products in Oakland revealed that some users wanted the crime analysts to assume a greater role in analyzing data and defining problems rather than simply disseminating information which may or may not be understood.

The importance of the crime analysts having verbal contact with users is important in promoting user acceptance. It also has importance in dissemination. Information may be needed immediately by the users. The matter may be of minor importance, or involving a limited number of officers, thus, obviating the need for a written report. In addition, sending out a report, or displaying it on a map on a bulletin board does not guarantee that any heed will be paid to the information, where a conversation or address to a meeting will ensure at least minimal attention. Personal contact also provides the best means of presenting the crime analysts with feedback on their performance and on user needs. Only two departments were discovered which have attempted evaluations of their crime analysis program including solicitations of comments from users.[296]

A problem exists in establishing contact with field personnel because of the centralization of the crime analysis operation or where it is not a 24-hour activity. The former issue may be resolved by establishing district level operations or adopting the use of liaison officers.[297] Another alternative is for the crime analyst to periodically initiate field contacts by visiting the field operation units.[298] The latter problem remains an issue where the department lacks the resources or motivation to establish an around-the-clock operation.

As noted elsehwere, several programs provide for regular meetings between crime analysis personnel and users.[299] To aid in a city-wide anti-robbery campaign in Cincinnati in 1974, it was recommended that an information group composed of district crime prevention sergeants, a robbery task force representative, a public relation section representative and the crime analyst should meet at least weekly to ensure proper dissemination of information.[300]

Usually, crime analysis operations disseminate information using a combination of techniques. Depending on the conceived role of crime analysis, resources, user demands, degree of automation as well as other factors, any number or mix of reports may be used. Described below are several actual or conceived of crime analysis programs and their methods for disseminating crime analysis information.

The proposed Denver operation would have used daily, weekly, and monthly reports on crime by type, location, and time. For special purposes, bulletins on criminal behavior patterns, known suspects, and potential victims would be produced when analysis indicated the need for them. Pin maps cumulative for one-month periods would be displayed in the crime analysis office.

In the University City, Missouri PREWARNS system, a monthly crime analysis package formed the core of the dissemination activity.

> The monthly package: 1) statistically documents all occurrences of robbery, burglary, assaults, larceny, auto theft, disturbance, juvenile arrest and traffic accidents combined with various environmental variables relative to each type of crime; 2) discusses the relationships between these physical and social causes of crime in a narrative which emphasizes any changing or recurring patterns of criminal activity; and 3) further supports the statistical display and narrative with computer maps aggregating the data by police sector or by exact coordinate point on street sector maps.[301]

A proposed crime-specific burglary project in Stockton, California, will operate on information disseminated in the following manner: 1) computer printouts of the numbers of various major crimes committed monthly and annually, 2) pin maps, 3) daily occurrence sheets distributed to all patrol watches and investigations personnel, 4) special bulletins to describe suspects, M.O. files and descriptions of stolen property, and 5) inter-divisional meetings between detectives and patrol.[302]

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In Oakland, California, the crime analysis section was documented as using the following outputs in 1973 (the crime analysis operation is now considerably changed according to knowledge gained in a recent site visit): daily district crime summary, weekly crime summary, daily recap information log, one-week composite pin maps, specific offense maps (current and past two-week period), special crime problem maps, alphabetical field contact printout (daily, monthly or yearly), patrol beat field contact printout (daily, monthly or yearly), crime analysis bulletins, special M.O. bulletins and auto theft known offender file and map.[303] The pin maps were found to be the most used output.[304] One user suggested that one report which might prove useful would be a report prepared for the start of each shift detailing the significant events occurring during the previous two shifts.[305] There was no indication in the literature of this type of report being used in any of the described programs.

Moving beyond describing the content and format of the products of crime analysis, this section addresses the most essential issue about a crime analysis operation: How useful is the information to the person receiving it? Consideration is extended to some of the variables of content and format which influence the value or usefulness.

a) Relevancy. Does the disseminated information address specific problems or as noted earlier, does it just provide

general information? Is there a clear relationship between problem goals and the information produced to help accomplish them? These and other questions are ones which are seldom dealt with in most departments.

In Oakland users complained that crime analysis was not specific enough in defining a crime problem. It was suggested that there should be more precision in establishing norms of crime trends and when deviation from the norm signifies a legitimate problem.[306] Another criticism was that there was not enough follow-up information on problems once they were initially identified.[307]

b) Timeliness. This issue is closely related to the one above. Information delivered about a three week-old crime pattern may be about two weeks outdated. In Dallas, three days was considered too long to wait for informational support of tactical deployment of special units (preparation and dissemination of the information took up about one day of the three).[308] Generally, the dissemination process is not the major source of delay. A more likely cause is the processing and analysis and arrangement of the reports into weekly, monthly or yearly summaries.

c) Interpretation. Are the reports or maps presented in such a manner or with appropriate explanation so that users may easily discern the needed information? A major goal of the second

year of the Seaside, California, anti-burglary program was to pr - vide "simplification of data interpretation and the subsequen decision-making process. Previously, the computer output of prediction information created difficulties for the patrolmen because of the time and trouble involved in decoding the output sheets.[310] Now, the data are read from the machine in direct natural language. A complaint of users of the Oakland crime analysis output was that reports were too numerous and addressed too many topics and tended to overwhelm the users with too much information.[311]

Although the factors described above may contribute to the refusal to use the information, there may be other uncontrollable ones influencing the issue. There may be an attitudinal set resisting the replacement of the common sense subjective judgment type of analysis and decision-making by the scientific approach. Most organizations at one level or another are beset by a reflexive opposition to any new or innovative way of doing things.

Another type of factor limiting but not completely eliminating the use of crime analysis was described in the Oakland crime analysis study. At the time of the study, district sergeants were responsible for patrol deployment.[312] However, it was found that the sergeants made sparse usage of the crime analysis unit's output. As to why this might be, it was surmised that:

> The answer might be that even with the most precise information about recent crime incidence, what deployment action to take is not always clear. For example, a spurt in the incidence of robberies in a particular beat does not necessarily imply a need for a concentration of patrol activity in that beat, because such a concentration would mean giving less attention to other problems, and hence would involve a decision about priorities. District sergeants seem to have an understandable reluctance to decide on their own what the priorities should be in dealing with crime problems. Hence, in the absence of direction from above, they may decide that beyond making their men aware of the problems and encouraging them to be more vigilant, no further action should be taken.
>
> Moreover, the reluctance to make priority decisions seems to be shared by the captains and lieutenants. The general feeling seems to be that except for unusually obvious problems . . . Patrol Division is responsible for dealing with all crime, and is not free, on its own, to decide to concentrate on one problem at the expense of attention to others. Unless specific direction about priorities comes from above, the Patrol supervisors may very well feel that there is little point in researching crime problems in great detail, because there is nothing they can do about a particular problem anyway. Hence, CAU information sources go unused.[313]

Thus, a significant issue has been raised about the way crime analysis is affected by the allocation of responsibility within the department, one that cannot be resolved without changing basic attitudes, goals and organizational relationships.

Another factor hypothesized as a reason for reluctance to use crime analysis information was the absence of any means of judging the success of an operation based on such information.[314]

Mentioned above and discussed throughout the report are factors both internal and external to the crime analysis

operation which influence its success as a police function support tool. Certainly dissemination -- the three key issues being content, means of dissemination and user response -- is critical to judging the worth of the crime analysis effort. The literature provides a guide to the first two issues but little attention is paid to the third, which is the essential factor in justifying the continuation and promotion of crime analysis as a police tool. There does not seem to be very much concern within most police departments, however, as to how crime analysis is used, or, if it is not used, why.

Although the issues of timeliness, relevancy and interpretation place inherent limitations on the outputs of crime analysis, there are other variables that also affect the usage of crime analysis information. The management style of a department is important in its influence on the latitude permitted for making decisions in deployment at various levels of the department. In the traditional patrol setting, with fixed beats and constraints on movement of personnel, supervisors may not be permitted to deploy patrol officers in an optimum manner to deal with obvious crime patterns. Priorities set at the highest levels will influence the choice of problem targets, sometimes quite independent of the problems indicated by the analysis effort.

FOOTNOTES

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5. Buck, George A., project director, The Police Crime Analysis Unit Handbook. Prescriptive Package. November 1973: Law Enforcement Assistance Administration, National Institute of Law Enforcement and Criminal Justice, U.S. Department of Justice, Washington, D.C., p. 9.

6. Diggles, Walter J., Police Planning and Analysis Office. January 19, 1973: College of William and Mary, Metropolitan Criminal Justice Center, Williamsburg, Virginia, p. 13. The monograph also discusses the staffing requirements, job descriptions and task requirements. Pages 44-46 set forth a budget including salaries, office equipment, operating expenses and professional services.

7. Galvin, Raymond T., project director, "Organizing and Staffing the Planning Process." Training Bulletins for Planning and Research Units in Medium-Sized Police Departments by Michigan State University, School of Police Administration and Public Safety. September 1968: Law Enforcement Assistance Administration, U.S. Department of Justice, Washington, D.C., p. 5.

8. Kansas City, Missouri Police Department, Directed Patrol Concept, Phase One Development. May 1975: Kansas City, Missouri, p. II-16.

9. Denver, Colorado Police Department, Crime Analysis Section. January 1972: Research and Development Bureau, Denver, Colorado, p. 36.

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16. Buck, op. cit., pp. 13-14.

17. Ibid., p. 11.

18. Denver, Colorado Police Department, op. cit., p. 37.

19. Information obtained during a telephone interview with Fred Newton from the Pueblo, Colorado Police Department on June 3, 1975.

20. Dallas, Texas Police Department and the System Development Corporation, op. cit., Appendix A, p. 2.

21. Anderson, Dale W., et al., Seaside Police Department Crime Prevention Program, Phase One/Burglary, 1972-1973. Annual Report. Undated. Seaside, California Police Department, Seaside, California, p. 2.

22. Phoenix, Arizona Police Department, District Crime Prevention Crime Application for Action Grant. January 1974: Phoenix, Arizona.

23. Information obtained from a personal interview with

Captain Townes of the Birmingham, Alabama Police Department on June 19, 1975.

24. Colton, Kent W., Use of Computers by Police: Patterns of Success and Failure. Reprint from Urban Data Service, Vol. 4, No. 4, April 1972. 1973: Operations Research Center, Cambridge, Massachusetts, n.p.

25. Wilson and McLaren, op. cit., pp. 171-172.

26. Ibid., p. 170.

27. Dallas, Texas Police Department and the System Development Corporation, op. cit.

28. Ibid., p. 1-1.

29. Hall, Earle E. and Jack F. Chappell, "Man-machine Systems to Aid in the Apprehension of Career Criminals." Law Enforcement Science & Technology II, edited by S. I. Cohn. Proceedings of the Second National Symposium on Law Enforcement Science & Technology. 1968: IIT Research Institute, pp. 477-488; and Cornell Aeronautical Laboratory, Inc., The Use of Computer-Based Modus Operandi Data Systems (MODS). October 1970: Buffalo, New York, p. vii.

30. Cornell Aeronautical Laboratory, Inc., loc. cit.

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36. See Datz, David, The Crime Analysis Unit's Contribution to Field Operations. June 22, 1973: MAPS Study Team, Oakland, California, pp. 15-18 for a discussion of field officer relunctance to use crime analysis information in deploying forces.

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Health, Center for Studies of Crime and Delinquency, pp. 90-91, for a discussion of the way in which an individual officer uses knowledge about his beat area and its inhabitants.

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64. Parks, Roger B., "Complementary Measures of Police Performance." Workshop in Political Theory and Policy Analysis, Department of Political Science, Indiana University, Bloomington, Indiana, 1974, p. 11, regarding the implications of behavioral biases toward scoring well, particularly when measures are self-reported.

65. See for example Wilson and McLaren, op. cit., p. 364. and Appendix J, pp. 666-688; and Chapman, op. cit., p. 292; and Walton, Frank E., "Selective Distribution of Police Patrol Force." In Chapman, op. cit., pp. 296-314.

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80. Bennett and DuBois, op. cit., p. 16.

81. Stein, Donald P., Jan-Louise Crawshaw and James C. Herron, "Crime Prediction by Computer--Does it Work and Is It Useful?" Law Enforcement Science and Technology II, edited by S. I. Cohn. Proceedings of the Second National Symposium on Law Enforcement Science and Technology. 1968: IIT Research Institute, pp. 543-549.

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102. See U.S. Department of Justice (January 1974), op. cit., for UCR classification definitions and procedures.

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128. Colton (October 1974), op. cit., p. 27.

129. Denver, Colorado Police Department, op. cit., p. 8.

130. Kupersmith, op. cit., p. 234.

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173. Ibid., p. 667.

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175. Ibid.

176. Ibid. "Previous experience has shown that about one-third of an officer's time on shift should be allocated to protect against the tendency for cases to occur in groups rather than to be spaced equitably throughout the tour of duty. An additional one-third of an officer's time should be available for repressive patrol activity, and the remaining one-third should be available to handle calls-for-services." McLaren, op. cit., p. 11.

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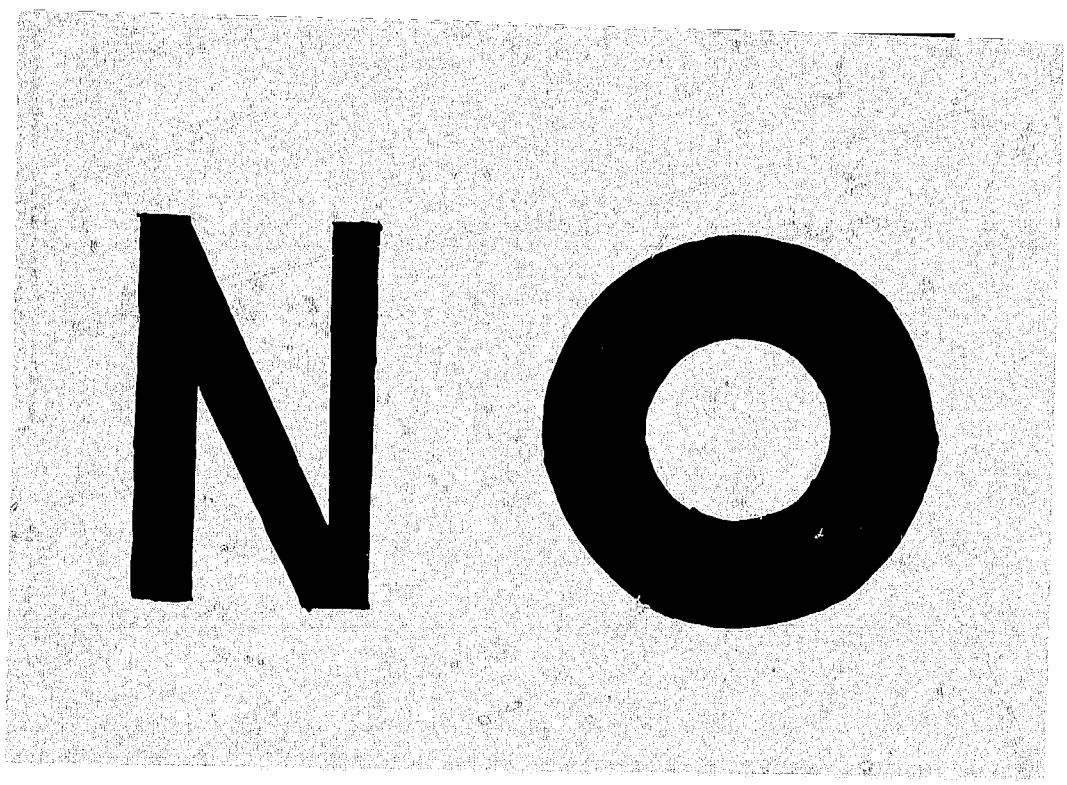
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