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KANSAS CITY ASAP
SECTION I

Analytic Study 3:
An Analysis of ASAP Patrol Activity

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Midwest Research Institute
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Kansas City, Mo. 64110

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FINAL REPORT

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ACQUISITIONS

METRIC CONVERSION FACTORS

Approximate Conversions to Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
		LENGTH		
in	inches	*2.5	centimeters	cm
ft	feet	30	centimeters	cm
yd	yards	0.9	meters	m
mi	miles	1.6	kilometers	km
		AREA		
in^2	square inches	6.5	square centimeters	cm^2
ft^2	square feet	0.09	square meters	m^2
yd^2	square yards	0.8	square meters	m^2
mi^2	square miles	2.6	square kilometers	km^2
	acres	0.4	hectares	ha
		MASS (weight)		
oz	ounces	28	grams	g
lb	pounds	0.45	kilograms	kg
	short tons (2000 lb)	0.9	tonnes	t
		VOLUME		
tsp	teaspoons	5	milliliters	ml
Tbsp	tablespoons	15	milliliters	ml
fl oz	fluid ounces	30	milliliters	ml
c	cups	0.24	liters	l
pt	pints	0.47	liters	l
qt	quarts	0.95	liters	l
gal	gallons	3.8	liters	l
ft^3	cubic feet	0.03	cubic meters	m^3
yd^3	cubic yards	0.76	cubic meters	m^3
		TEMPERATURE (exact)		
°F	Fahrenheit temperature	5 9 (after subtracting 32)	Celsius temperature	°C

Approximate Conversions from Metric Measures

Symbol	When You Know	Multiply by	To Find	Symbol
		LENGTH		
mm	millimeters	0.04	inches	in
cm	centimeters	0.4	inches	in
m	meters	3.3	feet	ft
m	meters	1.1	yards	yd
km	kilometers	0.6	miles	mi
		AREA		
cm^2	square centimeters	0.16	square inches	in^2
m^2	square meters	1.2	square yards	yd^2
km^2	square kilometers	0.4	square miles	mi^2
ha	hectares (10,000 m^2)	2.5	acres	
		MASS (weight)		
g	grams	0.035	ounces	oz
kg	kilograms	2.2	pounds	lb
t	tonnes (1000 kg)	1.1	short tons	
		VOLUME		
ml	milliliters	0.03	fluid ounces	fl oz
l	liters	2.1	pints	pt
l	liters	1.06	quarts	qt
l	liters	0.26	gallons	gal
m^3	cubic meters	35	cubic feet	ft^3
m^3	cubic meters	1.3	cubic yards	yd^3
		TEMPERATURE (exact)		
°C	Celsius temperature	9 5 (then add 32)	Fahrenheit temperature	°F

```
 °F
-40      0    32  40    80  98.6 120   160   212
 |---|---|---|---|---|---|---|---|---|---|---|
-40    -20    0     20   37 40    60    80   100
 °C                                         °C
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16. Abstract

This study concerns activities and impacts of the police in Kansas City, Missouri, regarding enforcement of laws pertaining to drinking and driving. Arrests more than doubled as a result of ASAP. A Special Alcohol Safety Patrol (SASP), although it comprised less than 1% of the police department, accounted directly for well over half the increase and, by example, caused the rest of the department's arrests to increase. By supplying a substantial caseload for other project activities, and by operating effectively and efficiently, the basic enforcement goals were satisfied. Patrol experiments aimed at increasing the apprehension of younger or more wealthy drivers were largely unsuccessful, mostly because the otherwise useful practice of "cooperative arrests" distorted certain data records used in planning and evaluating such experiments.

This report is one of a series of analytic studies. The others are: (1) An Analysis of Project Impact on Ultimate Performance Measures; (4) Impact on Traffic Safety System; (6) An Analysis of Diagnosis, Referral, Rehabilitation and Probation; and (7) Impact on Public Knowledge and Attitudes.

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This Analytic Study is a part of the final evaluation of the Kansas City Alcohol Safety Action Project. The series of studies evaluates the major aspects of the Kansas City ASAP over its 5-year existence, with emphasis on the most recent year, 1976. This is Part 3 of the report, and focuses on the activities of the Special Alcohol Safety Patrol (SASP) and its interactions with the rest of the Kansas City, Missouri, Police Department and other agencies.

The author has been privileged throughout the course of the project to meet and work with many members of the Kansas City, Missouri, Police Department. I am pleased to acknowledge the persons who have been most helpful during the last 6 years, together with their position within the department at the time of our interaction. (Police departments have a way of rotating assignments!)

> Clarence M. Kelly, Chief of Police
> Joseph McNamara, Chief of Police
> Marvin VanKirk, Chief of Police
> Major Francis Tye, Commander, Traffic Division
> Major William Moulder, Commander, Traffic Division
> Captain Robert Rennau
> Captain Walter White
> Captain Robert McKinney
> Sergeant John Weddle, SASP
> Sergeant Lee Bowen

The 10 police officers, who each took an active role in helping to reduce drunk driving in Kansas City.

The author is also pleased and proud to have been able to work with several colleagues, past and present, in the course of the project. Michael C. Sharp has been a stalwart assistant to the author in all matters of data reduction and statistical analysis. Rosemary Moran has been involved continuously in data compilation, tabulation, and analysis. Earlier

in the project, James P. Foley and, before him, Dr. George A. Beitel were extremely actively engaged in the evaluation activities relevant to enforcement. The contributions of all these people form a part of this report.

Approved for:

MIDWEST RESEARCH INSTITUTE

Bruce W. Macy, Director
Economics and Management Science Division

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CHAPTER I

INTRODUCTION AND OBJECTIVES

The enforcement countermeasure provides the first and most visible step in the system of the Kansas City Alcohol Safety Action Project (ASAP), as it does for all ASAPs. Without the detection and arrest of drunk drivers no rehabilitation agency would have clients, and in all likelihood, more people would drive under the influence because of a lack of deterrence. Thus, because enforcement plays such a pivotal role in the project, an analysis of this activity is beneficial in assessing current efforts and evaluating their effects.

The enforcement of laws pertaining to drinking and driving is, of course, a duty of all police officers. To put special emphasis on this duty, the Kansas City ASAP organized and supported a special police unit within the Kansas City, Missouri, Police Department (KCMOPD) entitled the Special Alcohol Safety Patrol (SASP). The objective of the SASP, as stated in the Kansas City ASAP Detailed Project Plan[1]/ is:

> "Increased arrest of drinking drivers, [with] special
> emphasis on problem drinkers."

This Analytic Study addresses the attainment of that objective, together with a number of subsidiary objectives and questions.

The subsidiary questions deal with the means of achieving the stated objective and specific matters of importance to enforcement activities in general, as well as to how they relate to the overall ASAP system.[2]/ Most of these questions were not yet formally posed at the outset of the ASAP; rather, they evolved through interactions between the SASP, the rest of the KCMOPD, ASAP management, ASAP evaluation, and the National Highway Traffic Safety Administration (NHTSA). The following illustrate the types of subsidiary questions considered in this study:

- What effort was expended in special enforcement, as measured by man-hours, vehicle miles, dollars, etc.?

- How efficiently was the effort expended, as indicated by arrests and other enforcement activities, and their distributions by time of day and day of week?

- How effective were the enforcement efforts in arresting the target population (problem drinker drivers)?

1

● How effective were the arrest efforts in providing clients for the ASAP system?

● How beneficial was the provision of special equipment or knowledge?

● What lessons were learned that could be applied to similar efforts in other communities?

To place this study in proper perspective, it is instructive to indicate areas that, for various reasons, are _not_ considered here. In contrast to many demonstration programs, the enforcement element of ASAP, although a fundamental component, is not the only element. The overall purpose of ASAP was conceived initially, and considered so throughout the project duration, as being served only through a coordinated team approach involving enforcement, prosecution, adjudication, investigation, referral, treatment, follow-up, record keeping, public information and education, project management, and evaluation. Because of this team approach it is impossible to credit any one element, such as enforcement, with the achievements of the overall project (although, as indicated earlier, the contributions of enforcement to the team effort can be measured).

Therefore, this study does not emphasize a number of measures that are more properly related to the total project impact; they are treated elsewhere.[2] Measures related to accidents and accident reduction, alcohol involvement in accidents, alcohol usage by drivers at risk,* public attitudes and knowledge, public awareness of ASAP, etc., are not the subject of this study.

Of course, it can be argued that subsets of some of the above measures might be suitably addressed as being indicative of enforcement effectiveness. For example, reductions in accidents during the time periods of SASP patrolling,** or in areas where SASP patrols, could under some situations be properly associated with SASP effectiveness. However, the Kansas City ASAP policies on SASP patrol (citywide, at night, every night, low profile) are not conducive to differential analysis. The project

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*   Drivers on the streets at times and places that crashes occur, and therefore drivers who presumably are exposed to the same hazards and risks as those actually involved in crashes.

**   Summary accident statistics are tabulated in Appendix B for the interested reader. Analysis of these data are in another report.[2]

target--drunk driving--occurs citywide, mostly at night, and approximately uniformly throughout the week. Thus, any reductions observed in nighttime accidents, or alcohol-related accidents, cannot properly be credited solely to the special enforcement unit.

The low profile characteristic further constrains the scope of the analytic investigation. The SASP, officers comprising less than 0.7% of the authorized strength of the KCMOPD, drive only unmarked vehicles. They patrol citywide and are not supported by auxiliary units such as mobile testing and booking vans used by some communities. They are not even noticed by most of the motoring public. Therefore, their presence on the street is not a plausible deterrent to traffic violations, accidents, or street crimes.

The SASP had a well-defined objective. Their purpose was to arrest drunk drivers, thereby accomplishing the first step in the ASAP process. This Analytic Study focuses on their activities and achievements pursuant to that purpose. Any other possible effects must be considered secondary and serendipitous, and any suggestions of a cause/effect relationship would surely be highly implausible to the sophisticated reader.

That vigorous enforcement is a necessary part of a program to reduce drunk driving is not doubted, although of course, it is not enough by itself.[6] Clearly, most drunk driving goes undetected. It has been estimated that there may be as many as 16,000 miles of impaired driving[7] for each DUI arrest. Borkenstein[8] estimated the chances of being arrested for driving drunk as 1 in 2,000. More recently, Beitel et al.[9] determined that the odds could be increased to about 1 in 200 by an ASAP patrol. This Analytic Study focuses on the enforcement emphasis in Kansas City.

Chapter II of this study describes the organization of SASP, their patrol policies, arrest procedures, and other operational matters. Chapter III briefly describes the methodologies used in this Analytic Study, treating each major area of analysis separately. Chapter IV presents the results of these analyses, in the same order as the methodologies are given in Chapter III. Chapter V discusses these results both separately and in toto, drawing conclusions as to the individual and overall findings. Finally, Chapter VI presents a few recommendations suggested for this or other communities, which should help in increasing the effectiveness of a similar special patrol. Appendix A contains details of the development of a special patrol experiment conducted during the last 3 months of 1976. Appendix B presents tabulated accident data by type and time of day.

CHAPTER II

BACKGROUND

The Kansas City, Missouri, Police Department has an authorized strength of 1,300 officers, but budgetary limitations kept the actual level closer to 1,200. Of these about 666 were assigned to the District (nontraffic) Patrol and 107 were assigned to the Traffic Division. These are the two divisions whose officers make nearly all of the DUI arrests. The Traffic Division has a Traffic Specialist Unit that contains the Hit and Run Section, the Accident Investigation Section, and the Special Alcohol Safety Patrol (SASP) Section (see Figure 1). Although all police officers are charged with enforcing all laws, the drunk driving laws are the special concern of SASP. Officers in the Accident Investigation Unit and the District Patrol also place special emphasis on such violations.
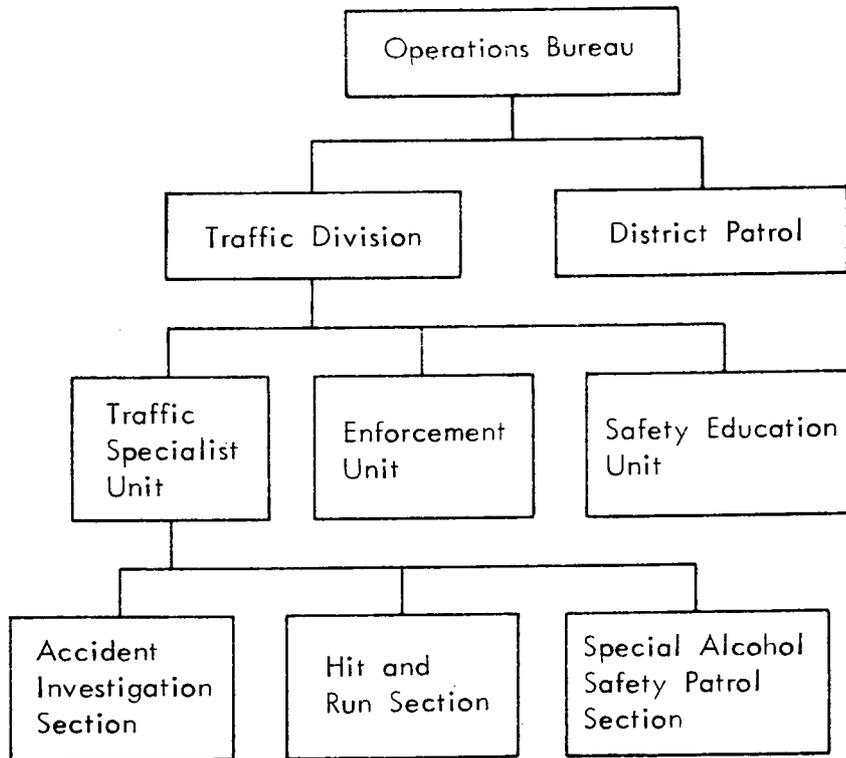
Figure 1 - Police Department Organization

The SASP section was initiated in 1972 by ASAP. Originally consisting of three patrolmen and a field sergeant, the unit grew in 1972 to six patrolmen and the field sergeant. A police department desk sergeant was also assigned to the unit, and in December 1975, another patrolman was added to the unit. Thus, at the end of the project, SASP included seven patrolmen, a field sergeant, and a desk sergeant. The financial support for this unit was divided nearly equally between ASAP (NHTSA) and the KCMOPD. The unit continued in operation after cessation of the federally funded ASAP, supported by state and local monies.

The function of the Special Alcohol Safety Patrol is to patrol for and arrest drunk drivers, and the patrol has been very successful in limiting its activities to this specific function. In the following presentation, the patrol practices and policies are discussed first, followed by a brief review of the arrest procedure. Next a special briefing program is described, followed by a discussion of the concept of cooperative arrests and other extra duties carried out by the SASP officers.

A. Patrol Duties

SASP utilizes one-man, unmarked cars exclusively. Patrol activities tend to emphasize the higher trafficked areas, and areas with higher crash rates. Subject to command planning and approval, each officer patrols independently. He maintains contact with the dispatcher as to his general location from time to time, and tends to patrol those parts of the city with which he is most familiar.

The SASP officers have no other routine functions other than to patrol for drunk drivers, to carry out arrests of those suspected of DUI, and to present testimony regarding those arrests in court. Only rarely do they take part in other law enforcement duties, and then only under special situations, such as when a fellow officer needs immediate assistance, or when they happen upon the scene of an accident or a crime in progress. Only in rare situations do they respond to the scene of reported accidents or crimes.

Usually, patrolling for drunk drivers is done moving with or slightly slower than the traffic flow on major streets. From time to time, an officer will observe traffic flow from a stationary position such as a side street. There is a tendency for the SASP officers to patrol more frequently in areas of higher traffic density or those containing concentrations of restaurants, bars, and other places where drinking followed by driving is suspected to be more prevalent.

B. Arrest Procedures

Almost all DUI arrests occur in conjunction with some other moving violation citation. It is departmental policy that the suspect be arrested for the violation that gave the officer probable cause to stop the vehicle. Commonly, the original citation is for careless driving, but more specific charges such as stop sign violations, driving left of center, improper turning, etc., are quite frequent. Interrogation also leads to charges of driving without a valid operator's license on many occasions.

The normal procedures followed after making the stop are briefly as follows. First, through the police computerized data system, a license check is made concerning the vehicle and the driver. This procedure occasionally turns up stolen vehicles, persons wanted in other connections, persons presently on ASAP probation, or persons with suspended or revoked licenses. Then, if the officer suspects the driver has been drinking, he will solicit his cooperation in the conduct of field sobriety tests. The tests used most frequently are walking heel to toe, touching the index finger to the nose with the eyes closed, picking up coins from the pavement, and a visual examination of pupil dilation. These tests, in conjunction with the officer's impressions of the speech and conduct of the suspect, will lead the officer to decide whether or not the suspect should be placed under arrest for DUI. No alcohol screening devices or mobile test vans are used in Kansas City, so the officer has no accurate knowledge of the suspect's blood alcohol concentration (BAC) at the time of arrest.

At this point the suspect is informed that he is under arrest for driving under the influence of intoxicating liquor,* he is advised of his rights, and the ticket is written. If there is a sober passenger available, and the driver gives his permission, his vehicle is turned over to the passenger. Otherwise, a city tow truck is called to impound the vehicle. The arresting officer usually waits at the scene for the tow truck, but on occasion may call in a district officer if it appears there will be a substantial delay, so that the arrested driver may be taken to a district station within a reasonable time.

The SASP officer usually drives the suspect either to the main police station or, oftentimes, to a more convenient district station. (On rare occasions a "paddy wagon" will be called upon if the suspect is hostile

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* Beginning September 1975, a _per se_ law became effective in Missouri, making it illegal to be operating a motor vehicle when one's BAC was 0.10 or more. The arrest policy was not changed; drivers were usually charged with the more serious DUI, leaving it to the prosecutor to consider reducing the DUI charges to _per se_.

or resisting arrest.) At the station, the driver is again advised of his rights (implied consent law, right to attorney, etc.). The driver is then asked to take a breath test. Stephenson Breathalyzers are used in Kansas City, and all SASP officers are state-qualified operators. In addition to the breath test, additional sobriety tests similar to those given in the field may be administered at the station. At this time, the arresting officer also completes an Alcoholic Influence Report Form, a copy of which is attached as Appendix A.

Finally, the driver is turned over to the detention unit. There, bonding arrangements are explained and the driver is given the opportunity to contact a friend, relative, or bondsman. If he cannot meet the bonding requirements (typically, $125 cash, or a bondsman fee of 15% of that amount), he is detained until the following morning, at which time he will appear in court. If he makes bond, his court appearance will be 15 to 45 days later, following the court docketing procedures that schedule cases so as to mini-mize officer court time. (All such time is overtime for SASP officers, as court sessions are not held at night during their duty hours.)

C. Briefings

As stated earlier, district officers (as well as other officers) were also expected to be active in enforcing drunk driving laws. The entire KCMOPD was made aware of ASAP and SASP at the beginning of the project, hoping to augment the enforcement efforts of the SASP.

At the beginning of 1975 a series of district officer briefings was instituted. These briefings were conducted by the ASAP officers at the district stations during their roll calls. They were initiated be-cause of the large decrease in district officer DUI arrests in 1974.

The briefings, extending over 4 months, presented information in a sequential fashion. They covered topics such as the problem of the drunk driver, how to recognize drunk drivers, and how to carry out the arrest procedures. District officers were also encouraged to contact an ASAP officer in the event that assistance was required. A total of 100 briefings was presented during the 4 months, 10 per month in the central district, 8 per month in the south district, and 7 per month in the east district.

D. Cooperative Arrests

Cooperative arrests--arrests in which a SASP officer works coop-eratively with a district officer in making a DUI arrest, usually by pro-cessing a subject initially stopped by the district officer--constitute an

unknown portion of the total DUI arrests. The proportion was initially
estimated informally at 10 to 20%. However, records of this practice
were not routinely kept.

E. Other Activities

On only one brief occasion during the 5 years of ASAP operations
in Kansas City were the SASP officers called upon to perform a function not
related to ASAP.* However, from time to time they did participate in ASAP
duties other than patrolling for drunk driving. Conducting district offi-
cer briefings has already been mentioned. They also assisted periodically
in training functions at the police academy, to instruct in the operation
of breath-testing equipment and general enforcement of drunk driving laws.
SASP officers accepted public speaking engagements at times, or appeared
on radio and TV broadcasts. They also participated in project workshops
and seminars, as well as on programs in neighboring communities. Finally,
they gave valuable assistance to the evaluator in the annual ASAP roadside
surveys, by providing traffic control and related help. All of these activ-
ities together probably accounted for no more than 1% of the officers's
total time.

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* That situation was a citywide emergency occasioned by a local strike of
the fire-fighters union, in which for several days the police depart-
ment was called upon to fight fires as well as to carry out police
duties.

CHAPTER III

METHODOLOGY

A variety of approaches are employed in this Analytic Study, ranging from subjective observation to relatively sophisticated statistical techniques. The methods used are described below for the various topics treated in this study, in the order of their presentation in Chapter IV.

A. Citywide DUI Arrests

Arrests are tabulated and examined subjectively, in accordance with the arresting unit. The data sources consist of computerized and manual logs kept by the Kansas City, Missouri, Police Department, together with monthly reports prepared especially for the Kansas City ASAP by the Missouri Highway Patrol.

B. SASP Performance

The key performance measures are tabulated and discussed in this section. The data are taken from special monthly reports prepared for the Kansas City ASAP by the Kansas City, Missouri, Police Department, Special Alcohol Safety Patrol (SASP).

C. Performance by Day of Week and Time of Day

The data presented here are taken from the "Appendix H"* tables. Chi-square analyses are employed to determine the significance of certain differences between time-of-day and day-of-week distributions of arrests and crashes.

D. Blood Alcohol Concentration

The blood alcohol concentration (BAC) data are taken from the "Appendix H" tables. Distributions are compared using both Kolgomorov-Smirnov and Chi-square tests. In addition, an analysis of variance was

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* These tables of ASAP statistics were provided to NHTSA on a regular basis, usually in separately bound volumes.

performed using years and arresting unit as independent variables. A linear regression analysis was applied to the total set of arrest BAC's to determine the time trend.

E. Breath Test Refusal Rates

The data analyzed were taken from the "Appendix H" tables. An analysis of variance was used to examine differences in refusal rates from year to year.

F. Conviction Rates

Court disposition data were taken from the Kansas City, Missouri, Police Department computerized data files, as reported in the "Appendix H" tables. A linear regression analysis was used to determine and illustrate the significance of the change in the conviction rates with time.

G. Patrol Experiment

The details behind the planning and execution of a special patrol experiment in late 1976 are given in Appendix A.* The important points in this activity can be summarized as follows. In 1975, special data were kept for 7 months on the patrol activities and on the arrests of the officers in the Special Alcohol Safety Patrol. Particular attention was paid to the portion of the city (Zone) in which the patrols and arrests occurred. These data were then analyzed to determine the relative efficiency of patrolling in each zone, together with the profile characteristics of persons arrested in each zone. Using these data, a patrol strategy was developed aimed at increasing the arrest rate of higher income persons and to a lesser extent, younger persons while striving to maintain approximately the same overall arrest rate.

The experiment was then carried out over a 3-month period in 1976; and again, special logs were kept by each officer. The data were then reduced and presented in relationship to the anticipated results. Differences were tested for significance under the assumption that arrests are distributed Poisson.

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* Earlier experiments are analyzed elsewhere.[4/]

H. Performance Related to Cost

Cost data are taken from "Appendix H" tables, and costs per arrest are computed and presented in tabular format.

I. Videotape

The effectiveness of using videotape is summarized here, from analyses reported earlier.[5/] For the most part, the data were obtained from special files kept during the first 1 to 2 years of the project (1972-1973) when videotape was used fairly frequently. Chi-square tests were used to determine the significance of certain differences.

J. Interdivisional Cooperation

The data consist primarily of reports and observations provided by the KCMOPD, supplemented by a short period of special record keeping and by data from the special patrol experiment.

CHAPTER IV

RESULTS

A. Citywide DUI Arrests

Table 1 shows the yearly arrest data for driving under the influence of intoxicating liquors. The Kansas City, Missouri, Police Department more than doubled its DUI arrests in the first year of the project, from 2,463 in 1971 to 5,050 in 1972. The number of arrests increased an additional 10% in 1973, but experienced a decline in 1974 and another in 1975, to a rate of about 400 arrests per month. In 1976 the total arrest rate increased to its 1973 level, to 5,557, or about 463 per month. Overall, the DUI arrest rate has approximated two arrests per 100 licensed drivers per year--a level considered "high productivity" by NHTSA.[12]

TABLE 1

KANSAS CITY, MISSOURI DUI ARRESTS, BY UNIT

Source	1971	1972	1973	1974	1975	1976
KCMOPD						
SASP[a]	--	1,535	1,876	2,080	1,947	2,358
Accident-Related	962	1,357	1,314	1,190	1,211	1,183
Other KCMOPD	1,501	2,162	2,357	1,874	1,621	2,016
Subtotal	2,463	5,054	5,547	5,144	4,779	5,557
Highway Patrol						
Accident-Related	71	62	41	23	53	43
Other	118	89	70	85	179	245
Subtotal	189	151	111	108	232	288
Total	2,652	5,205	5,658	5,252	5,011	5,845

[a] Based on SASP records. Final computerized data base shows about 2% fewer; they are credited instead to "Other KCMOPD."

The DUI arrests occasioned by an accident increased substantially in 1972 over the rate in 1971, not because of an increase in accidents, but because of the increased police awareness of the possibility of alcohol involvement in accidents, and the willingness of the ASAP system to attempt to deal effectively with the persons arrested. The accident-related arrests dropped somewhat after the high rate in 1972, but remained above the pre-ASAP level during all 5 years of the project.

Arrests by the Special Alcohol Safety Patrol clearly accounted for a great deal of the increase in total arrests. About 60% of the increase during the first 2 years of the ASAP was contributed by the SASP officers. During the last 3 years, SASP officer arrests increased further so that in this period SASP arrests accounted for about 80% of the increase over the pre-ASAP level. These trends are portrayed in Figure 2. District officer arrests increased greatly in 1972 and 1973, and then declined in 1974 and again in 1975 to just above the pre-ASAP level. Their arrests increased, however, in 1976.

Figure 3 presents the 1976 monthly arrest data in comparison with those from 1975 and the 1972-1974 3-year average. The 1976 arrests were higher than those of 1975 for each of the 12 months, and they exceeded the prior 3-year average for 8 of the 12 months. During the last month of the project--December 1976--there were 572 DUI arrests, the highest monthly total ever recorded.

Missouri State Highway Patrol arrests within the city limits of Kansas City, Missouri, are also included in Table 1. These cases do not become part of the ASAP case load as they are normally processed through the state courts rather than the municipal courts. The Highway Patrol arrest rate increased substantially in 1975, and even further in 1976.

B. SASP Performance

Table 2 summarizes the activities and performance measures of the Special Alcohol Safety Patrol. The level of effort, measured by patrol hours and by mileage, dropped in 1975 because of the extended absence of one of the patrolmen during most of the first half of that year due to illness. The level of effort increased substantially in 1976, with the addition of one more police officer to the unit.

13
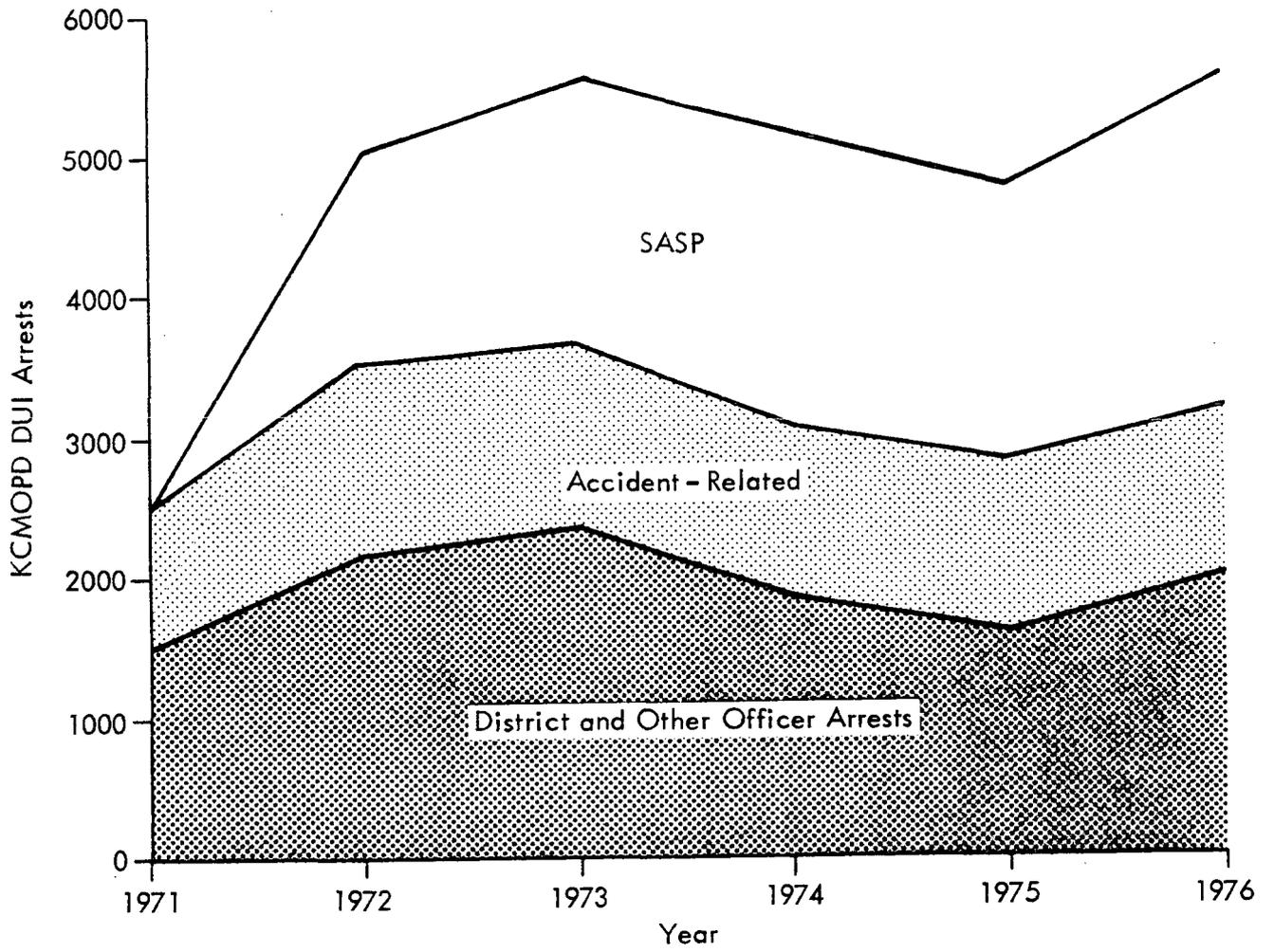
Figure 2 - Distribution of KCMOPD DUI Arrests
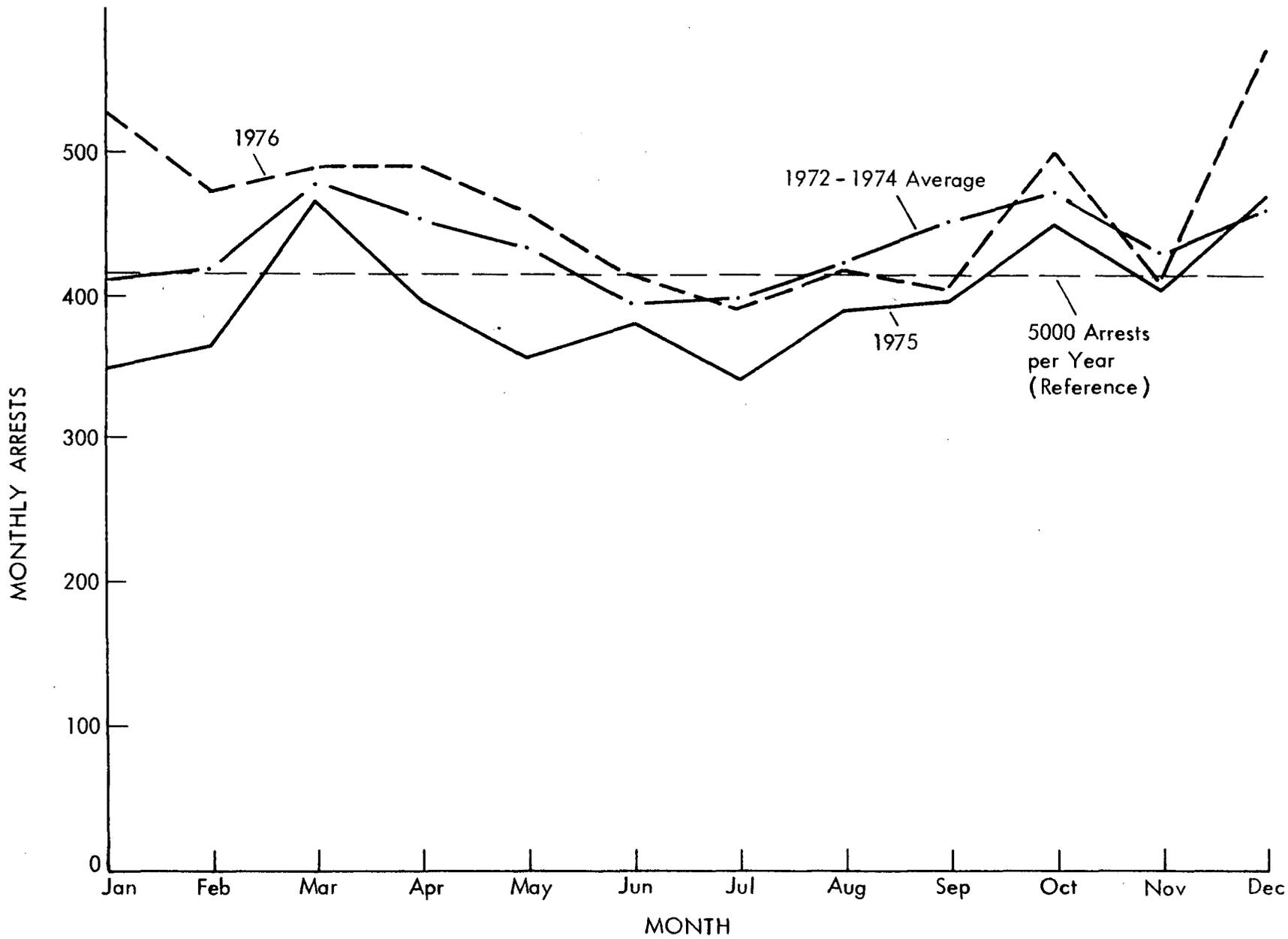
Figure 3 - Total Kansas City Arrests for DUI

TABLE 2

SASP PERFORMANCE MEASURES

Measure	1972	1973	1974	1975	1976
Patrol Hours (hr)	10,682	13,014	13,088	11,992	14,872
Mileage	102,959	135,586	123,423	102,961	169,161
Arrests					
DUI	1,535	1,876	2,080	1,947	2,358
Careless Driving	1,143	877	779	891	1,041
License, No Valid	279	280	224	219	220
Other	723	1,567	1,735	1,408	1,569
DUI Arrests per:					
Mile	0.015	0.014	0.017	0.019	0.014
Patrol Hour	0.144	0.144	0.159	0.162	0.159
Total Hour	0.115	0.125	0.139	0.133	0.133
Reports - Total	4,213	4,851	5,017	4,785	6,827
Vehicle Checks[a]/	3,553	5,238	3,111	2,847	3,543
Calls	183	420	333	272	56
Total Court Appearances	758	623	580	741	850
Overtime (hr)	375	136	93	255	164

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a/ Vehicle stopped, driver investigated, but no subsequent arrest is made.

The increase in patrol hours in 1976 was matched by a corresponding increase in DUI arrests by the SASP. The arrest rate of 0.159 arrests per patrol hour (one arrest for every 6.3 patrol hours) has been essentially constant over the last 3 years of the project. Likewise, the arrest rate measured in terms of total hours (including court time and overtime) has also remained uniform. The mileage arrests rate dropped somewhat in 1976. It was down substantially every month of the year, except January, in comparison with the corresponding month during the previous year. The mileage arrest rate was particularly low during the late spring, summer, and fall of 1976.

There is usually a moving violation arrest for each DUI arrest, and sometimes more than one. As seen on Table 2, there was an average of about 1.2 such moving violation arrests per DUI arrest most years, but the ratio dropped to 1.1 in 1976. (These figures do not include citations for driving without a valid license.)

C. Performance by Day of Week and Time of Day

SASP patrolled Monday through Saturday from 8 PM to 4 AM, and from 4 PM to midnight on Sunday. For purposes of this discussion, days are considered to begin and end at 4 AM, coinciding with most of the patrol activity.

Table 3 shows the patrol activity by day of week together with the arrests made and the daily arrest rate. These figures pertain to the patrol officers only and do not include the activities of the sergeants who, by policy, seldom make arrests. The patrol activity was relatively uniform throughout the weeknights, but dropped off somewhat on Saturday night, and further still on Sunday night. The arrest rate was highest on Friday and Saturday nights and lowest on Sunday nights.

TABLE 3

1976 SASP ACTIVITY BY DAY OF WEEK

Day of Week[a]	Patrolman Days[b]	DUI Arrests[c]	Arrests ÷ Patrolman Days
Monday	246	316	1.28
Tuesday	231	283	1.23
Wednesday	246	345	1.40
Thursday	260	367	1.41
Friday	255	485	1.90
Saturday	218	398	1.83
Sunday	165	119	0.72
Total	1,621	2,313	1.43

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a/ Time period extended to 4:00 AM of succeeding day to correspond to patrolled period.

b/ Data from officer's monthly reports.

c/ Data from "Appendix H," Table 8A.

The SASP arrests by day of week are compared with other DUI arrests and with nighttime accidents in Figure 4.* The arrest rate by SASP officers very closely resembles that of the other police officers, with the exception of Friday and Saturday nights. SASP officer arrests peak on Friday night and drop off on Saturday, whereas other officers' arrests reach their peak on Saturday night and are slightly lower on Friday night. SASP arrests tend to parallel injury crashes, except the latter are relatively more frequent on weekends. Alcohol-related fatal crashes are more difficult to compare because of their small number, but appear to be proportionately higher on Saturday than arrests, especially SASP arrests.

For this comparison, both 1975 and 1976 data were included because of the relatively small number of alcohol-related fatal crashes. Despite doubting the sample, the seemingly large fluctuations are not statistically significant. For example, the apparently high Wednesday rate (12 over the 2 years in question) is not significantly different from the only 5 or 6 on Monday, Tuesday, or Thursday. Nevertheless, nighttime alcohol-related fatal crashes appear to peak on Friday and Saturday nights, when nighttime injury crashes as well as DUI arrests also reach their peak.

The problem reflected by Saturday and Sunday activity is dealt with further in Figure 5. Although productions (arrests per patrolman day) was at a high level on Saturday, the amount of patrolling by SASP was slightly lower then than on any other day of the week except Sunday. The Sunday patrol activity was probably at a reasonable level relative to Sunday night injury and fatal crash frequency. The production rate of 0.72 arrests per patrolman day was substantially less on Sunday than on any other day of the week, although much greater than experienced in 1975 (0.28 arrests per patrolman day).

The problem of matching manpower to the days of the week in an effective manner has been addressed in the analytic studies for several years.$\underline{3,4/}$ The manpower allocation has changed over the last 3 years, as shown by Figure 6. Each year, there was a proportionately higher level of assignment on Friday and Saturday nights.

The time-of-day performance is shown in Figure 7, which contains the 1975 data reported previously.$\underline{4/}$ SASP operated on an 8 PM to 4 AM shift Monday through Saturday, and 4 PM until midnight on Sunday. The arrest figures---which are predominately in the 10 PM to 2 AM time period with a peak between 1 AM and 2 AM---reflect this concentration of effort. The

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* The accidents shown occurred between 8 PM and 4 AM (see Analytic Study 1$\underline{2/}$ for a more complete discussion of accident statistics by time of day, and Appendix B for accident data.)
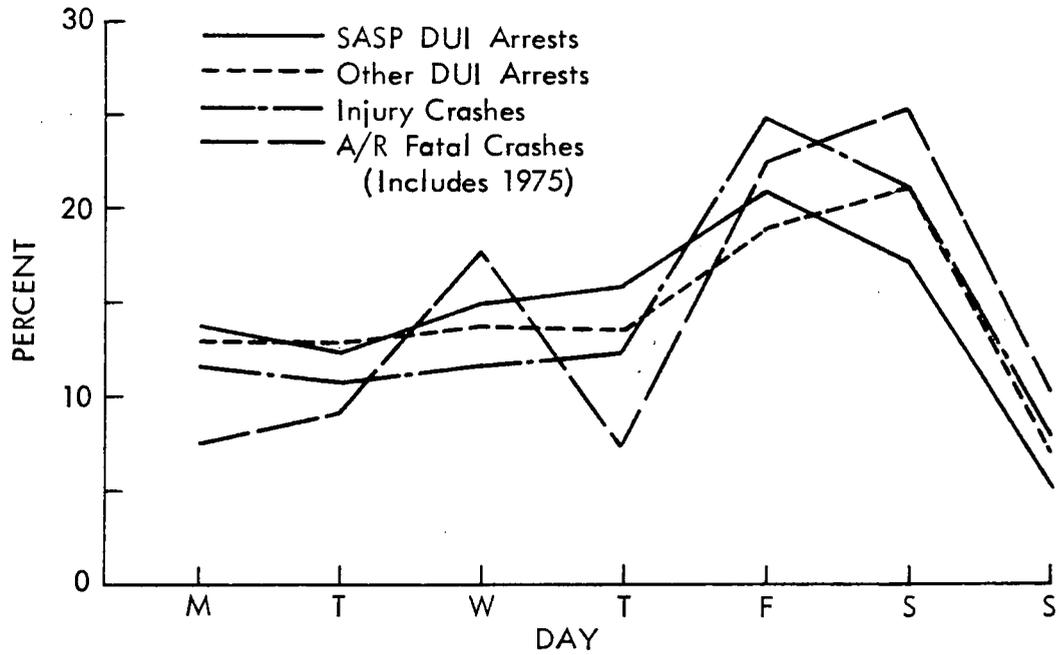
Figure 4 - Night (8 PM - 4 AM) Arrests and Accidents in 1976
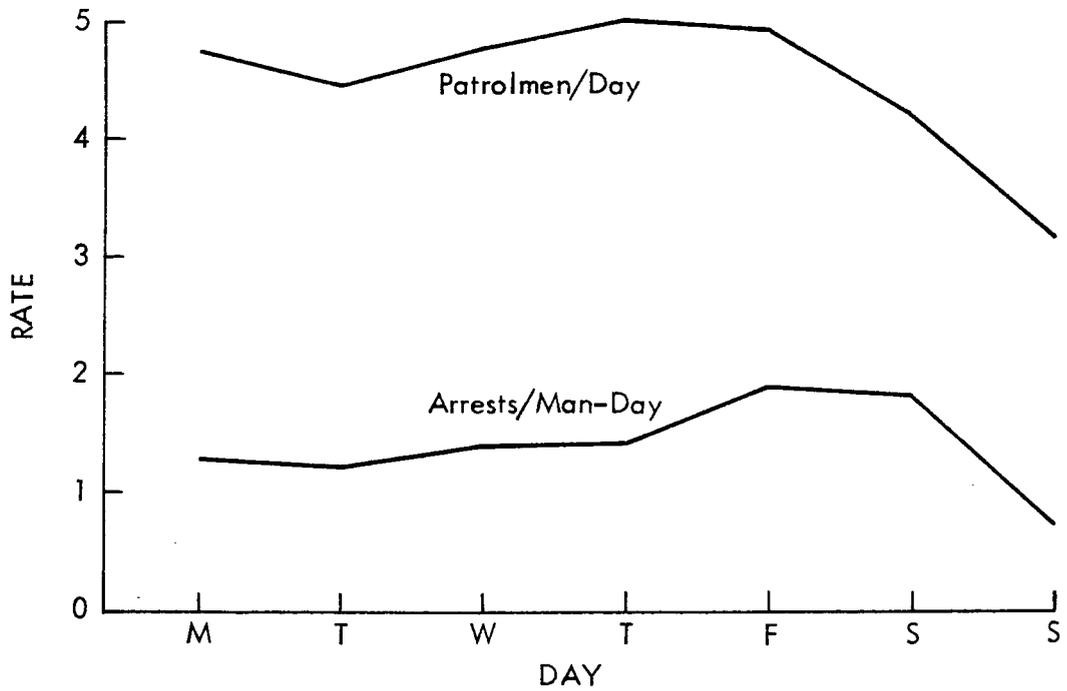
Figure 5 - SASP Activities by Day and Week

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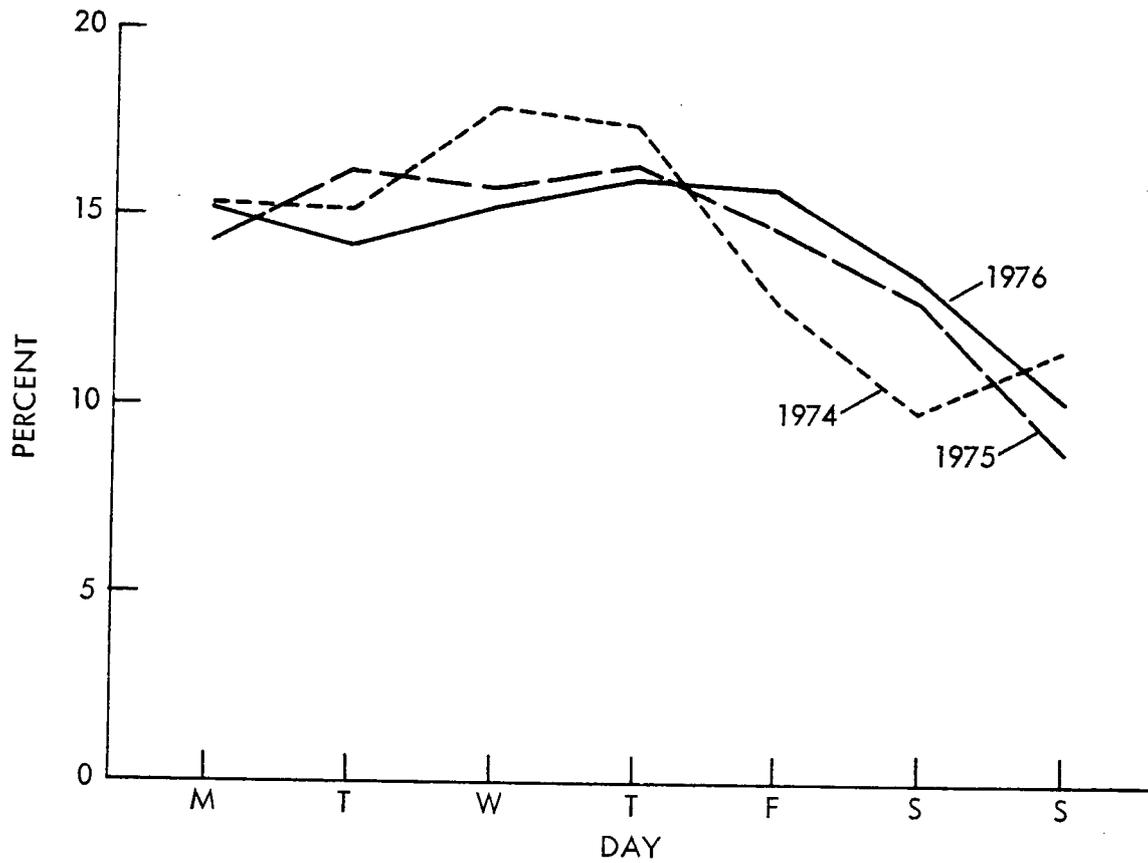
Figure 6 - SASP Manpower Assignment by Day of Week
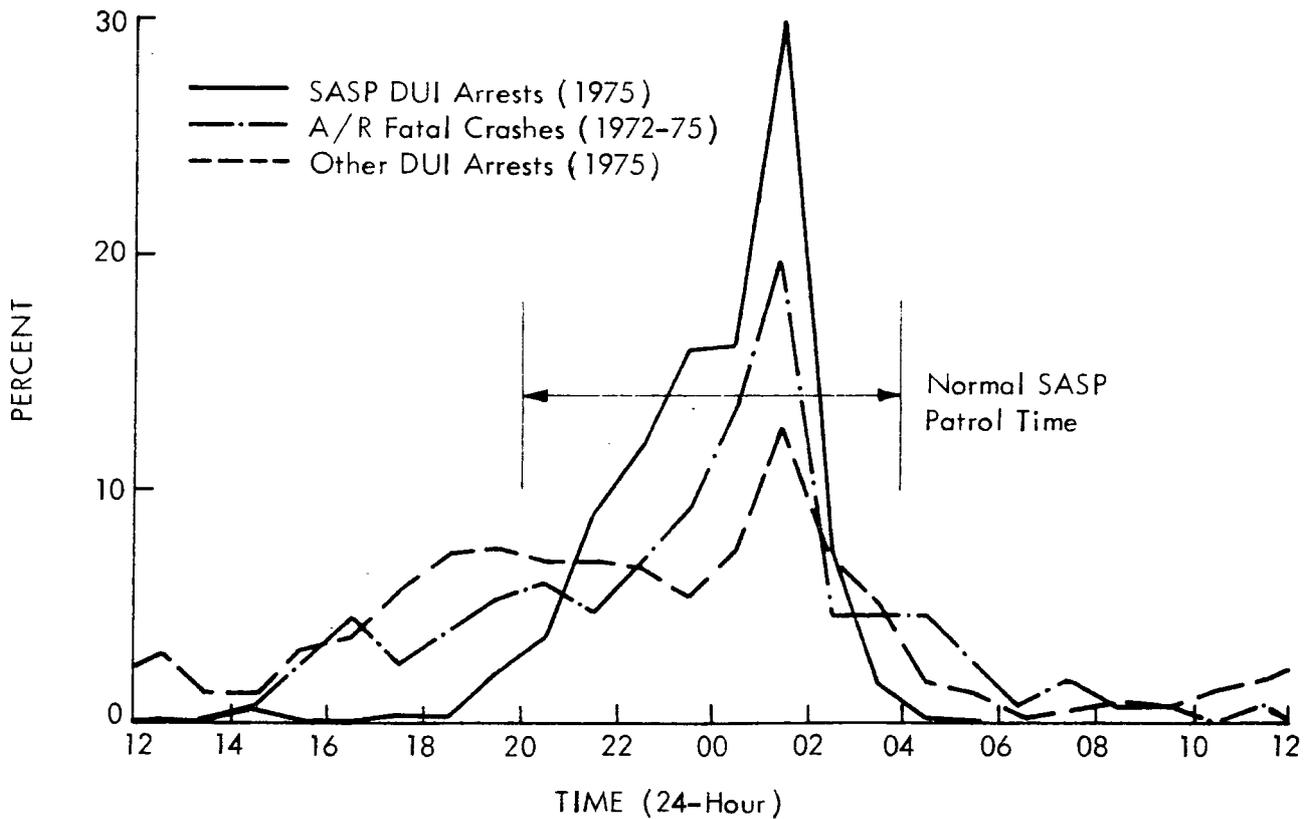
Figure 7 - Arrests by Time of Day

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few arrests before 8 PM are mostly attributed to the Sunday afternoon working hours. In addition, an occasional arrest was made while an officer was off duty.

Figure 7 also illustrates the distribution of the arrests by other officers, by time of day. The distribution of these arrests was more uniform, particularly during the late afternoon and early evening. Also shown in Figure 7 is the time distribution of all alcohol-related fatal crashes for the period 1972-1975. It exhibits a 3-hour peak from 11 PM through 2 AM but otherwise an essentially constant rate from 4 PM through 5 AM.

The hours of patrol by SASP were intended to coincide with the hours when drunk driving was most prevalent. Using alcohol-related fatal crashes as a guide to this prevalence, it appears that the patrol time was nearly optimum. A Chi-square analysis comparing the distribution of alcohol-related fatal crashes with the distribution of SASP DUI arrests over the 8-hour period, showed them to be different but not to a great extent $(x^2$ (7) = 14.2 $p \leq 0.05$). The difference is accounted for by the lower arrest rate during the first hour of duty when roll call and other functions occupy a portion of the patrolmen's time, and during the last hours of duty when paperwork, processing previously arrested drunk drivers, etc., occupy extra time. Other than for the first and last hours, the distributions did not differ $(x^2$ (5) = 1.9).

D. Blood Alcohol Concentration

The blood alcohol concentrations (BACs) of those arrested provide a means of examining enforcement effectiveness. The distributions of BACs in 1976 are shown in Table 4. The distribution of those arrested by SASP officers is more concentrated in the ranges 0.10 to 0.14 and 0.15 to 0.19, whereas the BACs of those arrested by other officers is skewed more to the higher values. The difference in the distributions is statistically significant based on a Chi-squared test (x^2 (4) = 100.54, p < 0.0001). The significant difference is also indicated by the Kolgomorov-Smirnov test (x^2 (2) = 46.77, p < 0.0001).

The differences in the distribution of BACs of persons arrested by SASP officers in 1976 and the distributions observed during the previous 2 years are shown in Figure 8. The shift to lower BACs in 1976 is significant, compared to the 1975 distribution (Kologmorov-Smirnov test, x^2 (2) = 13.90, p < 0.0001). Moreover, the 1975 distribution was significantly lower than the 1974 distribution according to a Kolgomorov-Smirnov test $(x^2$ (2) = 13.49, p < 0.005).
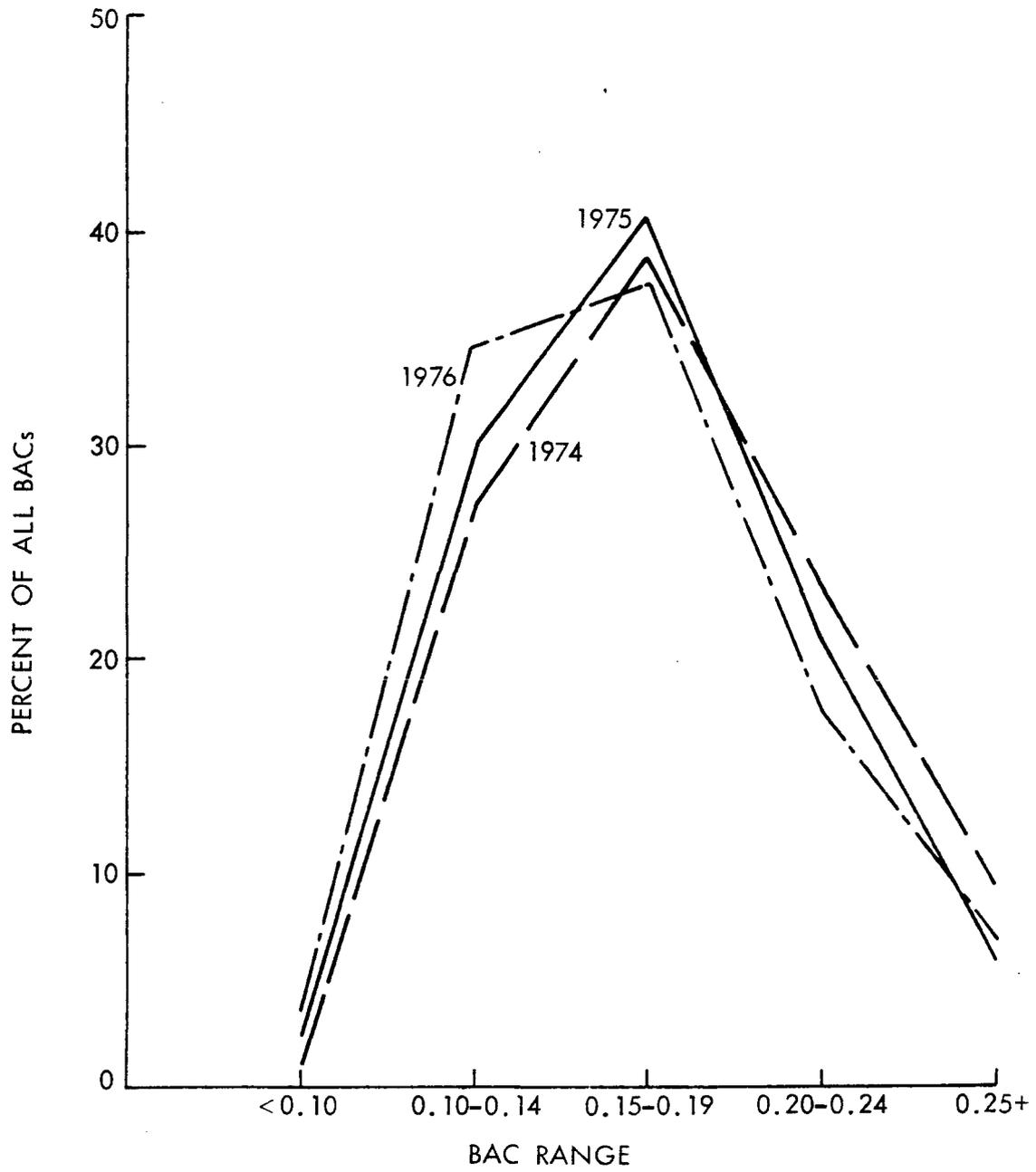
Figure 8 - Changing Distributions of BACs of Drivers Arrested by SASP

TABLE 4

BAC DISTRIBUTION BY ARRESTING UNIT IN 1976

BAC	ASAP	Non-ASAP
< 0.10	74 (3.61%)	150 (5.92%)
0.10 - 0.14	706 (34.47%)	628 (24.78%)
0.15 - 0.19	768 (37.50%)	880 (34.73%)
0.20 - 0.24	359 (17.53%)	552 (21.78%)
0.25+	141 (6.88%)	324 (12.79%)

The BAC data can also be compared from year to year and by arresting unit by examining the mean values. Table 5 contains these values together with the number of BACs making up each average for the years 1971 through 1976. The arrests are divided into three categories: SASP arrests, arrests resulting from a crash, and arrests not resulting from a crash but made by officers other than SASP. The data suggest that the average BAC has declined over the 6-year interval and that the mean BAC for SASP arrests tends to be less than the mean BAC for all other arrests. These observations were confirmed by an analysis of variance for the 5 years of SASP's existence, comparing SASP arrests with all other arrests. Analysis indicated a statistically significant year effect ($F_{(4,\infty)} = 3.76$, $p \leq 0.01$). It also indicated a statistically significant officer effect ($F_{(1,\infty)} = 6.94$, $p < 0.01$). The interaction between year and officer was only marginally significant ($F_{(4,\infty)} = 2.14$, $p \leq 0.10$).

Reference to Table 5 shows the overall average BAC declined each year from 1971 through 1975, but that it increased slightly in 1976. The Fischer Least Significant Difference for yearly averages is 0.043, so the declines from 1971 to 1972 and from 1974 to 1975 were statistically significant ($p \leq 0.05$). The other two yearly declines, and the increase in 1976, were not statistically significant. The 1976 increase came entirely from non-SASP arrests. (SASP arrests yielded a decreased average BAC.)

The decline in average BACs during the 5 years of the ASAP is shown graphically in Figure 9. The slope of linear regression indicates a decrease in average BAC of 0.00255 per year, with a standard error of 0.001845. Thus, the slope is significantly different from zero ($0.025 < p < 0.01$). Simply stated, the average BAC has decreased from 0.18 in 1972 to 0.17 in 1976.
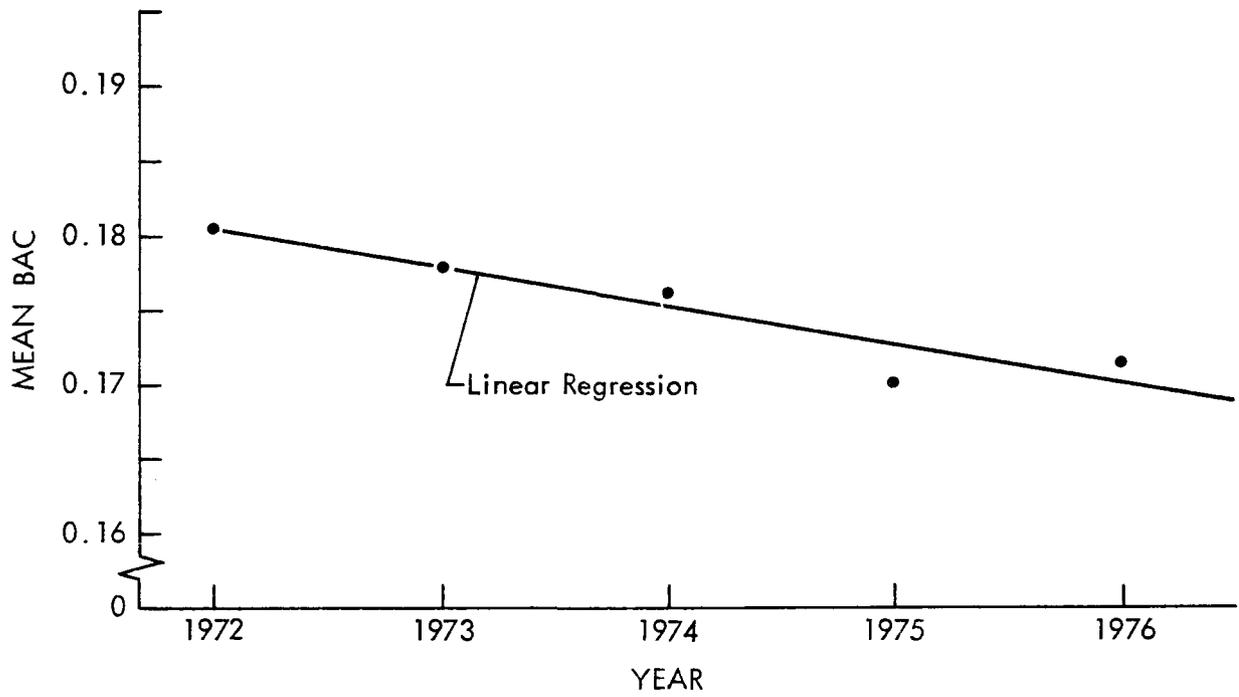
Figure 9 - Decline in Annual Average BAC

TABLE 5

BAC COMPARISONS, BY YEAR[a]

	1971	1972	1973	1974	1975	1976
SASP	-	0.173	0.178	0.177	0.169	0.165
	-	(1,258)	(1,600)	(1,823)	(1,661)	(2,048)
Crash-Involved	0.186	0.187	0.187	0.182	0.174	0.176
	(671)	(725)	(909)	(937)	(956)	(886)
Other	0.186	0.193	0.176	0.173	0.169	0.176
	(1,092)	(1,823)	(1,713)	(1,582)	(1,186)	(1,648)
Total	0.186	0.180	0.178	0.176	0.170	0.172
	(1,763)	(3,806)	(4,222)	(4,342)	(3,803)	(4,582)

a/ Each entry consists of the average BAC and, in parentheses, the sample size (number of BAC values taken and included in the average).

E. Breath Test Refusal Rates

        One objective of the police officers, after making an arrest, is to collect evidence for use in the courtroom. One of the most useful pieces of evidence for DUI arrest is the Blood Alcohol Concentration (BAC) which in Missouri is almost always determined from a breath test. Table 6 shows the extent to which the police department was successful in obtaining this evidence in 1976.

TABLE 6

BREATH TEST ACCEPTANCE IN 1976[a]

Source	Arrests	BACs	Percent
SASP	2,313	2,048	88.5
Other, No Crash	2,053	1,648	80.3
Property Damage Crash	830	616	74.2
Injury Crash	349	270	77.4

a/ Data taken from 1976 Appendix H, Tables 6 and 8, 1976.

Overall, SASP obtained BACs on nearly 89% of all persons arrested, compared with 80% obtained by other officers on arrests not involving a crash. The inability to obtain these data was slightly greater among arrests resulting from an accident.

The acceptance rates over the last 6 years are shown in Table 7. The differences in acceptance rates between sources that were observed in 1976 were observed the other years as well. That is, SASP always had the highest acceptance rate, and the acceptance was generally lowest among crash--involved drivers. There were significant changes in the acceptance rates from year to year. An analysis of variance of the total yearly figures resulted in $(F (5,\infty) = 9.28)$ which is significant $(p < 0.01)$. The increase from 1971 to 1972 was due in large part to the formation of the Special Alcohol Safety Patrol. Another large increase was observed between 1973 and 1974. This increase occurred for all four categories of arrest shown in Table 7. A statistically significant decrease in the acceptance rate happened in 1976, most notably among drivers involved in a property-damage-only crash and among drivers arrested by a SASP officer.

TABLE 7

PERCENTAGE OF BREATH TEST ACCEPTANCES

Source	1971	1972	1973	1974	1975	1976
SASP	-	83.9	85.3	90.9	93.6	88.5
Injury Crash	60.5	66.0	64.6	74.6	75.0	77.4
PDO Crash	67.2	72.8	71.3	80.8	80.9	74.2
Other	73.3	72.3	72.6	81.2	81.9	80.3
Total	70.1	75.4	76.2	84.5	85.9	82.6

Examination of the detailed officer logs kept by SASP indicated that the increased refusal rate in 1976 was not attributable to just a few officers; nearly all officers experienced this change.

F. Conviction Rates

The purpose of the enforcement element of ASAP is not simply to arrest drivers, but to make arrests of sufficient "quality" that the persons will be convicted by the courts, and thus provide a suitable caseload for other elements of ASAP. Presumably, higher conviction rates will result from arrests backed up by sufficient evidence.

In the Kansas City ASAP, arrested drivers stand to be convicted on any one of several charges. Subsequent referral to a treatment agency is generally independent of the charge on which the driver was convicted. Therefore, the important point is whether or not cases result in convictions (regardless of the charge). The data in Figure 10 represent the percentage of cases disposed each calendar quarter by means of an acquittal or dismissal of all charges (that is, there was no conviction). The linear regression line has a slope of -0.06% per quarter (about 1/4% per year) with a standard error of 0.0198. Thus, the downward trend is highly significant ($p < 0.005$). The "nonconviction rate" has declined from about 9-1/4% in 1971 to about 7-3/4% in 1976.

G. Patrol Experiment

The results of the 3-month patrol experiment are presented in Table 8. During this 3-month period, officers of the Special Alcohol Safety Patrol were assigned to the five zones of the city, according to the experimental design in Appendix A, between the hours of 10 PM and 2 AM on Thursday, Friday, and Saturday nights. Table 8 shows the number of arrests, the number of patrol hours, and the arrest rate (arrests per patrol hour) in each zone during the two 2-hour time blocks of 10 PM to midnight and midnight to 2 AM, together with various summarizations. Also shown in Table 8 are the comparable data obtained the previous year from normal patrol activities. These earlier data were used as the basis of the experimental design. The major findings incorporated in Table 8 and in the report logs from which the table was assembled are presented in the next several paragraphs.

The apportionment of patrol time by zone is shown in Figure 11, and compared to the experimental plan. (The plan envisioned 25% of the patrol time being accumulated in zone 1, zone 2, zone 5 and the combined zones 3 and 4.) The actual distribution of patrol time was fairly close to the plan. There is a slight excess of time in zone 1 (about 30% versus 25%), which was balanced by a shortage of time in zone 2 (about 20% versus 25%). The patrolling in zones 3, 4, and 5 matched the planned levels almost exactly.

Productivity, in terms of arrests, is shown in Figure 12. Overall, there were 226 arrests recorded during the experiment. This number is slightly greater than 210, which is the number of arrests anticipated based on the number of hours of patrol and the 1975 arrest rate. However, the distribution of these 226 arrests among the zones differs greatly from what was anticipated, again based upon patrol hours in each zone and the prior year's arrest rate within each zone. Zones 1 and 2 each recorded substantially more arrests than were anticipated, while zone 5 recorded far fewer

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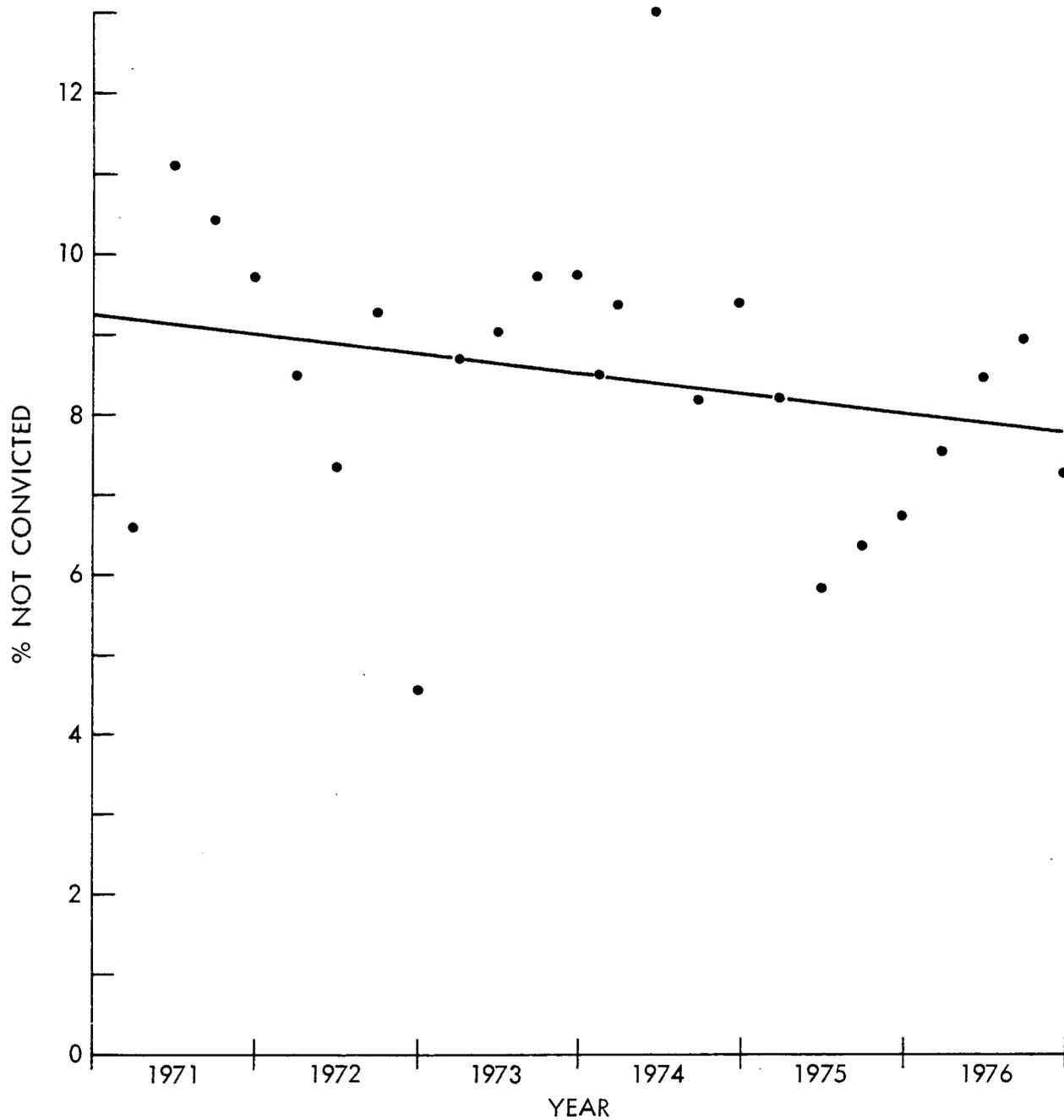
Figure 10 - Trend in Lack of Convictions

TABLE 8

PATROL EXPERIMENT DUI ARRESTS[a]

Zone		(10-12 PM)		12 PM - 2 AM		Total	
1	a	39	(162)	71	(259)	110	(421)
	h	67.53	(382.0)	54.77	(287.5)	122.3	(669.5)
	r	0.5775	(0.4241)	1.2963	(0.9009)	0.8994	(0.6288)
2	a	27	(100)	38	(214)	65	(314)
	h	48.17	(351.1)	33.65	(299.4)	81.82	(650.5)
	r	0.5605	(0.2848)	1.1293	(0.7148)	0.7944	(0.4827)
3	a	17	(28)	12	(23)	29	(51)
	h	44.73	(92.2)	39.07	(47)	83.80	(139.2)
	r	0.3801	(0.3037)	0.3071	(0.4894)	0.3461	(0.3664)
4	a	3	(4)	3	(8)	6	(12)
	h	8.82	(60.1)	5.5	(44.8)	14.32	(104.9)
	r	0.3401	(0.0666)	0.5455	(0.1786)	0.4190	(0.1144)
5	a	6	(12)	10	(41)	16	(53)
	h	53.08	(30.2)	46.43	(32.7)	99.52	(62.9)
	r	0.1130	(0.3974)	0.2154	(1.2538)	0.1608	(0.8426)
Total	a	92	(306)	134	(545)	226	(851)
	h	222.33	(915.6)	179.42	(711.4)	401.75	(1627)
	r	0.4138	(0.3342)	0.7469	(0.7661)	0.5625	(0.5230)

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[a] Key: a = arrests
　　　　　　h = patrol hours
　　　　　　r = arrest rate, arrests/hour

Numbers in parentheses are the baseline (1975) values used to
　design the experiment.
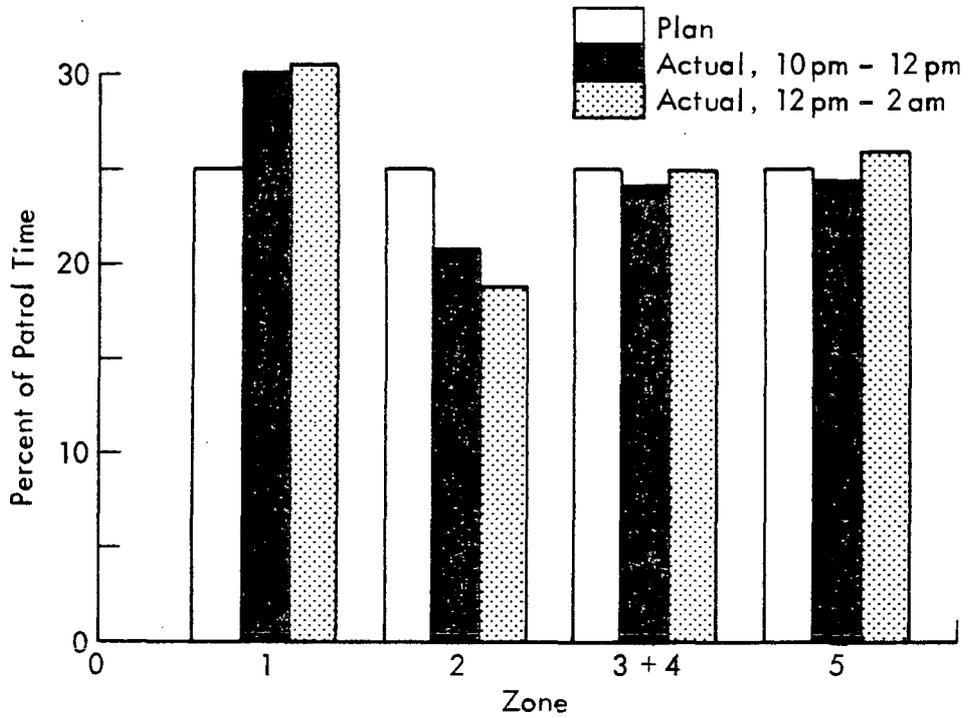
Figure 11 - Patrol Hours by Zone
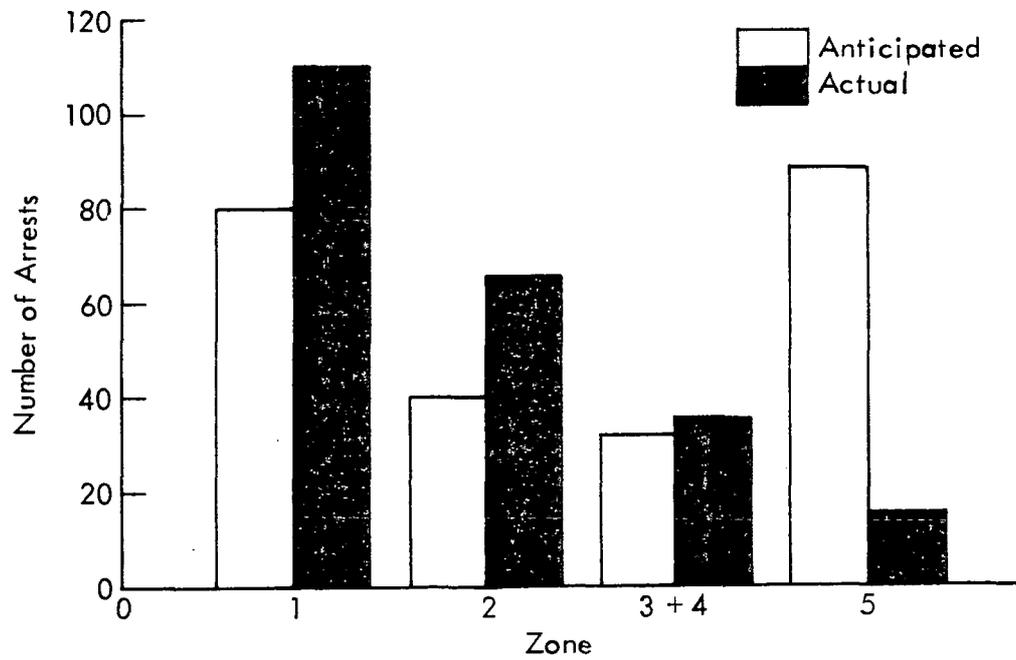
Figure 12 - Arrests by Zone

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than were anticipated (16 versus 84). The differences in productivity, actual versus anticipated, were tested using the assumption that the arrests were from a Poisson distribution. The differences in zones 1, 2 and 5 were all significant at a level of at least $p < 0.05$, although the total increase in arrests was not statistically significant. In these three zones the differences were also statistically significant, in most cases, for each of the two time periods separately (10 PM to midnight and midnight to 2 AM).

The major purpose of the patrol experiment was, of course, to try to increase the relative arrest rate of higher income persons and, to a lesser extent, younger drivers, by reallocating patrol resources among the five zones. The results pertinent to these objectives are summarized in Figure 13. The data on which the experimental design was based reflected that 35.5% of drivers arrested during this time period were under age 30. The experimental design anticipated an increase in this percentage to 38.4%. The arrests actually produced 38.2% under age 30. The fact that the actual and anticipated results were nearly identical was at least partially fortuitous because the confidence band in the anticipated results, expressed as a percentage, was from 29.8 to 47.6% with 90% confidence.

The previous data indicated that 65.1% of the arrested drivers during this time period had average yearly incomes of $10,000 or greater. The experiment was designed to raise this to approximately 75.7%. The experiment actually produced a drop from the prior year, to 58.9% (see Figure 13). The difference between anticipated and actual results was highly significant (x^2 (1) = 14.07, $p < 0.001$). Much of this difference can be attributed to the paucity of arrests in zone 5, the high income zone. However, examination of the detailed arrest logs showed that for both time periods and in nearly every zone, the percentage of persons arrested who were in this higher income bracket dropped from the previous year. Although none of these decreases were statistically significant, the trend was consistent across the zones. Overall, the drop from the past experience (65.1% higher income drivers) to the actual results (58.9%) was slightly over 6%, although that also was not a statistically significant drop (x^2 (1) = 2.55).

The surprisingly small number of arrests in zone 5 prompted a more indepth examination of those arrests. During the entire 3 months, there were 38 SASP arrests in that zone, of which 16 occurred during the experimental times and days, and the other 22 occurred on other days of the week or at other times of the day. The detailed examination of these arrests showed that two of them occurred outside of normal duty hours. For the remaining 36, therefore, it was possible to compare the time, date, and location of arrest with the log showing the location of the arresting officer's patrol activities. This comparison showed that 18 (50%) of the 36 arrests in zone 5 occurred during times when the arresting officer was

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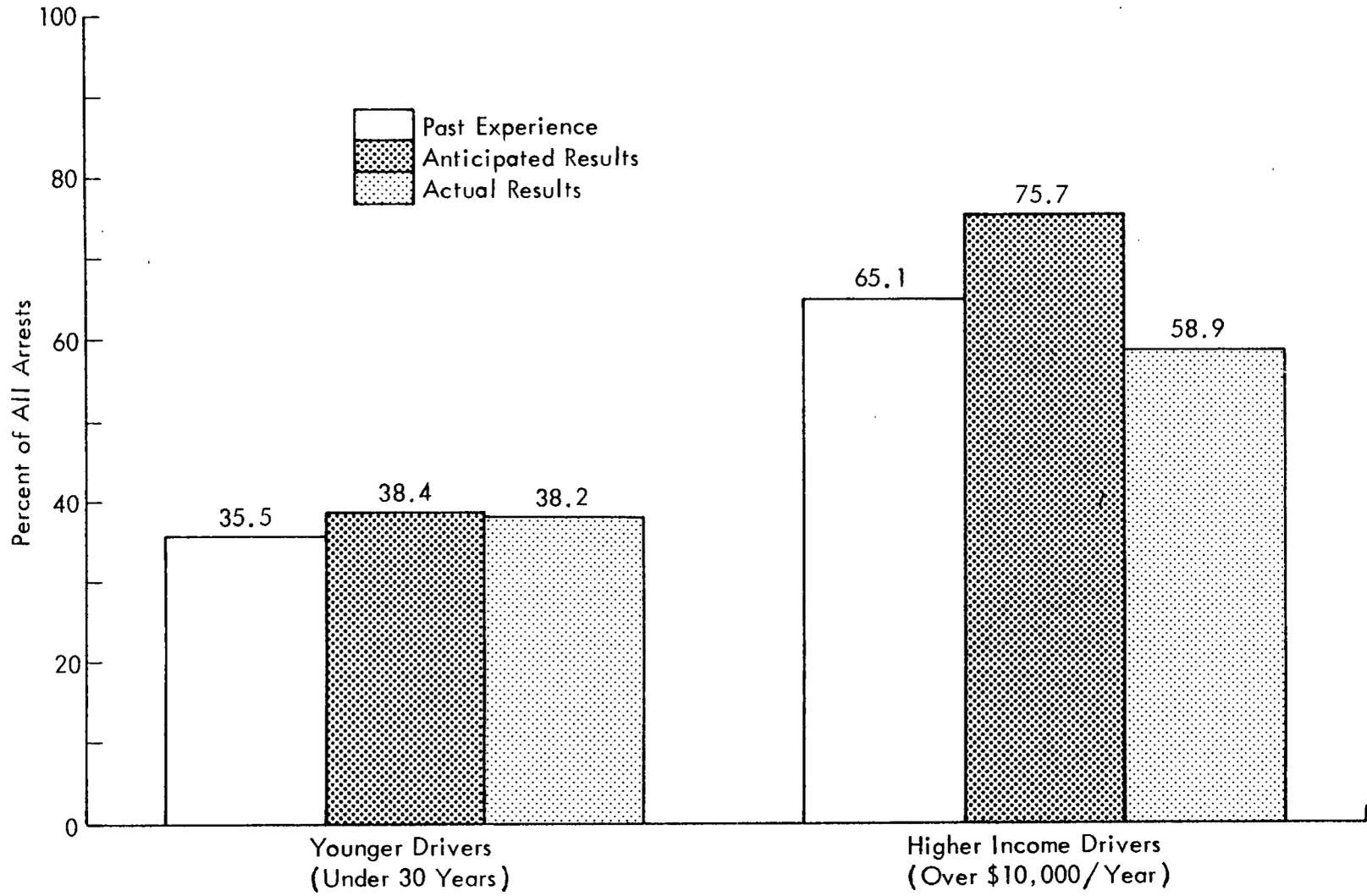
Figure 13 - Main Results of Patrol Experiment

not patrolling in zone 5, but was presumably in another zone. Thus, at most only half of the arrests recorded in zone 5 can be attributed to patrol activity. Half (or more) of the arrests must, therefore, have come about from a call for assistance from a non-SASP officer--a cooperative arrest.

H. Performance Related to Cost

In 1975 the Special Alcohol Safety Patrol was federally funded at the level of $107,667 (see Table 9). However, over one-fourth of this amount was for a new fleet of vehicles, whose value could be prorated over a period of several years. The remainder of the funding covered the salaries of three patrolmen and the field sergeant, plus a small amount for incidental supplies. The 1976 federal funding was $97,749. Not shown in Table 9 are the city contributions, which amounted to approximately $70,000 in 1975 and a like amount in 1976; they covered the salaries of the other three patrolmen (plus an additional patrolman starting in December 1975), the desk sergeant, and fuel and maintenance for the officers' vehicles.

TABLE 9

SASP COSTS BY YEAR

	1972[a]	1973	1974	1975[b]	1976	Total
Money Expended	$146,394	$105,907	$115,924	$107,667	$97,749	$573,641
Arrests	1,535	1,876	2,080	1,947	2,358	9,796
Cost per Arrest	$95.37	$56.45	$55.73	$55.30	$41.45	$58.56

a/ Includes 2 months of planning in 1971 and costs of patrol vehicles.
b/ Includes $31,518 for new patrol vehicles.

Consideration of the cumulative costs over the 5 years of the project yields a cost of $58.56 per DUI arrest by the Special Alcohol Safety Patrol. The cost per arrest is closer to $73 if the city contribution is considered.

I. Videotape

In the original Detailed Work Plan it was assumed that all persons arrested by SASP, and many other arrested drivers, would be videotaped; hence, a performance estimate of 2,500 per year was made. However, there were only 822 tapes made in the first 2 years of ASAP. The use of videotape rapidly declined toward the end of the first year. This decrease resulted from a change in plan from blanket taping to selective taping when it was believed (by the arresting officer) to be most beneficial. The results given here are based on the usage in the first year, and are a summarization of an earlier report.[5]

There were only slight differences in the frequency of videotape use according to race or age of defendant. There was a slight tendency to videotape whites (19.0%) more often than blacks (15.1%). There was almost no age bias among those videotaped.

Of 575 videotape cases handled by the special ASAP prosecutor, the videotapes were presented as evidence in only 62 cases (11%). In 117 (20%) of the videotaped cases the prosecutor did not realize that a tape was available. In no case did a legal or technical difficulty prevent the use of a tape as evidence. However, there was a small difference in the frequency of use of defense attorneys. When a videotape had been made, 56% of the defendants retained an attorney, compared to 50% of defendants not videotaped.

For the analysis of videotape the computer records of 621 cases disposed of between April 15, 1972 and April 15, 1973 were utilized. In order to maximize the uniformity of the samples under consideration, only cases involving white defendants arrested by SASP officers were included. Almost all of these were prosecuted by the special ASAP prosecutor. They were compared with 2,581 similar SASP arrests that were not videotaped. It was found that, overall, the videotaped group had statistically fewer dismissals and guilty pleas to a lesser charge, and more guilty pleas to and convictions on DUI, than the control group. But the BAC distributions were not the same for the two groups. For example, 13% of the videotaped group had refused the breath test, compared to only 8% of the control group. Also, a smaller percentage of low BAC (under 0.15%) drivers were videotaped (19% compared to 28%). It is, therefore, necessary to compare the videotaped group with the control group by BAC strata. Results of these comparisons showed that the dispositions were influenced by the videotape only when the BACs of the defendants were between 0.15 and 0.24%, especially in the 0.15 to 0.19% range. Even though the officers tended to emphasize usage of videotape when a breath test was refused and to deemphasize it

when the BAC was below the average of those arrested, the presence or absence of videotape did not influence these dispositions. Neither did it influence the disposition of high-BAC cases.

Unfortunately, the above "objective" analysis is not as clean as is desirable, because the matching of videotaped and control groups is not accurate. Initially, nearly all SASP cases were videotaped, so there was almost no concurrent control group. Then, as a decline in videotape usage occurred, and videotape began to be used on a selective basis, emphasis was placed on those cases where videotape would, it was hoped, help more than hinder. This selectivity, alone, could account for the difference in outcomes in the mid-BAC range.

Presuming these factors to be unimportant, it is nevertheless instructive to examine the practical outcome regardless of the detailed reasons. Although the overall difference in acquittal rates (4% for videotaped cases vs 7% for the control group) is relatively large, the theoretical number of acquittals eliminated by videotaping was only 16 out of 621 cases. Because the videotape countermeasure was funded at $17,335, this implies a cost per improved case of about $1,000, hardly cost-beneficial on this basis.

The lack of clear, objective benefits of videotape should be compared with the subjective merits of the countermeasure. In intangible ways, the courts, police, and public education countermeasures have all benefited considerably from the videotape experience.

One of the more important tasks during the initial phase of ASAP was the education of the participants in the judicial process (judges, prosecutors, and defense attorneys) in the reality of the drunk driver and his performance as seen by the police. Videotape supplied this need. Those judges who so desired could observe the defendant as he was shortly after arrest. At least once, the court en banc viewed a number of sample videotapes (not as trial evidence) and were able to obtain a more realistic image of the arrested drunk driver. They could observe that even the high-BAC driver, whose driving was sufficiently impared to present a safety hazard and attract the attention of the arresting officer, was not "falling down drunk," but far more subtly impaired. They were able to correlate officer testimony in court regarding the defendant's condition to the defendant's appearance and bearing on tape. The experience developed confidence in the judges concerning police testimony.

Videotaping gives the police another tool they can use to strengthen their cases when they feel it is necessary. It gives them the opportunity to present evidence in court as they saw it. In arrests in which the defendant refuses the breath test, videotape allows the police

officer to obtain other evidence of impairment which can be taken to court with confidence. This confidence is a necessary element of morale whether or not the outcome of the case is significantly different. At least the officer knows he has done his best in collecting evidence for the prosecutor.

Videotape has a great deal of public relations appeal. It was initially novel and very threatening. The possibility of being on film if arrested for DUI probably had greater value as a deterrent than in securing a conviction. The threat of a (potentially) public, audiovisual record of one's making a spectacle of oneself probably only influences the true social drinker, but the social drinker is also the principal audience of the public education campaign launched through the mass media. Problem drinkers, on the other hand, are probably less deterred by videotape, and less reachable through the media.

J. Interdivisional Cooperation

At the beginning of 1975, a series of district officer briefings was instituted. These briefings were conducted by the ASAP officers at the district stations during their roll calls. They were initiated because of the large decrease in district officer DUI arrests in 1974.

The briefings, extending over 4 months, presented information in a sequential fashion. They covered topics such as the problem of the drunk driver, how to recognize drunk drivers, and how to carry out the arrest procedures. District officers were also encouraged to contact an ASAP officer in the event that assistance was required. A total of 100 briefings was presented during the 4 months, 10 per month in the central district, 8 per month in the south district, and 7 per month in the east district.

The concept of an ASAP officer providing assistance to a district officer is termed a cooperative arrest. Typically, the district officer initiates the procedure by stopping a suspect and then radioing for assistance by an ASAP officer. The ASAP officer then proceeds to the scene and completes the processing by transporting the suspect to a district station, administering the breath test, etc.

The practice of cooperative arrests has undoubtedly been in existence for a long time. Little is known, however, about how widespread the practice is. Earlier in the project, it was estimated that between 10 and 20% of the SASP arrests were, in actuality, cooperative arrests. However, routine records of the practice were not kept. Therefore, in conjunction with other SASP record-keeping activities, a separate tabulation of

all cooperative arrests was kept for 3 months in mid-1975.[4/] The tabulation indicated that, at that time, about 31% of all SASP arrests were cooperative arrests.

No additional special record keeping of this type has been attempted. However, it is believed that the cooperative arrest practice is becoming increasingly prevalent. Data acquired in the recent patrol experiment suggest that, at least in some situations, cooperative arrests may account for half or more of the SASP arrests. Coincidentally, a member of the police command staff recently hypothesized, independently, that such arrests account for about 50% of the SASP total.

The practice of cooperative arrests creates some bookkeeping problems. At times, some records indicate the district officer as being responsible for the arrest, while other records show the SASP officer. Thus, for example, the DUI arrest logs indicate that SASP made 2,358 arrests in 1976, whereas the computerized data base (from which "Appendix H" tables are obtained) credits SASP with only 2,313 arrests. Both figures are used at various points in this report, according to the source of the data set analyzed.

CHAPTER V

DISCUSSION AND CONCLUSIONS

Total DUI arrests in Kansas City nearly doubled in the first year of ASAP, and have continued at a comparable or higher level since. The Special Alcohol Safety Patrol (SASP) accounted for well over half of the increase, directly, and was probably also influential in increasing the arrest rate for the rest of the police department. One way in which this influence was felt was through the practice of cooperative arrests. Although routine data on such activities were not kept, all indications are that the practice grew more widespread during the ASAP period. It is felt that the practice of cooperative arrests was beneficial, overall, as a strategy toward increasing the total number of arrests. The only major disadvantage observed was not the practice itself, but the lack of accurate data regarding the practice--leading to common misinterpretations of patrol activities and their effectiveness.

There are several indications that drunk driving, particularly at the higher BACs commonly associated with problem drinkers, has been declining in Kansas City. Of course, the most direct indication comes from the roadside surveys.[11]/ However, arrest data are also substantially in agreement with this hypothesis. Over the last 5 years there has been a small but steady declining trend in average BACs of those arrested, despite an essentially uniform arrest rate. The decline has been strongly impacted by the formation of SASP, but BACs of persons arrested by other officers have shown a similar declining trend. Among SASP arrests, the decline has been matched by a substantial drop in the number of persons arrested at very high BACs (0.15 and more) and with a concomitant increase in the number of persons arrested at BACs between 0.10 and 0.14.

Another indication that drunk driving may not be as prevalent now is the increasing difficulty encountered by SASP officers in locating drunk drivers. Although the SASP arrest rate (arrests per hour) has remained relatively constant, apparently more and more of the arrests were initiated by other officers (cooperative arrests). Hence, the arrest rate resulting from SASP detections has apparently been declining somewhat.

SASP officers are specialists in the apprehension and processing of drunk drivers. One way in which this expertise is obvious is in the ability of SASP to obtain breath tests from those they arrest. The refusal rate was substantially lower among SASP arrests than for other arrests initially, and has maintained an improving trend throughout the project. Other police officers have also improved in their ability to obtain BACs, so that the overall refusal rate for the police department has decreased

from 30% just before ASAP to about 14% in 1975. A slight reversal to this
trend was observed in 1976, for unexplained reasons. In particular, a
slight increase in the refusal rate was experienced in 1976 among persons
arrested by SASP or persons arrested as a result of a property damage ac-
cident. On the other hand, the refusal rate did not increase for persons
arrested by district officers or persons involved in an injury crash.

Patrol strategies, in terms of time of day and day of week of
patrol activity, have proven to be very good. In fact, the time-of-day
deployment strategy (8 PM till 4 AM) is probably optimum in that it repre-
sents the eight consecutive hours in which both alcohol-related accident
rates and arrest rates for the rest of the police department are maximum.
The day-of-week deployment showed continuous improvement throughout the
project, but still did not come up to the amount of patrol effort on
Saturdays that would be required to be commensurate with accident rates
and other arrest rates.

The increased arrest rates observed during the period of the ASAP
resulted in a similar increase in the client caseload available for rehabil-
itation programs. That is, not only did the arrests increase in number,
but the evidence associated with the arrests was sufficient to yield a
high conviction rate. In fact, the conviction rate not only kept pace with
the pre-ASAP level, but increased at a rate of about one-fourth of a per-
centage point per year.

Profile studies[10] have clearly demonstrated that young people
and higher income people are substantially involved in alcohol-related
fatal crashes, yet are not arrested nearly in proportion to their involve-
ment. This discrepancy is frustratingly difficult to overcome, probably
for a variety of reasons. Some reasons are validated by hard data, and
others only by opinions and observations. For example, blood alcohol levels
of younger drivers involved in alcohol-related fatal crashes are typically
not as high as those of older drivers, and oftentimes they are in the range
of 0.05 to 0.10. Furthermore, younger drinking drivers are involved in
fatal crashes far more frequently than their presence on the streets at
night would indicate (as determined from roadside surveys). In other words
young drinking drivers are more likely to make fatal driving errors than
older drinking drivers. The data are softer concerning income levels, but
we do know[11] that drunk drivers with income levels over $9,500 per year
are observed in roadside surveys relatively more frequently than they are
arrested, and are involved in alcohol-related fatal crashes even more fre-
quently. The fact that they are not arrested as often may be because of
different drinking habitats (suburbs), of different driving behaviors (more

cautious, more prone to use secondary streets, etc.), or better abilities to "fake it" after being stopped. Whatever the reasons, the project has been largely unsuccessful in bringing about large changes in the profile characteristics of the arrested population.

Valiant attempts were made to accomplish this and other objectives through patrol experiments. Although, for the most part, the experiments were carried out as planned, they generally met with disappointing results. Most of the disappointment stemmed from the confounding effect of cooperative arrests. Such arrests could not be extricated from the total set of base-line data on which the patrol experiments were planned, so the plans were faulty. The plans implicitly assumed that the arrests recorded were re-lated to the concurrent patrol activity; whereas, in fact, such was not the case--the arrests often resulted from calls for assistance completely independent of present patrol activity. Moreover, such events were not infrequent, and perhaps accounted for as much as 30 to 50% of all arrests.

Cost data suggest that DUI arrests in Kansas City by the Special Alcohol Safety Patrol were relatively modest compared to other ASAPs.[12] Although the cost varied from year to year, depending on such things as one-time (or infrequent) purchases (cars), unusual illness, etc., the Kansas City experience suggests that one DUI arrest per special officer per shift can be achieved at an expenditure of from $50 to $100 per arrest. The figure is even lower if the indirect effects of increased arrests by the police department arise as a side benefit to the creation of a special unit. The cost is, of course, substantially less than the income derived from fines as a result of such arrests.[2]

Videotape usage, fairly common during the first 1 to 2 years of the project, was judged to be useful as an educational tool for the courts and others, but not cost beneficial as a means of routinely increasing the probability of conviction. Although some increase in conviction rate could possibly be attributed to the use of videotape, that increase is far out of line with the costs involved. At that, only the direct costs in terms of equipment and facilities were accounted for. The cost-effectiveness ratio would be even worse if one were to include the costs of the manpower required: (a) by the police department in video taping in subjects in the studio, (b) by the prosecutor in reviewing the tapes in case preparation; (c) by the judge and courtroom personnel in utilizing the tapes during courtroom proceedings.

Conclusions

       1. SASP was very successful in meeting its objective, "Increased arrest of drinking drivers."

       2. SASP was moderately successful in meeting its subobjective, "Special emphasis on problem drinkers."

       3. The presence of SASP, together with the rest of the ASAP system, served as a catalyst to increase the arrest rate of other police officers in Kansas City.

       4. The arrests not only met and exceeded quantitative goals but were also of sufficient "quality" that conviction rates remained high and even climbed, providing the rest of the project with a substantial client base.

       5. SASP, consisting of a small but highly directed and motivated group of officers, operated extremely effectively and at reasonable cost.

       6. The patrol hours selected by SASP were nearly optimum, and the patrol assignments by day of week were very good and improving, but not optimum from an arrest rate viewpoint.

       7. Perhaps the most difficult task in this type of police patrol is to accomplish the arrests of young drunk drivers and higher income drunk drivers in proportion to their presence on the streets and, more importantly, their involvement in fatal crashes.

       8. The practice of cooperative arrests is useful and probably enhances the total police department operation, although because of a lack of good record keeping, the practice badly distorted the planning and operation of patrol experiments.

       9. Videotape, used in a studio setting, was probably highly useful as an educational tool, but certainly not cost effective as an operational tool to be applied routinely to all DUI arrests.

CHAPTER VI

RECOMMENDATIONS

Communities wishing to impact the drunk driving problem can learn
many valuable lessons from the Kansas City experience. If such communities
wanted to implement a special enforcement effort, the following recommenda-
tions should be considered.

1. A special unit, size depending upon the community, should be
formed, whose sole function is to concentrate on the drunk driving problem.
The officers in the unit should be specially selected, highly motivated, and
appropriately rewarded. Officers with an interest in traffic patrol will
probably do better than others.

2. The special unit must be backed up by an enlightened judicial
system, which is capable of properly and efficiently processing persons ar-
rested through prosecution, adjudication, sentencing, and referral.

3. The special unit should actively promote the concept of coop-
erative arrests, as a means of expanding their observational and detectional
capabilities to the rest of the police force.

4. The special unit should concentrate its patrol during the late
night and early morning hours. They can be most effective between approxi-
mately 9 PM and 3 AM on Fridays and Saturdays. Subject to manpower limita-
tions, patrol can be extended beyond this framework to other days of the
week and perhaps, to slightly earlier or later hours.

5. Other communities may wish to consider using marked and highly
visible vehicles for these officers, as an added deterrent to drunk driving.
Most ASAP communities did this, although Kansas City preferred using un-
marked cars, presumably to maximize the arrest rate. (No formal experimen-
tation was performed.)

6. The community may want to consider coupling the special en-
forcement activities with a vigorous public information and education
campaign to increase the deterrent effect on drunk drivers.

7. Special consideration should be given to techniques of de-
tection and apprehension of young drunk drivers and higher income drunk
drivers, to the extent that such persons contribute to the alcohol-related
fatal crash picture.

8. The community may wish to justify the cost of a special
patrol in terms of increased court fines. From this viewpoint, Kansas City
(and numerous other ASAPs) has found such a special unit to be highly cost-
effective.

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TERMS AND ABBREVIATIONS

ASAP: Alcohol Safety Action Project

SASP: Special Alcohol Safety Patrol

KCMOPD: Kansas City, Missouri Police Department

NHTSA: National Highway Traffic Safety Administration

DUI: Driving Under the Influence of Intoxicating Liquor

per se: A lesser offense, compared to DUI, under which it is illegal for a person to drive or be in actual physical control of a motor vehicle when the person has ten-hundredths of one percent or more by weight of alcohol in the blood. ("Impairment" or "influence" need not be proved.)

BAC: Blood Alcohol Content, percent weight by volume (grams of alcohol per 100 ml of blood).

APPENDIX A

PATROL EXPERIMENT DESIGN

A. Baseline Data

Kansas City, in common with most large municipalities, is divided into beats and zones by the police department. Because of the limited number of men in SASP, most patrol activities have been designed around the five zones of the city rather than the beats, which are considered too small for this purpose.

The five zones are shown in Figure A-1. Zone 1 includes the central business district, much of the intercity, and a majority of the hotels, restaurants, bars, etc., in Kansas City. Zone 2, the south zone, is mostly residential with the western part containing middle and upper income level areas and the eastern part including lower to middle income level areas. This zone includes the large Country Club Plaza area with its restaurants and shops as well as the Kansas City campus of the University of Missouri and other educational and public institutions. Zone 3, the northeast zone, borders on the neighboring City of Independence and includes much industry along with lower to middle income housing. Zone 4, the north zone, tends to be semirural with some upper middle class housing developments, shops, etc. Relatively sparsely populated, it includes many relatively high-speed highways and city streets and is nearly as large, geographically, as the other four groups combined. The far south zone, Zone 5, is mostly residential except for the southern edge which is essentially rural. The housing in this zone is middle to upper income level to the west and middle to lower middle income level to the east.

Also shown in Figure A-1 are the district stations in Kansas City. (Another station, at 8131 North Oak, would be about 2 in. off the top of the map.) Nearly all DUI arrests are processed at one of three locations: the SASP studio at the main headquarters (the northernmost station in Zone 1), the 63rd street station (in Zone 2) or the central station (easternmost of the Zone 1 locations). The others are used only when the arrest is made very close by; otherwise the officer prefers to travel the few extra minutes to one of the first three.

Experimentation began with a baseline data collection effort that was initiated in January 1975, modified, and finalized at the beginning of March 1975. The data collection consisted of two parts. Patrol activity was recorded in detail by each officer, who indicated at what times he was actually patrolling and in what zone. Duty time in which the officer was performing functions other than patrol (e.g., processing an arrested drunk driver), was purposely not included in this record-keeping process. Simultaneously, a special log was kept of each arrest made by each officer including the location, time, date, and selected information about the suspect. During this baseline period, which extended from March through June of 1975, the SASP officers followed their normal patrol practices as
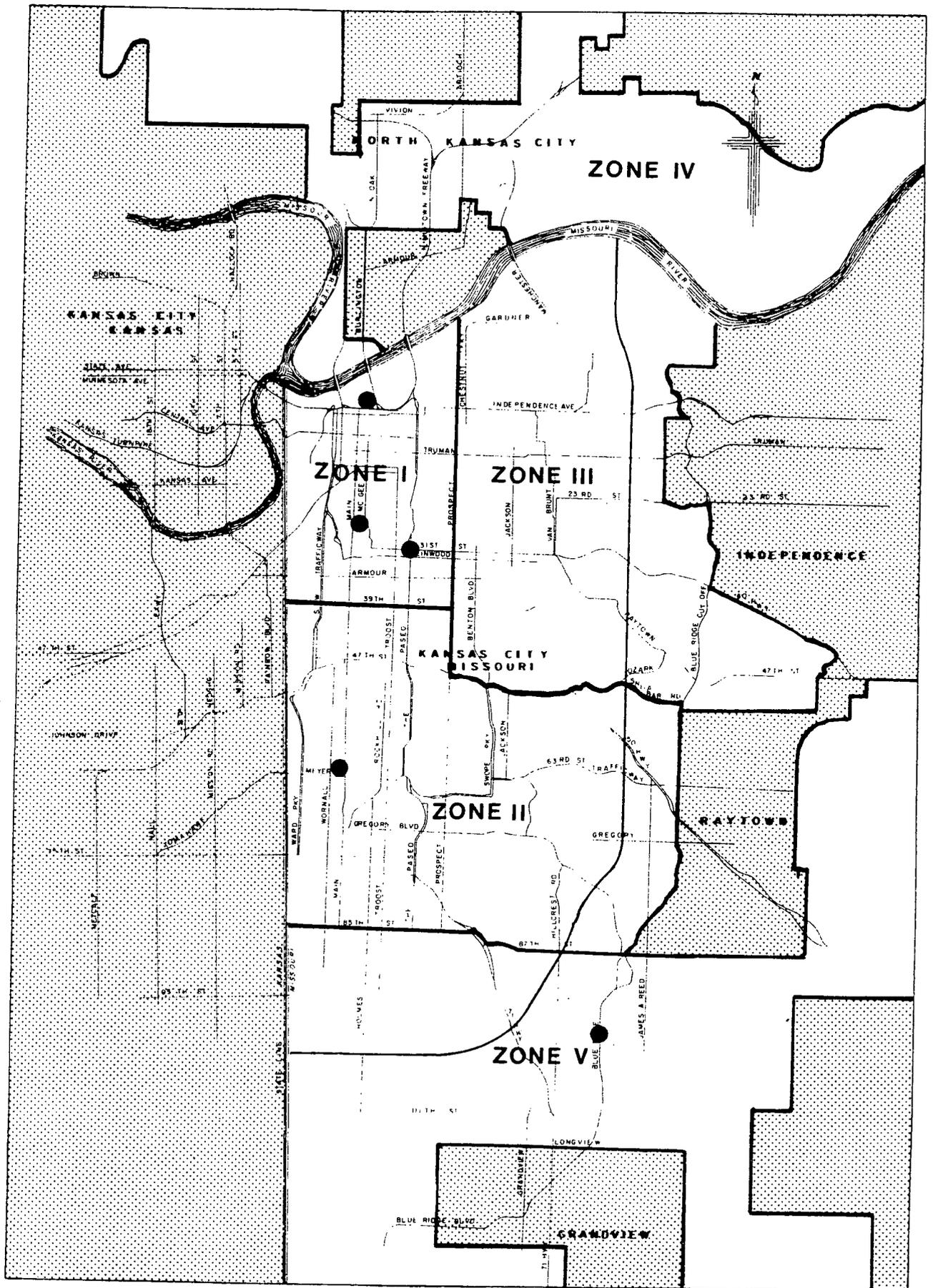
Figure A-1 - Kansas City Patrol Zones (large dots represent district stations.)

described earlier in this report. That is, no specific assignments were made--the officers were free to patrol largely in response to their own individual preferences.

Following this baseline period, a series of experiments that had been planned to carry through the remainder of 1975 and all of 1976 was begun. The experiments were designed to help answer the following two questions:

1. Can a strategy be developed that is more effective and efficient than the random patrol used in the first 3 years of the project?

2. Do enforcement activities really impact the drinking driver populations, by making measurable differences in their travel patterns?

These experiments did not progress as planned and, finally, were abandoned in early October 1975. Thereafter, random patrol was resumed. Details of the plans, the activities, and the results are in an earlier report.[4/]

The main results from the two periods of baseline (random) patrol are shown in Table A-1. There was no statistically significant difference between the before and after periods. Zone 4 was significantly less productive than any other zone. The other zones were only marginally different from one another, except that Zone 2 (the most productive) was significantly better than Zone 3 (the second least productive).

Subsequent interest focused on age and income characteristics of those arrested in the various zones at different times. The baseline data are shown in Tables A-2 and A-3. Incomes were determined by the median income level of the census tract in which the arrested person resided (not where he was arrested). Age differences between zones were minimal, although proportionally more young persons were arrested after than before midnight. Income levels varied greatly, however. Almost all persons arrested in Zone 5 were in the higher income group, compared to only about half in Zones 1 and 3.

B. Development of Strategies and Figures of Merit

Because the data show wide differences in the arrest rates by time of day and by zone, it seems that by changing the deployment of manpower, different net results in terms of arrests might be achieved. However, changing the deployment strategy might simultaneously produce other kinds of results--some favorable and some unfavorable. Therefore, it seems appropriate to formulate a general patrol strategy, incorporating as many factors and approaches as seem important, and then (at least on paper) try varing strategies to determine where improvements can be made.

TABLE A-1

BASELINE ARREST RATE DATA, BY ZONE[a]

Zone		2000 - 2200	2200 - 0000	0000 - 0200	0200 - 0400	Average
		Time				
Z1	Before	29/234.2 = 0.124	71/163.2 = 0.435	140/136.1 = 1.029	17/155.4 = 0.109	0.353
	After	27/200.4 = 0.135	91/218.8 = 0.416	119/151.4 = 0.416	17/186.8 = 0.091	
Z2	Before	20/79.6 = 0.251	66/209.5 = 0.315	147/196.4 = 0.748	63/177.3 = 0.355	0.400
	After	19/74 = 0.257	34/141.6 = 0.240	67/103 = 0.650	18/102.8 = 0.175	
Z3	Before	10/63.9 = 0.156	22/69.8 = 0.315	17/33.1 = 0.514	2/35.9 = 0.056	0.257
	After	5/17.1 = 0.292	6/22.4 = 0.268	6/13.9 = 0.432	1/13.3 = 0.075	
Z4	Before	3/62 = 0.048	2/55.2 = 0.036	4/34.8 = 0.115	0/21 = 0.000	0.074
	After	0/8.9 = 0.000	2/4.9 = 0.408	4/10 = 0.400	0/6 = 0.000	
Z5	Before	4/8.2 = 0.488	6/13.5 = 0.444	24/15 = 1.600	6/112.1 = 0.054	0.299
	After	1/13.4 = 0.075	6/16.7 = 0.359	17/17.7 = 0.960	5/33.9 = 0.147	
Average		0.155	0.334	0.786	0.153	0.340

[a] Each entry consists of the number of arrests, the number of man-hours of patrol, and their quotient (the arrest rate). "Before" data collected during March- June 1975; "After" data collected during October-December 1975.

TABLE A-2

BASELINE AGE DATA[a] BY ZONE

Zone	10 PM-12 PM			12 PM-2AM		
	N_1	N_2	R	N_1	N_2	R
1	42	120	0.350	91	177	0.514
2	29	72	0.403	101	112	0.902
3	7	19	0.368	7	14	0.500
4	1	3	0.333	2	7	0.286
5	5	9	0.556	20	22	0.909

[a] N_1 = number of arrested persons under 30.
N_2 = number of arrested persons 30 and older.
R   = N_1/N_2.

TABLE A-3

BASELINE INCOME DATA[a] BY ZONE

Zone	10 PM-12 PM			12 PM-2AM		
	N_1	N_2	R	N_1	N_2	R
1	69	69	1.000	99	109	0.908
2	80	16	5.000	156	41	3.805
3	14	12	1.167	10	9	1.111
4	2	2	1.000	5	1	5.000
5	12	0	∞	39	2	19.500

[a] N_1 = number of arrested persons with incomes of $10,000 or more.
N_2 = number of arrested persons with incomes under $10,000.
R   = N_1/N_2.

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The beginning point must be the statement of the objective or objectives of any patrol strategy. Several possible objectives or reasons for patrol can be itemized:

- To deploy manpower uniformly in all five zones.

- To deploy manpower to the zones in proportion to the arrest rates anticipated in those zones.

- To deploy manpower in proportion to the observed number of alcohol-related (nighttime) crashes in each zone.

- To deploy manpower in proportion to the observed number of arrests of young drunk drivers in each zone.

- To deploy manpower in proportion to the observed number of DUI arrests of middle to upper income drivers in each zone.

- To deploy manpower the same way it is being done now.

Using such objectives or reasons for patrol, either singly or in combination, a framework for incorporating them into an overall strategy can be formulated and methodology for assessing or rating alternate strategies devised.

The framework can be treated mathematically as follows. Let:

H_i = desired hours of patrol in zone i,

R_j = j^{th} weighted reason for patrol,

a_{ij} = "response" coefficient for patrolling in zone i for reason j.

Then,

$$H_i = K \sum_j a_{ij}R_j$$

where K is a normalizing constant such that $\sum_i H_i$ = available hours. For convenience, set $\sum_i a_{ij} = 1$ and $\sum_j R_j = 1$. Then, if K = 1, H_i will be the fraction of the total patrol time devoted to zone i.

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The reasons cited above for patrolling can be assigned as follows:

R_1: to assure equal coverage of all areas

R_2: to patrol in relation to total number of arrests

R_3: to patrol in relation to where A/R accidents occur

R_4: to patrol in realtion to arrests of younger drivers

R_5: to patrol in relation to arrests of higher income drivers

R_6: to maintain present patrol strategy

Corresponding to each reason, R_j, are a set of response coefficients a_{ij}. For example, to assure equal coverage of all areas,

$$a_{i1} = 1/5 \text{ for all zones.}$$

To patrol in relation to the total number of arrests, using the data in Table A-1 and normalizing, yields the following five sets of coefficients for the a_{i2}:

	Z1	Z2	Z3	Z4	Z5
t1	0.153	0.302	0.220	0.050	0.275
t2	0.287	0.193	0.206	0.045	0.269
t3	0.255	0.202	0.138	0.051	0.354
t4	0.189	0.552	0.116	0.000	0.143
all	0.255	0.289	0.186	0.054	0.216

The a_{i2} have different values by time of day because of the large differences in observed arrest rates.

For patrolling in proportion to alcohol-related crashes, the following might be used:

$$a_{i3} = 0.336, 0.237, 0.256, 0.113, 0.058.$$

These values are based on crash arrests for DUI between the hours of 8 PM and 4 AM, between July 29, and December 15, 1974, the period during which these special statistics were accumulated.

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Reason 4, to patrol in relation to arrests of younger drivers, has associated with it coefficients derived from Table A-2, based on the ratios of younger to older drivers. The coefficients are:

$$a_{i4} = 0.174, 0.200, 0.183, 0.166, \text{ and } 0.276 \text{ for time } t2,$$

and
$$a_{i4} = 0.165, 0.290, 0.161, 0.092, \text{ and } 0.292 \text{ for time } t3.$$

Similarly, the coefficients for reason 5 can be developed from Table A-3:

$$a_{i5} = 0.029, 0.146, 0.049, 0.029, 0.746 \text{ for time } t2,$$

and
$$a_{i5} = 0.030, 0.125, 0.037, 0.165, 0.643 \text{ for time } t3.$$

Finally, reason 6, to maintain present patrol strategies, yields overall coefficients of:

$$a_{i6} = 0.417, 0.383, 0.101, 0.066, 0.033 \text{ for time } t2,$$

and
$$a_{i6} = 0.404, 0.421, 0.066, 0.063, 0.046 \text{ for time } t3.$$

Let us now consider an example, combining several different reasons for patrol into a single strategy. Suppose we wish to have a strategy that emphasizes patrolling in proportion to arrest rate, but that also allocates manpower somewhat in accordance with alcohol-related crashes. Moreover, the strategy must leave no zone unpatrolled. For this example we might set:

$$R_1 = 0.10$$

$$R_2 = 0.60$$

$$R_3 = 0.30$$

Then, during the period midnight to 0200, we could require:

$$H_1 = (0.02 + 0.153 + 0.1119) = 0.2849$$

$$H_2 = (0.02 + 0.1212 + 0.1008) = 0.2420$$

$$H_3 = (0.02 + 0.0828 + 0.0600) = 0.1628$$

$$H_4 = (0.02 + 0.0306 + 0.0165) = 0.0671$$

$$H_5 = (0.02 + 0.2124 + 0.0108) = 0.2432$$

A strategy having been selected, the next step is to ask what results should be expected. For this purpose one can devise a "figure of merit,"

$$F_j = S_j \sum_i H_i P_i$$

where H_i is again the fraction of time patrolled in zone i,

P_{ij} is the "production rate" in zone i corresponding to reason j,

F_j is the figure of merit for reason j, and

S_j is an arbitrary scaling factor, for convenience in comparing different F_j's.

For example, the P_{ij} for reason 2 (arrests) are simply the arrest rates in each zone, obtained by combining the before and after results in Table A-1. For the time block considered they are:

$$P_{i2} = 0.901, \ 0.715, \ 0.489, \ 0.179, \ 1.254$$

The corresponding arbitrary constant, S_2, is conveniently set at 711.4, the number of hours of patrol accumulated in the determination of the above factors. Through this selection, F_2 computed using the _existing_ strategy ($H_i = a_{i6}$) is 545, the actual number of arrests accomplished during that time. The sample strategy then yields an F_2 of 579, implying that 34 additional arrests would have occurred had this strategy been employed at that time rather than the actual one.

Other P_{ij}'s and S_j's can be generated. Figures of Merit for reasons 1 and 6 are trivial, and simply reflect the degree to which all areas are patrolled equally, or in accordance with present strategy, respectively. The values used for reasons 2 through 5 are given in Table A-4.

TABLE A-4

FIGURE OF MERIT[a/] COEFFICIENTS

i	Time	P_{1j}	P_{2j}	P_{3j}	P_{4j}	P_{5j}	S_j[b/]
2	2	0.424	0.285	0.304	0.067	0.397	915.6
	3	0.901	0.715	0.489	0.179	1.254	711.4
3	2	92	65	70	31	16	10
	3	92	65	70	31	16	10
4	2	0.110	0.082	0.082	0.017	0.142	915.6
	3	0.306	0.339	0.163	0.040	0.597	711.4
5	2	0.213	0.237	0.164	0.034	0.397	915.6
	3	0.429	0.566	0.257	0.149	1.193	711.4

a/ These coefficients yield Figures of Merit defined as follows:
F_2/S_2 = Total arrest rate per hour of patrol
F_4/S_4 = "Young" arrest rate per hour of patrol
F_5/S_5 = "Higher Income" arrest rate per hour of patrol
F_3 = Relative patrol concentration in alcohol-related crash zones.

b/ S_2, S_4 and S_5 should be set equal to the number of actual patrol hours in future applications, to yield meaningful F values.

For convenience, S_3 was set at 10 simply to make the F_3's of magnitude comparable to the F_2's. Thus, F_3, using the example strategy, is 582, less than the value 718 calculated using the actual deployment. Therefore, the actual deployment was better than the sample strategy as far as allocating patrol hours to where the alcohol-related crashes were occurring.

Additional strategies, and reasons for patrol strategies, are easily derived. Thus, for example, if one wished to simply maximize the number of arrests, one would patrol exclusively in Zone 5 during the midnight to 2 AM time period because that zone experienced the highest arrest rate. Theoretically, this would lead to an F_2 of 890 arrests, 345 more than actually happened. Obviously, such a strategy would not be operationally feasible. Yet, it might be desirable to patrol more heavily in Zone 5 than would be suggested by 2--which is to patrol in proportion to the zone arrest rates. Thus, for example, one could patrol in proportion to the square of the zone arrest rates. This reason (R_7, say) would yield:

$$a_{i7} = 0.257, \ 0.161, \ 0.075, \ 0.010, \ 0.496$$

(These values are obtained by squaring the a_{i2}, and then normalizing so that $\sum_i a_{i7} = 1$.) If this reason solely dictated the strategy, almost half of the patrolling would occur in Zone 5 and almost none (1%) in Zone 4; an F_2 of 715 arrests would result.

C. The Strategy Actually Employed

After a series of meetings involving representatives of ASAP management, ASAP evaluation, SASP, and KCMOPD command staff, a patrol strategy was agreed upon. The strategy, expressed mathematically, was:

$$H_i = K \left[1/4 \ a_{i3}R_3 + 1/4 \ a_{i4}R_4 + 1/4 \ a_{i5}R_5 + 1/4 \ a_{i6}R_6 \right]$$

That is, equal emphasis would be placed on each of four patrol reasons-- to patrol in proportion to where there were: alcohol-related accidents; arrests of younger drivers; arrests of higher income drivers; and where prior patrol had taken place. The last was a precautionary measure taken to assuage concern over possibly drastic changes in patrol deployment.

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The plan was to follow this strategy during the hours of 10 PM to 2 AM, when arrests were most frequent and the baseline data most reliable. Further, it was decided to implement it only on 3 nights per week--Thursday, Friday, and Saturday. No special publicity attended the experiment.

Using the tabulated coefficients, the strategy yields the following deployment plan:

Zone	Time	H (calculated)	H (practical)
1	10 PM-12 PM	0.2390	1/4
2	10 PM-12 PM	0.2415	1/4
3	10 PM-12 PM	0.1473	1/4
4	10 PM-12 PM	0.0935	
5	10 PM-12 PM	0.2783	1/4
1	12 PM- 2 AM	0.2338	1/4
2	12 PM- 2 AM	0.2683	1/4
3	12 PM- 2 AM	0.1300	1/4
4	12 PM- 2 AM	0.1083	
5	12 PM- 2 AM	0.2598	1/4

In other words, if four officers were on duty, one would patrol in each of the Zones 1, 2 and 5, while the fourth would cover Zones 3 and 4.

Comparative figures of merit are shown below:*

		Figure of Merit	
Time	Type	Value (planned)	Value (baseline)
10 PM-12 PM	F_2 (Total arrests)	43.4	43.7
10 PM-12 PM	F_3 (A/R crashes)	79	104
10 PM-12 PM	F_4 (Age)	13.0	12.0
10 PM-12 PM	F_5 (Income)	32.1	28.4
12 PM- 2 AM	F_2 (Total arrests)	81.1	77.9
12 PM- 2 AM	F_3 (A/R crashes)	79	103
12 PM- 2 AM	F_4 (Age)	34.9	31.7
12 PM- 2 AM	F_5 (Income)	62.1	50.1

* These figures are on a monthly basis, assuming four officers on patrol at all times.

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These figures indicate that total arrests, under the planned strategy, should remain essentially unchanged during the earlier time period but should increase slightly during the later period. Moreover, arrests of young persons should increase slightly (8 to 10%) and arrests of higher income persons should increase appreciably (13 to 24%). However, arrests would be less well matched to zones where alcohol-related crashes had occurred.

Combining the two time periods yields the following monthly expected values (with 90% confidence limits):

Arrests	:	124 ($\pm$ 18)
"Young" arrests	:	48 ($\pm$ 11)
"Higher income" arrests:		94 ($\pm$ 16)

APPENDIX B

KANSAS CITY CRASH DATA

	Fatal Crashes							Injury Crashes				
YR/MO	A/R	Not A/R	DAY	NITE	SV	MV	PED	SV	MV	PED	DAY	NITE
KCASAP6901	1	4	2	3	3	1	1	80	183	32	222	64
KCASAP6902	3	4	4	3	2	3	2	118	223	39	249	102
KCASAP6903	3	2	4	1	1	3	1	110	245	43	282	92
KCASAP6904	6	2	0	6	5	2	1	122	262	51	303	112
KCASAP6905	5	0	2	3	2	3	0	109	295	56	328	119
KCASAP6906	4	4	4	4	3	3	2	131	296	48	323	124
KCASAP6907	5	2	2	5	2	3	2	123	325	58	349	136
KCASAP6908	3	5	4	4	2	4	2	139	280	48	341	116
KCASAP6909	2	3	3	2	2	2	1	121	295	48	349	99
KCASAP6910	4	6	7	3	3	5	2	122	366	55	395	129
KCASAP6911	8	3	6	5	7	4	0	120	285	47	315	115
KCASAP6912	5	7	7	5	4	3	5	148	345	49	392	129
KCASAP7001	2	0	1	1	1	1	0	86	271	34	250	141
KCASAP7002	4	0	1	3	2	2	0	78	213	19	212	98
KCASAP7003	1	7	5	3	1	5	2	70	244	28	246	96
KCASAP7004	5	4	4	5	2	5	2	79	268	50	279	118
KCASAP7005	4	3	5	2	3	4	0	75	283	48	296	106
KCASAP7006	4	2	4	2	2	1	3	85	286	51	300	121
KCASAP7007	4	0	1	3	4	0	0	100	238	37	252	123
KCASAP7008	4	3	3	4	4	2	1	80	248	47	271	104
KCASAP7009	6	7	9	4	2	7	4	73	255	38	274	92
KCASAP7010	3	4	4	3	1	4	2	67	303	47	313	104
KCASAP7011	3	5	6	2	3	2	4	78	262	38	276	101
KCASAP7012	4	4	2	6	4	3	1	77	280	31	297	91
KCASAP7101	3	1	2	2	3	0	1	68	274	28	266	97
KCASAP7102	5	1	1	5	3	2	1	58	237	28	245	88
KCASAP7103	1	4	5	0	1	3	1	65	279	54	288	107
KCASAP7104	0	3	3	0	1	0	2	74	249	41	269	95
KCASAP7105	4	4	4	4	5	3	0	99	302	57	328	131
KCASAP7106	1	3	2	2	2	1	1	90	274	35	301	97
KCASAP7107	4	1	3	2	5	0	0	114	351	45	356	109
KCASAP7108	0	3	1	2	0	3	0	85	311	33	277	114
KCASAP7109	5	1	2	4	2	4	0	68	252	47	280	87
KCASAP7110	5	5	6	5	5	4	2	85	266	38	287	102
KCASAP7111	5	5	5	5	6	3	1	75	255	38	277	90
KCASAP7112	6	5	6	5	4	6	1	118	211	28	301	111
KCASAP7201	3	4	3	4	4	3	0	82	259	25	271	94
KCASAP7202	5	1	4	2	3	2	1	75	207	38	239	81
KCASAP7203	8	5	5	6	7	3	3	91	246	40	279	98
KCASAP7204	4	4	6	2	3	5	0	67	297	44	307	100
KCASAP7205	6	5	7	4	4	6	1	89	331	48	350	116
KCASAP7206	1	3	3	1	3	0	1	88	290	34	313	99
KCASAP7207	5	6	7	4	4	4	3	86	301	35	298	122
KCASAP7208	2	5	3	4	1	4	2	85	270	43	302	95
KCASAP7209	6	1	3	4	3	4	0	67	279	26	284	88
KCASAP7210	1	4	4	1	2	1	2	101	290	26	320	96
KCASAP7211	1	3	3	1	1	1	2	82	287	29	294	103
KCASAP7212	6	4	5	5	1	5	4	96	311	30	323	113

NOTE: Day = 4:00 PM - 8:00 PM; Nite = 8:00 PM - 4:00 AM

	Fatal Crashes							Injury Crashes				
YR/MO	A/R	Not A/R	DAY	NITE	SV	MV	PED	SV	MV	PED	DAY	NITE
KCASAP7301	2	6	7	1	2	2	4	87	282	28	288	108
KCASAP7302	2	5	4	3	4	3	0	72	279	36	310	76
KCASAP7303	2	4	4	2	4	0	2	92	287	41	296	124
KCASAP7304	7	2	4	5	6	2	1	85	308	49	340	103
KCASAP7305	5	1	3	3	3	2	1	108	336	49	351	141
KCASAP7306	3	5	5	3	2	3	3	90	291	38	308	111
KCASAP7307	3	3	2	4	2	3	1	113	300	33	339	109
KCASAP7308	3	5	5	3	4	3	1	104	294	32	338	92
KCASAP7309	2	1	2	1	2	1	0	103	311	31	334	110
KCASAP7310	3	8	9	2	6	4	1	111	293	42	334	112
KCASAP7311	3	3	4	2	1	4	1	58	246	44	273	74
KCASAP7312	3	3	4	2	4	1	1	77	270	26	273	99
KCASAP7401	1	3	4	0	0	2	2	55	297	32	298	85
KCASAP7402	0	1	1	0	0	0	1	58	167	28	177	76
KCASAP7403	3	3	3	3	3	1	2	94	278	33	294	110
KCASAP7404	3	3	2	4	0	5	1	86	249	44	282	96
KCASAP7405	3	3	4	2	3	1	2	107	354	35	361	132
KCASAP7406	1	1	1	1	1	0	1	114	321	40	351	123
KCASAP7407	3	3	3	3	4	2	0	117	337	47	358	142
KCASAP7408	5	4	5	4	3	3	3	136	348	36	395	124
KCASAP7409	3	2	2	3	2	2	1	100	309	34	342	101
KCASAP7410	1	5	6	0	1	3	2	88	317	45	330	120
KCASAP7411	2	5	4	3	3	3	1	82	341	42	356	109
KCASAP7412	4	2	3	3	2	2	2	87	327	37	332	119
KCASAP7501	4	1	3	2	2	3	0	82	258	27	277	89
KCASAP7502	1	4	4	1	0	2	3	95	255	38	295	93
KCASAP7503	2	0	1	1	1	0	1	90	335	30	337	117
KCASAP7504	3	4	3	4	3	3	1	115	340	32	359	128
KCASAP7505	3	1	1	3	3	1	0	121	391	49	407	154
KCASAP7506	4	4	5	3	3	2	3	137	375	35	402	145
KCASAP7507	2	5	5	3	2	6	0	109	341	40	358	132
KCASAP7508	6	4	6	4	5	2	2	108	292	25	298	127
KCASAP7509	4	5	6	3	2	5	2	101	335	43	360	119
KCASAP7510	3	5	5	3	1	6	1	121	406	37	407	157
KCASAP7511	4	5	6	3	4	4	1	91	344	19	354	100
KCASAP7512	0	2	2	0	0	1	1	118	356	36	365	145
KCASAP7601	3	1	1	4	0	3	1	71	337	40	352	95
KCASAP7602	3	3	2	4	2	2	2	90	298	34	320	102
KCASAP7603	1	2	2	1	2	1	0	96	312	35	327	116
KCASAP7604	3	2	2	3	2	2	1	96	330	45	375	96
KCASAP7605	5	5	5	5	3	5	2	130	397	34	391	170
KCASAP7606	5	3	4	4	3	3	2	151	443	41	471	164
KCASAP7607	5	2	2	5	4	2	1	121	392	32	402	143
KCASAP7608	3	3	2	4	3	1	2	127	388	35	393	157
KCASAP7609	3	6	6	3	6	1	2	108	363	36	367	140
KCASAP7610	5	1	2	4	3	2	1	113	398	34	398	147
KCASAP7611	1	0	0	1	1	0	0	90	324	36	356	94
KCASAP7612	5	1	2	3	2	2	2	94	340	30	335	129

NOTE: Day = 4:00 PM - 8:00 PM; Nite = 8:00 PM - 4:00 AM