

Managing Patrol Operations Program Test Design

National Institute of Law Enforcement and Criminal Justice
Law Enforcement Assistance Administration
U.S. Department of Justice

48147
12

Program Test Design documents are developed by design groups composed of representatives of the National Institute of Law Enforcement and Criminal Justice and various other LEAA and Department of Justice program offices. The documents are prepared with contractual assistance, and are reviewed by a panel of experts conversant with the critical research and operational issues in the topic area.

The design group for the Managing Patrol Operations Program Test Design consisted of the following individuals:

National Institute of Law Enforcement and Criminal Justice, LEAA

Anthony Pasciuto, Chairman
Mary Ann Beck
John Bonner
William Saulsbury
George Silberman
W. Phillip Travers

Office of Criminal Justice Programs, LEAA

James Vetter

Consultant support was provided by Ilene Greenberg and Robert Rosenblum; Abt Associates, Cambridge, Massachusetts.

Advisory Committee members were:

A.J. Brown, Chief of Police, Fort Worth, Texas
Nelson Heller, Executive Director, The Institute for Public Program Analysis, St. Louis, Missouri
James Parsons, Chief of Police, Birmingham, Alabama
Theodore Schell, Office of Assistant Secretary for Science and Technology, Department of Commerce
Victor Strecher, Director, Institute of Contemporary Corrections and the Behavioral Sciences, Sam Houston State University, Huntsville, Texas
Hubert Williams, Director, Newark Police Department, Newark, New Jersey

NCJRS
JUN 21 1981
ACQUISITIONS

James M.H. Gregg
Assistant Administrator
Law Enforcement Assistance Administration

Blair G. Ewing
Deputy Director
National Institute of Law Enforcement and
Criminal Justice

Preface

The National Institute of Law Enforcement and Criminal Justice, the research arm of the Law Enforcement Assistance Administration, is sponsoring a field test of a set of analytic techniques and management strategies which is intended to better utilize patrol resources. The basis for the field test is a Program Test Design, a document with detailed specification of selected program elements. The goals of each field test effort is to determine the effectiveness of these elements or program strategies in multiple settings and to examine their transferability to other jurisdictions.

A number of police departments have experimented with one or more of the elements of this patrol management program. In response to this experimentation, the National Institute has created a composite of the "best" approaches in the field which will be implemented in three departments in cities in the 200,000 to 450,000 population range. Both the process of implementation and its outcomes will be evaluated by the Institute. There are two underlying objectives of the field test:

- To assess the impact of this configuration of techniques and strategies on patrol efficiency; and
- To determine if the program merits widespread replication.

TABLE OF CONTENTS

	<u>Page</u>
Preface	
I. INTRODUCTION	1
A. Rethinking Traditional Assumptions About Patrol.	1
B. Purpose of the Managing Patrol Operations Field Test.	5
II. PROGRAM DESIGN	7
A. Allocating Resources.	8
B. Undertaking Directed Activity	17
C. Products of the Pre-Implementation Phase.	22
III. EVALUATION DESIGN.	24
A. Analytic Framework.	24
B. Evaluation Objectives	25
C. Scope of the Evaluation	26
IV. IMPLEMENTATION AND NILECJ SUPPORT	30
V. SITE SELECTION CRITERIA.	31
RESOURCE DOCUMENTS	33

I. INTRODUCTION

During the early 1970's rising crime rates and an increasingly pervasive fear of crime contributed to an unprecedented growth in the cost of police service. Law enforcement expenditures in 1974, nearly 6 billion, represented a 60 percent increase over the 1970 total of \$3.8 billion.¹ This increase in demand, coupled with already overtaxed municipal budgets, encouraged police administrators and researchers to question the assumptions underlying traditional operational policy and to develop more efficient means of allocating existing resources. The central focus of attention became the patrol function, both because of its role as the personification of police service and as the largest consumer of police department resources. Between 60 and 70 percent of the sworn personnel are typically assigned to patrol, which amounts to approximately half of all police expenditures.²

A. Rethinking Traditional Assumptions About Patrol

Throughout most of this century the law enforcement community shared the view that the five basic goals of police patrol³ were served by the following patrol allocation strategies:

- a patrol unit will respond to all calls for service as quickly as possible;
- random patrol will be performed during uncommitted time; and
- self-initiated activities will also be performed during uncommitted time.

1 Expenditures and Employment Data for the Criminal Justice System, 1969-70 and 1974 (available from NCJRS).

2 Gay et al., Improving Patrol Productivity, Vol. I, Routine Patrol, Prescriptive Package, 1977 (available from NCJRS).

3 crime prevention and deterrence, the apprehension of criminals, the provision of non-crime-related services, the provision of a sense of community security and satisfaction with the police, and the recovery of stolen property.

In other words, it was assumed that

- the calls for service response should be optimized at the expense of other patrol functions; random patrol and self-initiated activities should, in effect, compete for the remaining time.⁴

Within a reasonably short period of time--roughly the last five years--the findings of a growing body of empirical research have raised serious doubts about the efficacy of these traditional patrol strategies, relative to recent alternative approaches.

Strategy #1: A patrol unit will respond to all calls for service as quickly as possible.

This strategy includes two notions. The first is that all calls for service will be handled by a patrol unit. However, analyses of the calls for service workload in many departments have revealed that approximately 30 percent of the call workload represents incidents about which the police can do little or nothing. These include a variety of minor non-criminal complaints as well as reported crimes where there is neither suspect nor evidence. Many departments are in the process of developing and implementing call prioritization systems that include guidelines for non-mobile responses (e.g., referrals to other agencies, telephone reports, mail-in and station house reports) to these types of calls. Studies in St. Louis and Kansas City, Missouri; South Central Connecticut; and Wilmington, Delaware suggest that these non-mobile response strategies can cut down on the resources devoted to the calls for service response without sacrificing community satisfaction.

4 Gay et al., op. cit. According to traditional policy, a fourth function, administrative tasks (e.g., report writing, transporting prisoners, appearing in court) should also compete for this uncommitted time. Since this function is outside the scope of the current test design, it has been omitted from the discussion.

5 Ibid., p. 62.

The second notion implicit in this strategy is that all calls will be serviced as quickly as possible. However, somewhere between 50 and 60 percent of the calls for service workload is composed of calls of reported crimes and other incidents that occurred more than 15 minutes before the police were notified. In these cases a mobile response may be appropriate but it does not have to be immediate. The Kansas City Response Time Study indicates that citizens are willing to let dispatchers schedule a delayed response to calls of this nature. Dissatisfaction results primarily when the unit does not arrive at the designated time. This suggests that delayed mobile response guidelines can also increase calls for service efficiency while maintaining the level of community satisfaction.

Strategy #2: Random patrol will be performed during uncommitted time.

Random patrol implies that there is little systematic relationship between the location of a patrol unit at any given time and the location and time of crime or other problem occurrences. The much-debated Kansas City Preventive Patrol Experiment has questioned the value of this use of uncommitted patrol time by offering evidence that rates of reported crime, arrest patterns and citizen fear of crime are largely unresponsive to changes in the level of intensity of random patrol. The installation of computerized management information systems and the development of crime and problem analysis techniques have made it possible to replace random patrol with pre-planned or "directed" activities. These activities can be aimed at identified crime problems or those related to order maintenance, community relations, or traffic enforcement. While it is very difficult to measure the consequences of directed activities, given the inadequacy of the indicators of effectiveness and the difficulty in separating program effects from external effects, studies in Kansas City, South Central Connecticut, San Diego, and Wilmington suggest that these strategies have contributed to the achievement of the departments' particular performance objectives.

5 Ibid., p. 62.

6 Pate et al., Police Response time: Its Determinants and Effects, 1977 (available from the Police Foundation).

7 Kelling et al., The Kansas City Preventive Patrol Experiment: A Summary Report, 1974 (available from the Police Foundation).

8 Gay et al., op. cit., p. 90.

Strategy #3: Self-initiated activities will also be performed during uncommitted time.

Self-initiated activities are crime or service-oriented activities executed in response to observations made by officers performing random patrol. While some of these activities may serve one or more of the goals of patrol, the total resources they consume may not represent the most efficient allocation. Structuring or directing these activities on the basis of identified crime and service-related problems is likely to increase the allocation efficiency of uncommitted resources.

Assumption: The calls for service response should be optimized at the expense of other patrol functions; random patrol and self-initiated activities should, in effect, compete for the remaining time.

If the calls for service response, according to traditional operational policy, is not to be sacrificed for any officer or department-initiated activity, this would imply that any given call for service is more deserving of patrol resources than any given activity conducted during uncommitted patrol time. While this is obviously an impossible statement, it does highlight the need to consider that there are trade-offs implicit in calls for service optimization. To the extent that patrol units are responding to calls that could be just as effectively (and more efficiently) handled on the telephone, for instance, resources for other worthwhile activities are diminished. The directed patrol studies mentioned above indicate that directed activities, designed in response to identified crime and service-related problems, can be successful in meeting local performance objectives.

The emerging view, supported by a growing body of research, is that the calls for service response and the directed activities should have equal priority as patrol functions and that this should be reflected in efforts to increase the efficiency of the calls for service response so that additional resources can be allocated to directed activities. The design of call prioritization systems is consistent with this view. So is the development of computer programs that tie allocation to the time, location and volume of demand. These allocation models, generated in response to computerization and a dissatisfaction with traditional allocation schemes, have been demonstrated successful in assisting police departments

in reducing the portion of patrol resources necessary to service the call workload. The three most widely-accepted versions, in combination with the other new techniques and strategy options described in this brief review, are the subjects of the proposed testing effort.

B. Purpose of the Managing Patrol Operations Field Test

There are two operational assumptions underlying this Test Design that have guided the development of the program goal and objectives. The first assumption is derived from the empirical research findings cited above. It is assumed that

by systematically matching deployment to workload conditions and by managing demand for police service, departments will be able to free a greater portion of patrol resources which can then be devoted to directed activities, defined in response to a local crime and problem analysis.

This assumption can be translated into two operational objectives:

- to increase the efficiency of the calls for service response and thereby increase the portion of patrol resources devoted to what has been traditionally called random patrol; and
- to replace random patrol with field service activities directed toward specific crime and service-oriented problems.

The second assumption of the program is also an implicit assumption of the patrol allocation techniques comprising a component of this Test Design. It is also assumed that

9 See, for example, Tien et al., An Alternative Approach in Police Patrol: The Wilmington Split-Force Experiment, NILECU, 1977 (available from Public Systems Evaluation, Inc., 929 Massachusetts Avenue, Cambridge, Mass. 02139); Larson, Illustrative Police Sector Redesign in District Four in Boston, NSF, 1974 (available from the Operations Research Center, MIT, Cambridge, Mass. 02134).

the efficacy of the patrol allocation strategies selected for implementation is largely dependent on the ability of police policy makers to set realistic patrol performance objectives and to design strategies consistent with those objectives.

These skills are so central to the program that another required element is a training program for policy makers in each department which is intended to assist them in developing those skills. While the training effort will be described in Section II, it is now possible to specify a third operational objective:

- to develop the ability of police policy makers to define realistic patrol performance objectives and to formulate allocation strategies that serve those objectives, through training designed for that purpose.

These three objectives provide the linkages between the assumptions upon which the testing effort is based and the overriding goal of the program: *to enhance the capability of police departments to achieve patrol performance objectives.*

II. PROGRAM DESIGN

Implicit in the goal of the testing effort is that local patrol performance objectives represent the focus of the program. The training, techniques and strategies are merely mechanisms for operationalizing those objectives in a way that gives them the best chance of being met. This means that police policy makers in each department will have considerable flexibility in tailoring the program to their particular needs. Thus, much of what defines "implementation" will become apparent only after these policy makers have had an opportunity to experience the training, work with the analytic models, and develop the strategies that most logically flow from those activities. This Program Design then must be limited to a description of the pre-implementation elements of the program--the training program, the analytic techniques and some demonstrated strategy options--that, in concert with local performance objectives, will shape each individual implementation.

The Managing Patrol Operations Program is defined by two separate though interacting processes. These include:

- Allocating Resources--the process of matching resource allocations to workload conditions and managing the calls for service workload; and
- Undertaking Directed Activity--the process of analyzing crime and service-oriented problems and developing strategies to address those problems.

As the Evaluation Design will demonstrate in greater detail, these processes are related in this way: resource allocation is intended to reduce the portion of patrol resources devoted to the calls for service response; the resources saved are then to be reallocated to directed activities.

For the purpose of defining each basic element of the program, the remainder of this section will be devoted to a description of the techniques and strategy options specific to each process and the role performance objectives and training play in linking those elements.

A. Allocating Resources

As indicated by the definition above, the process of allocating patrol resources is composed of two sub-flows: first, matching resource allocations to workload conditions according to a workload analysis and second, managing the calls for service workload based on a system of prioritization. This bifurcated process is illustrated in Figure 2.1.

1. Technique: Workload Analysis

The workload analysis, providing the basis for the initial patrol allocation, will be performed with the assistance of three computer programs: computer designed work schedules, Patrol Car Allocation Model (PCAM) and the Hypercube model (see footnote p. 14). The mechanism by which these computer programs are translated into operational strategies is the training of police department policy makers in the setting of patrol performance objectives. These sessions will be designed and administered by a contractor retained by the Institute for this purpose.¹ These training sessions will also cover the applications of the computer programs and will be conducted jointly with allocation strategy planning sessions. This is so that performance objectives can be specified and strategies designed within the context of the computer models' own assumptions, constraints, limitations and capabilities. The role of the training contractor will not only be to develop and orchestrate these sessions but also to share relevant experiences of other police departments and to offer insights into the likely implications of alternative allocation decisions as the models suggest them.

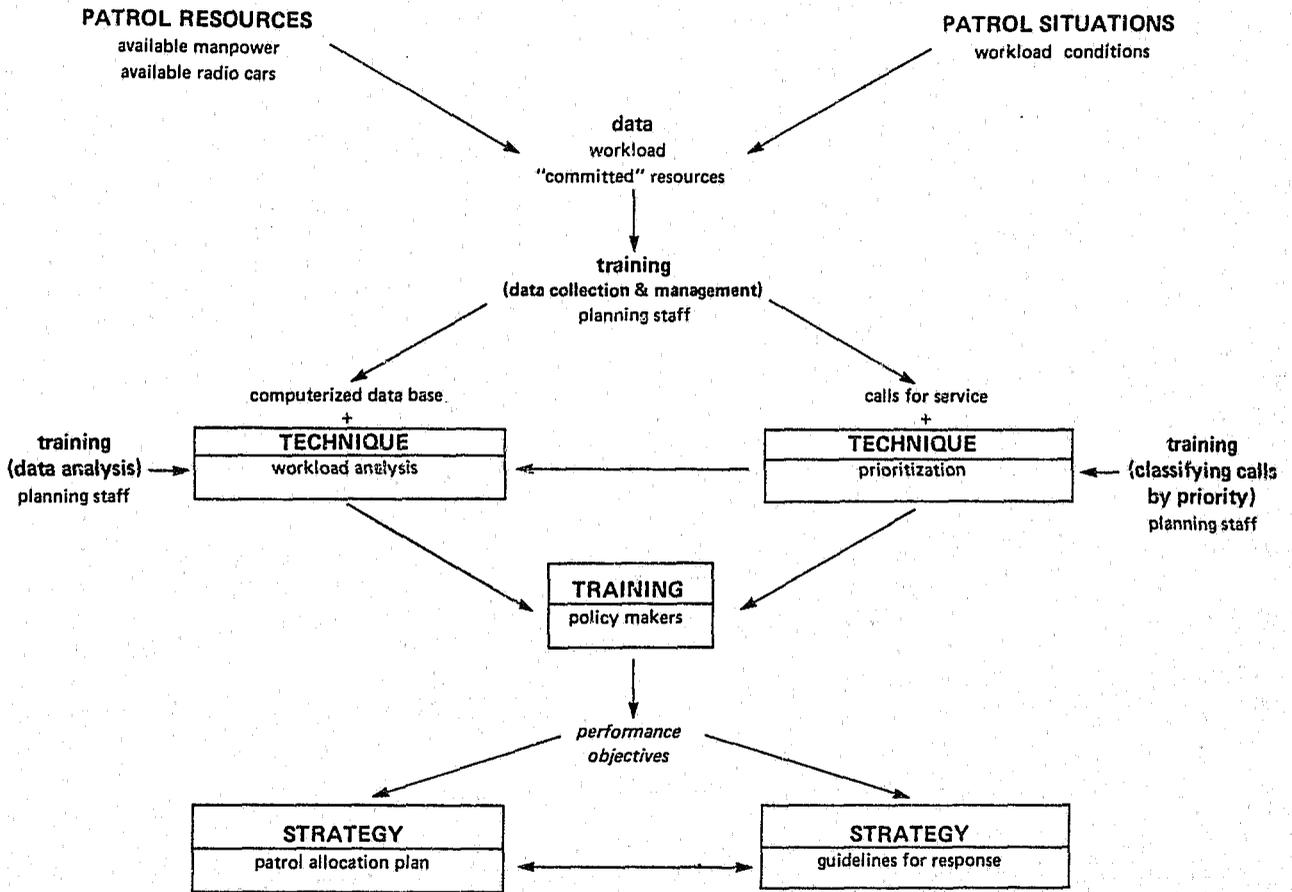
a. Computer Designed Work Schedules²

This program enables police departments to schedule patrol personnel so that the workload among officers is equalized, geographically and over time. The work scheduling system determines appropriate manning levels

1 The training contractor will be responsible for the design and execution of all training programs reflected in Figures 2.1, 2.2 and 3.1.

2 Heller, What Law Enforcement Can Gain from Computer Designed Work Schedules, NILECJ, 1974 (available from the U.S. Government Printing Office).

FIGURE 2.1
ALLOCATING RESOURCES
 Pre-Implementation Phase



for each day and shift and constructs suitable sequences of shift assignments and of days worked and days off for each officer, individual precinct, or the entire department, according to design constraints set by the user.

The user must first select the type of schedule preferred for each officer or group of officers, such as:

- those in which all officers are permanently assigned to specified shifts;
- those in which all officers periodically rotate shifts after specified periods of time;
- those in which no two officers have identical on-duty assignments over a complete schedule rotation period;
- those in which officers in teams of specified numbers work the same hours;
- those involving overlay shifts; and
- those based on two or more schedules of the same or different types (e.g., a schedule in which one group of officers rotates through the day and afternoon shifts only, while a second group rotates through the afternoon and night shifts only).

Several design features are controlled by the user. These include:

- periods of days off: the user specifies the lengths of the longest and shortest acceptable periods of consecutive days off, the desired days of the week off, the number of paid holidays and days of compensatory time off for overtime earned.
- periods of on-duty days: the user specifies the lengths of the longest and shortest acceptable periods of consecutive days on duty.

- watch change conditions: the user specifies the lengths of the longest and shortest acceptable periods of days off in between shift changes, which guarantees officers at least one day off.
- Number of on-duty officers: the user can set lower limits for minimum manning requirements and upper limits that would apply to all shifts should there be, for example, equipment limitations that would require similar manpower limitations.

The references to ranges between "longest and shortest" indicate trade-offs implicit in the model. It is obviously impossible to satisfy all objectives optimally. A department that is interested in long consecutive off-duty periods, for example, might have to sacrifice the days of the week (i.e., Saturdays and Sundays) in order to achieve that objective. The program, however, is capable of generating alternative work schedules which are all within the ranges initially set by the user. Thus, the trade-offs become readily apparent.

Operation of the program is dependent upon the following data items in addition to those described above:

- average workload for each shift each day of the week (workload may be measured by the number of calls for service, the number of reported crimes or the number of hours spent servicing calls);
- the shifts during the week when officers will be on duty and their hours;
- the number of officers in the unit being scheduled;
- the number of weeks officers are assigned to each shift before rotation; and
- the number of weekends in a row an officer may work between weekends off.

b. Patrol Car Allocation Model (PCAM)³

PCAM determines the optimal number of patrol units (i.e., mobile vehicles) to have on duty in each patrol area. Patrol unit requirements typically vary according to the season of the year, day of the week, hour of the day. The program matches allocation to these changing requirements in a way that is consistent with overall manpower resources, the hours of the day patrol officers begin work, dispatch policies and performance objectives for patrol units in responding to calls for service.

This allocation model has both descriptive and prescriptive capabilities. In its descriptive mode, PCAM generates performance data for any given allocation of patrol units assigned to an area during specified hours and thus permits the user to compare alternative allocations. The set of information provided for each alternative plan includes:

- average workload of patrol units;
- average amount of uncommitted time for patrol units;
- average travel time to incidents;
- percentage of calls that will have to wait in queue until a patrol unit is available to dispatch to the incident;
- average number of minutes calls in each priority class will have to wait in queue;
- average patrol frequency; and
- average total response time (time in queue plus travel time).

PCAM has three basic prescriptive capabilities. The first is to determine the minimum number of patrol units that must be on duty in each geographical area during all hours of the day in order to meet performance objectives related to one or more of the data items above.

3 Chaiken and Dormant, Patrol Car Allocation Model: Users Manual, NILECJ and HUD, 1975 (available from the Rand Corporation, 1700 Main Street, Santa Monica, Calif. 90406).

Here again, it is impossible to optimize all objectives. If, for example, the user wants to insure that the average total response time for the highest priority calls is less than four minutes, then the desired percentage of lower priority calls placed in queue may have to be sacrificed to some extent. The program would specify, however, not only what that trade-off would be, but also what the percentage of low priority calls placed in queue would be for each additional minute of average total response time.

The second capability is to determine the "best" allocation across sectors and/or among different times of the day or week, based on the optimization of one of the following:

- the smallest possible percentage of calls that must be placed in queue;
- the smallest possible average length of time calls for a given priority must wait in queue; or
- the smallest possible average total response time.

PCAM's third prescriptive capability is a combination of the first two. The user is permitted to develop an allocation plan that both complies with specified performance objectives and is the "best" plan that can be achieved if those objectives are to be met.

The following data items are necessary in order to operate the model:

- geographical subdivisions by square miles, number of street miles to be patrolled;
- temporal characteristics such as number of time blocks in a day (period of time when the number of units on duty does not change), number of shifts in each day, the ending hours for each block, the blocks that constitute each shift;
- data for each hour such as call rate and service time for every hour of every day in every division;
- crime rates; and

- unavailability parameters, or the fraction of time on non-calls for service work and the fraction of time on calls for service work.

C. The Hypercube Model⁴

This program is a logical complement to the Patrol Car Allocation Model. While PCAM provides a mechanism for systematically allocating resources to major geographical patrol areas, the Hypercube model offers a guide to the design of individual patrol sectors. Thus, it assists field commanders in deploying resources to the sectors within each patrol area. The Hypercube does not construct sector boundaries. Rather, it estimates the impact of alternative sector designs on various patrol performance measures and thus makes it possible for patrol commanders to select the design that best meets that department's performance objectives. The initial design is produced by the user; the computer then calculates the resulting values of the performance measures. The user can then accept or reject that design. If he rejects it, he goes through the same process until he produces a design that satisfies his performance objectives.

The design of sector boundaries is intended to achieve four general performance objectives:

- equalize workload among patrol units;
- minimize average response time for the entire sector;
- equalize response time among different parts of a sector; and
- minimize cross-sector dispatching.

As in the case of the other models, all of these objectives cannot be optimized to the degree that the user might prefer. In order to reduce cross-sector dispatching to 15 percent, for instance, the user might have to settle for a less than optimal degree of disparity in response times among different parts of a sector. But this trade-off, as well as alternative trade-offs between these two performance measures, would be clearly defined by the model.

⁴ Use of the Hypercube technique is optional; however, if departments choose not to use this tool, they must select an alternative method for constructing sector boundaries. Review and approval of the alternative method by NILECJ is required.

Data for the model must be disaggregated by reporting area (typically four to eight city blocks). The required items include:

- calls for service rate;
- estimate of travel time from each reporting area to every other;
- intra-reporting area travel times;
- fraction of time available for preventive patrol;
- average service time; and
- total number of patrol units.

2. Technique: Prioritization

Calls for service, as suggested earlier, generally fall into three categories: approximately 15 percent of the workload is of an emergency nature such that rapid response to the scene could make a difference in achieving the goals of police departments. At the other end of the priority continuum is roughly 30 percent of the workload which is reasonably unresponsive to police intervention. The remaining 55 percent includes crime and service incidents where a police response is appropriate but it is not required to be immediate.⁵ While this breakdown of the calls for service demand represents a general classification scheme and offers guidelines for prioritization, it is only the beginning of a system for managing demand.

Prioritizing calls involves the often tedious process of evaluating each call for service in terms of the time and nature of the occurrence and the assignment of that all to an appropriate priority category (either the three categories specified above or variations determined by individual departments). Response time objectives must then be set for each category so that these performance objectives can be achieved through the operation of the PCAM and Hypercube models. The training program for policy makers will focus on this objective-setting activity and on the development of guidelines for response associated with each priority category.

5 Gay et al., op cit., Ch. 3.

a. Strategy Options: Guidelines for Response

The response strategies that emerge from the process of setting objectives related to prioritization are almost as varied as the types of calls for service. The most basic guidelines for response represent an order of preferences for mobile responses, should calls have to be held in queue. In this case, a priority one, or emergency, call would be assigned to the closest available unit; a priority two call would be serviced next; and a priority three call would be handled by a mobile unit if there are no more serious demands for service. As noted in Section I, more recent alternative systems are based on a set of differential response strategies that are intended to match resource allocations to the value (as defined by the individual departments) of a police response. There are three basic classes of responses which include additional options:

- Mobile responses
 - (1) one v. two-officer units
 - (2) one or more units
 - (3) sworn v. non-sworn personnel
- Stacking of service calls based on a scheduled response
- Non-mobile responses
 - (1) referrals to other agencies
 - (2) telephone reports
 - (3) mail-in and station house reports

This patrol management program is not designed to prescribe a specific set of strategic responses. (Given the wide array of available approaches and the importance of developing these approaches within the context of local performance objectives, this would be, in any event, a meaningless exercise.) Rather, the program is intended to encourage policy makers in each department to deliberately consider various means of handling the calls for service workload, the trade-offs implicit in each alternative and then to develop guidelines for response that are consistent with their assessments.

Systems for managing demand serve two functions. Each suggests its own set of alternative allocation decisions:

First, these systems can contribute to calls for service efficiency. Decisions involved in selecting strategies for this purpose are based on an evaluation of each call relative to the entire calls for service workload. These decisions imply trade-offs largely between resource efficiency, on the one hand, and citizen satisfaction, on the other. While studies suggest that citizen satisfaction is not diminished by the implementation of scheduled or non-mobile response strategies, for instance, the public can develop service expectations that are not easily altered.

Second, response strategies are also intended to rationalize the distribution of resources between the calls for service response and directed activities. This means that, in assigning a response strategy to a particular call, that call must be evaluated not only in terms of the efficiency/effectiveness objectives of the calls for service response, but also in terms of non-calls for service considerations. Every call that can be handled without dispatching a unit frees an estimated 40 minutes of patrol time.⁶ Thus, there is a clear trade-off implicit in the allocation of resources to each call for service. Efforts to develop response strategies that attempt to deal with these competing demands should include guidelines that cover, for example, the circumstances under which an officer performing a directed activity could, or could not, be redeployed to respond to a call for service.

B. Undertaking Directed Activity

The patrol allocation strategies that are generated during the pre-implementation training/planning sessions are intended to increase the portion of patrol resources available for directed activities. Policy makers will then be free to use those resources to address crime and service-related problems identified through a local crime and problem analysis. Figure 2.2 illustrates the pre-implementation plan.

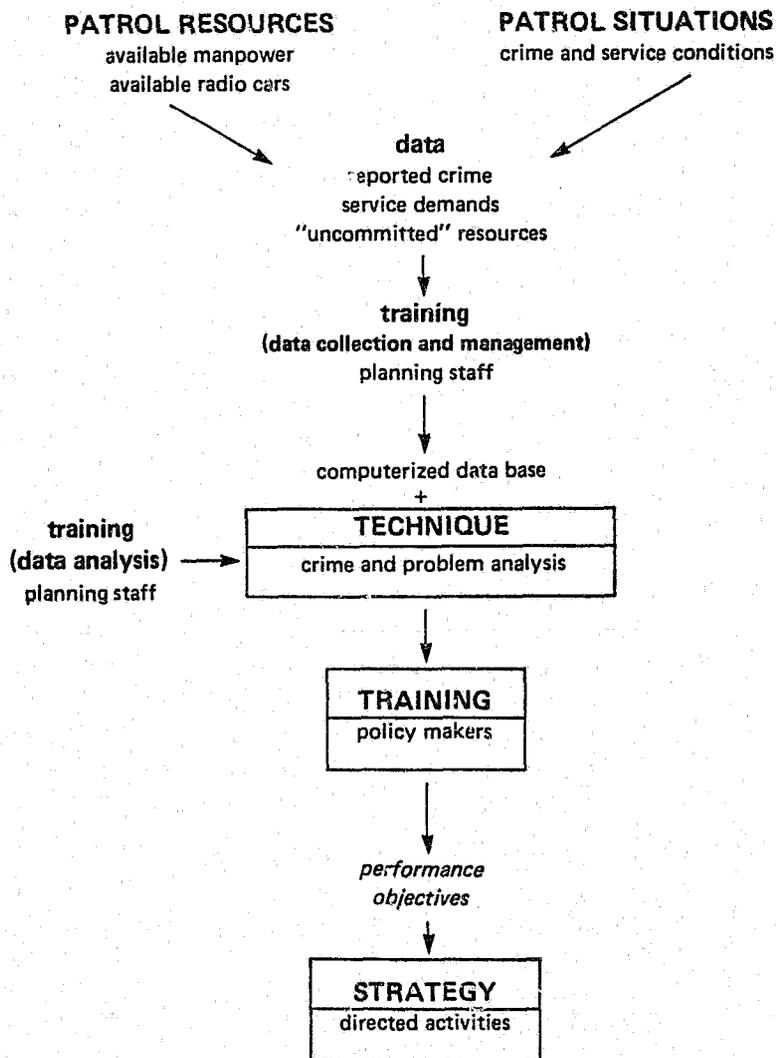
1. Technique: Crime and Problem Analysis

"Only when an agency has begun to detect, classify, and describe and analyze patterns of activity can patrol tactics be designed to address those problems." The systematic analysis of crime and service conditions is aimed at problem identification--the pinpointing of crime

6 Ibid., p. 67.

7 Ibid., p. 93.

FIGURE 2.2
UNDERTAKING DIRECTED ACTIVITY
Pre-Implementation Phase



patterns and problems of order maintenance, community relations and traffic enforcement. Certain problems that surface through the analytic process may not justify police intervention; others may suggest a range of tactical response strategies. The specification of local performance objectives will be critical, then, in determining not only which problems will be addressed but also the strategies that are most appropriate. Participating departments will be responsible for developing a directed activity program that serves their needs as they define them. The purpose of the training session for policy makers will be to assist them in establishing the linkages between problems, objectives and solutions.

While departments are encouraged to analyze non-crime-related problems and to develop strategies to address them, the following discussion of analytic techniques and strategy options will focus on crime problems as they have been the principal subjects of directed activity experimentation.

Three types of crime analyses are most commonly performed. The first two focus on crime types and the third on crime suspects:

- Spatial and temporal crime pattern identification. The most common form of crime analysis, this involves the mapping of crime incidents by location over time. This mapping procedure can suggest possible targets for directed patrol, either types of crime or, for each target crime, geographical subdivisions and hours of the day.
- In-depth crime pattern analysis. This analysis is intended to determine whether the patterns identified above are likely to be responsive to specialized patrol and, if so, what particular strategies and tactics would be most effective. Data on the precise locations of target offenses within selected geographical areas; suspect descriptions; victim characteristics; M.O.'s common to a number of offenses; property losses; etc., might be considered.
- Suspect analysis. Unlike the previous two, suspect analysis examines geographical patterns only as they pertain to the activities of a particular suspect or group of suspects. While this analysis is also somewhat less systematic and based on "softer" data, it is essential in order to generate the kind of evidence that would be necessary to support the implementation of surveillance activities.

The value of these analyses in assisting policy makers in designing effective response strategies is obviously a function of the validity, currency and detail of the data. At a minimum, current valid data should be available according to:

- type of incident;
- location by address;
- time by day and hour;
- method of operation (e.g., weapon, point of entry, etc.);
- suspects by name, race, sex and vehicle; and
- property loss.

a. Strategy Options: Directed Activities

The emergence of the directed patrol concept has generated a wide array of tactics for dealing with specialized crime and service-related problems. Described below are examples of the most widely-accepted crime-related options designed to achieve the goals of prevention, deterrence and apprehension. Each can be traced to a crime condition of a specific nature.

Crime Prevention

- Community education, security surveys and target hardening: a program that offers security advice to residents and owners of commercial property in areas experiencing high burglary rates.
- Property marking: a program designed to deter burglars by encouraging citizens to engrave valuable property with a number or name that would establish ownership in the event it were stolen.

8 Ibid., Ch. 4.

Crime Deterrence

- Saturation patrol: a program involving high visibility patrol concentrated in areas of high criminal activity; the effectiveness of this strategy has been traced to written instructions for patrol officers specifying directed patrol assignments, well-defined guidelines for the implementation and cancellation of those assignments and a feedback mechanism into the planning process so that strategies are developed on the basis of the most current information.
- Field interrogation: a program based on high visibility aimed at street and property crime to demonstrate to potential criminals that the police are present; officers are instructed to stop, question and at times search a citizen where there is reason to believe he has committed or is about to commit a crime.

Criminal Apprehension

- Decoys and stake-outs: programs designed to combat street crime; decoys are police officers posing as potential victims; stake-outs differ from decoy operations in that the officers observe the actual targets of crime.
- Suspect identification: a program that assigns officers to collect information on suspects, witnesses and other information that might lead to an arrest.
- Suspect search: a program where patrol units are dispatched to the area surrounding an in-progress or recently reported crime to observe suspicious people and engage in saturation patrol.

The decision to adopt one or more of these strategies or to develop new ones will be left to participating departments.

C. Products of the Pre-Implementation Phase

Implementation of this patrol management program is dependent upon the ability of police policy makers to define patrol performance objectives, to analyze problems in light of those objectives and to evaluate and choose among alternative tactical response strategies. The training/planning sessions, offered as part of the test program, are intended to enhance these skills and to provide the involved decision-makers with a well-defined sense of the policy options that appear to be most closely tied to their own expectations for the department's patrol operations. At the end of this six-month pre-implementation phase, participating departments will be required to prepare and submit to the National Institute a program plan for the twelve-month implementation period. This document should first provide a clear specification of the patrol performance objectives set by the department. In addition, the plan should describe:

- each strategy the department intends to execute;
- evidence of the problem justifying its selection;
- the current strategy and the nature of its inadequacy (strategies that will not be altered in response to the analysis should also be explained);
- at least one alternative strategy that was considered and the reasons for its rejection;
- the objectives of the preferred strategy and measures of success;
- steps of the process that will be necessary to move from what the department is now doing to that preferred strategy; and
- anticipated implementation problems and efforts that can be taken to minimize them.

This exercise is intended to give both the Institute and the department's policy makers an opportunity to critically evaluate the logic of the flow from problem identification through objective definition to strategy design. It will also give each department an opportunity to develop a guide for the implementation of the program. This plan should include all strategies relevant to the five major policy areas covered by this program:

- work schedules,
- radio car allocation to patrol areas,
- sector design and deployment,
- guidelines for response, and
- directed activity.

NILECJ will spend up to two months reviewing each department's proposed plan and working with the department on any recommended refinements. Funding for implementation will be subject to approval of the plan by NILECJ.

III. EVALUATION DESIGN

The National Institute will award a grant for an independent assessment of the program in each department and an overall evaluation of the field test which is designed to accomplish two goals:

- to determine the degree to which the program achieved its objectives and goal; and
- to identify the conditions which inhibit or facilitate successful implementation.

It has been a recurrent theme of this design document that the performance objectives of each department and the patrol strategies intended to serve those objectives will be defined after the start of the program. Evaluations, if they are to test true achievement of objectives, must be designed in light of both program objectives and elements (in this case, strategies) as they are operationalized in each site. While a precise definition of the evaluation design must be deferred until implementation, it is possible at this point to describe the basic analytic framework and the objectives and scope of the evaluation effort.

A. Analytic Framework

It is not possible to conduct a controlled experiment to test the elements of this program for a number of reasons: first, the department-wide nature of the patrol management concept makes comparisons within a city impractical; second, comparisons among cities would be equally difficult with only three sites; third, the site selection criteria outlined in Section V preclude random selection; and most importantly fourth, the program has been deliberately designed to give participating departments wide latitude in the implementation of the basic program elements. Instead, the evaluators will be asked to design a "before and during" comparison in each site which includes both a process and an outcome component. The primary focus of the outcome evaluation will be on improvements in field service efficiency. Effectiveness outcomes will be given a secondary place in the analysis because of the inadequacy of the indicators and the inability to separate program effects from the factors outside the control of police policy.

The value of a process evaluation is grounded in the assumption that as programs move from theoretical abstractions to concrete reality aspects of the design concept are likely to undergo redefinition. Some of these changes will represent substantial improvements in making the design more workable or more directly related to local objectives. Others may reflect essential compromises necessitated by, for instance, unexpected changes in resource supply or the volume of calls for service. It is critical to identify the extent, nature and effect of such influences (in other words, what actually happened) in order to determine accurately whether the program is responsible for the outcomes.

In addition, it is through a process evaluation that the process of change can be documented. This effort can not only aid in replication of the current program but it can contribute to a greater understanding generally of how change occurs in police agencies. Thus, all future interventions become the beneficiaries. The process evaluation incorporated into this design is not only intended to expose factors that seem to be related to goal achievement but also, should obstacles to implementation prove insurmountable, to isolate characteristics of departments or cities that should be avoided in future implementation efforts. At the same time, to the extent departments can successfully overcome operational problems, documentation of their methods can guide replicators facing similar difficulties. If the evaluation is to be able to relate program characteristics to favorable and unfavorable outcomes a clear description of those characteristics must be constructed, one that includes idiosyncratic variations across departments.

The outcome component of the evaluation will be designed during the pre-implementation phase in response to the performance objectives set by each participating department.

B. Evaluation Design

There are six objectives that will be addressed by a process and outcome evaluation in each site:

1. To insure the validity of the reported program data (process evaluation);
2. To document the process of allocation and directed strategy design (process evaluation);

3. To assess the value of the training program for policy makers in developing their ability to specify performance objectives and design strategies that serve those objectives (process and outcome evaluations);
4. To document the process of implementation and the degree to which the program was implemented as planned (process evaluation);
5. To assess the impact of the program on patrol efficiency (outcome evaluation); and
6. To determine the relationship between the process of implementation and program outcomes (process and outcome evaluations).

Each of the evaluation efforts reflected in these objectives corresponds to a specific stage in the process of implementation. (The sixth objective covers the entire implementation period.) This is demonstrated diagrammatically in Figure 3.1 for the two program processes-- Allocating Resources and Undertaking Directed Activity--described in the previous section. The scope of the evaluation implied by each objective is defined below.

C. Scope of the Evaluation

1. To insure the validity of the reported program data.

This objective refers to the data collection procedures of each police department prior to implementation of the program and to those of the training contractor and planning staff in their effort to establish a data management system during the planning phase of the program. This evaluation will focus on the dispatch process and crime reporting procedures in each department. Most of the workload and calls for service data are drawn from the dispatch cards completed on reported incidents. Both the formal guidelines governing this process and actual practice should be documented. This process evaluation should include similar documentation of crime reporting procedures so that data drawn from crime reporting forms can be analyzed and interpreted in light of the definitions that each department attaches to crime types and their relationship to real events.

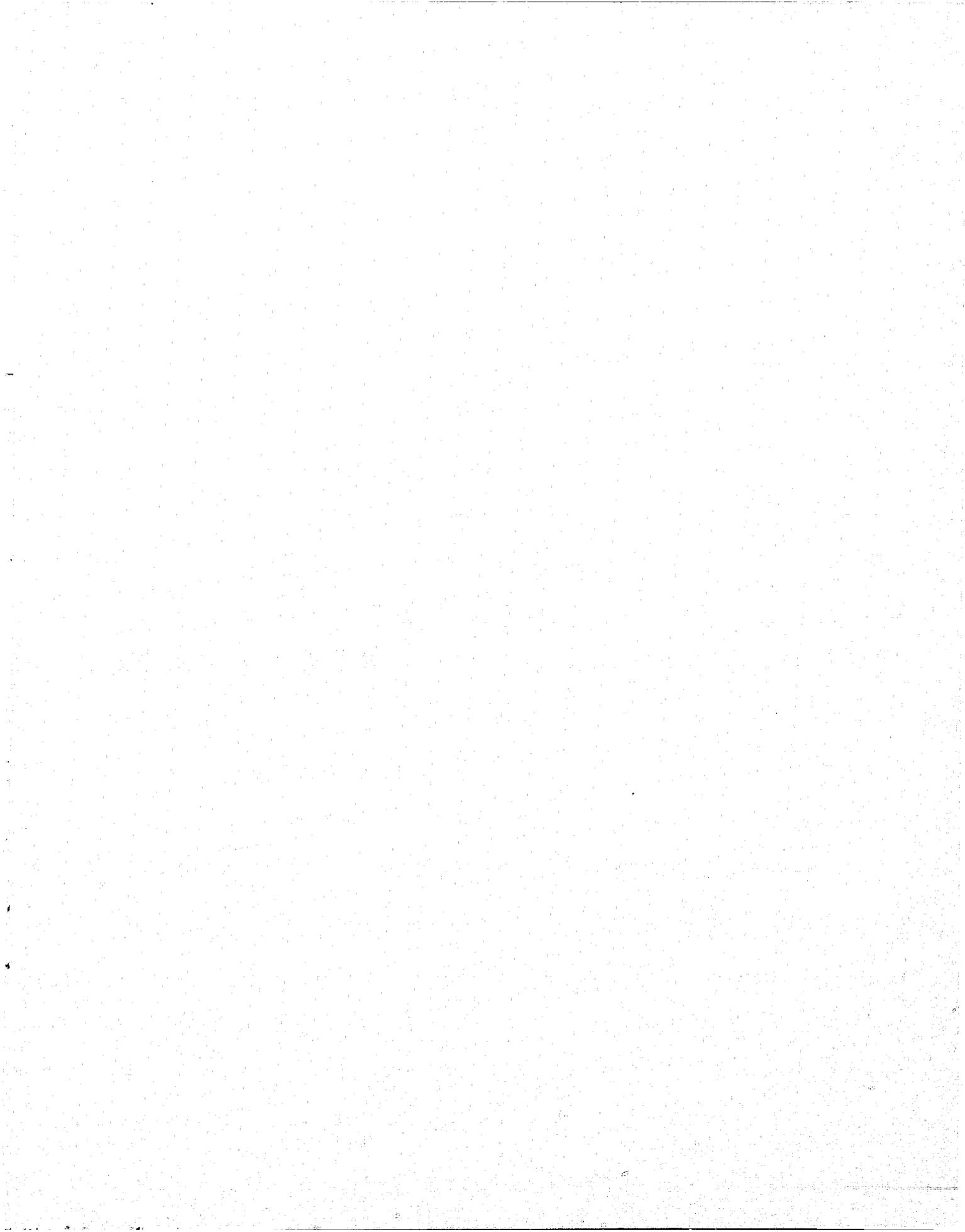
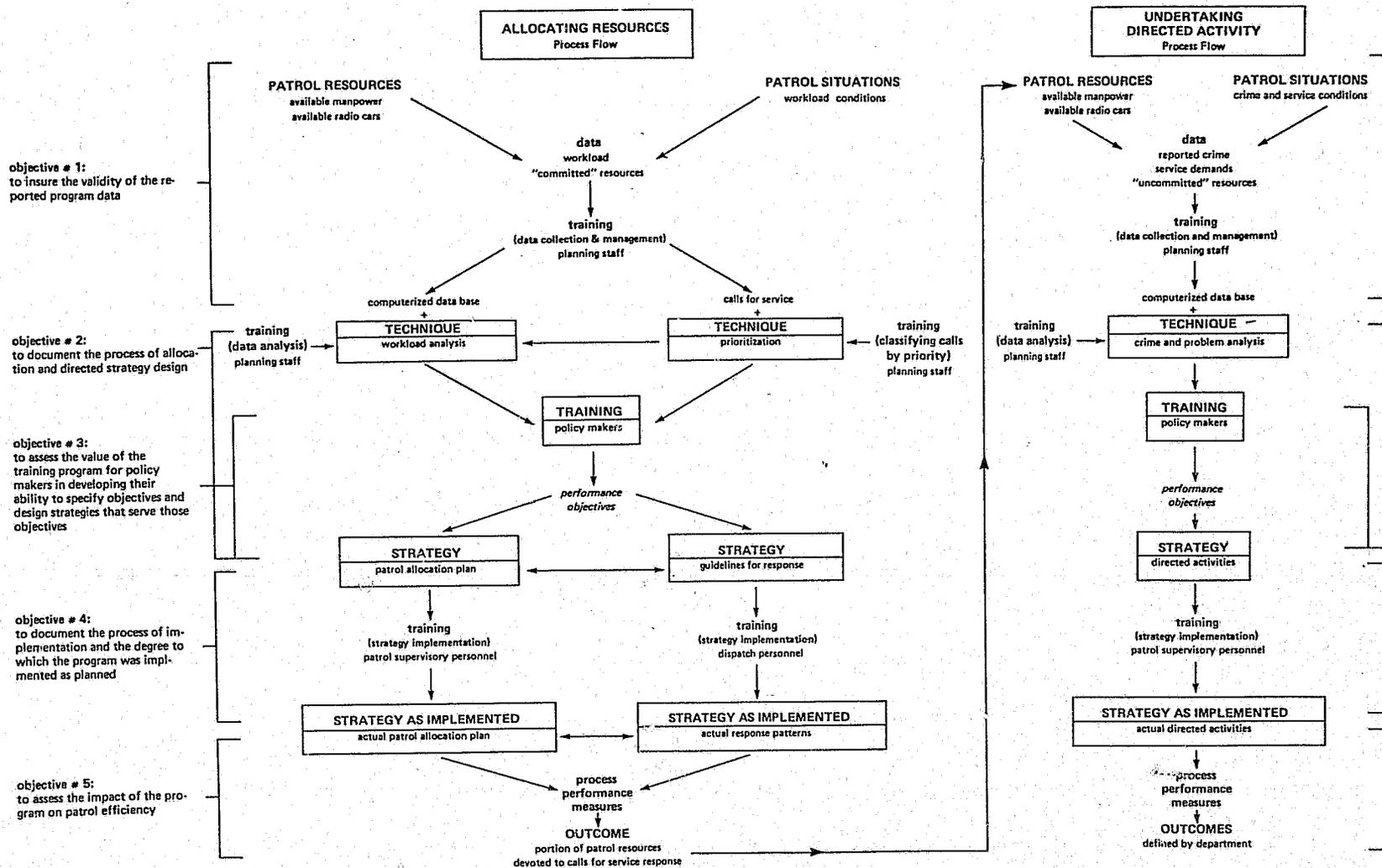


FIGURE 3.1
EVALUATION DESIGN
 analytic framework



2. To document the process of allocation and directed strategy design.

The process evaluation underlying this objective covers the analytic activities and the training and planning sessions during the pre-implementation phase. The evaluators will observe this process in order to identify the factors that appear to account for the strategies as they are ultimately conceptualized. This will include an analysis of the effects of the assumptions and limitations of the analytic techniques on the way in which policy makers think about and define performance objectives. Two additional issues are of interest. The first is the quality of both the workload analysis and the crime and problem analysis, in other words, the comprehensiveness and rigor of the investigation and the relationship between the data and identified problems. The second area of interest is the logic of the strategies in relation to the problems as they are defined. The constraints considered by the decision makers (e.g., resources, community demands, expectations from city hall) and the training contractor (e.g., experiences in other cities) are also certain to shape both the process and the outcomes (i.e., strategies).

3. To assess the value of the training program for policy makers in developing their ability to specify objectives and design strategies that serve those objectives.

The process component of this evaluation is a subset of the previous evaluation. It is an effort to document the process of training and to attempt to separate its effects on objective setting and strategy design from the other likely contributors identified above.

The outcome component of this evaluation is intended to quantify the degree to which the training assisted policy makers in setting objectives and formulating strategies. This will involve a brief pre- and post-training survey of participating decision makers covering their performance objectives, order of their priority, recommended strategies and expected outcomes.

4. To document the process of implementation and the degree to which the program was implemented as planned.

This evaluation effort is probably the single most critical. The evaluators will observe this process in an attempt to determine what actually

took place in the field. There are many factors that can account for the difference between the strategies as conceived and the strategies as implemented. These include, but are not limited to, unexpected changes in resources, the field training of supervisory and dispatch personnel, the attitudes of patrol personnel toward the program, the way in which supervisors communicate the goals and requirements of the program to officers in the field and the nature of the feedback mechanism for adjusting allocation strategies based on the most current data. Specific attention should be given to changes in the level of police morale and the influence of these changes on observed outcomes.

5. To assess the impact of the program on patrol efficiency.

Much of what accounts for the inability of "interventions" to achieve their stated objectives are objectives that are beyond the realm of possibility, given the current state of the art. The objectives of this program have been defined so they are modest enough to be accomplished yet sufficiently broad that meaningful findings can be produced. The focus on efficiency outcomes and the secondary emphasis on effectiveness is an effort to achieve this balance. The indicators of efficiency (e.g., response time, workload balance, dispatch delay, etc.) are measurable and are to a large degree controllable by police policy. Key indicators of effectiveness can not make these claims as readily. Thus, the evaluation will be concerned primarily with changes in efficiency and the extent to which these changes can be attributed to the program. While individual departments may set effectiveness objectives (e.g., increased arrests, increased citizen satisfaction), the evaluation of their achievement, while required, is not expected to produce conclusive findings.

In addition to specific efficiency and effectiveness objectives established by each participating department, there is an underlying efficiency objective of the overall program: to reduce the portion of patrol resources devoted to the calls for service response and to increase those available for directed activities.

6. To determine the relationship between the process of implementation and program outcomes.

This summary evaluation will involve establishing the linkages between the findings of the process and outcome evaluations. Here it is important to consider the logic of the flow from process to observed outcomes and any possible non-programmatic interpretations of those outcomes.

IV. IMPLEMENTATION AND NILECJ SUPPORT

The proposed testing effort has been designed for implementation in three phases over a twenty month period. The initial phase will involve six months of data collection, training of program personnel and strategic planning and an additional two months of program plan review by the National Institute. The program is expected to be in operation over the following twelve months. A grant will be awarded to an evaluation firm for a twenty-four month period so that the evaluators can observe both phases of the program and spend the remaining four months analyzing the data and preparing the final report.

NILECJ support will be provided in the form of financial assistance and training. Between \$100,000 and \$150,000 will be awarded to each department to cover a program coordinator, data collection and associated computer costs, the participation of dispatcher and field supervisory personnel in training provided under the program, and an augmented crime analysis and planning capability. The precise award will vary in accordance with the existing state of the department's analysis and planning capability. In addition, there will be a training contractor responsible for training key program personnel, consultant services to aid in the planning and implementation of the elements to be tested, and various conferences and meetings to enable selected program participants from each department to discuss problems and issues of mutual concern.

V. SITE SELECTION CRITERIA

NILECJ's screening of potential test sites was based on nine criteria. These criteria have been partitioned into three categories to represent department characteristics that:

- indicate potential for successful implementation of the program elements (program design considerations);
- provide the basis for a meaningful "before and during" comparison (evaluation design considerations); and
- suggest the findings will have implications for the larger universe of police departments (replication considerations).

First, successful implementation depends, to a great degree, on selecting sites demonstrating an interest in defining patrol performance objectives as well as a willingness and ability to make the kind of operational and organizational policy changes that those objectives might suggest. These could include one or more of the following: the redesign of sector boundaries; the redistribution of manpower geographically; the rescheduling of officer working hours; the prioritization or reprioritization of the calls for service response; the development of new guidelines for response; and the reorganization of the patrol division or the entire department. In addition, site candidates should have the basic tools for research in order to conduct the analyses upon which these policy changes are based.

More specifically, department receptivity--a commitment from both the chief and patrol supervisory personnel to the goals and objectives of the program and an expressed willingness to alter policy in response to the dictates of the model--is the first site selection criterion. The second is a history of innovation in the department, that is, evidence of this commitment and willingness to change. The third criterion is the absence of organizational and political constraints that would impede the process of implementation. These could include, but are not restricted to: a limited tenure of the chief such that the continuation of the program over a two-year period could not be assured; the unavailability of local planning staff to guide implementation; contractual prohibitions; and opposition from the local police union or city hall. Data availability and computer access, the fourth and fifth criteria, represent the ingredients of the analytic process. The data items outlined in Section II

are the informational requirements. Valid data should exist for a year prior to implementation. Access to a computer is not only essential to the successful implementation of the testing effort but it also has implications for program longevity beyond the two-year implementation period.

The next two criteria support the evaluation design. In order for the evaluators to make meaningful inferences about the effects of the program, based on a simple before and during comparison, departments should be able to establish a reasonable distance between the current basis for patrol allocation and the basis for allocation implicit in the elements of the program. Thus, departments with little or no experience with these elements would be more attractive candidates. A related criterion is crime conditions that are likely to be responsive to directed patrol strategies. This reflects an interest in identifying departments where the nature, level of intensity or distribution of crime offers a logical justification for the implementation of directed activities.

The last two are "second order" criteria. This means that if the site selection efforts produced more than three site candidates, these criteria would be imposed in order to select sites that were most representative of the larger universe of police departments. There is obviously value in implementing the program in departments that can produce the most generalizable findings. While the first seven selection criteria preclude random selection of sites (and therefore, generalizability in a pure statistical sense), geographic distribution and police-population ratios reflecting the norm would contribute to the evaluators' assessment of the potential for successful replication of the program. The justification for the first criterion in this category requires little explanation. If all departments were selected from one section of the country it might be considerably more difficult to make a convincing argument about the relevance of the findings to departments outside of that area. The second criterion has implications not only for replication but for the implementation of the program and evaluation as well. The police-population ratio is a measure of department allocation and deployment flexibility. If the ratio were well above average (perhaps 3.7 per 1,000 or greater), it would be difficult to demonstrate persuasively that any positive effects of the program were not due in large part to this tremendous flexibility of movement of police personnel. On the other hand, if the ratio were well below average (1.2 per 1,000 or less, for instance), police policy makers would be severely restricted in their ability to redistribute manpower both geographically and over time.

RESOURCE DOCUMENTS

Selected Bibliography

Chaiken and Dormant, Patrol Car Allocation Model: Users Manual. (NILECJ and HUD. Available from the Rand Corporation, 1700 Main Street, Santa Monica, Calif. 90406).

Stenzel et al., Field Evaluation of the Hypercube System for the Analysis of Police Patrol Operations: Executive Summary. (NSF. Available from Institute for Public Program Analysis, 230 S. Bemiston, Suite 914, St. Louis, Mo. 63105).

Gay et al., Improving Patrol Productivity, Vol. 1 "Routine Patrol" and Vol. 2 "Specialized Patrol." (Prescriptive Packages. Available from NCJRS.)

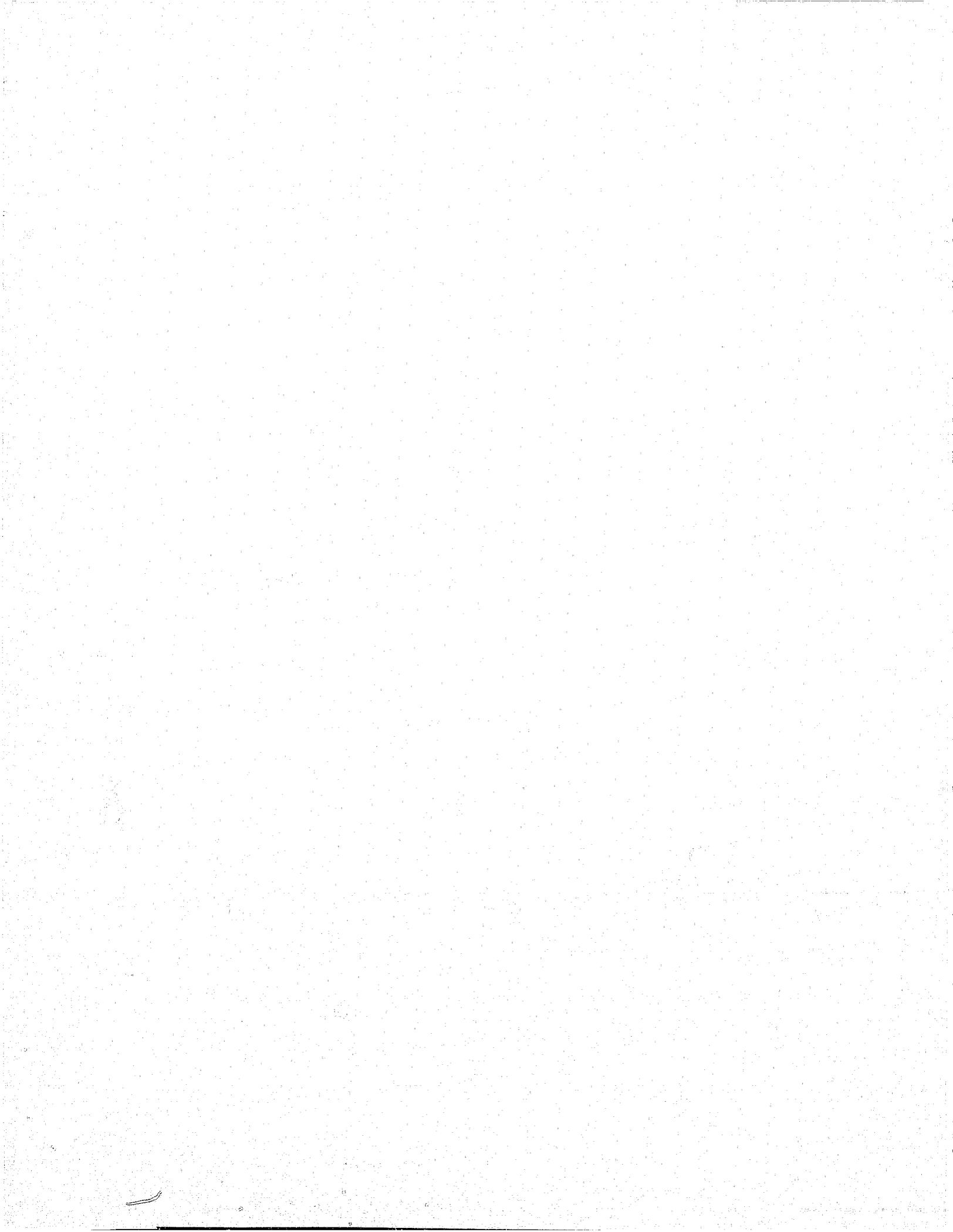
Grassie and Hollister, A Preliminary Guideline Manual for Patrol Operations Analysis. (LEAA ICAP Program.)

Heller, What Law Enforcement Can Gain from Computer Designed Work Schedules. (NILECJ. Available from the U.S. Government Printing Office.)

Larson, Illustrative Police Sector Redesign in District Four in Boston. (NSF. Available from Operations Research Center, M.I.T., Cambridge, Mass. 02139.)

Patrol Allocation Methodology for Police Departments. (HUD. Available from the U.S. Government Printing Office.)

Tien et al., An Alternative Approach in Police Patrol: The Wilmington Split-Force Experiment. (NILECJ. Available from Public Systems Evaluation, Inc., 929 Massachusetts Avenue, Cambridge, Mass. 02139.)



END