*THE APPLICABILITY OF A HELICOPTER PATROL PROCEDURE
TO DIVERSE AREAS: A COST-BENEFIT EVALUATION*

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The residential burglary deterrent effects of a helicopter patrol procedure were investigated in four separate areas with a multiple baseline technology. The helicopter was flown during an 8:00 a.m. to 4:00 p.m. period in two high density population areas of approximately 9.82 and 14.71 square miles and two low density population areas of 117.49 and 89.97 square miles. The helicopter patrol reduced residential burglaries without crime displacement in the two high density areas but had no deterrent effects in the low density areas. The costs of the helicopter patrol were justified by the benefits that resulted from the reduced home burglaries in the two high density areas. Because the helicopter patrol program is funded by general tax revenues, there is a disparity between those people paying for the procedure (all residents of Nashville) and those citizens that receive the burglary deterrent benefits (only residents of high-density areas). This distribution of benefit limitation suggests two courses of action: (1) The helicopter should be flown only in high population density areas even though the low population density areas are also victimized by high burglary rates. (2) A more comprehensive burglary reduction program must be developed so that effective deterrence can be realized in low density areas. These latter techniques would supplement helicopter patrol strategies and thus form a comprehensive burglary deterrent package that has an equitable benefit distribution.

DESCRIPTORS: patrol evaluation, cost analysis, police

Police agencies have recently directed resources toward the evaluation of patrol procedures. Major investigations have occurred in Kansas City and Nashville concerning saturation patrol (Kelling, Pate, Dieckman, & Brown, 1975; Schnelle, Kirchner, McNees, & Lawler, 1975; in San Diego concerning field interrogation techniques (Boydston, 1976); and in Cincinnati and Rochester concerning team policing strategies (Bloch & Bell, 1976).

These investigations have established a data base which has generally underscored the limitations of patrol as a method to reduce crime levels. Despite the clarity of evidence which emphasizes the ineffectiveness of patrol, there are also data which suggest promising directions for police patrol research.

Schnelle, Kirchner, Macrae, McNees, Eck, Snodgrass, Casey, and Uselton (1978) demonstrated that home burglaries were temporarily suppressed in a small area when helicopters patrolled an area during daylight hours. A helicopter patrolled a 5.66-square-mile area during two separate 12-day periods. Home burglaries were suppressed in both intervention periods as compared to baseline conditions even though no apprehensions due to the helicopter could be documented. No other serious crime was affected by helicopter patrol and there was no displacement of serious crimes to other areas in Nashville. Finally, the costs of flying the helicopter in intervention conditions were offset by the savings that resulted from the reduced number of burglaries. It was concluded that helicopter patrol was a cost-effective crime deterrent procedure.

The present study presents data which clarify

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the effects described in the previous helicopter investigation. Specifically, the applicability of helicopter patrol to four additional areas of the city was investigated. This attempt to replicate the helicopter patrol effects in diverse areas was evaluated against changes in burglary reports, as well as cost-benefit criteria. It was considered particularly important to document the distribution of benefits across different areas of the city that result from the helicopter patrol since the patrol costs must be offset by tax revenues collected from all areas of the city.

This distribution-of-benefit issue is an important topic in the area of cost-benefit analysis as discussed by Weisbrod (1972) and Hirsch (1973). In general, the issue of benefit distribution becomes critical when some segments of a population receive benefits and others do not. If equality of program outcomes across population subgroups is desirable, then it is necessary to evaluate programs not only in terms of their efficiency (how well they produce effects given resource input) but also in terms of their benefit distribution.

METHOD

Setting

Four target areas in the Nashville metropolitan area were selected for this evaluation. Two of these areas were approximately 9.82 and 14.71 square miles in size and were characterized as high population density zones since they encompassed populations of 49,978 and 65,910, respectively. The remaining two areas were 117.49 and 89.97 square miles in size and were characterized as low population density zones since they, respectively, included populations of 48,182 and 45,435. All population figures are based on a 1970 census. The helicopter patrol procedure had previously been documented to be a cost-effective burglary deterrent in a high population density area of 5.66 square miles (Schnelle *et al.* 1978). Thus, the patrol in the two high density zones was considered to be a new test of helicopter patrol. The selection of

the zones was made by the assistant chief of police in charge of patrol operations, who picked the areas based on their relatively high home burglary levels.

Measures

Crime and patrol cost measures were collected in the same fashion as described in a previous helicopter evaluation article by Schnelle *et al.*, 1978. In short, crime reports were monitored on a daily basis from all areas of the city. Home burglary reports were specifically analyzed as to time of occurrence; and weekend burglary incidents were separated from those burglaries that occurred Monday through Friday. Those burglary reports that could have occurred over a several-day period were analyzed separately from those in which the occurrence time could be localized within one shift. Burglaries that were estimated to have occurred over a time span that crossed several shifts were assigned to the shift that accounted for most of the burglary hours. For example, if a burglary were estimated by the victim to have occurred between 3:00 p.m. and 10:00 p.m., then the crime would be recorded in the third shift (4:00 p.m. to 12:00 a.m.) because most of the estimated burglary hours fell within that shift. The marginal cost of the helicopter patrol was calculated by taking into account fuel, oil, and equipment replacement costs. These latter costs increased from \$29.50 per hour to approximately \$30.00 per hour during the time period of the evaluation. The benefit of the helicopter patrol was anticipated to be a reduction in home burglaries. This benefit was translated into cash terms by multiplying a 1976 estimate of the average Nashville area insurance company settlement for a burglary (\$486.50) by the number of burglaries. The two largest insurers of Nashville area homes provided the settlement figure. Thus, the costs of the helicopter patrol conditions (helicopter and burglary costs) should be less than baseline burglary loss estimates alone, if the helicopter is cost effective.

Procedure

The patrol chief decided to fly the target areas in the following order: high density area I; high density area II; low density area I; low density area II. Thus, the effects of the procedure were evaluated using a multiple baseline design. For evaluation purposes, the chief was requested to leave the helicopter in any one area for a minimum of ten days. Otherwise, the chief exercised complete discretion as to how long the helicopter would remain in an area. The helicopter section patrolled a target area for an eight-hour period between 8:00 a.m. and 4:00 p.m. Two helicopters alternated 2.5-hour shifts during the target periods Monday through Friday. The helicopters did not fly on weekends. Decisions as to when weather conditions prohibited flying were left to the pilots. Normal car patrol levels of one car per zone during each 8-hour shift were maintained. The helicopter patrol was evaluated between September 1976 and January 1977, and the intervention periods lasted 10 and 9 days in the high population density zones and 21 and 14 days in the low

population density zones. The helicopter flew an average of 5.2 hours per day during the patrol conditions.

RESULTS

Figure 1 illustrates the changes in burglary rates in both high population areas. The burglary deterrent effect of the helicopter procedure was replicated in these zones as indicated by the fact that in baseline the average number of daily burglaries was 2.83 and 2.25, respectively, and during helicopter patrol the average number of burglaries per day was 1.22 and 1.16. The average daily costs of flying the helicopter were added to these burglary loss figures during intervention periods and compared to burglary loss estimates alone during baseline conditions. The helicopter was judged cost effective because the baseline burglary costs in the high density zones were \$1,376 and \$1,094, respectively, whereas the combined burglary and helicopter costs during intervention were \$823 and \$815.

The inability of the helicopter to deter burglaries in the two low population density zones

Fig. 1. Number of home burglaries in two high density areas over baseline and intervention conditions.

was documented by the fact that the average daily baseline burglaries in these two high density zones were 1.65 and .80, respectively, but during intervention conditions these same figures were 2.14 and 1.21. This failure is further underscored by cost data collected from the low population density zones which show that the average daily property loss estimates in baseline were \$803 and \$389.20, but during intervention conditions the property lost and helicopter costs added up to be \$1,241 and \$819.

During the time period of these evaluations there was no evidence of changes in reported crime levels of any incident other than home burglaries in either of the target zones or zones adjacent to the target zones. The other offenses monitored were murder, assault, sex offenses, robberies, thefts, burglaries, and arson.

The potential displacement of crime levels was checked by monitoring home burglaries in all zones surrounding the experimental zone for a 30-day period before helicopter patrol, during helicopter patrol, and for a 30-day period after helicopter patrol. It should be noted, however, that some serious crimes (i.e., homicide, rape) are reported at such a low rate that it is difficult to detect meaningful change in these low frequency crimes.

The number of instances in which time of burglary occurrence, within any 24-hour period, could not be established did not change dramatically during the experimental periods. There was a daily average of 3.22 such burglaries during the experimental periods in all four areas and an average of 3.1 per day during the baseline periods.

DISCUSSION

The data collected from the high population density zones replicate crime deterrent effects described in a previous helicopter evaluation article by Schnelle *et al.*, 1978. The fact that the helicopter effect was replicated adds credibility to the validity of the patrol procedure. However, the fact that no apprehensions were made, also

a replication of the previous evaluation, does not increase confidence that the patrol procedure will continue to be effective over longer time periods. There is some indication from patrol research done in Kansas City that novel crime reduction procedures are often temporarily reactive (Pate, Bowers, & Parks, 1976).

The data collected from the low population density zones contribute two additional insights concerning helicopter patrol. First, the fact that the helicopter patrol procedure will not work if the area of coverage is large and not densely populated but only if the area is small suggests that the visibility of the patrol procedure is essential. Periodic informal checks of each area in which the helicopter was patrolling suggested that the helicopter was frequently visible in the high density areas, but only sporadically visible in the low density areas. Reducing the area of coverage in low density areas is not a viable solution to the visibility problem, since a small area within large zones does not encompass a large enough population frequently victimized by burglaries. Research to verify formally the importance of helicopter visibility will have to involve combining several high density zones into one large area of patrol coverage. If in the latter research the helicopter is demonstrated to be ineffective, the visibility of the helicopter, and not other characteristics associated with high density areas, e.g., population characteristics, would probably be documented to be the critical program variable.

The second insight, contributed by the disparity of helicopter effects in low and high density areas, is the documentation of the distribution of benefit limitations. Under ideal circumstances, the police department would prefer to develop a burglary deterrent program that can be efficiently implemented in all the metropolitan areas because all areas are victimized by burglaries and support the police department through tax revenues. Clearly, the fact that the helicopter patrol is limited in its applicability is a program shortcoming that would lead to the discontinuation of the helicopter program if

another burglary deterrent program existed that was more generally equitable in its effects. Unfortunately, an alternative validated burglary deterrent program is not now present in Nashville, and thus the police department has decided to maintain helicopter patrol in those areas in which it can be effective.

The marginal cost of the helicopter patrol is more than compensated for by the immediate savings that result from reduced burglaries in those areas in which the helicopter is effective. Furthermore, cities that currently own helicopters may be in a position similar to Nashville in which existing helicopters are underutilized. In such cases there are negligible "opportunity loss" costs because the helicopters are not being diverted from alternative programs which produce documented benefits. The cost-benefit data documented in Nashville would have to be supplemented by opportunity loss cost figures in those cities in which such costs would occur. Finally, the cost-benefit data described in this paper would also change if a city had to purchase a helicopter in order to initiate a burglary deterrent program.

In fact, approximately 200 law enforcement agencies, including Nashville, currently own helicopters and may not have to consider purchasing costs in a cost-benefit analysis of the helicopter program (Nelms, 1976). If purchasing costs are to be included in a cost-benefit analysis, then the procedure of discounting must be used to contrast program costs to program benefits (Neenan, 1974).

A discounting technique is necessary because it would be unfair to load all one-time purchase costs into a first year cost-benefit evaluation of a program that lasts for several years. Obviously such an approach would underestimate the first year ratio of program benefits to program costs and overestimate the benefit to cost ratio in following years. Similarly, it would be unfair to take simply the estimated life of a helicopter and equally spread its one-time purchase costs across that life span.

The exact cost figures that must be consid-

ered by a city assessing the value of a helicopter program would depend on the actual investment a particular city would have to make and the method of financing that the city would use. If a city did not have any existing aviation capabilities such as trained pilots and mechanics, ground storage facilities, or communication equipment, then the investment cost would be much higher than the Nashville program.

The intent of this paper has been to provide planners a model for intelligent evaluation of the potential value of a helicopter program in their individual areas. There is a possibility that helicopter costs cannot be justified by program benefits in many situations. In fact, the possibility that the Nashville program might lead to diminishing effects with continued usage could lead to an unfavorable cost-benefit ratio and program termination.

Given the description of program costs and benefits and following the line of analysis described in this paper, each city should be able to make an informed determination of the potential value of helicopter patrol for their unique situation.

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Received March 13, 1978

Final acceptance May 17, 1979