*PATROL EVALUATION RESEARCH: A MULTIPLE-BASELINE
ANALYSIS OF SATURATION POLICE PATROLLING
DURING DAY AND NIGHT HOURS*

JOHN F. SCHNELLE,¹ ROBERT E. KIRCHNER, JR., JOE D. CASEY,
PAUL H. USELTON, JR., AND M. PATRICK MCNEES

NASHVILLE METROPOLITAN POLICE DEPARTMENT, LUTON MENTAL
HEALTH CENTER, AND MIDDLE TENNESSEE STATE UNIVERSITY

The effects of a carefully monitored and increased police patrol on the report of crime were examined in four patrol zones. Overall patrol movement was increased to four times normal levels and slow patrol movement (under 20 mph) to around 30 times normal levels for 10 days. The patrol was active in two zones between 9:00 a.m. and 5:00 p.m. and in the other two zones between 7:00 p.m. and 3:00 a.m. A multiple-baseline design and time-series statistical analyses showed statistically reliable changes in reported levels of Part I crime (such as robbery, burglary, and aggravated assault) during both night patrols, but not in the day patrols. In both night-patrol zones, there were also reliable increases from saturation patrol to postsaturation patrol in report of Part I crime after the night patrol was terminated. Neither of the day patrols showed significant crime report changes on termination. Despite statistically reliable decreases in report of crime during nighttime hours, the value of saturation patrolling as a crime-prevention technique was questioned on cost/benefit grounds.

DESCRIPTORS: patrol evaluation, saturation patrol, multiple baseline, police

Police departments have historically depended on patrol activities to deter crime. Kakalik and Weldon (1973) reported that over \$1 billion is diverted annually to police-patrol programs; a survey by the National Commission on Police Productivity revealed that between 70% and 90% of a metropolitan police department's patrol personnel are working on street-patrol related assignments. Despite the widespread emphasis on patrol, there have been few empirical evaluations of the crime-suppressing effects of the various patrol strategies.

Kelling, Pate, Dieckman, and Brown (1974) conducted an experimental evaluation in Kansas City concerning the effects of decreasing and increasing patrol on several dependent variables, including report of crime and victimization surveys (unreported crime). The latter investigators define "random" patrol as being "police time available for self-initiated patrol activities", and care was taken to indicate that this definition did not assure that the patrolmen actually used the

time they had available for self-initiated patrol for actual preventive patrol purposes. In the context of the latter definition, the investigators increased time available for preventive patrol in five randomly chosen beats by doubling and tripling the number of patrol cars available for patrol (proactive beats). All patrol cars were withdrawn from a second group of five zones with instructions to patrol on the border of those zones and to answer calls for service only within the zones. Finally, five beats were designated as control zones, the existing patrol level of one car per shift remaining intact. Surprisingly, the latter manipulations, which were monitored for 1 yr, did not produce significant differences between zones, either on report of crime or on survey measures of unreported crime.

The latter research attracted national publicity and criticism from several sources (Davis and Knowles, 1975). Many of these criticisms involved the actual degree of the decreased patrol in the reactive beats, but important criticisms were also made of the definition of "random patrol". In particular, mention has been made of the fact that even though the time available

¹Reprints may be obtained from J. F. Schnelle, c/o Nashville Metropolitan Police Department, 110 N. Public Square, Nashville, Tennessee 37201.

for patrol was increased in the proactive zones, there is no assurance that the increased time was used for preventive patrol activities.

A second empirical evaluation of the effects of increasing patrol strength was reported by Schnelle, Kirchner, McNees, and Lawler (1975). These investigators evaluated the effect of increasing patrol directed toward prevention of one specific crime (home burglary) and, consistent with the Kansas City results, found that the saturation patrol did not significantly decrease reports of home burglaries.

The present investigation was undertaken to test further the "no-effect" results previously collected. In particular, efforts were made to clarify several issues that Nashville police administrators thought relevant to the previous patrol research. These were: (1) The previous patrol studies simply evaluated the effects of putting more police and patrol cars into an area. No attempt was made to assess the actual amount of preventive patrol that was conducted, even though the Kansas City experiment did have observers ride with the police on occasion. It is possible that simply adding additional cars does not directly lead to arithmetical increases in patrol movement and coverage. The present study used instrumentation to provide direct, continuous measures of patrol performance leading to quantified estimates of patrol activity increases. (2) Nashville police administrators felt that the preventive patrol could be best conducted if extra police cars were freed from nonpatrol related functions, *i.e.*, answering calls for assistance, traffic work, *etc.* In the Kansas City research, police did perform such nonpatrol duties and the extent to which this work interfered with patrol is not easily estimated. (3) It was the consensus that patrol cars should patrol zones at sustained slow speeds. The latter factor was thought important because slow patrolling officers were hypothesized to be not only more visible to citizens, but also to be more likely to detect signs of crime, *i.e.*, evidence of breaking and entering. Previous studies did not involve attempts to sustain slow patrolling practices.

(4) Police administrators indicated that increased patrol would have a greater crime-deterrent effect during the night shift than during the day shift. Fewer people for the police to observe and less night traffic, leading to greater police-car visibility, were thought to be two factors that would contribute to the differential crime-prevention effect.

METHOD

Experimental Zones

Four patrol zones were selected for study from 33 possible zones in the Metropolitan Nashville area. These zones were picked because they had a consistently high rate of serious crime and it would, therefore, be easier to assess the effects of a short-term patrol intervention designed to reduce crime. An average of 3.8 Part I crimes occurred per 24-hr period in the four high crime zones for a 30-day period before intervention in each zone. Part I crimes consist of robberies, larcenies, burglaries, aggravated assaults, homicides, motor-vehicle thefts, and forcible rapes. The average for all other Nashville zones during the same period was 1.2. Two of the four zones were randomly selected for saturation patrol during the second shift, 9:00 a.m. to 5:00 p.m., and the other two for saturation patrol during the night shift, 7:00 p.m. to 3:00 a.m. The areas of the two day patrol zones were 7.74 and 1.65 square miles. The population was 17,978 and 27,251; median income, \$6297 and \$9071. An average of 11% and 77%, respectively, of all structures within the zones were classified as residential. For the night patrol zones, the areas were 1.67 and 1.23 square miles, population was 13,548 and 8359, and median income was \$5208 and \$6045. Fifty per cent and 26% of the zones were classified residential housing.

Saturation Patrol

Four tactical squad cars were placed in the patrol zones in addition to the car regularly assigned to the zones, making a total of five cars in

each zone. Tactical squads exist in most major police departments and consist of small groups of officers who undertake a variety of specified assignments. The four tactical squad cars were instructed not to answer calls within these zones, except for emergency calls or calls of crime in progress. During this study in four zones, all four cars together spent only an average of 54 min per day on such calls. There was no difference between zones as to the amount of time on such calls. In some zones, the presence of parks or universities, which are patrolled by private security, made it unnecessary to patrol the entire zone area. Thus, cars were assigned specific patrol routes in each zone so that there was a car covering 0.62 square miles in Day Zone One, 0.51 square miles in Day Zone Two, 0.42 square miles in Night Zone Three, and 0.30 square miles in Night Zone Four. The cars were one-man patrol cars and were instructed to patrol their areas at a sustained slow speed (below 20 mph). In addition, patrolmen were given daily feedback about the frequency and location of Part I crime that occurred in their zones.

Independent Measure of Patrol Activity

Patrol was continually monitored by tachograph instrumentation. The tachograph is an instrument that works off the transmission of a patrol car and provides a continuous, time-based, graphical readout of vehicle speed, distance travelled, engine operation, and the use of emergency lights.² Tachographs were placed on every experimental patrol car employed in this study. Kloss (Note 2) described the tachograph in some detail. The tachograph data of specific interest in this experiment was total moving time and total time moving under 20 mph, even though a number of other patrol performance measures were collected. Written feedback on both the latter variables was given daily to all

patrol officers. Two people independently analyzed the tachograph records with a commercially available field-chart analyzer to assess scoring accuracy. Reliability between the two scorers was calculated dividing the lowest daily time score collected by the highest daily time score collected and multiplying by 100. For example, if Observer 1 detected 100 min of patrol time under 20 mph and Observer 2 detected 110 min, then $(100/110) \times 100 = 91\%$. Reliability checks were made for each measure. The reliability for scoring total patrol-time movement averaged 95%, and reliability for time moving under 20 mph was 85%. To obtain a comparison base against which the patrol-strength variables measured by the tachograph in this study could be contrasted, tachographs were placed on all regular cars in one of the experimental day zones and in one of the experimental night zones between December 15, 1974, and January 15, 1975. The tachograph measures were taken for a 30-day period and were removed from all zone cars some three months before the patrol experiments took place.

The measurement and feedback system just described was designed to ascertain exactly how much patrol movement existed in the saturated zone and to ensure that patrol performance would be maintained at a reasonably constant level throughout the patrol experiment. In addition to monitoring the latter performance variables, random checks were also made of patrol cars' location. The latter checks were accomplished by having supervisors make random, daily, on-site visits to the experimental patrol zones. The patrol officers were told of the possibility of such checks before each patrol, but were not told when checks would take place. At no time during this study were police cars observed to be out of their assigned zone.

Crime Measures

Report of crime was the measure employed to evaluate the effectiveness of patrol, and Part I report of crime was the subclass of reported crime of particular interest. To check the quality

²Tachographs utilized in this study were purchased from ARGON Instruments Corporation, 36-21 33rd Street, Long Island City, New York 11106. The authors wish to thank Todd Risley and James Kloss for suggesting the use of tachographs.

of the Metro crime-reporting system, the following steps were taken: (1) Each address given for an instance of Part I reported crime was cross-checked against the addresses that comprised each patrol zone. This was done to prevent crime from being assigned to incorrect zones by either patrol officers or desk sergeants. (2) A random sample of the names of presumed victims of crimes was crosschecked against the city directory to ensure accuracy of the address filed in the investigative report. (3) The investigative officer's written report of the crime was randomly checked against the classification of that crime to ensure that the crime classification was constant throughout the experiment. (4) Complaints by citizens on police inactivity in regard to report of crime were continually monitored to ensure that police officers were not neglecting to write up crime reported directly to them. Black (1971) and Black and Reiss (1970) reported data that indicate that police sometimes do not write up a formal crime report in response to a complaint for the following two reasons: first, when the relational distance between disputants is small, as in domestic disturbance, the police might not file a formal crime report because of the low probability of future prosecution; second, the police at times make subjective on-the-scene judgments about the merits of a case and may not write a crime report if the evidence and/or complainant seems suspicious. In either of these two situations, the Nashville police file a miscellaneous incident report instead of a crime report. To guard against the possibility that more complaints were filed as miscellaneous incidents during the patrol intervention periods, the frequency of miscellaneous incidents was analyzed during baseline and intervention periods. There were no significant changes in miscellaneous-incident reports in any of the four experimental zones during this evaluation. (5) Two people, working independently, listed all classes of crime by shift, day, and zone. An agreement index was calculated to ensure accuracy of the retrieval of the crime data from the data sheets. Agreement reliability was 98%

during the entire investigation and 100% during the saturation periods.

All crime reported in this study was due to citizens calling the listed police telephone number. Only rarely in baseline, and never in the saturation periods, did citizens report crime directly to the patrolling police officers.

Experimental Design

A multiple-baseline design was employed to evaluate the effects of patrol intervention. Two zones were randomly picked from the four possible zones to be saturated first during the day shift from 9:00 a.m. to 5:00 p.m. The first zone was saturated between April 14 and April 25, and the second zone between April 28 and May 9. The final two zones were randomly selected from four possibilities to be patrolled during the night shifts. The first night-shift patrol zone was patrolled between June 10 and June 21, and the second night patrol zone between July 15 and July 30.

RESULTS

Figure 1 illustrates the reported Part I crime data in each zone before, during, and after patrol interventions. Time-series analyses testing the statistical significance of changes in the level and slope of each time-series line were conducted. Time-series analysis adjusts for the interdependency of time-series data and provides a 't' test to estimate the significance of difference between experimental phases (see Glass, Willson, and Gottman, Note 1). Neither of the two-day patrol zones showed a significant change in level at the point of intervention ($t = 0.66$, $df = 50$, $p > 0.05$; $t = 0.79$, $df = 60$, $p > 0.05$). However, both night-patrol zones did show significant changes in level from the pre-intervention to the intervention period ($t = -2.48$, $df = 126$, $p < 0.05$; $t = 2.08$, $df = 98$, $p < 0.05$). None of the four zones showed significant changes in slope ($t = 0.72$, 80, 176, 0.37, respectively).

Fig. 1. Daily frequency of Part I crime during presaturation patrol, saturation patrol, and postsaturation patrol. Upper two panels illustrate reported crime during the day shifts; lower two panels illustrate crime during night shifts.

Furthermore, time-series tests were conducted testing changes in level from the patrol intervention period to the postintervention period. Once again, there were statistically significant changes (increases) in level of reported crime from intervention to postintervention in the two night-patrol zones ($t = +3.53$, $df = 44$, $p < 0.05$; $t = +2.10$, $df = 21$, $p < 0.05$). Neither of the day patrol zones showed significant level changes from the intervention to the postintervention period ($t = -1.5$, $df = 44$, $p > 0.05$; $t = -0.08$, $df = 44$, $p > 0.05$).

Time-series tests were also conducted on the Part I report of crime on all zones surrounding those in which the interventions took place. No surrounding zone showed a significant change in level of Part I report of crime at the time of intervention in adjacent experimental zones, thus indicating that crime did not show a "displacement" effect when patrol was increased in the target areas. Similarly, there was no apparent change in crime reports within each zone during shifts when the saturation patrol was not in ef-

fect. Part I crime was further subdivided into crime against property (burglary, theft) and crime against persons (assaults, rape, armed robbery). The latter two classes were separately analyzed for the two day-patrol zones and the two night-patrol zones. Even though most of the decreases in crime in all zones were due to decreases in crime against persons, none of the decreases was statistically significant. In addition, there were no changes in the frequency of arrests in any of the four experimental zones.

Figure 2 illustrates the total amount of overall moving time and the total amount of moving time under 20 mph that was directly measured by the tachographs. The pre-intervention tachograph data were collected from one of the night patrol zones and one of the day patrol zones three months before the actual saturation-patrol experiment was initiated. The data from the latter two zones represent the average daily performance of two different cars patrolling the day shift and two different cars patrolling the night shift for a 30-day period. The data from

Fig. 2. Upper panel illustrates total time in minutes, as indicated by tachograph records, that all patrol cars spent moving each day before and during saturation patrol. Lower panel illustrates total time that patrol cars spent moving under 20 mph each day before and during saturation patrol.

the saturation zones were averaged each day of the patrol for the two day-patrol zones and for each night of the patrol for the two night-patrol zones. There was an overall average 398% increase in total moving time and a 3040% increase in moving time under 20 mph from the pre-intervention to the intervention period in all four zones combined.

DISCUSSION

The most significant finding of this investigation, in the context of previous studies that showed no effect of increased patrolling, is the differential effect of increased night patrol *versus* increased day patrol. Furthermore, this study, unlike others before it, does provide direct verification not only that patrol levels were in-

creased, but also quantified estimates about how much patrol levels were increased.

One hypothesis as to why there should be a day/night difference in the effectiveness of preventive patrol lies in the fact that home burglaries occur primarily during daylight hours, but not so much at night, whereas business burglaries occur primarily at night. Patrol cars find it easier to patrol businesses and perhaps prevent business burglaries at night because: (1) there are fewer physical obstructions (trees, shrubbery) obscuring businesses than obscuring homes; (2) there is less movement of people at night and, hence, more of a chance to detect suspicious activity; (3) business establishments are generally grouped closer together than are residences and, hence, can be covered in a shorter period of time. A specific analysis of the crime

occurring during the intervention periods in all of the zones revealed that the number of home burglaries did not change during the daylight hours when the saturation patrol was in effect. There was, however, only one incident of a business burglary occurring in the two night-patrol zones during both 10-day intervention periods. Before the night patrols, there was an average of 2.1 business burglaries per 10-day period in the two night-patrol zones.

Taken at face value, the latter results suggest that to maximize effect, police should deploy extra men for preventive crime patrolling at night rather than during daylight hours. However, a close appraisal of the results suggests a qualifying comment concerning the practical importance of the statistical significance that was achieved.

Most obviously, there are cost factors to be considered if police departments attempt a wide-scale application of the apparently successful interventions documented in this investigation. The Nashville Police Department estimates that it costs \$5000 to buy a car and \$46.25 per shift, per week to maintain a patrol car for a seven-day period. The average salary for a patrol officer over the same period of time is \$272.16. To replicate the experiment city-wide, this cost would be at least four times more, reflecting simply the increase in patrol cars and manpower. In addition, the tachograph instrumentation and supervisor time required for the patrol performance and crime feedback system utilized in this experiment would have to be added to the basic car and manpower costs. The latter cost factors might not be prohibitive if the crime-suppressant effects lasted beyond the time that the increased patrol was in effect; however, in this experiment crime promptly returned to pre-intervention levels. Thus, to maintain reduced levels of crime, it may be necessary to maintain increased patrol levels in all relevant metropolitan patrol zones.

If the night crime suppression could be maintained over long time periods, then the costs of implementing the patrol would have to be judged against several more subjective cost-sav-

ing criteria, such as reduced property losses and personal injuries that resulted from night patrolling. The problems in making such cost comparisons are numerous and would merit discussion in this paper only if it were feasible to implement the successful interventions on a wide-scale and long-term basis. In reality, no matter what cost savings resulted from night crime suppression, the Nashville police Department cannot afford to maintain patrol at the levels demanded in this study. Only if the night crime suppression would have lasted beyond the patrol presence, or if the reduced crime levels could be sustained by fewer men, would it be practical for a city to implement the patrol procedures described here. Therefore, a detailed description of savings that resulted from reduced crime levels is not directly relevant to decisions concerning whether or not the patrol procedures should be routinely employed.

In summary, the present results indicate that police departments should try alternatives to saturation patrolling in attempts to reduce crime levels. However, since most metropolitan police departments maintain tactical squads, whose primary function is to reduce crime in problem areas, this investigation also suggests that these existing tactical squads can best be employed at night, if patrolling is to be done at all.

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