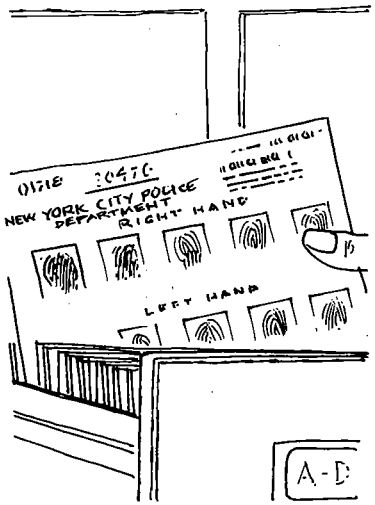

POLICE MANPOWER VERSUS CRIME

S. James Press *University of Chicago*

CRIME AND its prevention are much discussed these days, especially crimes of violence against individuals. Among the ways society moves to prevent or decrease crime, an important and time-honored one is the use of the police.

How effective are the police, and how may they be made more effective? For example, what impact does an increase of police manpower have? Such questions have in the past been remarkably little studied, in part because it is difficult and expensive to do the studies. This essay describes one study that was carried out where statistics played a central role. In this study, police manpower was increased substantially in one precinct of New York City. It was found that the manpower increase was accompanied by decreases in certain kinds of crime, in particular robbery and auto theft, but there were no changes in other kinds of crime, for example, burglary.

THE PROBLEM

To allocate police resources efficiently, it is useful to know whether the amount of crime committed in a given area is affected by increasing police manpower and associated equipment in the area; if crime is affected, by how much; and which crimes are affected the most. Getting at such questions requires careful statistical analysis because of a number of difficulties. Some difficulties are observational, in that data most appropriate for examining these questions have simply not been collected. Other difficulties are inherent in the problem. Some of them are:

(1) The true amount of crime committed in an area is never known precisely since only some fraction of it is actually reported. Further, the proportion reported may itself increase if police manpower increases.
(2) Crime changes must be analyzed in a controlled fashion so that the effects of changed manpower can be compared with what crime *would* have been had the changes not been carried out. If crime patterns are continually shifting, such controlled study becomes more difficult. Thus, if an area experiences basic sociological or economic changes (such as might happen after an influx of low-income immigrants), patterns of crime might be expected to change independently of changes in police procedure.
(3) If a "crackdown on crime" is attempted in one area of the city and not in others, crime may decrease in that part of the city but increase in other parts as criminals merely relocate their activities. If such increases are spread over many areas in small amounts, their detection would be difficult because the effect would be masked by random fluctuations in reported crime, and by other factors external to the basic problem.

Because of data-gathering problems and inherent problems like those above, it has been difficult to quantify the effects of increased police manpower on crime. We shall see that statistical analysis helped clarify and interpret data from a New York City study in which police manpower was substantially increased in a single police precinct. Reported crimes in that precinct (and others) were recorded before and after the increase in police manpower.

The police made available data on daily reported crimes during the five-year period from January 1, 1963, to December 31, 1967. The crime reports were classified according to crime type (robbery, burglary, etc.), exact date, time, place, and nature of crime, and whether or not the crime was of the "outside" type (visible from the street). An example is shown by calendar quarter for "total robberies" in Figure 1.

On October 18, 1966, the police increased the number of patrolmen assigned to the 20th Precinct, located on the West Side of Manhattan (see

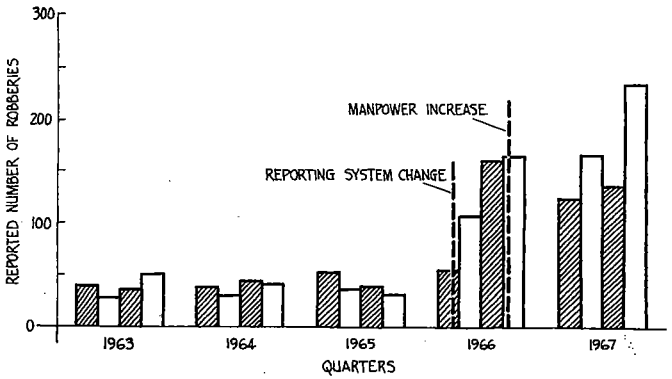

FIGURE 1
Reported number of robberies in the 20th Precinct. Source: Press (1971)

Figure 2), from an average of 212 to an average of 298 while police manpower elsewhere in the city remained fairly constant.

METHOD OF STUDY

The fundamental question of the study was whether the increase in police manpower decreased reported crimes. To answer this question, a number of analytic decisions had to be made, for example, should crimes be studied

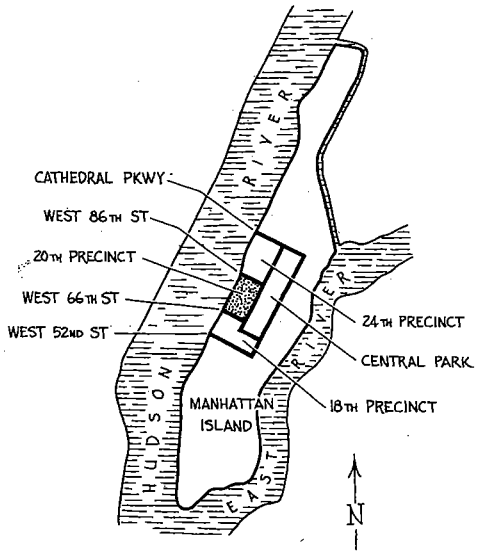

FIGURE 2
Locations of police precincts under study. Source: Press (1971)

on a daily, weekly, or some other time-period basis? The decision was to study crime on a weekly basis because of unevenness in the incidence of crime over the days of the week; more crime is committed on weekends.

A second analytic problem was that of seasonality; more outside crime is committed during the warmer months than during the colder months; for other crime types the reverse is true. A naive study of crime records might easily mistake an indicated increase for a "real" increase, rather than a seasonal effect. By using a statistical averaging technique this seasonal effect can be minimized.

The total period was divided into a low-manpower period (before the increase in police manpower) and a high-manpower period. The seasonally adjusted average weekly crime volumes during the low- and high-manpower periods could now be compared. Their differences, however, might not reflect the effect of increased police manpower since there was no control. That is, there was no way to tell whether an observed change in reported crime might have occurred anyhow—without a change in police manpower. To provide some measure of control for this effect (since it had not been provided by the design of the study), the following procedure was established. A group of precincts located in other parts of the city were selected as controls for the 20th Precinct, separately for each crime type, on the basis of how "similar" they were to the 20th, from a crime standpoint. Crime changes were then studied for the control precincts in the same way they were studied for the 20th Precinct. The difference in average weekly crime from low- to high-manpower periods in the 20th Precinct was compared with the average difference in the control precincts; the difference between these differences was taken to be the net effect associated with the increase in police manpower in the 20th Precinct.

The net changes in reported crime were evaluated as described above. At this point, decisions were made about which net changes were larger than could be explained by purely chance, or sampling variation. For example, if it were found that the estimated net change in reported crime (over and above the change in the control precincts) was a *decrease* of two crimes per week, was this observed change real, or just an effect explainable by purely chance (sampling) variation? Perhaps if the experiment were carried out again, a net *increase* of two crimes per week would be observed, just because of slightly different conditions at the times of observation. To reduce such uncertainties about interpretation, intervals of credibility, that is, intervals which reflect a high degree of belief in the net change results, were established. The idea behind these intervals is the following.

Prior to examining the data it was believed that almost any net change might be observed. After observing the data, however, it was determined (by means of statistical techniques) that uncertainty about the true net change of crime could then be confined to a rather small interval.

For example, suppose as in the illustration above, it were found that the

observed net decrease in crime was about two crimes per week, and further, that the chance was very great (95%) that the *true* decrease was between 1.3 crimes per week and 2.6 crimes per week. Then, it could be concluded with little chance of error that a real decrease was being observed (since the interval includes only decreases) and that an observed increase would be highly unlikely in a future study. In many cases it was found that, although a net decrease or increase was observed, in fact, the interval of credibility included both positive and negative numbers and thus the apparent change could be attributable to sampling variation and might not be a real effect at all.

RESULTS

Some major results of the study are given in Table 1. A percentage change is relative to what would have occurred without the police manpower change. A net change was taken to be "statistically significant" if the 95% credibility interval included only positive or only negative numbers. In the table, all results are statistically significant unless the contrary is stated.

To understand how the numbers in the table were developed, consider the case of *outside robbery.* It was found that 4.56 crimes per week were reported on the average, in the 20th Precinct, prior to the substantial change

TABLE 1. Changes in Crime Rate of Inside and Outside Crimes*

ROBBERY:	A net decrease of 2.6 crimes per week (33%) for crimes visible from the street and a net decrease of about 2 crimes per week (21%) for others
GRAND LARCENY:	A net decrease of 17 crimes per week (49%) for crimes visible from the street and a net decrease of 6.6 crimes per week (29%) for others
BURGLARY:	Changes in reported crime not visible from the street (97% of all burglaries in New York) were not statistically significant
AUTO THEFT:	There was a net decrease of 7.7 crimes per week (49%)
MISCELLANEOUS FELONIES:	There was a net decrease of 1.9 crimes per week (38%) for crimes visible from the street
TOTAL FELONIES:	A net decrease of 23.7 crimes per week (36%) for crimes visible from the street and a net decrease of 4.4 crimes per week (5%) for others
MISCELLANEOUS MISDEMEANORS:	Crimes visible from the street showed a net decrease of 8 crimes per week (15%); other crime changes were not statistically signicant
TOTAL MISDEMEANORS:	Net changes were not statistically significant

* The data classified reported crimes as *outside crimes*, which are visible from the street, and *inside crimes.*

in police manpower (after adjustment for seasonal effects). After the manpower change, an average of 5.01 crimes per week were reported (after seasonal adjustment). In the control precinct, the corresponding numbers were 4.76 and 7.79, respectively. Thus, there was an increase of only 0.45 crimes per week in the 20th Precinct while there was an increase of 3.03 crimes per week in the control precinct (where there was *no* change in police manpower). The implication is that the reported number of outside robberies would have increased by 3.03 crimes per week (instead of only 0.45) during the same time interval had there not been a substantial increase in police manpower. The net effect of the police manpower change is 3.03 minus 0.45, or a decrease of about 2.6 crimes per week, the entry reported in the table. The 95% credibility interval was computed to be from 1.49 to 3.70. Since the interval included only decreases, it was concluded that the measured reduction in reported crime was a real effect.

It may be noted from the table that the increase in police manpower had little if any effect upon burglaries. This is not surprising since almost all burglaries are inside-type crimes. Placing more police in the neighborhood is not likely to have an appreciable effect upon such crimes unless the police manpower increase is accompanied by a change in the pattern of deployment to one which is designed to focus on burglaries.

The police manpower increase was accompanied by appreciable decreases in the violent crime of robbery (a crime that, by definition, requires a confrontation between criminal and victim) and the property crimes of grand larceny and auto theft. These results make sense since these crimes take place in the street, where a police manpower increase is likely to have its greatest effect.

TECHNICAL AND INTERPRETIVE PROBLEMS

Some of the technical difficulties which had to be overcome to arrive at the above conclusions, and some of the difficulties of interpretation of results of any such study, are described below.

Unfortunately, there was no opportunity for the statisticians to help in the design of the study so that, for example, the quality of the additional patrolmen (relative to the others) could not be assessed, the way in which the additional patrolmen were deployed and utilized could not be determined, and it could not be determined whether or not there was a *Hawthorne effect,* that is, a reduction or increase in reported crime simply because the patrolmen and residents knew a change was taking place (and therefore tried hard to effect a change). Also, the experiment was not repeated so that random errors would tend to average out. That is, several precincts in which police manpower was increased by the same percentage might have been, but were not, used. Another possibility might have been to increase police manpower (and then remove the additional force) several times in the 20th Precinct.

Moreover, the 20th Precinct might have peculiarities not common to the other precincts, and had several precincts been selected at random and the results averaged, results would have been more acceptable as representative of the City.

During the period of investigation the method of reporting crime underwent major changes. On March 10, 1966, a central reporting bureau was established for the entire city to replace the earlier precinct-by-precinct reporting system. Moreover, some of the definitions of what constitutes a reportable crime changed. The overall effect was to increase the number of reported crimes, that is, to reduce the number of crimes the police are aware of, but which previously may have gone unreported on official records. As a result, reported incidence of crime showed a substantial fictitious increase after the change in the reporting system. From an analysis standpoint, the data in the two periods (before and after the reporting system change) are not directly comparable so that reporting comparisons without statistical analysis would be misleading. (Data collected *after* the change in reporting system but *prior* to the increase in police manpower could be and were compared directly with data collected after the police manpower increase.) It was decided that although data collected before and after the reporting system change were somewhat different, the "early" data could at least be used to estimate the pattern of seasonal variation since that factor is likely to be least affected by changes in the reporting system. To evaluate seasonal variation, the early data were averaged in a special way designed to eliminate all effects except the seasonal component. Since the seasonal variation has a period of one year, the average was taken for one year periods over the approximately three years of data available prior to the change in reporting system. The results of this procedure were then used to eliminate the seasonal component from all the data collected subsequent to the change in reporting system.

It was also reasoned that when a new system of reporting crime is instituted it takes some time for the police personnel to adapt to the new system. That is, if crime records were used from the instant of adoption of the new system, part of any observed change in reported crime might be attributable to this transient effect. It was decided that about a month of adaptation time would be adequate, since over this period mistakes could be made one week, discovered during the next week or two, and corrected thereafter. After a month, most adaptation errors should have been eliminated.

In an analogous way, it was reasoned that after a substantial change in police manpower in an area the residents might change their rate of reporting crime, and therefore the reported incidence of crime. This might occur because of their increased awareness of the presence of police in the area, and therefore a greater feeling that something might be done about the crimes they report. To allow, at least in part, for the short-run aspect of this adaptation effect, the first month of data after the manpower increase began was not used in the detailed analysis.

SUMMARY

The problem of main interest was whether increased police manpower is effective as a deterrent to crime. In a New York City police precinct, police manpower was increased by 40%. Large volumes of data were collected for reported crime, over a five-year period, for all police precincts in the city. The simplest methods of summarizing the data could not, by themselves, be used to answer the question posed. By using techniques of seasonal adjustment, the method of comparison with control precincts, and credibility intervals, modern statistics was used to shed more light on a difficult problem. That is, by using statistical techniques, results were obtained, suggesting that, while increased police manpower is probably not very effective against certain types of crimes such as burglary and misdemeanors, it may be effective against other crimes such as robbery, grand larceny, and auto theft.

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