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THE IMACT OF POLICE ACTIVITY ON CRIME: ROBBERIES ON THE NEW YORK CITY SUBWAY SYSTEM

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THE IMPACT OF POLICE ACTIVITY ON CRIME: ROBBERIES ON THE NEW YORK CITY SUBWAY SYSTEM

JAN M. CHAIKEN
MICHAEL W LAWLESS
KEITH A. STEVENSON

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THE
NEW YORK CITY
RAND
INSTITUTE
545 MADISON AVENUE NEW YORK NEW YORK 10022 (212) 758-2244

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PREFACE

This study was undertaken under a New York City-Rand Institute contract for management improvement analysis from the New York City Bureau of the Budget. As specified in the contract, the purpose of the study was to "examine and report the effects of police manpower on crime, documenting and analyzing as a case example effects on transit crime of changes . . . in the deployment of transit police, and interactions of these crime effects with crime in surface transportation. . . ."

We hope our findings will prove useful to those who rely on the subways for transportation and to the City government, the Transit Authority, and the Transit Police. In addition, researchers concerned with crime deterrence will find many of their hypotheses have been analytically confirmed or refuted here in the context of subway crime, and a number of new hypotheses have been raised for later study.

SUMMARY

Many police activities, including apprehension of criminals and patrol by uniformed officers on foot or in cars, are often assumed to deter crime. But the circumstances under which deterrence actually occurs are not well understood, and many policemen as well as researchers doubt the effectiveness of particular measures intended to reduce crime. Once anticrime measures are instituted, analysis of their effectiveness may be complicated by changes in reported crime rates that (1) may reflect changes in reporting practices rather than in actual crime rates, or (2) may be caused by entirely unrelated influences. In addition, even an apparently successful anticrime measure may simply displace crime to other targets, times, or locations.

This report presents and analyzes an 8-year history of subway robbery in New York, which has unique qualities for establishing the relationship between police activity and crime rates. Robbery incidence patterns are reviewed, along with characteristics of such crimes and the men who commit them. By comparing these patterns with other crime rates and with the deployment, activities, and arrest rates of the Transit Authority Police Department (a separate police force which has jurisdiction over the New York City subways), we were able to identify the major contributors to changes in robbery rates. In addition, many of the findings are applicable to some felony crimes other than robbery.

In 1965, in response to a rising subway crime rate, Mayor Wagner ordered nearly a tripling of the Transit Police force, from 1219 to over 3100 men. The additional men were to patrol every station and train In the system during the night from 8:00 p.m. to 4:00 a.m. As was widely reported in the press at the time, subway crime rates during those hours appeared to decrease sharply. Our study shows that whereas reported decreases in the number of minor crimes are at least partially explained by changes in police practices, the decrease In the felony crime rate was genuine and substantial. The deterrent effect of this form of uniformed patrol Is therefore conclusively

demonstrated. However, the cost to the City for each felony crime deterred was also substantial—$35,000.

Analysis of crime rates during the remainder of the day showed that displacement of crimes to other times did not occur in the short run. On the contrary, crime rates temporarily decreased during the hours when no manning change took place. This phenomenon, which we call a "phantom effect," may be attributed to uncertainty on the part of potential offenders regarding the details of the new deployment. The phantom effect lasted approximately eight months, after which increases in crime during the hours without increased manning were much larger than during the nighttime period. As a consequence, the vast majority of serious subway crimes currently occur during the daytime hours between 4:00 a.m. and 8:00 p.m. when the smallest number of policemen are on duty.

Since the number of subway robberies deterred in 1965 was small compared to above-ground robbery rates, we were unable to determine whether displacement to other targets took place. A sudden spurt in the number of robberies of bus drivers in 1968 and 1969, however, is shown to have diminished the number of subway robberies below the levels that would otherwise have been expected. Upon the introduction of exact change on the buses, robberies of bus drivers were virtually eliminated, and subway robbery rates returned to the anticipated levels. Therefore, displacement both away from and toward the subways occurred because of perceived or actual changes in the relative attractiveness of buses and subways as targets for robbers.

The robbers themselves are generally young and black, but otherwise there were substantial differences between those who rob passengers and those who rob token booths. The average age of passenger robbers was found to be about 17 years, and they rarely carry guns. They frequently operate in groups, often after school lets out, and their crimes may involve substantial violence. If a passenger robbery is successful, the average "take" is about $50. Token booth robbers average 22 years in age, operate singly or in pairs, and are commonly armed. Many are narcotics addicts, and their profit averages around $150. One particularly active booth robber was found to have "earned" $2600 in one month.

An analysis of the activity patterns of subway robbers showed that collectively they concentrate on a small number of stations and portions of train routes, but otherwise there were no common characteristics that would provide guidance for police deployment. The stations and portions of routes having the highest robbery rates tend to lie underneath those parts of the City where surface robbery rates are also high. Evidently robbers prefer to escape into neighborhoods they know fairly well.

The Transit Police detectives have about the same success rates for arresting passenger robbers as the City detectives have for all robberies above ground, and in addition their arrest rates for token booth robbers were considerably higher, reflecting the successful use of stakeout techniques.

The report concludes with a recommendation that the Transit Police experiment with a flexible deployment plan. This would permit focusing more manpower on high-crime times and locations while retaining many of the benefits of the present total coverage between 8:00 p.m. and 4:00 a.m.

ACKNOWLEDGMENTS

The authors wish to acknowledge the support of the Bureau of the Budget of New York City which funded this study.

We are grateful to Chief Robert H. Rapp of the Transit Authority Police Department for having approved our study and granted access to records. Several other TAPD officers lent important assistance to our effort. Inspector Steven Opara, Chief of Patrol, provided data, unpublished analyses, and useful discussions. Sergeant J. Fumai contributed statistical summaries and spent many hours assisting the data collection. Useful information was provided in interviews by Detective Sergeant J. Condon and Lieutenant Vincent Calcagno. We also wish to thank Inspector J. Norton and Captain F. Guerriero for their assistance.

At The New York City-Rand Institute, we are grateful to Richard Danzig, whose efforts laid the groundwork for this study; to Gilbert Bassak, who collected some of the data; and to John Jennings, Edward Blum, and Sydney Cooper for their helpful comments.

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I. INTRODUCTION

On intuitive grounds, it is reasonable to believe that crime rates can be reduced by increasing the number of policemen on patrol or by other methods, such as plainclothes patrol, stakeouts, and investigation of past crimes, that increase the probability of apprehending a criminal offender. To deploy and assign patrol and detective manpower, however, police administrators would like to know in quantitative detail the extent to which particular crime types are affected by specific changes in police activity.

To date, studies directed at determining this relationship have not provided results with very clear implications for police deployment, primarily due to measurement problems. One of the most important problems, although entirely obvious, is that crime rates show long-term trends that are almost certainly more dependent on demographic, social, and economic influences than on any police activities. Thus, an increase or decrease in crime rates after the institution of an anticrime program may not be related to the program.

Another problem is that reported crime statistics are unreliable measures of the true amount of crime, both because the police are not informed of many crimes and because the police themselves exercise some control over which crimes are recorded and how they are classified. As an example, if more policemen are assigned to patrol duty, their augmented force may cause them to observe and report a larger fraction of crimes than they did before the increased manning, thus showing an apparent increase in crime. Alternatively, if the policemen know that the increased patrol is intended to reduce the numbers of crimes in certain categories, they might adjust their reporting practices to assure that the desired outcome appears to occur. Recorded data about crimes may also fail to identify times and locations in a way that permits comparison with the police activity whose effect is to be measured.

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*For a detailed discussion of these problems, together with references to previous studies, see Maltz [1].

If the measurement problems can be controlled in some way, the effects of interest are, first, whether crime rate reductions occur at the times and places where the police initiate new activities and, second, whether the police action causes displacement of crime. These displacement effects can potentially take several forms. If offenders move the location of their criminal activity away from that part of the city in which police effectiveness increases, either to other parts of the same city or to other jurisdictions, then *geographical displacement* occurs. If they change the time of day or day of the week at which they commit crimes, then *temporal displacement* occurs. In addition, offenders may change the *type* of crime they commit or the *targets* of their activity, so that, for instance, street muggers may become burglars, or bus robbers may hold up liquor stores.

To date, evidence that these effects exist has been primarily anecdotal, while careful analysis of crime data has led to mixed results. Press [2] found that increased police patrol manning in one New York precinct decreased the precinct's reported rates for certain outside crimes, while two of the three adjoining precincts showed no compensating displacement effects. The third adjoining precinct (Central Park) experienced an increase in reported crime, but it was not possible to determine whether displacement caused any part of the increase. Press took into account trends in reported crime rates that may have been independent of the increase in patrol manpower by comparing them with trends in similar distant precincts, but information about true crime rates was not available.

Also in New York, unpublished studies by the City on the effect of introducing the "fourth platoon," an added force of patrolmen in the hours from 6:00 p.m. to 2:00 a.m., concluded that decreases in reported crime rates occurred around the time of implementation. In some cases, however, the decreases began before the fourth platoon was actually implemented in the precinct; and in others, crime appeared to increase between 4:00 p.m. and 6:00 p.m. Moreover, a Kansas City study of the relationship between uniformed patrol in marked cars and true crime rates, not completed at this writing, is reported to indicate the absence of a deterrent effect for this form of patrol [3].

This report presents and analyzes an 8-year history of subway robbery in New York, which has unique qualities for establishing the relationship between police deployment and crime rates. We are interested not only in identifying why robbery rates have changed in the past on the subway system, but also in describing the characteristics of the crimes in enough detail that implications for possibly more effective future deployment can be derived.

As a whole, subway crime is well suited for analysis because it is not difficult to determine unambiguously whether a reported crime did or did not occur on the subway system. Moreover, the Transit Authority in New York has its own police force (the Transit Authority Police Department—TAPD) which maintains separate crime statistics, so that data on subway crimes are readily available. In most cases the location of the crime is clearly reported, at least to the closest subway station. We focus on robbery because it is a serious crime that concerns the public, and as a subclass of crimes it is fairly well defined—the taking or the attempt to take valuables from another person by the threat or use of force. In addition, crimes committed for monetary gain are generally considered to be more amenable to influence by police action than other types of crime.

Subway robberies may also be better reported than robberies in general. In the first place, the victims of some of these robberies are Transit Authority employees (i.e., primarily token booth operators), who are almost certain to report robberies because they must account for missing cash and tokens. When robbery victims are passengers, the subway itself delivers them to a station where it is convenient for them to report the robbery to a patrolman or change booth clerk. Victims of robberies outside the subway system often have to make a special effort to report the crime to the police.

The deployment of police on the New York subways is also unique, probably varying more by time of day than the deployment of any other police force in the country. Most patrol activity on the subway system is concentrated in the hours from 8:00 p.m. to 4:00 a.m., at which time nearly every train and station is patrolled by a uniformed policeman. This deployment pattern was not always the case, having been

introduced by Mayor Wagner in April 1965 in response to a steadily increasing subway crime rate. In that year, the total size of the TAPD increased from 1219 men to over 3100 in order to provide the desired coverage. Therefore a comparison of crime patterns before and after the change allows us to analyze the effect of the added manpower.

In addition, a number of factors suggest that the probability of arrests for robberies committed in the subway system may differ from the probability for robberies committed elsewhere. First, the Transit Police have their own detectives who operate independently from New York City detectives and use a different mix of investigative techniques. Second, subway stations and trains are spatially confined, offering only a limited number of escape routes. And third, the victims of token booth robberies are readily available to the police to identify suspects long after the crime is committed. We therefore examine the arrest probabilities for subway robberies and see whether there is an indication that the differences from city-wide probabilities affect offenders' choice of the subways as opposed to other locations for their crimes.

Finally, subway robbery data provide a unique resource for analyzing crime-type displacement effects, because during the period under study bus robberies in New York suddenly increased substantially, followed by the institution of exact fare on the buses. We can therefore analyze whether displacement of robbers from the subways to the buses took place when bus robberies increased, and then whether displacement in the opposite direction occurred when bus robbery became an unprofitable venture.

To conduct this study, we obtained available summaries of crime statistics from the Transit Police covering the period 1963-1970, and we collected more detailed information about robberies. We determined the date and location of all robberies reported to the Transit Police from January to April 1970 and from January to April 1971.* Then,

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* These periods were selected by virtue of the time of data collection (mid-1971) and our desire to make comparisons with 1970 and 1965. Aggregate data do not suggest substantial seasonal variations that would make these data atypical, with the exception of after-school crime patterns.

for a systematic 20-percent sample of these robberies, we obtained details from the crime reports, as shown in the data coding sheets in Appendix A. For comparison purposes, the times of all robberies in 1965 were also collected from crime reports. In addition, for every robbery included in the 20-percent sample which was cleared by arrest, we obtained information about the arrestee(s), including characteristics of other crimes these offenders allegedly committed.

Because we focused on robberies, the conclusions we can draw about manpower deployment are not necessarily appropriate for all crimes taken together, and therefore this aspect of the present study must be considered only as an example of a methodology that could be applied to a complete analysis of deployment strategies.

The next section briefly explores the deployment of the Transit Police. This information was obtained from interviews with Transit Police officials conducted by the authors in 1971 and also by Kakalik and Wildhorn [4] in 1970. Section III describes our general findings with regard to subway crime patterns and their relationship to external influences and police activity. In Sec. IV we examine subway robberies and robbers in detail, and in Sec. V we develop indices of TAPD detective performance. The last section presents our conclusions.

II. TRANSIT POLICE DEPLOYMENT

The Transit Authority Police Department, established in 1936, is responsible for law enforcement and security within the subway system. Its activities complement those of the New York City Police Department (NYCPD), rather than substituting for them fully. There are various forms of routine cooperation between the two departments, which consist primarily of "overhead" functions that the City Police provide to the Transit Police. For example, the NYCPD processes all Transit Police arrests at the local NYCPD precinct station and provides jail services and escort to detention facilities. In addition, the TAPD relies on the City Police for crime checks on suspects and other investigative services such as crime laboratory analyses.

Crimes reported to the Transit Police are transmitted to the NYCPD for inclusion in the City's crime statistics. Moreover, the officers of each department have full police powers in the areas ordinarily covered by the other department. Thus, the City Police will respond to emergencies in the subway system if requested to do so, and the Transit Police may enforce any city or state law within New York City, Aside from pursuing suspects from the subways into the streets, however, Transit policemen do not exercise their powers outside the subway system *to* any substantial extent, and some of them may not be aware that they have such authority.

Between 1965 and 1971, the size and deployment of the Transit Police force remained fairly constant. The total number of sworn personnel was about 3180 in 1971, of whom about 2780 were assigned to the Patrol Division, 233 to the Detective Division, and the remainder to headquarters and planning.

DETECTIVES

In 1971, the Detective Division included 129 men and women with the rank of detective, and 104 with patrolman rank. A special force

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* The Transit Police budget is paid from New York City tax revenue, not from Transit Authority Income.

of 8 detectives under the direction of a Detective Sergeant was assigned exclusively to investigate robberies whose victims are Transit Authority employees (i.e., mostly token booth robberies). These crimes are called "TA robberies." The rest of the Detective Division was divided among the detective squad, assigned to investigate all other crimes, the public safety squad, and a confidential investigation unit.

Although no detectives were assigned exclusively to passenger robberies, some concentrated on related crimes committed by purse snatchers, bag openers, and pickpockets; they worked in man-woman teams from 11:00 a.m. to 7:00 p.m., or noon to 8:00 p.m. The other detectives worked rotating 8-hour tours beginning at 8:00 a.m., 4:00 p.m., or midnight, except that women did not work the two night tours. As a result, more detectives were on duty between noon and 8:00 p.m. than at other times.

Detectives working in the field are assigned to one of four sectors where they cover all reported crimes. Ordinarily, between two and four detectives will be on duty in each sector. Personnel who are working the 8:00 a.m. tour report to a subway station in their sector, while at other times they report to TAPD headquarters. They telephone their office every hour to get the latest information about recently reported crimes in their sector. Investigations can therefore begin soon after the crime is committed.

The Detective Division also had available a squad of 74 patrolmen (referred to as the Task Force) who worked in plainclothes on booth stakeout duty but were not members of the Division. These men worked in pairs, mostly at night. The existence of this booth stakeout squad, together with the assignment of 8 detectives exclusively to TA robberies, indicates that the Detective Division places the highest priority on the investigation of token booth robberies. The next highest priority appears to be on purse snatchers and the like, with all other crimes, including passenger robbery, falling approximately together at a third priority level.

PATROL

The deployment of the uniformed patrol force of the Transit Police follows substantially different patterns. Prior to 1965, the patrol force consisted of about 900 men who were evenly allocated around the clock. Since then, the main consideration in allocating the patrol force has been to meet, at least approximately, the objective specified by Mayor Wagner that every subway station and every train should be policed between 8:00 p.m. and 4:00 a.m. As we shall see, the manpower requirements for accomplishing this are so substantial that the number of patrolmen who can be on duty at other times is necessarily smaller than during the 8:00 p.m. to 4:00 a.m. period, given the total size of the Transit Police force.

In 1971, 297 subway trains were operating in the system at 8:00 p.m. on a weekday, gradually decreasing (as the frequency of service declined) to 197 at 4:00 a.m. A patrolman assigned to one of these trains generally rode the train for a complete one-way or round trip (depending on the length of the journey)» at the end of which he might transfer to another train. Taking into account requirements for breaks and meals for the men, the exact timing of train arrivals and departures at the terminals, and the need to have each officer end his tour where he started it, the TAPD determined that 319 patrolmen had to be on duty on weekday evenings to man all the trains from 8:00 p.m. to 4:00 a.m. [5]. On weekends, more trains were running at night, so that a total of 356 men were needed to police all the trains.

The timing is actually fairly tight, since most policemen on this tour begin work at 8:00 p.m., and the schedule calls for all trains to have a patrolman on board by 8:15 p.m. This is accomplished by having the men report to work at approximately 20 district stations and substations around the City, rather than at a single central location. These stations are not necessarily the terminals at which the subway trains begin their trips, but many of them are. The small difference between the maximum number of trains operating at any one time and the number of men used to man the trains indicates quite clearly that the police scheduling was cleverly and efficiently designed.

Although the TAPD appears to do its best to man every single

train every night, subway station manning has been somewhat less than complete. A total of 484 subway stations were in the transit system in 1971, so that at least this many men were needed to man them all from 8:00 p.m. to 4:00 a.m. In the case of station assignments, the TAPD has never attempted to cover all positions 100 percent of the time (i.e., including break and meal times), so that at most 488 men have actually been assigned to subway stations at one time.† Accepting this nominal standard for station coverage, we see that the largest total number of men needed to cover every station and train in 1971 was 807 on a weekday night and 844 on a weekend.

The desired coverage from 8:00 p.m. to 4:00 a.m. can be provided in part by men who work a steady 8:00 p.m. to 4:00 a.m. tour ("fourth platoon"), while the rest of the coverage comes from the "regular" rotating three-tour schedule. The rotating shifts work 8-hour tours beginning at midnight, 8:00 a.m., or 4:00 p.m. To simplify assignments, certain "patrol posts" are manned around the clock by the men on the rotating schedule. These posts include from one to eight stations and/or several sections of train routes. The men assigned to the stations appear to remain primarily at one of the stations on their post. In this way, approximately 182 stations are covered nearly 24 hours every day. Beginning at 8:00 p.m., the men on the rotating tours stay at the "key" station on their post, while the remaining stations, together with all the trains, are covered by patrolmen from the fourth platoon.

In practice, it often happened that the full complement of men was not available for patrol duty due to illness, vacation, special assignment, and so forth. Thus, some patrolmen would be assigned to posts covering two stations even during the 8:00 p.m. to 4:00 a.m. period. A small number of stations form adjacent pairs, making double-station assignments reasonably satisfactory, but in most cases it was

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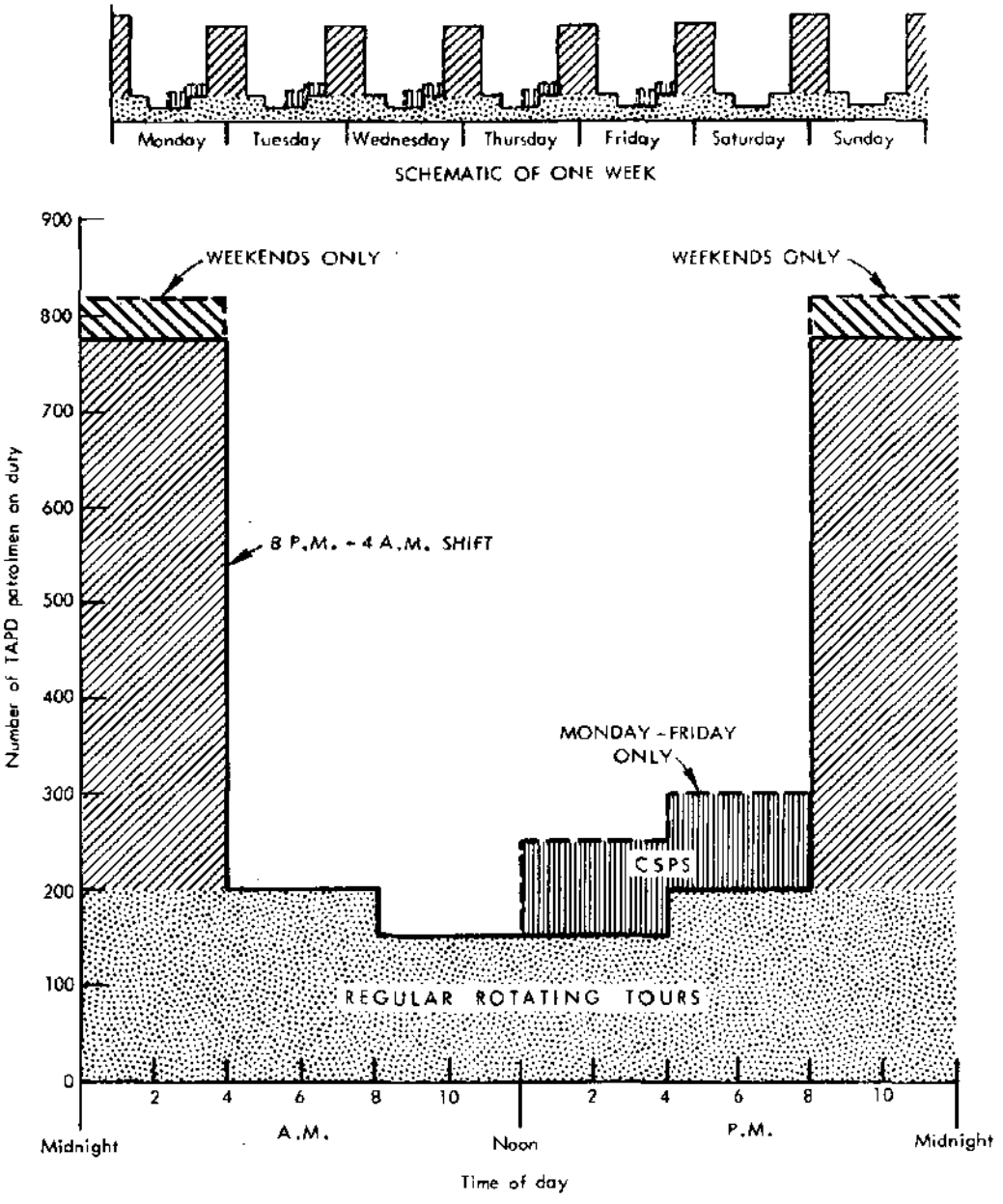
For assignment purposes, the Transit Police have subdivided a few large stations, so this number includes some stations counted more than once.

† That is, every station was manned by at least one officer, with four stations having two officers.

necessary for the patrolman to take a subway train from one station to the other. Beginning in October 1970, the TAPD reduced the haphazard nature of the double assignments by specifying some stations that were not to be assigned a patrolman and providing two-man teams of patrolmen in (street) patrol cars to cover these stations. The specified stations are primarily on elevated lines. As of 1971, the resulting foot patrol assignments covered 182 stations with men on the rotating schedule, and 243 with men on the fourth platoon, for a total of 425 covered stations out of 484.

In addition to the men on rotating schedules and on the fourth platoon, there is another group of about 100 patrolmen, called the Centralized Special Patrol Service (CSPS), which works from noon to 8:00 p.m. on weekdays and provides reinforced manning at stations that have a large volume of passenger traffic after school or at the close of business, when many robberies occur. They provide "crowd control" services as well as law enforcement.

The overall deployment of uniformed TAPD patrol by time of day in 1971 was therefore as summarized in Fig. 1, which shows about 64 percent of all man-hours devoted to patrol were concentrated between 8:00 p.m. and 4:00 a.m. On the average, about 1250 patrolmen were at work in the field daily, which means that the full-time services of nearly 2200 patrolmen were accounted for by patrol activities. Thus, only 20 percent of the man-hours available to the Patrol Division were consumed in supervision, assistance to investigations, court appearances, and non-patrol activities of all types. This is considerably smaller than the fraction of patrol forces in general-purpose police departments that are engaged in non-field activities, reflecting the fact that the Transit Police perform a very specialized type of police function. Although we have not been able to obtain exactly comparable figures for other police departments, data collected from six departments by the National Commission on Productivity suggest that about 60 percent of Patrol Division man-hours in municipal police departments may be devoted to non-field activities.



SOURCE: TAPD Patrol Division

Fig. 1 -- Allocation of TAPD patrol by time of day

III. INFLUENCES ON SUBWAY CRIME RATES

THE MANNING INCREASE*

When Mayor Wagner ordered an increase in the authorized strength of the Transit Police, subway crime rates in New York were increasing in a fairly dramatic fashion. Between 1963 and 1964, the number of reported felonies in the subway system increased 52.5 percent, from 1119 to 1707, and a comparison of reported felonies in the first three months of 1965 (just prior to the increased manning) with the same period of 1964 showed that the increase was continuing at 41.4 percent per year [6]. Public and governmental attention seems to have been focused on this problem by the murder of a 17-year-old youth on an "A" train during the night of March 12, 1965.

The increased manning from 8:00 p.m. to 4:00 a.m. was instituted in full on April 7, 1965, with the City Police providing 83 percent of the extra men until the TAPD could hire and train enough new patrolmen. During this process, which required nearly a year, the City Police and the Transit Police worked 6-day weeks in order to maintain the previous levels of deployment for Transit Police during the rest of the day, and for City Police elsewhere.

What happened to the subway crime rate in the five years that followed is shown in Fig. 2, which displays annual counts of all reported robberies on the subway system, felonies (which include robberies), misdemeanors, and the total of felonies, misdemeanors, and lesser offenses (now called violations). Looking first at the total subway crime rate, we see that the increases experienced in 1964 and early 1965 were terminated when the special patrols were introduced, and in fact total reported crime on the subway system continued to decrease for several years. The logarithmic scale of this graph makes the decrease look small, but numerically it was substantial. Even with increasing crime rates in 1969 and 1970, the total reported

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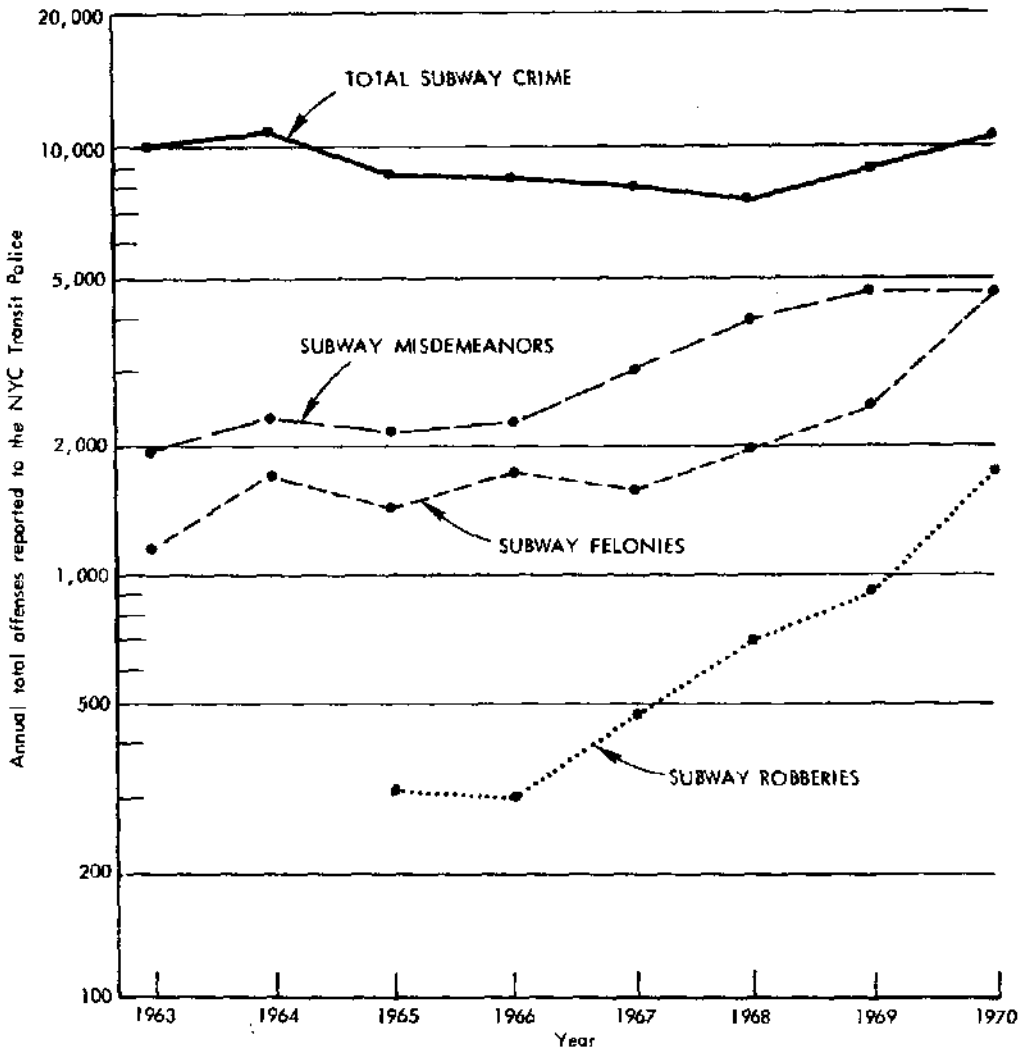
* Steven Opara, Chief of Patrol, TAPD, supplied information for the following two paragraphs.

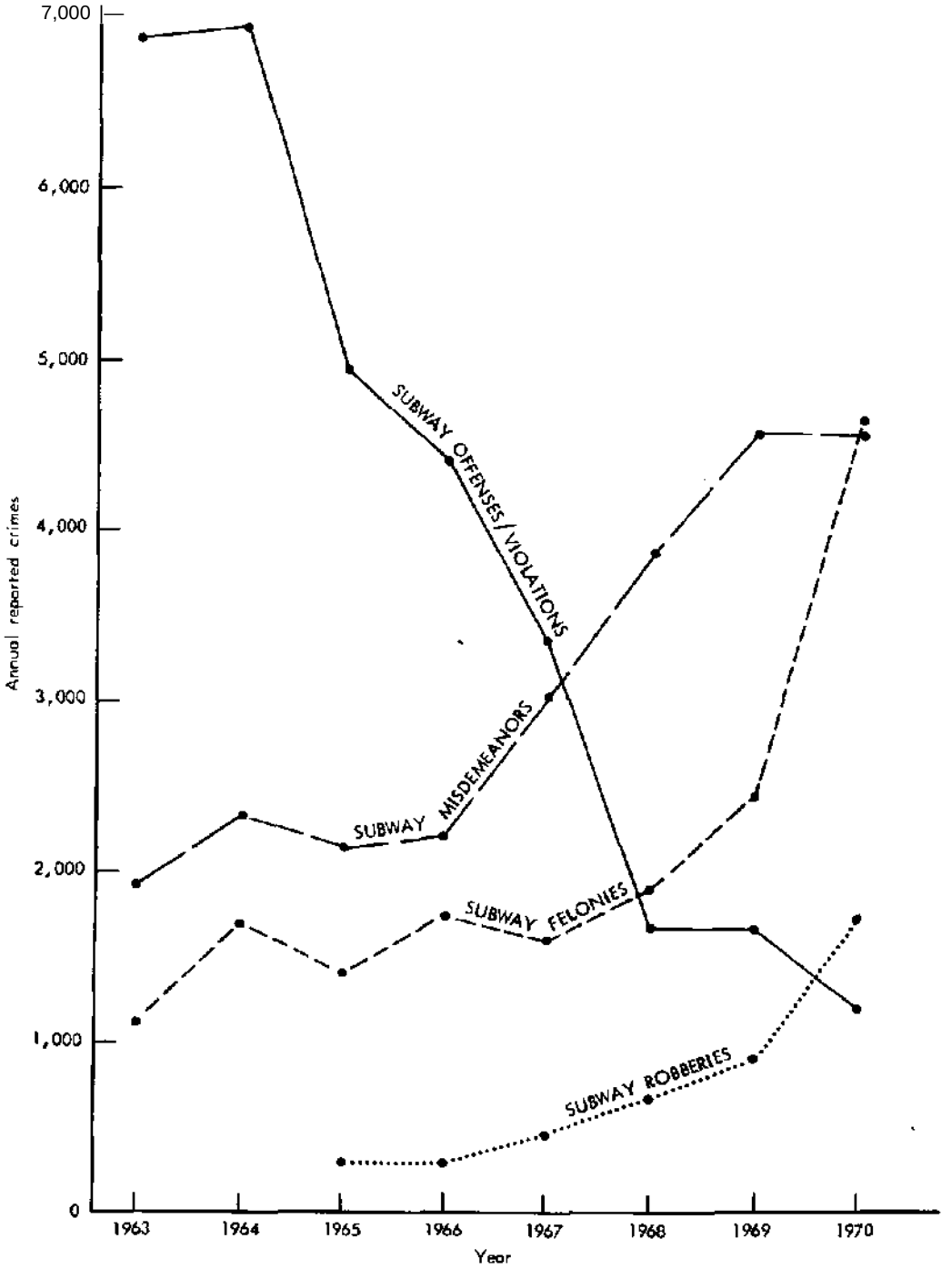


SOURCE: TAPD Annual Crime Reports and Special Tabulations

Fig. 2 -- Annual reported subway crime 1963-1970, log scale

crime rate was still lower in 1970 than the levels experienced in 1964.

Referring to Fig. 3_f we see first that the decrease in total crime is almost exclusively attributable to a dramatic drop in the number of reported violations that began in 1965 and continued through 1968. Second, we notice that although the reported number of felonies and misdemeanors decreased in 1965, these were temporary and less dramatic. This is not to imply that the increased manning had



SOURCE: TAPD Annual Crime Reports
and Special Tabulations

Fig. 3 -- Annual reported subway crime 1963-1970, linear scale

no impact on serious crimes. Prior to April 1965, felonies were increasing at an annual rate of 52 percent [7] and it was not until 1968 that this rate of increase was matched. As the figure shows, robberies contributed heavily to the rising felony rate, increasing from less than 20 percent of all felonies in 1966 to nearly 40 percent in 1970. From 1968 to 1970, subway robberies increased at an annual rate of about 60 percent as compared with a citywide increase in all robberies of 16 percent.*

We see, then, that the increased manning by the Transit Police did not keep the overall rate of serious subway crime low over the long run, although it may well be true that the rate in the late 1960s would have been even higher without the extra men. To examine the effect of the increased manning during the hours in which it was concentrated, we turn to Fig. 4, which shows the reported annual total crime rates and felony rates on the subways, broken into two time segments: 8:00 p.m. to 4:00 a.m. ("night") and 4:00 a.m. to 8:00 p.m. ("day"). To compare the rates in the two periods, which are of different length, we have divided by the number of hours. For example, a value of 0.5 on this figure would mean that, on the average, one crime was committed every two hours somewhere in the New York City subway system.

It is interesting to note first that reported total crime rates per hour were higher during the day than at night, even before the manning change. This might suggest that the common perception of the subway crime problem as being concentrated at night was incorrect. However, the difference in crime rates was primarily due to the greater rate of minor crimes during the day. In 1963 and 1964, the hourly rate of *felonies* was almost identical during the "day" and the "night" periods, and our analysis of robberies occurring on the subway system in the three months prior to the manning change indicates that almost twice as many robberies were committed hourly at "night" as during the "day."

In addition, since the number of riders on the subway system

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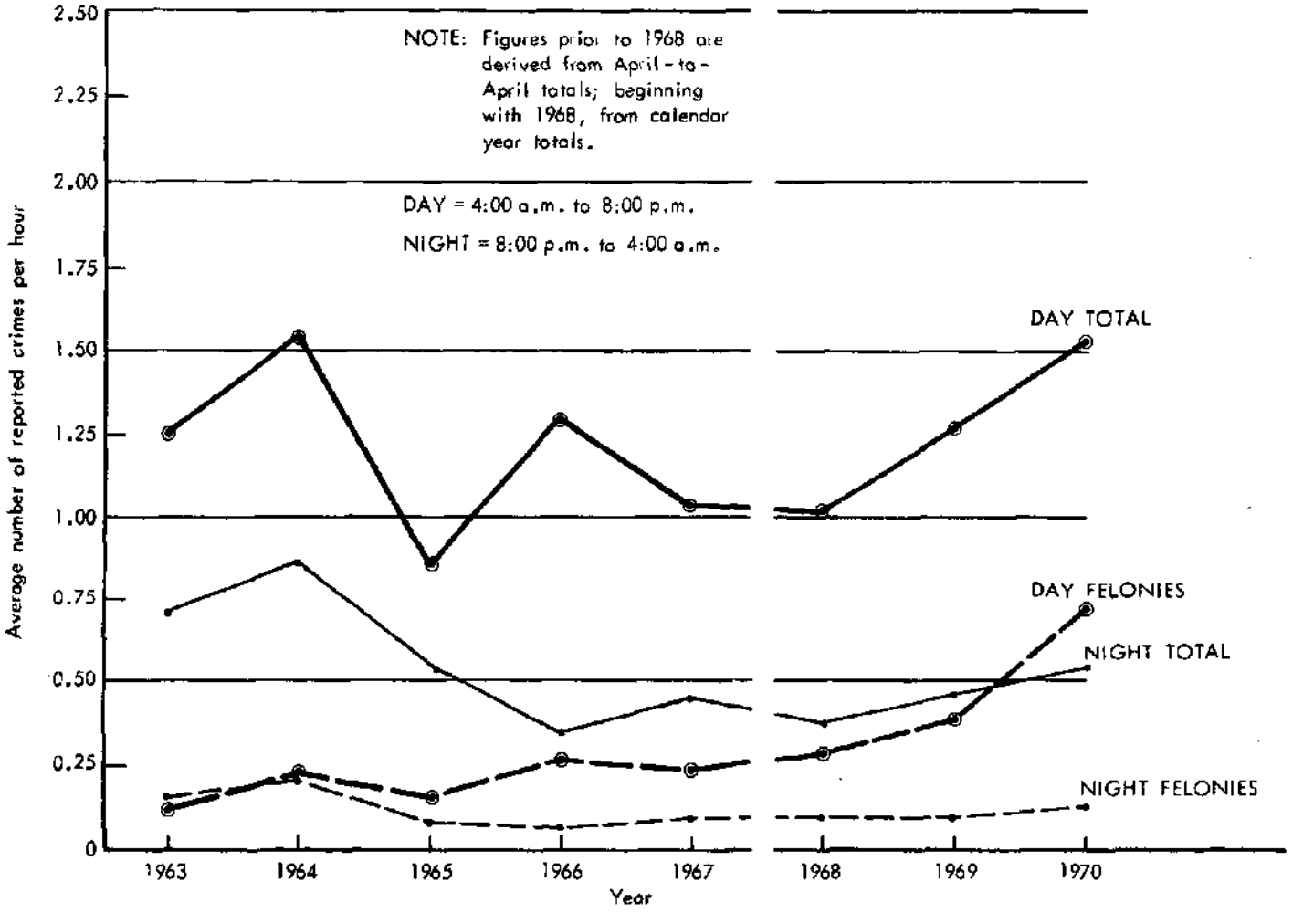
*Source: NYCPD, Annual Crime Reports.



SOURCE: TAPD Planning Division

Fig. 4 -- Average day and night reported subway crimes per hour, 1963-1970

between 6:00 a.m. and 8:00 p.m. is at least 10 times as great as the number from 2:00 to 4:00 a.m., and reaches a level over 50 times as great around 5:30 p.m.,* the chances of a passenger's being the victim of a crime were clearly higher at night than during the day. (We have not made an exact calculation of victimization rates, since this would necessitate determining which crimes actually had passengers as victims.) Thus it is understandable that in 1965, with the possibility of a reelection campaign in mind, the Mayor chose the hours from 8:00 p.m. to 4:00 a.m. as his target for increased subway police manpower even though, strictly speaking, the "high crime" hours were during the day.

The second observation to note from Fig. 4 is that reported crime rates during the hours of increased patrols did in fact drop more substantially and for a more sustained period than the overall crime rates. Indeed, the number of felonies reported at night reached, at their lowest, a level only one-third as high as that attained in the year preceding the manning Increase. Six years later, reported rates for nearly all crime types between 8:00 p.m. and 4:00 a.m. had not returned to their 1964 and early 1965 levels.

Third, we can observe that a drop also occurred in reported crime rates during the daytime hours from 4:00 a.m. to 8:00 p.m. in the year following the institution of the special patrols, despite the fact that no important changes were made in police manpower levels during those hours. Total reported daytime crime decreased 40 percent in one year, with felonies down 25 percent. This effect was very short-lived, however, as reported daytime felony rates rebounded past their 1964 level by 1966, and by 1970 they had reached a level about 6.5 times as high as the nighttime rates.

As we pointed out in the Introduction, observations of this type can possibly be explained by changes in crime reporting practices as well as by changes in actual crime rates on the subway system. In this particular case we must be wary of the possibility that the

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* Source: New York City Transit Authority Department of Public Information and Community Relations.

reporting practices of the City Police who were added to the system differed from those of the Transit Police. In addition, the decrease in reported daytime crime after April 1965 suggests a change in reporting practices by the Transit Police themselves.

In Fig. 5, another indication of possible changes in the fraction of crimes reported is present in the data for arrests on the subway system. The fairly dramatic decline in arrests for minor offenses (violations) over the 1963 to 1970 period, and especially the 43-percent decrease in such arrests from 1964 to 1965 (when manpower increased by a factor of 2.5), suggests that the police patrolling the subways may have gradually paid less attention to these offenses or handled them by methods other than by making arrests. As arrests for violations were decreasing, the number of summons issued was increasing. This decreased the number of arrests per reported violation, as shown in Fig. 6. Because the Transit Police crime reports indicate that, on the average, police officers report over 90 percent of violations, a change in police practices could be expected to affect the reported number of such crimes to a greater extent than crimes members of the public often report.

One possible explanation for a change in practices related to arrests for minor offenses might be that the City Police, temporarily added to the subway police force in 1965, were unaccustomed to making such arrests. In addition, either the city officers themselves or their commanders may have objected to their spending time in court after an arrest for a violation. Whatever the reason, the TAPD apparently did change its policies in this regard, eventually leading to protests on the part of the transit patrolmen's union. In 1970, John T. Maye, president of the Transit Patrolmen's Benevolent Association, stated that the Transit Authority wanted to hold down the number of arrests so crime statistics would indicate the subways were safer, and that superior officers were ordering transit patrolmen to release some suspects rather than book them [8].

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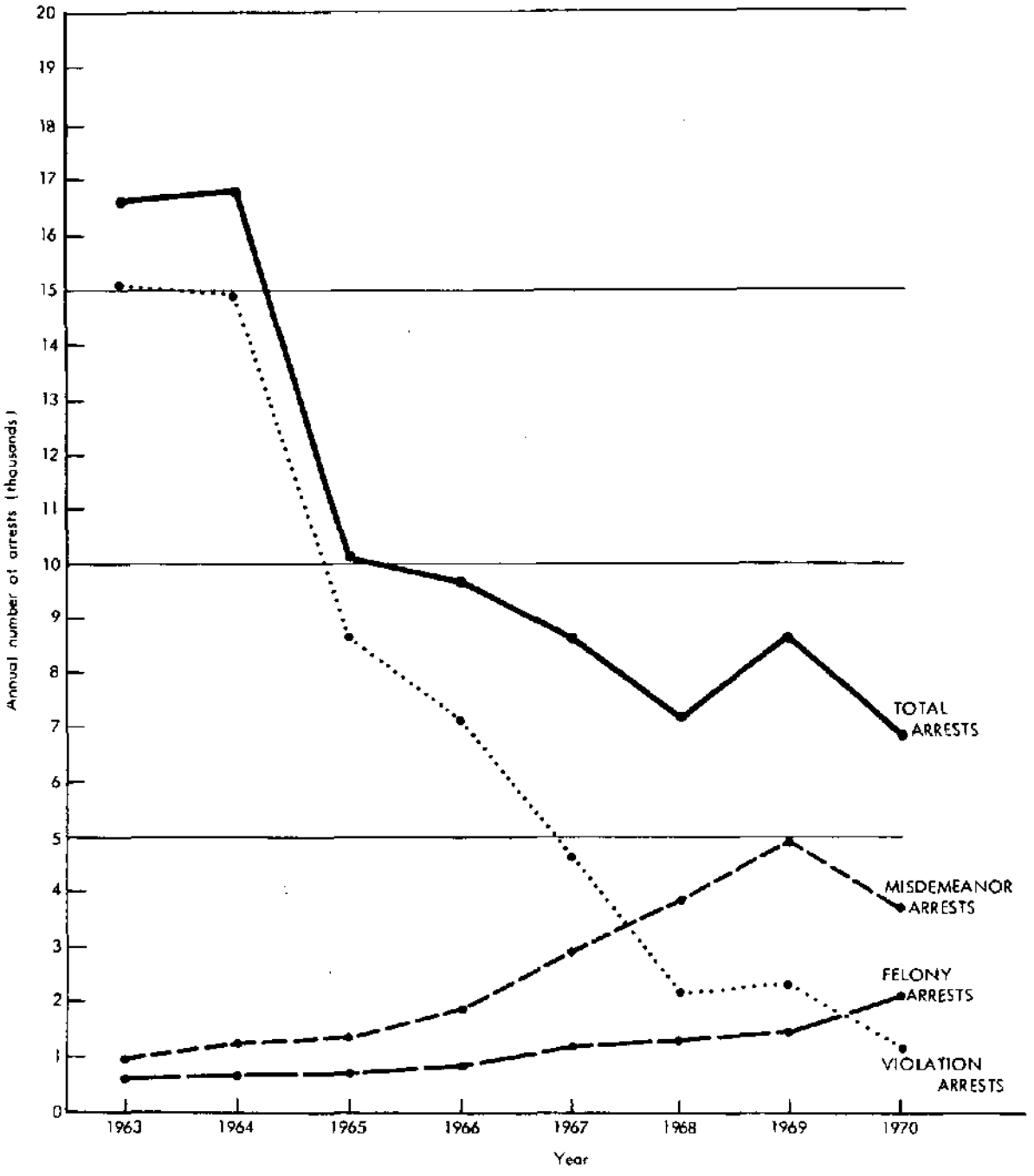
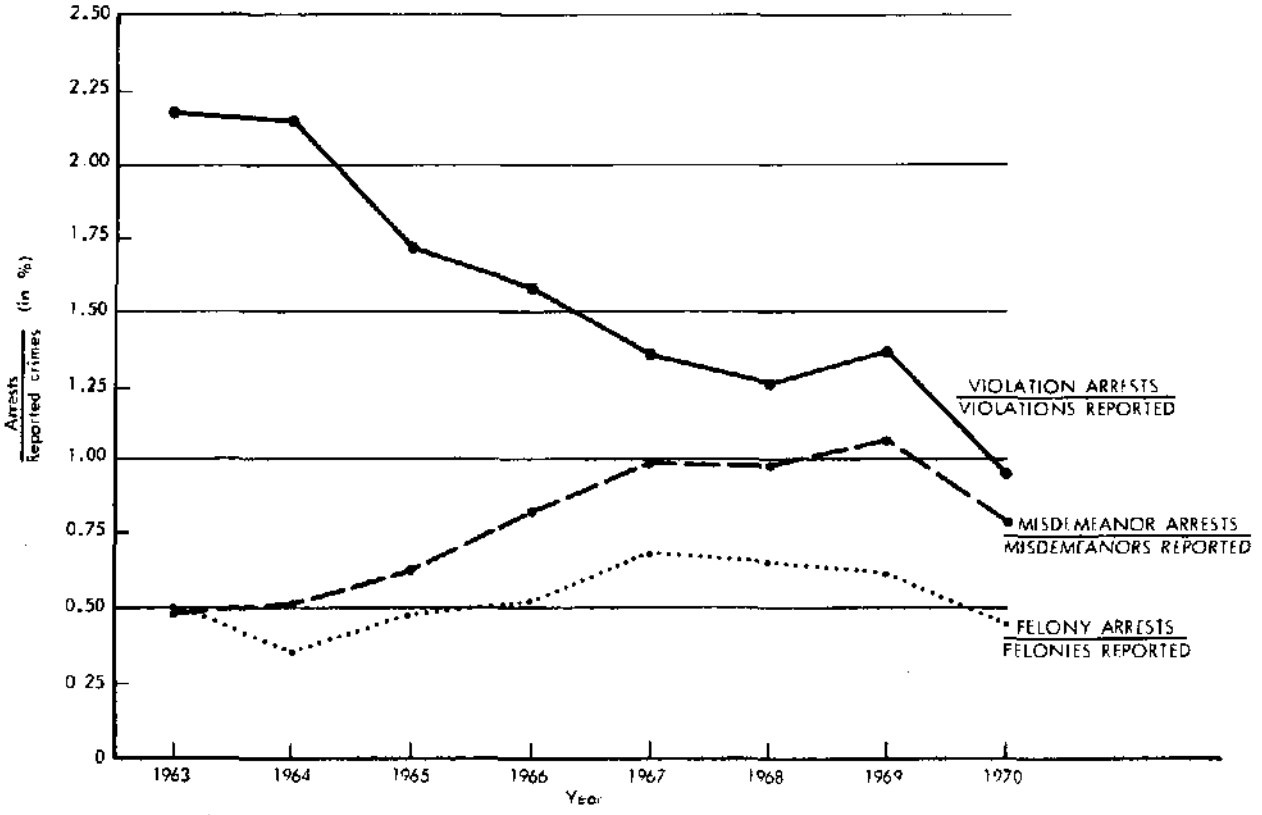
* The number of arrests for violations exceeds the number of reported violations in each year due to multiple arrests for a single offense.



SOURCE: New York City Transit Police Crime Reports

Fig. 5 -- Annual number of arrests for subway crimes, 1963-1970



SOURCE: TAPD Annual Crime Reports

Fig. 6 -- Arrests as a percentage of subway crimes reported: violations, misdemeanors, and felonies, 1963-1970

We conclude that although the actual number of minor offenses on the subways may have decreased following the increase in manning, much of the decrease in reported minor offenses appears to have resulted from changes in police practices. The question then arises as to whether the observed decreases in reported *serious* crimes at night, and in 1965 during the day as well, reflect an actual decrease in the number of crimes. Here we rely on the data we obtained concerning TA robberies, which as we mentioned are likely to be extremely well reported, as nearly all of them are token booth robberies. Table 1 shows the numbers of such robberies in the four quarters of 1965.

Table 1

DAY AND NIGHT REPORTED TRANSIT AUTHORITY ROBBERIES
FOR FOUR QUARTERS OF 1965

Time of Day	January-March	April-June	July-September	October-December
8:00 p.m.-4:00 a.m.	23	3	4	2
4:00 a.m.-8:00 p.m.	22	2	5	11

SOURCE: NYC Transit Police Incident Files.

Although the numbers are small, the patterns for this presumably well-reported crime confirm, in even greater detail, the phenomena suggested by annual total reported felonies: TA robbery rates dropped sharply both during the day and at night immediately after increased manning was introduced in April 1965, and the daytime rate began to recover toward the end of the year. In addition, our sample data for robberies in 1970 indicate that about 15 Transit Authority robberies occurred between 8:00 p.m. and 4:00 a.m. in the first quarter of 1970. Thus, by comparison with the 23 TA robberies in the first quarter of 1965, we see that by 1970 the nighttime rates for this crime had not returned to the levels experienced prior to April 1965, which is also the same as observed for total reported felonies.

Therefore there is no indication from the TA robbery data that changes in reporting practices can explain the observed reduction in

reported felonies. On the contrary, the decrease in TA robbery rates beginning in April 1965 and through December is even larger than the decrease in total reported felonies during the same period. This implies either that booth robberies were deterred to a greater extent than other felonies or that the fraction of felonies reported increased after the manning change. Either explanation leads to the conclusion that a true reduction occurred in the number of felonies in the subway system.

While the nighttime reduction in felonies might be what one would expect, considering the massive infusion of police manpower during those hours, the finding is still of interest because there are so few documented case examples demonstrating that the expected effect actually occurs. On the other hand, the magnitude of the decrease is such as to indicate why many police administrators are skeptical about the productivity of police patrol as a crime deterrent. Even guaranteeing that every train had at least one policeman on it, which is in a practical sense close to saturation manning, was not adequate to reduce the felony rate on the trains below about one crime every other night. If an average of three serious crimes in two nights can be considered "alarming" enough for the Mayor to take action, it is not clear that one in two nights can be considered comforting. The added cost to the City for producing this two-thirds reduction in felonies at night was at least $13 million per year (gradually increasing with inflation), which amounts to about $35,000 per felony crime deterred.

Nonetheless, it is clear that the Transit Police and the City administration were pleased with the extent of the reduction in crime. In every month from May to September 1965, there was a favorable statement to the press by either the Mayor or a Transit Authority spokesman. In June, Transit Commissioner Gilhooley said that nighttime subway crime "had been reduced drastically" [9], In July, Acting Mayor Screvane said, "What we have achieved in the subways we must achieve above ground, too. We can and we will" [10]. In September, Mayor Wagner described the decrease in subway crime at night as "stunning" [11].

We find the short-term reduction in daytime felony rates considerably more intriguing, and with greater implications for patrol deployment, than the nighttime reduction, because it is essentially a "free" side benefit. This phenomenon, which we call a "phantom effect," has not to our knowledge been shown clearly to exist in any previous analysis of crime changes following the institution of an anticrime program. The terra refers to deterrence caused by a police activity that is not actually present. In part it appears to depend on potential offenders[1] confusion or lack of information about the details of police activity, leading to an incorrect perception of the threat of apprehension. Certainly, anyone who read the newspapers was aware that the number of police on the subway had been increased, and may not have paid attention to the times of day affected. The police often assume that a phantom effect is operative in the case of less serious forms of misconduct so that, for example, occasional radar monitoring will cause motorists to act as if the radar were in use even when it is not.

In the case of subway crime, we may also imagine that some people found, on several occasions when they were contemplating a robbery, too many policemen on patrol to make the risk worth taking. Their impression of an increased police presence then persisted in other times of day when they happened not to see any policemen. The existence of the phantom effect thus tends to confirm that potential offenders do In fact try to estimate the risks of criminal activity and are deterred if they perceive an increased threat of apprehension, whether or not the circumstances at the particular time justify such a perception. If, on the contrary, potential offenders were persistent enough and methodical enough to check whether, say, the train they were on was patrolled by a policeman at that particular time, then we would not expect to find a substantial phantom effect.

The probability that a felon would be arrested did in fact increase after the manning change, as can be seen in Fig. 6: felony arrests remained constant between 1964 and 1965 while the number of felonies declined. This no doubt contributed to the deterrent effect, both during the day and at night, by word of mouth about arrests. If

the increase in manning had substantially increased the actual number of arrests, this would presumably have contributed to reduced crime by removing arrestees from criminal activity. The data, however, do not suggest that this occurred.

The duration of the phantom effect on the subway system appears to have been about eight months. We can see this from the data we collected for robberies, which show that the number of TA robberies between 4:00 a.m. and 8:00 p.m. in December 1965 nearly returned to the average for the first three months of the year, and the same was true for passenger robberies. A reasonable interpretation is that it took about this long for robbers to realize that police deployment on the subways had remained unchanged during the daytime. In addition, press attention to crime rates on the subway had substantially subsided by December.

It is important to note that the observed phantom effect is the exact opposite of temporal displacement. For temporal displacement to occur, offenders would have to detect the times of day at which patrol was increased and the times at which it remained unchanged, and then transfer their activities to the least risky times. In a practical sense, displacement cannot be said to have occurred (except in individual cases) until the total felony rate on the subway system had returned to its levels prior to the manning change, with the bulk of criminal activity concentrated in the hours having the least amount of patrol. This did not happen until nearly two years after the manning change, and one might argue that a "natural," or externally caused, increase in the daytime felony rate, rather than a displacement effect, would account for the temporal distribution of crime by 1967. Section IV discusses the current patterns of robbery by time of day.

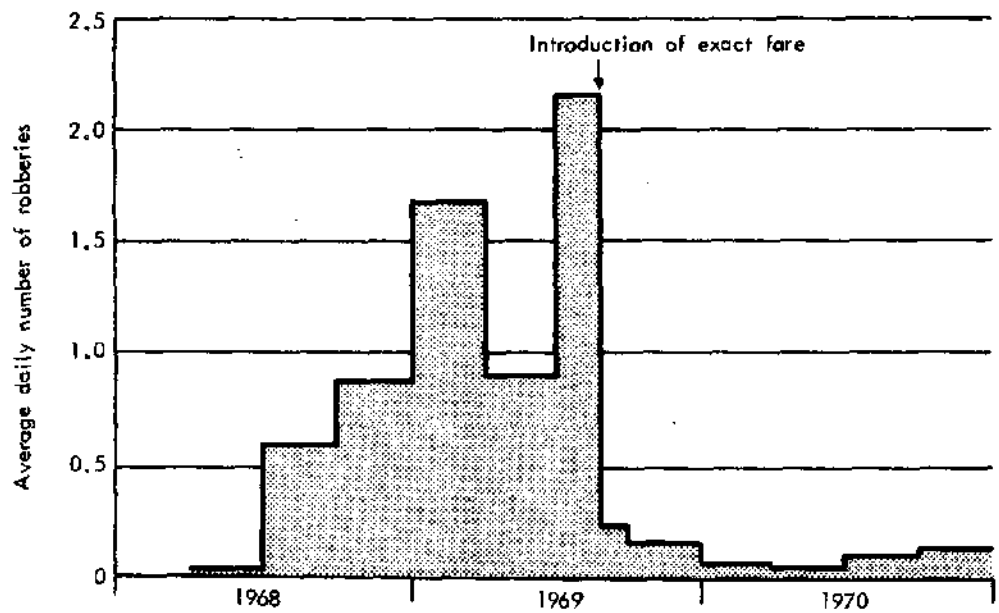
It would certainly be interesting to know whether the felonies that "disappeared" from the subway system simply reappeared elsewhere in the city as geographical or crime-type displacements. But the numbers of subway crimes were so small compared to the numbers above ground that it is impractical to look for this effect in the data. Fortunately, however, we have been able to study crime-type

displacement by considering a subsequent interaction between subway robberies and bus robberies.

EXACT FARE ON BUSES

Although "script" or "exact fare" systems were used over 30 years ago on some streetcar lines, they were gradually abandoned, and have only recently reappeared as anticrime measures. The first city to implement a script plan was Washington, D.C., in mid-1968. This development was precipitated by the shooting of a D.C. Transit bus driver during a robbery on May 9, 1968, followed by the murder of a driver on May 17, in much the same way as the subway murder in New York initiated the increased manning. During the following year, many cities adopted similar plans, and exact fare was introduced on New York City buses in August 1969.

The effect of exact fare plans on the rate of bus robberies was dramatic and convincing. Figure 7 shows the number of reported bus robberies in New York City, by quarter, beginning in 1968. Bus



SOURCE: NYCPD Planning Division

Fig. 7 -- Average daily number of reported bus robberies in New York City, 1968-1970

robberies jumped from virtually none in early 1968 to a high of 67 per month just prior to the institution of exact fare, when bus robberies then dropped to 7 or lower in every month after exact fare. The Stanford Research Institute reported similar results in a 1969 study of bus robbery rates in 15 cities that instituted exact fare plans [12]. On the average, monthly bus robbery rates were 98 percent lower after the inauguration of exact fare than they were before.*

We are interested in whether the crime data indicate an interrelationship between bus and subway robbery. Despite dissimilarities in the details of the two types of crime, the possibility of displacement between them warrants analysis. What actually happened is that the numbers of subway robberies, which had been increasing at an annual rate of 46 percent in the year prior to exact fare, suddenly began to increase at an annual rate of 92 percent. In addition, policemen who had interrogated arrested robbers were sure they had been displaced from other targets. In 1971, a reporter for *The Neo) York Times* asked an unnamed Transit patrolman the cause of the increasing subway robbery rates. "It's very simple," he said. "The guys who used to hold up buses and taxis now knock off change booths" [13].

Analysis of the data suggests a possible alternative explanation, however, namely that a partial displacement of potential robbers *au)ay* from the subways took place in 1968 when robbing buses became "popular." Then, in 1969, when exact fare was introduced, the increase in subway robberies was only a fraction of the decrease in bus robberies. Figure 8 shows the total number of bus and subway robberies in New York from 1965 to 1971, averaged over three-month periods. The straight line on this figure is the least-square-error fit to the data for the periods before and after the precipitous increase in bus robberies.† It shows that subway robberies both before and after the spurt of bus robberies increased about 56 percent annually.

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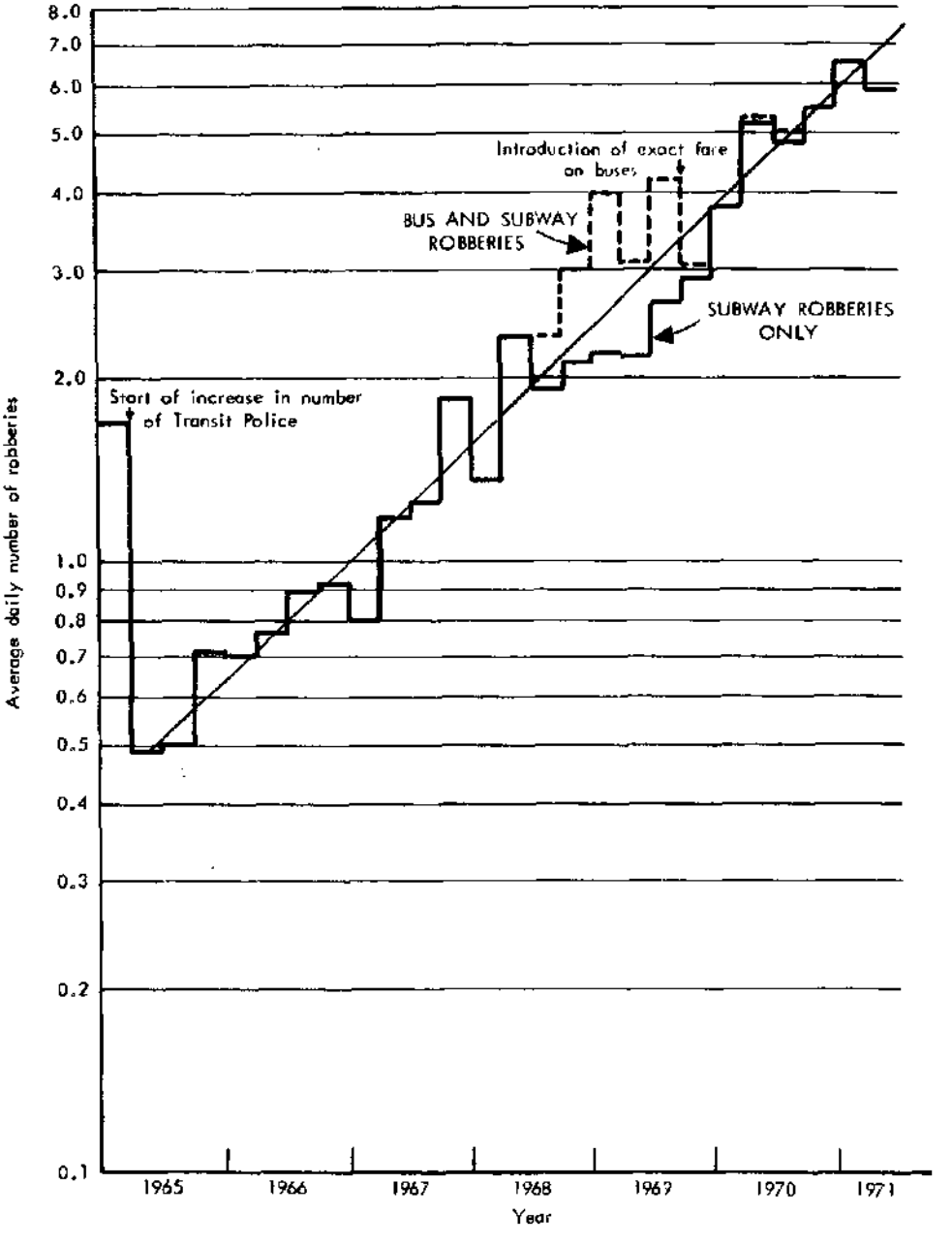
*Study periods before exact fare ranged from one to six months; study periods after exact fare were four to nine months.

†I.e., it is a fit to the logarithm of the average daily number of robberies for 19 quarters: the second quarter of 1965 through the second quarter of 1968 and the first quarter of 1970 through the second quarter of 1971. If only the data before 1968 are fit, the result is practically the same.



SOURCE: NYCPD and TAPD Planning Divisions

Fig. 8 -- Average daily number of reported bus and subway robberies in New York City by quarter, 1965-1971

After exact bus fares were introduced, the number of subway robberies was not substantially higher or lower than would have been expected by extrapolating the trend from 1965 to 1968. During every quarter when bus robberies were more frequent than one every three days, however, we find that (1) the number of subway robberies was lower than the trend line, and (2) the total number of bus and subway robberies was above the trend line. These findings suggest quite strongly that some persons who would otherwise have been robbing in the subways found the buses a more attractive target, while in addition there were some bus robbers who were not being diverted from the subways.*

By virtue of the artifically induced "reduction"† in subway robberies during 1968 and 1969, the 1970 increase in subway robberies appeared to be extraordinarily rapid. But Fig. 8 suggests that the robbery rates were merely readjusting to the levels that would have prevailed had the subways not been the beneficiary of a displacement effect to the buses.

We have no satisfactory explanation for the underlying exponential increase in the total of bus and subway robberies (i.e., the straight line on the logarithmic graph), which is a key element of our analysis of the displacement effect. However, an increase of this type was commonly observed for crime rates of various types in the period from 1965-1970, as well as in calls to police and fire departments for emergency services.

If a displacement of taxicab robberies to or from the subway system also occurred, as suggested by the Transit patrolman quoted

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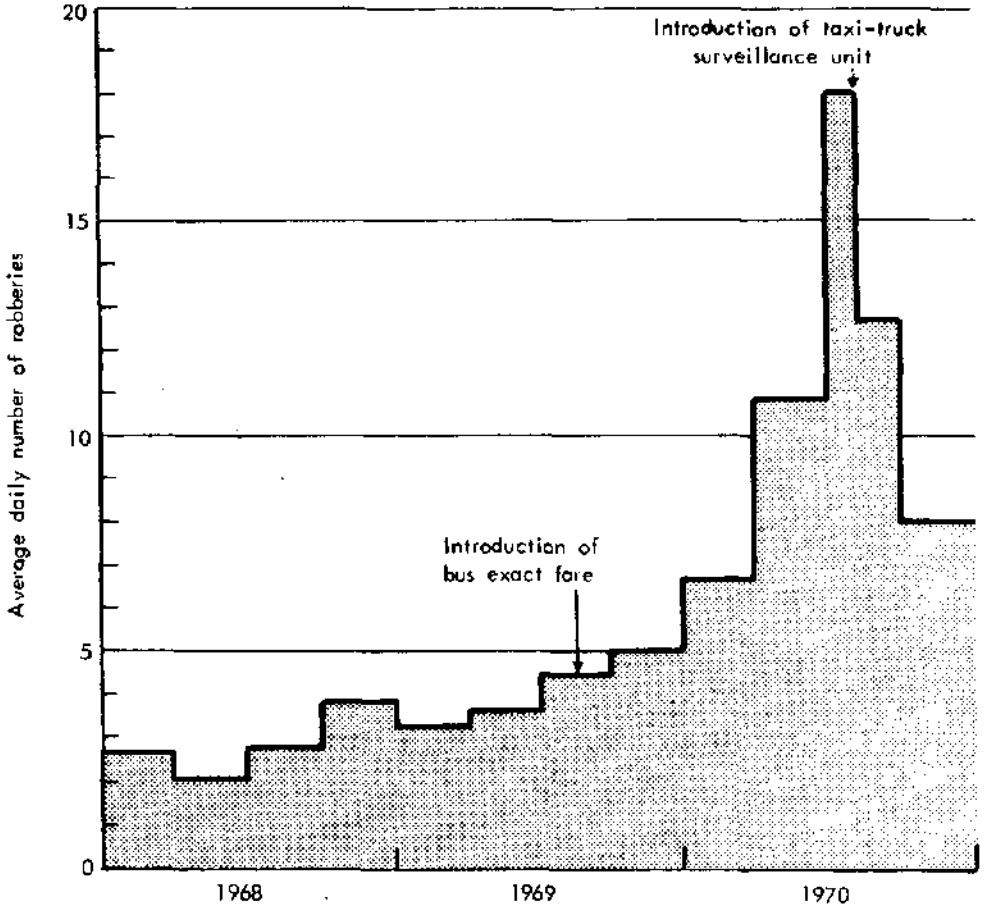
*This conclusion might be unwarranted if the average "take" from a bus robbery was less than for a subway robbery. In this case, more bus robberies than subway robberies would be required to produce a given income for each robber. But we do not believe the disparity in "take" was very large, because the subway robberies include passenger robberies (which are generally less lucrative) as well as token booths, while bus drivers were the primary targets of bus robbers. See Sec. IV.

†Subway robberies were not actually reduced; their incidence was only lower than would have been expected by extrapolating the trend.

‡See Chaiken and Rolph [14].

above, the data indicate it was not very substantial. Figure 9 shows the average number of taxi robberies, averaged over three-month periods, from 1968 to 1970. In July 1970, the New York Police Department introduced a special taxi-truck surveillance unit, and taxi drivers implemented protective measures of their own (e.g., glass barriers, limited cash). We note that the number of taxi robberies is somewhat larger than the number of subway robberies, so that even a partial displacement could be expected to appear as a large effect in subway crime statistics. But the 1970 increase in taxi robberies was not accompanied by decreased subway robberies, nor was the later decrease in taxi robberies associated with a clearly identifiable



SOURCE: NYCPD Planning Division

Fig. 9 -- Average daily number of reported taxi robberies in New York City, 1968-1970

increase in subway robberies. The evidence for a displacement effect from the buses to taxis is marginal at best, but the sum of bus and subway robberies decreased slightly in the three-month period immediately following exact fare, accompanied by an increase in taxi robberies.

MULTIPLIER EFFECT

The data for subway, bus, and taxi robberies taken together indicate a form of "multiplier" effect. When a few people demonstrate that a particular type of crime or time of day is relatively safe and profitable, others are encouraged to try it, and the incidence of that crime increases very rapidly. Then, the institution of an anticrime measure demonstrates that the odds have changed and, at least temporarily, the multiplier operates in the opposite direction, causing a decrease in incidence that may even be greater than merited by the effectiveness of the measure. After a period of adjustment, however, at least a portion of the crimes reappear in a different form or at a different location or time of day. Therefore, the short-term effect of an anticrime program may not be a good measure of its overall value if continued indefinitely.

Our analysis indicates that if one has a good hypothesis concerning the target to which criminals are being displaced, then it is possible to detect the displacement effect from crime data. Without such a hypothesis the crimes may seem to disappear, but it appears more reasonable to believe that at least a portion of them are eventually displaced to unidentified targets. We therefore wonder what happened to the criminals who were deterred from subway crime in 1965 by both the direct and the phantom effect of increased police patrol on the subway. If any substantial number of them were displaced to aboveground crime, the net benefit to society created by the increase in Transit Police manpower was even smaller than we indicated in our discussion of subway crimes alone.

Danzig [15] has considered the implications of this phenomenon from the point of view of the economist. He observed that, by virtue of displacement, the anticrime programs instituted in various parts

of the transit system appear to be forms of suboptimization. "A transportation system administrator whose domain included buses, taxis, and subways might never have assented to bus system exact fares." In addition, insofar as total crime is not reduced by various anticrime measures, an externalization of costs occurs: the expenses of crimes that were previously borne by the subway, bus, or taxi companies, their employees, and their passengers are shifted onto someone else. These effects are rarely taken into account when deciding whether to implement new anticrime activities.

The issue is made more complex by how little we know about police production functions and about the "costs" of crime to society. In most cases, a new anticrime measure will partly displace crime and partly deter it. Whether or not a particular program is suboptimal will depend on the extent to which crime is deterred, and also on the relative "costs" of the crimes (both the financial costs and the physical and psychological costs of victimization) to and from which activity is displaced.

A discussion of an externalization of "costs" as a consequence of crime displacement hinges on the yet undeveloped notion of an equitable distribution of these costs in a society. But it would seem to be true, in the light of the "multiplier" effect discussed above, that in some situations local anticrime measures are clearly necessary to *prevent* an externalization of costs. If a certain type of crime is demonstrated to be lucrative and as a result criminals are drawn into it and away from less rewarding activities, and if, furthermore, the victims of this new crime form a relatively small, confined group like token booth operators, bus drivers, and subway passengers, then doing nothing to deter this crime would force this small group of people to bear an increasing fraction of the total victimization costs of crime. To internalize these externalities, the victims should be reimbursed by the rest of the society. In the area of crime, this reimbursement typically takes the form of an anticrime measure, the costs of which the whole society bears and a subgroup benefits from.

IV. CHARACTERISTICS OF SUBWAY ROBBERIES AND OFFENDERS

TYPES OF ROBBERY

The Transit Police separate robberies into four categories. The first consists of attempts to take Transit Authority property or assets (TA robberies), which are primarily token booth robberies. Robberies of TA personnel (trainmen, clerks, etc.) to obtain their personal property are considered as a second category. The third category Is passenger robberies, and the fourth is robberies of concessionaires (newspaper stand and store owners within the subway system). Concessionaire and TA personnel robberies together amount to only 1 to 3 percent of the total and have been included within TA robberies in our tabulations.

Before the manning change in 1965, TA robberies accounted for about 30 percent of the total. At first, TA robberies decreased more than passenger robberies, and then between late 1965 and 1971 they increased more rapidly than passenger robberies: 91.8 percent per year for TA robberies and 45.3 percent for passenger robberies. At the end of this time, TA robberies again accounted for about one-third of all robberies. Table 2 shows the numbers of robberies of each type included in the samples on which we base our findings.

Table 2

SAMPLE SIZES BY TYPE OF ROBBERY[a]

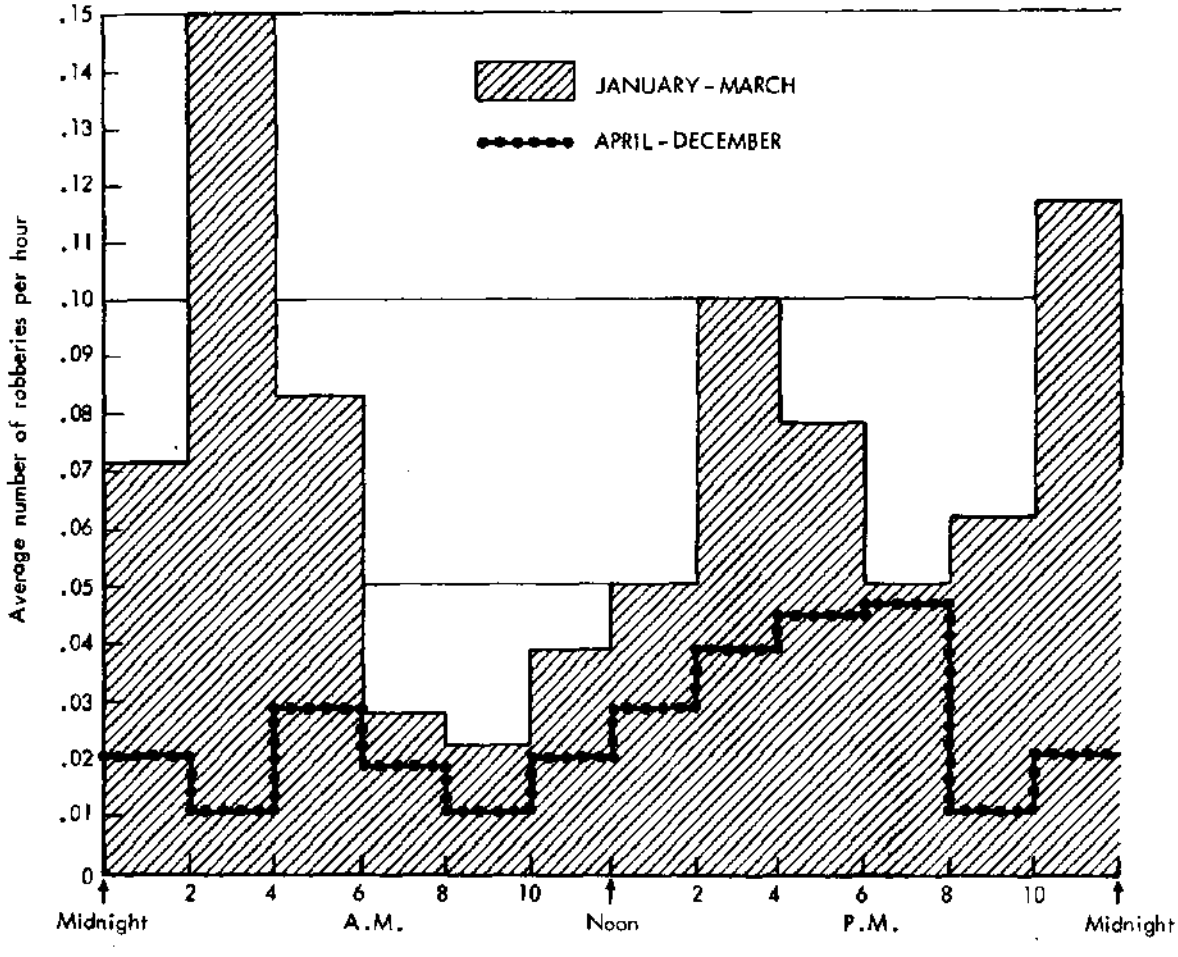
	Jan-March 1965		Apr-Dec 1965		Jan-Apr 1970			Jan-Apr 1971		
Type	N	%	N	%	N	%	Sample	N	%	Sample
Passenger	111	71.2	117	78.0	355	64.0	71	565	71.5	112
TA	45	28.8	33	22.0	200	36.0	40	225	28.5	45
Total	156	100.0	150	100.0	555	100.0	111	790	100.0	157

[a]Date and location obtained for all robberies listed, unless missing from the crime report. Additional data collected for robberies in sample,

Passenger robbery may be further distinguished according to whether the crime occurred on a train or in a station. In our 1970 sample we found the robberies to be about equally divided between the two types. For 1971, 69 percent were robberies in stations.

TEMPORAL CHARACTERISTICS,

Before increased police patrol was introduced on the subways at night, subway robbers appear to have favored the nighttime hours between 10:00 p.m. and 6:00 a.m., with a second, smaller peak in incidence around 2:00 to 4:00 p.m. Our evidence for this comes from the robbery counts (TA plus passenger robberies) for the January through March 1965 period, shown on Fig. 10, which we determined by inspecting



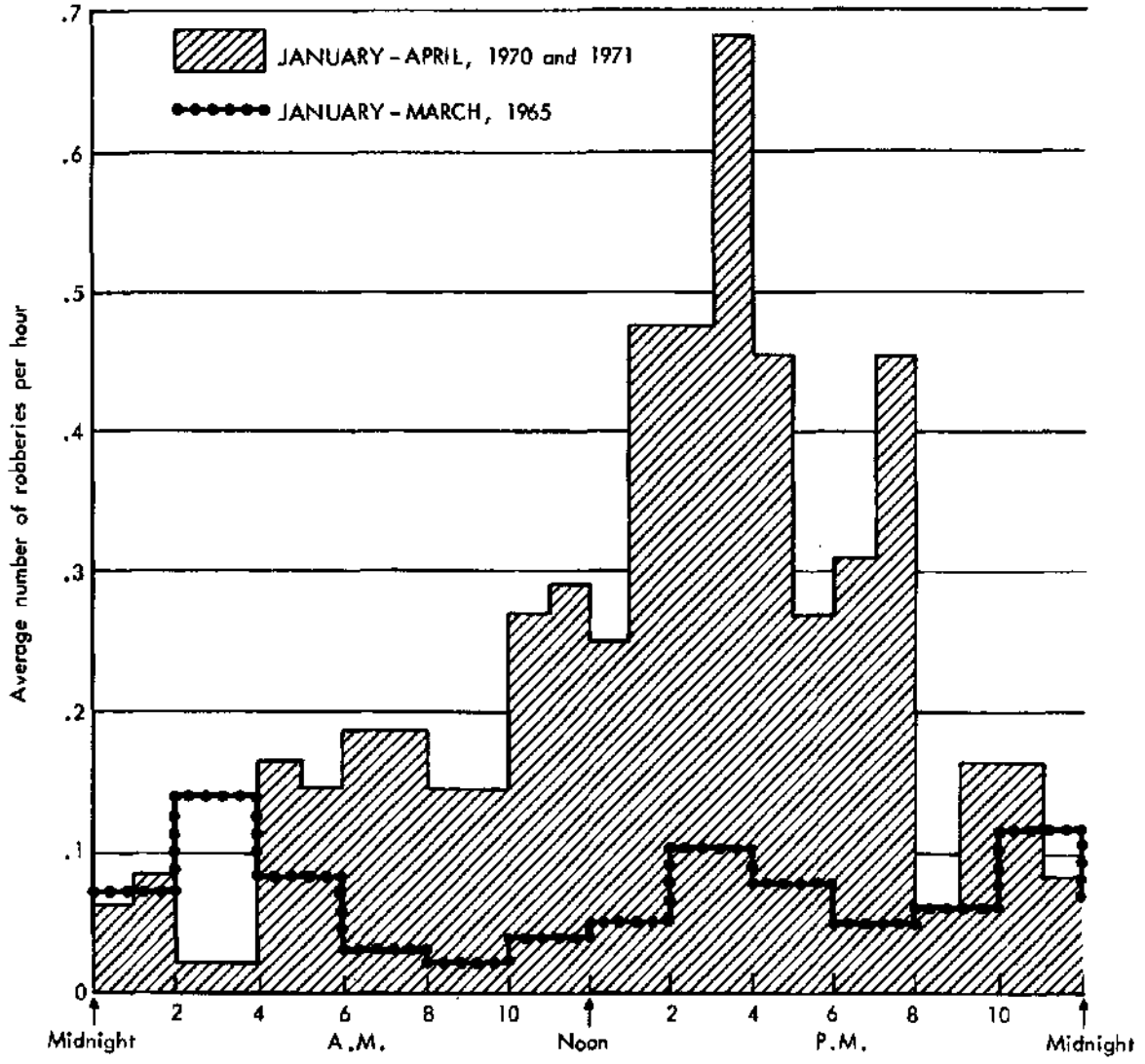
SOURCE: TAPD Incident Records

Fig. 10 -- Average number of reported subway robberies per hour before and after institution of TAPD extra shift, 1965

every robbery crime report for 1965. The primary explanations for the nighttime peak appear to have been the lower risk of interception or identification of a robber at night, when there were few people on the subway system, and the relative ease of escape at night. The daytime peak is probably attributable to schoolchildren, as discussed later. The combination of the direct effect of the patrols at night and their phantom effect during the day, which was smaller in magnitude than the direct effect, caused an almost immediate shift in the relationship between daytime and nighttime robbery rates, as shown by the counts for April through December 1965, also on Fig. 10. In these months, the vast majority of robberies occurred during the daytime.

Between 1965 and 1971, subway robbery trends were much the same as previously described for felonies as a whole, with nighttime robberies increasing at a much slower rate than daytime robberies. As a result, by 1971 the distribution of robberies by time of day was even more dramatically concentrated in the hours with the least police patrol. This pattern can be seen in Fig. 11, which shows the number of reported robberies per hour for the first four months of 1970 and 1971 combined, and for comparative purposes also reproduces the January-March 1965 robbery rates from Fig. 10. Considering only the 6:00 a.m. to 8:00 p.m. period (i.e., except for the high-patrol time and two hours afterward), the relative distributions of crimes by hour are remarkably similar. This may perhaps be observed visually from the figure, but the numerical percentages given in Table 3 are more persuasive. Therefore, robbers' preferences for different times of day have not changed much during the hours when police activity remained the same, with the exception that the period from 4:00 to 6:00 a.m. is somewhat lower in incidence than would be expected based on 1965 patterns.

The steep drop in robbery Incidence at 8:00 p.m. is clear evidence of the deterrent effect of the extra manpower, although one cannot be sure whether this is caused by offenders[1] prior knowledge that the policemen will be on duty at 8:00 p.m. or by their observation of the patrolmen. The rise an hour earlier suggests that robbers



SOURCE: Sample of TAPD Incident Reports

Fig. 11 -- Comparison of average reported robberies per hour for first quarter of 1965 and first four months of 1970 and 1971

Table 3

DISTRIBUTION OF REPORTED ROBBERIES
FROM 6:00 A.M. TO 8:00 P.M.

Time	Percent of 6:00 a.m. to 8:00 p.m. Total	
	1965	1970-1971
6:00-8:00 a.m.	7.6	8.1
8:00-10:00 a.m.	6.1	6.3
10:00 a.m.-noon	10.6	12.2
Noon-2:00 p.m.	13.6	15.8
2:00-4:00 p.m.	27.3	25.2
4:00-6:00 p.m.	21.2	15.8
6:00-8:00 p.m.	13.6	16.7
Total	100.0	100.0

may say to themselves, "Now's my last chance," but Is probably just a rebound after the inhibiting effect on criminals of the crush of passengers at rush hour.

Whether the shift in patterns between 1965 and 1971 can be called temporal displacement is perhaps a matter of definition. In our view, the presence of displacement would imply that some or most of the daytime robberies would occur at night if the extra police were not on duty then. The alternative possibility is that elimination of the fourth platoon would increase nighttime robbery without a compensating decrease during the day. Probably the truth lies somewhere in between. In particular, it is hard to imagine that the after-school peak at 3:00 to 4:00 p.m. would be reduced by enhancing the opportunity for robbery at night, even if schoolchildren returned to the subways at night.

When the distributions by time of day were determined separately for TA robberies, passenger robberies on trains, and passenger robberies in stations, no statistically significant differences were found from the overall distribution, and therefore they are about the same for all practical purposes.

Broken down by day of the week, there were noticeable distinctions between TA and passenger robbery. TA robberies were remarkably evenly

distributed across the days, with a slight rise on Sundays, while passenger robbery peaked on Wednesdays in both 1970 and 1971, with the lowest incidence on Sunday. These distributions are shown in Fig. 12. We did not collect enough data to compare time of day patterns on different days of the week.

We also analyzed the actual dates of robberies at or associated with individual stations. Our initial impression was that there were periods of concentrated activity at some stations, interspersed with periods of little or no robbery. Figure 13 shows the dates on which robberies occurred at two selected stations. Visually, one gains the impression that robberies were abnormally frequent at the 96th Street Station in mid-February and at the 163rd Street Station between the middle and end of January. This phenomenon might be called date clustering, with a cluster consisting of an initiating robbery event and the robberies that followed within a short period of time.

If date clustering existed, its importance lay in the possibility that the police could mobilize in response to the initial robbery and intercept or deter subsequent attempts. Clustered robberies, therefore, had to occur within a time frame for which it would be feasible to provide a stakeout squad or additional patrol to the particular station. Four days was chosen as a reasonable period for this extra coverage, and we based our subsequent analysis on the number of robberies occurring at a station within four days of an initiating robbery.

To test for the existence of significant clustering, we compared the frequency of observed robberies with a random frequency of occurrence. If robberies occurred by chance, and a particular station had a total of N robberies during a four-month period covered by our data, then each of the N robberies would be equally likely to fall on any one of the days in the period. Under this assumption of chance occurrences, it is possible to calculate the probability that a robbery would be followed by four days in which no robbery occurred, by four days in which one robbery occurred, and so forth.

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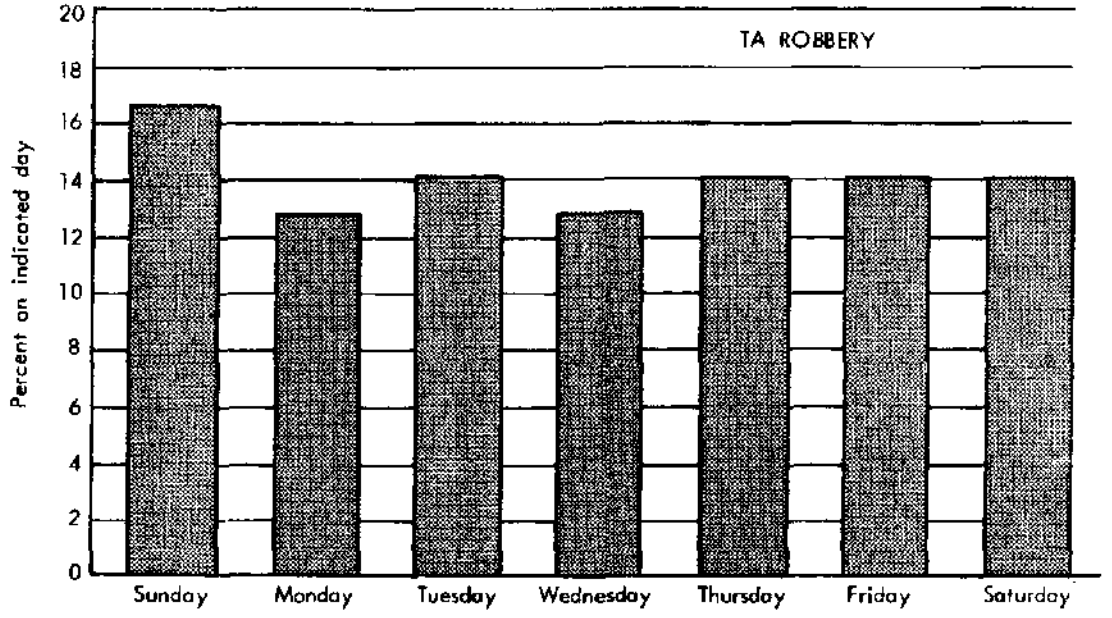
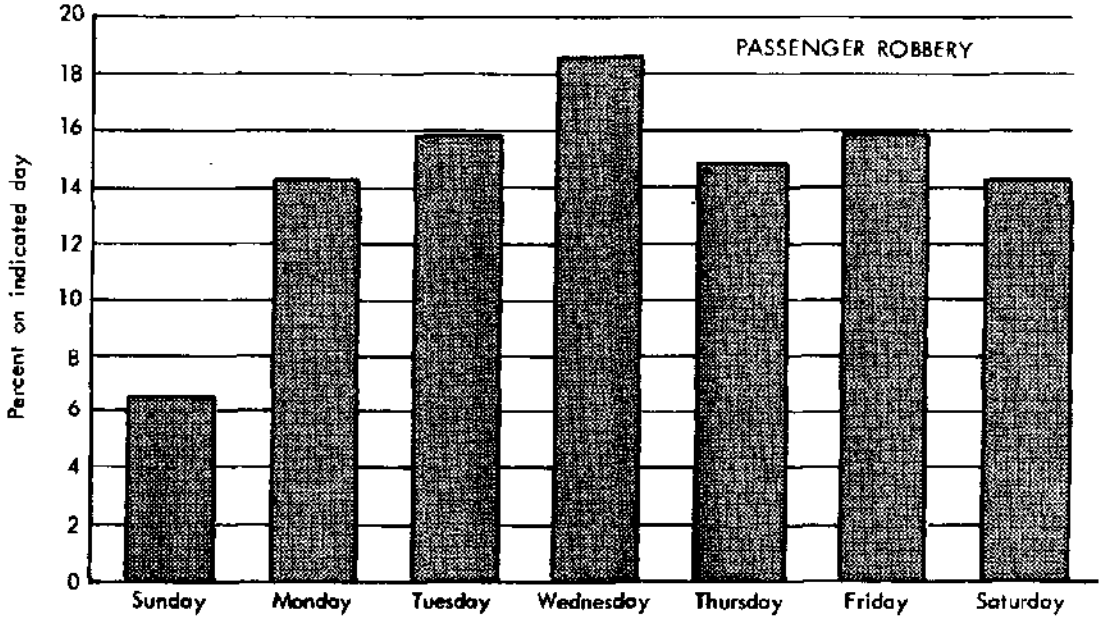
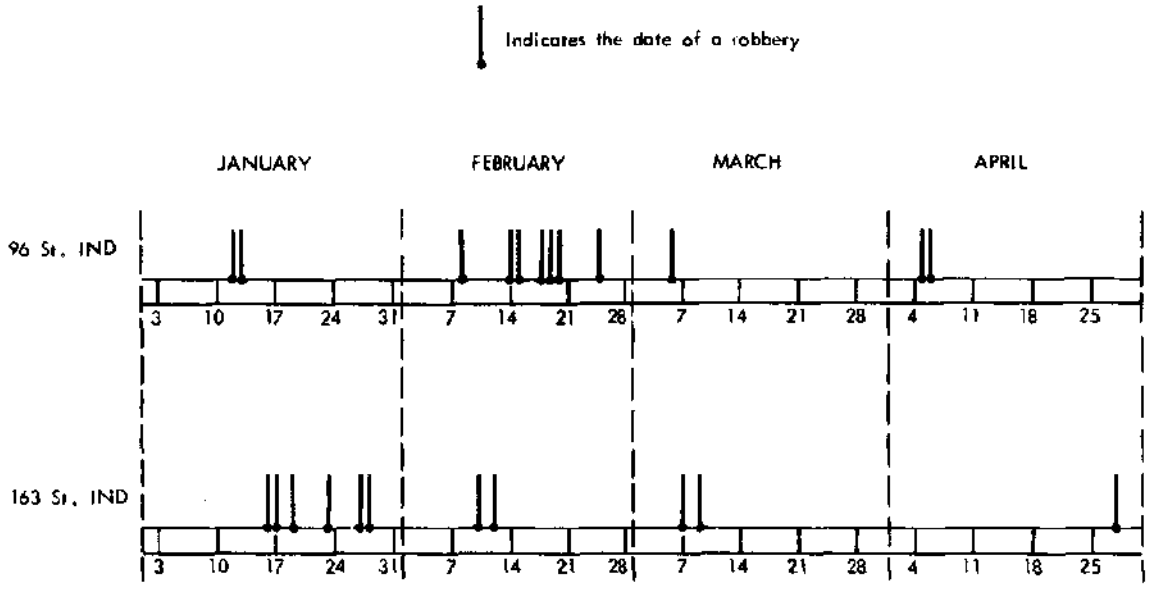
* The TAPD records a robbery on a train as if it occurred at the next station on the train's route.





SOURCE: Sample of TAPD Incident Reports

Fig. 12 -- Distribution of reported subway robberies by day of week, January-April 1970 and 1971



SOURCE: TAPD Incident Reports

Fig. 13 -- Dates of reported robberies at two subway stations, January-April 1971

Stations with a robbery level of 10 or more incidents during January through April in either 1970 or 1971 were selected for analysis. The result was that every station's pattern of incidence followed very closely the probabilities calculated under the assumption of chance occurrences. We conclude that date clustering does not occur, so it appears that robbers do not return soon to the scene of a successful robbery. This, by the way, coincided with the impressions of the Transit Police, who reminded us of the futility of closing the barn door after the horse is gone.

Since TA robberies occur at only one-half of the rate of passenger robberies, the above analysis for *all* robberies does not rule out the possibility of some date clustering among the former. This would be consistent with the observation of one of the detectives assigned to investigate booth robberies that word spread among addicts in the "shooting galleries" that a particular station was a good "hit." It would also be consistent with the success of the relatively small stakeout squad in arresting booth robbers (see Sec. V). TA robbery rates at individual stations are so small, however, that the success

of the stakeouts may be better explained by robberies clustering in time among small groups of stations, and the detectives and the stakeout teams being aided by other sources of information.

GEOGRAPHICAL CHARACTERISTICS

We have identified the stations at which subway robberies occurred, and thereby can describe both general geographical patterns of incidence and particular areas with high or low incidence. On the average, there were 2.5 robberies for each of the 484 stations in the subway system during the 8-month sample period (January-April 1970 and January-April 1971). But 30.8 percent of the stations were incident free, and the robbery count went as high as 27 at one station. Therefore the robberies were far from evenly spread among stations. Of the four boroughs the subways serve, Manhattan had the highest subway robbery incidence. Queens had the lowest overall rate, with most of the stations there having no robbery during the study period. 105 stations had one holdup; these represent 21.7 percent of the total. Table 4 shows the number of stations having 2-5, 6-10, or over 10 robberies during the sample period.

Table 4

FREQUENCY OF ROBBERIES AT STATIONS, JANUARY-APRIL 1970 AND 1971

Number of Robberies	Stations	
	Number	Percent
0	149	30.8
1	105	21.7
2-5	159	32.8
6-10	53	11.0
Over 10	18	3.7
Total	484	100.0

Figures 14 through 17 present maps of the subway systems in the four boroughs that have subways. These maps indicate the range of robberies during the sample period at each station. When several stations interconnect at the same location, we have added the robberies together. Thus, for example, there are 21 locations on the maps having more than 10 robberies. Seventeen of these were in Manhattan (see Fig. 14). The highest frequency for any one station in the entire system was in Manhattan at the 125th Street IND stop.†

The Eighth Avenue IND line, which contains the 125th Street station, showed a high concentration of crime, relative even to the overall level in Manhattan. Indeed, none of the stops on that line between 163rd Street-Amsterdam Avenue and 81st Street had less than 6 incidents. A high robbery rate persisted south as far along the line as 23rd Street. This is not unexpected, since the line traverses both high-crime districts (where neighborhood stations and passengers may conveniently be victimized by local robbers—discussed further below) and high-density commercial and business areas.

The Times Square-42nd Street area contained another group of high-crime stations: The stops at 42nd Street and 8th Avenue, 34th Street and 8th Avenue, Times Square, and 42nd Street and 5th Avenue each had more than 10 robberies. Other high-frequency stations in Manhattan were Union Square, Washington Square, and Canal Street-Holland Tunnel. Although no section of the borough was completely crime-free, the Upper West Side and Midtown were the hardest hit.

Brooklyn ranked next behind Manhattan in level of incidence (see Fig. 15). By contrast, however, there were long stretches of subway line with very low robbery rates. The northeast section of the borough contained most of Brooklyn's high-robbery stations. Three stops in the area—Kosciusko Street, Rockaway Avenue, and Sutter Avenue—had

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These maps are based on those distributed by the Transit Authority, in which distances are generally distorted for easy use by passengers.

†At one time the subways were operated in three divisions which were commonly known by their initials: IND, IRT, and BMT. These names continue to be used to describe stations and subway lines despite their present lack of operational significance.

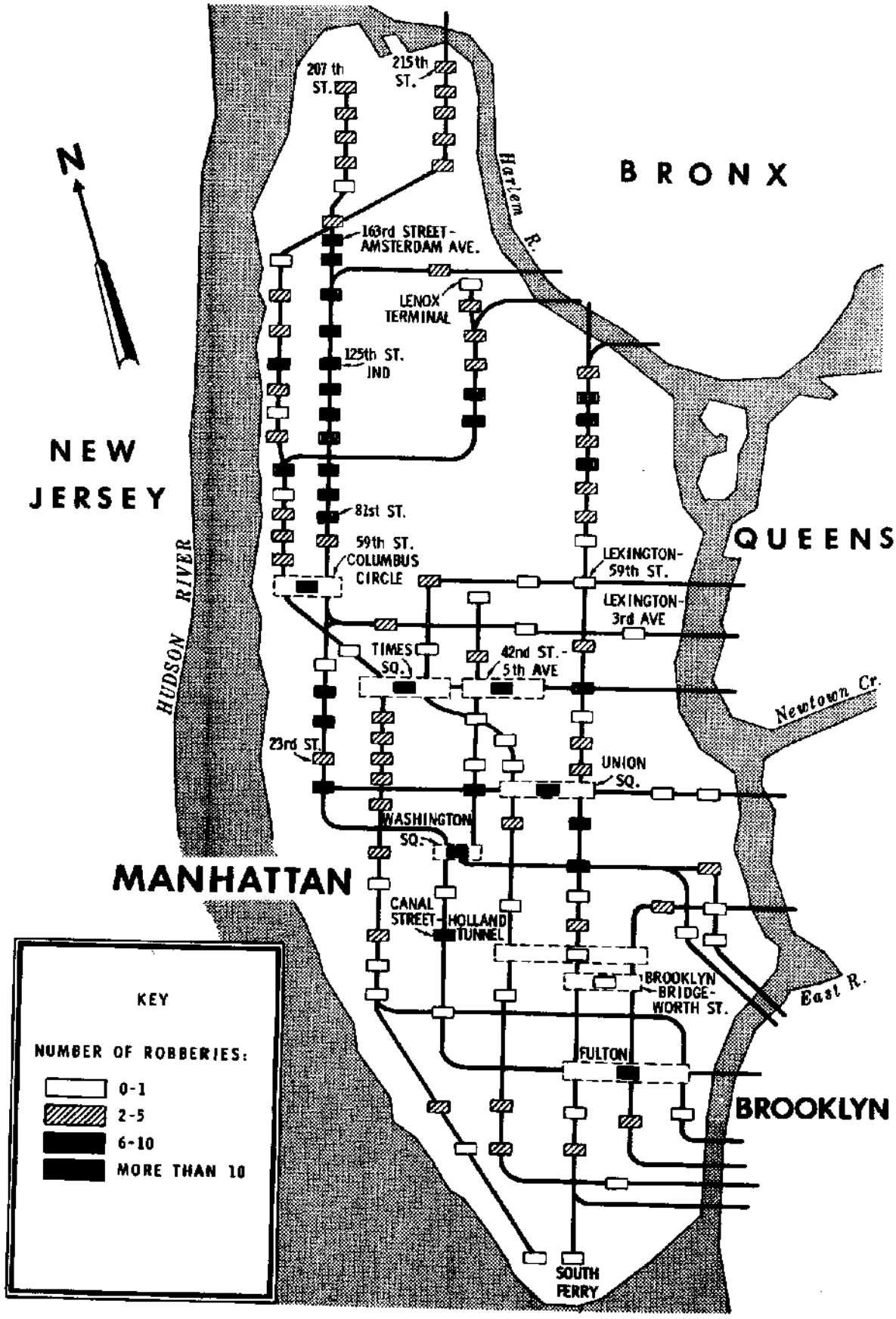

Fig. 14 -- Map of robbery incidence in Manhattan subway stations, January-April 1970 and 1971

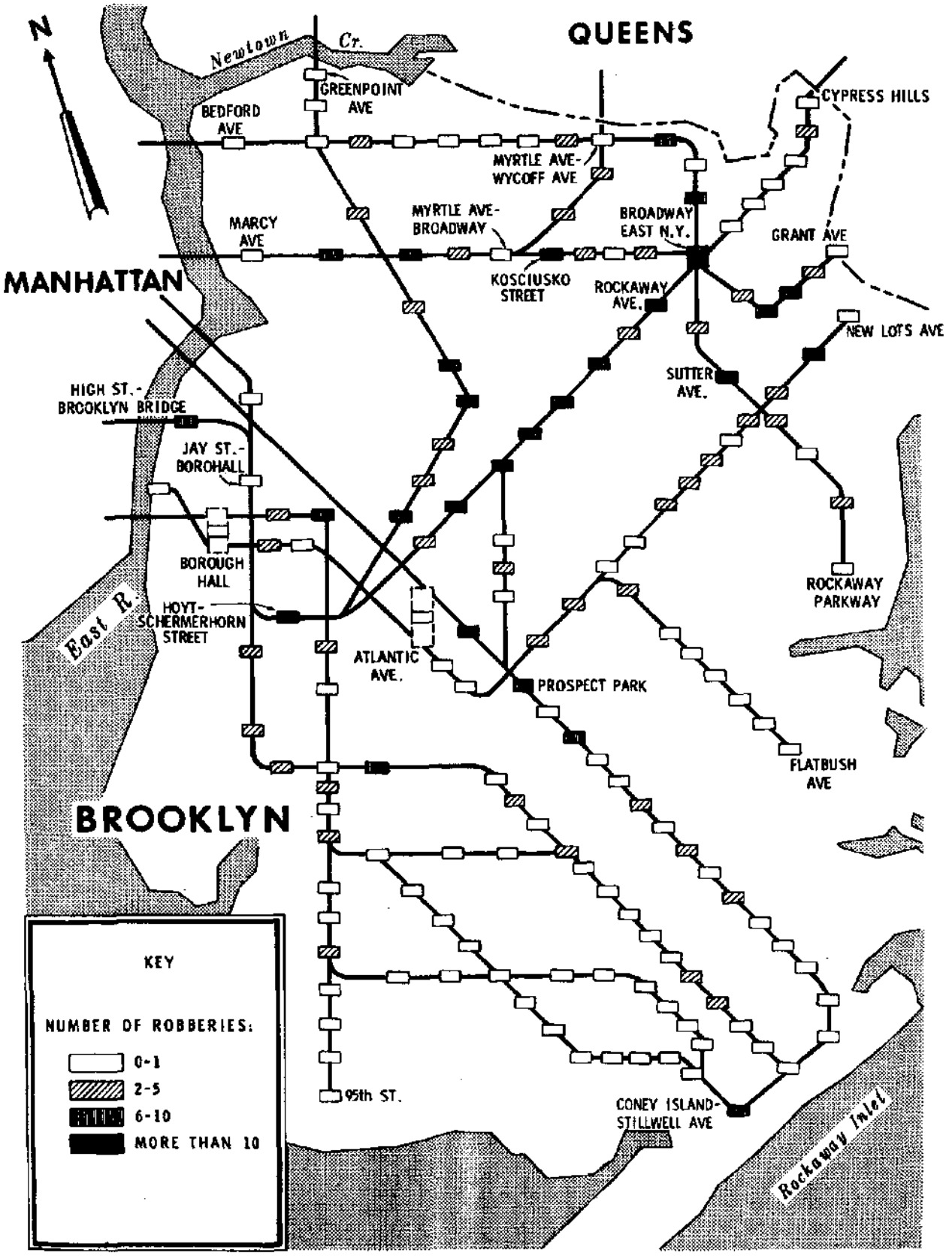

Fig. 15 -- Map of robbery incidence in Brooklyn subway stations, January-April 1970 and 1971

more than 10 holdups. Only one other station compared in frequency: Hoyt-Schennerhorn Street in the western part. Large sections had relatively low rates, including the Central Brooklyn area of Flatbush and all of South Brooklyn.

Few stations in the Bronx (Fig. 16) went completely without incident, but the frequency at any particular stop never exceeded 10 robberies. The South Bronx received most of the activity, with the level decreasing toward the northern sections. The IND line entering from Manhattan and terminating at 205th Street was the hardest-hit route. Seven stations had 6 to 10 robberies, the remaining three had 2 to 5. A direct contrast is the elevated IRT line. Located only a short distance away from the IND and terminating at Woodlawn Avenue, it had the fewest incidents in the Bronx subways. None of its stations had more than 5 holdups, and 7 of the 11 were free of robbery.

Queens, the fourth borough in the subway system, had the lowest incidence rate (see Fig. 17). Only 3 stations there showed more than 5 robberies in the 8-month period: Queens Plaza, 67th Avenue, and 71st Avenue, all on the IND line. Because the Transit Police record crimes occurring on trains as located at the train's next stop, express stations have their crime rate biased upward by robberies that occur on the length of express tracks. Some of the robberies at Queens Plaza and 71st Avenue—two stops on the E and F express trains--are in this category. Actual in-station holdups are, therefore, somewhat fewer. No station in Queens had more than 10 robberies, and the majority had none in the period studied.

By inspection of the maps, anyone who is familiar with New York will observe that subway robbery tends to be highest in areas having a high surface crime rate. This indicates that subway crime is only one facet of an area's crime problem and suggests that robbers prefer to commit their crimes in familiar areas, perhaps for ease of escape. Because the subways provide mobility for criminals, however, one would also expect that subway crime would be somewhat more evenly spread around the city than surface crime.

To examine the extent of these effects quantitatively, surface robbery data for 1971 were compared with 1970 and 1971 subway robbery

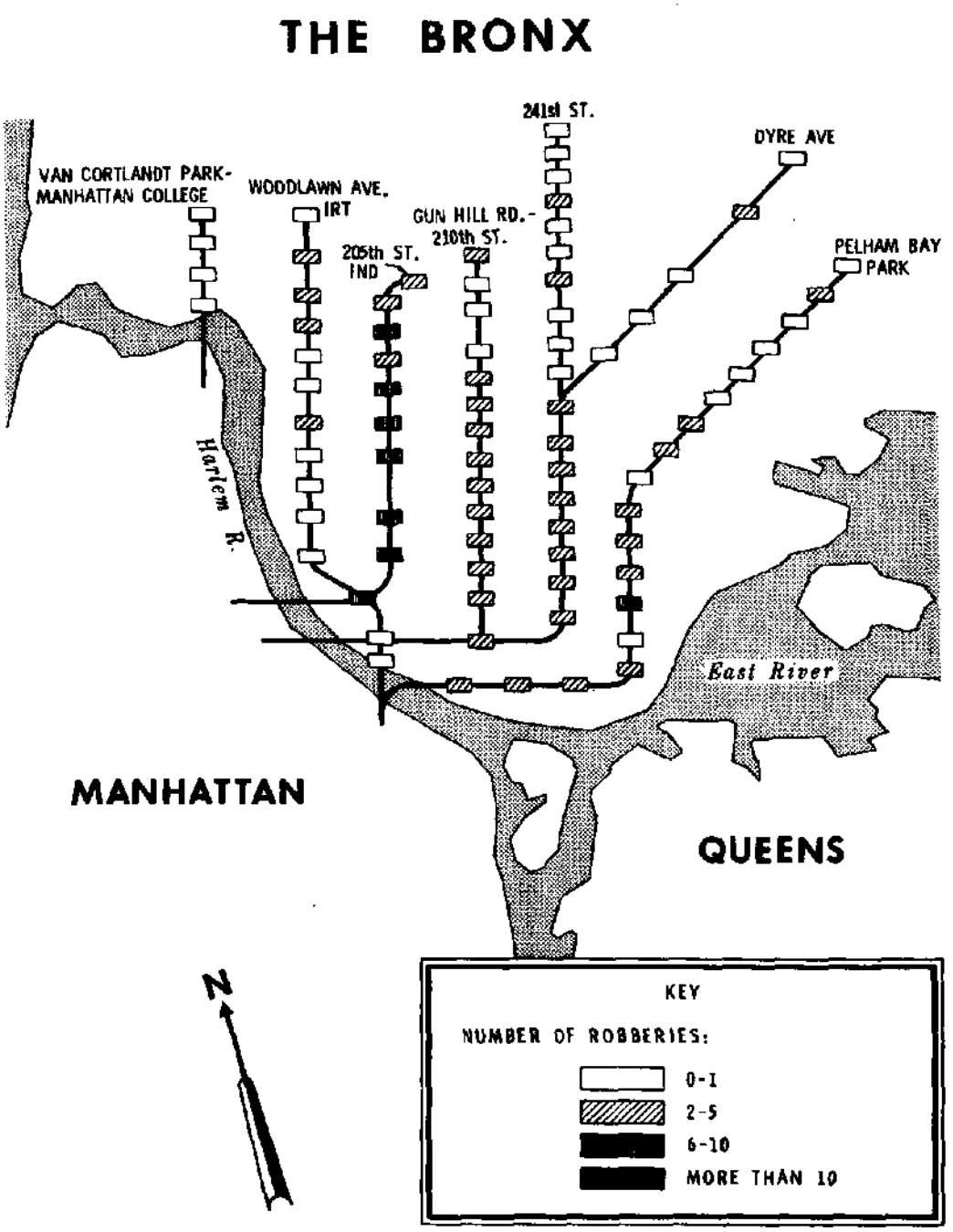

Fig. 16 -- Map of robbery incidence in Bronx subway stations, January-April 1970 and 1971

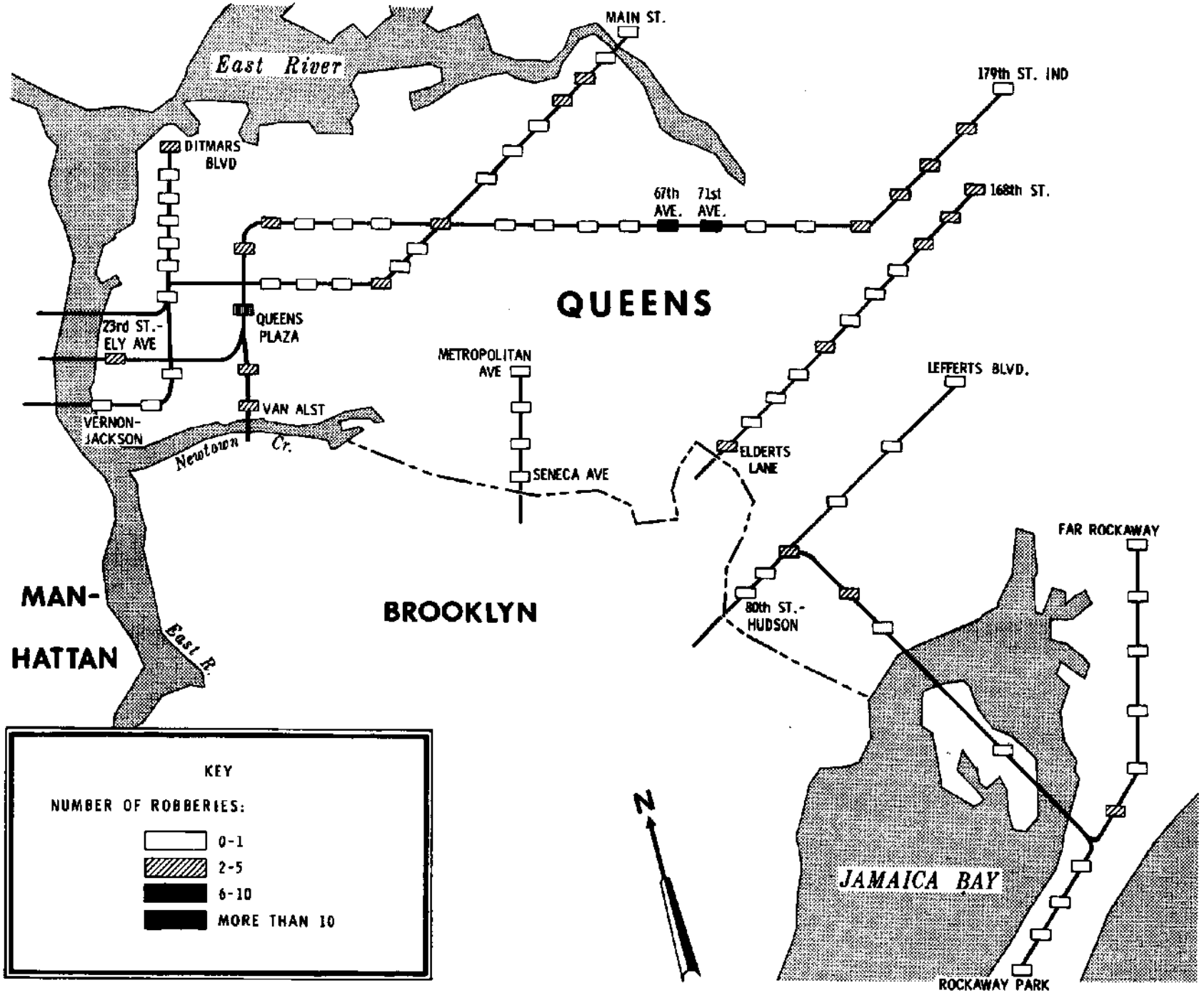

Fig. 17 -- Map of robbery incidence in Queens subway stations, January-April 1970 and 1971

data from our sample. As a measure of surface robbery, we used the number of robberies reported to the NYCPD in each precinct, normalized per 10,000 population, as presented in a *New lork Times* tabulation [16]. The subway figures were also aggregated by precinct, and were normalized by the number of subway stations in the precinct. Included were four precincts that have subway stops but had no subway robbery during the sample period. The 14th Precinct, which at the time covered the Times Square area, was excluded from the analysis since its surface robbery crimes cannot be reasonably normalized by dividing by the resident population.

Figure 18 shows the relationship between surface and subway robbery rates. Each point on the graph represents a single precinct, and the smooth curve is the least-squares fit of a quadratic curve to the data. (A few high-crime precincts included in the regression are beyond the scale of the graph.) The curve indicates that the subway robbery rate increases steadily with increasing surface crime rates, although precincts with high surface robbery rates have less subway crime, on the average, than would be expected by extending the pattern for low-crime precincts in a straight line. This fact, together with the positive intercept of the curve at the axis representing zero surface robberies, confirms that the subways do tend to transfer some crimes from high-crime areas into low-crime ones.

The quadratic fit on Fig. 18 accounts for 41.0 percent of the data variance, which is significant at the 0.01 level. We may therefore reject the hypothesis that subway crime is unrelated to surface crime, even though the data points appear widely scattered. The quadratic fit is also significantly better than simply fitting a straight line to the data. However, an analysis based only on ranking the precincts from highest to lowest in subway crime per station and surface crime per 10,000 population has slightly more explanatory power than the quadratic fit shown in Fig. 18. The Spearman rank-order correlation for these data is $r = 0.692$, so $r^2 = 0.479$, which is larger than 0.410.

With stations on precinct boundaries, the station was arbitrarily assigned to the lower-numbered precinct.

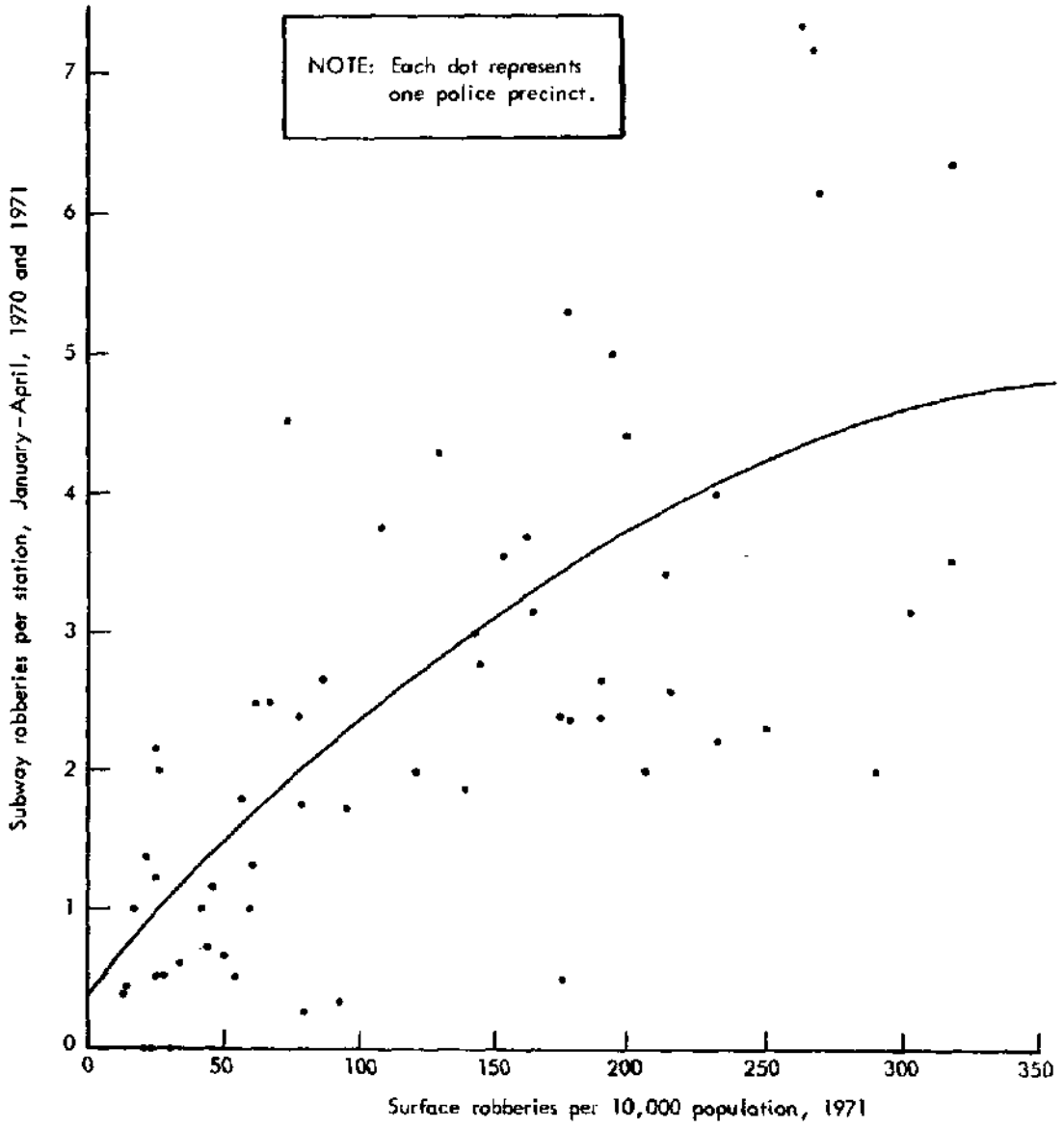

Fig. 18 -- Reported surface and subway robberies in NYC police precincts

SUBWAY ROBBER CHARACTERISTICS

Our data concerning subway robbers were obtained from victims' descriptions and supplemented by arrest information when the crime was cleared by arrest. Although victim descriptions may be in error for particular crimes, consistent patterns found in the reports of many victims can be considered fairly reliable. We found, for example, that the passenger robbers differed from token booth robbers in several characteristics. Moreover, descriptions of the robbers and

their crimes indicate that concurrent participation in both types of robbery activity was not widespread.

Passenger robbers were young, with the majority under 17 years old and some reported to be 10 or under. (However, the youngest arrestee was 11.) The average of ages reported by victims was 17.3 years. Passenger robberies were more often than not committed by groups, usually two or three individuals, but in one of our sample cases "over 50" were reported in the group. In total, at least 512 perpetrators were involved in the 183 passenger robberies, or an average of over 2.8 persons per incident. Most of the crimes committed by larger groups occurred after the end of school on weekday afternoons. Whether through choice or unavailability, passenger robbers seldom relied on handguns; in fact, no more than 8 percent of passenger robberies involved the use of a gun. Three-quarters of passenger robbers used no weapon other than their fists, while most of the remainder used knives, clubs, or simulated guns. Nonetheless, passenger robbers often subjected their victims to considerable physical violence.

Token booth robbers were on average an older group, the mean age being 22 years. Booth robbers also differed from passenger robbers in method of operation, using handguns, real or simulated, in all but 7 percent of TA robberies. However, occurrence of actual physical violence was not frequent. Three-quarters of these holdups were committed by individuals working alone, the remainder by small groups that never exceeded 4 in our sample. The total number of perpetrators for the 85 booth robberies sampled was 116, for an average of 1.4 persons per robbery.

For both types of robberies, the perpetrators were predominantly described as black (over 90 percent), and fewer were described as Hispanic than white. Among arrestees, 6 percent were white, 9 percent Puerto Rican, and 85 percent black.

Older robbers can probably obtain handguns more easily. Besides, a substantial threat must be presented for a transit clerk, protected by his booth, to surrender his cash and tokens.

LOSSES FROM SUBWAY ROBBERY

Because robbery is defined as the taking or the attempt to take valuables from another person by the threat or use of force, the data include some robberies involving no loss. These were cases in which a pickup arrest was made during the attempt, or the robber, for some other reason, left the scene without any money. In the remaining cases, losses consisted of money, subway tokens, and the value of possessions reported stolen, and are called the "take" by the Transit Police.

In about 18 percent of booth robberies, no loss was reported. Excluding these cases, the mean take for sampled booth robberies in 1970 was $250; in 1971 It was $127.* One-third of all TA robberies had takes between $100 and $250, with only 10 percent above the $250 level. Surprisingly large amounts of tokens (values over $100) were taken in some booth robberies.

As one would expect, booth robbery is considerably more lucrative than passenger robbery, but losses in passenger robberies were not Insignificant. For our sample periods, the mean takes for successful passenger robberies were $41.35 in 1970, and $81.69 in 1971. Nearly half of the passengers lost $10 or less, but in 14 percent of the robberies the value of stolen property exceeded $100. Slightly more of the passenger robberies than TA robberies were abortive: 21 percent of all passenger holdups sampled ended with no take reported. For higher average amount of take and smaller occurrence of zero-take attempts, booth robbery is a profit-maximizing choice for a robber faced with the decision of specializing in one type. There is, however, greater risk, as indicated in Sec. V by arrest rates for TA robbery.

PROFILES OF ACTIVE BOOTH ROBBERS' CAREERS

Through various means, the Transit Police associate robberies in their records with apprehended robbers, and consider these cases

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* The difference in the averages for the two years is primarily accounted for by a small number (3) of robberies with takes over $900 in our 1970 sample.

closed. The number of previously unsolved cases "cleared" in this way indicates the number of holdups attributed by the police to individual robbers. Although in general clearance data may be unreliable indicators of the number of crimes committed by an arrestee [17], in the case of TA robbery the Transit Police have no difficulty locating the victim (who is a TA employee) to provide positive identification. We were told by the Transit Police that this is done routinely, and therefore the clearance data for TA robbery are of some interest. In particular, assuming that the police make a conscientious effort to identify at least the recent crimes committed by an arrestee, clearance data provide a record of each individual's recent robbery career.

For each person whose arrest cleared one of the TA robberies in our sample, we determined all the TA robberies cleared by that arrest and other arrests of the same person in 1970 or 1971. As a result, the robberies covered by this analysis in many cases occurred outside our sample periods of January-April. It should be noted that the method used to select the arrestees has a natural bias toward picking the most active robbers, and therefore the group for whom we have data may not be representative of all robbers.

In total, there were 29 men in this group. The ethnic distribution consisted of one white, one Hispanic, and 27 blacks. The average age of these arrestees was 22 years. At the time of arrest, the Transit Police make a determination of narcotic dependency on the basis of physical evidence or, sometimes, on the ar res tee's admission. The determination for these robbers was that 24 of the 29 were addicts.

The mean number of robberies associated, by arrest or clearance, with one of these men was 6.3. Most of them were found responsible for 3 or fewer holdups, but one man arrested in 1970 was identified with 37 booth robberies. The maximum was 16 in 1971. Because the data were collected very soon after the end of the 1971 sample period, however, it is reasonable to expect that there was a subsequent increase in the total number of robberies cleared by all individuals in the sample and in the upper bound of holdups cleared by one robber. At the mean 1970 take-level, including zero-take crimes, the average

booth robber collected about $1285 from this activity during approximately one year.

An arrest does not necessarily terminate the careers of these offenders. Indeed, for the men in this group, the average number of arrests during the year was 1.58.

Early in the study, we hypothesized that some relatively small but very active segment of subway robbers might be responsible for a disproportionate amount of the total holdups. If such a group were indeed present, especially if they exhibited similar traits with regard to method of operation, this would have important implications for the Detective Division. Special investigative effort spent on apprehending these active robbers could substantially decrease all holdups. Using clearance data that extended many months prior to the sample periods, we assembled profiles of the careers of 19 particularly active booth robbers arrested in 1970 and 1971. The information relevant to the present study concerned *modus opevandi* characteristics that the Transit Police could act upon if some consistency were present. Specifically, this included:

- Temporal data: Were the incidents clustered by date, possibly interspersed with periods of no activity? Did the robber concentrate on particular hours of the day? Were the heavy patrol hours avoided?
- Geographical data: Were struck stations located in an identifiable small area? Were they stations of a particular line? Did the robber continue to change locations, or did he repeat at particular places?

The 19 individuals cannot be considered typical of all booth robbers. On the contrary, they were particularly successful because most eluded the police for a relatively long time, and each was thought responsible for many robberies. The criterion for including a robber in the sample was that he had committed 5 or more robberies. Among this group the average number of robberies was 9.7 during a "career" that averaged very nearly 7 weeks. The extreme members of this group

in some sense were an individual who committed 36 robberies in 128 days and another who committed 10 robberies in a brief 5-day spurt. The average time between robberies was 5.3 days.

There were some striking and perhaps expected similarities among the robbers' operations, as well as some important differences. Most avoided the 8:00 p.m. to 4:00 a.m. period, committing only 22.3 percent (on average) of their robberies between these times. As a group, they committed as many robberies in the hour before and the hour after the intensive patrolling period as they did during those hours. The more successful robbers, those who committed 10 or more crimes, were even more careful to avoid the police, attempting only 15.8 percent of their robberies between 8:00 p.m. and 4:00 a.m. Some robbers did tend to favor particular times of the day, especially the early morning hours, but overall behavior varied too much to allow any general conclusions. There was little or no evidence of robberies clustering on particular days, and the frequency with which the men in the sample robbed varied from a hectic two per day (for 5 days) to a leisurely one every 12 days (for 58 days). The amount of the take apparently had no significant effect on the time until the next "hit."

Most robbers in this group concentrated their activities in a relatively small geographical area, typically near the location given to the police as their home address. This would suggest that the robber chose a familiar area in which to operate so as to facilitate his escape after the robbery. Although some individuals seemed to prefer the same line, and others "hit" a few stations repeatedly, in general the robbers appeared to move among the stations and the lines in their chosen area without establishing any definite pattern.

Some appreciation of the differences among the robbers' patterns of operation can be gained from the following short portraits of five of the most active individuals. These men were not chosen as representative of the group on whom we had data and are obviously not representative of all robbers. They were chosen to illustrate the differences we found among the people in our sample. One was notable primarily for the consistency in location and time of his jobs, while another robbed in all boroughs, spread his attempts in time, and seldom repeated at a single station.

Police considered *Robber 1* responsible for 25 robberies occurring in 29 days, which makes him extraordinarily active in this pursuit. Although he concentrated on the "D" line, his activity was widely dispersed throughout the route. Most of his robberies occurred between 10:00 a.m. and 6:00 p.m. Only 4 occurred between 8:00 p.m. and 4:00 a.m. Robber l's total take was $2622, about $105 per job. Although it is not very realistic to suppose that Robber l's level of activity could be sustained for an entire year, it is interesting to note that his rate of return from holdups during his active period was equivalent to an annual income of $31,000. Robber 1 appears to have abandoned his career of his own accord and was arrested several months after the last robbery attributed to him.

Bobber 2 was also intensely active for a short period, but his patterns were much more consistent. He was associated with 14 jobs in the 21 days preceding his arrest. His activity was primarily limited to stations in one area, the Bedford-Stuyvesant section of Brooklyn. Many of his jobs were repeats at previously hit stations. As his experience grew, he became increasingly active, averaging one robbery a day toward the end.

Robber 3 appears to have been the most professional of the five. His activities included all four boroughs. He was active along the D line, but also hit the 8th Avenue IND, Broadway IRT, and Lexington Avenue IRT. Although he usually robbed a particular station only once, he hit the 14th and 34th Street IND stops three times each. Robberies were also well-spaced by date, his 36 jobs occurring over a 128-day period. The average period between jobs was 3.6 days, which is a slow pace compared to the previous two. Robber 3 was careful to avoid the extra shift period, committing only two of his robberies between 8:00 p.m. and 4:00 a.m. Total take from his holdups was over $4530, or about $126 per job.

Robber 4's career extended over 106 days. During this period his 16 robberies yielded a total of $6330. The average take was $396, but individual takes varied widely: two, for example, were under $100, two others were over $1750. Again, robbery activity was concentrated in a single geographical area, this time Astoria and Long Island City.

His only attempts outside this area were unsuccessful. Robber 4 often hit adjacent stations and returned to previously robbed stations. He appears to have been less concerned about the police, as 4 of his 16 holdups occurred during the 8:00 p.m. to 4:00 a.m. shift. Robber 4 was shot and killed during a robbery attempt in 1971.

Finally, *Robber S's* activity was the most predictable and least productive. Nine of his 19 robberies occurred between 4:00 and 5:00 a.m. His target stations were geographically concentrated and, with one exception, each was robbed twice. Robber 5's total take over the 56 days before apprehension was $734, for a mean take of $41. His career illustrates that it may be possible to avoid arrest, even with a relatively predictable pattern, by choosing the early morning hours after the extra police go off duty. Robber 5 was unlucky inasmuch as most of his hits produced very small amounts, especially those in the hours after 4:00 a.m. Some of his colleagues were much more successful at these times, however; in particular, three robberies in 1971 between 4:30 a.m. and 5:08 a.m. yielded nearly $4700 in tokens.

While we have stressed that the prolific individuals described in this section are not typical of all robbers, they are responsible for a substantial fraction of all token booth robberies. Reference to TAPD records indicated that for 1970, the year for which most complete records were available, 18 arrestees were identified as being responsible for 34 percent of the 663 token booth robberies committed in that year.

Many questions remain unanswered after our review of robbers' careers. For example, considering that most of the men in our sample were heroin addicts, why do we not find that the timing of their crimes reflects the size of their previous take? The model of an "economic man" would suggest that after a profitable robbery, an addict could pay for his habit for an extended period without committing another robbery.

Also, since we have studied only the careers of arrested robbers, the question arises as to whether the remaining robbers are similar. Are most of the unarrested robbers addicts, or are addicts simply likely to be arrested? Does there exist a group of very successful, professional

robbers who have avoided apprehension by varying the time, frequency, and location of their operations, unlike the arrested ones? If so, a small number of men could account for nearly all the uncleared booth robberies known to the transit police. In fact, if they were as active as the arrested robbers described above, ten men unknown to the police could have committed all these crimes, and a total of 28 men would be responsible for nearly 85 percent of all booth robberies in one year. We do not think this is likely, and prefer the hypothesis that unarrested robbers operate sporadically or perhaps only once or twice, but the data we collected cannot confirm this.

V. APPREHENSION EFFECTIVENESS

As Greenwood [17] pointed out, statistics ordinarily used to measure the apprehension effectiveness of police departments are inadequate in a number of ways. Simply calculating the number of arrests the police make in a given period and dividing by the number of crimes reported in the same period may be misleading because some of the arrests could be for crimes committed earlier. In addition, several perpetrators might be arrested for a single crime, so the number of arrests is not a satisfactory indication of the number of crimes solved. Greenwood introduced incident-oriented statistics in which a fixed set of crimes is examined and one determines whether or not an arrest was made for each of them.

The only analogous figure commonly reported by police departments is the fraction of crimes cleared by arrest; however, this includes crimes for which the police have identified the perpetrator but may not have made an arrest. A typical example would be when an offender is apprehended during a robbery and confesses to earlier robberies. Clearances are also made through eyewitness identification and comparison of the *modus operandi* of crimes. The evidence in the case of one of the crimes may be more than adequate for prosecution, so the police may choose to make an arrest only for that one. But the use of clearance rate as a measure of effectiveness can encourage some police commanders to declare crimes cleared even when the evidence is not strong, and therefore a variation of clearance statistics among police units does not necessarily reflect variations in effectiveness.

The final problem with usual arrest and clearance statistics is that they aggregate together the effects of activities by uniformed patrolmen and by detectives. To determine which police activities are contributing to apprehension effectiveness, pick-up arrests by uniformed patrolmen must be separated from arrests by detectives, and detective arrests resulting from investigations must be separated from the others.

Fortunately, the TAPD crime-report files are so arranged that

we were able to collect data to calculate appropriate Incident-oriented apprehension statistics. In cases involving a pick-up arrest at the scene, the arrests are noted on the crime report, and it is possible to determine whether detectives or uniformed patrolmen made the arrest. In the case of a later arrest, a supplemental report form Is filed with the original crime report, thereby identifying this arrest as a result of an investigation. Moreover, reports for crimes cleared without an arrest are so marked in TAPD files.

We therefore were able to determine the following for each type of crime in our 20-percent sample of robberies between January and April, in both 1970 and 1971:

N = number of incidents in the sample.

N_a = number of incidents in which an arrest was made.

$N_{\bar{a}} = N - N_a$ = number of incidents in which no arrest was made.

Np= number of incidents in which a pick-up arrest was made.

Npd = number of incidents in which a pick-up arrest was made by detectives.

$N_{po} = N_p - N_{pd}$ = number of incidents In which pick-up arrests were made by officers other than detectives.

Nsd = number of incidents for which a supplemental arrest was made.

$N_d = N_{pd} + N_{sd}$ = number of incidents for which an arrest of either type was made by detectives.

N_c = number of incidents cleared.

The first performance measure we calculated is the *total arrest index,* which is computed as the total of Incidents In which an arrest was made, divided by the total number of incidents:

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* Excluded are one 1971 and three 1970 passenger robberies determined to be "unfounded."

† All of these were made by detectives.

‡ It is not necessary to locate all perpetrators to clear an incident; one arrest can close a case. Since an arrest clears an incident, $N_a \leq N_c$.

$$\text{Total arrest Index} = \frac{N_a}{N} = 1 - \frac{N_{\bar{a}}}{N} .$$

Table 5 shows that arrests were made for 12,5 percent of the 1970 TA robbery cases and for 17.8 percent of these in 1971. The total arrest index for passenger robbery was **higher** for both years: 29.4 percent in 1970 and 19.6 percent in 1971. Three of these indices are higher than the comparable NYCPD figure for 1968 robberies of 13.3 percent, as reported by Greenwood [17]. This index reflects the activities of both uniformed patrolmen and detectives.

Table 5

COMPARATIVE PERFORMANCE STATISTICS FOR ROBBERY

	Transit Police					
	TA Robbery		Passenger Robbery		NYPD[a]	FBI[b]
Category	1971	1970	1971	1970	1968	1970
Total arrest index	.178	.125	.196	.294	.133	
Detective arrest index	.122	.079	.062	.054	.056	
Investigation arrest index	.023	.014	.009	.029		
Clearance rate	.295	.575	.232	.338	.220	.364
Cases per detective[c]	25	22	2.6	1.6		
Robberies in sample	45	40	112	68		
Total robberies					15,847	35,980

[a] Greenwood [17].

[b] Federal Bureau of Investigation, *Crime in the United States*, Uniform Crime Reports—1970, Statistics for 3 Cities with Population over 3 Million.

[c] The TA robbery caseload is handled by a special group of detectives, whereas passenger robberies are one of several crime types assigned to all nonspecialized detectives.

Detective Division performance is measured by considering only those crimes that the detectives had something to do with. The *detective arrest index* compares incidents involving a detective arrest—either pick-up or supplemental—with the total of incidents not

immediately closed with a pick-up arrest by a nondetective. Thus it includes arrests produced by detective patrol, stakeout, and investigation. This index is computed as

$$\text{Detective arrest index} = \frac{N_d}{N - N_{po}} .$$

For TA robbery cases, the detectives had arrests for 7.9 percent of the 1970 cases and 12.2 percent of the 1971 cases in which other officers made no pick up. For passenger robbery, the proportions were 5.4 percent in 1970 and 5.6 percent in 1971. These figures are so close to the 5.6-percent detective arrest index for robbery reported by Greenwood from 1968 NYCPD data as to suggest that passenger robbery on the subways is similar in many respects to street robbery and that the two departments are about equally effective in solving these crimes. The higher arrest rate for TA robbery presumably reflects the existence of special units within the Transit Police detective division to deal with this crime; however, an influential factor may be that cooperation by the victim is easier to obtain for TA robberies.

On balance, considering both types of crimes together, the TAPD detectives present a record of successful operations based on the results of the sample. In addition, the disparity between the detective arrest index and the total arrest index indicates that uniformed policemen contribute substantially to the apprehension activities of the Transit Police.

The effectiveness of detectives in solving past crimes reported to them is measured by the *investigative arrest index*. Pick-up arrests that result primarily from detective stakeout work are separated from arrests that result from investigation. Thus we have

$$\text{Investigative arrest index} = \frac{N_a - N_p}{N - N_p} = 1 - \frac{N_a}{N - N_p} .$$

That is, the number of cases with pick-up arrests is subtracted from the total number with arrests; this is divided by the number of incidents in which no pick-up arrest was made. The index shows that the detectives "solved" and closed by supplemental arrest 1.4 percent of 1970 TA robbery incidents and 2.3 percent in 1971. Passenger robbery had an investigative arrest index of 2.9 percent in 1970 and 0.9 percent in 1971. These figures indicate clearly that arrests for past crimes are obtained in approximately equal proportions for both types of crimes and the main contribution to greater detective success for TA robberies is the stakeout technique.

We turn finally to the *clearance rate,* which is defined as N_c/N, the number of cases cleared in a period divided by the total number of incidents in the period. The TAPD's 1970 TA robbery clearance rate is the highest in the table at 57.5 percent. The other TA statistics are only slightly below the national rate of 36.4 percent. All the clearance levels except 1971 passenger robbery at 23.2 percent are substantially above the NYCPD robbery clearance rate of 22.0 percent. But the data were collected soon after the end of the sample period in 1971, and it is therefore likely that the 1971 clearance rates subsequently increased. Many of the arrests that cleared 1970 cases were made several months later, but it is reasonable to assume that by the summer of 1971 the TAPD had cleared nearly all of the early 1970 cases that would ever be cleared. Therefore the 1970 clearance rates as shown in the table may be considered representative of TAPD performance.

Thus, it appears that the TAPD clearance rate for TA robbery is over 50 percent, which can be considered very high. It no doubt reflects the fact that some TA robbers are active repeat offenders as well as the relative ease of obtaining identification of arrestees by token booth clerks. But primarily we think it reflects effective performance by the TA detectives who specialize in booth robberies. Chances appear good that an offender who commits a series of booth holdups will be apprehended. The steady growth in this type of crime through 1971 seemed to result not from a low probability of arrest but from the relatively high probability of being able to take a large amount of money.

Although the deterrent effect of uniformed patrol suggests that to a certain extent robbers behave rationally by weighing their probability of apprehension, our findings in regard to detective arrest rates suggest that delayed apprehension is not an effective deterrent to TA robbers. Indeed, we have seen that a sizable number of men who have already been arrested for booth robbery will return to commit the same crime again.

We are therefore led to speculate that even if detectives could guarantee every robber would eventually be arrested, the momentary value of having cash in hand would be attractive enough to outweigh the disbenefit of future apprehension for some robbers. Thus the deterrent effect of delayed apprehension appears minimal. But if the deterrent force, when successful, prevents the robber from spending any of his take, then its effectiveness is increased.[A]

[A] This observation is confirmed by recent developments. After the data collection described in this report, the Transit Authority began installation of new token booths with enhanced security against gunmen. These appear to have deterred TA robberies to an extent which had been unachievable by the detectives.

VI. IMPLICATIONS

CRIME ON THE SUBWAY SYSTEM

The amount of crime reported on the New York City subway system reflects a complex combination of influences: the number of policemen on duty at various times and locations, the police reporting practices, the general crime levels in parts of the City through which subways pass, and the perceived attractiveness of opportunities to commit crimes in the subway system as compared to other places. In addition, there are doubtlessly other influences on crime rates that we did not examine in detail, Including the numbers and attitudes of passengers (both as potential victims and as witnesses or obstacles to crime), the pregnability of token booths, and the procedures used to safeguard Transit Authority receipts after their removal from token booths.

Even If it Is not possible to separate the effects of these diverse influences completely, the following conclusions are Inescapable from the data:

- Except for changes clearly attributable to anticrime activities of the Transit Police or the Transit Authority, the rate of serious crime in the subway system has tended to increase steadily from year to year.
- The addition of uniformed patrol officers in the subway system has decreased the amount of serious crime committed at the times and places the officers are deployed.
- Although we were unable to determine whether increased subway patrol in 1965 displaced crime to targets *outside* the subway system, no *•immediate* displacement of crime *within* the subway system took place to times of day having no increased patrol. On the contrary, the increased manpower caused a phantom effect that temporarily decreased serious crime rates at times and places

where no increase in patrol occurred. This indicates that a potential offender's perception that a policeman is *probably* present has a deterrent effect even if no policeman is actually observed.

- The phantom effect lasted approximately eight months.
- After the phantom effect had run its course, crime increased most rapidly during the times of day that have the fewest patrolmen on duty.
- The deterrent effect of uniformed patrolmen does not dissipate with the passage of time, as evidenced by the present sharp decrease in subway crime rates at 8:00 p.m., when the fourth platoon begins work.
- When a particular type of crime proves to be lucrative and relatively safe, additional offenders will be attracted to it, possibly in lieu of other criminal opportunities. This apparently happened in 1969 with bus robberies, for which the data suggest that some individuals who otherwise would have been committing subway robberies were robbing bus drivers instead.
- The geographical locations of subway crimes are not evenly spread throughout the system but are focused on a small number of stations and the portions of train routes that run between those stations. The high-crime locations can be easily identified from historical data (although we have only done so for robbery crimes) and tend to be where surface crime rates are also high.
- Subway robbers are predominantly young and black, but there are substantial differences between those who rob passengers and those who rob token booths. Many passenger robbers are school-age children, and the bulk of their crimes are committed in the afternoon just after school hours. Few passenger robberies involve the use of guns, but many are violent crimes. By contrast, token booth robbers are somewhat older

and frequently use guns, but do not often use violence. Based on TAPD determination of narcotics dependency, which is not by a definitive medical test in all cases, the bulk of token booth robbers appear to be narcotics users.

- The TAPD detectives appear to be at least as successful in solving passenger robberies as detectives in the City police force are at solving robberies above ground, and in addition the Transit Police detectives are even more effective in arresting token booth robbers, reflecting the existence of a squad that specializes in such crimes and apparently has good intelligence sources to permit successful use of stakeout techniques.
- Token booth robbery can be a lucrative activity for at least a brief period of time, but the data suggest that there could not be even as many as ten individuals in the entire city who commit such robberies regularly for, say, a year without being apprehended. Nonetheless, successful apprehension by detectives appears to be minimally effective as a deterrent to TA robbers.

PATROL DEPLOYMENT

The deployment of uniformed transit policemen, unchanged in its essential characteristics since 1965, consists of concentrated patrol between 8:00 p.m. and 4:00 a.m., spread more or less evenly over all stations and trains, and a substantially smaller force during the rest of the day, semifocused on stations with the most passenger traffic. By contrast, crime in the subway system is concentrated between 4:00 a.m. and 8:00 p.m. and is not spread evenly among trains and stations.

Were it not for the fact that a large part of the crime pattern is clearly a *consequence* of the patrol deployment pattern, one would certainly conclude from this contrast that the policemen are patrolling in the wrong places at the wrong times. In any event, the

Transit Police evidently cannot substantially decrease overall subway crime levels unless more men are assigned to the high-crime locations during the high-crime periods of the day.

The Transit Police, who are as concerned about this disparity as anyone is, have repeatedly expressed a need to increase their force by perhaps 60 percent. This would permit them to patrol stations and trains during the high-crime hours with as many policemen as are now on duty at night. We feel there can be little doubt that such a change would indeed decrease the numbers of subway crimes substantially. But an important question is whether less expensive alternatives might have much the same effect. In particular, what changes in the deployment of existing manpower could be expected to reduce crime?

Since the essentially static and predictable nature of the present deployment pattern gives the criminal a major advantage, we feel that nearly any sensible change would be beneficial in the short run, because it would introduce surprise and uncertainty. The unexpected appearance of numerous policemen at times or places where they had never been before is likely to have a direct deterrent effect, while their absence at other accustomed times and places could not be immediately detected with assurance by potential offenders. *In other words it is reasonable to believe that the Transit Police can capitalize on the phantom effect of police manpower by making temporary redeployments.*

Let us consider an example. Imagine that for a two-week period beginning tomorrow the Transit Police operate the fourth platoon from 7:00 p.m. to 3:00 a.m. instead of from 8:00 p.m. to 4:00 a.m. Since the rate of serious subway crimes is currently about six times as large between 7:00 and 8:00 p.m. as between 8:00 and 9:00 p.m., we can expect that the direct deterrent effect of the added men would decrease crime substantially between 7:00 and 8:00 p.m. And, unless an unusually dramatic announcement of the change were made, it is unlikely that many potential offenders would become aware of the improved opportunity for crime between 3:00 and 4:00 a.m. before the end of the two weeks. In effect, "phantom" police would be on duty from 3:00 to 4:00 a.m. along with the regularly scheduled men, simply because they have been there for the past eight years.

At the end of the two weeks, before potential offenders can conclude with assurance that manning has been reduced between 3:00 and 4:00 a.m., the previous patrol levels during that hour should be restored. Perhaps the fourth platoon might work from 9:00 p.m. to 5:00 a.m. Then there could well be a residual phantom effect from 7:00 to 8:00 p.m., based on offenders[1] conclusion that there are now added policemen during that hour, and the hour beginning at 8:00 p.m. would almost certainly benefit from a phantom effect of the policemen who have been there for many years. Meanwhile, those offenders who plan their crimes for just after 4:00 a.m. in the certain knowledge that most policemen have gone off duty would be in for a big surprise.

At this point in the example, imagine that the Transit Police announce publicly the success of their 7:00 p.m.-3:00 a.m. schedule and their future plans for flexible deployment of the fourth platoon. If events in 1965 are any guide to what might happen, enough uncertainty about subway police deployment could occur to reduce crime even at hours so far unaffected by the manning changes.

At the end of the second two weeks, still another schedule could be introduced, or the 8:00 p.m. to 4:00 a.m. tour could be restored.

There is nothing magical about the choice of two-week durations in this example. Indeed the Transit Police should select the duration of each deployment pattern without letting the rest of us know what it is. By monitoring actual crime rates, they would be able to tell, better than we can guess, whether the phantom effect actually occurs and when it begins to dissipate. The essential features of the example are that deployment patterns change unpredictably from time to time and that no hour which has traditionally been fully manned would suffer a permanent reduction in police patrol.

Should these small changes In deployment patterns prove workable and effective, it would then be time to consider attacking the true high-crime hours of the day, which are not at 7:00 p.m. or 4:00 a.m. but In mid-afternoon. To accomplish this, many policemen must temporarily appear on duty in the afternoon.

Where are they to come from? Clearly some stations and portions of train routes would have to be unmanned at night, but it is possible

to identify locations at which crimes are unlikely to occur whether policemen are present or not. The maps shown in Figs. 14 through 17 could be used for this purpose, but it would be preferable for the Transit Police to prepare new maps showing the locations of all felonies for a recent period during the 8:00 p.m. to 4:00 a.m. period.

Supposing that half of the 600 men on the fourth platoon were removed, it would still be possible to patrol all the trains and one-third of the stations at night, using the remainder of the fourth platoon and the nighttime police from the regular rotating shift. Alternatively, a larger fraction of the stations could be patrolled, along with those portions of train routes where crimes actually occur. Meanwhile, these 300 men, if concentrated during the afternoon on perhaps 20 stations and the routes between them, could undoubtedly have a measurable effect on crime rates. Even if daytime deployment occurred for only one week each month, total felony crime on the subways would clearly be lower than if present practices were continued.

The notions of flexible deployment proposed here are not novel, but rather have been successfully adopted by plainclothes anticrime teams in many municipal police departments, including New York's. Through analysis and mapping of current crime patterns, a plan for the next day's deployment is developed. Since the anticrime forces are not large enough to cover every high-crime area continuously, they saturate one area at a time, moving on to the next one after they have had the desired impact. The City administration and the Transit Authority must relieve the Transit Police of the implied duty to provide 100-percent manning during certain hours, and instead encourage them to put their men where the crimes are.

PLAINCLOTHES PATROL

The major argument against changing the deployment of the fourth platoon is that the riding public is reassured by the guaranteed presence of a patrolman on each subway station and train after 8:00 p.m. Should any reduction in coverage occur, the number of nighttime passengers might decrease, and business at restaurants, theaters, and similar establishments might suffer. We doubt very much that this

argument applies to such minor variations as occasionally beginning the fourth platoon an hour or so earlier or later than it now begins, but it may be correct in regard to the major redeployment needed to assign 300 additional men to afternoon duty.

To counter this problem, and possibly reap crime-reduction benefits as well, we would recommend a plainclothes patrol on stations and trains as a partial substitute for uniformed patrol. If this were done, the Transit Police could announce that every station and train was still patrolled, but in some instances you cannot tell who the policeman is. If, as might be expected from the success of the municipal plainclothes anticrime teams mentioned above, these officers succeed in foiling crimes, arresting felons, and removing trouble-makers from trains, resistance to decreased uniformed presence might dissipate. Then, when a redeployment subsequently takes place, neither potential offenders nor law-abiding passengers could know for sure whether their station and train are patrolled.

EVALUATION

Any introduction of flexible deployment should be carried out gradually over several months[1] time, with special collection and tabulation of crime and arrest data. This will permit careful planning of manpower schedules and target areas, and evaluation of whether desired effects are achieved. Crime reports should indicate whether the station or train on which the crime occurred was unmanned or manned and whether by a plainclothes patrolman or a uniformed patrolman. Crime totals for hours in which patrol levels are temporarily decreased should be compared with the previous crime rates for the same hours and adjacent hours to determine whether a phantom effect occurs and how long it lasts. Crimes against persons should also be tabulated by hour, so that victimization rates can be calculated by comparison with ridership figures.

The phantom effect cannot be expected to be as strong as the direct deterrent effect of policemen on duty, and therefore crime rates will inevitably rise somewhat in hours having decreased manning levels on the average. However, flexible deployment is intended to

reduce overall crime levels and victimization rates on the subway system, and it should be evaluated in these terms.

DETECTIVE DEPLOYMENT

The TAPD Detective Division is an effective unit, and despite our efforts to study hypotheses such as the existence of date-clustering of robberies or common *modus oper>andi* among robbers, we have been unable to suggest improvements in detective deployment. However, the special success of Transit Police detectives in arresting token booth robbers, while commendable, tends to indicate that the TAPD behaves in some ways like a proprietary police force working for the Transit Authority rather than a special-purpose public police force, which it is. The only major specialized unit within the TAPD Detective Division is assigned to TA robberies, and it has a large group of patrolmen available to it for stakeout duty.

If the Transit Authority paid the salaries of Transit policemen, indeed if they just paid the salaries of the men assigned to prevention and solution of TA robberies, we would expect them to be in fact a proprietary police force. But the taxpayers of New York City pay for the Transit Police. The TAPD Detective Division should therefore make a special effort to assure that at least the same energy, intelligence, and investigative techniques are brought to the solution of crimes against people as to crimes against the Transit Authority.

CONCLUSION

This report was not intended to be a comprehensive evaluation of TAPD activities, nor of police effectiveness in relation to all types of crimes they face daily. Instead it is a case study of one crime, robbery, in a context that permits resolution of some important conceptual unknowns related to the impact of police activity on crime, and, we hope, suggests possibilities for improved deployment of the subway police in New York.

Appendix A

CODING SHEET FOR TRANSIT ROBBERY INCIDENTS

Column	Item Number	Item	Code/Remarks
1	1	Continuation number	1
	2	ID number	
2		Division code	1 BMT 2 IND 3 IRT
3-5		Serial number	
6	3	Robbery type	1 Booth 2 Passenger train 3 Passenger station 4 Other 0 Unknown
	4	Post and station number	Follows TAPD station codes
7-10		Post number	
11		Station number	
12,13	5	Train number	E.g., A, CC, 5, etc.
14	6	Complainant	1 Token booth clerk 2 TA patrolman 3 Private citizen 4 Other 0 Unknown
15	7	Location of robbery	1 Token booth 2 Train 3 Platform 4 Other (e.g., stairs) 0 Unknown
16-18	8	Amount taken	0-899 Amount taken in dollars 900 900 or over 999 Unknown
19-22	9	Time of robbery	24-hour clock 9999 Unknown
	10	Date of robbery	
23,24		Month	1-12 January-December
25,26		Day	1-last day of month
27,28		Year	70,71
29	11	Day of week	1-7 Sunday-Saturday
30-31	12	Number of perpetrators	Number entered 99 "Group"

Column	Item Number	Item	Code/Remarks
	13-16	Data for 4 perpetrators	
32,33		1	
36,37		2	Age in years
40,41		Age 3	00 Unknown
44,45		4	
34		1	1 Black
38		2	2 Hispanic
42		Race 3	3 White
46		4	4 Other
			0 Unknown
35		1	1 No
39		2	2 Yes
43		Armed (gun) 3	3 Simulated a gun
47		4	4 Other weapon
			0 Unknown
48	17	Incident cleared	1 Pick-up arrest 2 Investigation arrest 3 Rearrest 4 Clear on ID, suspicion, etc. 5 Unfounded complaint 6 Not cleared 0 Unknown
49,50	18	Number of arrests	Number of perpetrators of this crime arrested for this crime
	19-22	Data for 4 arrestees	
51,52		1	
54,55		2	
57,58		Age 3	Age in years
60,61		4	
53		1	1 Black
56		2	2 Hispanic
59		Race 3	3 White
62		4	4 Other
			0 Unknown
63-66	23	Time of arrests	24-hour clock
	24	Date of arrests	
67,68		Month	1-12 January-December
69,70		Day	1-last day of month
71,72		Year	70,71
73	25	Arrestor	1 Uniformed TA officer 2 TA detective 3 Other police 4 Unknown

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