

**Patrol Officer Deployment
1991-1995**

Office of City Auditor

Patrol Officer Deployment 1991-1995

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Executive Summary

Purpose

The officers of the Seattle Police Department (SPD) serve as the City's principal defense against crime. As the first to provide most emergency assistance, SPD's patrol officers¹ play a particularly important role in protecting the public. In April 1996, the Chair of the City Council's Public Safety Committee asked the Office of City Auditor to:

- determine the number of police officers on patrol duty at any given time and the factors influencing that number;
- compare the deployment of patrol officers with SPD's deployment plans, and
- examine the relationship between the number of police officers and the crime rate.²

Results

From 1991 through 1995, the number of patrol officers deployed by SPD varied with the time of day, ranging from about 55 in the morning to 120 in the afternoon and 115 in the evening -- a reflection of work load differences. Although SPD had about 1,900 authorized personnel during that period, two factors significantly affected the number of patrol officers SPD could deploy. First, about two-thirds of SPD's personnel are either police officers who are not assigned to work as patrol officers or are civilians who perform duties which do not require a police officer. Second, approximately two patrol officers had to be employed to ensure that one patrol officer was always deployed for an eight hour shift, 365 days per year. The number of patrol officers can be augmented, as the need arises, by other police officers working within precinct boundaries. We reviewed a sample of the SPD patrol officer deployment records that we relied upon for our analysis and found them to be generally accurate.

On an annual basis, SPD's actual deployment of patrol officers generally matched its seasonal patrol officer deployment plans both city-wide and in individual precincts between 1991 and 1995. However, actual staffing consistently fell short of planned levels during December and in the morning. Our analysis found significant shortfalls on Monday mornings as well as Friday and Saturday evenings. Patrol officer work schedules prevent SPD from meeting the higher staffing levels suggested by the plans for Friday and Saturday nights without resorting to overtime or drafting officers from specialized units. We were not able to determine the effect of the shortfalls in staffing on SPD operations.

¹ Unless stated otherwise, we define patrol officers as sworn SPD personnel, ranking below sergeant, who are assigned to one of the city's four police precincts to perform patrol duties in cars, on bicycles or on foot.

² For this study, we did not attempt to analyze the link between the number of officers on patrol and SPD response times to citizen calls for service (i.e., 911 calls and other requests for assistance from the public). However, the Legislative Department's Central Staff and SPD are collaborating on research about the relationship between SPD patrol officer staffing and response times to the most critical types of calls for service.

The effect of additional police officers on the crime rate is not well understood. Most expert opinion and research findings suggest that changing the size of a city's police force does not affect the crime rate in any predictable manner. Methodological issues make the police-crime link particularly difficult to study. However, two recent statistical studies found a relationship between the number of police and reported crime rates and recommended increasing the number of police officers as a means of reducing crime in most large cities. A large-scale multiple regression analysis overseen by expert consultants would be required to describe the relationship between numbers of police and reported levels of crime in Seattle.

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CHAPTER ONE: INTRODUCTION

PURPOSE

The officers of the Seattle Police Department (SPD) serve as the City's principal defense against crime. As the first to provide most emergency assistance, SPD's patrol officers play a particularly important role in protecting the public. In April 1996, the Chair of the City Council's Public Safety Committee asked the Office of City Auditor to:

- determine the number of police officers on patrol duty at any given time and the factors influencing that number;
- compare the deployment of patrol officers with SPD's deployment plans, and
- examine the relationship between the number of police officers and the crime rate.

SCOPE AND METHODOLOGY

In performing this study, we examined SPD manuals and directives, interviewed personnel from SPD headquarters and precincts, and accompanied several on-duty patrol car units to familiarize ourselves with the work of a patrol officer.

To determine the number of patrol officers deployed on patrol during a typical Seattle day and perform related analyses, we first obtained from SPD a computer database of patrol officer attendance and deployment data, 1991-1995, and converted the database into spreadsheet format. We were unable to retrieve data for December 1992 from the database; consequently we calculated 1992 averages using just the 11 months of available data. To test the accuracy of the database, we reviewed a sample of precinct watch-attendance forms and the corresponding entries which SPD headquarters made in the database for the period July 1 to December 31, 1995. This judgmental sample of 46 watch-attendance forms included 30 from the North Precinct, five each from the South and East precincts, and six from the West Precinct. We used a random number generator to select the date and watch of the documents we reviewed. In 1993 SPD substantially revised the form the precincts used to record patrol officer attendance and the form SPD headquarters used to enter data into the computer database. According to an SPD official, the revisions made completing the forms much easier and probably increased the accuracy of the attendance data in the database after that point. We did not attempt to compare the accuracy of the 1991-1992 data to the 1993-1995 data.

To calculate the number of patrol officers that SPD must employ to provide continuous coverage of a patrol officer position (24 hours per day, 365 days per year), we contacted

other local government audit offices with experience in police staffing and deployment issues to identify a commonly accepted methodology. We used a formula from the book, Administrative Analysis for Local Government: Practical Application of Selected Techniques, by David N. Ammons of the Carl Vinson Institute of Government at the University of Georgia. This formula is referred to as the “staffing factor” or “fill ratio.”

To compare actual patrol officer deployment with SPD’s deployment plans, we matched data from SPD’s patrol officer attendance and deployment database with seasonal deployment plans covering 1991 through 1995.

To probe the relationship between the number of police officers and the crime rate, we conducted a literature search with the assistance of the Seattle Public Library, searched applicable sites on the Internet, and reviewed numerous articles and studies. We also discussed this topic with officials from SPD, the U.S. General Accounting Office, the academic community, and such research organizations as the RAND Corporation, the Police Executive Research Foundation, and the Urban Institute.

We conducted our work between April and November 1996 in accordance with Government Auditing Standards.

BACKGROUND

The citizens of Seattle, as well as those who visit or commute to Seattle for work, rely upon SPD for protection against crime and for assistance and advice in various routine and emergency situations. SPD’s patrol officers³ are generally the first officers to respond to citizen requests for help, whether under emergency or non-emergency conditions. Their duties include deterring crimes, apprehending suspects, initiating criminal investigations, gathering evidence and maintaining order. When “deployed on patrol,” about 85 percent patrol in cars; the remainder, on bicycles or foot. By SPD policy 20 percent of patrol cars are staffed with two officers. The remaining 80 percent are one officer cars. Patrol car officers’ primary responsibilities are to respond to citizen calls for service and patrol their assigned areas. According to SPD, although foot and bicycle beat officers do not routinely respond to calls for service, they will respond when a patrol car officer is unavailable or the beat officers are near the call.

Some precinct patrol officers who are not deployed on patrol are assigned duties such as desk officer to handle citizen

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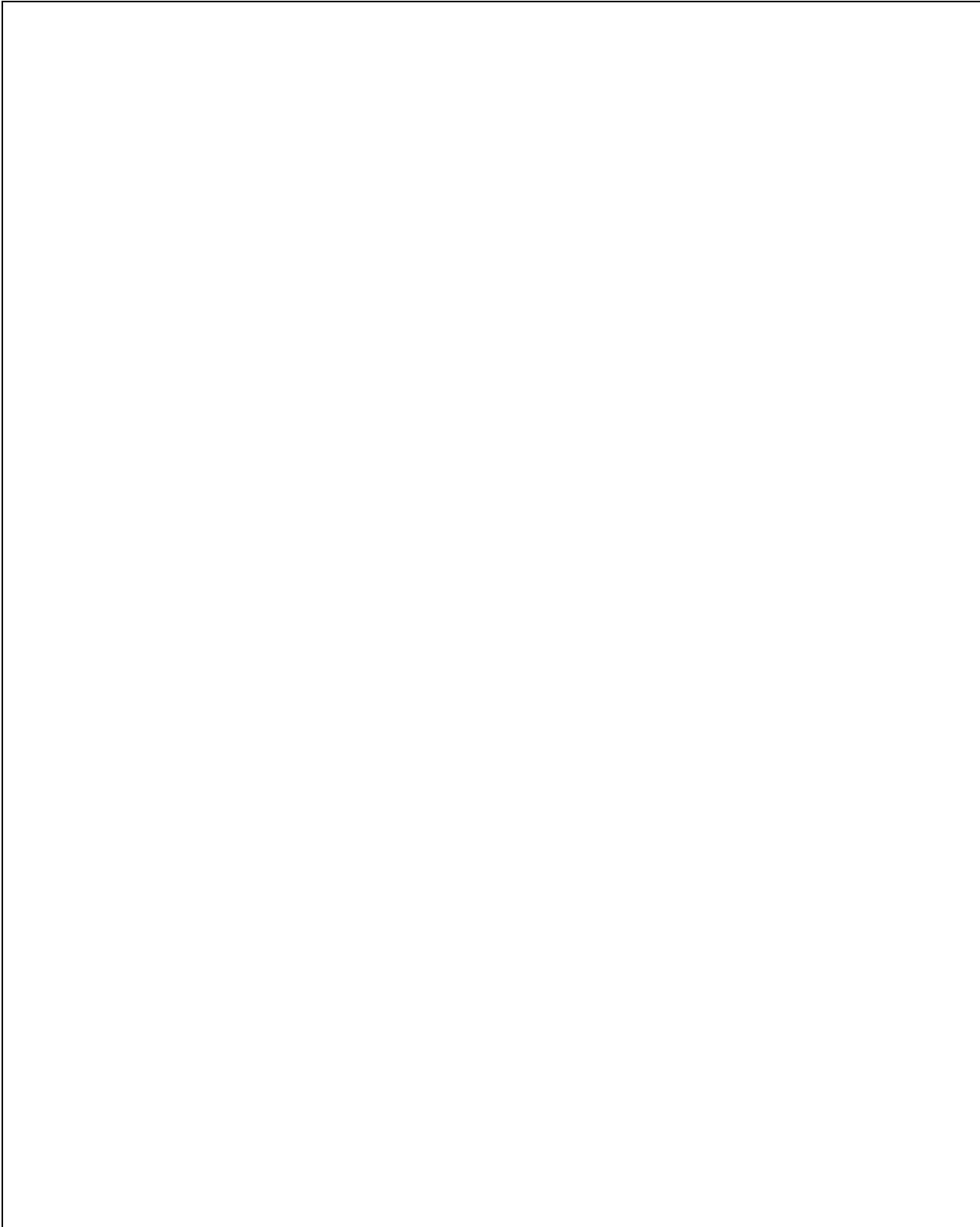
inquiries, driving the precinct patrol wagon to transport prisoners to the King County Jail⁴, or serving on such specialized precinct units as the Anti-Crime Team or the Community Police Team⁵, which are not intended to be used to respond to calls for service or engage in routine patrol activities. Typical activities of a precinct's Anti-Crime Team include serving search warrants, conducting "buy and bust" operations against narcotics dealers, conducting vice "sting" operations, and performing intensive (non-routine) patrol of high crime areas. In contrast, Community Police Team personnel work with the community to devise long-term, innovative solutions to problems which have required repeated police responses. Community Police Teams deal with issues which tend to result in numerous and repeated 911 calls from citizens (for example, noise complaints, neighbor disputes, drug houses, transient encampments, and abandoned properties). Precinct commands assign problems to Community Police Teams which a single appearance of an officer at a single site cannot typically resolve; rather, solutions to such problems require a long-term effort and often intensive coordination with other City, County, State, Federal, or private groups. For example, the East Precinct's Community Police Team worked with City Light, the City's Health Department, and neighborhood residents to persuade a King County judge to close down a restaurant frequented by drug dealers and users. Some Community Police Team personnel are also assigned to work with local schools or the Seattle Housing Authority.

The vast majority of the City's patrol officers serve under SPD's Operations Bureau in one of the City's four patrol precincts. These precincts operate 24 hours per day and provide continuous police service throughout their areas of responsibility. Figure 1 shows the boundaries, areas, and populations of the four precincts.

⁴ From 1993 to 1995, about ten percent of precinct patrol officers available for patrol duty worked as desk officers, prisoner wagon or mobile precinct drivers, or as acting sergeants.

⁵ See Figure 8 in Chapter Two for the number of authorized Community Police Team and Anti-Crime Team positions in each precinct.

Figure 1: Patrol Car Districts
Source: SPD 1995 Annual Report



A precinct commander, with the rank of captain, supervises each precinct. A lieutenant supervises each of the precinct's three eight-hour shifts or "watches."⁶ Each precinct comprises three geographic sectors.⁷ A patrol sergeant supervises the patrol officers assigned to a sector on a given watch.

SPD reassesses the number of patrol officers it assigns to each precinct three times each year, creating seasonal deployment plans for 1) the five months January-May, 2) the four months June-September, and 3) the three months October-December. Within each precinct, the plan specifies the appropriate number of patrol officers for each day of the week and watch. In developing its deployment plans, SPD uses a computer software program, the Patrol Car Allocation Model (PCAM). The purpose of this model is to deploy patrol cars--but not foot or bicycle beat officers--in such a way as to equalize police response times to 911 telephone calls for assistance throughout all parts of Seattle at all times. The model specifies how many of the projected available pool of staffed patrol cars SPD should deploy within a specific precinct sector during a specific watch and day of the week (for example, six patrol cars in the West Precinct's Queen Sector during second watch on Mondays). To develop its deployment recommendations, the model incorporates seasonal patrol work load data from the previous year and patrol officer staffing projected for the coming season. SPD officials told us SPD usually uses the PCAM-suggested patrol car seasonal deployment without modification but that the Assistant Chief of the Operations Bureau, who reviews and approves the deployment plans, has the authority to modify them if conditions warrant a change. Because the PCAM model deals only with patrol cars,⁸ senior SPD officials determine the number, working hours, and locations of foot and bicycle beat officers.⁹ After they receive the approved seasonal deployment plans for their precincts, precinct commanders are allowed to make small or temporary adjustments to the plan's suggested deployment within their precincts, without consulting SPD headquarters, as long as they do not require additional officers.

⁶ Watch starting times are staggered to maintain some police coverage during watch changes.

⁷ The Seattle Police Officers Guild recently negotiated and approved a new contract and work agreement with the City that will result in the city's precincts being divided into four sectors instead of three. The new contract and agreement will also change patrol officers' work schedules from six eight-hour work days followed by two days off to four nine-hour work days followed by two days off. SPD plans to implement these changes in January 1997.

⁸ Precinct commanders can choose to substitute bicycle patrols for patrol cars. These bicycle patrol units are referred to as emphasis bike patrols. The emphasis bike patrols are expected to cover the same territory as a patrol car and to respond to 911 calls.

⁹ According to SPD officials, City Council budget decisions also influence the number of foot beat officers. The officials said that in past budgets the City Council added positions for foot beat officers.

CHAPTER TWO

SEVERAL FACTORS AFFECT THE NUMBER OF PATROL OFFICERS WHO CAN BE DEPLOYED ON THE STREETS AT A GIVEN TIME

The number of SPD patrol officers deployed on patrol duty varied from about 55 to 120 on a typical day in Seattle during 1991-1995. Although SPD was authorized to employ approximately 1,900 personnel during that period, two factors significantly affected the number of officers that the Department could deploy as patrol officers at any given time:

- about one-third of all SPD personnel, or about half of all sworn¹⁰ officers, were assigned to work as patrol officers, and
- SPD needed to employ about two patrol officers to ensure that one patrol officer was always deployed for an eight-hour shift, 365 days of the year.

As the need arises, however, SPD can make other officers available to assist patrol officers. We reviewed a sample of SPD patrol officer deployment records that we used for our analysis and found them to be generally accurate.

About One-Third of Police Department Personnel Are Working As Patrol Officers

According to Office of Management and Planning figures, as of December 1995, 32 percent of total authorized¹¹ SPD personnel were available for assignment as patrol officers. Of the remaining 68 percent,

- about 8 percent are sworn supervisory patrol personnel or officers in specialized precinct units such as Community Police Teams;
- about 34 percent are civilians holding such positions as school crossing guard, parking enforcement officer, communications dispatcher, and administrative specialist; and,
- about 26 percent are sworn personnel performing duties other than patrol (for example, Chief of Police, detective, motorcycle officer, harbor officer, mounted officer).

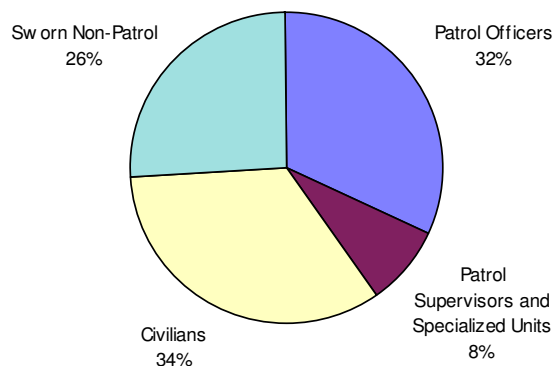
Figure 2 shows the distribution of authorized SPD positions as of December 1995.

¹⁰ Sworn SPD personnel are commissioned and empowered to enforce the criminal laws of the City of Seattle and State of Washington

¹¹ Authorized positions are those that are authorized in the City's adopted budget. The number of positions actually filled at any one time may be less than the number of authorized positions due to such factors as resignations or retirements.

Figure 2:

SPD Authorized Positions As of December 1995



Note: According to SPD, at any time from one to three percent of authorized sworn SPD positions are occupied by recruits or student officers in training.

Of the approximately 1,260 authorized sworn personnel in SPD, patrol officers comprise the largest portion (about 50 percent). Figure 3 provides additional detail on authorized SPD positions.

Figure 3: Authorized SPD Positions by Category and Year, 1991-1995 (Source: Office of Management and Planning)

| | 1991 | 1992 | 1993 | 1994 | 1995 |
|--------------------|-------|-------|-------|-------|-------|
| Total Positions | 1,854 | 1,885 | 1,868 | 1,899 | 1,908 |
| Sworn Personnel | 1,256 | 1,255 | 1,234 | 1,266 | 1,261 |
| Patrol Officers | 612 | 610 | 609 | 615 | 612 |
| Patrol Supervisors | 77 | 84 | 84 | 82 | 81 |
| Specialized Patrol | 40 | 42 | 46 | 73 | 81 |
| Not in Patrol | 527 | 519 | 495 | 496 | 487 |
| Civilians | 598 | 630 | 634 | 633 | 647 |

Note: “Patrol Supervisors” category includes sergeants, lieutenants, majors, and captains. The “Specialized Patrol” category counts personnel authorized for the Anti-Crime Teams, city-wide Anti-Violence Team, Community Police Teams, and for 1995, Seattle Center patrol.

Compared To Two Other Cities, Seattle Has A Higher Percentage of Sworn Personnel That Are Patrol Officers

In order to gain some perspective on the proportion of SPD’s sworn personnel who are involved in patrol-related duties, we obtained information from two other cities on this topic.¹² As Figure 4 shows, during the selected periods, Seattle assigned a higher percentage of its sworn police personnel to patrol duties than Kansas City, Missouri or Portland, Oregon.

¹² We recognize that there are limitations to the inferences that can be drawn from comparisons of jurisdictions because of differences in demographic and geographic factors as well as police personnel categories.

Figure 4: Comparison of Percentage of Sworn Personnel Assigned Patrol-Related Duties (Authorized Positions)

| | | Sworn | Patrol Officers | % Sworn That Are Patrol Officers |
|-------------|-------------|-------|-----------------|----------------------------------|
| Seattle | As of 12/95 | 1261 | 757 | 60% |
| Portland | As of 6/94 | 955 | 561 | 59% |
| Kansas City | As of 1/96 | 1227 | 657 | 54% |

Note: The category “Patrol Officers” excludes ranks above sergeant and includes members of specialized units.

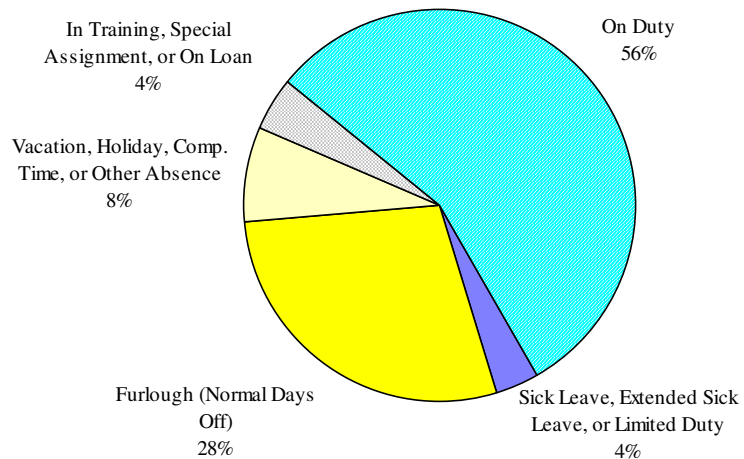
Source: SPD 1995 Annual Report; Offices of the City Auditor for Portland, Oregon and Kansas City, Missouri.

Patrol Officers Must Provide Coverage 24 Hours a Day, Seven Days a Week for the Entire Year

SPD must employ enough patrol officers to ensure that there are a sufficient number on duty for each watch (eight-hour shift¹³), 24 hours a day, 365 days per year. Because a single patrol officer has furlough days off (the patrol officers’ equivalent of weekends), vacation, sick leave, and training, more than one officer is required to make sure that there is always an officer filling a duty position for an eight-hour watch. Figure 5 shows that during 1995 a typical patrol officer was available to work on a watch for 56% of the 365 days of the year.

Figure 5

Distribution of Patrol Officer Days



The number of patrol officers that SPD must employ to keep a single officer on duty for a watch is called the “staffing factor” or “fill ratio.” Using SPD data on actual patrol officer deployment for our calculations, we determined that the staffing

¹³ The Seattle Police Officers Guild recently negotiated and approved a new contract and work agreement with the City that will change patrol officers’ work schedules from six eight-hour work days followed by two days off to four nine-hour work days followed by two days off. SPD plans to implement these changes in January 1997.

factor for a patrol officer on an average watch for the years 1991-1995 was approximately 1.8. In other words, SPD had to employ 1.8 officers to ensure that a patrol officer position was always filled on a watch.¹⁴

Furthermore, for the period 1991-1995, SPD had to employ 5.4 officers (3 times 1.8--the single-watch staffing factor = 5.4) to ensure that one patrol officer position was filled 24 hours a day (that is, for all three watches). Therefore, according to this staffing factor calculation, if SPD were to employ 100 more patrol officers, this would result in about 56 more watch positions being covered (100 divided by 1.8 = about 56) or roughly 19 more patrol officer positions being filled on a 24 hour basis (100 divided by 5.4 = 19). See the Scope and Methodology Section and Addendum A for an explanation of how the staffing factors were calculated.

SPD Deployed Between 55 and 120 Patrol Officers At a Given Time

Throughout 1991-1995, SPD on average deployed about 97 patrol officers at any given time on the streets of Seattle, with watch (eight-hour shift) averages ranging from 55 (morning) to 120 (afternoon) and 115 (evening). This means in a typical day, 290 patrol officers were deployed in patrol cars, on bicycles or on foot, approximately 15 percent of the roughly 1900 authorized SPD personnel and 23 percent of the Department's roughly 1260 authorized sworn police officers. The annual average number of patrol officers deployed each day ranged from 286 to 293 over the five year period.

Figure 6 shows that the average number of patrol officers SPD deployed varied significantly with the time of day.

Figure 6: Average Number of Patrol Officers Deployed Daily in Seattle by Watch, 1991-1995.

| Watch | Number of Patrol Officers |
|--------------------|----------------------------------|
| First (morning) | 55 |
| Second (afternoon) | 120 |
| Third (evening) | 115 |

According to SPD officials, SPD deploys significantly fewer officers during the first (morning) watch because of its historically lighter work load.

¹⁴ Based on patrol officer availability data for 1991-1995, the staffing factor will increase from 1.8 to 2.0 under the new nine-hour shift schedule. The staffing factor will increase because officers will work nine-hour shifts, thus completing their annually required 2,088 hours of work in fewer days.

Staffing Varies Slightly Between Precincts Over Time

As Figure 7 shows below, in adjusting the number of patrol officers it deploys in each precinct to reflect changes in work load, SPD has shifted patrol officer resources over time. Most noticeably, SPD has gradually increased patrol officer staffing in the North Precinct and decreased staffing in the East Precinct.

Figure 7: Daily Average Number (Three Watches) of Patrol Officers Fielded in a Precinct, 1991-1995

| Year | Average Per Precinct | North | West | East | South |
|------|----------------------|-------|------|------|-------|
| 1991 | 73 | 67 | 76 | 73 | 76 |
| 1992 | 71 | 63 | 79 | 68 | 75 |
| 1993 | 73 | 71 | 81 | 67 | 74 |
| 1994 | 73 | 73 | 79 | 64 | 75 |
| 1995 | 73 | 72 | 77 | 65 | 77 |

As Need Arises Other Sworn Officers Are Available to Assist the Officers Deployed on Patrol

Other sworn officers are available within precinct boundaries to assist officers on patrol if circumstances require such an intervention. These officers include members of the precinct’s Anti-Crime Team (generally at night) and Community Police Team (generally during the day) working in the precincts. Figure 8 shows the number of authorized Anti-Crime Team and Community Police Team positions, including sergeants, as of May 1996.

Figure 8: Authorized Anti-Crime Team and Community Police Team Positions by Precinct, May 1996

| Precinct | Anti-Crime Team | Community Police Team |
|----------|-----------------|--------------------------|
| North | 6 | 10 (4 funded by grants) |
| South | 6 | 16 (10 funded by grants) |
| East | 6 | 16 (7 funded by grants) |
| West | 6 | 7 (2 funded by grants) |

Some non-patrol officers from units that are not part of the precinct organizational structure also work regularly or occasionally in the precincts and assist patrol officers as circumstances warrant. These include motorcycle officers, traffic officers in cars, mounted officers, harbor patrol, canine officers, the city-wide Anti-Violence Team, the Special Patrol Unit, and detectives specializing in such areas as narcotics, gangs, robbery, homicide, burglary, and vice. As of early 1996, this pool of officers consisted of about 375 authorized positions, excluding those ranking above sergeant.

Deployment Records Used For Our Analysis Appear Generally Accurate

In comparing precinct patrol officer deployment documents and corresponding SPD headquarters computer database records for 46 precinct watches we selected from the last six months of 1995, we found that the records appeared to be fairly accurate. Only 64 (six percent) of the 1104 figures written on the Daily Staffing Allocation Form which the precincts sent to SPD headquarters were inconsistent with the equivalent figures on the Manpower Distribution Form which the precincts used to record patrol officer attendance status and assignments for the watch. The Daily Staffing Allocation Form draws its information from the Manpower Distribution Form. SPD headquarters enters the contents of the Daily Staffing Allocation Form into the computer database that the Department's Patrol Car Allocation Model software uses to create patrol car deployment plans. The net impact of the inconsistencies was insignificant -- only about 20 hours of patrol officer time out of a total of 1855 hours of officer time.

In testing 966 figures which SPD headquarters entered into the computer database from Daily Staffing Allocation Forms, we found only seven differences from the figures on the forms. Furthermore, four of the seven differences occurred because the individual at headquarters entering the data from the forms into the database appropriately corrected for arithmetic errors on the forms.

Conclusion

Several factors affected the number of SPD officers deployed on patrol at a given time between 1991 and 1995, including: the number of police personnel that were sworn officers (about 1260 out of 1900), the number of sworn officers that were designated patrol officers (about 612), the amount of coverage that must be provided (24 hours a day, seven days a week, all year), and the percent of paid time, on average, that patrol officers were unavailable for duty (16 percent). These factors resulted in SPD deploying an average of between 55 and 120 patrol officers at a given time between 1991-1995. As the need arises, other sworn officers are available to assist the officers deployed on patrol.

CHAPTER THREE

SPD MET PATROL DEPLOYMENT GOALS WITH SOME EXCEPTIONS

On an annual basis, SPD's deployment of patrol officers generally matched its seasonal patrol officer deployment plans both city-wide and in individual precincts between 1991 and 1995. However, actual staffing consistently fell short of seasonal plan levels during December and morning watch. Our analysis also revealed significant shortfalls on Monday mornings as well as Friday and Saturday evenings. Patrol officer work schedules prevent SPD from meeting the plans' higher staffing levels recommended for Friday and Saturday night without resorting to overtime or measures such as drafting officers from specialized units. We were not able to determine the effect of these shortfalls in staffing on SPD operations. SPD plans to update the computer software it uses to allocate patrol cars. This update could narrow some gaps between seasonal plan staffing levels and actual patrol officer deployment.

No Significant Annual Differences Between Plan and Actual Deployment On A City-wide Or Precinct Basis

Between 1991 and 1995, SPD's deployment of patrol officers generally matched its seasonal patrol officer deployment plans, both city-wide and by precinct. As Figure 9 shows, the average city-wide daily difference between the number of patrol officers recommended by the plans and the number of officers SPD actually deployed ranged from 3.8 fewer officers than planned to 2.04 more officers than planned. In addition, as seen in Figure 9, the overall gap between planned and actual deployment narrowed from 3.8 to 0.31 over the course of the five year period.

Figure 9: City-wide Annual Average of Daily Differences Between Seasonal Plans and Actual Patrol Officer Deployment, 1991-1995

| Year | Difference in Patrol Officers |
|-------------|--------------------------------------|
| 1991 | -3.80 |
| 1992 | 1.51 |
| 1993 | 2.04 |
| 1994 | -0.37 |
| 1995 | -0.31 |

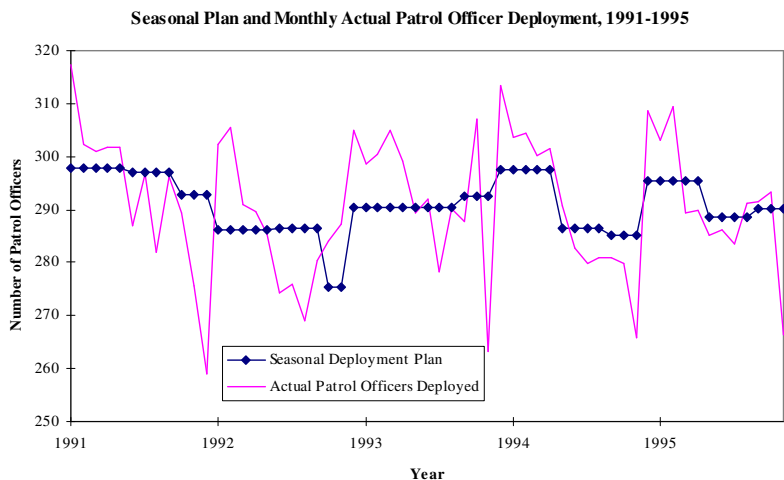
Similarly, for individual precincts over the same period, annual average patrol officer deployment figures were within three percent of planned levels.

Analysis of Monthly Patrol Officer Deployment Shows Some Significant Shortfalls

There were some significant shortfalls between actual patrol officer staffing and seasonal deployment plans between 1991 and 1995. Some of this variation can be expected because of estimation and averaging used by SPD to develop deployment plans. However, when actual staffing falls significantly below planned levels, SPD may need to deploy more patrol officers. It would be prudent for SPD to consider whether these shortfalls have an operational impact which should be addressed through policy or staffing changes.

Actual city-wide patrol officer deployment tended to remain near or above seasonal plan levels from January to May and during the autumn. However, it fell significantly short in December and, to a lesser extent, during the summer months. As Figure 10 shows, each December¹⁵ a large gap appeared between the planned patrol officer staffing and the actual number of officers patrolling the streets.

Figure 10



Note: SPD patrol officer deployment data was unavailable for December 1992; therefore, that month is not reflected in this figure.

During December between 1991 and 1995, SPD averaged about 27 fewer officers on patrol per day than its seasonal plans recommended. Over this five year period the gap narrowed somewhat, from 34 to 24 officers. Figure 11 shows the monthly December shortfalls for 1991-1995.

Figure 11: Average Daily Difference Between December Actual

¹⁵ We could not retrieve data on actual patrol officer deployment in December 1992 from the database we obtained from SPD.

Patrol Officer Deployment and Seasonal Plans, 1991-1995

| Year | December |
|------|--------------------|
| 1991 | 34 |
| 1992 | Data not available |
| 1993 | 29 |
| 1994 | 19 |
| 1995 | 24 |

An SPD official told us that the December gap between planned and actual staffing probably stemmed from Department rules, which require officers who accumulate extra hours of leave during the year to use them before the end of December. Our analysis of selected leave categories confirmed this by showing that patrol officers take large amounts of holiday leave, which is subject to SPD's "use or lose" rules, in December.

August provided the next most significant monthly shortfall during 1991-1995, with an average daily shortfall of 11.2 officers. However, as Figure 12 shows, this shortfall decreased between 1991 and 1995, from 15 officers to 5.

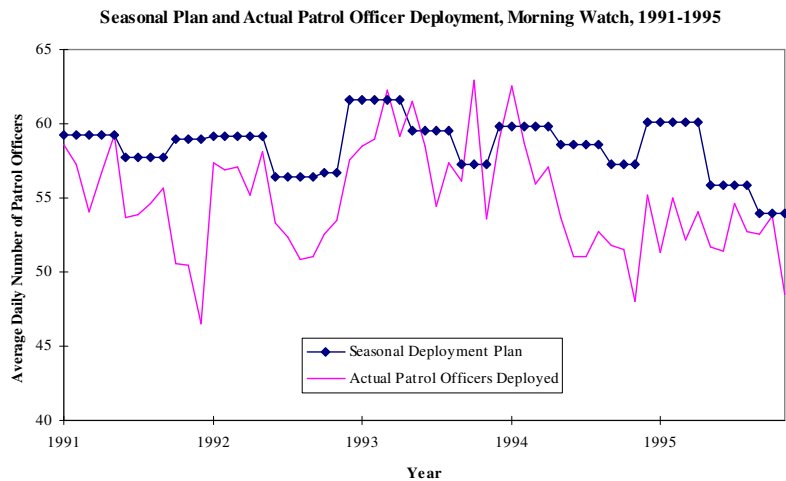
Figure 12: Average Daily Difference Between August Actual Patrol Officer Deployment and Seasonal Plans, 1991-1995

| Year | August |
|------|--------|
| 1991 | 15 |
| 1992 | 17 |
| 1993 | 12 |
| 1994 | 7 |
| 1995 | 5 |

**Morning Hour
Deployment Usually Falls
Below Planned Staffing
Levels**

Although the average number of officers on patrol city-wide during the afternoon and evening watches tended to remain above the seasonal deployment plan figures between 1991-1995, the morning watch usually had fewer officers than the seasonal plan recommended. City-wide, between 1991 and 1995, SPD's deployment of morning watch patrol officers fell an average of four officers below the plans' suggested levels. Furthermore, actual patrol officer deployment during the morning watch tended to fall short of planned levels in all precincts. Figure 13 shows that morning watch deployment usually fell below planned levels.

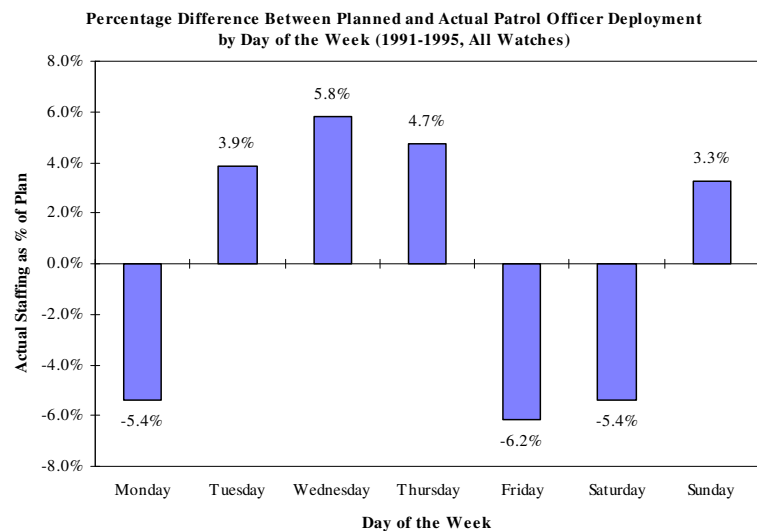
Figure 13



Some Staffing Shortfalls Related to Days of Week

After analyzing deployment data by day of the week, we found that actual patrol officer deployment tended to fall below seasonal plan levels on Mondays, Fridays and Saturdays and to exceed planned levels on the other days of the week. Figure 14 shows these differences between the seasonal plans and actual staffing.

Figure 14



The largest average shortfalls in actual staffing occurred on Monday mornings and on Friday and Saturday nights.¹⁶ On Friday and Saturday nights, times generally with high work loads, the North, South, and East precincts were about four to five officers below planned levels. Conversely, two to four more patrol officers reported for duty at each precinct on

¹⁶ Actual staffing was 16 percent below seasonal plan levels on Monday mornings, and about 13 percent below planned levels on Friday and Saturday nights.

Sunday, Tuesday, Wednesday, and Thursday evenings than the seasonal plan recommended.

Patrol Officer Work Schedules Appear to Hamper Adequate Staffing of Some Watches

Unless it takes measures such as drafting officers from specialized units or requiring overtime, SPD cannot meet the seasonal plans' recommended higher patrol officer staffing levels for Friday and Saturday nights because of the standard patrol officer work schedule. Agreements negotiated by the City with the Seattle Police Officers Guild specify that SPD's patrol officers follow a standard schedule of six eight-hour work days followed by two days off. In January 1997, this schedule will change to four nine-hour work days followed by two days off. Under those two types of schedules, SPD cannot assign staff so that weekend nights are consistently staffed with additional patrol officers. Mathematically, one cannot match SPD's eight-day (six on/two off) work week and six-day (four on/two off) work week with the seven day week so that Friday and Saturday nights are consistently staffed with more officers than the other times of the week.¹⁷

There are other schedules which would mitigate the weekend evening shortages, but these schedules present other problems for SPD. With a five days on/two days off schedule it would be possible to schedule patrol officers so that there would be a larger number consistently available to cover the busy evening weekend hours without drafting officers from specialized units or resorting to overtime. However, a five days on/two days off schedule would cause other problems for SPD such as disrupting supervisory oversight of all squads as well as requiring certain officers to always work on weekends.

SPD Plans to Update Model for Planning Patrol Car Deployment

SPD plans to update the computer software model it uses for allocating patrol car units in its seasonal deployment plans. SPD has used the Patrol Car Allocation Model (PCAM) software since 1977. According to SPD, the model, as well as some of the hardware used with it, must be updated because of several shortcomings which limit its effectiveness as a planning tool. The model's primary shortcoming is its inability to reduce and equalize SPD's response times to the most critical types of 911 calls through patrol car deployment. Some of the other limitations, such as the links to the data sources and current hardware, make it difficult for SPD to develop deployment plans in a timely and efficient manner. If improvements are made, SPD could make more frequent and accurate deployment plans.

¹⁷ Data provided to us by the consultant hired by the City to help develop the new police officer shift schedule indicates that the Friday and Saturday night work load situation may improve when the new schedule is implemented in 1997. His data suggests that SPD patrol officers reporting to the Friday and Saturday night shifts will not face the large backlog of calls for service that they must cope with under the current shift system. The consultant used East Precinct's summer 1993 work load data as the empirical basis for his calculations.

This could lead to smaller differences between SPD's deployment plans and actual patrol deployment. At the conclusion of this review, SPD had listed its desired improvements in a Request for Proposal that it planned to issue in early 1997.

SPD plans to use Federal grant monies and matching City funds to pay for the software and hardware updates. An SPD official said that the Department planned on implementing the new system by December 1997.

Conclusion

We were unable to determine the effect the shortfalls in patrol officer staffing had on SPD operations during Decembers, morning watches, Monday mornings and Friday and Saturday nights. To gauge their operational relevance, SPD may want to analyze the shortfalls' effect on response times to citizens' 911 calls by comparing those periods with others where staffing levels were at or above those suggested by the plans. If the shortfalls are not causing operational difficulties, SPD may want to examine whether present levels of patrol officer staffing are unnecessarily high and whether an opportunity exists to reduce or reallocate patrol personnel. If the shortfalls are causing operational difficulties, SPD may want to seek ways to obtain higher staffing levels. For example, to help correct the December shortfall, SPD may want to seek authority to relax present use-or-lose excess leave policies to permit carrying extra hours into the first three or four months of the following year -- a time period when staffing generally exceeds planned levels.

In addition, if the lack of synchronization between a seven-day week and the negotiated patrol officer work schedule (six on/two off or four on/two off) is creating staffing shortages during watches with high work load and overages during watches with low work load, SPD may wish to discuss this problem and possible solutions with the Seattle Police Officer's Guild and the City Council. Possible solutions that might be discussed include:

- patrol officers working additional hours;
- drafting officers from other units to work occasionally as patrol officers during high work load periods; or,
- exploring legal and labor contract changes to increase staffing flexibility .

CHAPTER FOUR

DIFFICULT TO LINK NUMBER OF POLICE AND CRIME RATE

The effect of additional police officers on the crime rate is not well understood. Expert opinion and most research findings suggest that changes in the size of a city's police force do not affect the crime rate in any predictable manner. Methodological issues make the police-crime link particularly difficult to study. However, two recent statistical studies found a relationship between police numbers and crime rates and recommended increasing the number of police officers as a means of reducing crime in most large cities. A large-scale multiple regression analysis overseen by expert consultants would be required to describe the relationship between numbers of police and levels of crime in Seattle.¹⁸

Most Research Shows No Discernible Link Between Number of Police and Crime Rate

Most studies of the relationship between the number of police and the crime rate conclude that adding police has either little, no, or an unknown effect on the crime rate. The only qualification most studies make to this finding is that a massive increase of police in a densely populated area will probably lead to a reduction in crime. However, scholars debate the duration of the decrease and degree to which the increased police presence merely shifts crime to a neighboring area. Undercutting any strong relationship between the number of police and the crime rate are the large variations in the ratio of police officers to population from one large city to another, without any comparable differences in the crime rate. For example, Detroit has twice as many police officers per capita as Omaha, as well as four times the number of violent crimes. Washington, D.C., also has an extremely high crime rate but one of the highest levels of police per capita in the United States. Many studies have even suggested that the true nature of the police-crime relationship is that increases in crime lead to an increase in police. Factors alleged to account for the apparent lack of a strong link between numbers of police and levels of crime include

- most police work involves reacting to crimes already committed rather than reducing crime;
- the most common police strategies, such as reliance on preventive patrol,¹⁹ are ineffective; and.

¹⁸ For this study, we did not attempt to analyze the link between the number of officers on patrol and response times to citizen calls for service (i.e., 911 calls and other requests for assistance from the public). However, the Legislative Department's Central Staff and SPD are collaborating on research about the relationship between SPD patrol officer staffing and response times to the most critical types of calls for service.

¹⁹ Preventive patrol means having officers walk or drive through their beats in more or less random fashion whenever they are not responding to a specific call for service.

-
- adding police may sometimes actually causes reported crime rates to increase because citizens become more willing to report crimes to the police if they see a larger police presence in their neighborhood.

Perhaps the most well-known and thorough study of the link between numbers of police and levels of crime was the Kansas City Preventive Patrol experiment which the Police Foundation conducted in 1972-1973 to determine whether different levels of patrol activity by marked police cars affected the crime rate. Unlike previous experiments, it attempted to control for factors other than police that could influence the crime rate, such as random changes in criminal activity and unreported crimes. Experts disagree over how to interpret the study's results. Some believe that it showed that additional police patrol would not lower the crime rate. Others said that it showed only that increases in preventive patrol in marked cars did not by itself, seem to affect how much crime occurred in Kansas City over a period of one year.

Some Experts Believe Patrol Tactics May Be More Important Than Additional Officers In Affecting Crime

Some criminal justice experts have stated that what police do on patrol may affect crime rates more than the number of officers on patrol. They contend that previous research focused too much on measuring only the effect of a greater or lesser police presence on crime, and that few studies made a significant effort to monitor what the police actually did. They argue that adding police to reduce response times and increase levels of preventive patrol by car do not appear to deter crime and lead to few additional arrests. Instead, they advocate trying innovative policing methods, to include more aggressive and directed patrol activities (for example, focusing on detecting illegal guns, and "hot spots" -- areas with the greatest concentration of violent crimes) and problem-oriented/community policing. However, these experts also acknowledge that these innovative methods are largely untested and will require carefully designed experiments to measure their effect on crime rates.

Experts Are Not Debating Need For Police Officers

Experts are not debating whether the police are necessary or whether they have a deterrent effect on crime. The history of police strikes in large cities provides consistent evidence that, without a police presence, crime increases dramatically and "all hell breaks loose." What experts are debating is how many police are needed or, in other words, how much more crime will be prevented by deploying additional police officers. One criminal justice expert summed up the issue by saying that police reduce crime to a certain extent, "but not in a way that can be reduced to a precise formula whereby X number of

additional police yields Y amount of crime reduction.”²⁰

Methodological Issues Make the Police-Crime Relationship Difficult to Study

Three methodological issues make it particularly difficult to study and make accurate conclusions about the police-crime relationship.

1. Many factors other than police practices and the number of police affect the crime rate. According to the Federal Bureau of Investigation’s 1994 Uniform Crime Report, completely and accurately assessing a jurisdiction’s crime levels requires careful consideration of geographic and demographic factors, along with the strength of an area’s law enforcement agencies. Key factors include economic conditions, population density, degree of urbanization, population transience, and population composition (race, ethnicity, age, gender, education levels and prevalent family structures).
2. Crime statistics do not accurately record the true crime rate. Research has shown that reported crime statistics considerably understate the true crime rate.
3. Creating controlled experimental conditions for police research is very difficult in a real world setting. For example, recreating the unique controlled conditions of the 1972-1973 Kansas City experiment would be extremely difficult today not only because of high costs but also because of the political difficulties of randomly decreasing the amount of patrol some neighborhoods receive.

Recent Studies Find Numbers of Police Affect Crime Levels

Two recent studies that used the statistical technique of regression analysis concluded that the number of police officers has a substantial and statistically significant impact on crime in large cities.²¹ Both studies contain new approaches to modeling the relationship between number of police and levels of crime and conclude that adding more police officers could reduce crime in large cities substantially. Both studies argue that previous research that found no police-crime link contained incorrect assumptions. The authors noted that previous studies were biased against finding that police reduced crime because, among other things, they did not control for the fact that hiring more police when crime is increasing can make it appear that more police leads to more crime. One of the authors estimates

²⁰ Samuel Walker, Sense And Nonsense About Crime: A Policy Guide, (Pacific Grove, California: Brooks/Cole Publishing Company, 1989), p. 130.

²¹ The studies are summarized in the following articles: Copyright ©Levitt, Steven D. “Using Electoral Cycles In Police Hiring to Estimate the Effect of Police on Crime.” National Bureau of Economic Research Working Paper Series, Working Paper No. 4991 (January 1995); and Marvell, Thomas B. and Moody, Carlisle E. “Specification Problems, Police Levels, and Crime Rates.” Criminology, vol. 34, no. 4 (November 1996).

that the addition of a sworn officer could reduce the number of crimes across certain categories by 8-10 per year.²² He suggests that the current number of police officers in large cities is below the socially optimal level.

Further Research Needed to Describe the Relationship Between the Number of Police and the Level of Crime in Seattle

To make statistically valid statements about the relationship between the number of SPD patrol officers and the number of crimes committed in Seattle, experts told us we would need to perform a large-scale multiple regression analysis which incorporated information from other databases to control for non-police factors influencing the crime rate. They added that we would be wise to work with or hire someone who has extensive experience with performing and interpreting the results of such modeling.

Using crime statistics obtained from SPD, we performed a regression on and calculated the correlation between the number of deployed patrol officers and serious crimes (Part I Offenses)²³ recorded by SPD in Seattle for 1991-1995. We did not find a statistically significant relationship between the number of deployed patrol officers and the number of serious crimes committed in Seattle. However, experts agree that many factors other than patrol officer staffing influence the crime rate. Therefore, our regression and correlation were overly simplistic because they did not account for these other factors.

Addendum B contains several charts that plot the number of deployed patrol officers versus crimes for Seattle from 1991 to 1995.

Conclusion

Currently, there is no consensus among experts as to the effect of additional police officers on the crime rate. Furthermore, there are many methodological issues that greatly complicate the study of this relationship. Therefore, we did not attempt to draw conclusions about the relationship of the number of SPD police officers to crime in Seattle.

²² Levitt, "Using Electoral Cycles In Police Hiring to Estimate the Effect of Police on Crime", p.5.

²³ We did not perform a regression on or calculate a correlation for the number of patrol officers versus less serious crimes (Part II Offenses) because we could not obtain monthly and precinct level Part II data from SPD for 1991-1994.



ADDENDA

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Staffing Factor and Fill Ratio Methodology

The "staffing factor," or "fill ratio" is the number of employees who must be employed so that there is always one employee actually staffing a critical job during working hours. For example, SPD patrol officers must be available to answer emergency calls 24 hours a day, every day of the year. However, each officer only works about eight hours a day, receives some paid days off (holidays, vacation, and sick leave), and must attend training or work occasionally on special assignments. The staffing factor we calculated is the number of patrol officers who must be employed by SPD to ensure that one officer is always available for patrol duty on a watch (eight-hour shift).

Our staffing factor analysis used patrol officer deployment data provided by SPD in a computer database. The data was provided in terms of officer-watches. For each precinct and each watch, the numbers of officers were listed by various attendance categories (on duty, sick leave, vacation, etc.). For our analysis, we first summed the total of annual officer-watches in each of the attendance categories with the exception of "on loan to this unit" (excluding this category prevented double counting of available officers between precincts).

In the second stage, we calculated the proportion of time in which a patrol officer on regular paid time (that is, excluding paid overtime) was available for patrol duty. First, we summed the time that officers were available for work (all of their time with the exclusion of normal days off, which are known as furlough days). Next, we added together all of the paid time when officers were unavailable for patrol duty for reasons such as sick leave, training, etc. (excluding furlough). Finally, we calculated the officer-watches that officers were available for patrol duty as a proportion of the time they were expected to be at work using the following formula:

$$\text{Proportion of Time Available for Patrol} = \frac{\text{Time expected to be at work} - \text{Time unavailable}}{\text{Time expected to be at work}} = 78 \%$$

Finally, we calculated the staffing factor by dividing the total patrol officer coverage required by the number of hours each officer is available for patrol duty. Coverage is required for 2920 hours in order to have an officer on patrol for one watch all year long. Officers are hired to work 2088 hours per year. In 1995 patrol officers were available for patrol duty 78 percent of the time (from the calculation above). The staffing factor is calculated as follows:

$$\text{Staffing Factor} = \frac{(2920 \text{ hours of coverage required})}{(2088 \text{ work hours per officer}) * (78 \%)} = 1.8$$

Some data was missing from the computer database provided by SPD. The loss of data for random individual watches is not likely to skew significantly the results of this analysis because any given watch represents only a small part of the total sums calculated. We used this data to calculate proportions, which would not be greatly affected by missing watches. While we did not notice a pattern of watch data which was missing a specific category of data (for example, did not report "Sick Leave"), such a pattern would skew the results of our proportion calculation and, subsequently, affect our staffing factor.

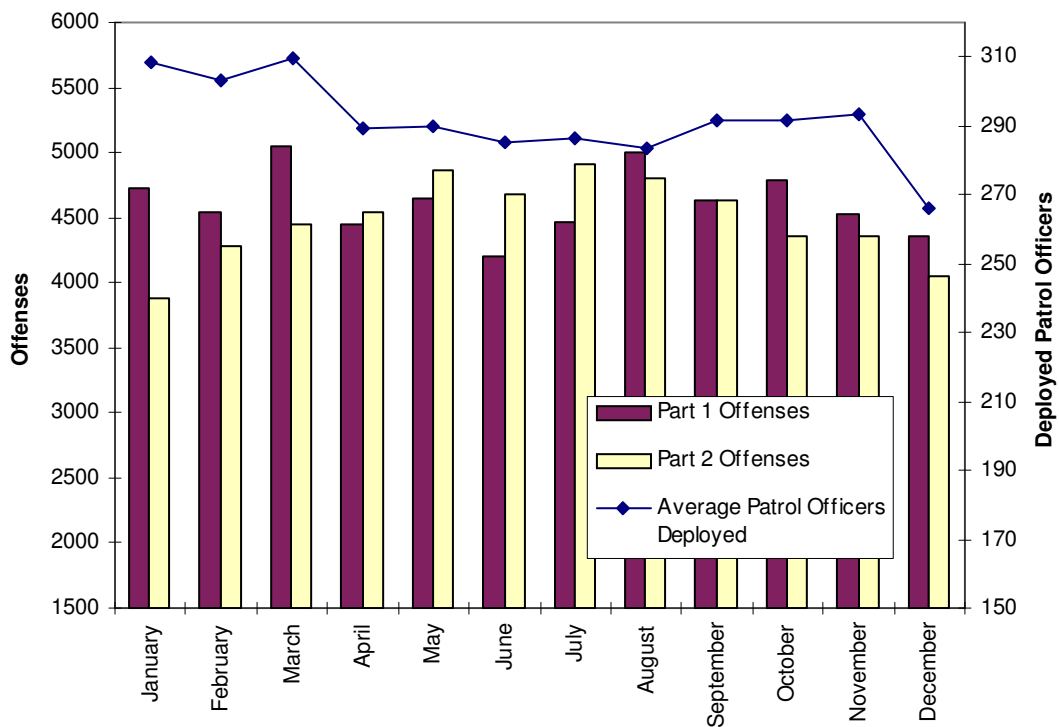
We made some adjustments to the staffing factor in 1992 to reflect missing data for December of that year. We also counted patrol officers serving as prisoner van or mobile precinct drivers, acting sergeants, or desk officers as available for patrol.

Crime Statistics and Patrol Officer Deployment for Seattle 1991-1995

This addendum contains charts that plot the deployment of patrol officers against crimes for Seattle for 1991-1995. These charts do not take into account other variables that could affect the crime rate. Experts agree that many factors other than patrol officer staffing influence the crime rate.

Figure 15 shows city-wide patrol officer deployment and Part I and Part II crimes in Seattle for 1991-1995. Part I offenses (as defined by the Federal Bureau of Investigation) are murder, rape, robbery, aggravated assault, burglary, theft (larceny), motor vehicle theft, and arson. Part II offenses (which are defined locally) include counterfeiting and forgery, embezzlement, vandalism, commercial vice and prostitution, drug abuse violations, offenses against family and children, liquor laws, disorderly conduct, fraud, stolen property, weapons possession, sex offenses (except rape and prostitution), gambling, and driving under the influence. It should be noted that the data for one of the Part II offenses--stolen property--was not included in these crime statistics. Unexpected computer programming difficulties prevented SPD from including stolen property in the Part II offenses data they provided to us for this report.

Figure 15: 1995 Part 1 and 2 City-wide Crimes and Deployed Patrol Officers



Figures 16-19 show, by precinct, the patrol officer deployment and Part I offenses for 1991-1995. SPD could not, due to time constraints and computer difficulties, provide us with monthly tallies by precinct of Part II crimes committed from 1991-1994. Therefore, we did not include Part II offenses in the following figures. Furthermore, gaps that appear in the patrol officer deployed portion of the charts are caused by the absence of such data for December 1992.

Figure 16

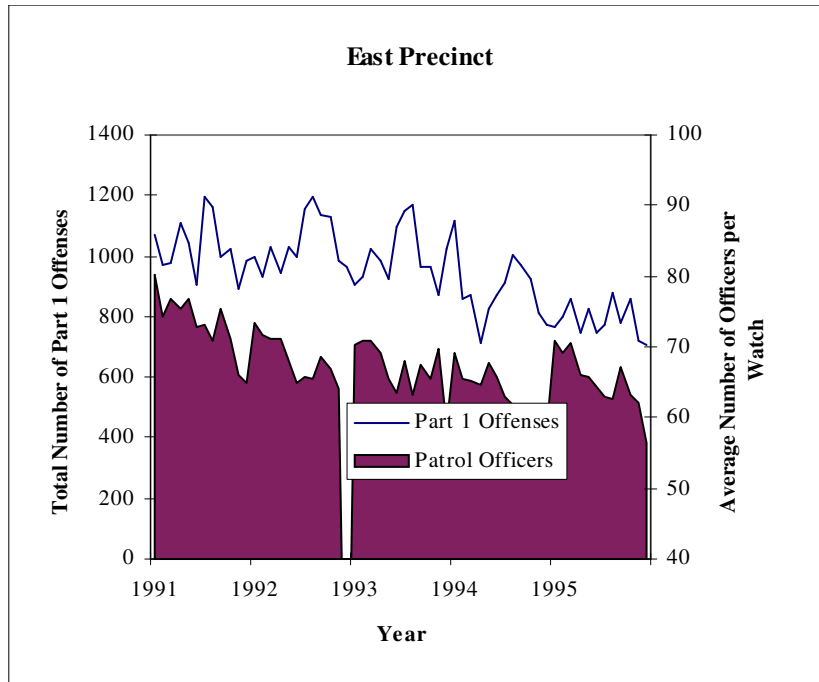


Figure 17

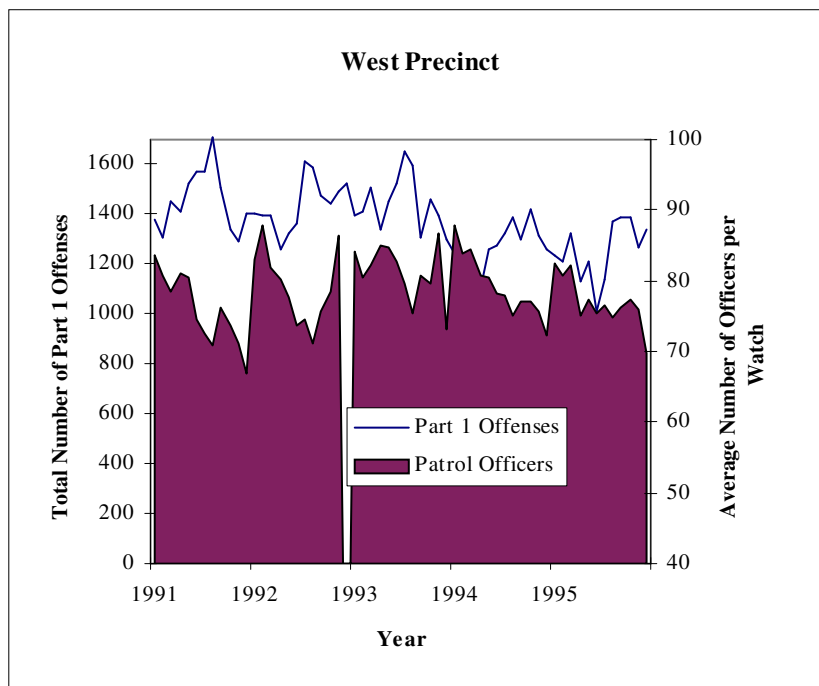


Figure 18

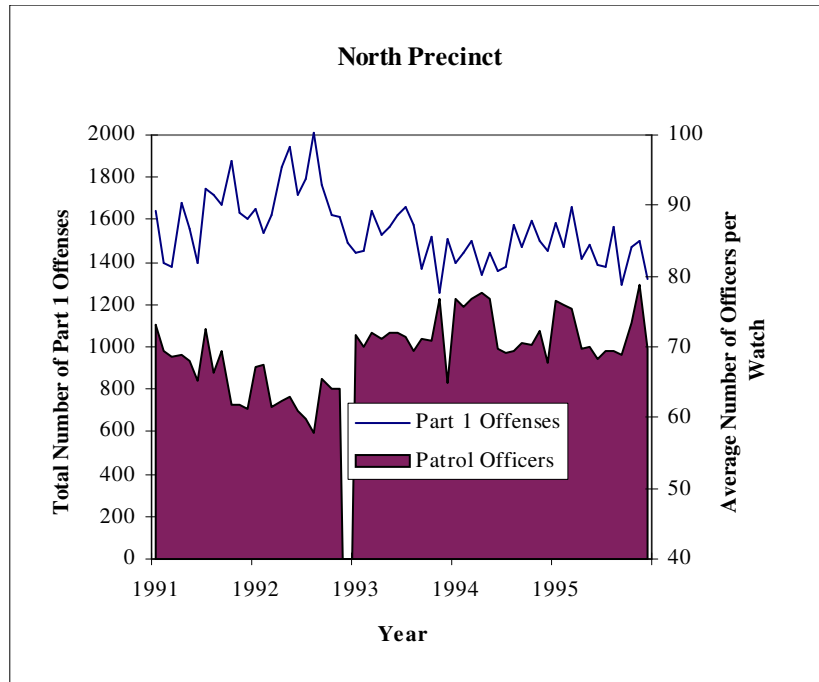
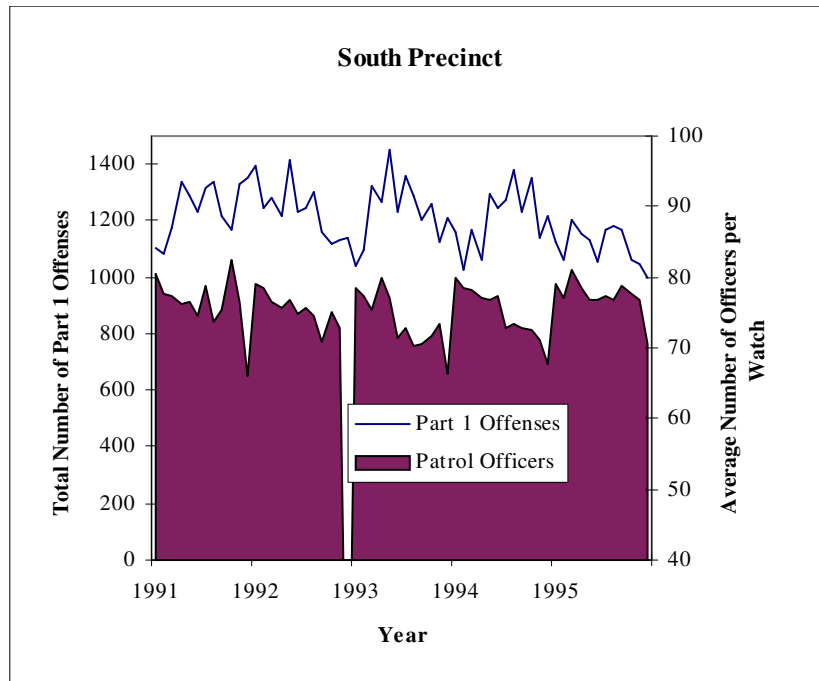


Figure 19



Seattle Police Department Response to Our Audit Report





Office of City Auditor Report Evaluation Form

**FAX...WRITE...CALL...DROP BY...
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Our mission at the Office of City Auditor is to help assist the City in achieving honest, efficient management and full accountability throughout the City government. We service the public interest by providing the Mayor, the City Council and City managers with accurate information, unbiased analysis, and objective recommendations on how best to use public resources in support of the well-being of the citizens of Seattle.

Your feedback helps us do a better job. If you could please take a few minutes to fill out the following information for us, it will help us assess and improve our work.

* * * * *

Report: **Patrol Officer Deployment 1991-1995 (December 31, 1996)**

Please rate the following elements of this report by checking the appropriate box:

| | Too Little | Just Right | Too Much |
|------------------------|-------------------|-------------------|-----------------|
| Background Information | | | |
| Details | | | |
| Length of Report | | | |
| Clarity of Writing | | | |
| Potential Impact | | | |

Suggestions for our report format: _____

Suggestions for future studies: _____

Other comments, thoughts, ideas: _____

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