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Factors Related to Police Staffing

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Abstract

This study explores data related to police staffing through a convenience sample of 68 American police departments. The relationship between police officer staffing, and exogenous variables such as crime, population, calls for service, and endogenous variables such as workload, response time, patrol deployment and service times was explored. The results indicate that the percentage of officers assigned to patrol, violent crime, the rate of calls for service, and summer response time are significantly related to the size of a police department. In addition, the study introduces workload variables that could be useful in understanding service demands and staffing decisions in local police departments in the United States and explores factors related to police staffing.

Key Words: Police Staffing Strength, Police Workload

1. Introduction

Determining the number of police officers needed for any given community is often an exercise in great speculation. After education, one of the greatest expenses on any local government's budget is public safety (Huddleston, 2005). And yet, the impact of having too few or too many police officers allocated to a police department is often neither recognized nor fully understood. When the police are absent, as in a strike, the consequences are known and the complete absence of the police has a direct impact on crime (Ayres, 1977; Bopp, Chignell and Maddox, 1977; Giacopassi and Sparger, 1981). However, under normal conditions, the size of police departments varies considerably by jurisdiction, and personnel deployment does not appear to be related to exogenous factors such as population, crime, geography, etc. (Edwards, 2011).

Koper, Maguire & Moore (2001), cataloged more than 50 studies relating to the "causes" of police staffing strength. As they point out, some studies are more rigorous than others and there are a wide assortment of variables used to explore the issue. In fact, police staffing strength is a moving target, with some studies looking at sworn employees, some total employees, and others the amount of public expenditures on policing. Furthermore, the independent variables thought to influence police staffing strength also vary widely. Koper et al (2001) identified almost 90 different variables used to explain staffing strength and reduced them into seven broad dimensions, six related to the environment and one related to the department itself.

From an environmental perspective, police staffing studies look to crime, demographics, economics (both public and private), as well as structural elements in the environment, such as segregation, special facilities (airports, stadiums), etc. to explain department size.

Internally, studies look at arrests, salaries, expenditures, clearance rates, and surprisingly only one study cataloged examined calls for service, as a variable related to department strength. Considering that police departments generally reflect the political environment where they are, it is not surprising to see a wide array of variables, both internal and external to the departments, that might be thought to influence staffing strength decisions (Bayley, 1994, Maloney and Moty, 2002)

From a theoretical perspective, studies on police staffing generally rely on public choice, conflict, or organization perspectives (Nalla, Lynch, & Lieber, 1997). Public choice theory suggests that police staffing decisions are based upon some public request for services from the police (Chaiken, 1975, Bayley, 1994, O'Boyle, 1993). As crime increases, or other public demands on a department increase, the size of a police department changes accordingly.

Conflict theory supports the hypothesis that economic conflict (Chambliss & Seidman, 1982; Quinney, 1977; Turk, 1969), or racial/ethnic conflict (Blalock, 1967) will determine policing style and size. Research on conflict theory is mixed. One perspective examines the threat perspective posed to powerful "elites" and suggests a curvilinear relationship between police department size and the racial or economic equality. As the percentage of minorities in a community increase up to a tipping point, police staffing strength will increase. Once the community passes this tipping point with a high level of racial or economic inequality police staffing strength decreases (Jackson and Carroll, 1981). However, Sampson and Raudenbush (1999) note that the evidence suggests that poor, minority communities are often the most insistent on increasing police protection.

The least developed area of these theoretical perspectives is organizational. In general, the only explanation offered in this area is organizational inertia. In other words, current staffing strength is a function of prior staffing strength (Brandl, Chamlin, & Frank, 1995; Chamlin & Langworthy, 1996; Nalla et al., 1997). This understanding of police staffing strength is the least rational of the three and the least useful for understanding the changes over time.

Wilson and Weiss (2012) provide a comprehensive overview of the various staffing models employed by local police departments in the United States. Five common methods have been traditionally used to determine police staffing models in the United States. 1) crime trends; 2) minimum-manning levels; 3) per capita approach, 4) authorized/budgeted levels; and (least commonly); 5) workload-based models.

As the police professionalized during the early 20th century, the primary goal of police operations became crime reduction (Kelling and Moore, 1988). Crime levels and trends became the primary driver for police staffing. As crime levels rose, more police officers were hired to address it. At first blush, this approach seems appropriate. In actuality, it is a particularly inefficient approach to staffing.

Consider the following: When the police are ineffective at combating crime more police are added. When the police are effective at combating crime, fewer officers are needed. This model essentially provides incentives for poor performance and disincentives for superior performance. Additionally, we know that crime rates are influenced by many factors other than merely the level of police response. In fact, many criminologists discount the role of the police entirely when it comes to crime rates in a particular community (Greene and Taylor, 1991; Felson, 1993). So, using crime rates to staff a police department should not be the recommended approach. Fortunately, this model of staffing is rarely used.

Another very popular approach to staffing is based upon predetermined minimum-manning levels for patrol. Generally determined by past practice, policy, supervisory judgment, or a combination of the three, personnel staffing is set at a certain level. Typically, this approach is also used to determine the number of officers required to work each shift. Departments establish "hard" and "soft" minimums. Hard minimums cannot be breached without calling other officers in to work on an overtime basis. Soft minimums occur where supervisors use discretion to drop staffing below a predetermined level, when circumstances allow. However, departments often memorialize these staffing levels in collective bargaining agreements. Staffing levels therefore becomes part of the labor-management context and is thereby difficult to modify.

Equally popular is the per-capita approach to police staffing. Departments across the country look to officer-to-population ratios as a simple method to determine appropriate staffing. Although the International Association of Chiefs of Police (IACP) does not recommend this method, it nonetheless published a directorate on just this very topic.

A recent IACP "Perspectives" article presents Bureau of Justice Statistics (BJS) data on local police department officer-to-population ratios. The source is a 2003 BJS study that reports the average ratio of full-time officers per 1,000 residents. Departments are categorized by size of population served, ranging from 250,000 or more, to communities of 1,000 to 2,499 residents. According to the article, the ratio of full-time officers per 1,000 residents ranges from 2.6 per 1,000 to 1.8 per 1,000, with an average ratio of 2.5 full-time officers per 1,000 residents (IACP, 2005). Many communities rely on this IACP model to make staffing decisions. As easy as it is to comprehend and apply, this model is equally flawed and unreliable.

The authorized/budgeted approach to staffing is a variant of the minimum-manning model. In this approach, the city or town establishes a predetermined level of staffing that fits within the budget of the community. Essentially, this is a "What can I afford?" model, as opposed to one that is based on actual community needs. Again, this is a fairly common approach to police staffing, and it bases the determination of personnel levels on the community's budgeting process. It is also a fairly simple approach whereby the previous year's budget is examined in light of the current financial situation and staffing decisions are made. The danger here is that staffing decisions can become politicized or predicated on an artificial figure. The ability of a community to pay for services in previous years, or a change in political administrations, is not necessarily a sound foundation on which to make police staffing decisions.

Lastly, and least common, are staffing decisions that are made based upon actual workload. During the 1990's and 1980's, a number of pioneering queuing and optimization models for patrol resource allocation were developed but unfortunately, not widely used (Srinivasan, et al., 2013, p. 703). Operations research methods have proven to hold promise (Curtin et al., 2010) but unfortunately, research indicates that these methods have been underutilized for police staffing (Wilson and Heinonen, 2011). Police departments generally lack the resources and/or expertise to utilize these methods.

In 2011, the U.S. Department of Justice, Office of Community Oriented Policing Services (COPS Office) issued a report detailing the impact that the downturn of the economy had on local law enforcement. Local communities still reeling in the aftershock of the "Great Recession", experienced budget shortfalls in the face of declining tax revenue. Many communities were hard-hit financially and were forced to make difficult decisions regarding the size of their workforce and the quality and nature of their work (Wilson, 2012). They looked to leverage technology, consolidate services with other agencies, civilianize, enlist volunteers, cut services, or simply eliminated positions (U.S. Department of Justice, COPS, 2011)

Table 1 provides an illustration of the historical change in the number of American police (sworn and civilian) employees between the years 2004 and 2014. According to Table 1, the overall number of law enforcement employees decreased 12.2 percent from a high of 1,024,228 in 2008 to 899,212 in 2014, or a reduction of just over 125,000 positions. In percentage terms, civilian workers were the hardest hit group of employees. Civilian police employee positions fell 14.7 percent from a high of 318,104 in 2007 to a low of 271,263 in 2014. In absolute terms, the U.S. experienced the loss of more than 80,000 sworn police positions (11.3 percent) in the six years after the "Great Recession." However, in conjunction with this decrease in personnel, crime rates also fell. Violent crime rate in the communities covered by this survey fell 23.6 percent from a high of 479 per 100,000 population in 2006 to a low of 366 per 100,000 in 2014. Property crime experienced a similar reduction, declining 24.4 percent between 2005 and 2014.

Table 1 – Police Employees 2008 - 2014

Year	Population	Violent Crime Rate	Property Crime Rate	Total LE Employees	Total Police	Police Per 1000	Total Civilians	Police Cities	Non-City
2004	278433063	463	3415	970588	675734	2.43	294854	429630	246104
2005	279200617	469	3432	969070	673146	2.41	295924	431580	241566
2006	283238660	479	3347	987125	683396	2.41	303729	436908	246488
2007	285866466	471	3276	1017954	699850	2.45	318104	446669	253181
2008	286237461	459	3215	1024228	708569	2.48	315659	449896	258673
2009	289417471	431	3041	1021456	706886	2.44	314570	452037	254849
2010	291414594	405	2946	1013608	705009	2.42	308599	448905	256104
2011	293058940	387	2905	1001984	698460	2.38	303524	442931	255529
2012	285020066	388	2868	956322	670439	2.35	285883	429925	240514
2013	268684780	369	2734	902410	626942	2.33	274468	389934	237008
2014	268296362	366	2596	899212	627949	2.34	271263	403984	223965

Essentially, these data suggest that the downsizing of American police departments in the aftermath of the "Great Recession" did not necessarily translate into an increase in violent and property crime rates. The data also suggest that staffing with fewer police officers is not related to more crime; in fact, just the opposite occurred. But making the decision on how many police officers are necessary to meet the public safety needs of a community is still an unsettled issue. While the police do more than just respond to crime, the experience of the last six years has opened a discussion on how many officers a community needs and what those officers should be doing during their shifts. Police managers are now routinely asked to justify requests for additional staffing, as well as current staffing levels. But this calls for facts, not opinion. As Brotheim (2003) noted "as requests for staffing projections increase in this age of tighter municipal budgets, law enforcement agencies are faced with an ever growing demand to accurately and consistently foresee staffing needs and to present a methodology for the projections and requests" (p. 9). Throughout most of the United States, a weakened economy resulted "in a lower municipal tax base which, in turn forced police agencies to justify their workforce size in an effort to reduce costs and substantive expenditures to the local constituents" (Srinivasan, et al., 2013, p. 702).

Several other recent industry-wide challenges such as increased retirements and turnover, generational preferences and expectations, competition among employers and military call-ups have significantly impacted both the pool of qualified police applicants and the number of active duty officers available for assignment. (Wilson and Heinonen, 2011; Wislon, 2011) It is generally agreed that these factors have profoundly impacted a department's ability to maintain appropriate staffing levels.

Recently, professional organizations such as the International City/County Management Association (ICMA), the International Association of Chiefs of Police (IACP), and the Commission on Accreditation for Law Enforcement Agencies (CALEA) are advocates of this approach, as it relies on actual levels of demand for police services and matches that demand with the supply of police resources. Typically, this approach relies on an examination of calls for service received by a department; these calls are modeled to understand demand and supply. This approach also has shortcomings though, in that it relies almost exclusively on demand through 911 calls and ignores other elements of community demands placed on a department. In order to overcome these shortcomings, workload demands should be modeled and then placed in context with other operational demands facing the department. The result is a comprehensive assessment of workload through both calls for service and other sustained operational commitments placed on the department. This approach, however, requires a complex data analysis that is beyond the capacity of many police departments. Nonetheless, it offers the most accurate and reliable predictor of police staffing levels (Northwestern University Traffic Institute, 1993; Wilson and Weiss, 2012; McCabe, 2013).

Over the last several years, data has been collected from numerous police departments in the United States on these workload variables.

This effort was directed at providing individual communities with information about police service demands so that they could make rational decisions about the staffing strength of the police as well as the style of services they deliver. Considering that organizational level variables are the least understood related to police staffing strength, this is a unique and important opportunity to explore these data. The approach taken here is not to test any one of the theoretical perspectives, but to shed light on the topic of police staffing strength. This exploratory approach relies on data collected for individual departments and attempts to identify patterns and trends present in those data.

2. Methodology

The present study examines data collected by the International City/County Management Association, Center for Public Safety Management (CPSM), over the last seven years. Since 2009, CPSM has been working with local governments to study police operations and develop useful staffing models, broadly exploring the issue regarding appropriate staffing levels for police operations and public safety needs.

The International City/County Management Association (ICMA) is a 103-year-old, nonprofit professional association of local government administrators and managers, with approximately 9,000 members located in 32 countries. Since its inception in 1914, ICMA's work has spanned all of the activities of local government—parks, libraries, recreation, public works, economic development, code enforcement, brownfield development, public safety, etc. The CPSM, originally a part of the Information and Assistance Division of ICMA, and now an independent LLC, provides support to local governments in the areas of police, fire, EMS, emergency management, and homeland security. CPSM provides technical assistance on issues of public safety to local communities throughout the United States (ICMA, 2016).

The 68 police departments identified for inclusion in this study contracted with CPSM for police staffing and allocation studies. These 68 departments represent a convenience sample of police departments from 32 states in every region of the country.

In order to explore the relationship between police officer staffing and community demographics, this study examines several measures to describe both. They represent a mix of environmental and organizational variables discussed previously. These variables are described in greater detail below.

2.1 Variables

2.1.1. Officers-per-1,000. Each police department's actual number of sworn officers at the time of the CPSM study was used as the measure of police personnel assigned to the department. Population was identified from the American Community Survey. This staffing level was adjusted by dividing by the population/1,000. Officers-per-1000 is the dependent variable. The other variables listed below will act as predictor variables to determine whether they show any relationship with the number of police officers in a given community.

2.1.2 Patrol Percentage. This is defined as the percentage of sworn officers in the department assigned to the patrol function. The patrol function is defined as any position engaged in or supervising the handling of calls for service from the public.

2.1.3. Index Crime Rate. Data on violent and property crime were obtained from the FBI Uniform Crime Reporting (UCR) Program website for each community in the study. The violent crime rate was obtained by adding the reported incidents of Murder/Non-negligent Homicide, Rape, Robbery, and Aggravated Assault as defined by the UCR. Property crime was defined as reported incidents of Burglary, Larceny Theft, Motor Vehicle Theft, and Arson, as defined by the UCR. These data were converted into crime rates per 100,000 population by multiplying the reported number of crimes in each category 100,000 and then dividing by the population of the community.

2.1.4. Calls for Service Rate. For each department, data were collected from the 9-1-1 emergency communications system for that community for a one-year period. Data were extracted from the computer-aided dispatch (CAD) system, and processed from the raw data into a usable form. This process required several steps. First, duplicate patrol units recorded on a single event, and records that do not indicate an actual activity were removed. Second, any incomplete data points were removed. Third, events assigned to patrol and nonpatrol units are identified and nonpatrol events were removed. Fourth, events that had less than one minute assigned to the call were removed (as these calls were likely unfounded or unnecessary) (See Wilson and Weiss, 2014, who suggest that incompleteness and inaccuracy of police administrative data are not uncommon).

Lastly, events are categorized 'public-driven' or 'police-driven', depending upon the source initiating the call. This process created an aggregate number of Calls-For-Service (CFS) handled by the subject department during a given year. Again, because this variable is closely related to the size of the community, CFS in a given 12-month period is translated into a rate by dividing the total number of CFS by the population.

2.1.5. Service Time. This is a workload variable that is determined by the overall number of minutes a department takes to handle a CFS from the time the CFS is assigned to the patrol unit until the time the CFS is cleared/concluded. If multiple units are assigned to handle one specific CFS, all of their time is included in this calculation.

2.1.6. Responding Units. The average number of units assigned to a CFS.

2.1.7. Response Time. This is calculated as the amount of time from when a CFS is first received at the communications center until the time the police unit indicates arrival at the scene of the incident. Not all CFS in the workload calculations have an associated response time due to officers not recording their arrival in all cases. This is undoubtedly due to emergency situations as well as human error. Response time was separated into dispatch time and travel time. Dispatch time is the amount of time between when a CFS is first received by the emergency communications call taker, until it is dispatched to a patrol unit for response. Travel time is simply the amount of time it takes for the patrol unit to reach the scene of the incident after receiving notice from the dispatcher. For the purposes of this study, the overall response time (dispatch plus travel) was used.

2.1.8. Total Service Time. This variable is defined as the overall amount of time dedicated for handling the average CFS. It is computed by multiplying the Service Time by the number of Responding Units.

2.1.9. Saturation Index. The saturation index (SI) is a measure of workload as a function of the amount of staffing resources available to perform that work. Workload SI is calculated by dividing the workload from CFS (total number of minutes required to handle each CFS, multiplied by the number of patrol units assigned to handle that CFS), by the number of patrol officers available to handle that workload.

Workload from CFS was captured in two main categories: (1) CFS from the public; and (2) CFS generated directly by officers on patrol. In addition to these major work streams, the time dedicated to administrative and other duties that pull officers out of service (meal period, report writing, etc.) were included in the calculation.

SI is calculated at 15-minute increments. A measure of zero on the SI indicates that there was no workload during the 15-minute period, and a measure of 100 on the SI indicates that all patrol units are assigned to CFS workload during the 15- minute period being studied. An SI of greater than 100 can be recorded when there is more workload from CFS than the actual number of patrol officers available to handle that work (i.e. a call backlog).

Sworn personnel levels are calculated in the same 15-minute increments as well. Departments identified exactly how many officers were working at each 15-minute increment throughout the day for the months of February and August. This is generally accomplished by a query of the personnel system (by physically inspecting personnel logs, along with CFS assignments) to determine which officers are actually working at the times being examined. Each of the 68 departments had a different process for accounting for personnel; however, the calculation of this variable required a measure of all sworn officers assigned to duty at 15-minute increments throughout the day over the two months studied.

The 'workload' saturation index is computed for four distinct periods: weekdays and weekends during the months of February and August. The weekend is defined as any time between midnight Friday and midnight Sunday. These four time periods were selected to show both seasonal and temporal variation in both workload and personnel staffing.

3. Results

The greatest challenge with the interpretation of the results of the data analysis is the issue of simultaneity. It is very possible that there is a "simultaneous" relationship between many of the variables being studied. For example, crime rate and the number of CFS undoubtedly rise and fall together. The more crime the more CFS and vice versa. More difficult to disentangle is the relationship between staffing level and the variables thought to influence it. There are good reasons to believe that they may be very closely related and therefore, the cause and effect relationship very difficult to diagnose (Fisher and Nagin, 1978; Nagin, 1978, 1998). This has been a serious methodological problem for decades and one not solved here. The only relationships that can be determined, therefore, are not causal and only relational.

The dependent variable of staffing size, because of the serious simultaneity threat, can only be viewed as related to the independent variables in question and not necessarily caused by them. The findings nonetheless offer an interesting glimpse into the relationships between the variables, and while not determinative, certainly the basis of further discussion. In addition, several variables used in this study are unknown to the police staffing literature. Workload indicators, for example, are not present in the literature and largely unknown as a measure of police staffing strength. Examination of these variables and their association with police staffing strength is worthwhile.

3.1 Descriptive Variables

Table 2 provides a summary of the descriptive data of this study. Included in this study were departments with as few as 16 officers and as many as 1,255, with a mean of 96.91. At approximately 100 sworn officers on average, the typical department in this study would be considered to be medium- to large-sized, when compared to the size of the average U.S. police department. In our sample, the average number of officers per 1,000 population is 1.99, with a low of 0.35 and a high of 4.65 per 1,000. The average population size of the communities studied is 58,125. According to the IACP and BJS data on officers per population, a community with a population between 50,000 and 100,000 would have a ratio of 1.8 officers per 1,000 residents. Therefore, the police departments included in this research appear to be slightly over that benchmark (IACP, 2005)

The average percentage of officers assigned to patrol was computed to be 65.36 percent, which is consistent with the average reported by the BJS Law Enforcement Management and Administrative Statistics study of approximately 67 percent on patrol (BJS, 2013).

Table 2 – Variable Descriptive Data

	Minimum	Maximum	Mean	Std. Dev.
Officers	16	1,255	96.91	158.90
Officer1000	.35	4.65	1.99	0.92
Patrol	11	734	60.83	94.91
Patrol Percent	33.3	89.5	65.36	10.38
Population	5,417	328,343	58,125.37	72,055.20
Index Crime	32	27,654	2,434.95	4,623.85
Violent Crime	1	5,660	358.70	928.39
Property Crime	30	21,994	2,076.25	3,758.34
Calls for Service (CFS) Rate	0.25	6.89	1.01	0.94
Service Time CFS	16.0	42.9	28.54	6.85
Responding Unit	1.2	2.2	1.66	0.25
Saturation Index Winter Weekdays	5	67	29.03	13.47
Saturation Index Winter Weekends	4	68	30.01	14.52
Saturation Index Summer Weekdays	6	74	31.02	13.38
Saturation Index Summer Weekends	5	73	33.20	14.08
Response Time Winter	3.10	28.70	11.54	5.58
Response Time Summer	2.40	33.30	11.86	6.08
Total Service Time	23.64	84.00	48.33	14.54

The communities studied show remarkably low rates of crime. The average violent crime rate (M=358.7) and average property crime rate (M=2,076.25) are substantially lower than the national averages (FBI UCR, 2016).

The average CFS rate is calculated as approximately 1.01 CFS per person, with a low of 0.25 CFS per person to a high of 6.89.

The departments also show very good response times. Although national standards do not exist for police response times, in general, an acceptable response time to an emergency CFS is approximately 15 minutes. The departments studied have an average response time of 11.54 minutes during the winter, and 11.86 minutes in the summer.

Service time, responding units, and saturation indexes are all unique variables calculated by CPSM. No benchmarking data exists for these variables. They are examples of the amount of resources dedicated to workload from public service demands. Little is known, from a workload perspective, about the amount of time and personnel dedicated to a typical CFS. This is perhaps the most important information needed to fully understand the resources necessary to provide police services on patrol, yet it appears to be the least understood. The amount of time spent on CFS and the number of officers assigned per call can have a dramatic impact on service delivery and provide an understanding about the relative efficiencies of officers on patrol. Many variables impact the amount of time needed to handle a CFS. Report writing skills and the efficiency of records management systems can either speed or slow the process. Response time, crime rates, staffing, supervision, etc. can all play a significant role in the relative efficiency or inefficiency of the patrol function.

Our analysis indicates that, in the communities studied, the average amount of time taken to handle a CFS is 28.54 minutes. This ranges from a low of 16 minutes to a high of 42.9 minutes for the average call. Similarly, an average of 1.66 officers were assigned to handle these calls, with a low of 1.2 officers to a high of 2.22 officers per CFS. Without greater context, it is difficult to place these variables into perspective. However, a dialogue is certainly necessary about the appropriateness of these variables as being useful in understanding the patrol function driving their staffing decisions, and providing departments with a more useful tool to gauge the overall efficiency of their operations.

Saturation index (SI) is also an important measure in this regard. Patrol allocation refers to the amount of officers assigned to patrol, while *patrol deployment* refers to the issues regarding when, where, and how these officer should be assigned (Fritsch, Liederbach, and Taylor, 2009). Patrol deployment, therefore, can be measured by saturation index and the workload reflected in this measure. While there are several industry benchmarks in this area, most police departments seem to be quite in the dark when it comes to calculating this ratio and using it as a tool for proper patrol deployment.

For the departments studied in this research the average SI was calculated as approximately 30 percent (Winter Weekdays M=29.03, Winter Weekends M=30.01, Summer Weekdays M=31.02, and Summer Weekends M=33.20). This is consistent with prior studies approximately 70 percent of "downtime" on the average patrol officer's shift (Famega, 2005). In many ways, a 30 percent SI is contradictory to the manner in which the police are deployed. Most police administrators and scholars look to have a substantially greater amount of time dedicated to work than 30 percent. "Uncommitted" time, or the amount *not* assigned to CFS for patrol officers is recommended to be in the area of 60 percent (McCabe, 2013). An SI value of 30 percent indicates a substantial underutilization of police patrol resources.

Total service time for CFS has a wide range of values. With an average of 48.33 minutes per CFS, service time varies from a low of 23.64 officer-minutes per call to a high of 84.00 officer-minutes per CFS. Again, this variable is not used as a benchmark by police organizations and is seldom calculated as a measure of performance. However, it could be a means to understand the relative amount of workload for each CFS handled by a police department.

These variables were then entered into an ordinary least square regression model as predictors of officers-per-1,000. The results of the regression analysis are presented in Table 3.

Table 3 – OLS Regression Model Predictors of Police Staffing

Variable	B	SE	Beta	t	p-value	VIF
(Constant)	2.577	.411		6.275	.000	
Patrol Percent	-0.23	0.009	-0.253	-2.637*	0.012	1.641
VCR	.001	.000	0.267	2.056*	0.046	3.008
PCR	1.093E5	.000	0.023	0.189	0.851	2.583
Calls For Service Rate	0.480	0.105	0.511	4.560	.000	2.248
Service Time Public	-0.039	0.086	-0.296	-0.461	0.647	73.810
Responding Units	-0.677	1.482	-0.165	-0.457	0.650	23.206
Saturation Index Winter Weekdays	-0.003	.021	-0.037	-0.123	0.903	16.185
Saturation Index Winter Weekends	0.005	.020	0.079	0.256	0.799	17.102
Saturation Index Summer Weekdays	0.042	0.022	0.586	1.767	0.084	19.624
Saturation Index Summer Weekends	-0.045	0.073	-0.659	-2.057*	0.046	18.313
Response Time Winter	-0.076	0.073	-0.453	-1.050	0.300	33.237
Response Time Summer	-0.013	0.069	-0.084	-0.189	0.851	35.356
Total Service Time Public	0.017	0.051	0.261	0.343	0.733	103.660

Model Adjusted R-Square = 0.687
**p<0.01 level
*p<0.05 level

The model produced some very interesting results. Overall, the adjusted R-square for the model was 0.687, indicating that more than two-thirds of the variance in the number of sworn officers adjusted for by population was predicted by the model. Included in the initial analysis was a measure of variance inflation (VIF). The bivariate correlations presented in Table 3 indicated several variables that are strongly correlated and the degree of multicollinearity might influence the regression analysis. Examination of the VIF column in Table 4 indicates that the model under examination has many factors that are: correlated with each other; are redundant; and possibly masking the influence of other more relevant variables. In order to control for this multicollinearity, nonsignificant predictor variables with a VIF of greater than 5 were excluded for the model. The regression analysis was run again. This approach was used as it allows for the exclusion of redundant factors and, as long as the adjusted R-square of the overall model does not suffer, the remaining factors would be better predictors of police staffing (Martz, 2013).

Table 4 illustrates the results of this analysis. Using the best subsets regression modeling, four predictors remain. All are significant predictors of police staffing and all have a low degree of VIF, making them an excellent fit for the final model. The new model also has an improvement in adjusted R-square to 0.683. Therefore, elimination of the redundant predictor variables eliminated the multicollinearity and improved the power of the overall model. In addition, the remaining predictor variables all showed a significant relationship with police staffing.

Table 4 – OLS Regression Model Predicting Police Staffing Excluding Multicollinear Variables

Variable	B	SE	Beta	t	VIF
(Constant)	4.011	0.555		7.223	
Patrol Percent	-0.21	0.007	-0.242	-3.064**	1.179
VCR	.001	.000	0.329	3.846**	1.383
Calls For Service Rate	0.383	0.077	0.408	4.991**	1.259
Response Time Summer	-0.106	0.014	-0.698	-7.394**	1.681

Model Adjusted R-Square = 0.693
**p<0.01 level
*p<0.05 level

The percentage of officers on patrol is significantly related to overall police staffing in the departments studied (B=-0.21; p<0.001). As the overall number of officers in a department increases, the percentage of them assigned to the patrol function decreases. While this appears to be somewhat paradoxical, this result is consistent with data reported by the LEMAS studies that demonstrate that larger departments tend to be more specialized and assign proportionally fewer officers to patrol (LEMAS, 2007).

Officers-per-1,000 is also related to the size of the community, with larger communities having a higher per capita measure of police staffing. It is not suprising then that, the model should demonstrate that the higher the ratio of officers-per-1,000 in a given department the lower the percentage of them officers assigned to patrol. That assumption is confirmed here.

Another intuitive finding is that the violent crime rate in a community is significantly related to police staffing (B=0.001; p<0.001). The higher the rate of violent crime, the larger the total police staff required to deal with that crime. An obvious conclusion is that the more effective departments can be at reducing violent crime and CFS, the less total staffing they will require. The historical experience of crime trends in the United States presented in Table 1 indicates a steady decrease in violent crime over the past eight years. The findings in the present study are consistent with this trend. The less violence in a community, the less of a need for police. This should be considered an effort that departments can take to reduce violent crime will not only reduce victimization a central finding of this research; any but will also reduce the need for police staffing.

Similarly, police staffing is also significantly related to CFS (B=0.383; p<0.001). The more CFS handled per population, the more officers that are recommended to handle those CFS. Likewise, reducing the number of CFS handled by a police department would result in fewer officers needed to handle these calls. This too is not surprising, as police departments allocate more than 60 percent of their staffing to patrol functions in order to meet service demands from the community. Having the CFS rate positively and strongly related to staffing is intuitive and reinforces the reality of the reactive nature of policing in the United States. While this is obvious, the aggregate number of CFS handled is not out of the control of police departments and government officials. Communities across the United States are taking steps to reduce the volume of CFS received through their 9-1-1 systems. Thoughtful reduction steps, such as differential call responses, online report writing, false alarm abatement ordinances, and eliminating responses to “property damage only” vehicle crashes are all strategies being implemented to reduce the volume of CFS (ICMA, 2007).

The last significant predictor in the model is response times during the summer (B=-0.106; p<0.001). This indicates that increases in the police staffing level are related to a reduction in police response time during the summer. Again, this is not surprising. As police staffing increases, so does the ability to respond to CFS quickly. This would be particularly relevant during the summer months when vacation time and personal leave would be at its height. The more officers in a given department, the more likely that it can accommodate vacations during the summer months and still have ample patrol resources available to quickly respond to CFS.

4. Discussion

The results of this study point to several insights with regards to police staffing. One promising finding is the level of agreement of results of this study with previous work on this topic. The criterion validity established strengthens both the findings here, as well as a more general understanding of this field. For example, the finding that patrol strength is inversely related to staffing confirms existing descriptive data from the LEMAS studies. Larger police departments generally have more specialized positions. These specialized positions naturally compete with patrol for personnel resources. In larger departments, therefore, patrol strength will be a smaller percentage of the overall total of personnel. Not only is this intuitive, the conclusion is supported by the data on organizational size and personnel distribution. Similarly, staffing levels are related to violent crime. This, too, should come as no surprise. Communities with higher levels of violent crime tend to be more urban, and more urban communities also tend to staff a greater number of officers.

The other variables significantly related to staffing are calls-for-service rate and summer response time. CFS rate is positively related to staffing; the greater the CFS rate, the more staff. Summer response time is inversely related to staff; lower summer response time is associated with higher staffing levels. The combination of these two associations illustrates a somewhat irrational basis for police staffing.

Summertime is generally a time of high demand for police service. The workload indexes calculated in this study indicated that there is approximately a 13 percent increase in workload during summer weekends, compared to winter weekdays. Summertime is also vacation time. Most police departments in the U.S. are confronted with the reality of a high demand for requests for leave during this period. It is common for police departments to have vacation usage soar during the summer. As a result, they struggle to deploy officers for duty. Undoubtedly, as leave usage and vacancies increase, departments would face challenges meeting demands for service. This would also be reflected in an increase in response times to these service demands. The finding that higher staffing is related to lower response times during the summer speaks to this issue. But it also identifies a broader issue, where staffing decisions might be made to accommodate times of peak demand for leave and not necessarily peak service (i.e., CFS) demands.

The departments in this study that had higher per-capita staffing levels had lower summer response times. Considering that the departments studied were not aware of workload levels, and that workload levels in general were not related to staffing, it is reasonable to conclude that the other side of the equation, leave requests, is a driver of increases in saturation index and response time. Essentially, departments have higher staff levels to keep response time low. The causal relationship cannot be determined with the methodology presented here, but there is enough information to conclude this could be the case. This warrants further examination and research.

CFS rate shows a similar irrational association with staffing. The more CFS a department logs, the more staff it has. This seems obvious. Not so obvious are the decisions regarding which types of calls to respond to in the first place. During the collection of these data, numerous anecdotal accounts were provided about police responses to frivolous and nonemergency calls. Calls such as "kids refusing to do homework," "litter on my lawn," or "requests for traffic directions" were offered as examples of the types of CFS assigned to officers in some of the departments studied. Many departments in this study took the position that, if someone calls 9-1-1, they will get a police response, no matter how frivolous or unnecessary that request might be. This is a policy decision made by the department and supported by public officials and community stakeholders. It appears that these types of non-emergency calls might be driving the rate of CFS that these departments handle. The results of the analysis indicate that a higher rate of CFS is significantly related to staffing rate. Therefore, response to frivolous CFS will drive the need for more police personnel. An alternative and perhaps more logical approach might be to triage CFS more efficiently in order to conserve scarce police resources for emergencies. This would eliminate nonemergency CFS as well as lower the number of police staff needed to handle these calls.

One of the most interesting findings in the present study is the fact that none of the workload variables, as calculated by saturation index, factored into the final model that predicted staffing levels. While not surprising, this is somewhat counterintuitive. Since staffing decisions based upon workload are rarely used are and certainly not used in the departments studied, without an understanding of the actual workload faced by the patrol function it would be challenging to base staffing levels on this variable. In other words, it would have been purely by chance that these variables appeared in the final model. If departments are unaware of this measure, and do not capture or track it, it should be no surprise that the measure of workload is unrelated to staffing.

The problem with this finding is that the departments studied were staffed independent of the amount of work handled by a major component of their operations. This would be analogous to a retail store staffing employees without an understanding of the number of customers shopping during the day. Staffing in a manner unrelated to workload appears to be a significant shortcoming in the management of these departments. Police managers should look to this type of analysis in order to improve the efficiency of their operations, by matching supply of officers with service demands from the public (i.e. 'dynamic staffing').

Cross-sectional studies like this one present several challenges to the validity of their findings. Because of the nature of these data and the way they were processed, findings must be evaluated cautiously. These findings are strengthened, however, by their relationship to findings from other studies exploring similar subjects. Nonetheless, causality and proof of the relationships uncovered in this research cannot be demonstrated. Additionally, the use of nonprobability convenience samples like the present study presents further challenge. It is indeed difficult, if not impossible, to generalize the findings from 68 police departments to the entire population of more than 17,000 departments that exist in the United States.

Nevertheless, considering these limitations, there are valuable takeaways offered by this research. These findings can and should open a discussion regarding different and more robust methods of allocating police resources.

Using workload as a key measure to support staffing decisions is logical and relatively easy, but it is seldom used in American police departments. It is recommended that this measure be used as a tool in establishing benchmarks for departments and in evaluating their actual service demand and personnel deployment. This would not only improve the efficiency of police operations, but be a far more fiscally responsible means of serving these communities.

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