

**An analysis of police department staffing:
How many officers do you really need?**

A Review of 62 Police Agencies Analyzed by the ICMA / CPSM

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Police Allocation and Deployment

I. Introduction

It is the middle of the afternoon on an exceptionally busy day, and your attention is broken by the sound of a police siren from a patrol car passing by. You stop for a moment and wonder “Gee, I hope everything is alright,” and then your thoughts drift to more pragmatic issues, like “I wonder what kind of call that was; what was the need for a ‘Code-3’ response?”

A minute or two passes and you decide to call the Chief. Ordinarily, you resist making this type of call, but something tells you that you need to get to the bottom of this incident. He picks up on the first ring and you ask him about the “lights-and-sirens” response, and he is not aware of any emergencies in Town, but will check and get back to you. The Chief calls a few minutes later and informs you that there was a traffic accident reported up on Main Street. It turns out no one was injured, and there was just minor damage to both vehicles.

For months (if not years), the Chief has been a strong advocate for increasing the size of the department. He has made a fairly convincing argument that the department is short-staffed and that continued operation at the current personnel headcount is jeopardizing public safety. The population of the Town is growing and it seems there are more and more sirens heard every day. But you’re just not sure. You live and work in Town, and it just doesn’t seem unsafe. You’re not getting an inordinate number of complaints from the community or the Council about public safety, and the call for more resources in the police department does not seem to be at a critical stage.... yet, you hope. The Chief, after all, is the expert and you need to rely on his judgment.

With these thoughts rattling around your head, and the wail of police sirens still fresh in your ears, you start to ask more pointed questions. “Was there really a need to respond ‘Code-3’ to a reported traffic accident?” “Do we really even need to dispatch an officer to a traffic accident?” “What other types of calls are we dispatching officers to that might not be a police emergency?” “How many officers do we have working right now?” “Are there too many officers assigned to handle too many assignments that are not police emergencies?”

The Chief’s response is quick and convincing. He reassuringly advises that “Our community expects a rapid response to calls for service. We respond to all forms of emergencies and consider traffic accidents one type of emergency.” The Chief continues, “And while I don’t know specifically how many officers are working this very moment, I can assure you that we need more of them to provide the level of service our community expects.”

You end the conversation with the Chief in order to get back to your busy day, and thank him for his prompt response and patience in handling your bothersome call. You’re not convinced,

however, that the department needs more sworn officers. In your mind, there needs to be an objective and empirical way of understanding police staffing. Although you trust the Chief's judgment, his opinion, combined with accurate data, would give you the information you need to make this important, expensive, and irrevocable decision.

Fortunately, you are not alone. City and Town Managers/Administrators around the country wrestle with this very scenario on a daily basis. How many officers does my police department really need? Communities faced with difficult budgetary decisions often look at public safety agencies for potential cut-backs. To be sure, no one wants to cut public safety resources and risk harm to the community. On the other hand, some communities are growing at a rapid pace and are finding it difficult to provide sufficient services to the growing populace. And in the middle, there are numerous communities looking to make the "right" decisions in the interest of "good government." Collectively, the decisions to be made are critical ones, and providing the "right" level of police staffing is probably the most difficult and important one a City Manager can make.

With these issues in mind, you begin to ask the harder question: Is there an objective standard for making this determination? Should my Chief be using some form of performance metrics to make the request for additional staffing in addition to his or her professional opinion? And the answer is a resounding "YES!"

The size and style of a police department and the types of services that it provides are a reflection of the character and demands of that community. The challenge is to determine the appropriate allocation and deployment of officers to meet that demand. Once the personnel are allocated properly, the next questions focus on how they are "deployed." The analysis that is necessary should attempt to build upon this discussion and answer the "how many" and "how to deploy" questions that are the essence of police operational and personnel resource decisions.

II. Staffing Models

Police staffing models in the U.S. are generally determined by one of five common methods. Departments traditionally have used crime trends, a per-capita approach, minimum-manning levels, authorized/budgeted levels, and least-commonly, workload-based models to make staffing decisions.

As the police professionalized in the early 20th century, the primary goal of police operations became crime reduction. Crime levels and trends became the benchmark for police staffing. The more crime, the more police officers hired to combat this crime. On face value this approach seems appropriate, but in actuality it is an inefficient approach to staffing. When the police are ineffective at combating crime, this approach calls for adding more police. When the police are

effective at combating crime, fewer officers are needed. Therefore, using this model essentially provides incentives for poor performance and disincentives for good performance. Additionally, crime rates are influenced by many other factors than just the response by the police. In fact, many criminologists discount the role of the police entirely when it comes to crime rates in a community. So, using crime rates to staff a police department is not the recommended approach. Fortunately, this model of staffing is rarely used anymore.

Another very popular approach to staffing is one based upon predetermined minimum-manning levels. 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, wherein hard minimums cannot be breached without calling other officers in to work on overtime, and soft minimums occur where supervisors can use discretion to maintain staffing below a predetermined level. However, departments often memorialize these staffing levels in collective bargaining agreements and the staffing becomes part of the labor-management context and thus difficult to modify.

Equally popular is the per-capita approach to staffing. Departments across the country look to officer-to-population ratios as an easy method to determine appropriate staffing. Although the International Association of Chiefs of Police does not recommend this method, IACP nonetheless published a directorate on just this very topic. A recent IACP “Perspectives” article presents Bureau of Justice Statistics 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. Many communities rely on this model to make staffing decisions. As easy as it is to comprehend and apply, this model is equally inefficient and unreliable.

The authorized/budgeted approach to staffing is a variant of the minimum-manning model. In this approach the city or town predetermines a specific 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 places the determination of personnel levels on the community’s budgeting process. It is also a fairly simple approach wherein the previous year’s budget is examined in context with 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 made on actual workload. ICMA is a strong advocate 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, and these calls are modeled to understand demand and supply. This approach also has shortcomings 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, and consistent with the approach used by ICMA, 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, but it nonetheless offers the most accurate and reliable predictor of police staffing levels.

III. ICMA Research on Police Staffing

Over the past five years, the ICMA Center for Public Safety Management (CPSM) has been engaged in providing consulting services to numerous communities across the country. Since 2008, ICMA has conducted police operational and data analyses in 61 cities and towns located in 26 states in all regions of the U.S.; populations of communities studied range from 8,000 to more than 800,000. These studies have allowed communities to understand the public demands placed upon the police and undoubtedly helped the communities make difficult staffing decisions. The data collected by CPSM also provides valuable insight into police operations around the country. Albeit a sample of convenience, the data derived from these 61 studies and discussed here provide interesting insight into staffing decisions made by the communities represented.

The ICMA data analysis¹ relies on information captured in a department's computer-aided dispatch (CAD) system. ICMA extracts one year's worth of CAD calls for service and dispatch data in order to explore demand for police services. The analysis focuses on three main areas: workload, deployment, and response times. These three areas are related almost exclusively to patrol operations, which constitute the most significant portion of nearly any police department's personnel and financial commitment.

For the detailed workload analysis, ICMA uses two four-week sample periods. Typically, the first period is August, or summer, and the second period is February, or winter. Each and every call dispatched through 911 is identified for these two periods. The calls are isolated and a total amount of time spent handling the call is calculated. Once these calculations are made, the data is converted into tables and charts that display the demand for police services in hourly increments

¹ A comprehensive discussion on workload analysis is presented in Section IV of this paper. The presentation of the information here is simply to describe some of the variables used in the ICMA research on staffing.

across the 24-hour day for both weekdays and weekends. This gives us four distinct time periods to examine

In addition to the workload, ICMA collects information about the number of officers assigned to patrol during these four time periods. Instead of using the number of officers scheduled, ICMA relies on the “actual” number of officers present and working on any given shift/day.

This collection of information provides a more accurate and thorough picture of the actual demands placed on the workforce and allows ICMA to calculate “workload” as a percentage of available resources. During times when all available resources are committed to calls for service, workload would equal 100 percent. When there are no calls for service being handled in a given hour, workload would equal 0 percent.

The product of the workload analysis is essentially four graphic figures that display the workload (demand/available staffing) encountered by the police department across the average day during the four periods (weekdays and weekends in both summer and winter). We believe strongly that workload is the critical determinant of police staffing. Ensuring the proper amount of police resources available throughout the day is the goal of staffing a police department efficiently. When the workload is low, there is a surplus of personnel, and officers are underutilized. When workload is too high, there is a shortage of personnel, and officers are overtaxed and services suffer.

The statistics created by the ICMA-CPSM approach provide valuable tools to examine police staffing decisions. In addition to these data, the ICMA approach looks at population, crime, patrol staffing, total number of calls for service, response times, total service time for calls for service, and the 90th percentile response time for calls for service to evaluate department staffing decisions. Table 1 presents all the variables collected by ICMA for the 61 communities in the sample.

Table 1: ICMA Police Staffing Data Analysis

Variable Descriptives	Mean	Minimum	Maximum
Population	67,745.7	5,417.0	83,3024.0
Officers per 100,000 Population	201.2	35.3	465.1
Patrol Percent	66.1	32.4	96.8
Index Crime Rate, per 100,000	3,235.1	405.0	9,418.8
VCR (Violent crime rate, per 100,000)	349.3	12.5	1,415.4
PCR (Property crime rate, per 100,000)	2,885.9	379.7	8,111.6
CFS Rate	1,004.8	2.2	6,894.2
Avg. Service Time Police CFS	17.7	8.1	47.3
Avg. Service Time Public CFS	28.7	16.0	42.9
Avg. # of Responding Units Police CFS	1.2	1.0	1.6
Avg. # of Responding Units Public CFS	1.6	1.2	2.2
Total Service Time Police CFS (officer min.)	22.1	9.7	75.7
Total Service Time Public CFS (officer-min.)	48.0	23.6	84.0
Workload Percent Weekdays Winter	26.6	5.0	48.0
Workload Percent Weekends Winter	28.4	4.0	52.0
Workload Percent Weekdays Summer	28.7	6.0	50.0
Workload Percent Weekends Summer	31.8	5.0	53.0
Average Response Time Winter	11.0	3.1	26.9
Average Response Time Summer	11.2	2.4	26.0

While Table 1 provides a list of all the variables that might be examined by ICMA, different studies call for different data, and some data are not available in every community. Population is the first variable, which ranges from more than 800,000 to under 6,000, with a mean of 67,746. The staffing figures were transformed into number of officers per 100,000 population, and while not a useful tool for staffing decisions, it is a useful conversion for analysis. Population influences many variables in this data set; therefore, it is important to control for population size by transforming variables into rates to improve the analysis. For example, the table shows the number of officers per 100,000 and the percentage of offices on patrol compared to the total number of officers in the department.

Other variables used in the analysis are the FBI’s Uniform Crime Reporting (UCR) index crime rates, and the rate of 911 calls for service (CFS) per 1,000 population. Workload and CFS processing data are key elements as well. *Service time* represents the number of minutes required to handle the average CFS, *Responding units* is the average number of police units assigned to a CFS, and *Total Service Time* is the total number of officer-minutes needed to handle a CFS (number of officers multiplied by the number of minutes). These variables are categorized separately by CFS received directly from the public (labeled “public”), and CFS initiated by the

police themselves (labeled “police”). Additionally, the workload figures discussed earlier (winter-summer, weekday-weekend) are incorporated into the analysis, as well as the average response time to CFS.

The data presented above offer extremely useful—but unfortunately rarely used—pieces of information to understand police staffing and deployment.

Rule of 60 Guidelines

As a general guideline, ICMA applies a “Rule of 60” to evaluate police department staffing allocation and deployment. This Rule of 60 applies to three critical variables:

1. There should be approximately 60 percent of the total number of sworn officers in a department assigned to the patrol function. According to the table the mean patrol percentage is 66.1 percent. In other words the average department in this study assigns about two-thirds of its officers to patrol.
2. The average workload for patrol staffing should not exceed 60 percent. The mean workloads presented above for winter weekdays and weekends and summer weekdays and weekends are 26.6 percent, 28.4 percent, 28.7 percent, and 31.8 percent, respectively. This indicates that less than one-third of the available patrol resources are committed to demands from the community in the average department.

The highest reported means in the sample of communities studied does not exceed the 60 percent threshold. In other words, the busiest communities in the ICMA analysis do not dedicate more than 60 percent of their patrol resources towards workload (which includes public initiated CFS, police-initiated CFS, administrative and out-of-service time, as well as directed patrol time).

3. The Total Service Time (officer-minutes) should not exceed a factor of 60. The mean service times presented above are 22.1 officer-minutes for a police initiated CFS, and 48.0 officer-minutes for a CFS received from the public through 911.

Collectively, these three “Rule of 60” calculations represent much more comprehensive and robust variables to use in making police staffing allocation and deployment decisions. These variables are the foundation of ICMA’s assessment of an agency’s staffing decisions and the starting point for evaluating the staffing model used by a particular organization. These items permit the exploration of the questions “Are there enough officers?” “Are they assigned in the right units?” “Are we responding to the demand from the community in an appropriate fashion?”

Key Variables in Making Staffing Decisions

Armed with all the information developed in a typical study, a further examination of staffing is possible. With these data in mind, which variable, if any of them, are influential to a department in making staffing decisions? Table-2 presents the correlation coefficients that compare the number of officers per 100,000 in a police department with all of the variables included in Table 1.

Table 2: Correlation Analysis – Officers per 100,000 Population

	Officers per 100,000
Officers per 100,000 Population	1
Patrol Percent	0.049
Index Crime Rate	0.144
VCR	0.141
PCR	0.14
CFS Rate	.638**
Avg. Service Time Police CFS	-.279*
Avg. Service Time Public CFS	-.635**
Avg. # of Responding Units Police CFS	-0.155
Avg. # of Responding Units Public CFS	-0.008
Total Service Time Police CFS	-0.25
Total Service Time Public CFS	-.514**
Workload Percent Weekdays Winter	-0.255
Workload Percent Weekends Winter	-0.278
Workload Percent Weekdays Summer	-.316*
Workload Percent Weekends Summer	-.337*
Response Time Winter	-.630**
Response Time Summer	-.639**

*Significant at the $p < 0.05$ level

**Significant at the $p < 0.01$ level

As can be seen in Table 2, there are six variables from the initial analysis that are significantly correlated with the number of officers per 100,000 population in a department.

The CFS rate, or the number of calls through 911, is very strongly correlated with department staffing. With an $r=0.638$, police staffing is significantly correlated with 911 CFS rate. In other words, the more 911 calls in a community, the larger the police department. The other significantly correlated measures show an inverse relationship with overall staffing rate. Average service time for both police and public CFS is inversely correlated with staffing levels, which means as officer staffing increases, total service time decreases. This makes sense because the more officers a department has on staff the faster they will be able to handle CFS. Similarly,

summer workload and response time are also inversely correlated. The more officers a department has, the lower the workload in the summer, and the lower the response time the department will experience. Again, this finding is intuitively obvious. Workload (work/staffing) will decrease with a greater number of officers and more officers will be available to respond to CFS faster. Interestingly, however, is that winter workload and crime rate do not factor into staffing decisions.

In common-sense terms, these statistics indicate two important factors associate with police staffing decisions. The departments in the ICMA analyses increase staffing to meet 911 CFS volume. The more CFS a community accepts (controlling for population), the larger its police department will be. Also, it appears that departments make staffing decisions to accommodate peak workload demands.

ICMA selects weekends in the summer to understand peak CFS volume contrasted with the lowest available staffing. It is no secret that officers look to take days off during the summer, and particularly weekends in the summer, and this is usually when departments face staffing shortages. This analysis supports the conclusions that departments make staffing decisions with this in mind. According to these statistics, the number of officers in a department is predicted by weekend summer demand: the more officers, the lower the demand. Clearly, this must be considered one of the most important variables that factor into department staffing decisions.

There are many shortcomings with this analysis, and caution must be exercised interpreting these results too aggressively. However, there is ample information here to provide police executives and researchers to pause and think about the factors associated with police staffing decisions. It does appear, albeit from this limited sample, that crime is not a factor, response time is not a factor, and service demands are not a factor, but CFS rate and peak-demand staffing are factors. This finding presents a very important point for discussion for police chiefs and City/Town Managers about exactly what are they paying for when it comes to staffing a police department. CFS and summer vacations are manageable. Perhaps when it comes to increasing or decreasing the size of a police department, the managers responsible for these decisions should look first at the quantity and quality of CFS actually being handled by the department, as well as how the officers are allocated and deployed in order to meet peak service demands.

IV. The Preferred Approach to Determining Police Staffing

Our discussion will now focus on a sample demand analysis conducted by the ICMA-CPSM. This is not a hypothetical example, but an actual case study in which the data from the department's CAD system were extracted to conduct the analysis. We'll call the department the "Victory" Police Department; the VPD is representative of many police departments in the U.S. and is perhaps the most representative department from the 61 departments that we have studied.

Patrol Staffing and Deployment

Uniformed patrol is considered the backbone of policing. Bureau of Justice Statistics indicate that more than 95 percent of U. S. police departments roughly equal in size to the VPD provide uniformed patrol. Officers assigned to this important function are the most visible members of the department and command the largest share of departmental resources. Proper allocation of these resources is critical to having officers readily available to respond to calls for service and to provide law enforcement services to the public.

Understanding actual workload requires reviewing total reported events within the context of how the events originated, such as through directed patrol, administrative tasks, officer-initiated activities, and citizen-initiated activities. Performing this analysis allows the activities that are really "calls" to be differentiated from other types of activities. Understanding the difference between the various types of events and the resulting staffing implications are critical to determining deployment needs. In our sample department, we'll look at the total deployed hours of the police department with a comparison to the time being spent to currently provide services.

From an organizational standpoint, it is important to have uniformed patrol resources available at all times of the day to deal with issues such as proactive enforcement and community policing. Patrol is generally the most visible and most available resource in policing and the ability to harness this resource is critical for successful operations.

From an officer's standpoint, once a certain level of CFS activity is reached the officer's focus shifts to a CFS-based reactionary mode. Once a threshold, or saturation point, is reached, the patrol officer's mindset begins to shift from a proactive approach in which he or she looks for ways to deal with crime and quality-of-life conditions in the community to a mindset in which he or she continually prepares for the next CFS. After saturation, officers cease proactive policing and engage in a reactionary style of policing. Uncommitted time is spent waiting for the next call. The saturation threshold for patrol officers is believed to be 60 percent.

Earlier, we discussed the "Rule of 60," which can be applied to evaluate patrol staffing. The first part of the Rule of 60 maintains that 60 percent of the sworn officers in a department should be dedicated to the patrol function, and the second part maintains that no more than 60 percent of patrol time should be "saturated" by workload demands from the community.

Rule of 60 – Part 1

The first part of the Rule of 60 is an assessment of the ratio of personnel between patrol and total sworn staffing. ICMA recommends that approximately 60 percent of all sworn officers should be assigned to patrol in a CFS response function. This benchmark will be different for different communities and will likely increase as the department (and community) gets larger. In general, however, this is a useful benchmark to evaluate the personnel allocation in the department. Departments with patrol allocations much greater than 60 percent might indicate an over-investment in patrol (or under-investment in other areas of the organization).

Rule of 60 – Part 2

The second part of the Rule of 60 examines workload and discretionary time and suggests that no more than 60 percent of patrol time should be committed to calls for service. In other words, ICMA suggests that no more than 60 percent of available patrol officer time be spent responding to the service demands of the community. The remaining 40 percent of the time is discretionary time for officers to be available to address community problems and be available for serious emergencies. This Rule of 60 for patrol deployment does not mean the remaining 40 percent of time is downtime or break time. It is simply a reflection of the point at which patrol officer time is saturated by CFS.

This ratio of dedicated time compared to discretionary time is referred to as the saturation index (SI). It is ICMA's contention that patrol staffing is optimally deployed when the SI is slightly less than 60 percent. An SI greater than 60 percent indicates that the patrol manpower is largely reactive, and overburdened with CFS and workload demands. An SI of somewhat less than 60 percent indicates that patrol manpower is optimally staffed. SI levels much lower than 60 percent, however, indicate patrol resources that are underutilized and signal an opportunity for a reduction in patrol resources or reallocation of police personnel.

Departments must be cautious in interpreting the SI too narrowly. For example, one should not conclude that SI can never exceed 60 percent at any time during the day, or that in any given hour no more than 60 percent of any officer's time be committed to CFS. The SI at 60 percent is intended to be a benchmark to evaluate service demands on patrol staffing. If SI levels are near or exceed 60 percent for substantial periods of a given shift, or at isolated and specific times during the day, decisions should be made to reallocate or realign personnel to reduce the SI to levels below 60. Lastly, this is not a hard-and-fast rule, but a benchmark to be used in evaluating staffing decisions.

As noted earlier, a typical ICMA workload analysis involves the examination of weekdays and weekends (1800 Friday to 1800 Sunday) in the months of February and August. These

periods are representative of times of low and high demand. Figures 1 and 2 present the patrol workload demands and SI for weekdays in February 2012 for the Victory Police Department.

Figure 1: VPD Deployment and Main Workload, Weekdays, February 2012

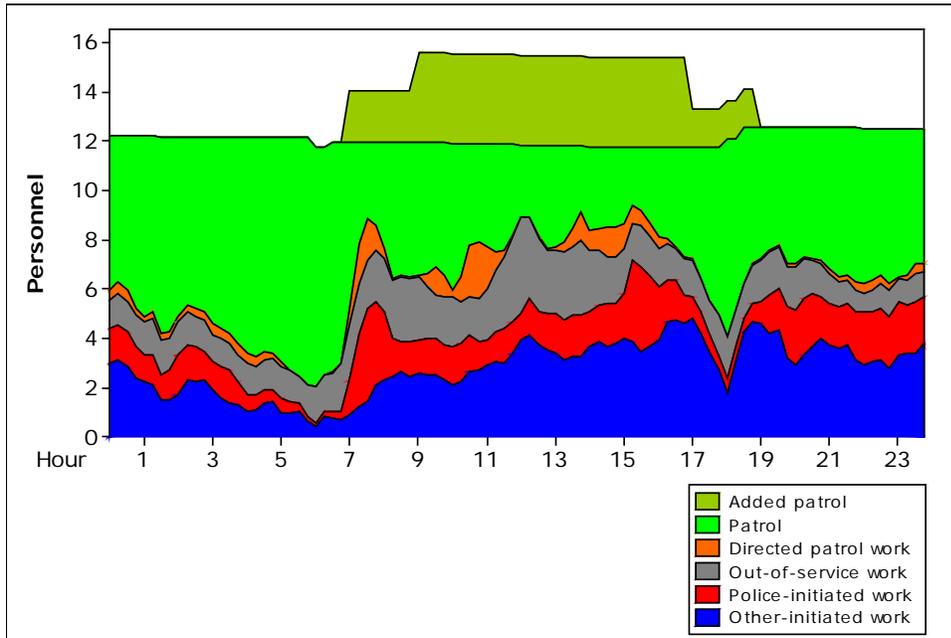
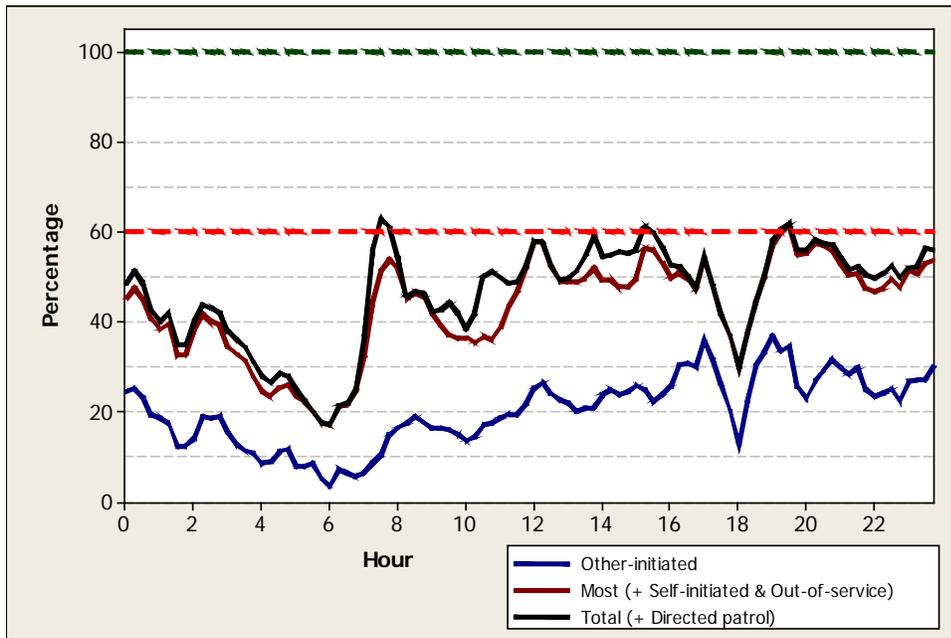


FIGURE 2: VPD Workload Percentage by Hour, Weekdays, February 2012



Workload vs. Deployment: Weekdays, February 2012

Average workload:	6.3 officers per hour
Average % deployed (SI):	46 percent
Peak SI:	63 percent
Peak SI time:	7:30 p.m.

As these figures indicate, the SI in the VPD exceeds the 60 percent threshold several times during the day. The SI ranges from a low of approximately 18 percent at 6:00 a.m. to a high of 61 percent at 7:30 p.m., with a daily average of 43 percent.

Figures 1 and 2 indicate that patrol resources in the VPD during winter weekdays are under stress. From about 7:00 a.m. until after midnight, the patrol saturation index hovers just below the 60 percent threshold. This demonstrates that patrol resources in Victory are largely reactive. While there is a large body of traffic enforcement taking place, the overall saturation of patrol resources is very close to unacceptable levels. The 60 percent threshold is considered the point at which discretionary patrol time changes from potentially productive time that can be directed at community conditions, to unproductive time where patrol units wait for the next CFS to be dispatched. Essentially, for the bulk of the day in Victory, patrol resources operate very close to this “unproductive” threshold, and measures should be taken to support patrol staffing.

Reaching this level during any period under observation also has the adverse impact of tainting all other periods under observation. In other words, once officers experience high, and sustained, levels of patrol saturation, they are likely to conclude that patrol saturation is high always, or that they always need to be prepared to respond to high CFS demands. This effectively ends proactive police response. In the context of high violent and property crime rates in the community, this is a situation that needs to be reexamined. Victory’s best defense against high crime is an active and productive patrol force. The data from Figures 1 and 2 indicate that the VPD patrol staffing is almost entirely reactive and not positioned well to respond to crime occurrences in the community. Additional resources committed to patrol, in conjunction with focused and directed patrol aimed at crime, disorder, and quality-of-life issues, would be strongly recommended.

In our studies, this process is repeated for the other three time periods (winter weekends, summer weekdays and weekends) in order to fully explore workload, manpower, and the saturation index. The goal for a police department is to keep the saturation index below the 60 percent threshold, which we believe is the optimal deployment for patrol staffing.

Looking at the comparisons of the green, red, and black lines in the SI figures, and comparing workload to available staffing, the data indicate that more officers are required to properly staff the patrol function in Victory.

Workload and Staffing Example

Drawing on the information from the data analysis it is possible to construct a patrol work schedule in Victory that meets the demand for police services. Table 3 shows the peak demand for police services in terms of total workload during weekends and weekdays in February and

August. These peak workload demands are listed in the left portion of the table and are presented for each hour of the day. For example, at midnight during the week in February, total workload demand for police service in the VPD was 4.17 police-hours. In other words, through citizen-initiated CFS, self-initiated activities by VPD officers, and out-of-service requirements, 4.17 hours of time were expended at that hour.

Inspection of the table indicates that demand for services, or total workload, decreases as the night progresses and hits a low point around 6:00 a.m. The workload then increases throughout the day. The second through fifth columns of the table represent workload demands for weekdays and weekends in February and weekdays and weekends in August, respectively. Workload patterns are slightly different on weekends in August, but the general peak load pattern appears in each column.

To staff appropriately, ICMA recommends that the peak workload at each individual hour during the day be considered. The column in Table 3 labeled "Peak Workload," represents the highest workload observed during that hour in any one of the four periods (weekends/weekdays in February/August). For example, looking at the 12:00 a.m. hour, the peak workload was 7.52 police-hours in weekends in August. The "Peak Workload" column, therefore, is constructed by selecting the highest workload figure from any of the four 24-hour time periods in the table.

Table 3: Patrol Division: Peak Workload Staffing

Time	Workload				Peak Work-Load	Required Staffing	
	February		August			60% SI	Staffing
	Weekday	Weekend	Weekday	Weekend			
12 AM	4.17	5.43	5.81	7.52	7.52	12.5	17
1 AM	3.94	4.33	4.60	7.12	7.12	11.9	16
2 AM	3.88	4.94	5.12	7.57	7.57	12.6	17
3 AM	3.24	3.88	4.21	5.67	5.67	9.5	13
4 AM	2.27	4.12	3.35	4.71	4.71	7.9	11
5 AM	1.99	2.76	2.56	4.82	4.82	8.0	11
6 AM	1.75	2.27	2.51	3.94	3.94	6.6	9
7 AM	3.79	2.49	7.59	4.03	7.59	12.7	17
8 AM	4.23	2.59	6.75	5.24	6.75	11.3	15
9 AM	4.34	2.57	6.65	6.29	6.65	11.1	15
10 AM	5.15	2.95	7.03	6.67	7.03	11.7	16
11 AM	4.86	3.58	7.75	7.10	7.75	12.9	18
12 PM	5.01	4.00	8.38	5.71	8.38	14.0	19
1 PM	5.46	3.93	8.28	6.50	8.28	13.8	19
2 PM	4.64	3.83	8.45	5.81	8.45	14.1	19
3 PM	4.75	3.75	8.97	5.79	8.97	15.0	20
4 PM	4.53	3.26	7.78	6.11	7.78	13.0	18
5 PM	4.42	3.12	6.02	5.45	6.02	10.0	14
6 PM	3.69	2.88	5.61	5.02	5.61	9.4	13
7 PM	4.69	3.74	7.40	6.43	7.40	12.3	17
8 PM	4.81	4.01	7.17	5.43	7.17	11.9	16
9 PM	5.06	4.72	6.52	6.07	6.52	10.9	15
10 PM	4.50	4.88	6.32	6.54	6.54	10.9	15
11 PM	5.01	4.83	6.76	6.59	6.76	11.3	15

The column labeled “60% SI” represents the number of police officers required to maintain staffing levels at the 60 percent saturation index for that given hour, based on the peak workload. Thus, with 7.52 hours of workload during the 12:00 a.m. hour, 12.5 police officers are required to meet that workload while maintaining the 60 percent saturation threshold ($7.52/.60 = 12.5$). The same calculation is made for each hour of the 24-hour period and the result is the number of police officers that are required to be available to meet peak workload and maintain the 60 percent saturation threshold.

We then have to go one step further. Staffing patrol coverage is a challenging task. In order to have a certain number of officers available during any given hour, additional officers must be assigned. Training, sick time, court, vacations, and a myriad of other responsibilities take

personnel away from their primary patrol assignments. On a typical shift it is common that 25 percent of the officers assigned will be unavailable for patrol because of another competing responsibility.² Therefore, in order to ensure that 12.5 officers are available to meet peak workload demands and adhere to the 60 percent saturation index threshold, a staffing adjustment must be made so as to assign additional officers to work with the expectation that a certain complement will be unavailable because of other demands. The right-most column in Table 3 presents the number of officers that need to be assigned in order to meet appropriate levels of workload in Victory. At 12:00 a.m., in order to meet the peak workload demand of 7.52 officer-hours, the 60 percent threshold dictates that 12.5 officers need to be working. This means that 17 officers need to be scheduled for that time ($12.5/.75 = 17$, rounding up to the nearest whole number).

Inspection of the next row of Table 3 shows the workload and required staffing for the 1:00 a.m. hour. In this case the peak workload is 7.12 police-hours, and 16 officers must be scheduled to work in order for 11.9 of them to be available to meet that peak workload within the 60 percent threshold. Using the same calculation for each hour of the day results in a 24-hour staffing distribution. As shown in the table, required hourly staffing for peak workload ranges from a high of 20 officers at to a low of 9 officers. The table also shows that the staffing requirement is not uniform; it fluctuates throughout the day. During our study, patrol officers reported anecdotally of being very busy handling calls and managing the workload. Examination on Table 3 illustrates that peak staffing that is needed almost always is greater than the staffing levels currently deployed in the VPD. The ordinary staffing levels of 10 to 12 officers on each platoon explains why officers report being very busy, as the VPD's current staffing plan is inadequate to meet peak demand staffing.

The challenge of managing patrol operations is to ensure that sufficient resources are available to meet demand through appropriate staffing and scheduling. The VPD employs two 12-hour shifts with essentially fixed personnel assignments. The fixed nature of the staffing, combined with the variable nature of workload demands, will naturally create periods of personnel surplus and shortage throughout the day. The goal is to minimize these surpluses and shortages and create a work schedule that reduces the variance between demand and supply.

In an ideal world, the VPD would be able to carve out the right number of people working at the precise hour to meet both supply and demand. Unfortunately, the rigid nature of the deployment schedule makes this impossible. Thus, the perfect state can only be approximated by creating the "best fit" of patrol staffing and workload demand. The best fit occurs when the variation between workload demand and police officer supply is the lowest. This best fit is

² The Police Executive Research Forum recognizes 75 percent as the appropriate factor for determining patrol availability staffing.

created by modeling or manipulating various combinations of officers and 12-hour blocks to reduce the variance between supply and demand to its lowest possible level.

Table 4 shows the culmination of these factors working together. The far-left column, labeled “Time,” is the hour of the day. The “Needed” columns represent the number of police officers needed in that given hour as defined in Table 3. The “Sample Schedule” column represents the optimal shift and personnel combination based upon the shift/demand modeling. The figures in the “Current” column show the current staffing on patrol in the VPD. Finally, the numbers in the “Deviation” columns represent the difference between the number of officers needed and the number of officers required. Where the deviation is negative, there are fewer officers assigned than needed to meet the 60 percent threshold; where the number is positive there are more officers assigned than required.

Table 4: Staffing Deviation

Time	Needed	Sample Schedule	Deviation	Needed	Current	Deviation
12 AM	17	15	-2	17	12	-5
1 AM	16	15	-1	16	12	-4
2 AM	17	15	-2	17	12	-5
3 AM	13	15	2	13	12	-1
4 AM	11	15	4	11	12	1
5 AM	11	15	4	11	12	1
6 AM	9	18	9	9	12	3
7 AM	17	18	1	17	12	-5
8 AM	15	18	3	15	12	-3
9 AM	15	18	3	15	12	-3
10 AM	16	18	2	16	12	-4
11 AM	18	18	0	18	12	-6
12 PM	19	18	-1	19	12	-7
1 PM	19	18	-1	19	12	-7
2 PM	19	18	-1	19	12	-7
3 PM	20	18	-2	20	12	-8
4 PM	18	18	0	18	12	-6
5 PM	14	18	4	14	12	-2
6 PM	13	15	2	13	12	-1
7 PM	17	15	-2	17	12	-5
8 PM	16	15	-1	16	12	-4
9 PM	15	15	0	15	12	-3
10 PM	15	15	0	15	12	-3
11 PM	15	15	0	15	12	-3
Total Deviation			21			-87
Variance			7.1			7.7

In a perfect system, the deviations would all be zeros, and demand would be met perfectly by appropriate staffing. Since this is impossible to achieve, best fit is the desired state. Adding up the deviations over the 24-hour day results in the surplus/deficit of staff on patrol. The term “variance” is simply a calculation that portrays the amount of variability in the deviation between demand and supply, or workload and staffing. The best fit seeks to minimize the variability to the greatest extent possible. Large differences between workload and available staff would indicate a poor fit and this would be captured by the level of variance.

Taking all these factors together permits a comparison of the current staffing with the proposed staffing of 33 officers assigned to two 12-hour shifts. The total number of deviations

(difference between demand and available staff) is -87, or -3.3 per hour. This indicates that over the course of the 24-hour period there are 87 officer/hours too few to meet peak demand within the 60 percent threshold. Similarly, the variance in the proposed model is lower than the current staffing model (7.1 compared to 7.7). This indicates that the proposed two 12-hour shift plan meets the workload demands better than the current staffing model because the variability between the workload and the staffing is lower.

Revisiting the Rule of 60

Based upon the above discussion it is necessary to revisit Rule of 60 to demonstrate the impact this staffing model will have on workload, and to determine the foundation for staffing the department.

Table 5 illustrates the analysis in reverse. Based upon a proposed the 66-officer, 15/18 shift distribution, with 6:00 a.m./6:00 p.m. start and end times, and the observed peak workload demands, we can calculate the expected saturation index. The column labeled “Assigned” represents the 15/18 shift assignments. With the assumption that only 75 percent of the officers assigned will be available for patrol (25 percent absent due to court, sick, training, vacation, etc.) the column “Assigned” is reduced by 25 percent to reach the “On-Duty” column, which provides an estimate of the number of officers who will actually be assigned to patrol. The peak demand is taken from Table 3; the far-right column is the saturation index based upon the peak demand data combined with the proposed staffing and schedule.

According to this analysis, the average peak saturation would be approximately 50.2 percent. During the 24-hour day, the 60 percent threshold is breached during four of the hourly periods. Furthermore, considering that these values represent peak demand, this appears to be an appropriate deployment plan to meet workload demands in Victory.

Table 5: Projected Saturation Index at Peak Demand with 15/18 Shift Staffing

Time	Assigned	On-Duty	Peak	SI
12 AM	15	12	7.52	62.7
1 AM	15	12	7.12	59.3
2 AM	15	12	7.57	63.1
3 AM	15	12	5.67	47.3
4 AM	15	12	4.71	39.3
5 AM	15	12	4.82	40.2
6 AM	18	14	3.94	28.1
7 AM	18	14	7.59	54.2
8 AM	18	14	6.75	48.2
9 AM	18	14	6.65	47.5
10 AM	18	14	7.03	50.2
11 AM	18	14	7.75	55.4
12 PM	18	14	8.38	59.9
1 PM	18	14	8.28	59.2
2 PM	18	14	8.45	60.3
3 PM	18	14	8.97	64.1
4 PM	18	14	7.78	55.6
5 PM	18	14	6.02	43.0
6 PM	15	15	5.61	37.4
7 PM	15	15	7.40	49.3
8 PM	15	15	7.17	47.8
9 PM	15	15	6.52	43.5
10 PM	15	15	6.54	43.6
11 PM	15	15	6.76	45.1
			Average	50.2

No schedule is perfect, and the sample schedule provided is no exception. Pulling all of these factors together, it is possible to reconfigure the patrol staffing for the patrol division. In this example, the patrol division in the VPD would be staffed with one captain, four lieutenants, eight sergeants, and sixty-six police officers (Table 6).

Table 6: Recommended VPD Patrol Division Staffing

Captain	Shift	Squad	Lieutenant	Sergeant	Patrol Officer
	Operations	NA	1		
	0600x1800	A	1	2	18
	0600x1800	B	1	2	18
	1800x0600	A	1	2	15
	1800x0600	B	1	2	15
1			5	8	66

This staffing example increases the number of officers assigned to patrol from 46 to 66, and maintains the same level of supervision. Additionally, this sample schedule adheres to steady shifts (without rotating day and night) with 18 officers on the day shift and 15 officers on the night shift. While the VPD had an interest in rotating officers from day shift to night shift, we strongly recommended that the three-set rotation be abandoned to one of greater duration. Departments of similar size with similar shift alignments rotate schedules at an annual or semiannual basis. We urged the VPD to consider a greater length of time between shift rotations to minimize the adverse impact such rotations have on officers.

The second part of the Rule of 60 suggests that 60 percent of the department should be in patrol operations. With one captain, four lieutenants, eight sergeants, and sixty-six police officers, the patrol division in the VPD would be staffed with 79 sworn officers. According to the Rule of 60, this should represent 60 percent of all sworn personnel in the department. Under these conditions, therefore, the appropriate staffing levels for sworn personnel in the VPD should be approximately 132 officers ($79/.60=132$).

The end result of this analysis is that the VPD Patrol Division could be staffed with a minimum of 66 officers assigned to four 12-hour shifts under the model proposed. This would provide a better fit of coverage to meet service demands. Also, the proposed schedule calls for one lieutenant and two sergeants to supervise each platoon, which is consistent with the current model.

V. Conclusion

Communities need to consider many important issues when determining appropriate police staffing levels. The data presented here are rarely used in contemporary police management, but are far better than the staffing allocation and deployment approaches currently in use. City, town, and department officials need to use reliable data to make these important staffing decisions. Relying on antiquated and unreliable methods to make one of the most financially important and critical decisions with respect to the quality of life and safety of a community is ill-advised.

Looking at other approaches is a good start. However, police departments must embrace the use of more sophisticated data analysis and must identify benchmarks to evaluate staffing decisions. The argument made here is that at least three benchmarks could be identified easily and then be used to evaluate staffing allocation and deployment. How many officers are assigned to patrol? What is the workload level of those officers on patrol? How much time is expended handling a CFS? Looking at these three measures will shed important light on how many officers a community needs and whether or not they are being deployed efficiently.