



How many patrol officers/deputies does a law enforcement agency need?

This white paper reviews the common methods used today to answer this question along with the limitations of each. It provides a comprehensive discussion of the factors and performance objectives that impact police patrol allocation and how modern patrol allocation models, including the Model for the Allocation of Patrol Personnel (MAPP), account for each of these factors and objectives.

Factors that Impact Police Patrol Allocation

White Paper

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TABLE OF CONTENTS

Introduction	1
Common Patrol Allocation Methods	1
Overview of MAPP	4
Factors that Impact Police Patrol Allocation	6
<u>Data-Driven Variables</u>	6
<i>Calls for Service</i>	7
<i>Service Time</i>	9
<i>Roadway Miles (Impacts Visibility)</i>	10
<i>Patrol Speed (Impacts Visibility)</i>	11
<i>Geographic Area (Impacts Response Time)</i>	12
<i>Response Speed (Impacts Response Time)</i>	12
<i>Leave Rate</i>	13
<u>Policy Variables</u>	15
<i>Policing Service Model</i>	15
<i>Response Time</i>	16
<i>Immediate Availability to Respond to Emergencies</i>	17
<i>Visibility Objective</i>	18
<i>Self-Initiated Activity</i>	20
<i>Administrative Activity</i>	21
<i>Unrecoverable Patrol Time</i>	21
<i>Two-Officer Patrol Units</i>	23
How Policy Decisions Impact Patrol Allocation	23
<u>Example 1: Base MAPP</u>	24
<u>Example 2: Increased Self-Initiated Time</u>	25
<u>Example 3: Slower Response Time</u>	26
<u>Example 4: Increased Visibility</u>	27
Discussion and Conclusion	28

INTRODUCTION

It is common for law enforcement administrators to ask some variation of the question, “How many patrol officers/deputies do we need?” In reality, there is no universally applicable answer to this question. How many patrol officers are needed depends upon what level of police services is desired. There is no fixed standard in this respect. Some communities want a Priority 1 response time of 4 minutes; some are willing to tolerate 7 or 8 minutes. Some communities want 50 percent of each shift to be spent on proactive patrol; some are willing to get by on 15 percent. Some communities want extensive traffic enforcement; some do not. Some communities want high patrol visibility in residential neighborhoods; for others, one drive through a neighborhood every 2 weeks is plenty. There is no rule requiring that at least one patrol officer always be available in a jurisdiction for a true 911 emergency, but most jurisdictions want there to be at least one patrol unit free all, or nearly all, of the time. Other communities enjoy readily available back-up units for true emergencies, such as contiguous jurisdictions or a university campus police department within the jurisdiction, and can therefore staff the patrol function at lower levels at certain times. Addressing the above complex array of issues, among others, in reality, provides the answer to the question “How many patrol officers/deputies are needed?”

COMMON PATROL ALLOCATION METHODS

Many law enforcement agencies continue to cling to allocation methods that are both outdated and insufficient to assess the variety of demands put on the police patrol function. Patrol officers are concurrently responding to service demand, both critical and noncritical, maintaining spatial and time distribution to assure rapid response to

emergency situations, providing reassuring visibility to the community, engaging in active crime deterrent efforts, and remaining alert on emergency standby for truly critical situations. Patrol allocation models should take all these factors, and more, into account in determining patrol staffing needs, but most allocation methods do not consider the complexities of the police patrol function. In many law enforcement agencies, the process of making patrol allocation decisions has been a haphazard process that has been influenced by both political and financial considerations completely apart from considerations of how many officers it takes to do the work the police are expected to do in the way they are expected to do it.

Rudimentary patrol allocation methods in use today can be divided into four categories. First, some departments make allocation decisions based on police/population ratios, which are not even reasonably reflective of the level of police service provided to a community (i.e., higher ratios do not equate to better police service) and do not even isolate the patrol function. The International Association of Chiefs of Police has discouraged the use of police/population ratios stating, “Ready-made, universally applicable patrol staffing standards do not exist. Ratios, such as officers-per-thousand population, are totally inappropriate as a basis for [patrol] staffing decisions.”¹

Second, some law enforcement agencies make allocation decisions based on comparative studies of peer jurisdictions. Agency personnel utilize the number of patrol officers in their jurisdiction and compare it to the number and rate of patrol officers in 5-10 similar jurisdictions to identify discrepancies. These studies lack methodological rigor and validity which limit their utility in making patrol allocation decisions.

¹ International Association of Chiefs of Police. *Patrol Staffing and Deployment Study*, p.2. <https://www.theiacp.org/LinkClick.aspx?fileticket=AKL78d4MBw8%3D&tabid=252>. Retrieved on July 6, 2013.

Third, some departments continue to allocate by geography, assigning 1 officer per beat 24 hours a day, 7 days a week without regard to calls for service or crime pattern variation over time of day, day of week, and location. For example, if a police agency has 14 beats, then the number of officers that need to be assigned to patrol is 14 officers per shift plus additional officers to account for the leave rate. By summing the needs of each shift, the agency identifies the total patrol staffing needs.

Fourth, some agencies conduct workload assessments in determining patrol allocation needs. Although workload assessments are a more sophisticated approach to patrol allocation than the above three methods, the primary limitation is workload assessments are typically focused on calls for service only and the number of patrol officers needed to handle the call demand. Workload assessments typically do not take into account the vast array of tasks and performance objectives assigned to patrol, including meeting response time goals, maintaining visibility in the community, having officers available to immediately respond to an emergency, and the need to perform proactive activities, among other tasks and objectives. An analogy is that workload assessments look at only one piece of a multiple piece puzzle in making patrol allocation decisions.

Over time, patrol allocation models have become more sophisticated and have taken into account more and more factors in determining patrol allocation needs. This paper provides a comprehensive discussion of the factors and performance objectives that impact police patrol allocation and how modern patrol allocation models, including the Model for the Allocation of Patrol Personnel (MAPP)², account for each of these factors

² For additional information about the MAPP, refer to <http://policestaffing.unt.edu>

and objectives. Police administrators need to take these variables or factors into account when determining how many officers need to be assigned to the patrol function.

OVERVIEW OF MAPP

The Model for the Allocation of Patrol Personnel (MAPP) is a validated patrol allocation model created by the author that has been successfully utilized by several police departments and sheriff's offices in the United States to accurately determine the number of officers required in patrol, utilizing variable service level schemes and performance objectives.³

The MAPP is designed to determine the number of officers that need to be assigned to patrol based on calls for service demand and established patrol performance objectives. Each patrol performance objective is briefly discussed below.

- **Ability to meet response time goal for Priority 1 calls for service**

It is crucial for law enforcement agencies to have patrol officers geographically disbursed throughout the community so they are able to respond rapidly to Priority 1 calls for service. Priority 1 calls involve crimes in-progress and incidents that put citizens in imminent danger where rapid response matters. The MAPP takes into account the number of officers that need to be assigned to patrol in order to meet the response time goal to Priority 1 calls set by the law enforcement agency.

³ Most recently, the MAPP has been utilized in comprehensive staffing studies completed by Dr. Fritsch for the Allen TX, Denton TX, DeSoto TX, El Paso TX, Eugene OR, McKinney TX, Midlothian TX, Riley County KS, and Rowlett TX Police Departments. The web-based MAPP is used by police and sheriff's departments throughout the United States through an agreement with the University of North Texas. Dr. Fritsch has also authored a book entitled *Police Patrol Allocation and Deployment*, the only book on the market dedicated to the assessment of police patrol staffing issues.

- **Ability to meet response time goal for Priority 2 calls for service**

It is also important for officers to respond quickly to Priority 2 calls to ensure the incident does not escalate into a more serious situation. Therefore, the MAPP takes into account the number of officers that need to be assigned to patrol in order to meet the response time goal to Priority 2 calls set by the law enforcement agency.

- **Ability to meet response time goal for Priority 3 calls for service**

Although these calls are not as critical, it is also important for officers to be able to respond to Priority 3 calls in a reasonable amount of time primarily for citizen satisfaction reasons. Therefore, the MAPP takes into account the number of officers that need to be assigned to patrol in order to meet the department's response time goal for Priority 3 calls.

- **Having an officer available to immediately respond to a Priority 1 call**

Law enforcement agencies should have officers available who can immediately respond to an emergency (Priority 1) call for service. If all on-duty officers are busy on other calls for service and activities, then the responses to Priority 1 calls will be delayed. In order to ensure sufficient immediate availability, a performance objective is set in the MAPP for the percentage of Priority 1 calls for which there should be at least one officer available to respond. This model then takes that percentage into account in determining the number of officers that need to be assigned to patrol.

- **Visibility of officers**

The public, as they carry out their daily activities, likes to see police officers. They also like to see police officers in their neighborhoods. It is important for the police to be visible to citizens in order to make citizens feel safe and to deter potential criminal

activity. Therefore, the MAPP sets visibility objectives for patrol and determines how many officers need to be assigned to patrol to meet these objectives.

- **Officer self-initiated time**

Officers are expected to spend a certain percentage of their on-duty time performing self-initiated activities such as enforcing traffic violations, stopping suspicious persons, and patrolling locations known for criminal activity. The MAPP accounts for these additional activities performed by officers when determining the number of officers that need to be assigned to patrol.

FACTORS THAT IMPACT POLICE PATROL ALLOCATION

The factors that impact police patrol allocation can be divided based on their source. First, some of the factors that impact allocation are data-driven and therefore are derived from department records or other government agencies. Variables such as the number of calls for service and number of roadway miles in a jurisdiction fit into this category. Second, some of the factors that impact allocation are best categorized as policy decisions made by police administrators. Variables such as response time goals and visibility objectives fit into this category. The following sections will discuss the variables that impact police patrol allocation and thus the number of officers that need to be assigned to the patrol function.

Data-Driven Variables

As mentioned above, some variables that impact allocation are data-driven and when used in an allocation model are obtained from department records or other government agencies. Each of these variables will be discussed below.

Calls for Service

The number of calls for service a department receives certainly impacts the allocation of officers to patrol. Agencies with more calls for service need to assign more officers to patrol in comparison to agencies with fewer calls for service. When used in an allocation model, the value for this variable should include all calls for service for a particular time frame. Typically, allocation models are based on one year of calls for service data. However, these models can frequently be used to determine fluctuations in the need for officers assigned to patrol based on seasonal variations in calls for service. Therefore, the number of calls for service for each month can be identified, and these numbers are then used to understand fluctuations in the number of personnel that need to be assigned to patrol by month. This can assist an administrator in determining when the best months are to have substantial training provided to officers, when vacation time should be taken, and when officers should be encouraged to take compensatory time. The numbers of calls for service should also take into account back-up units as well. Administrative and self-initiated activities are typically excluded from calls for service numbers in allocation models since these activities are taken into account through policy decisions that will be discussed in a later section of this paper.

Therefore, calls for service workload is a key factor in determining the number of patrol officers needed. The choices that police administrators make on how to handle this workload has an important impact on the number of patrol officers required to serve a community as well. Some would argue that the management of calls for service workload is largely beyond the control of police administrators, but the reality is that police can, in collaboration with political and community leaders, devise viable alternative strategies

for handling these demands. Some police departments, for example, have stopped investigating non-injury auto accidents while others continue to engage in this practice. Some have stopped responding to unverified alarm calls at businesses and residences. It is common for alarm calls to account for 10–25 percent of the calls for service a department receives; accounting for the highest call volume activity in many law enforcement agencies. In the United States, between 94 and 98 percent (higher in some jurisdictions) of the alarm calls the police respond to are false, and they have a significant impact on police workload and staffing levels.⁴ There are a number of cities that have adopted a verified response policy, which essentially is a policy that says the police will not respond to an alarm call unless it has been verified that a crime has actually occurred. Furthermore, some departments use non-sworn officers or volunteers to handle certain types of calls.

The ability of a police department to engage in community policing, problem solving, intelligence-led policing, or any type of police service for that matter is heavily influenced by call management practices and policies. The police have an enormous number of choices on how to respond to the various expectations of the community. Should police officers respond to all calls for service? Can non-sworn personnel handle some of the calls? Can some reports or calls be handled over the telephone? Should police investigate non-injury traffic accidents? What opportunities do technology and the Internet present for managing police calls? Many departments have placed significant emphasis on managing calls for service and seeking alternative methods in order to maximize the time officers have on the street for other responsibilities. The end result of

⁴Rana Sampson. (2011). *False Burglar Alarms*, 2nd ed. Washington D.C.: U.S. Department of Justice. http://www.popcenter.org/problems/pdfs/false_alarms_2nded.pdf. Retrieved on July 6, 2013.

these call management practices is fewer calls for service that require an officer to respond. Thus, fewer calls for service equate to fewer patrol officers required for this specific patrol task.

Variables Used in MAPP to Account for this Factor

- Annual number of Priority 1 calls for service (primary unit)
- Annual number of Priority 2 calls for service (primary unit)
- Annual number of Priority 3 calls for service (primary unit)
- Annual number of back-up responses to Priority 1 calls for service
- Annual number of back-up responses to Priority 2 calls for service
- Annual number of back-up responses to Priority 3 calls for service

Service Time

Average service time is another variable that impacts patrol allocation. It is calculated based on the elapsed time from when an officer is dispatched to when an officer clears the call. Average service time is usually calculated based on the total number of calls for service, not on specific types of calls for service. This value represents the average amount of time taken to handle a call for service. If back-up units are not accounted for in the calculation of the total number of calls for service, then they need to be taken into consideration when calculating average service time. Basically, an administrator is attempting to account for all the time patrol officers spend on calls for service, including back-up units. For example, if one call for service takes 45 minutes but two back-up units respond, the call did not take 45 minutes of personnel time. Instead, this one call actually took 2 hours and 15 minutes of personnel time to complete (45 minutes (×) 3 officers = 2 hours and 15 minutes). If back-up units are not taken into consideration when

determining the number of officers that need to be assigned to patrol, staffing levels in patrol will be too low. Therefore, back-up units need to be taken into consideration either in determining the total number of calls for service or in calculating average service time.

Variables Used in MAPP to Account for this Factor

- Average service time per Priority 1 call for service
- Average service time per Priority 2 call for service
- Average service time per Priority 3 call for service
- Average service time per back-up to Priority 1 call for service
- Average service time per back-up to Priority 2 call for service
- Average service time per back-up to Priority 3 call for service

Roadway Miles (Impacts Visibility)

Patrol visibility is a concern for citizens and police administrators alike. The public wants the police to be visible in their communities and in their neighborhoods. The level of visibility of officers impacts the number of officers that need to be assigned to patrol. Agencies with a commitment to high visibility in their community will need more officers assigned to patrol than agencies with less commitment. In order to accomplish visibility goals, allocation models need to take into account the number of roadway miles within a given jurisdiction to determine the number of officers needed to satisfy the visibility demands of citizens and police administrators. As will be discussed in a later section of this paper, visibility standards are typically set for two types of roadways: major and residential. Major roadways include freeways, highways, and arterial thoroughfares. The police department may not have this information within its records, but the number of roadway miles broken down by type of roadway can typically be

obtained from another government agency such as the Department of Transportation or the Public Works Department. The number of roadway miles certainly impacts the number of patrol officers needed. Agencies with fewer roadway miles will need fewer officers to accomplish the visibility objective for patrol.

Variables Used in MAPP to Account for this Factor

- Number of miles, highway/arterial roadways
- Number of miles, collector/residential roadways

Patrol Speed (Impacts Visibility)

Similarly, the speed at which officers drive on major and residential roadways impacts the department's level of visibility and thus patrol staffing needs. Therefore, in order to determine the number of officers needed to meet the visibility standards set by agency administration, the average patrol speed on major and residential roadways is also needed. Basically, the previous two variables impact allocation because how visible officers can be varies by the number of roadway miles in a jurisdiction and how fast officers typically travel on these roadways. Fewer officers are needed for visibility purposes when an agency has 100 miles of roadway in which officers typically travel 30 mph in comparison to another agency that is responsible for over 500 miles of roadway in which officers typically travel 25 mph.

Although the technology exists to determine average patrol speed by roadway type, many agencies do not have these data. If an agency does not have these data, one alternative is to use the average patrol speed from comparable cities that have these data. Another alternative is to use patrol speeds determined from prior patrol allocation studies.

Although these alternatives are not ideal because they introduce error into an allocation model, it may be the only practical alternative for some agencies.

As an example, the average patrol speed on major roadways in prior allocation studies conducted by the author is 24 mph. Similarly, the average patrol speed on residential roadways in prior allocation studies is 14 mph. These patrol speeds were validated in a study supported by the National Highway Traffic Safety Administration. These values may seem low, but they take into account the time in which the officer must stop at stop lights/signs, sit in traffic, slow down to verify or dispel suspicious circumstances, and identify precursors to criminal activity.

Variables Used in MAPP to Account for this Factor

- Average patrol speed (mph), highway/arterial roadways
- Average patrol speed (mph), collector/residential roadways

Geographic Area (Impacts Response Time)

The area, in square miles, of a jurisdiction is taken into account in allocation models when determining the number of officers needed to meet the response time goals set by the law enforcement agency.

Variable Used in MAPP to Account for this Factor

- Area (square miles)

Response Speed (Impacts Response Time)

In addition to the area, in square miles, the average response speed for emergency and non-emergency calls for service is taken into account in allocation models in determining the number of officers needed to meet the response time goals set by the law enforcement agency. Like the issue, previously discussed, associated with determining average patrol

speed, values for the response speed for emergency and nonemergency calls may not be available within the agency. If this is the case, then this value can be derived from prior allocation studies and/or other comparable jurisdictions.

Variables Used in MAPP to Account for this Factor

- Average response speed (mph) for emergency calls for service
- Average response speed (mph) for non-emergency calls for service

Leave Rate

The leave rate also has a significant impact on allocation decisions. This rate is calculated by collecting and analyzing key time off data. A valid leave rate is crucial to the accuracy of patrol allocation decisions and the determination of the number of officers that need to be assigned to patrol. The leave rate for an agency is frequently underestimated, and it is argued that high overtime costs, the inability to cover some beats, the inability to free officers for training, and other staffing level issues can be attributed to inaccurately calculating the actual number of hours officers are available to work on patrol each year.

Typically, each officer is contracted to work 2,086 hours per year (40 hours per week (×) 52.14 weeks per year). However, an officer does not actually work the entire 2,086 hours. There are numerous instances in which officers may not actually be available for patrol during the 2,086 hours they are contracted to work. In order to accurately determine the net annual work hours per officer, all instances in which an officer is not available to work on patrol must be taken into consideration. These include the following:

- * Vacation time;
- * Compensatory time;

- * Sick leave;
- * Training;
- * Holidays;
- * Personal days;
- * Military service;
- * Provisions of the Family and Medical Leave Act;
- * Light-duty assignments for injured officers;
- * Time away from patrol while on special assignments;
- * Jury duty;
- * Worker's compensation time off; and,
- * Administrative leave.

By taking the above factors into account, it may be determined that out of the 2,086 hours officers are contracted to work each year, they are available to work on patrol for only 1,550 hours each year. It is crucial that the net annual work hours are calculated accurately, because if it is inaccurate, it can have a significant impact on staffing and coverage levels. The net annual work hours can then be used to calculate the leave rate by subtracting the net annual work hours from the number of hours officers are contracted to work each year. The result of this subtraction is then divided by the number of hours officers are contracted to work each year to obtain the leave rate.

A corollary to the leave rate is the relief factor. Since patrol officers must be on the street 24 hours a day, 365 days a year, the relief factor is used to determine how many officers are required to fill one position around the clock 365 days a year. For example,

for a 5-day, 8-hour-per-day work week with a common amount of leave, it requires six patrol officers to staff one patrol position around the clock 365 days a year.

Variable Used in MAPP to Account for this Factor

- Average time on leave

Policy Variables

Policy decisions have a significant impact on the allocation of patrol personnel as well. Several factors that impact allocation can be considered policy decisions. Police administrators set values for these variables, and they can be modified by the department as the conditions change. For example, if an administrator believes that the response time goal for emergency calls for service is too high, another lower value can be set and the number of officers needed to meet this new objective can be determined by an allocation model. There is no right or wrong value for any of the policy decisions that impact allocation. It is based on the level of service that a police department wants to provide to its citizens and based on the availability of resources needed to meet the performance objectives set for patrol. Each of the policy decisions that impacts the allocation of police patrol is discussed below.

Policing Service Model

The approach a department takes to policing has a significant impact on the staffing levels required. If a department chooses not to engage in community or problem-oriented policing then time does not have to be set aside for these activities. If a department uses a split-force concept in which one group of officers responds to calls for service and another has the community policing responsibilities, it will affect the number of officers required for patrol. Similarly, as previously discussed, the call management practices and

policies established by administrators have a significant impact on the allocation of patrol resources. For example, if an administrator believes that an officer should respond, in person, to every citizen's request for police service, then more officers will be needed in comparison to more restrictive service models.

Response Time

Response time is a central component in patrol resource allocation. If the department establishes an inappropriate response time goal, it will have an enormous effect on the number of patrol officers required to meet the goal. For example, in the 1973 report of the National Advisory Commission on Criminal Justice Standards and Goals, the response time standard was set at three to five minutes for all part one crime calls and 3 minutes or less for emergency calls in urban areas.⁵ This was an impossible standard to meet for emergency calls for service and one that made little sense when it was understood that most of the part one calls were not emergencies and 67 percent of these crimes were discovered sometime after they had occurred. Therefore, departments now establish response time goals that distinguish between emergency and nonemergency calls for service using a priority system.

The response time goals are set by police administrators and used in allocation models to determine the number of officers needed to meet the response time objectives. If response time goals are set fairly high, then fewer officers will need to be assigned to patrol to meet this objective in comparison to when response time goals are set fairly low. As with all the policy decisions, these values can be modified as changes in policy occur.

⁵ *National Advisory Commission on Criminal Justice Standards and Goals, Police.* (1973). <http://babel.hathitrust.org/cgi/pt?id=uc1.32106001090288;view=image;page=root;size=100;seq=2>. Retrieved on July 6, 2013.

In other words, a department may have a 6 minute response time goal for emergency calls, and patrol is staffed at a level to meet this goal. If the administration decides to lower this goal to 5 minutes, allocation models can be used to determine the number of officers needed to meet the new response time goal of 5 minutes to emergency calls.

Variables Used in MAPP to Account for this Factor

- Response time goal for emergency (Priority 1) calls for service
- Response time goal for Priority 2 calls for service
- Response time goal for Priority 3 calls for service

Immediate Availability to Respond to Emergencies

It is necessary for agencies to have officers available on patrol who can immediately respond to an emergency. The percentage of time that an agency wants at least one officer available to immediately respond to an emergency call for service impacts allocation. An agency will need more officers if administrators want one officer immediately available 95 percent of the time in comparison to an agency that wants one officer immediately available 75 percent of the time. Since emergency calls are potentially life-threatening, the percentage set for this objective is typically very high.

When allocation models determine the number of officers for this purpose, it is assumed that there are occasions when an officer who is on another call for service can clear that call and respond to the emergency call. When the officer is finished responding to the emergency call, then the officer can return to the previous call if another officer has not already covered it. Therefore, a certain percentage of calls for service can be preempted if an officer is needed to respond to an emergency call for service. However, it is also argued that some calls for service cannot or should not be preempted because of

the severity of the call for service, potential escalation, or because of dissatisfaction among citizens. Therefore, the percentage of calls for service that cannot be preempted is a policy decision, and its value impacts patrol allocation. The same is true for administrative activities and self-initiated patrol activities; some of these activities can be preempted so an officer can respond to an emergency call. The percentage of time these activities can and cannot be preempted is a policy decision that must be made by police administrators.

Variables Used in MAPP to Account for this Factor

- Percentage of emergency calls for service with one officer available
- Percentage of calls for service that cannot be preempted
- Percentage of administrative activities that cannot be preempted
- Percentage of self-initiated activities that cannot be preempted

Visibility Objective

A visibility objective is used in some allocation models to determine the number of officers needed for patrol visibility. The visibility objective is based on the answer to the question, how often should a patrol officer pass any given point on a roadway? Basically, if a person stood on a roadway, how often should he or she see a patrol officer? Typically, two visibility objectives are established based on the two types of roadways previously mentioned: major and residential roadways. It is expected that officers will be more visible on major roadways in comparison to residential roadways, therefore a separate visibility objective is set for each type of roadway in some allocation models.

The visibility objective is a policy decision that must be made by police administrators to fit the needs of their community. For example, in prior patrol allocation

studies conducted by the author, the average visibility objective is 4 hours for major roadways. Therefore, it is expected that an officer will pass a given point on a major roadway every 4 hours. This value, however, may be too high or low for many police administrators. Some administrators may be satisfied with a visibility objective of several hours while others may want a 1-hour visibility objective on major roadways. These policy decisions allow administrators an opportunity to set standards for the level of police service they want to provide to the community.

It is also important to note that the visibility objective is basically an average. Therefore, there will be some major roadways in which an officer is seen more frequently than the set visibility objective. Likewise, there will be some major roadways in which an officer is seen less frequently than the set objective.

A separate visibility objective for residential roadways is also established by police administrators. As residential visibility becomes a concern for citizens and administrators, the visibility objective can be lowered and the number of officers that need to be assigned to patrol to meet this new performance objective can be determined. Administrators decide the values for these variables and thus the level of patrol visibility in the community. Higher levels of patrol visibility will require that more officers be assigned to patrol. Likewise, lower levels of patrol visibility will require fewer officers.

Variables Used in MAPP to Account for this Factor

- Patrol visibility objective (hours), highway/arterial roadways
- Patrol visibility objective (hours), collector/residential roadways

Self-Initiated Activity

The amount of time officers spend on self-initiated activities also impacts allocation decisions. This includes time in which an officer can target “hot spots,” perform directed patrol activities, participate in community policing and problem solving activities, stop suspicious individuals, make traffic stops, as well as other activities. Agencies that expect patrol officers to conduct numerous traffic stops, stop suspicious individuals, target “hot spots,” and perform other self-initiated activities during their shift will require more officers assigned to patrol in comparison to agencies that do not emphasize self-initiated activities as much. In addition, a portion of self-initiated officer activity is not discretionary such as the occurrence of an accident or fight in view of an officer.

The time officers spend on self-initiated activities is taken into account in some allocation models. The self-initiated time can also be set similar to a performance objective. This policy decision is based on the answer to the question, how many minutes per hour should an officer spend on self-initiated activities? Unlike the administrative activity discussed below, it is generally not recommended that data on self-initiated activities largely influence this policy decision. Assessing prior practice does not necessarily mean that an adequate amount of time for self-initiated activities was afforded to officers. Administrators may want more self-initiated activities performed than current practice dictates.

Variable Used in MAPP to Account for this Factor

- Self-initiated time in minutes per hour per officer

Administrative Activity

Time spent on administrative activities impacts police patrol allocation as well. Allocation models take into account the administrative time an officer spends on duty in determining the number of officers needed for patrol. Administrative time can include meal breaks, other breaks, vehicle check/maintenance, briefing/roll call, court time, shift preparation activities as well as end of shift activities, and paperwork not completed during calls for service. Administrative time can be set similar to a performance objective. In other words, how many minutes should an officer spend on administrative activities? This is a policy decision, which can certainly be influenced by data. For example, data can be collected on the amount of time officers spend in court, eating meals and taking other breaks (per shift), and attending to vehicle maintenance (e.g., putting gas in the patrol vehicle). The data can be used by administrators in determining the appropriate value that should be set for the administrative time allotted per officer. The higher the value set for this variable, the more officers that will need to be assigned to patrol.

Variable Used in MAPP to Account for this Factor

- Administrative time in minutes per hour per officer

Unrecoverable Patrol Time

Several allocation models try to account for all the time officers spend on calls for service, administrative activities, self-initiated activities as well as efforts to meet performance objectives such as response time, immediate availability to respond to emergencies, and visibility. It is recognized that some patrol time is not used for any of the above purposes and thus can be classified as unrecoverable. As examples, the time

period is too short to increase visibility, to perform a self-initiated activity, or to conduct an administrative activity. This includes short periods of time between the clearing of one call and the receiving of another. It is common for an officer to clear a call and receive another within a few minutes. In this example, there is not enough time between calls for the officer to accomplish other tasks. This also includes time when an officer is stuck in traffic and other occasions as well. This time can be considered unrecoverable patrol time because it cannot be used to meet the performance objectives established by the department.

There is yet another way to conceptualize unrecoverable patrol time. Handling police calls for service is inherently stressful. The police overwhelmingly deal with conflict management. Repeatedly jumping from one conflict situation to another takes a psychological toll on officers. It may simply not be realistic to have an expectation that officers can do this night after night, week after week, month after month, without a break. The unrecoverable patrol time might also be regarded as recovery time for officers. They need some time to calm down, regroup, think through what just occurred, and prepare psychologically for the next conflict that will have to be resolved.

There are professions, albeit very few, in which practitioners do indeed move steadily from one stressful situation to another. Emergency medical technicians in very busy districts is one example; emergency room physicians another. But there is an element in policing that these professionals do not need to deal with; the ever present threat of personal assault. Policing is inherently far more dangerous than statistics indicate. The only reason we do not have a far greater number of officers injured or killed

than we do is because we train and retrain to use strong precaution. Therefore, unrecoverable patrol time can also be considered recovery time.

Variable Used in MAPP to Account for this Factor

- Unrecoverable patrol time in minutes per hour per officer

Two-Officer Patrol Units

Decisions on patrol allocation need to take into consideration and make adjustments for the percentage of time patrol units are staffed with two officers. Two-officer units do reduce the need for back-up units to certain calls for service, but two-officer units are not twice as capable as one-officer units of meeting the stated performance objectives for patrol. For example, a two-officer unit is not twice as visible as a one-officer unit. Likewise, a two-officer unit cannot respond twice as fast to a call for service as a one-officer unit. Therefore, the percentage of time patrol units are staffed with two officers has an impact on police patrol allocation. The value set for this variable in allocation models is a policy decision because the department can set the percentage of time that is acceptable to have two-officer units. It is important to note that even in agencies that deploy 100 percent one-officer units, there will often be two-officer units deployed during the period when there is an increase in vehicle maintenance problems and this must be taken into consideration when making allocation decisions.

Variable Used in MAPP to Account for this Factor

- Percentage of time patrol units are staffed with two officers

HOW POLICY DECISIONS IMPACT PATROL ALLOCATION

This section is designed to discuss how the policy decisions discussed above, and changes in policy decisions, impact the number of officers that need to be assigned to

patrol. Administrators set values for these variables for use in allocation models, and they can be modified by the department as the policies change. For example, if it is believed that a value is too high or low, then another value can be set and the number of officers needed to meet this new objective can be determined. Therefore, each time a policy decision is changed, a different number of officers needs to be assigned to patrol. Changes in some policy decisions can have a significant impact on allocation needs.

The following examples use the Model for the Allocation of Patrol Personnel (MAPP) to calculate the number of officers that need to be assigned to patrol. A few examples will be provided in order to demonstrate the impact that these decisions have on patrol allocation. For each of the examples below, the values set for each policy decision are provided in a table. Example 1 will serve as the base model. The values for the data-driven variables are not presented in the tables; only the values for the policy variables are given. The values for the data-driven variables remain constant in each example; only the values for one or more policy variables have changed.

Example 1: Base MAPP

Example 1 serves as the base MAPP for this section. The values for each policy decision are presented in Table 1.

Table 1 – Base MAPP Policy Decision Values

Policy Decision	Value
1) Self-initiated time in minutes per hour per officer	15 minutes
2) Administrative time in minutes per hour per officer	12.5 minutes
3) Unrecoverable patrol time in minutes per hour per officer	5 minutes
4) Response time goal for emergency (Priority 1) calls for service (minutes)	5 minutes
5) Response time goal for Priority 2 calls for service (minutes)	8 minutes
6) Response time goal for Priority 3 calls for service (minutes)	20 minutes
7) Percentage of emergency calls for service with one officer available	95%
8) Percentage of calls for service that cannot be preempted	55%
9) Percentage of administrative activities that cannot be preempted	15%
10) Percentage of self-initiated activities that cannot be preempted	45%
11) Patrol visibility objective (hours), highway/arterial roadways	4 hours
12) Patrol visibility objective (hours), collector/residential roadways	36 hours
13) Percentage of time patrol units are staffed with two officers	2%

When these values are used in the MAPP along with values for the data-driven variables, it is determined that **108 officers** need to be assigned to patrol. The assignment of 108 officers to patrol would allow the department to meet the performance objectives established involving response time, visibility, and availability to respond to emergency calls. In addition, officers would have 15 minutes per hour (25 percent of shift) for self-initiated activities and 12.5 minutes per hour (about 21 percent of shift) for administrative activities and would be able to answer a specified number of calls for service.

Example 2: Increased Self-Initiated Time

In Example 2, the values for the data-driven variables used in Example 1 remain the same and are, once again, not presented; only one of the policy decisions has changed from the base MAPP (self-initiated time in minutes per hour per officer). The values for each policy decision used in Example 2 are presented in Table 2. In Example 2, self-initiated time was increased from 15 minutes (25 percent of shift) in Example 1 to 20 minutes (about 33% of shift) of self-initiated time in minutes per hour per officer.

Table 2 – MAPP Policy Decision Values with Increased Self-Initiated Time

Policy Decision	Value
1) Self-initiated time in minutes per hour per officer	20 minutes
2) Administrative time in minutes per hour per officer	12.5 minutes
3) Unrecoverable patrol time in minutes per hour per officer	5 minutes
4) Response time goal for emergency (Priority 1) calls for service (minutes)	5 minutes
5) Response time goal for Priority 2 calls for service (minutes)	8 minutes
6) Response time goal for Priority 3 calls for service (minutes)	20 minutes
7) Percentage of emergency calls for service with one officer available	95%
8) Percentage of calls for service that cannot be preempted	55%
9) Percentage of administrative activities that cannot be preempted	15%
10) Percentage of self-initiated activities that cannot be preempted	45%
11) Patrol visibility objective (hours), highway/arterial roadways	4 hours
12) Patrol visibility objective (hours), collector/residential roadways	36 hours
13) Percentage of time patrol units are staffed with two officers	2%

When this modification is made, it is determined, by utilizing the MAPP, that **133 officers** need to be assigned to patrol, a difference of 25 more patrol officers in comparison to Example 1. It is important to note that the department will still be able to meet the performance objectives set in the first example as well as have the same amount of time for administrative activities. Example 2 illustrates the isolated cost of increasing self-initiated activities.

Example 3: Slower Response Times

The values for each policy decision used in Example 3 are presented in Table 3 (once again the values for the data-driven variables remain the same and are not presented).

Table 3 – MAPP Policy Decision Values with Slower Response Times

Policy Decision	Value
1) Self-initiated time in minutes per hour per officer	15 minutes
2) Administrative time in minutes per hour per officer	12.5 minutes
3) Unrecoverable patrol time in minutes per hour per officer	5 minutes
4) Response time goal for emergency (Priority 1) calls for service (minutes)	6 minutes
5) Response time goal for Priority 2 calls for service (minutes)	15 minutes
6) Response time goal for Priority 3 calls for service (minutes)	20 minutes
7) Percentage of emergency calls for service with one officer available	95%
8) Percentage of calls for service that cannot be preempted	55%
9) Percentage of administrative activities that cannot be preempted	15%
10) Percentage of self-initiated activities that cannot be preempted	45%
11) Patrol visibility objective (hours), highway/arterial roadways	4 hours
12) Patrol visibility objective (hours), collector/residential roadways	36 hours
13) Percentage of time patrol units are staffed with two officers	2%

Two modifications are made in this example in comparison to the base MAPP presented in Example 1. First, the response time goal for emergency (Priority 1) calls for service was increased from 5 minutes in Example 1 to 6 minutes in this example. Second, the response time goal for Priority 2 calls for service was increased from 8 minutes in Example 1 to 15 minutes in this example. When these two modifications are made to the base MAPP, it is determined that **99 officers** need to be assigned to patrol, a difference of 9 fewer officers in comparison to the first example. Therefore, it will take patrol officers more time to respond to Priority 1 and 2 calls for service in comparison to the first example, but the department will still be able to meet the other performance objectives as well as allocate time for administrative and self-initiated activities.

Example 4: Increased Visibility

The values for each policy decision used in Example 4 are presented in Table 4 (once again the values for the data-driven variables remain the same and are not presented).

Table 4 – MAPP Policy Decision Values with Increased Visibility

Policy Decision	Value
1) Self-initiated time in minutes per hour per officer	15 minutes
2) Administrative time in minutes per hour per officer	12.5 minutes
3) Unrecoverable patrol time in minutes per hour per officer	5 minutes
4) Response time goal for emergency (Priority 1) calls for service (minutes)	5 minutes
5) Response time goal for Priority 2 calls for service (minutes)	8 minutes
6) Response time goal for Priority 3 calls for service (minutes)	20 minutes
7) Percentage of emergency calls for service with one officer available	95%
8) Percentage of calls for service that cannot be preempted	55%
9) Percentage of administrative activities that cannot be preempted	15%
10) Percentage of self-initiated activities that cannot be preempted	45%
11) Patrol visibility objective (hours), highway/arterial roadways	2 hours
12) Patrol visibility objective (hours), collector/residential roadways	24 hours
13) Percentage of time patrol units are staffed with two officers	2%

Two modifications are made in this example in comparison to the first example. First, the patrol visibility objective for highway/arterial roadways was reduced from 4 hours in Example 1 to 2 hours in this example. Second, the patrol visibility objective for collector/residential roadways was reduced from 36 hours in Example 1 to 24 hours in this example. These modifications will lead to greater visibility of patrol officers in the community. Utilizing the MAPP, it is determined that **114 officers** need to be assigned to patrol to meet the performance objectives set in this example. This is an increase of 6 patrol officers in comparison to the first example.

DISCUSSION AND CONCLUSION

As demonstrated in this paper, the answer to the question, “How many patrol officers/deputies are needed?” varies based on several factors. The MAPP allows the user to specify the values for several performance objectives/variables in determining the number of officers that should be assigned to patrol. Many of these variables are policy decisions for which there is no outside correct answer. It depends upon the level of police

service desired in the community as well as what a given community is willing to purchase in police services.

The question then becomes, which of the above examples is right? The answer is that which is right is the wrong question. Each example accurately determines the number of officers that need to be assigned to patrol to meet the performance objectives set by the policy decisions. These examples demonstrate the critical importance of making logical and well thought out policy decisions on these variables. Saying that officers should respond to emergency calls for service in 5 minutes has significant ramifications on the number of officers that needs to be assigned to patrol. Similarly, using two-officer units, allocating a significant amount of time for self-initiated activities, and making any other modifications to the values used in allocation models can have a significant impact on the bottom line: the number of officers that needs to be assigned to patrol.

There should be consensus among the command staff of a law enforcement agency regarding which values should be set for these policy decisions and then patrol should be staffed based on the results of the allocation model utilized by the department. Staffing patrol to the level recommended by an allocation model will allow a department to meet the performance objectives set by the policy decisions. If patrol is not staffed to those requirements, then the performance objectives will not be met.