Methods for Determining a Resource Deployment Strategy for the Violet Township Fire Department

By: Kevin McFarland
Lieutenant
Violet Township Fire Department
8700 Refugee Road, Pickerington, OH 43147

A research project submitted to the Ohio Fire Executive Program

4 December 2016

CERTIFICATION STATEMENT

I hereby certify that the following statements are true:

1. This paper constitutes my own product, that where the language of others is set forth, quotation marks so indicate, and that appropriate credit is given where I have used the language, ideas, expressions, or writings of another.

2. I have affirmed the use of proper spelling and grammar in this document by using the spell and grammar check functions of a word processing software program and correcting the errors as suggested by the program.

Signed: _____

Printed Name: _____

ABSTRACT

The problem this study will address is the Violet Township Fire Department (VTFD) does not currently have a process to evaluate or plan for the future deployment of its resources. The purpose of this study is to develop and recommend a process and criteria that can be used in evaluating and planning for future deployment of department resources.

Four research questions were examined throughout the course of this project using a descriptive research method. The first question sought to determine what methods departments are using to determine station placement and resource allocation. Additionally, the research investigated what performance criteria departments are using to determine resource deployment schedules. The third question asked if the VTFD complies with national standards for response times in both Fire and EMS. The final question asked what criteria the VTFD deemed to be the most critical in determining the assignment of resources.

Procedurally, the research design consisted of two surveys. The groups polled were the Metropolitan Emergency Communications Center (MECC) departments and the Ohio Fire Chiefs.

The results determined that the VTFD needs to track and analyze more data. There is a need for a software system to compile run data to all areas of the township, en route times, on scene times, and types of calls. This data needs to be compared to national standards and disseminated to the members of the department. Additionally, the department needs to research the accreditation process. It was also recommended that the VTFD complete a Standards of Coverage document to set a guideline for department operations.

TABLE OF CONTENTS

INTRODUCTION

Statement of the Problem

The problem this study will address is the Violet Township Fire Department (VTFD) does not currently have a process to evaluate or plan for the future deployment of its resources. Due to the increase in growth and need to deploy additional resources, the department is constructing a new station that will eliminate restrictions on what equipment can fit into the building. The department needs to find a process that will place their equipment in the best location to serve the residents of Violet Township.

Purpose of the Study

The purpose of this study is to develop and recommend a process and criteria that can be used in evaluating and planning for future deployment of department resources.

Research Questions

The research questions this study will investigate using descriptive research are:

1. What methods are currently being used to determine station placement and resource allocation?
2. What performance criteria are other similar departments using when determining their deployment schedules?
3. Does the VTFD comply with national standards for response times in both Fire and EMS?
4. What criteria does the VTFD deem to be the most critical in determining assignment of resources?

BACKGROUND AND SIGNIFICANCE

Violet Township Fire Department currently provides service to a 42 square mile area of northwest Fairfield County out of three stations. The township has a population of 39,841 which is an increase of 40% since 2002. Residential homes protected by the department have also increased by 49% during this same time period. The number of businesses protected and inspected has increased from 400 to 812, or 103%. The overall valuation of the community has increased by 62%. Figure 1 shows the 42 square mile area of Violet Township in purple, with station locations identified.

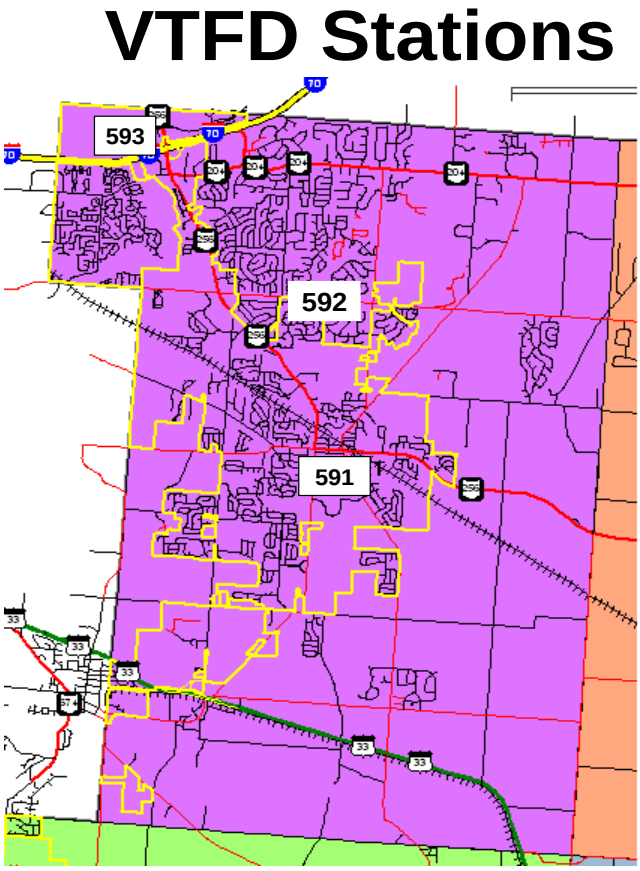


Figure 1

The fire department is currently experiencing increased run volumes in both EMS and Fire. Table 1 shows the run statistics from the Violet Township Year-End Reports (2010-2015). Fire and EMS run volumes have increased about 15% during the years 2010 until 2015. These statistics only reflect total runs for the department and cannot be broken down to specific fields at this time.

Table 1

Year-End Run Statistics for the VTFD

Year	Runs	Percentage Change
2010	4464	
2011	4357	-2.4%
2012	4801	+10.2%
2013	4706	-2%
2014	5022	+6.7
2015	5144	+2.4

A critical factor in the effectiveness of any emergency response agency is the ability to get personnel and equipment to the scene of the emergency in a timely manner. NFPA 1710 defines a specific benchmark time for career fire departments to place their first emergency response unit (ERU) en route to an emergency. Robert Upson and Kathy Notarianni use this standard as basis for their book *Quantitative Evaluation of Fire and EMS Mobilization Times* (2010). They use the NFPA 1710 standard that requires the first EMS ERU to be en route within 60 seconds 90% of the time and the first fire ERU to be en route within 80 seconds 90% of the

time measured from the beginning of alert notification. The VTFD turns out in 90 seconds or less 70.6% of the time for fire calls.

The Insurance Services Organization (ISO) provides additional guidance and recommendations for resource deployment and station locations. ISO's Public Protection Classification Program (PPC) plays an important role in the underwriting process at insurance companies (ISO report, 2015). In fact, most U.S. insurers use PPC information as part of their decision making when deciding what business to write, coverages to offer, or prices to charge for personal or commercial property insurance.

The department recently received a classification of 02/2Y in November of 2015 (ISO report, 2015). This places the VTFD in the top 1.8% of Ohio's 2,836 communities. There are only 51 Class 2 fire departments in Ohio (VTFD Levy Flyer, 2014). In the entire United States, there are only 1,060 departments with this rating, which puts Violet in the top 2.4% nationwide. This PPC rating is important to both fire departments and the communities they serve because an improved rating from a prior rating may get the homeowner lower insurance prices. The PPC rating also provides fire departments with a valuable benchmark, and is used by many departments as a valuable tool when planning, budgeting, and justifying fire protection improvements. Class 1 represents an exemplary fire suppression program, and Class 10 indicates that the area's fire suppression program does not meet ISO's minimum criteria.

Station 591 Located at 21 Lockville Rd.

Station 591 is the oldest of the three stations and was constructed in 1953 to house the volunteer firemen of Violet Township. It was designed to be the original township fire station and trustee meeting hall. The building was never designed to accommodate the current operations of a modern fire department. Over the last 60 years, many second floor living quarters remodels have been completed to house an increase in staffing. In the summer of 2003, the bay floors were dug out and lowered to help fit new trucks into the small station. The current bay height of 109 inches is still a very low height compared to any new fire station. The engine housed here only has approximately 2 inches of clearance on any side. This station currently houses two medic units (primary medic and a back-up medic), an engine company, and a grass truck.

Station 592 Located at 8700 Refugee Rd.

Station 592 was opened as the department headquarters in June of 1997. It continues to serve the township in that capacity and is an expansive building of 15,000 square feet. The department administration recognized this location as the center of the northern portion of the township and felt it was the best location to build Station 592 (Taylor, 2016). The department then negotiated with the landowner for the donation of the land. This building houses the administration (Chief, Assistant Chief, and Administrative Assistant), two prevention officers, a community medic, and the daily firefighting staff (5-10 personnel). The equipment assigned to Station 592 is an engine, a heavy rescue, a medic and a battalion SUV command vehicle. The bays are designed to be drive-thru, but storage of back-up equipment eliminates this feature.

Station 593 Located at 2365 Taylor Square Dr.

Station 593 is a unique single piece firehouse built in the end of a strip mall at the northern corner of Violet Township. This station was opened in 2006 and houses a medic with three personnel. The department did extensive research on opening this satellite station that is leased from the owners of the strip mall. Station 593's bay height does not pose a problem to putting any truck inside the building. Even though this station only houses a medic, it is built to house any truck in our fleet.

Not all of the equipment can fit into the bays at Station 591, which limits the department on where it can strategically place equipment (Appendix 1). E-592 is an engine company with a unique feature; it has a 61 foot SkyBoom on top of the truck to use as an elevated master stream. This feature has been used multiple times in Station 591's first-due area at fires and one rooftop

rescue. R-592 is another "specialty truck" that will not fit into Station 591. It has been placed at Station 592 because that is the only building big enough to house this truck.

New Station 591 Under Construction Fall 2016 Located at 21 Lockville Rd.

In August of 2016, ground was broken for a new Station 591 to be located at the site of the current station. The cost of the new firehouse is about $6 million, which includes the acquisition of two properties at 5 and 13 W. Columbus St. as well as environmental and soil studies (Gazette, 2016). In an interview with Chief Mike Little, he stated that there were 3 initial sites on which this station could be constructed (2016). One major factor in determining this station location was keeping it in the city of Pickerington, mainly old town Pickerington. The VTFD has had a presence in the old town area since the inception of the department and did not want to move to a location outside of the old town area. After a long process of looking at the other sites within the city and unsuccessfully attempting to acquire land, it was determined building on the existing site would be the best choice.

VTFD apparatus placement has been dictated by the size of the stations and where the trucks physically fit in the bays. At this time, E-592 and R-592 can only be housed at Station 592. This is about to change with the construction of the previously mentioned Station 591. Historically, the officers on the department met and discussed where staffing and equipment would be located. No science was used, just good old fashioned discussion and opinions.

At any point and time, Station 591 has the staffing (minimum of 5, maximum of 6) for two pieces of equipment out of the four available. They cover the southern portion of the township and have a very large area to cover. This area is growing rapidly with new single-family housing, multiple-family housing, and commercial development. Current operational standards direct the crew at Station 591 to send M-594 on any second EMS call in their area. M-594 is cross-staffed with two members of E-591's crew. This effectively takes E-591 out of service and puts the officer in the grass truck alone. The officer can possibly be first-due to a working fire alone and with very few options in the grass truck.

Station 592 has the staffing (minimum of 5, maximum of 7) for three pieces of equipment out of the four available. The battalion chief is always with his vehicle and the other trucks are cross-staffed. The crew of R-592 will take E-592 on any fire in the township unless they are already out in the rescue. R-592 does not have a pump or water and is strictly a heavy rescue unit. If they are in quarters, the medic crew will move over to the rescue for any fire in the township and leave the medic in quarters. Any truck cross-staffed with the medic crew will only have two personnel on it. If both the rescue and medic are out on a call or training, the engine with our elevated waterway remains in quarters. This potentially leaves the township with only one engine to protect 42 square miles of territory that does not have elevated master stream options.

Many years ago, the officers designated the trucks at Station 592 as “specialty trucks.” They were referring to E-592 with the elevated waterway and Heavy Rescue 592. This is why Station 592 always has more staffing than Station 591. The leadership wanted to make sure it had more staffing available for the bigger specialty trucks. Even with the addition of staff, the department administration has never looked at adjusting manpower or moving equipment. The only statistical data researched by the administration are the above mentioned ISO report and year-end run statistics.

The VTFD has a unique opportunity to conduct research to determine where our equipment can best serve the residents of Violet Township. The purchase of the new equipment (R-592 and E-592) and the construction of a new firehouse provide the department with options not previously available. Along with the efficient placement of apparatus in the stations, the department administration can review its response policies to become a better functioning department that can handle a large volume of calls.

The potential impact this study could have on the VTFD is using a proven research method to determine apparatus placement and possibly move closer to accreditation.

LITERATURE REVIEW

The literature review information was researched to answer the four research questions. The focus of the literature was on finding what process to use to determine resource allocation, not to actually allocate the resources of the Violet Township Fire Department. The resources were obtained from internet sites, textbooks, journals, past Ohio Fire Executive (OFE) papers, past National Fire Academy (NFA) Executive Fire Officer (EFO) papers, and some periodicals. Officials from Violet Township, Washington Township, and the Newark Fire Department were personally contacted for information pertaining to the research questions.

Traditionally, the focus of risk assessment has been the identification of fire hazards and planning an appropriate suppression response force to mitigate the emergency. Today, risk assessment goes well beyond the fire problem to medical and other emergencies. Fire chiefs must assess a wide array of hazards, the risk level associated with an adverse event involving those hazards and the necessary resources for response to such an event.

The *NFPA Fire Protection Handbook* defines hazard levels of occupancies by types and each level carries inherent risks (NFPA, 2008). The three levels are as follows:

- **High-Hazard Occupancies**—Schools, hospitals, nursing homes, explosive plants, refineries, high-rise buildings and other high life hazard or large fire potential occupancies.

- **Medium-Hazard Occupancies**—Apartment, offices, mercantile and industrial occupancies not normally requiring extensive rescue by fire fighting forces.

- **Low-Hazard Occupancies**—One-, two-, or three-family dwellings and scattered small business and industrial occupancies.

Fire service leaders assess the number and location of each type of occupancy and its associated hazard level and then plan resource deployment to assure that sufficient fire department resources are dispatched to adverse events that occur in the occupancies.

A main component of managing community risk is determining local fire and emergency service levels and capabilities (ICMA, 2012). The most important point to remember is that fire and emergency service capabilities should not be developed in isolation from community risks. While nearly all fire departments must have certain fundamental capabilities, communities vary considerably in terms of risk, resources, and demands for service that will affect service levels and program choices.

In his research project entitled *Critical Need: Assessing Staffing and Resource Allocation within the Grayslake Fire Protection District,* John Christian identified that the history of fire station location for adequate response has been traced back to the all volunteer days (2010). This method was literally to put fire stations in locations that were easily accessed by these early firefighters. As career departments evolved, the thought process changed with the focus on putting stations and resources far enough apart to provide services to the entire community with no overlap. Today, if done correctly, eight specific components; risk expectations, service level objectives, risk identification, distribution, concentration, performance and reliability, existing deployment, and overall evaluation are researched and assessed to ensure proper fire department resource allocation (Christian, 2010).

Fire department operational performance is a function of three considerations; resource availability/reliability, department capability and overall effectiveness (Urban Fire Forum, 2011).

The probability of any given unit's availability is one indicator of the fire department's response reliability. Response reliability is defined as the probability that the required number of competently prepared staff and properly equipped apparatus will be available when a fire or emergency call is received. An effective response force is the minimum number of firefighters and equipment that must reach a specific emergency incident location within a maximum prescribed travel time. The maximum prescribed travel time acts as one indicator of resource deployment efficiency. As the number of emergency calls per day increases, the probability that a needed piece of apparatus will be busy when a call is received also increases. Consequently, if the right amount of redundancy is not built into the system so that timely and adequate response to emergency calls can be maintained, the department's response reliability decreases.

Once the details of risks/hazards are known for a community, the fire department can plan and deploy adequate resources to either manage the know risks or respond and mitigate the emergency when an adverse risk event like an unwanted fire or medical emergency occurs.

There are a number of resources available to assist fire service leaders in planning for adequate resource deployment in their community to assure that firefighter intervention in a risk event occurs in a timely manner to limit negative outcomes. The resources that apply to this study and the Violet Township Fire Department are explained below.

NFPA 1710 (2016) specifies the number of on-duty fire suppression personnel sufficient to carry out the necessary fire fighting task operations given expected fire fighting conditions in various hazard level occupancies. Though 1710 specifically addresses low hazard environments, it also mentions medium and high hazard levels as well. Excerpts from NFPA 1710 that pertain to VTFD operations are below.

4.1.2.1 The fire department shall establish the following objective: (2) 80 seconds turnout time for fire and special operations response and 60 seconds turnout time for EMS response.

5.2.2* Staffing. The number of on-duty fire suppression personnel shall be sufficient to perform the necessary firefighting operations given the expected fire conditions. The VTFD will need to look at its staffing levels to see if it has the proper staffing in place. This includes when multiple runs are occurring at the same time. The department has no plans to increase staffing in the near future, only replace members who retire or leave the department.

5.2.3 Operating Units. Fire company staffing requirements shall be based on minimum levels necessary for safe, effective, and efficient emergency levels. The VTFD has minimum staffing levels for each station, but no set minimum staffing level for apparatus.

5.2.3.1 Fire companies whose primary functions are to pump and deliver water and perform basic fire fighting at fires, including search and rescue, shall be known as engine companies. This applies to all VTFD engines, even E-592 with the elevated waterway. It will also apply to R-592 since it will operate as an engine/rescue.

5.2.3.1.1 These companies shall be staffed with a minimum of four on-duty members. VTFD rarely has four on-duty members staffing an engine company.

5.2.4 Deployment. This part of the standard discusses minimum requirements for initial full alarm assignments to multiple different structures/occupancies. The VTFD currently handles this type of deployment by using automated run card assignments. The dispatch center has run cards for all types of hazards within Violet Township that will assign the proper trucks to the event. These cards include the use of mutual aid departments.

5.3.3 EMS System Functions. The VTFD has determined that it will operate all of its equipment at an ALS (Advanced Life Support) level.

5.3.3.2.1 On-duty EMS units shall be staffed with the minimum personnel necessary for emergency medical care relative to the level of EMS provided by the fire department. The VTFD operates two-person medic units on all calls, no matter ALS or BLS. Each of the two members is state certified paramedics (all full-time VTFD personnel are FF II/Paramedics).

NFPA 1201 (2015) is the standard for Providing Fire and Emergency Services to the Public. It refers to and suggests aspects of community fire protection. Specifically, the standard refers to management and supervision of fire companies, fire/EMS staffing, and stations. The VTFD referenced this guideline to help make decisions on station locations, staffing, and how to decrease response times by utilization of different methods (Barr, 2006). Excerpts from NFPA 1201 that pertain to VTFD operations are below.

3.3.3* Fire and Emergency Service Organization (FESO). Any public, private, governmental, or military organization that provides emergency response, fire suppression, and related activities, whether for profit or government owned and operated. The VTFD provides both fire and EMS to the residents of Violet Township.

4.4.2 A master plan shall be created to coordinate the vision, mission, values, and goals of the FESO. The VTFD keeps these in the view of the firefighters by posting them in each station in common areas to view every shift.

4.4.2 The fire and emergency service system shall include a master plan for a service-area-wide balanced and cost-effective hazard management strategy that takes into consideration existing conditions and anticipates overall community growth. VTFD carefully budgets its money each year and anticipates major community growth in the next 10 years.

4.5.2 The FESO shall have an organizational structure of the size and complexity required to accomplish its mission. Staffing at the VTFD is calculated on run volume and ability to meet union agreed staffing levels.

NFPA 1600 (2013) is the Standard on Disaster/Emergency Management and Business Continuity Programs. Community preparedness programs should incorporate all elements identified in NFPA 1600. The program should also consider day-to-day emergency operations. If a jurisdiction can't appropriately handle everyday incidents, they certainly won't be able to handle a large, catastrophic incident. The entity should develop and implement a strategy to eliminate identified hazards or mitigate the effects of those hazards. The mitigation strategy will be based on results of the hazard identification and risk assessment, impact analysis, programs assessment, operational experience, and cost-benefit analysis.

One method of measuring fire and emergency service departments against established criteria is the Commission on Fire Accreditation International (CFAI) accreditation process, which is currently used by Washington Township Fire Department in Dublin, Ohio (Lynn, 2016). One component of this process is a thorough self-assessment. An organization measures itself against criteria within ten categories prescribed by CFAI. When the organization believes it meets the criteria, an independent evaluation team visits it and audits the results.

A major component of accreditation is the Standards of Coverage document. In the *Standards of Cover, 6th Edition,* the Center for Public Safety Excellence defines the process, known as "deployment analysis," as written procedures which determine the distribution and concentration of fixed and mobile resources of an organization (2015). The purpose of completing such a document is to assist the agency in ensuring a safe and effective response force for fire suppression, emergency medical services, and specialty response situations in

addition to homeland security issues. The development of the Standards of Coverage document will cover the following areas: Description of Community Served; Review of Services Provided; Review of Community Expectations and Performance Goals; Overview of Community Risks; Review of Historical System Performance; Performance Objectives and Performance Measures; Overview of Compliance Methodology; and Overall Evaluation, Conclusions, and Recommendations (CPSE, 2015).

Self-assessment and accreditation provide the fire and emergency service organizations with opportunities to develop both baseline and benchmarking information (ICMA, 2012). Thus, the accreditation process helps them define their levels of service. Furthermore, self-assessment is not a one-time event but an evolving, iterative process that often leads fire organizations to develop a wide range of documented operational objectives—from strategic plans to short-term plans of action to support documents for day-to-day operations—all of which are necessary foundation components of performance management.

Ideally, a FESO will prepare a deployment plan that looks at least ten years into the future and serves as the basis for the organization's long-range resource planning. This plan should include needs for stations and other facilities as well as for apparatus and staffing. Key considerations should include condition, size, and serviceability of existing stations; number, age, and mix of apparatus; and future growth or changes in development or population patterns within the community (ICMA, 2012).

In the NFPA document *Trends and Patterns of U.S. Fire Loss*, Marty Ahrens states that over the past three decades, the number of fire department responses has increased sharply (2016). The largest increase was in medical aid and rescue calls. In 2014, structure fires accounted for 38% of reported fires, with home structure fires representing 28% of the total.

Home structure fires caused 84% of all civilian fire deaths, 75% of civilian fire injuries, and 59% of total direct property damage. While today's fire departments do much more than fight fires, home structure fires are still a serious problem.

Most of the nation's fire departments integrate emergency medical services (EMS) into the operations of the fire department. In fire-based EMS agencies, fire personnel are generally cross-trained as emergency medical technicians (EMTs) or paramedics. Fire station facilities are typically located strategically throughout a community, and co-locating EMS resources can be an efficient and logical approach to providing adequate coverage.

The organization's structure of fire-based EMS agencies can vary. Some departments maintain their emergency medical services in a separate division and command structure. Others fully integrate all aspects of their medical services and fire operations throughout the department's hierarchy.

Some departments in the United States are now dynamically deploying their EMS resources. The Richmond (Virginia) Ambulance Authority uses sophisticated software programs to analyze emergency incident volume by hour of the day of the week, and it places ambulances in locations predicted to optimize response times for the expected incoming calls (ICMA, 2012). In addition to predicting the locations of future emergency incidents, the computerized algorithms guide the redeployment of available resources to ensure that the system efficiently maintains desired service levels during periods of emergency response.

In early 2012, the Fire Department of New York (FDNY) began a pilot program to evaluate whether more ambulances can be made available for life-threatening medical emergencies during high-volume periods (FDNY, 2012/2013). Instead of committing limited resources to minor injuries or illnesses, the Department will hold or "queue" certain low-priority

calls during periods of high volume, thus maintaining improved ambulance availability for high-priority, life-threatening calls.

The International Association of Fire Fighters (IAFF) Fire-Community Assessment Response Evaluation System, also known as FireCARES, will provide real-time access to information that shows exactly what risks fire fighters and the public face (2016). A national fire station file is already pre-loaded in FireCARES. By selecting a station from their community data set, IAFF leaders will be able to see if it's located properly, as well as add the response resources necessary for building a scientifically sound risk profile. FireCARES also offers the opportunity to add your department's response data to the system.

Several approaches to strategic performance management are being used and refined by FESO in North America. Regardless of the approach chosen, it is important to identify and understand the key program areas (major groupings of activities that provide services to the public), develop standardized ways to measure what is being done, and employ effective ways to display and share information. The measures should be tied to the goals and objectives outlined in the department's strategic plans.

Measures should be developed at three levels – organizational (strategic), process (tactical), and job/performer (individual) – and, at each level, for each of the three needs – goals, design, and management (ICMA, 2012). At every level (especially the crew level), supervisors and managers must have access to the performance measures. They must use them to identify and correct unwanted outcomes by engaging the people involved in crafting changes to the process.

As more fire and emergency service organizations learn how to use performance measurement, fire service leaders will be held increasingly accountable for their organization's

performance or lack of it. Battalion chiefs and company officers will have to become comfortable with and proficient at performance measurement. Several Central Ohio departments track many different performance measurements to make their departments more efficient. Crew leaders will have to learn how to use quantitative measurement and analytical methods to describe and improve the performance of their crews. Teaching the crews that data measurement is not punitive will be a difficult task, but it must be accomplished by the department administration for the department to succeed.

Successful fire and emergency service managers of the future will be as proficient in developing and interpreting run charts and other quality assurance tools as they currently are in working in prefire plans. Learning how to measure performance, analyze the data obtained, and use the data to manage the improvement of operational outcomes is the current challenge facing all supervisors and managers in the fire service. There is much to be learned and much to be gained by practicing performance management.

Effectively managing a fire department requires an understanding of and an ability to demonstrate how changes to resources will affect community outcomes. It is imperative that fire department leaders know how fire department resource deployment in their community affects community outcomes in three important areas: firefighter injury and death; civilian injury and death; property loss and environmental impact. If fire department resources (both mobile and personnel) are deployed to match the risk levels inherent to hazards in the community, then it is expected that outcomes in all three areas will likely be positive.

Police departments have been tracking data and using it to deploy resources since the 1980s. William Bratton, commissioner of the New York Police Department from 1994 to 1996, presided over a dramatic decline in the city's crime rate. Hired by Mayor Rudolph Giuliani as

part of a new crime fighting initiative, Bratton embraced the "broken windows" theory that made him as successful as the chief of the city's transit police.

Andrea Nagy and Joel Podolny state in their case study *William Bratton and the NYPD: Crime Control through Middle Management Reform* that just as a delivery company, in order to maximize speed and accuracy, would track the location of packages and trucks hour by hour, so the police department, in order to deliver a low crime rate, needed to track crime (2008). The precinct commander needed to know not just in general what were the tough neighborhoods but in detail what crimes were being committed and when and where. Bratton saw it was essential to analyze information properly, devise an effective and legal plan for action, and then follow through. Through an automated system called Compstat, he monitored the time, type, and location of crimes in each precinct on a weekly basis.

The response to Bratton's changes was immediate. Crime rates plummeted, and morale skyrocketed. Bratton was credited with transforming the structure and culture of the NYPD in a way that had never been done before. Bratton's success allowed Mayor Giuliani to fulfill his campaign promise that New Yorkers could "regain control of everyday life" (Nagy, 2008).

The literature review has provided answers to the research questions, but has also shown that there is much more to learn on the topic of resource allocation. It has identified that the current system most fire departments use, including the VTFD, works well for structural fire response, but may not be the most effective nor efficient model for the majority of calls that are being responded to today. This research will help provide the Violet Township Fire Department with a starting place to begin further plans for deploying the assets available within the department.

PROCEDURES

The research design will consist of three different sections. The first section will target the departments in the Metropolitan Emergency Communications Center (MECC) district, which includes the VTFD. This survey will look at how these departments track data and how they use that data within their organizations. The second survey group to be polled will be the Ohio Fire Chiefs, reaching a broader audience, to see how the state of Ohio tracks data. The third section will include an interview with Newark Fire Department Assistant Chief Tom O'Brien who conducts accreditation surveys for departments across the country.

The MECC district is made up of six different departments. These departments are from the same geographic region and are of similar size and scope to the VTFD. The departments that fall into the MECC district are the Violet Township Fire Department, Truro Township Fire Department, City of Whitehall Fire Department, Jefferson Township Fire Department, Mifflin Township Fire Department, and the Plain Township Fire Department. An online survey using AllCounted.com is what will be used to collect data. The goal of this survey is to see what our neighboring departments are doing with the data they collect.

The second survey will be sent out to Ohio Fire Chiefs, department heads and OFE Class 15 members, to get a broader scope of how departments in the entire state track data. An online survey using AllCounted.com will also be used for this data collection.

The final segment will consist of an interview with Newark Fire Department AC O'Brien to get national statistics from his personal experience. I will then compare this data with what is collected from MECC and the Ohio Fire Chiefs.

Definition of Terms

- Accreditation Process: All-encompassing review that is done by the department. It offers a self-assessment guide, helps development of a standard of cover, requires departments to have strategic plans, and trains department individuals who might be tasked with the development of these items.
- Fire District: One or more municipalities or townships join to form a joint fire district comprising the municipal corporations and all or any portions of the townships mutually agreed upon.
- ISO: Insurance Services Organization. Provides guidance and recommendations for resource deployment and station locations. It's ratings of departments play an important role in the underwriting process at insurance companies.
- MECC: Metropolitan Emergency Communications Center. A dispatch center that covers six departments on the east side of Columbus, OH. Along with dispatch communication, the MECC sets standards for EMS and fire protocols.
- NFPA: National Fire Protection Association. NFPA delivers information and knowledge through more than 300 consensus codes and standards, research, training, education, outreach and advocacy.
- NFPA 1710: Standard for Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments.
- Standards of Coverage Document: Written procedures which determine the distribution and concentration of fixed and mobile resources of an organization.
- Strategic Plan: A broadly-defined plan aimed at creating a desired future.

Limitations of the Study

- This study was designed to benefit the Violet Township Fire Department. The study results may not accurately portray other fire departments in different areas of the country.
- The researcher could find very little data on the effects of the accreditation process itself. The need for more data can only be solved as more departments enter the accreditation process.

RESULTS

Two surveys were sent out to various fire departments. The first survey was sent out to the MECC Chiefs and consisted of 16 questions that identified the size of the department, how they deployed resources, and what data they collect. Additionally, the study asked if the departments participated in the accreditation process. This survey was sent out to 6 departments and 4 responded with a survey participation rate of 67%. The same survey was sent to the Ohio Fire Chiefs and OFE class 15. One-hundred and ten surveys were distributed and 34 were received with a participation rate of 31%. The survey questions were designed to support the research questions and assist the author in finding what methods other departments use to determine resource allocation.

The first research question sought to determine what methods departments are using to determine station placement and resource allocation. This question was answered based on information described in the literature review. The survey results showed that over 60% of those surveyed use analysis of run statistics to determine resource allocation and station locations. Less than 15% of those surveyed utilize an outside consultant to assist in determining resource allocation.

The second and third research questions sought to determine what performance criteria

fire departments track. The Literature Review determined that NFPA 1710 defines a specific benchmark time for career fire departments to place their first emergency response unit en route to an emergency. The survey results showed that 75% of the MECC agencies and 65% of the Ohio Fire Chiefs agencies meet this standard. This number may be a bit high due to false tracking data. It has been noticed that trucks can be marked en route before they are actually moving and this skews the data. For this data to be accurate, the responding unit needs to wait to mark en route until they are actually moving out of the station.

The final research question was focused on finding out what criteria is determined to be the most critical in determining assignment of resources. This was the hardest question to answer, because most answers received were opinions and not facts. Approximately 80% of both groups surveyed do not have a standards of coverage document. This translates in to 0% of MECC and only 17% of the Ohio Fire Chiefs departments participating in the accreditation process. The majority of departments look at analysis of run statistics and opinion of the department administration to determine resource allocation. Assistant Chief O'Brien of the Newark Fire Department states that this is where fire departments have failed to utilize the accreditation system.

DISCUSSION

Tradition is a strong word in the fire service. It stands for our past from the founding father of Ben Franklin to our daily operations within the fire house walls. Traditionally, the fire service identified fire station location and resource allocation by making them easily accessible to the early volunteer firefighters. As career departments evolved, the thought process changed with the focus on putting stations and resources far enough apart to provide services to the entire

community with no overlap. The problem discovered in this research is that most fire departments have failed to utilize available data and systems to determine resource allocation.

For most fire departments, new stations have not been built during the current administrations tenure. One chief even stated in his survey response that he has no choice in station location because that is where they have always been. This was the case for VTFD Station 591 in Pickerington. It was the original firehouse for the volunteer firefighters that was converted to house a full-time department. The tradition of keeping stations in the same locations could lead departments to have poor response times in a community that has changed dramatically over many years. The small village of yesteryear may now be a bustling metropolis.

Over 50% of all surveys stated that they use analysis of run statistics to determine station location (Appendix 3). The VTFD is building a new station to replace current station 591. Many factors went into the determination of this location: Run statistics, cost, geographic location in township, etc. One major factor in determining this station location had nothing to do with run statistics; it was to keep a presence in the old town section of Pickerington. The tradition of having a station in old town and political issues played a major role in deciding to build the new station on the same site as the existing facility.

Data collection within the VTFD has mostly consisted of year-end run statistics. Overall run volume, EMS run numbers, fire run numbers, and runs taken per firefighter have been the only data tracked. Two years ago the department started tracking turn-out times (time from dispatch to en route) to see if they are meeting the national standard on response times. The survey results show that this data is what most departments track and base their decisions for

resource allocation. It is better than not tracking data at all, but it does not provide the best information for the allocation of resources.

On January 1, 2017, the VTFD will start using a new software system for run reporting, staffing, daily log, records keeping, and data tracking. This software will provide the opportunity for the department to track runs, both fire and EMS, to one square mile quadrants within the township. It will provide for better analysis of the resource deployment between the three stations. All of the MECC departments will be on the same software system and have the opportunity to analyze data to best serve their communities.

Many organizations have turned to outside consultants to assist them in evaluating fire department operations. None of the MECC departments use outside consulting and 42% of the Ohio Fire Chiefs departments use some form of consulting to determine station location (Appendix 3). There are also other organizations that exist to help guide departments down the path to community risk reduction. The Insurance Services Office (ISO) provides community ratings for the ability of a department to respond to fires. The National Fire Protection Association (NFPA) sets specific criteria and guidelines for a myriad of fire department functions. Neither of these organizations have a set path to help fire departments look from the inside out on ways to reduce community risk and allocate resources.

The best means available today in helping fire departments take an introspective look into how they respond to all types of emergent situations is provided by the Center for Public Safety Excellence (CPSE) and its Commission on Fire Accreditations International (CFAI).

The CFAI program is an all-encompassing review that is done by the department. It offers a self-assessment guide, helps development of a standard of cover, requires departments

to have strategic plans, and trains department individuals who might be tasked with the development of these items (CPSE, 2016). It was surprising to see that 44% of the MECC departments and 50% of the Ohio Fire Chiefs departments do not have a strategic plan for their organization.

A standard of cover planning process requires gathering the data necessary to develop a risk assessment. Survey results show only 20% of all departments surveyed have this document. Completing this document requires data gathering that brings in demographic information to see who is involved in emergency incidents, not just the number and type of incidents occurring. This data is needed to help plan how many stations are needed, how many pieces and what type of equipment are required, and how many emergency responders are required. The completed standard of cover document can also help lower the ISO ratings for any given fire department. This document can be completed as part of a risk assessment for any department without completing the entire accreditation process.

The full process of accreditation is a continual evaluation of all aspects of service response. The validity towards community risk reduction can be seen in operational changes that may result from the accreditation process (O'Brien, 2016). A peer-team conducts site visits to verify and validate the stated performance of the departments. The departments then appear before a commission whose members have reviewed the team's findings and decided upon credibility. This process can prove valuable to any size department in helping reduce community risk.

Currently there are over 30,000 fire and EMS service organizations worldwide, yet only a little over 200 accredited (Ristow, 2016). Ohio has 1,225 fire departments with only 10 accredited as of 2016 (Haynes, 2016). None of the MECC departments are accredited.

Departments that are accredited have given positive feedback on the benefits including socio-economic and political advantages.

The cost of accreditation is a deterrent for some organizations. Fees alone can easily exceed $3000 per year while in the accreditation process (Ristow, 2016). The internal costs are not easily defined as they are based on the unique make-up of each agency. The greatest internal costs are staff hours. The accreditation process can take up to 3 to 4 years to complete. Some agencies have reported that they have committed nearly 15,000 staff hours to the accreditation effort. This time requirement can easily overwhelm a smaller department that is trying to complete the accreditation process with limited staff.

Even if a department does not have the funding or resources to commit to full accreditation, the process model itself should be utilized to aid in community risk reduction. In the final analysis, it is apparent that the use of the improved data collection and its proper application results in maximized use of department resources and a reduction in overall community risk.

RECOMMENDATIONS

The purpose of this study was to develop and recommend a process and criteria that can be used in evaluating and planning for future deployment of department resources. The following are recommendations discovered during the completion of this study:

1. Implement the use of a software and records management program for the VTFD. Utilize this program to track specific performance criteria that has a direct bearing on the department operations. Use this software to identify concentration of run volumes and gaps in response times to both fire and EMS calls.

2. Compare the data collected with national standards and standards set forth by the chief of the department. Analyze the data to see how the department compares nationally and if the department is operating at its highest possible levels.
3. Research the process before deciding on attempting to become accredited. The research portion should include talking to community leaders, the members of the department, and members of the community. Also, visit local departments that are already accredited to gain from their experiences.
4. Complete a Standards of Coverage Document. Completing this document will help provide the department with written procedures to determine the distribution and concentration of fixed and mobile resources.

In closing, learning how to measure performance, analyze the data obtained, and use the data to manage the improvement of operational outcomes is the current challenge facing all supervisors and managers in the fire service. Teaching the crews that data measurement is not punitive will be a difficult task, but it must be accomplished by the department administration for the department to succeed. We are no longer just tracking our runs in a hand-written notebook, but tracking every detail to help us perform at our very best.

REFERENCES

Ahrens, Marty. (2016). *Trends and Patterns of U.S. Fire Loss.* National Fire Protection Association. Quincy, MA.

Barr, Douglas. (2006). *Methods for determining the need for a Third Fire Station in the Northwest Section of Violet Township.* Ohio Fire Executive Program. Retrieved from http://www.ohiofirechiefs.com/aws/OFCA/asset_manager/get_file/18537

Center for Public Safety Excellence. (2015) *Community Risk Assessment: Standards of Cover, 6th Edition.* Commission on Fire Accreditation International.

Christian, John R. (2010). *Critical Need: Assessing Staffing and Resource Allocation within the Grayslake Fire Protection District.* National Fire Academy. Retrieved from https://www.usfa.fema.gov/pdf/efop/efo45132.pdf

City of New York. (2012/2013). *Fire Department City of New York Annual Report.*

Coleman, R. (2006). The future of the fire service. In J.M. Buckman (Ed.), *Chief Fire Officer's Desk Reference* (pp. 443-451). Sudbury, MA: Jones and Bartlett.

Haynes, Hylton. (March 2016). *Number of Fire Departments in the United States By Population and By State, 2012-2014.* National Fire Protection Association.

International Association of Fire Fighters. (Winter 2016). *Putting Big Data to Work for Us: New User-Friendly Tool Helps Assure Adequate Resources and Create Your Personal Health and Exposure Diary.* IAFF Fire Fighter Quarterly. Washington, D.C.

Insurance Services Office. (2015, November). *Public Protection Classification (PPC) Summary Report Violet TS FPA Ohio.* Mt. Laurel, New Jersey.

Little, Mike. (Personal communication, July 18, 2016) Fire Chief Violet Township Fire Department.

Lynn, Bill. (Personal communication, April 11, 2016) Operations Battalion Chief Washington Township Fire Department. Dublin, Ohio.

Nagy, Andrea and Podolny, Joel. (2008). *William Bratton and the NYPD: Crime Control Through Middle Management Reform.* Yale School of Management, Yale case 07-015 Retrieved from http://som.yale.edu/sites/default/files/files/Case_Bratton_2nd_ed_Final_and_Complete.pdf

National Fire Protection Association, (2008). *Fire Protection Handbook, 20th Edition.*

National Fire Protection Association. (2015 Edition). NFPA 1201 Standard for Providing Fire and Emergency Services to the Public.

National Fire Protection Association. (2013 Edition). NFPA 1600 Standard on Disaster/Emergency Management and Business Continuity Program.

National Fire Protection Association. (2016 Edition). NFPA 1710 Standard for Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments.

O'Brien, T. (Personal communication, November 4, 2016). Assistant Chief Newark, Ohio Fire Department.

R. Upson and K. A. Notarianni. (2010). *Quantitative Evaluation of Fire and EMS Mobilization Times.* SpringerBriefs in Fire. Fire Protection Research Foundation.

Remoquillo, Spencer. (December 7, 2015). *Violet Township Fire Department Plans New Station.* Lancaster Eagle Gazette. Retrieved from http://www.lancastereaglegazette.com/story/news/local/2015/12/06/violet-township-fire-department-plans-new-station/76713998

Ristow, Karl, CFO, MIFireE. (2016). *Accreditation: Is it worth it?* Retreived from www.kristow@cpse.org

Taylor, K. (2003). *Violet Township Customer Service Manual.* Pickerington, Ohio. Violet Township Fire Department.

Thiel and Jennings (et al.). (2012). *Managing Fire and Emergency Services.* ICMA press.

Urban Fire Forum. (2011). *Fire Service Deployment: Assessing Community Vulnerability*. Retrieved from http://www.nfpa.org/press-room/news-releases/2011/report-cites-risks-to-public-safety-posed-by-budget-cuts

Violet Township Fire Department. (2010-2015). *Violet Township Fire Department Year-End Reports.* Pickerington, Ohio. Violet Township Fire Department.

APPENDIX 1 – VTFD APPARATUS LIMITATIONS

Current VTFD Apparatus, Station Location and Height Restrictions

Truck	Assigned Station	Fits in Station 591
E-591	591	Yes
M-591	591	Yes
M-594	591	Yes
G-591	591	Yes
E-592 with 61ft SkyBoom	592	No
R-592*	592	No
M-592	592	Yes
E-593	592	Yes
BN-591**	592	Yes
M-593	593	Yes

Note. Current Station 591 has a bay door clearance of 108" in height.

R-592* = New R-592 that is on order will not fit in Station 591.

BN-591** = Fits height wise into Station 591 but there is no open bay for the vehicle.

APPENDIX 2 – FIRE DEPARTMENT RESOURCE SURVEY FOR OFE PROJECT

1. Is your Fire Department a
    - Municipality
    - Township
    - Fire District
    - Other
2. What is the population of the area you serve?
    - 0 – 10,000
    - 10,001 – 50,000
    - 50,000 – 100,000
    - Greater Than 100,000
3. Total number of calls in 2015?
    - 0 – 1,000
    - 1,001 – 2,500
    - 2,501 – 5,000
    - 5,001 – 10,000
    - Greater Than 10,000

4. Total number of fire stations?
    - 1
    - 2
    - 3
    - 4
    - Greater than 4
5. What type of staffing do you run?
    - Full Time Only
    - Full and Part Time
    - Part Time Only
    - Volunteer
6. Does your department have a current strategic plan?
    - Yes
    - No

7. If yes, do you feel the department members are aware of what the plan is for your department's future?
    - Strongly Disagree
    - Disagree
    - Neutral
    - Agree
    - Strongly Agree
8. How does you department track statistics for run volume?
    - Internal tracking (excel spreadsheets, CAD system, etc)
    - Software system not associated with the CAD
    - Third Party company/consultant
9. What calls do you track?
    - EMS
    - Fire
    - Rescue
    - All of the Above

10. Do you meet the NFPA 1710 requirements for response times to structure fires (en route within 80 seconds 90% of the time)?

    - Yes
    - No

11. Do you feel the data your department tracks is useful to improving your daily operations?

    - Strongly Disagree
    - Disagree
    - Neutral
    - Agree
    - Strongly Agree

12. How does your department determine the location of your stations?

    - Internal committee group discussion
    - Analysis of run statistics and community needs
    - Outside consultant
    - All of the Above

13. How does your department determine resource allocation?

    - Analysis of run statics and community needs
    - Where trucks fit into the building
    - ISO needs
    - Not sure how it is done

14. Does your department have a Standards of Coverage document?

    - Yes
    - No

15. What is the current ISO rating of your department?

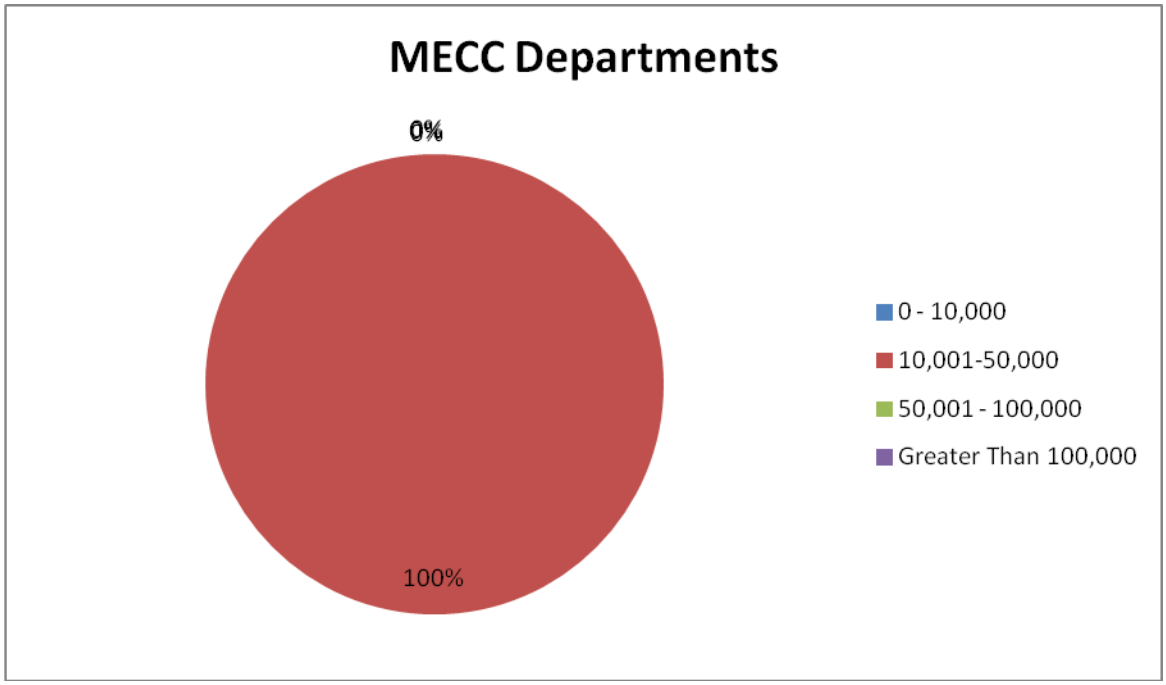
    - 1
    - 2
    - 3
    - 4
    - Greater than 4

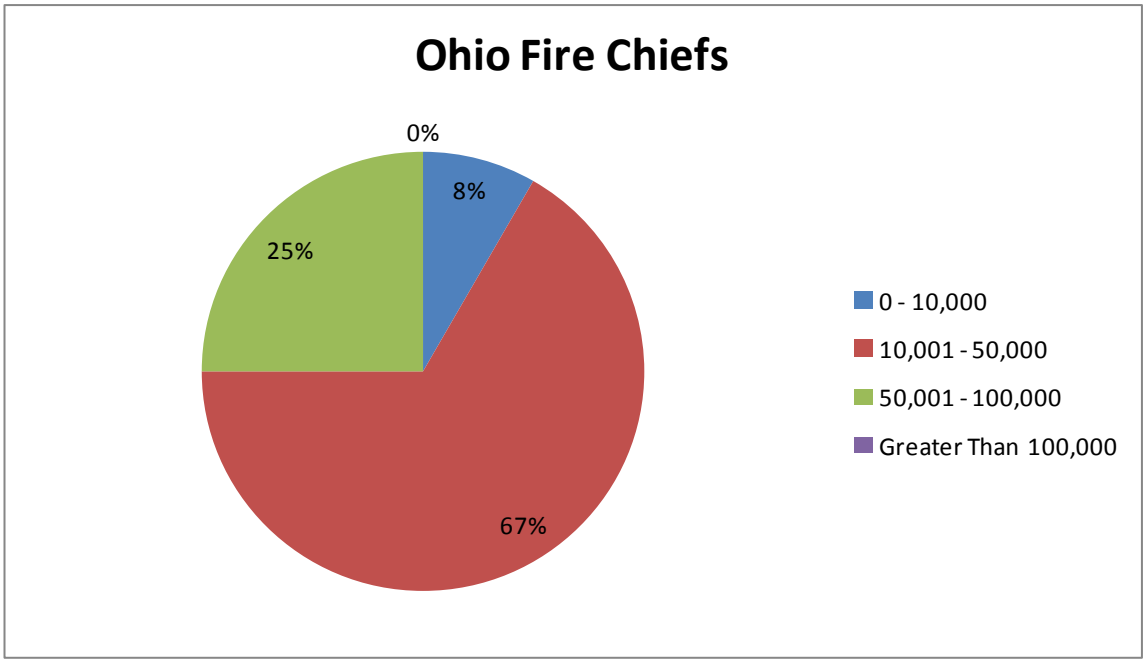
16. Does your department participate in the accreditation process?

    - Yes
    - No

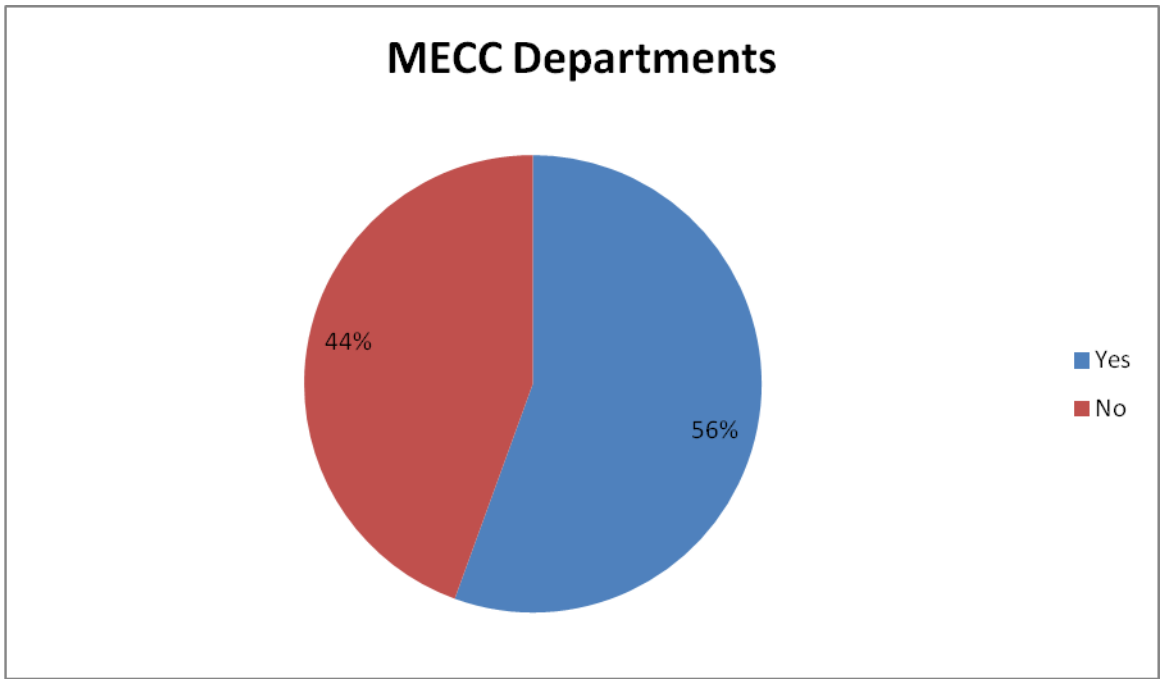
APPENDIX 3 – SURVEY RESULTS

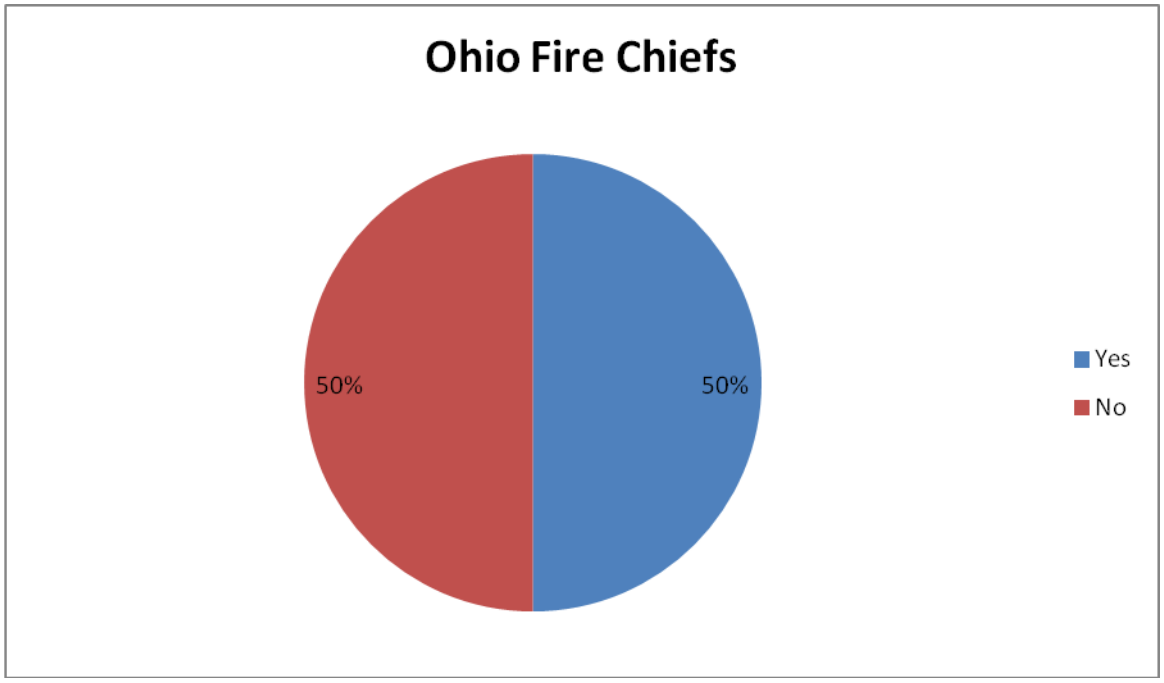
Question 2 – What is the population of the area you serve?



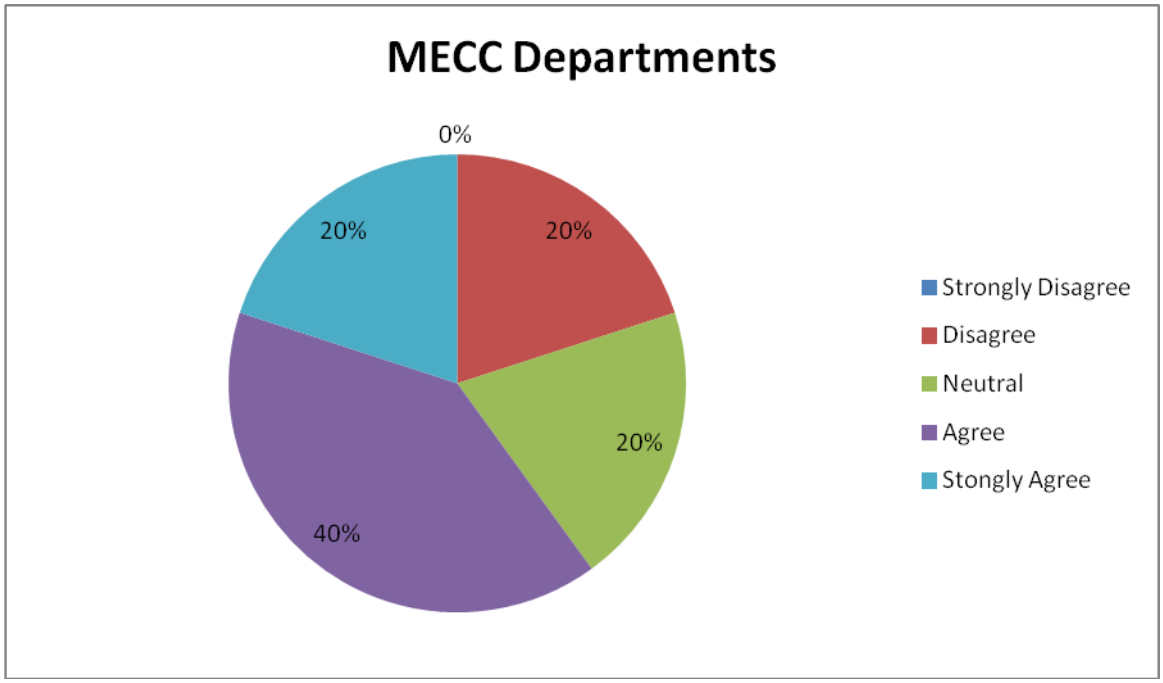


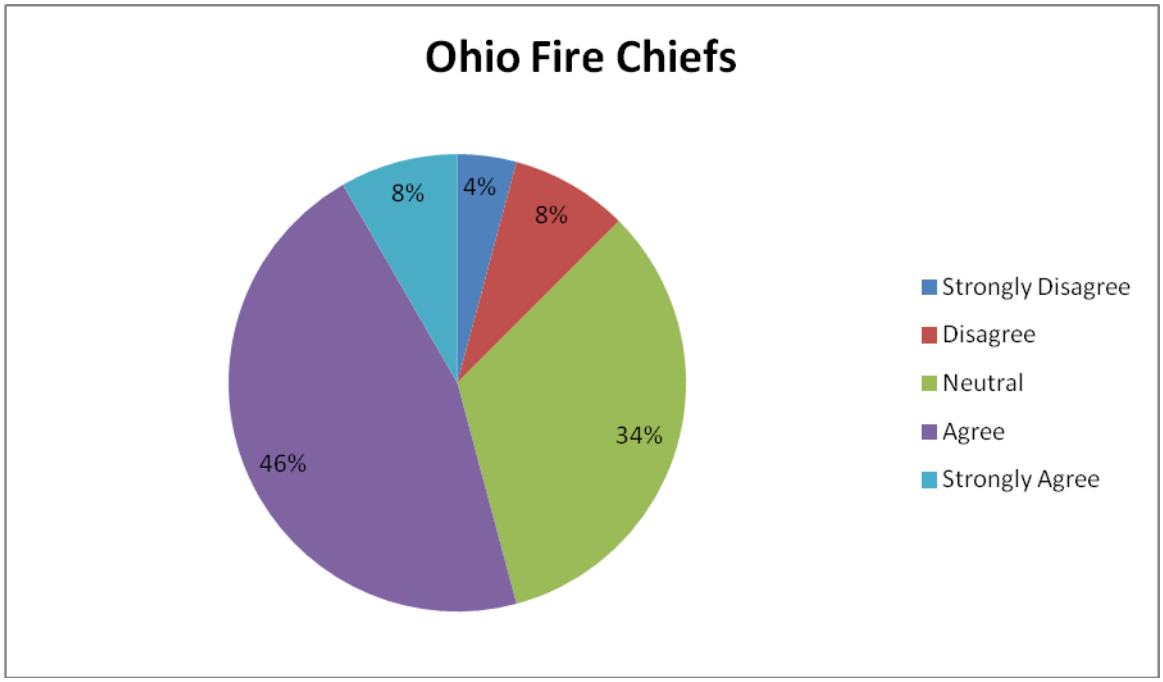
Question 6 – Does you department have a current strategic plan?



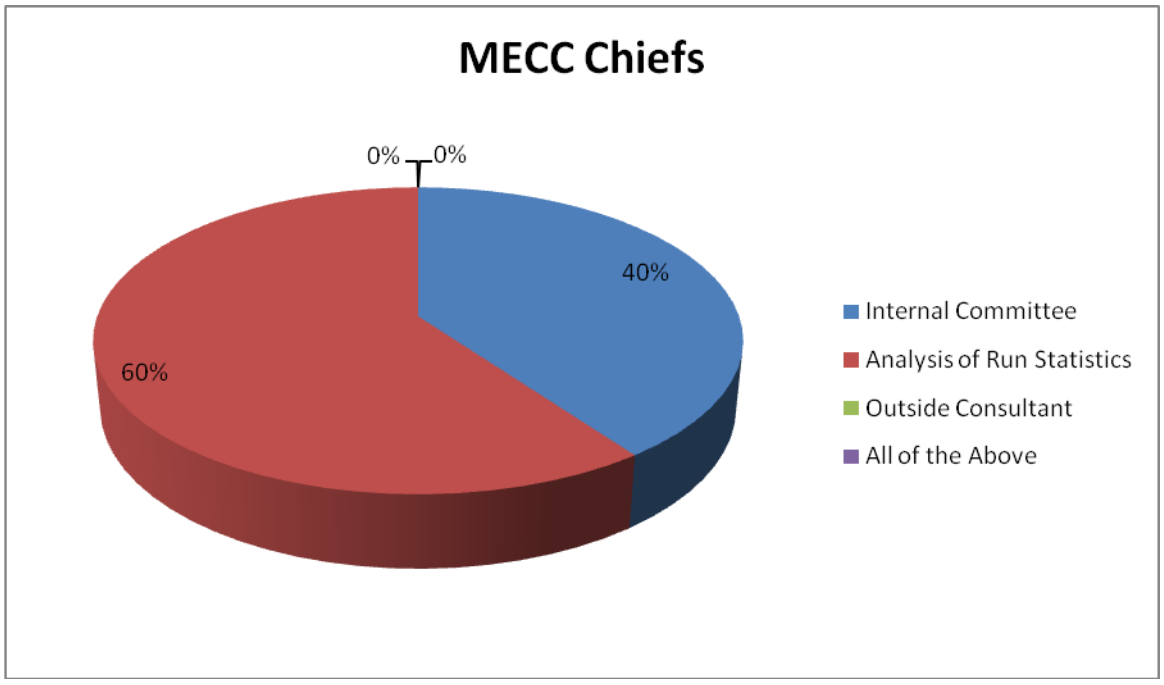


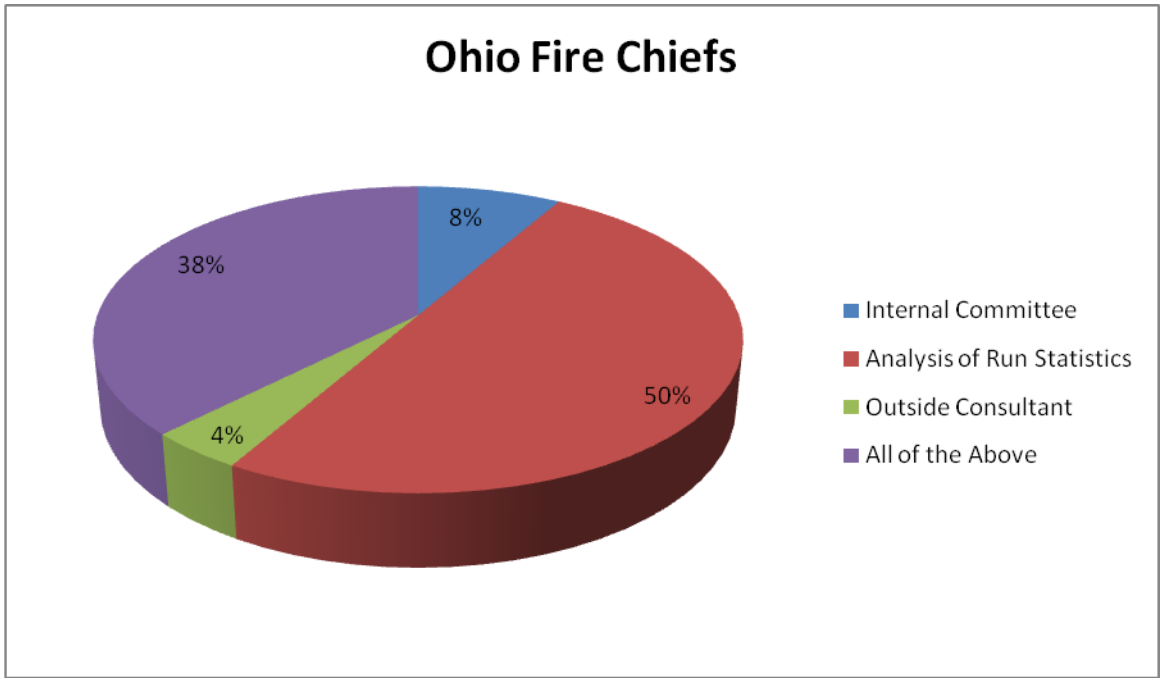
Question 11 – Do you feel the data your department tracks is useful to improving your daily operations?



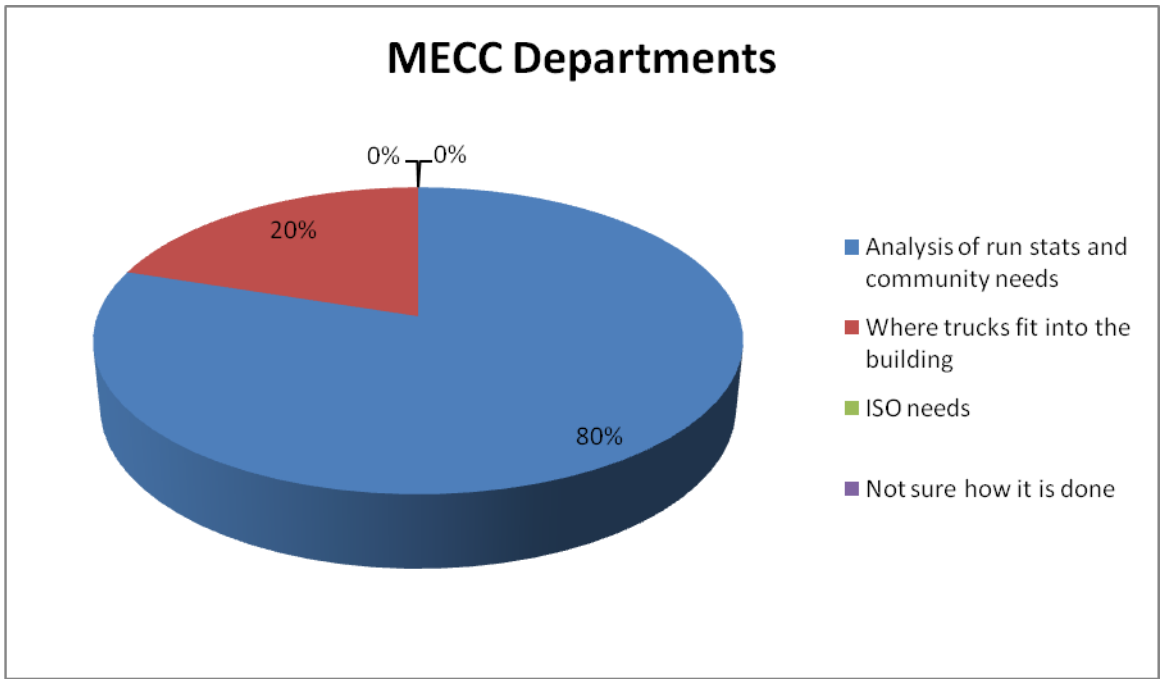


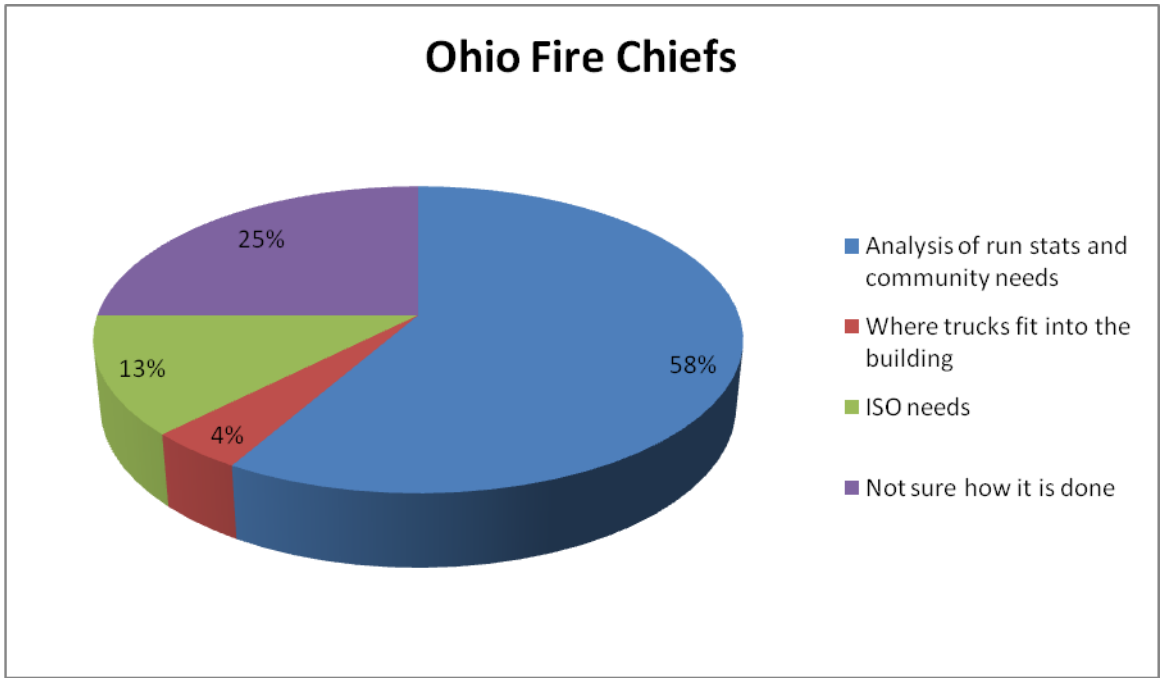
Question 12 – How does your department determine the location of your stations?



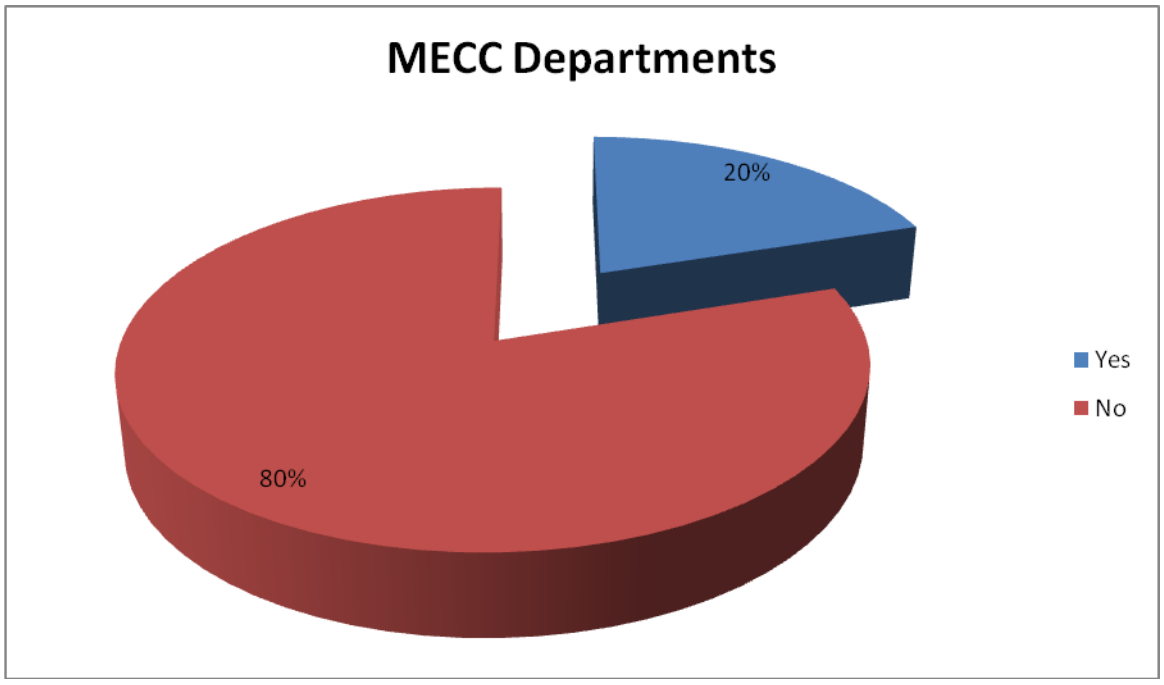


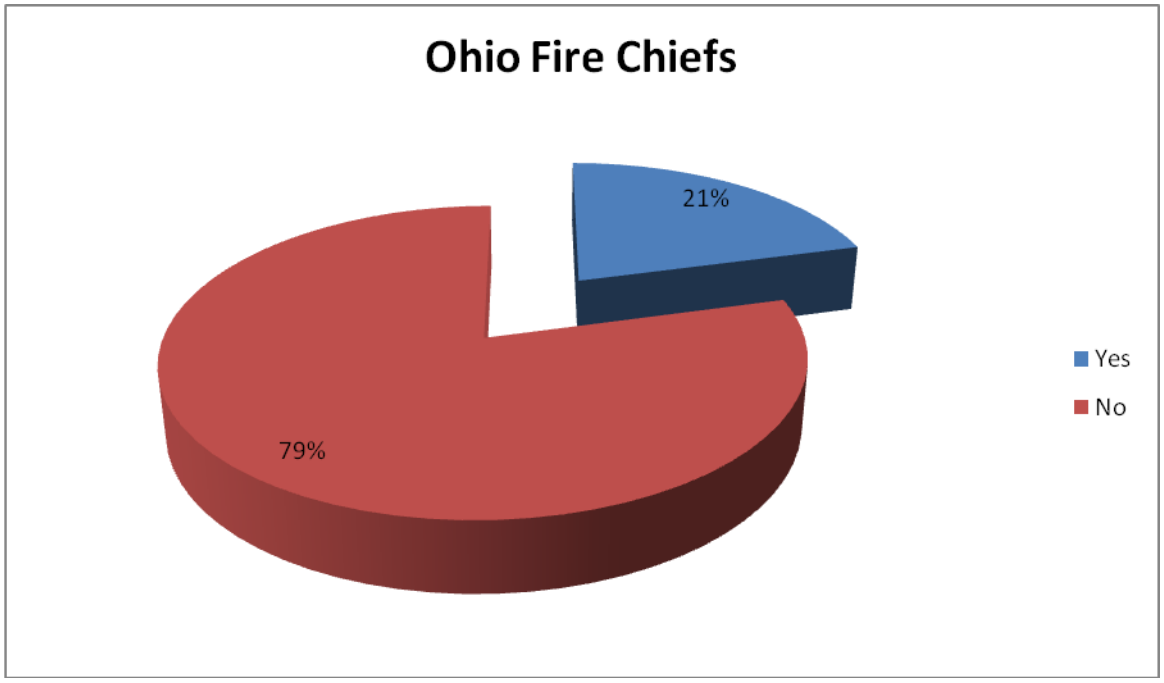
Question 13 – How does your department determine resource allocation?



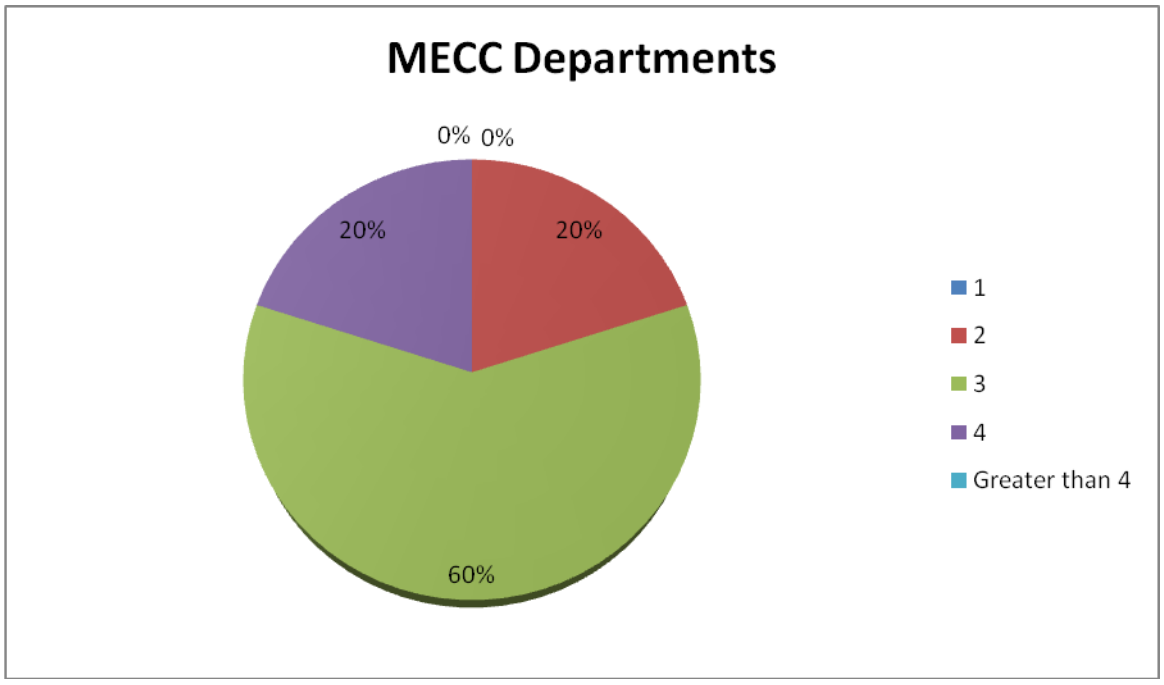


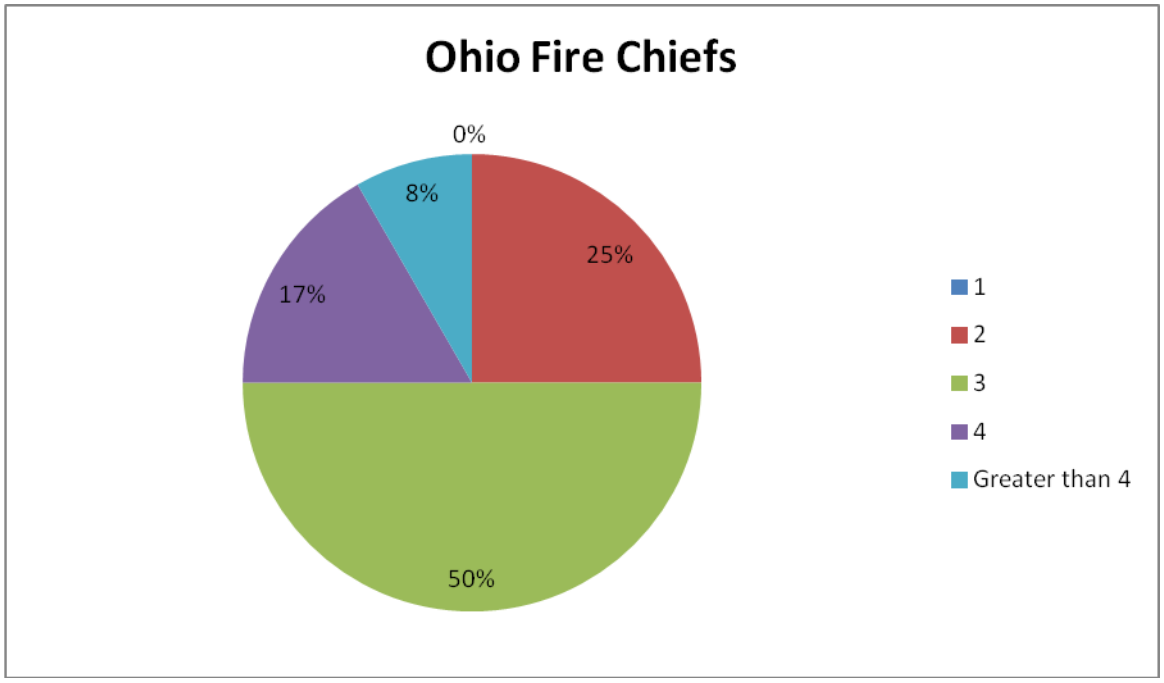
Question 14 – Does your department have a Standards of Coverage document?





Question 15 – What is the current ISO rating of your department?





Question 16 – Does your department participate in the accreditation process?