Performance Evaluation: Output or Outcome?

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CERTIFICATION STATEMENT

I hereby certify that 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.

Signed:_____

Abstract

The problem was the Fayetteville Fire Department (FFD) had not determined what type of annual performance measurement of emergency service would suit their needs. The purpose of the research was to determine what type of performance measurement for emergency services would suit the needs of the FFD, which ultimately led to the creation of a plan to develop a performance measurement model for the FFD. To complete the research the action research method was utilized and the following research questions were posed: (a) What were the options of performance measurement available? (b) What were the required datasets for the performance measurement? (c) What were the required capabilities of the FFD to capture the required data? It was necessary to complete a survey in order to answer the research question. In order to survey comparable departments, a database was created consisting of over 50,000 US cities. Using census data, university enrollment and various other datasets the list was narrowed to 93 comparable cities. The survey asked question regarding each department's method of performance measurement as well basic information about the department in order to check for compatibility. The results showed overwhelmingly that departments use some type of output-based measurement that focused on self-imposed benchmarks. These benchmarks included: National Fire Protection Agency (NFPA), Insurance Service Office (ISO), Commission of Fire Accreditation International (CFAI), and various other benchmarks. The following recommendations were made: Change the Computer Assisted Dispatch (CAD) software utilized by the FFD, better tracking in regards to NFPA benchmarks, research the CFAI program, research the applicability of the Cardiac Arrest Registry to Enhance

Survival (CARES) for the FFD, and complete further research regarding an outcomes-based performance measurement.

Keywords: NFPA, ISO, CFAI, Comparable, Comparison, Outcome, Output, Performance Measurement, Evaluation, Fractile, Staffing, PPC, Division 1, Student, College, University, Enrollment, Census, Demographics, GDP

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Performance Evaluation: Output or Outcome?

Introductions

After Hurricane Katrina some gaps in the Federal Emergency Management Agency's (FEMA) performance measurement were exposed. FEMA was focused on "outputs" as opposed to "outcomes" and they were doing a fine job of meeting their goals. One article reports that when the need for cots were upon them the succeeded in meeting their goals. However, their goals focused on the output of delivering cots not whether the cots were useable. FEMA delivered cots but they were lacking mattresses and blankets (Kamensky, 2005, p. 8) and hence unusable. When we look at the fire service, the question could be asked: are our cots useable? While we are not in the business of supplying cots, does the service we are providing meet the needs of the customer? Just like FEMA, the National Fire Protection Agency (NFPA) establishes benchmarks that are intended to measure the performance of the fire service (Flynn, 2009, p.6). We focus on benchmarks from the NFPA and other various organizations including our own, but do these benchmarks serve the purpose they are intended to? Does the benefit of the fire service outweigh the cost? These questions led to this research paper.

It would be nice to know this answers to these questions in their entirety, but it was necessary to focus this paper on only a small portion of the problem. The problem is the Fayetteville Fire Department (FFD) has not determined what type of annual performance measurement of emergency services would suit their needs. There is a level of commitment to tracking the response data, but the Computer Aided Dispatch (CAD) software is antiquated and is very limiting on the ability to accurately track times. There is also a bit of uncertainty of exactly what to track. The NFPA standards are broad and there is plenty of room for debate in various areas.

The purpose of this research is to determine what type of performance measurement for emergency services would suit the needs of the FFD and to ultimately create a plan to develop a performance measurement model. To achieve the purpose of this research the following research questions were posed: (a) What are the options of performance measurement available? (b) What are the required datasets for the performance measurement? (c) What are the required capabilities of the FFD to capture the required data? The action research method was utilized for this research. The final product and recommendation can be seen in appendix I.

Background and Significance

The city of Fayetteville Arkansas is the county hub for Washington County, has a population of 75 thousand people, and is the home of the University of Arkansas. The Fayetteville-Springdale-Rogers (NWA) Metropolitan Area has a population of 492 thousand people. The NWA Metropolitan Area is home to one of the world's largest companies Wal-Mart and many other smaller companies Tysons, JB Hunt, Jones Truck Lines. These employers and the University of Arkansas attract people from all over the world so Fayetteville has a diverse population. Fayetteville is positioned in the Ozark Mountains and covers 53.8 square miles and has several parks and miles of trails. The city of Fayetteville employs more than 800 people and has a Fire Department of 114 personnel.

The city of Fayetteville's problem today is not a new one. The root of the problem goes back several years. In the 1990's when the economy was booming there was no focus (politically) on the fire department or the services they provided. In the early 2000's there was a change in focus and efforts were made to evaluate services. There was very little historical data to evaluate the services provided. At that time run data started being collected but the time clock was ticking and 2009 hit before a tried and true method was adopted. Through this era there

were multiple administration changes and wholesale changes in focus. After weathering the storms of the economic downturn, it became very clear that a simple increase in run volume was not adequate justification for more funding. Today there is focus on the services provided to the citizens but the methodology used to evaluate the services has yet to be determined. If anything was learned from the economic downturn, it was that justifying the existence of the fire department was imperative. The FFD wants to insure that future economic problems do not take the same toll as the previous one did. This research has to provide some form of performance measurement that will allow the FFD to appraise its services.

The Fire Department strives to meet the standards set forth by NFPA and the Insurance Services Office (ISO). However, the funding is still tight and there is increasing need to justify the rising costs. The city has a class 2 ISO rating but is far from meeting the standards set forth by NFPA. To briefly explain the ISO rating process: ISO rates a city based on its fire department, water supply, and dispatch center. The city receives a rating between 1 and 10 with 1 being the best and 10 the worst. The fact the city of Fayetteville received an ISO rating of 2 but falls very short of the NFPA standards begs the question, which is accurate. Does ISO have an inaccurate and generous rating system or is NFPA simply a pie in sky dream nobody ever achieves? That question essentially sums up the direction of this research paper. What are other cities doing? Does Fayetteville provide an inferior service to its citizen? The answer according to ISO would be no, but by NFPA standards the answer would be yes. It is imperative for the future operations that the Fayetteville Fire department adopts a standard or possibly even a methodology that is unique to its needs to evaluate the services provided. This research paper may not provide all the answers but it should provide an evaluation of what other cities are doing

and provide a written plan for starting down the path of adopting or developing a standard for the Fayetteville Fire department.

A reoccurring theme of the Executive Development class, offered by the National Fire Academy, is dealing with change. This problem stems from a lack of change and has evolved into a real issue for justifying additional financing. In the assigned reading for the class, Leadership on The Line: Staying Alive Through the Dangers of Leading, Heifetz and Linsky (2002) describe two types of problems, technical and adaptive. While there were a multitude technical challenges that limited the department, the root of those technical problems could be linked to an adaptive problem. The adaptive problem being the Fayetteville Fire Department, and the fire service to an extent, failed to change at the pace of technology. Fire was changing and with it the need for quicker responses and an overall change in tactics. However, there was no proof of this, as far as Fayetteville could prove locally, because reports were a four-letter word. The data needed to justify more staffing and a quicker response had never been collected. An adaptive change had to happen, and the catalyst for that change came as a building collapse that trapped several firefighters. They all survived but it changed the direction of the Fayetteville Fire Department. Today there is better than a decade of data to reference but how to best utilize that data has yet to be codified. The first step in that process is deciding what choices of evaluation are available and then developing a plan to implement a program.

This problem touches most of the five strategic goals set forth by the United States Fire Administration (USFA). Its sole purpose is to address the first three goals: “Reduce Fire and Life Safety Through Preparedness”; “Promote Response, Local Planning and Preparedness for all Hazards”; “Enhance the Fire and Emergency’s Services Capability Response to and Recovery from All Hazards” (U.S. Fire Administration [USFA], 2014, p. 9). The findings of this paper

yield a list of options of evaluation and performance that are used by cities of comparable size, risks, and capability. Knowing the options available put the Fayetteville Fire Department one step closer to implementing a plan for the future. After the options are explored and weighed a plan for developing further research will be developed. This plan will serve as a road map to guide the Fayetteville Fire Department down the path of developing a policy that is personalized to their department and will put them in the position to better accomplish the goals set forth by the USFA.

Literature Review

Research Question 1

What are the options of performance measurement available?

There are volumes of information out there about measuring the performance of a department. However, it appears in reading the literature available that there is a void when it comes to a comprehensive analysis of measuring performance. A true measurement that shows society puts X into the department and receives Y for their investment. Instead the bulk of the research leans to more of a output based measurement, X standard was established and X standard was accomplished a certain percentage of the time. X standard is never analyzed for cost versus benefit. Another, less frequently used, approach focuses on the actual outcomes. X challenge was embraced and mitigated Y percent of the time. This too fails to capture the input required to mitigate the challenge.

Through the 1960s and ‘70s the planning approach was utilized within the public sector; the first divergence from this approach came in 1984 when President Ronald Regan and Prime Minister Margaret Thatcher ushered in more of a “business-like” approach, the New Public Management (NPM) (Pollitt, 2011, p. 4). The Governmental Accountability Office (GAO)

focuses on performance measurement here in the United States. The Coordinating for Cohesion in the Public Sector for the Future (COCOPS) focuses of the same thing in Europe. They measure and survey the performance of the various departments. In 1993 the Government Performance and Results Act (GPRA) was enacted by congress, and in 2010 the GPRA was revisited and updated to the GPRA Modernization Act (GPRAMA) (Governmental Accountability Office [GAO], 2013, p. 2). These acts are intended to focus on the performance of the various federal departments. The intent of the GPRA was to "help resolve long-standing management problems in the federal government and help provide greater accountability for results" (GAO, 2013, p. 5). The GPRAMA added additional requirements to the act. A couple of the more notable changes were the cross-agency priority (CAP) goals and the leadership positions. The CAP focuses on reducing the duplication of task between agencies. The leadership positions task people at the executive level with focusing on performance. These acts are certainly a step in the right direction, as they require some unit of measurement. They, however, focus on output not outcome. As highlighted above, FEMA's focus on output lead to the delivery of unusable cots, and by all their measures would be considered a success (Kamensky, 2005, p. 8).

The COCOPS reports that outcome measurement is tracked in Europe. With their research they did a meta-analysis of 518 reports and studies. However, they state a very small portion of the studies focuses on outputs, 61, and even a smaller amount, 39, look at the outcomes; the majority of departments focus on internal change and processes (Pollitt, 2011, p. 30). A real problem with the studies that actually track outcomes is a lack of inputs. One example the COCOPS report list is wait times in hospital waiting rooms in the UK. The government rolled out a new incentive program that based funding on the wait times in waiting

rooms. It was counted as a success because there was a reduction in wait times. However according to Pollitt (2011) they failed to take into account the fact that hospital funding also increased during that same timeframe. Pollitt (2011) tells of another very troubling thing, at least one hospital experienced a huge increase in mortality rates. As doctors received pressure to decrease wait times they were apt to leave a critical patient to care for stable patient to insure wait times were kept down. In reading the report it would appear that even the studies that claim to track outcomes fail to capture a true business-like cost versus benefit analysis. They also make a very good point by pointing out the self-interest by parties (UK, US, World Bank…) selling the NPM as a solution when it seems to be, at least by the research available, rhetoric (Pollitt, 2011, p. 56-57).

The previous two pieces of literature reviewed focused on the broad performance of government at the national level. The remainder of the literature reviewed was focused specifically on the fire service. One author poses the question "how do we define the performance of fire departments" (Wodicka, 2013, p. 12)? This question gets right to the root of the purpose of this research. Dr. Wodicka explains that departments base their performance on how well they conform to established professional standards. While there may be a correlation between these standards and property saved, good response time do not necessarily guarantee property and lives will be saved. There may be other variables that should be considered. Dr. Wodicka advises against adding variables simply because the theory is fallible. He states that the fire service needs to shift the thought process by which performance is measured. He explains there was a shift in the last decade in the academic world regarding the public performance measurement to more of societal impact model. Instead of focusing on the number of boxes checked by a municipality, they have gravitated towards more of a results-based model. Sure the

fire department may have been on the scene in six minutes, but did that save a persons life? What was the benefit to society for the money invested? Wodicka's (2013) proposal is to assess how well a fire department actually performs as opposed to its compliance with an arbitrary established standard.

Wodicka's article is well thought out and posses some good questions, but his article only talks about measuring the performance of the services provided i.e. the fire started and the fire department responded and extinguished the fire. What about the fire that never started because the firefighter had a talk with a group of preschoolers, or the fire that was extinguished upon arrival because the fire code required sprinklers? What about the reduced insurance rates the home and business owners receive? Dr. Wodicka was reached out to via email. The author asked if he had done more research in this area. He shared some of his early papers that were never published and stated that his focus had changed. He said he moved his focus to what caused the calls and ultimately did his dissertation on that subject. One of his colleagues, Dr. Carr Boyd, utilized a similar model and is cited below. Dr. Wodicka's idea is solid but the measurement needs to include every facet of the service provided by a fire department. A more widely accepted practice of performance measurement is a fire departments ability to comply with goals or standards.

One such set of standards, the most widely used, is the NFPA standards mentioned above. In a report, Fire Service Performance Measures, Flynn (2009) defines performance measurement as the "evaluation of achieved outcomes, compared to desired outcomes" (p. 3). A more accurate description, within the context listed above, would be: evaluation of achieved outputs, compared to desired outputs. Flynn's model of performance measurement is the traditional method of performance measurement. A municipality either adopts nationally

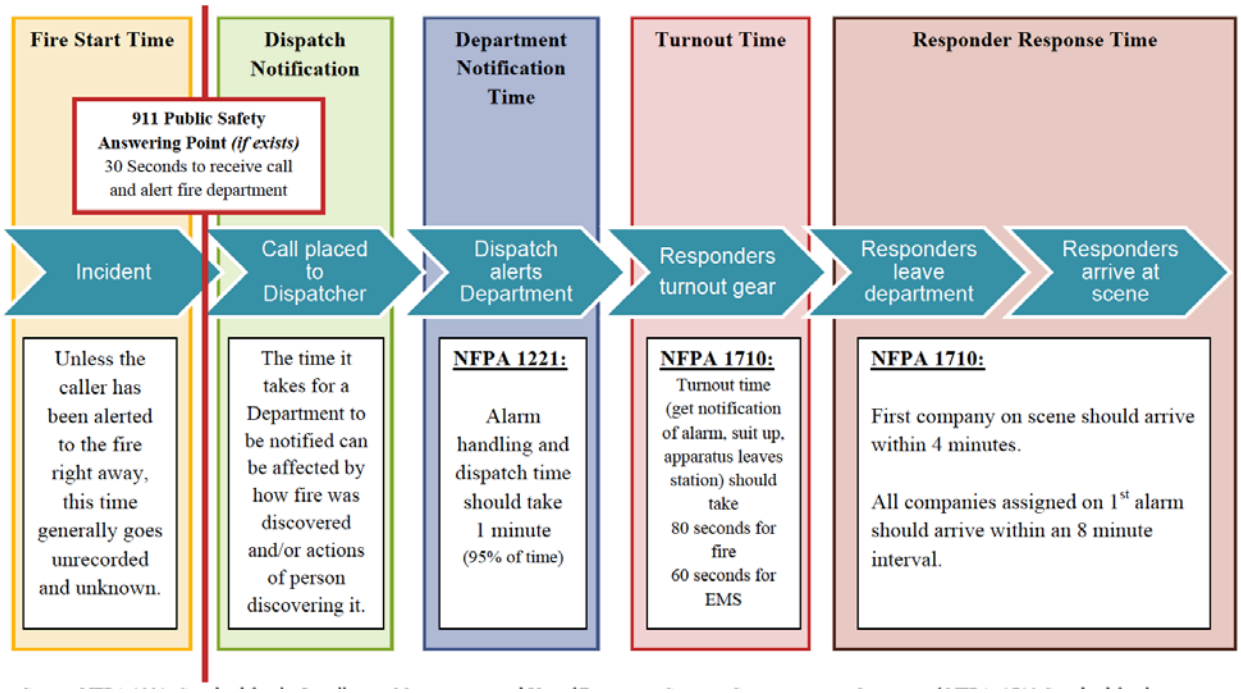
established standards or creates their own goals. These standards and goals are the benchmarks the department strives for. Their performance is then determined by how well they meet the benchmarks. The municipality also evaluates it performance compared to previous years' performance as well as other municipalities. They encourage the comparison of like communities but according to Flynn (2009) "there is no single characteristic that is a standard identifier for what constitutes a 'similar' community" (p.6). Within the research listed below a scientific approach was taken to find like communities.

In her paper Flynn (2009) discusses the functions of the fire service and the NFPA standards set forth to measure the function. She breaks the fire service into three major functions fire, emergency medical service (EMS), and HAZMAT. She includes a fourth category as well, other, which could include from: investigating an odor in a house to rescuing people from a collapsed building. The performance measurement of these functions is accomplished by comparing where a department's compliance with NFPA standards. These standards are important because they play a huge role in the fire service as it establishes benchmarks for fire departments.

To give a brief background of NFPA standards (regarding performance measures) NFPA standards give a benchmark for answering the 911 call, dispatching the emergency call, turnout time (the time it takes for the fire unit to leave the station), travel time, total response time (this is the response time of the last arriving unit of the original response) and the control time of the fire. It also gives benchmarks for emergency medical services (EMS) for both basic life support (BLS) units and advanced life support (ALS) units. The benchmarks include: turnout time, travel time, total response, transport time, hospital offload time, and total call time. Figure 1 below was a chart supplied by Flynn that displays a graphically the steps of performance

measurement as set forth by the NFPA. Another noteworthy thing to mention is their use of fractile percentages. Using an average of times flaws the data and potentially masks problems. The standards state that a department will achieve said benchmark X percent of the time. In measuring this way it gives a departments a bye on those remote locations where it is not feasible to have a station nearby or perhaps during times of high call volume and the initial responding unit is already on a call.

Figure 1: NFPA Flow Chart



For fires Flynn explains the following measurements. The first she mentions is fire spread. With this performance measurement she captures one of the things missed by Dr. Wodicka. If a department is measuring the percentage of fires extinguished prior to arrival of a fire company, they're accounting for the presence of a sprinkler system. This may be boring for the firefighters but it's a win for the prevention bureau. The fact that a sprinkler, which was required by the fire department, extinguished a fire is a measurable performance according to

Flynn. She also recommends that a department account for the percentage of fire that spreads beyond the point of origin. Flynn also covers several other measures: firefighter training, firefighter injuries, firefighter deaths, civilian injuries, civilian deaths, and the amount of property saved.

On the EMS side Flynn describes the following measures: percentage of patients requiring BLS or ALS, patients who refused treatment, patients who received treatment but refused transport, and the training of EMS personnel and whether or not they are certified. For hazmat calls the following measures were listed: the number of calls per 1000 population and per 1000 buildings, percent of hazmat incidents that spread prior to arrival, percent that spread after arrival, percent that didn't spread beyond the area of origin, percent of incidents that was beyond a certain threshold of area, and responder training and certifications. The benchmarks for Hazmat are: turnout time, travel time, total response time, control time, and the time spent on the scene.

Flynn describes an approach to performance measurement that is very different from that described by Dr. Wodicka. With her approach success is determined by a departments ability to comply with the NFPA standards. Dr. Wodicka refers to these standards as arbitrary but that may be somewhat of an inaccurate description. The standards do have a goal at hand and a reason behind that goal. The goal is to protect life and preserve property. What is missing from the process is the very thing that is described by Dr. Wodicka, a measurement of the end result. What was the amount of lives and property saved due to the compliance with the established benchmarks? The standards are written and put in place but there is nothing to measure the standards. If a department is in complete compliance with every NFPA standard out there but there is nothing to measure the results of the citizen's investment, are the citizens really getting a

return for their investment? Is society truly a better place because of the fire department, and to what extent is it better? These are important questions to be answered, as the investment required to achieve compliance with NFPA standards is sizeable.

With Fayetteville, for example, it seems as though compliance with every NFPA standard is so far out of reach that it is not even a plausible approach. This begs the question, are the NFPA standards plausible or just some pie in the sky dream that is too cost prohibitive to implement. Bryan Collins posed a similar question in an EFO paper in May of 2007. He researched what cities were doing to comply with NFPA 1710. He prefaced his research with the statement that NFPA is merely a recommendation not a requirement. Collins (2007) stated that many of the larger metropolitan fire departments were in compliance with 1710 with very few changes and little effort. He stated that other communities were able to become compliant through grants. To accomplish his research he sent out surveys and found that 50% of the departments surveyed were in compliance with the travel times and 68% complied with the total response time. His surveys revealed that 56% of the departments were in compliance with the staffing levels set forth by 1710. Collins research paper shows that a NFPA 1710 is certainly a plausible goal with close to 50% of the respondents meeting the goal. This is encouraging in that 1710 seems to be one of the insurmountable standards that lay in the path to compliance for Fayetteville.

Another widely accepted, at least within the fire service, measurement of a municipality's fire department is the ISO rating system. As described above ISO rates a city based on its fire department, water supply, and dispatch center. Using the Fire Service Rating Schedule (FSRS) the city receives a Public Protection Classification (PPC) between 1 and 10 with 1 being the best and 10 the worst. Up until 2012 a city received a maximum of 100 points.

The fire department maximum score was 50. The other 50 points was divided between the water system and the dispatch capabilities, the split was 40 and 10 respectively. After 2012, some updates to the rating schedule were made. There was an additional 5.5 points added for fire prevention so now the maximum score is 105.5 (Insurance Service Office [ISO], 2012, p. 3). Another big change in 2012 brought ISO closer to NFPA. Previously a fire department received a maximum of 4 points for the distribution of companies. They required a fire engine every 1-1/2 miles and a ladder company every 2-1/2 miles. The 2012 FSRS now gives 10 points based on the "Deployment Analysis", which requires a "systematic performance evaluation" (ISO, 2012, p. 9). This is very similar to the fractile percentages utilized by NFPA that were highlighted above. ISO like NFPA focuses on a municipality's ability to achieve predetermined benchmarks set forth by the organizations. The researcher listed below took a quite different approach.

A research paper written by Dr. Carr Boyd gives yet another option for resource allocation. As mentioned above, the emphasis is placed on equal distribution of a municipality's resource. This is seen in the 1-1/2 and 2-1/2 mile benchmarks described above. The same can be seen in NFPA 1710 while it may not have an explicit mile benchmark it does have a travel time benchmark. Neither of these standards account for call volume. Dr. Boyd (2009) explains a way to utilize call volume to make the determination of resource allocation. His work reveals a flaw in the even distribution of resources. This was made clear by analyzing who the customers were that required the services. Using a multivariate regression model he was able to show a correlation between call volume and demographic characteristics. By placing resources in a place that will rarely use the resource and not providing adequate resources for an area that utilizes the resources a municipality disenfranchises those who need the resources (Boyd, 2009,

p. 110). Dr. Boyd points to many factors that generate call volume such as median income and education. He also point to the political battle involved in reducing the amount of resources within the wealthier neighborhoods and reallocating them to the poverty stricken areas. His paper does not offer a means to measure performance but it brings questions to the equal distributions modeled by the other two standards. It does however offer an option to achieving in the benchmarks set forth by NFPA. If a municipality focuses on placing the resource near the customers, there will be a reduction in response times to those areas.

The only other type of performance evaluation utilized within the fire service is the accreditation process. The Commission on Fire Accreditation International (CFAI) is a made up of a board of 11 commissioners that oversees the application of agencies applying for accreditation, the development of training, updating the process, and every other aspect of the accreditation process. According to the CFAI website there is 207 fire departments in the US that are accredited (Center for Fire Accreditation International, 2015, p. 6). That is as a small number considering there are, according to Haynes and Stein (2014), 2477 career fire departments in the US. Ron Holt (2010), a CFAI commissioner, likens accreditation to "agency soul-searching" (Holt, 2010, p. 4). He list several advantages accredited agencies experience such as funding, planning, and just an all around better ability to sell the department to the politicians and citizenry. The article holds the accreditation process in high regards; however, the article does not carry the same level competence, as it offers little more than anecdotal evidence. The author offers no statistical analysis to support the claims he makes. Whether accreditation makes the funding rain down or not, it will still be beneficial to an agency. Simply developing or adopting standards that are tracked and reported annually is bound to make an agency more efficient.

Research Question 2 & 3

What are the required datasets for the performance measurement?

What are the required capabilities of the FFD to capture the required data?

These two research questions are listed together because they are very similar and they also have a common denominator. There is a gap in the research for both of them. This is not all that surprising in that they are both very technical questions and would not offer much of a challenge for a researcher. The questions are answered later on in the paper. While there were very different approaches to performance measurement in the literature above, the datasets and capabilities required to capture the data is very similar.

Summary of Literature Review

At the beginning of this section a claim was made that there was volumes of information available on performance measurement. It is easy to see this was a true claim. The literature and approaches varied greatly but almost all them shared one thing in common, there appears to be an almost complete absence of outcomes based performance measurement within the public sector. For the small amount there is available, there has been very little research done on it, and they failed to control the inputs so placing a value on the outcome is quite difficult. A far more prevalent form of performance measurement is output based. For this literature review and research the definition of output and outcome was borrowed from the COCOPS research. They stated “outputs are invariably intended to produce desirable outcomes beyond the organization or [program]” (Pollitt, 2011, p. 11). We, the fire service, like to consider achieving the self-imposed benchmarks as the desired outcome. However, they are clearly outputs. The outcomes would be the lives and property saved as a result of achieving the benchmarks. Unfortunately there is a gap in this area. None of the literature found offered a clear and concise path to

achieve favorable outcomes. There were a few of the studies in Europe that did focus on outcome but none actually captured the entire picture: What were the costs associated with the outcomes? Were there other factors that played a role in the outcomes? How did they achieve the outcomes? There is plenty of literature out there on the subject of performance measurement. Hopefully this research will be a step in the direction of filling void of outcome oriented performance measurement. While the intent of this research is to search out the options available, it is clear through the literature review there is a better way to measure performance but it has yet to be fully implemented or researched.

Procedures

The purpose of this research is to determine what type of annual performance measurement for emergency services would suit the needs of the Fayetteville Fire Department (FFD) and create a plan to develop a performance measurement model. The type of research chosen was action research, as a plan will be created to implement the chosen performance measurement. After reviewing the available literature on the subject of performance measurement, the focus evolved in to more of a specific type of performance measurement. All of the current measurements available focus on a department's outputs: How well do they comply with X benchmarks? A different form of performance measurement was found in a research paper outside of the fire service. The paper focused on outcomes, which sounds to be an appealing option for the FFD. However, the research was still approached with the same purpose in mind: What performance measurements are available?

A survey was developed for the purpose of researching what other departments were using in terms of performance measurement and what they were collecting to measure the performance (see: Appendix F). The design and development of the survey is discussed in more

detail below. The original thought process was to survey surrounding departments and see what they were using to measure performance. However, it was important to the author that the cities compared have similar risk as well as the financial means to mitigate the risk. It would be unrealistic to assume that Fayetteville could utilize the same program utilized by the New York City Fire Department nor would it be kosher to consider Fayetteville as exemplary in comparison to the volunteer fire department in the neighboring town. Unfortunately, as pointed out above, there is not a database available for comparable cities, so how does a department go about searching out comparable cities? To determine this, several different questions were pondered. The questions were ultimately refined down to two big questions: What risks generate the calls? What generates the funding for the department to mitigate the risk? A database of every U.S. city and town was created. The database contains the following variables for each city:

- USDA ranking of the county from most rural (1) to most urban (9).
- Population
- Square miles of the city
- Median income
- Percentage of poverty
- Median house value
- Metropolitan area Gross Domestic Product (GDP)
- If the city had a university or college of greater than 1000 students.
- Student population

  Note: This database is not in the appendix as it is thousands of pages. However, the author would be happy to provide it upon request. For the database contact the FFD

The rural/urban ranking for the county is available from the USDA Economic Research Services. The information for the metropolitan GDP is available from the U.S. Conference of Mayors. The student population is available from the National Center for Education Statistics. The rest of the variables, and thousands more, are available from the U.S. Census Bureau.

After the database was complete, it was time to decide what cities were comparable to Fayetteville Arkansas. There was statistical analysis completed on each of the variables (see: Appendix D). The mean and standard deviation was found for each variable. For each of the variables upper and lower limits were established by going one standard deviation above and below amount found in Fayetteville. This worked fine on everything with the exception of square miles. The standard deviation for square miles was quite large, 115 miles. This was not surprising as some of the cities were over 1600 square miles. For this variable an arbitrary amount of 10 square miles was chosen. Next, it was just a mater of seeing what cities fell within the newly established upper and lower limits. Before this was done, however, another step was taken.

Instead of giving all these variables equal weights an effort was made to determine if one variable carries more weight than another variable. For instance poverty level may play a larger role than population in regards to call volume. For this purpose a survey was completed to define the weights (see Appendix A). The survey was a "convenience survey" as it was posted on a forum on the International Association of Fire Chief's (IAFC) website. Members of the FFD, city of Fayetteville administrators, economic developers, bankers, and students & professors from the University of Arkansas also completed the survey. The survey was completed over 11 days starting on April 14th 2015. The exact population size is unknown but there were 109 respondents. The people completing the survey were asked to rate each of the

variables on their likelihood to pose a risk to a city's emergency services. They were also asked to rank the variables on their likelihood to benefit/impact the city's ability to fund emergency services. After the surveys were completed the mean scores for each variable were combined and added into the algorithm used to determine if the city fell within the established limits.

The cities received a score from 0 to 21.29. There was a clear drop in scores at the 94th city, so those 94 cities were considered the 94 most comparable cities to Fayetteville out of the more than 50,000 possible choices. A list of the 94 cities can be seen in Appendix J. An attempt was made to survey all 94 cities. The author read each and ever website for the various cities in an attempt to answer the survey questions (Appendix F). The departments were then contacted via phone and then email in many cases. The survey was either answered by phone or collected through an online surveying website. It was completed over 10 days starting on May 5th 2015. There was a great deal of data gathered from the websites that filled the gap in the research due to only 41 surveys being completed.

The survey consisted of some basic open-ended, close-ended, and forced-choice questions. The questions included the types of performance measurement utilized, CAD software used, compliance with different standards, and several question regarding the makeup and funding of the department. The questions were determined after reviewing the various literature listed above. Unfortunately, as highlighted in the literature review, there was very little that could be asked regarding performance measurement. The questions asked were intended to prompt a response about each department's practices in regards to performance measurement. They were also asked about what they were tracking and how they were tracking it. This was intended to determine what datasets were needed for tracking the performance. The other questions were intended to decide how accurate the comparable cities database was.

After the surveys were completed, the open-ended questions were divided into categories so they could be analyzed. The categories were based on what the respondents' answers were. The majority of the categories centered on fire industry standards. A couple forced-choice questions were utilized to determine how the departments gaged success. One such question was how they measured their performance of cardiac emergencies. It was important to delineate exactly what a department was calling success. The rest of the survey was analyzed on two main points: Whether the departments were comparable to the FFD, and how well the various departments complied with NFPA. Whether a department complied with NFPA was not being researched, but there was an assumption made that the majority of the departments would utilize the NFPA benchmarks in some form or fashion. There was statistical analysis performed to determine the mean and standard deviation of the responses to the various questions. If the results were not already numerical, they were converted into numbers so they could be analyzed. There were graphs created for the majority of the responses.

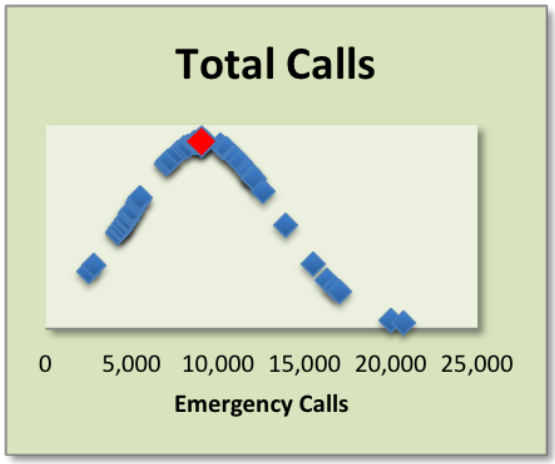
There are a few limitations with the research. The first limitation would be in the amount of research that was involved in creating the comparable cities database. That project could have been a research paper in its self. The variables chosen were not determined in a scientific way. After a multitude of variables were chosen, it would have been more suitable, than a survey asking for opinions, to use a multivariate linear regression model to determine the correlation of the different variables. Another limitation would be in the lack of response. With a population of 93 there should have been close to 75 respondents. Unfortunately, with only 41 responses to the survey, for a confidence level of 95% there will be a margin of error of up to 12% on part of the results.

Results

The first portion of the results section is devoted to the findings of the survey in regards to the comparable cities database. It was not part of the research but was required in order to accurately answer the research questions. As explained above it was important to survey departments that were comparable to the Fayetteville Fire Department (FFD). The survey asked several questions about the department in order to verify compatibility. Statistical analysis was completed on most but not all of the responses. The only responses that were not analyzed were the ones with very few respondents. A few of the questions and their statistical analysis are listed below. They are all very similar with the exception on the fire department budget where the FFD is lower. Fayetteville is very close to the mean for the rest of the responses. The remainder can be seen with the full survey and results can be seen in appendix G.

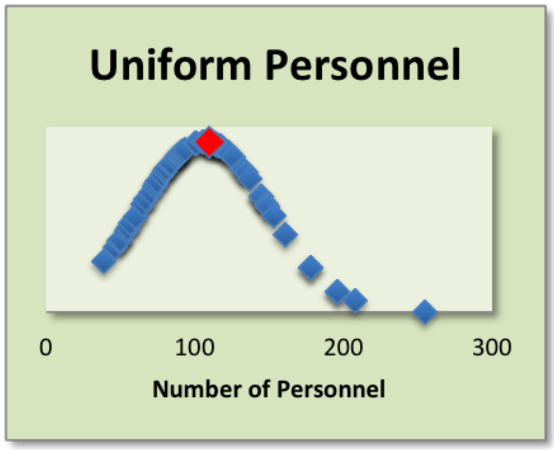
In the interest of keeping this portion brief, only as summary of the results is offered here. A more thorough analysis can be found in

Figure 2: Total Calls



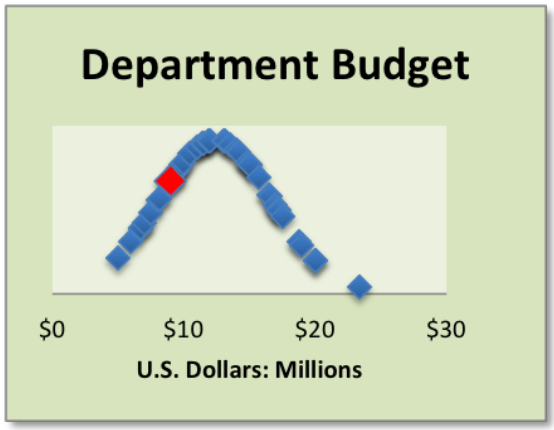
$\bar{x}$:9173 SD:4337 n:49 CI:95% MOE:10%

Figure 3: Uniform Personnel



$\bar{x}$:107 SD:43 n:66 CI:95% MOE:7%

Figure 4: Department Budget

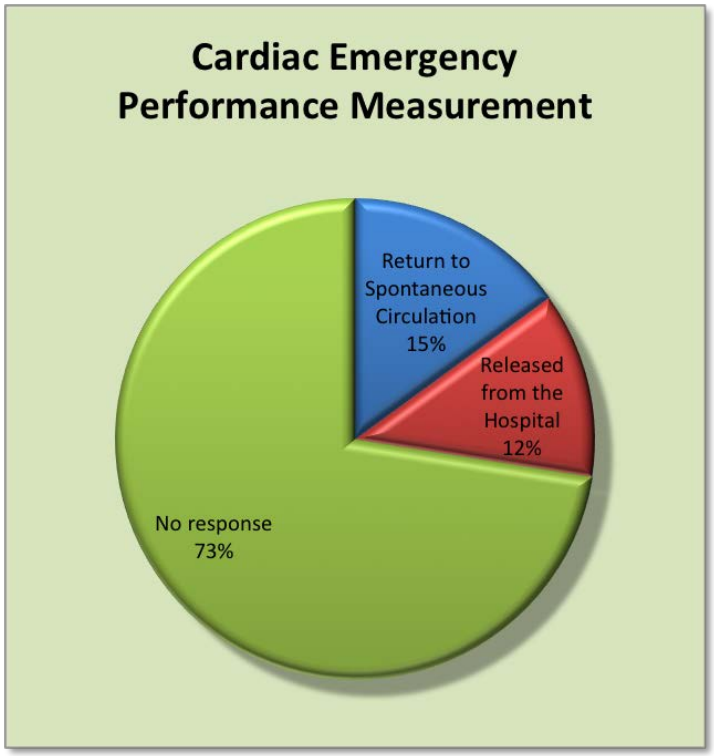


$\bar{x}$:12.4 SD:4.3 n:49 CI:95% MOE:10%

appendix A. In order to determine if the city had comparable risk the total amount of calls for last year was asked. Including what was gathered form the various websites there was 49 responses to this question. The mean was 9173 and the FFD had 9087 calls last year, so it would be true statement to say the FFD is very close to the mean. In order to determine the financial capabilities of the departments surveyed the amount of uniform-personnel, fire stations, and annual operating budget were asked. The number of responses ranged from 44 to 93. The FFD has 110 uniform personnel and the mean was 107. As mentioned above the budget was the only thing that had a decent variance from the mean. The mean was 12.4 million and the FFD has an annual operating budget of 9 million. Figures 2 through 4 illustrate the location of the FFD in relation to the mean. A read diamond denotes the FFD.

The remainder of the results section will focus on the purpose for this research. In searching for what options of performance measurement were available there were a few questions asked. Very few of the departments transported patient but a question was asked about how they track success for cardiac emergencies. The respondents were asked how they track their success on cardiac emergencies. This was a forced-choice question where the respondent had to

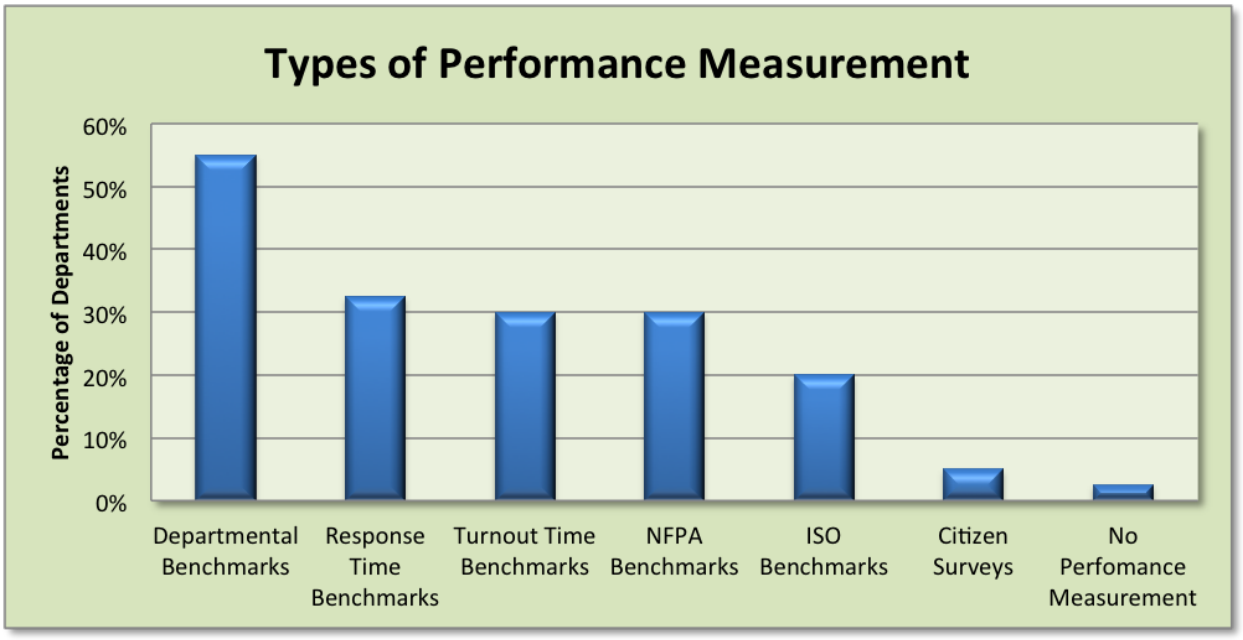
Figure 5: Tracking Cardiac Emergencies



answer whether they tracked a patient's return to spontaneous circulation or their release from the hospital. There was also another option to which some respondents answered none or both. The results from the rest of the question are displayed in figure 5. One respondent answered they use CARES so they use both. It was missed in the literature review but after a Google search it was determined that it was determined that CARES stood for Cardiac Arrest Registry to Enhance Survival. It will require more research but it appears to be a methodology of tracking success for at least a portion of what we do. While this may seem like a minor thing, this was the one real outcome based measurement this research uncovered.

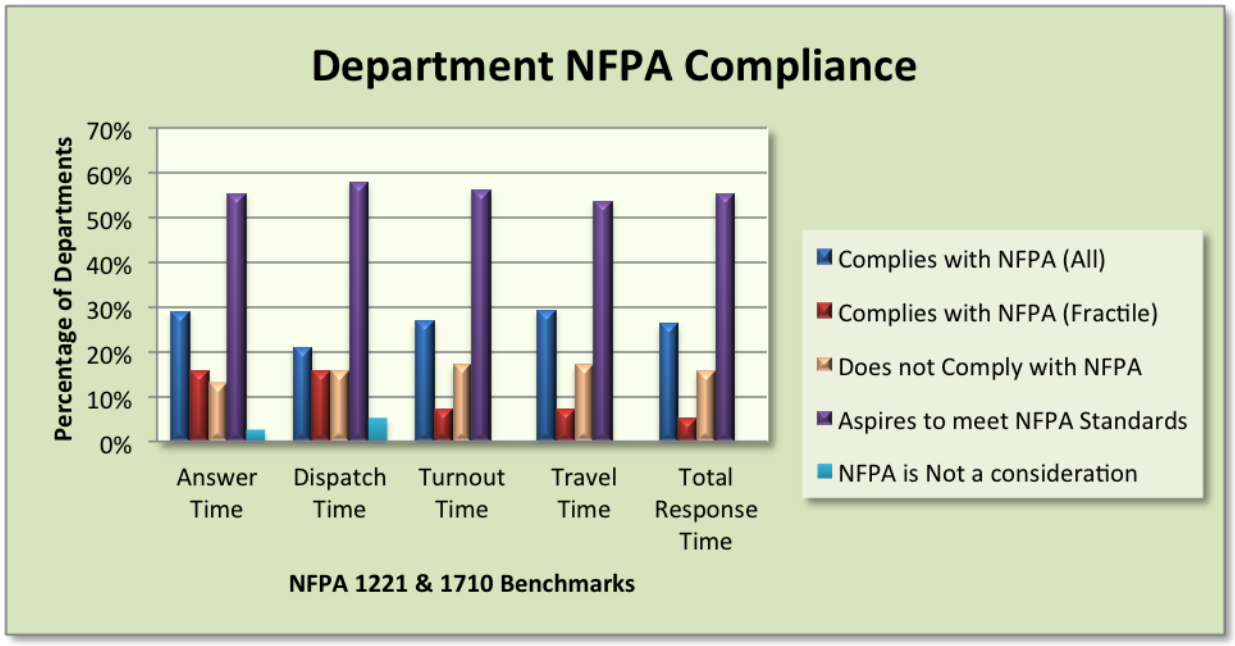
The next question asked was a basic open-ended question was asked: How is the performance of the services provided by your fire department measured? There were 40 responses to this question and it prompted various responses but the all had one thing in common, they focused on outputs. Several of the departments listed multiple of the following responses. The majority, 55%, of the responses was compliance with self-imposed benchmarks, as endorsed by the accreditation model. Within the self-imposed benchmarks falls the accreditation process. There are 14 accredited departments in this sample population of 94 comparable departments, which equates to 15%. The next front-runner was compliance with response time benchmarks coming in at 33%. Followed by Turnout time and NFPA benchmarks both at 30%. The remainder of the responses was ISO benchmarks (20%), citizen surveys (5%), and no measurement (3%) (see figure 6).

Figure 6: Types of Performance Measurement



From the review of literature the author was quite certain most cities would utilize NFPA benchmarks in some form or fashion. The next questions that were asked were two-fold. They were intended to aid in answering the previous research question but they also served as a sounding board for the second and third research questions. These questions prompted some contradiction with the previous open-ended question. With the previous question, 30% of the respondents stated they utilized NFPA as a benchmark for performance measurement. These questions received 41 responses that ranged from 79% to 84% of the respondents stating they either comply or aspire to comply with NFPA Standard for the Installation, Maintenance, and Use of Emergency Services Communication Systems (NFPA 1221) and NFPA Standard for Organization and Development of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments (NFPA 1710).

Figure 7: Department NFPA Compliance



The respondents were asked if their department met the standards set forth by NFPA 1221 and NFPA 1710 for: “Answer Time”, “Dispatch Time”, “Turnout Time”, “Travel Time”, and “Total Response Time” (see the literature review for explanation of terms). The response options were: Yes, No, Aspires to Meet NFPA, and Not a Consideration (see figure 7). An interesting thing to point out is the “Yes” answer was broken into two different answers. This was accomplished by asking the respondents in a separate question whether their department used average or fractile percentages. Those answers were then cross-referenced with the “Yes” answers. This was done to insure consistency. It is important to compare apples to apples. There is a big difference between average and fractile percentages. Notice the contrast in figure 7 between “Complies with NFPA (All)” and “Complies with NFPA (Fractile)”. The “All” category includes both average and fractile percentages. This point was made because in order to truly be in compliance with NFPA 1221 or NFPA 1710 a department must use fractile percentages.

While this research is not about NFPA compliance, the fact that a department knows if it complied with NFPA shows there is a level of commitment in regards to performance measurement. Striving to meet a benchmark and monitoring progress is an output based performance measurement. This also helps in explaining the second research question: What are the required datasets for the performance measurement? Using a benchmark oriented, output base, form of performance measurement requires a certain amount of data that must be available. A department must have the time elapsed for the following:

- From initiation of the original emergency call to the dispatcher answering the phone.
- From answering the phone to dispatching the unit.
- From dispatching the unit to the unit going en route.
- From the unit going en route to the first and last unit arrives on the scene.

By creating a database of these times the FFD would be able to see where it compared with NFPA standards. It would also allow the FFD to create its own benchmarks similar to those referenced by the department in the surveys. Prior to the latest version of ISO's FSRS these would not have aided in achieving ISO benchmarks. However, with the latest updates, as seen above, response times now matters.

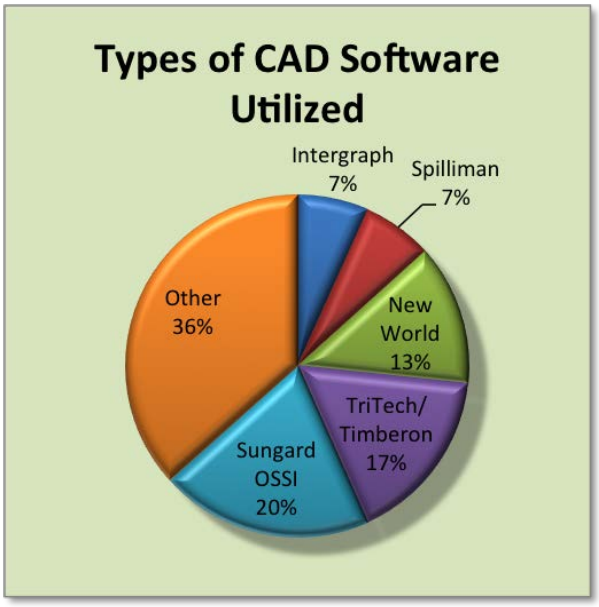
As mentioned above, the FFD is an ISO classification of 2. There is no new data required if ISO standards are the performance measurement chosen. The only other datasets outside of ISO data and the dispatch and response time data would be the data required to fulfill the CARES requirements:

- Basic patient information
- Patient location
- Hospital information including treatment and release

There is a copy of the CARES form attached (see Appendix H).

In order to determine the capabilities of the FFD to capture the required data, an open-ended question was asked. The respondents were asked what type of computer aided dispatch (CAD) their department utilized. This prompted a myriad of responses (see Figure 8 and Appendix G: Figure 24). About half of the departments used one of three brands of software. There were a couple more companies that more than one department used but the rest of the brands were only used by one department. This was an important question to answer, as CAD software can be cost prohibitive. This provided the FFD with a list of software option that comparable departments were using. The research did not go into the exact capabilities of the different software, but it did list what each department was using to collect the data utilized for their performance measurement.

Figure 8: Types of CAD Software



Discussion

As mentioned in the procedures section this research was full of rabbit holes. It was very easy to get side tracked into things outside of the scope of the research. However, as it was pointed out, there was a certain amount of this required. In order to provide plausible recommendations it was important to research cities that were comparable with the city of Fayetteville. After that path was travelled and a database established, the researcher was able to

continue down the path originally started, which was to explore the options of performance measurement and the capabilities required to complete the measurement.

It was pointed out in the procedures sections that the comparable cities database could have been created in a more scientific manner. Instead of using a survey to establish the weights, an analysis of what truly creates the call volume would have been more suitable. Dr. Boyd (2009) accomplished that in his research where he was able to show a correlation between call volume and demographics of the population being served. The same could have been applied to cities' database for each of the variables chosen. The variables chosen were also another gap in the scientific process. They were chosen on little more than a hunch; there's certainly not a good solid hypothesis to accompany each variable. However, through all the holes in the scientific methodology, there is some validity to the database. The cities were chosen based on one set of on variables, but the sample population was compared on an all-together different set of variables. By comparing the set of variables listed in appendix D, figure 13-19, to those in appendix G, figure 25, it is quite obvious that the city of Fayetteville is very similar to the other cities in the sample population. The graphs in appendix D show the Fayetteville is all over the place when compare to the total population. Where as the results in appendix G shows the Fayetteville Fire Department (FFD) is very close to the mean of the sample population chosen. Which would indicate that Fayetteville is a whole lot closer to the sample population than the total population. The only thing that the FFD was off from the mean on is department funding. This does not mean the city has less capability to fund their fire department. It could just mean that there is a different political focus in Fayetteville. While the database could have been more scientific, it is the author's belief that it served its purpose well.

It would appear that the fire service is not all that different than the rest of the world. We track our performance based on output. As illustrated above we gage our performance by the "evaluation of achieved outcomes, compared to desired outcomes" (Flynn, 2009, p. 3). As pointed out in the introduction FEMA takes the very same approach. However, as also pointed out, if we get too focused on the output we may disregard the outcome all together. The question was posed in the beginning: When we look at the fire service, the question could be asked: are our cots useable? After completing the research it is obvious that our cots are far from a useable ensemble. We do what Flynn describes to a tee, with one exception. COCOPS states "outputs are invariably intended to produce desirable outcomes beyond the organization or [program]" (Pollitt, 2011, p. 11). So what Flynn is really talking about is outputs. So the very organization tasked with guiding the fire service is failing to track a very important thing, the end result. As illustrated in the results above, we are falling well short of those established benchmarks. What are the implications of this? It really begs the question as to whether or not these benchmarks are plausible or even needed.

This research falls in stark contrast to that listed in Collins' (2007) research paper that shows that NFPA 1710 is a plausible goal with close to 50% of the respondents meeting the goal. It's hard to say why there is a divergence in the results between his research and that completed by this researcher. It could be that smaller departments like Fayetteville do not have the ability to comply. It could be that the departments surveyed by Collins was using average times as opposed to fractile percentages, this variable was not controlled for. The other thing that was alarming with his research was that it was only based on16 respondents (Collins, 2007, p.22). So, the viability of NFPA appears to be up for to debate but it would be hard to argue with the claim that a component to check for outcomes would be a great addition to the NFPA standards.

The lack of outcome-based measurement is not a problem that is unique to the United States. The COCOPS report was a comprehensive meta-analysis of more than 500 hundred studies in Europe. Their findings showed that only a minority of the studies focused on outputs and very few focused on outcomes. With the outcome based measurement they showed a real problem. With one example the showed how a large amount of emphasis was placed on the desired outcome by tying the departments funding to the outcome. There was in-turn pressure applied internally within the department to focus on this outcome. There was a huge success in the program, all except for the price tag. In this case the mortality rate rose exponentially. So in order to achieve the desired outcomes, members of society paid the ultimate price. It is important that we, the fire service, start focusing on what we are costing society.

Dr. Wodicka (2013) makes that very statement. He encourages the fire service to take a look at the outcomes. We are so focused on these self-imposed benchmarks that we miss the big picture. As is taught by the National Fire Academy, Executive Development course, we have to remove ourselves from the equation and look at the big picture from the "balcony". What are we doing with these self-imposed benchmarks? Is there a portion of society that is disenfranchised as pointed out by Dr. Boyd (2009, p.110)? It is very clear there is a large emphasis placed on these benchmarks. The results showed that almost a hundred percent of the respondent focused on some form of benchmark compliance. We focus on the output and never go to the balcony to check on the outcomes. Are we truly arrogant enough to believe that we are above the same follies highlighted in the COCOPS report or, even closer to home, the ones created by FEMA's focus on outputs?

One step in the direction of outcomes based measurement was discovered with this research. The author is ashamed to say that it wasn't discovered in the literature review. It could

be that the CARES model is new, or maybe they have not done a good job of educating fire departments of their existence. Or it could be that the author did a poor job on the literature review. Regardless of the answer, CARES, at least on the surface, sounds like a godsend. NFPA, as described by Flynn, does offer a measurement for the Emergency Medical Services (EMS) side, and as one might imagine, it focuses on outputs. The benchmarks look at patients requiring basic and advanced life support. There is response time benchmarks established for each. It is not known, but those benchmark could very well be established by the cares database. There is further research required in this area.

Twenty percent of the respondent stated they focused on ISO standards as a form of performance measurement. This could be in the rigid requirements of an engine and ladder company at certain established intervals or the little less rigid "Deployment Analysis", which requires a "systematic performance evaluation" (ISO, 2012, p. 9). Either way it is deeply immersed in an outputs-based form of measurement. Another option as described by Ron Holt (2010), a CFAI commissioner, as "agency soul-searching" (Holt, 2010, p. 4), is used at a disproportionate rate in this sample population of fire departments. There are just a little over 200 accredited departments in all of the US or roughly 8% of the departments. As highlighted in the results section there are 14 accredited departments in this sample population of 94 comparable departments, which equates to 15%. The research did not discover the reason for this disproportionate distribution, but it is certainly note worthy and needs further research.

To summarize the discussion: The research found that the fire service spends the vast majority of its time in the trenches providing a service to its customers. This is not a phenomenon unique to the fire service, as governments on at least two different continents utilize it. Governments are intended to serve their society. It is time we leave the trenches and head for

the balcony in order start giving society the service they deserve.

Recommendations

This paper has thoroughly researched the options of performance measurement for the Fayetteville Fire Department (FFD). This research has exposed a real void in the area of outcome based performance measurement. There are several recommendations on how the FFD should proceed from here. First, the FFD must update its computer-aided dispatch (CAD). The ability to accurately track data creates a real issue in any type of performance measurement discovered. The recommendations in Appendix F, Figure 24, list various CAD software used by comparable cities. Second, start tracking all the benchmarks set forth by the NFPA standards. A portion of this is already tracked but the exact timestamps, as listed by NFPA, need to be adjusted. As spelled out in the recommendations, certain things will require new CAD software but there are some minor adjustments that could aid in a more accurate database. This will only aid in output measurement. More of an outcomes based analysis would be more desirable, but regardless of what future research may reveal, creating an accurate database will be beneficial. Third, the department needs to look into what the accreditation model has to offer. This may or may not be a viable option for the FFD but at very least there entire model should be explored. Lastly, explore what it would take to participate in the CARES database. This appears to be viable option for the FFD.

For more research into an outcome-based performance measurement the CARES model should be researched. The next research paper will delve into what causes emergency calls. In order to fully understand how to help the problem, we must first fully understand the source of the problem. After the source of the problem is determined, future research should be able to

define how to accurately measure the performance of how well the FFD is addressing the problem.

References

Boyd, R. C. (2009). *Local public sector allocation of scarce emergency assets: An evaluation of the fire service* (Doctoral dissertation). Retrieved from http://usfa.sandbox.kohalibrary.com/app/work/181690

Center for Fire Accreditation International. (2015) http://www.publicsafetyexcellence.org/LinkClick.aspx?fileticket=PV3HlFGn86U%3d&tabid=71

Collins, B. (2007). *Nfpa 1710 and the moraga-orinda fire district*. Retrieved from U.S. Fire Administration: http://usfa.kohalibrary.com

Flynn, J. D. (2009). *Fire service performance measures*. Washington, DC: Government Printing Office.

Governmental Accountability Office. (2013). *Managing for results: Executive branch should more fully implement the gpra modernization act to address pressing governance challenges* (GAO-13-518). Retrieved from U.S. Government Accountability Office : www.gao.gov

Haynes, H. J. G., & Stien, G. P. (2014). *US fire department profile*. Washington, DC: Government Printing Office.

Heifetz, R. A., & Linsky, M. (2002). *Leadership on the line: Staying alive through the dangers of leading*. [Kindle]. Retrieved from

Holt, R. (2010, September). A different perspective of fire department accreditation. *Fire Chief*, *54*(9).

Insurance Service Office. (2012). *Revision to the fire suppression rating schedule (fsrs)* (AL-2012-FSRS). Retrieved from http://www.isomitigation.com

Kamensky, J. (2005, December). It's the outcomes, stupid! *PA TIMES*, p. 8. Retrieved from www.patimes.org

Pollitt, C. (2011). *The impacts of the new public management in europe: A meta-analysis*. Retrieved from Coordinating for Cohesion in the Public Sector of the Future: www.cocops.eu

U.S. Fire Administration. (2014). *America's fire and emergency services leader: Strategic plan fiscal years 2014-2018*. Washington, DC: Government Printing Office.

Wodicka, R. A. (2013, January). Measuring department performance. *Fire Engineering*. Retrieved from www.fireengineering.com

Appendix

Appendix A: City Risk & Funding Survey Questions

Copy of the survey used to decide the weights for each of the variables in the City Database.

1. What weight do the following factors carry when considering the risk posed to a city's emergency services?

	0	1	2	3	4
Population	○	○	○	○	○
Square Miles	○	○	○	○	○
Whether the city is rural or urban	○	○	○	○	○
Whether the city has a college/university	○	○	○	○	○
The enrollment of the college/university	○	○	○	○	○
Median income	○	○	○	○	○
Percentage of poverty level	○	○	○	○	○
Median house value	○	○	○	○	○
Metropolitan Area GDP	○	○	○	○	○

2. What weight do the following factors carry when considering the financial benefit/impact it offers/poses to a city?

	0	1	2	3	4
Population	○	○	○	○	○
Square miles	○	○	○	○	○
Whether the city is rural or urban	○	○	○	○	○
Whether the city has a college/university	○	○	○	○	○
The enrollment of the college/university	○	○	○	○	○
Median Income	○	○	○	○	○
Percentage of poverty level	○	○	○	○	○
Median house value	○	○	○	○	○
Metropolitan GDP	○	○	○	○	○

3. Is there some other factor that should be considered?

4. What is your career field?

5. What is your position?

Appendix B: Survey Results

Results from the above survey. Figure 10 shows the result broken down by each career field.

Figure 11 shows the combined total of the scores from all career fields.

Figure 10: Survey Results by Career Field

	Career Field					
	Banking	Economic Development	Educator	Government	Emergency Services	Other
Population	3.6	3.0	3.3	3.2	3.4	3.8
Square miles	3.1	3.0	2.7	2.8	2.8	2.6
Rural or urban	2.6	3.0	2.8	2.8	2.9	2.6
City has a college/university	2.6	2.5	2.2	2.8	2.8	2.5
The student enrollment	2.3	2.0	2.1	2.8	2.8	2.5
Median Income	1.9	2.0	2.7	2.6	2.7	3.0
Percentage of poverty level	1.9	3.0	3.1	3.1	2.8	3.1
Median house value	1.7	2.3	2.5	2.2	2.4	2.4
Metropolitan GDP	1.9	1.8	2.6	1.7	2.4	2.6

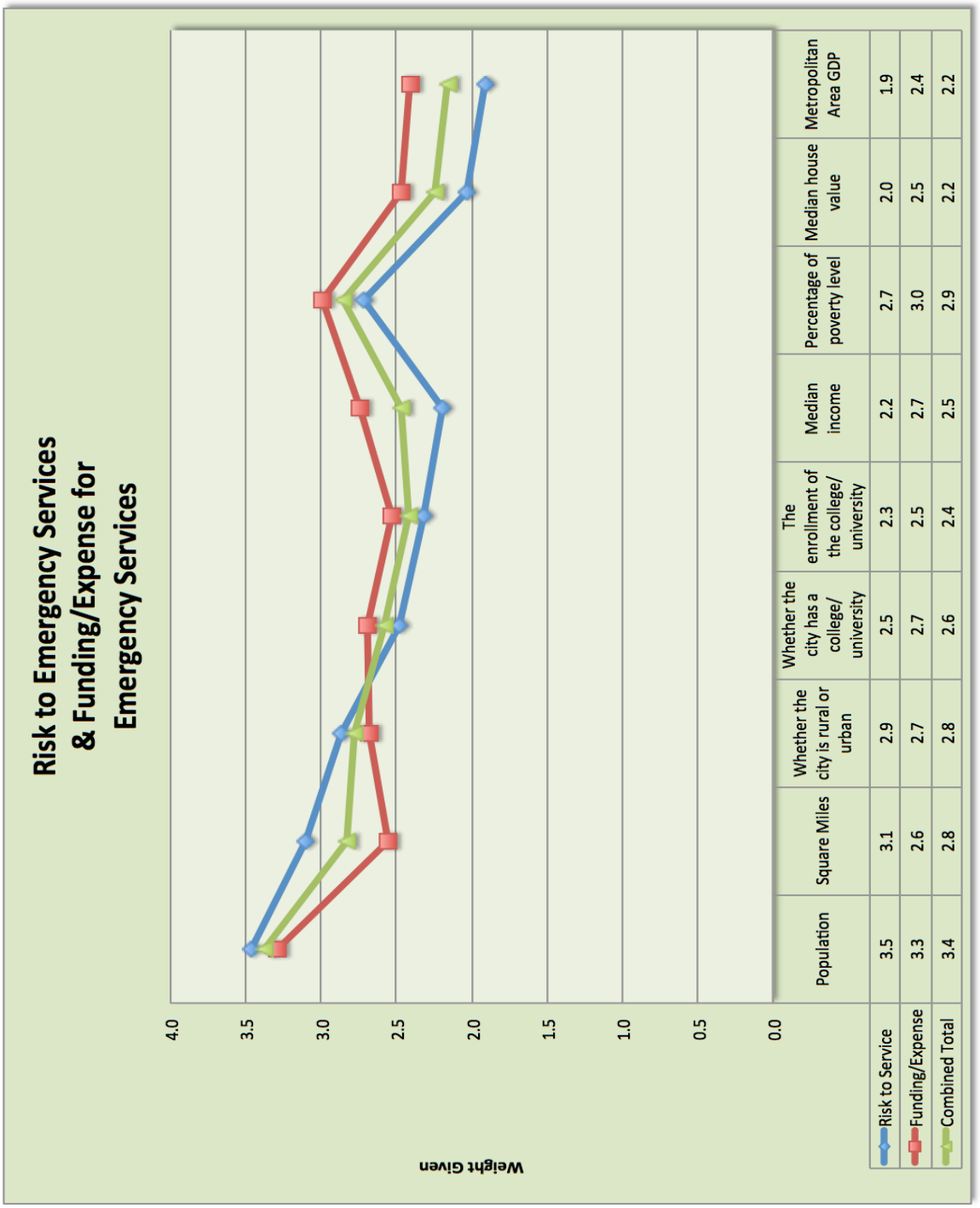
Figure 11: Survey Results Combined

	Combined Score		
	Risk	Funding	Total
Population	3.5	3.3	3.4
Square miles	3.1	2.6	2.8
Rural or urban	2.9	2.7	2.8
City has a college/university	2.5	2.7	2.6
The student enrollment	2.3	2.5	2.4
Median Income	2.2	2.7	2.5
Percentage of poverty level	2.7	3.0	2.9
Median house value	2.0	2.5	2.2
Metropolitan GDP	1.9	2.4	2.2

Appendix C Survey Results Graph

Figure 12 is graphically display of the difference of scores in each career field.

Figure 12: Graph of Survey Results



Appendix D: Comparable City Graphs

Statistical Analysis for the population for each of the variables within the city comparison database:

Figure 13: Metropolitan GDP: Mean: $43,222 Standard Deviation: $13,444

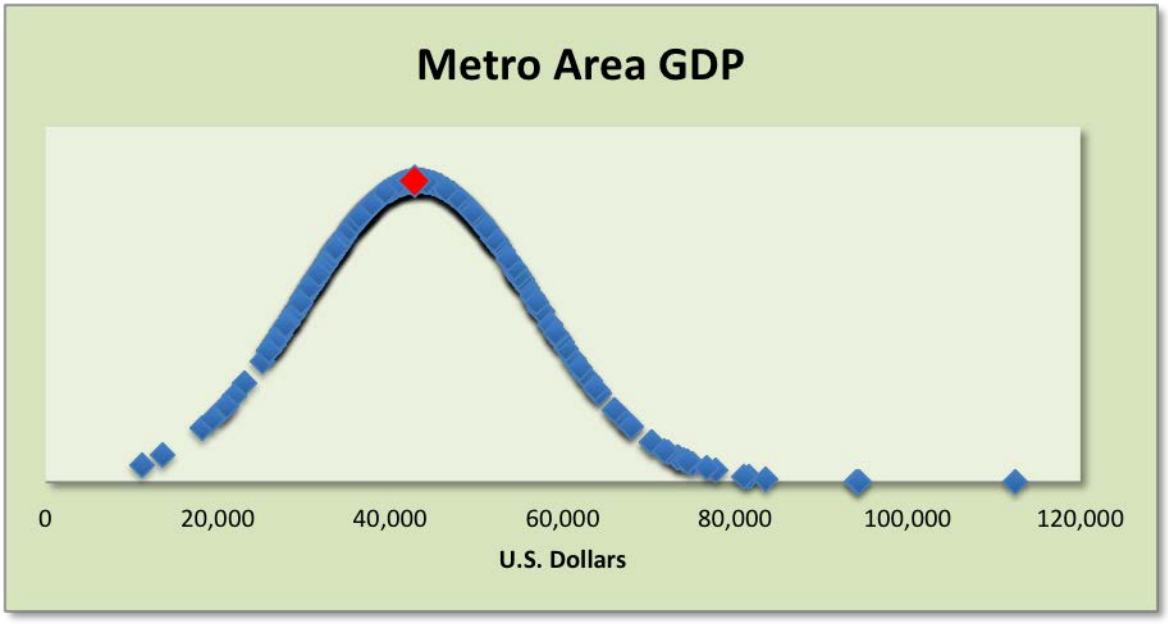


Figure 14: Population: Mean: 18,157 Standard Deviation: 38,525

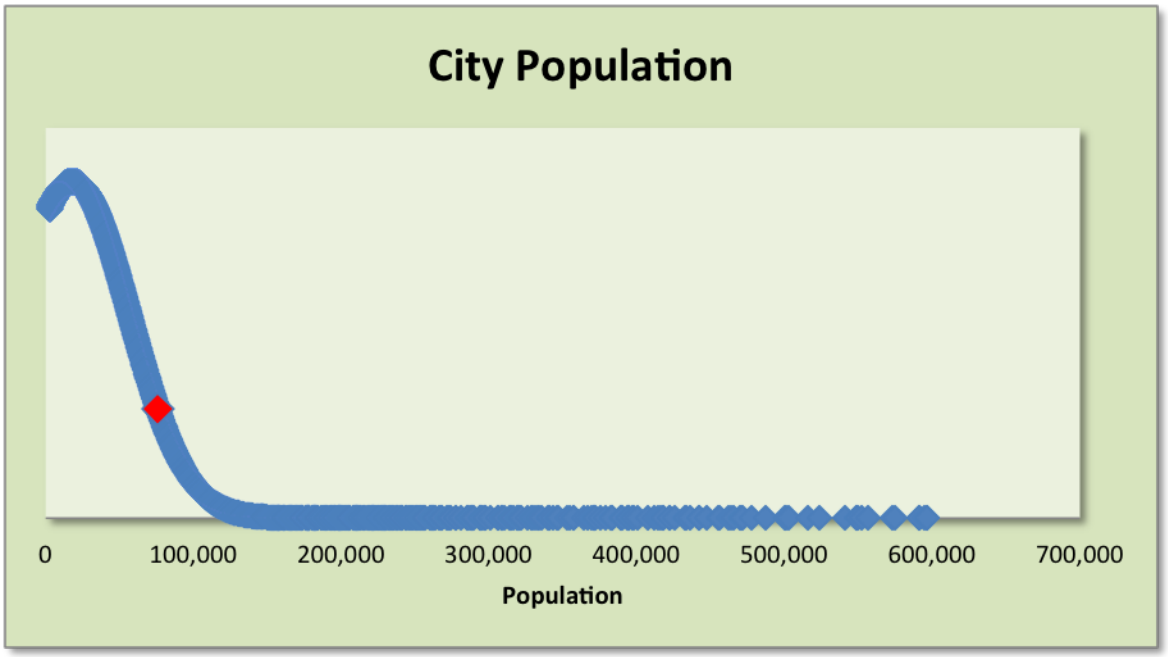


Figure 15: Square Miles: Mean: 43.9 Standard Deviation: 115

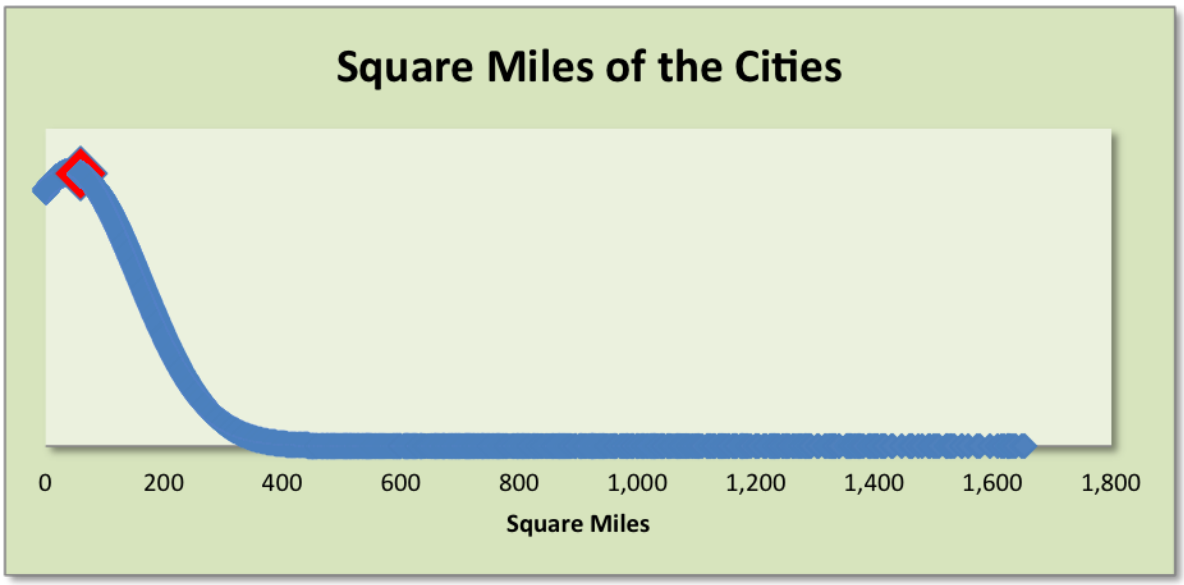


Figure 16: Median Income: Mean: $61,181 Standard Deviation: $24,529

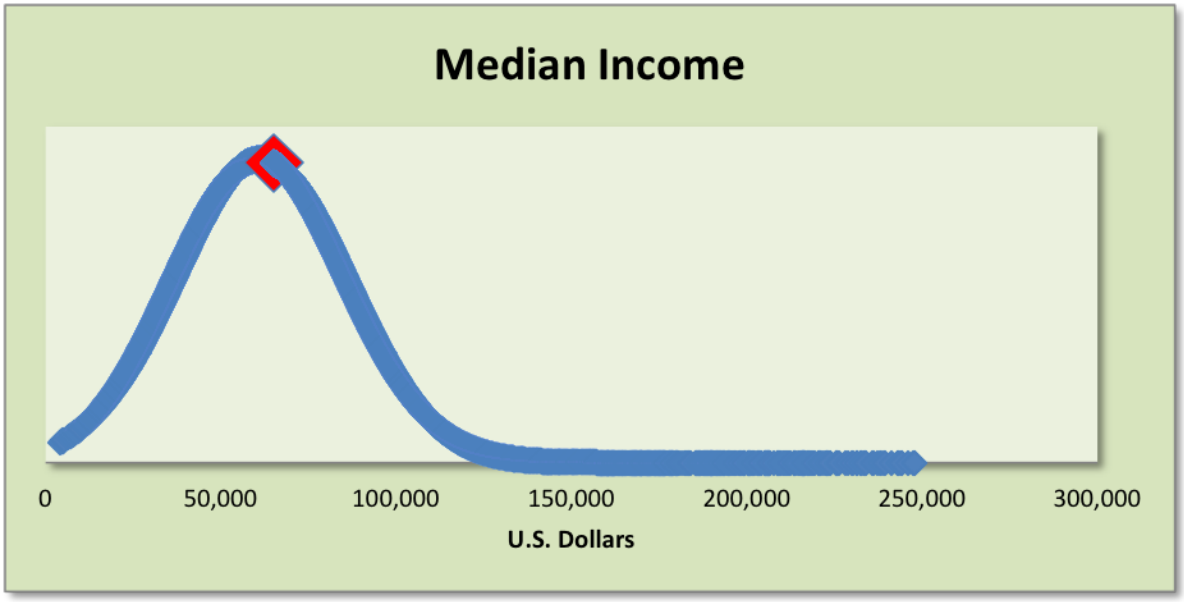


Figure 17: Percentage of population in poverty: Mean: 24.8 Standard Deviation: 16.6

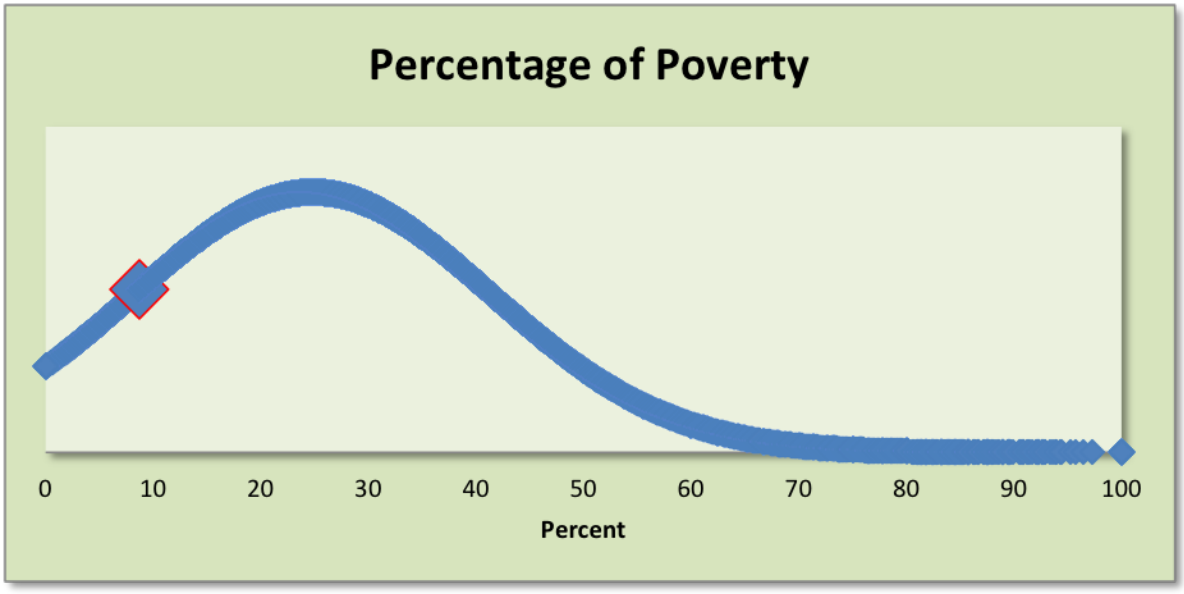


Figure 18: Median House Value: Mean: $148,324 Standard Deviation: $114,041

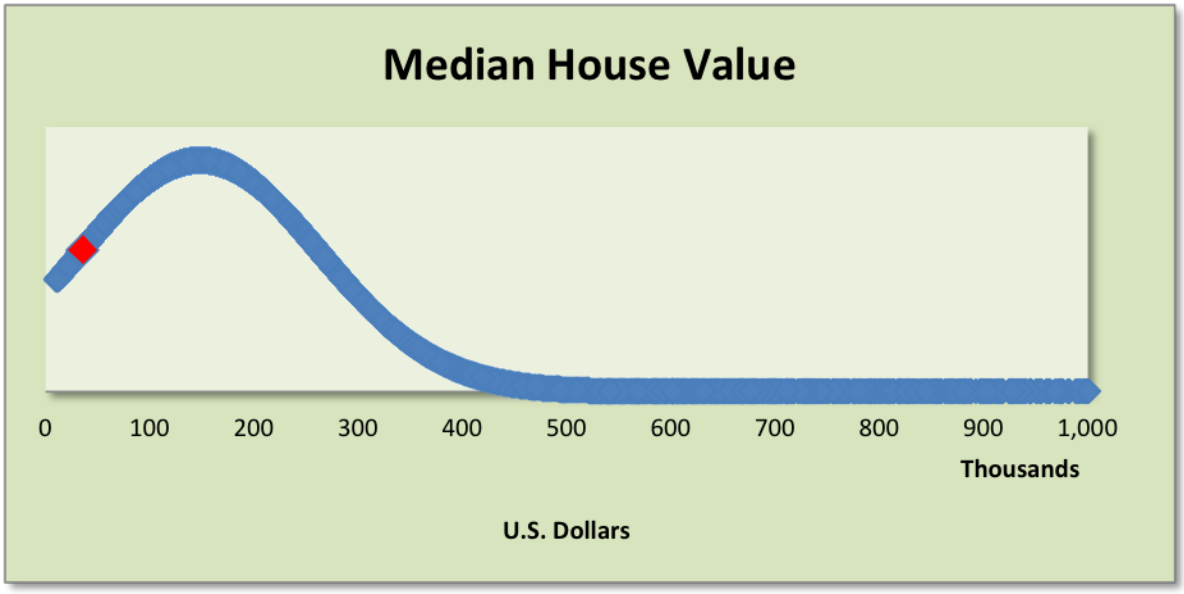
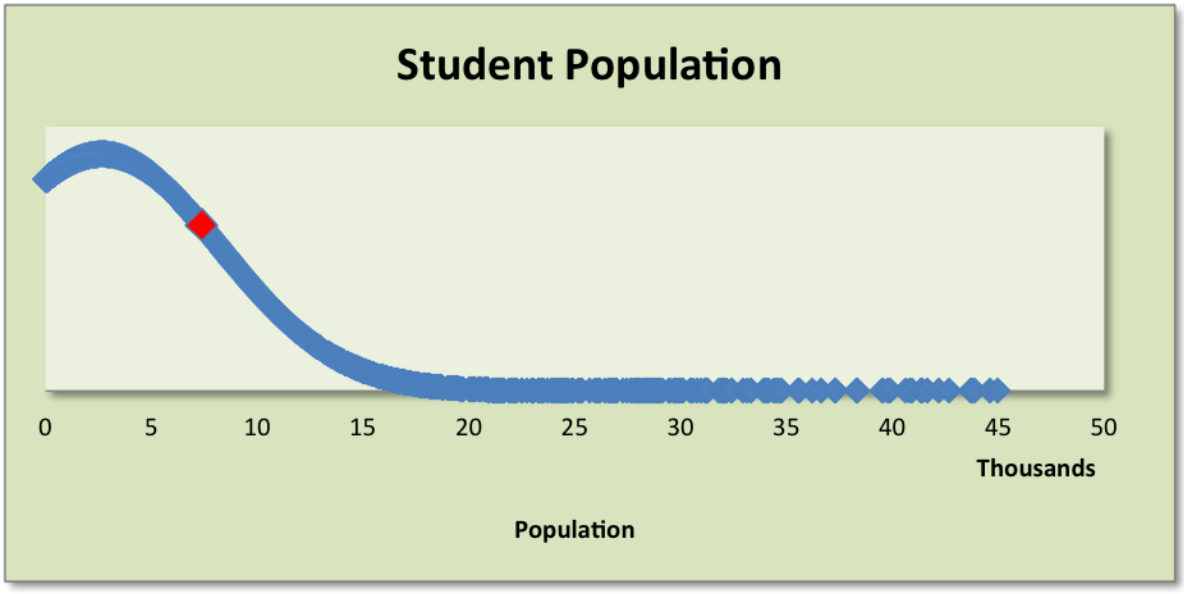


Figure 19: Student Population: Mean: 2,670 Standard Deviation: 5,563



Appendix E: Performance Measurement Survey Cover Letter

Cover Letter that was sent out with the surveys.

Fayetteville
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THE CITY OF FAYETTEVILLE, ARKANSAS
FIRE DEPARTMENT
303 West Center Street
Fayetteville, AR 72701
P (479) 575-8365 F (479) 575-0471

Performance Measurement Survey

My name is Brad Hardin, and I am a Battalion Chief for the Fayetteville Fire Department in Fayetteville Arkansas. I'm in my first year of the Executive Fire Officer program offered by the National Fire Academy. This survey is intended to aid in answering questions for a research project I am working on. The specific research question this is intended to answer is: What are the options for performance measurement? My initial intentions were to interview surrounding departments. However, the more I pondered the subject, I felt as though it would make more sense to interview similar cities with similar risk and funding to mitigate the risk. This opened a can of worms. I was unable to find an existing database of comparable cities. Using census data and many other sources I was able to create a database consisting of every city and town in the US. I then used statistics to narrow the list down to 95 matching cities, and your city is one of the 95 closest matches to Fayetteville.

I would be happy to share all the information gained from my research including my research paper. I would also be happy to modify the city database for your city so you can see a ranked list of comparable cities. I thank you for your help, and if I can ever do anything to help, please don't hesitate to ask.

Please click the link below to get to the survey. If you would prefer an interview over a survey, please let me know what time I should contact you.

https://www.surveymonkey.com/s/88Y68MD

Sincerely, Brad

Brad Hardin
Battalion Chief

Fayetteville Fire Department
303 W. Center
City of Fayetteville, Arkansas 72701
bhardin@fayetteville-ar.gov
T 479.973. 4824 | **F** 479.575.0471 | **M** 479.841.5671
Website | Facebook | Twitter | YouTube

Telecommunications Device for the Deaf TDD (479) 521-1316 113 West Mountain · Fayetteville, AR 72701

Appendix F: Performance Measurement Survey Questions

Copy of the survey sent to the comparable cities. This is the survey used for gathering what departments are doing for performance measurement.

1. What City and State is your Department in?

2. How is the performance of the services provided by your fire department measured?

3. Is there a dedicated tax for your fire department?

4. If your city has a university, does it assist with funding?

5. Approximately what is your city's general operating budget?

6. Approximately what is your department's operating budget?

7. If your department bills for EMS approximately what is the revenue?

8. What is your city's ISO rating?

9. Is your department accredited?

10. What was the total amount of calls for last year?

11. How many uniform firefighters does your department have?

12. How many non-uniform firefighters does your department have?

13. How many fire stations does your city have?

14. How many front-line units does your department have?

15. What kind of CAD does your department utilize?

16. 1. Does the CAD have canned reports to check compliance with the NFPA 1221 and 1710?

17. Does your department meet the standards set forth by NFPA 1221 and 1710 for the following? Please select as many as apply.

	Yes	No	Aspires to Meet NFPA	Not a consideration
Answer time	○	○	○	○
Dispatch time	○	○	○	○
Turnout time	○	○	○	○
Travel time	○	○	○	○
Total Response time	○	○	○	○

18. Does your department use fractile percentages or an average when computing times?

19. What is tracked in regards to the performance of your EMS?

Done

Appendix G: Survey Results

Below are the results combined results from the survey. Figure 20 was used to decide how well the department surveyed compared to the FFD. Figure 21 is the summary of the results from the questions about NFPA.

Figure 20: Department Comparison

	Department Comparison Section of Survey			
	Mean	Standard Deviation	Total	Respondents
Fire Budget	$12,703,193	4,345,617	$558,940,487	44
EMS Revenue	$1,857,398	1,391,255	$20,431,377	11
ISO Rating	3	1	-	45
Accredited			14	93
Total Calls	9273	4,372	435,822	47
Fire Uniform	107	43	7,037	66
Fire Non-Uniform	3	3	124	40
Stations	6	3	528	93
People Assigned per Shift	34	17	1,085	32
Minimum Staffing	28	12	679	24
How many frontline Units	9	4	291	32

Figure21: NFPA Compliance

	NFPA Section of Survey				
	Answer Time	Dispatch Time	Turnout Time	Travel Time	Total Response Time
Complies with NFPA	11	8	11	12	10
Does not Comply with NFPA	5	6	7	7	6
Aspires to Meet NFPA	21	22	23	22	21
Meets or Asspires to Meet	32	30	34	34	31
NFPA is Not a consideration	1	2	0	0	0
Complies with NFPA (All)	29%	21%	27%	29%	26%
Complies with NFPA (Fractile)	16%	16%	7%	7%	5%
Meets or Asspires to Meet	84%	79%	83%	83%	82%
Does not Comply with NFPA	13%	16%	17%	17%	16%
Aspires to Meet NFPA	55%	58%	56%	54%	55%
NFPA is Not a consideration	3%	5%	0%	0%	0%
Respondents	38	38	41	41	38

Figure 22 shows the response to how the departments track the times. Figure 23 shows how departments are recording successes for cardiac arrest emergencies.

Figure 22: Fractile or Average Percentages

Responses	
Fractile	16
Average	4
No Response	25
Total Respondents	42

Figure 23: Cardiac Emergency Performance

Responses	
Return to Spontaneous Circulation	6
Released from the Hospital	5
No response	29

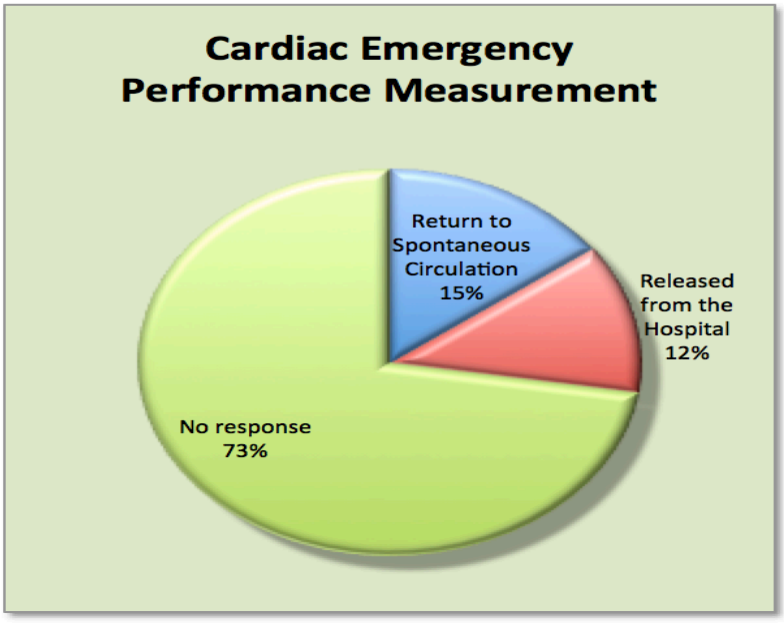


Figure 24: Types of CAD

What kind of CAD does your city use?	
Type	Departments
Sunguard OSSI	6
TriTech/Timberon	5
New World	4
Intergraph	2
Spilliman	2
Cassidian	1
HiTerm	1
IMC	1
Interact	1
Logistic Systems	1
Motorala premire	1
PSSI	1
Real Time 911	1
Southern Software	1
Vissions Zole RMS	1
Zuercher Technologies	1

Figure 24 displays the responses to the question what type of CAD is used by your department.

The following is the statistical analysis of the results from the above survey. On the next page Figure 25 is the graphical display of the statistics. Notice where the FFD falls on each of the charts. Again, the red diamond denotes the FFD. It

Total Calls: $\bar{x}$*:9173 SD:4337 n:49 CI:95% MOE:10%*

Uniform Personnel: $\bar{x}$*:107 SD:43 n:66 CI:95% MOE:7%*

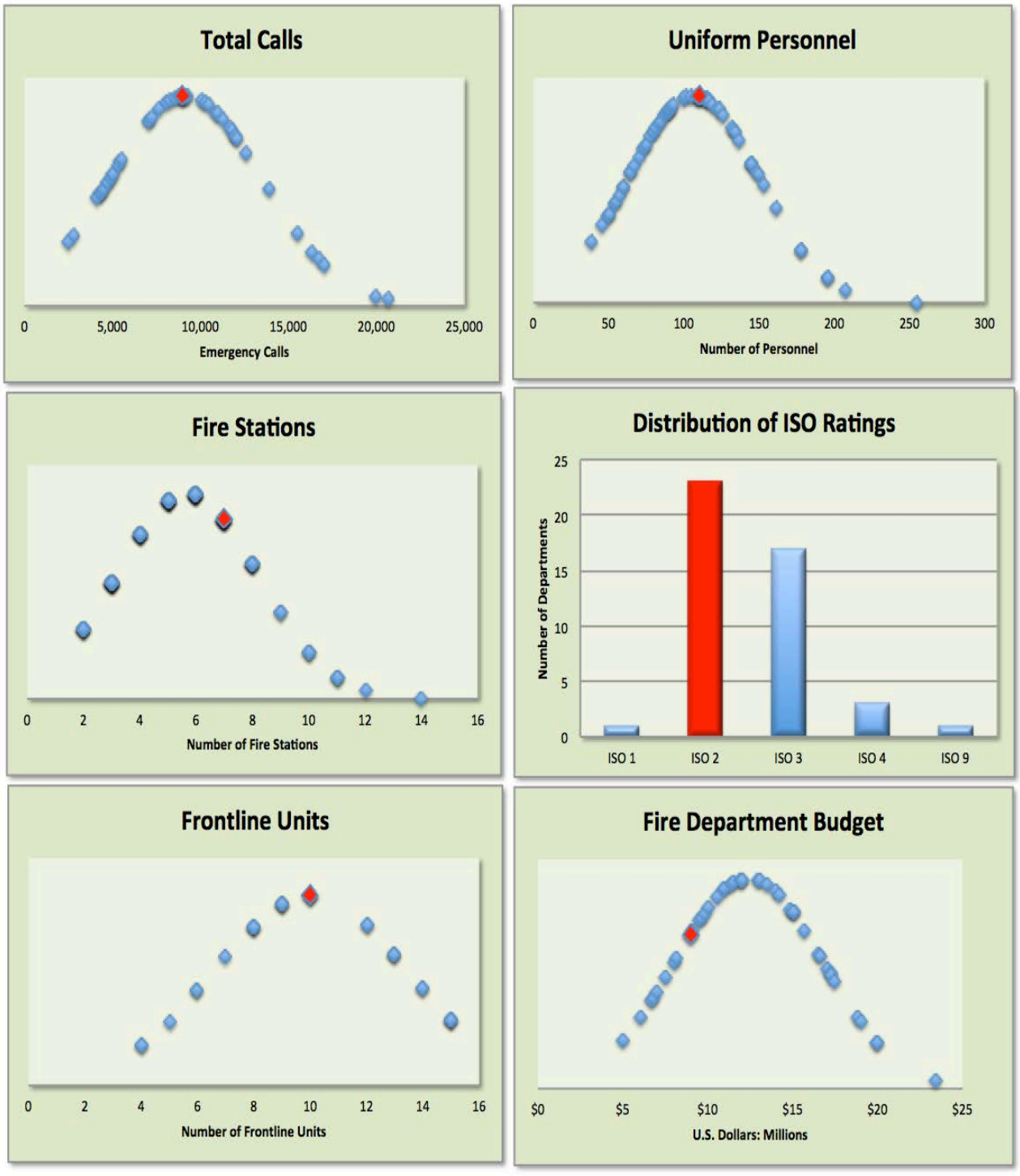
Fire Stations: $\bar{x}$*:6 S:3 n:93 CI:95% MOE:1%*

Distribution of ISO Ratings: $\bar{x}$*:4 S:1 n:45 CI:95% MOE:11%*

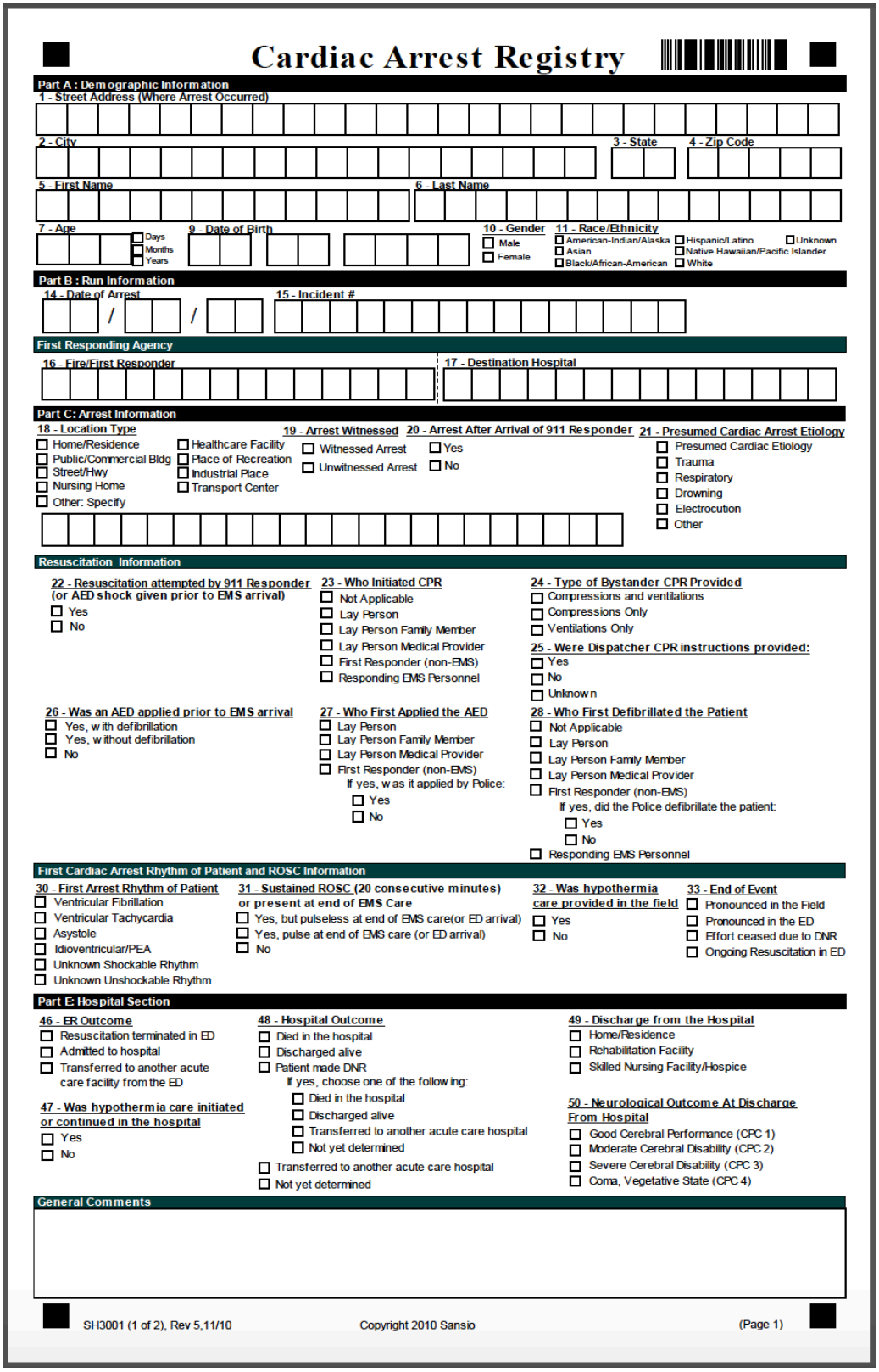
Frontline Units: $\bar{x}$*:10 S:3 n:29 CI:95% MOE:15%*

Fire Department Budget: $\bar{x}$*:12.4 SD:4.3 n:49 CI:95% MOE:10%*

Figure 25: Comparable Departments Graphs



Appendix H: CARES Data Form



Cardiac Arrest Registry

Part A : Demographic Information

1 - Street Address (Where Arrest Occurred)

2 - City | 3 - State | 4 - Zip Code

5 - First Name | 6 - Last Name

7 - Age ☐ Days ☐ Months ☐ Years | 9 - Date of Birth | 10 - Gender ☐ Male ☐ Female | 11 - Race/Ethnicity ☐ American-Indian/Alaska ☐ Asian ☐ Black/African-American ☐ Hispanic/Latino ☐ Native Hawaiian/Pacific Islander ☐ White ☐ Unknown

Part B : Run Information

14 - Date of Arrest / / | 15 - Incident #

First Responding Agency

16 - Fire/First Responder | 17 - Destination Hospital

Part C: Arrest Information

18 - Location Type
☐ Home/Residence ☐ Public/Commercial Bldg ☐ Street/Hwy ☐ Nursing Home ☐ Other: Specify
☐ Healthcare Facility ☐ Place of Recreation ☐ Industrial Place ☐ Transport Center

19 - Arrest Witnessed ☐ Witnessed Arrest ☐ Unwitnessed Arrest

20 - Arrest After Arrival of 911 Responder ☐ Yes ☐ No

21 - Presumed Cardiac Arrest Etiology
☐ Presumed Cardiac Etiology ☐ Trauma ☐ Respiratory ☐ Drowning ☐ Electrocution ☐ Other

Resuscitation Information

22 - Resuscitation attempted by 911 Responder (or AED shock given prior to EMS arrival)
☐ Yes ☐ No

23 - Who Initiated CPR
☐ Not Applicable ☐ Lay Person ☐ Lay Person Family Member ☐ Lay Person Medical Provider ☐ First Responder (non-EMS) ☐ Responding EMS Personnel

24 - Type of Bystander CPR Provided
☐ Compressions and ventilations ☐ Compressions Only ☐ Ventilations Only

25 - Were Dispatcher CPR instructions provided:
☐ Yes ☐ No ☐ Unknown

26 - Was an AED applied prior to EMS arrival
☐ Yes, with defibrillation ☐ Yes, without defibrillation ☐ No

27 - Who First Applied the AED
☐ Lay Person ☐ Lay Person Family Member ☐ Lay Person Medical Provider ☐ First Responder (non-EMS)
If yes, was it applied by Police: ☐ Yes ☐ No

28 - Who First Defibrillated the Patient
☐ Not Applicable ☐ Lay Person ☐ Lay Person Family Member ☐ Lay Person Medical Provider ☐ First Responder (non-EMS)
If yes, did the Police defibrillate the patient: ☐ Yes ☐ No
☐ Responding EMS Personnel

First Cardiac Arrest Rhythm of Patient and ROSC Information

30 - First Arrest Rhythm of Patient
☐ Ventricular Fibrillation ☐ Ventricular Tachycardia ☐ Asystole ☐ Idioventricular/PEA ☐ Unknown Shockable Rhythm ☐ Unknown Unshockable Rhythm

31 - Sustained ROSC (20 consecutive minutes) or present at end of EMS Care
☐ Yes, but pulseless at end of EMS care(or ED arrival) ☐ Yes, pulse at end of EMS care (or ED arrival) ☐ No

32 - Was hypothermia care provided in the field ☐ Yes ☐ No

33 - End of Event
☐ Pronounced in the Field ☐ Pronounced in the ED ☐ Effort ceased due to DNR ☐ Ongoing Resuscitation in ED

Part E: Hospital Section

46 - ER Outcome
☐ Resuscitation terminated in ED ☐ Admitted to hospital ☐ Transferred to another acute care facility from the ED

47 - Was hypothermia care initiated or continued in the hospital
☐ Yes ☐ No

48 - Hospital Outcome
☐ Died in the hospital ☐ Discharged alive ☐ Patient made DNR
If yes, choose one of the following: ☐ Died in the hospital ☐ Discharged alive ☐ Transferred to another acute care hospital ☐ Not yet determined
☐ Transferred to another acute care hospital ☐ Not yet determined

49 - Discharge from the Hospital
☐ Home/Residence ☐ Rehabilitation Facility ☐ Skilled Nursing Facility/Hospice

50 - Neurological Outcome At Discharge From Hospital
☐ Good Cerebral Performance (CPC 1) ☐ Moderate Cerebral Disability (CPC 2) ☐ Severe Cerebral Disability (CPC 3) ☐ Coma, Vegetative State (CPC 4)

General Comments

SH3001 (1 of 2), Rev 5,11/10 (Page 1)

Appendix I: Recommendations

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Recommendations for Performance Measurement

Purpose:

The purpose of this document is to provide direction for assessment of the services offered to the citizens of Fayetteville by the Fayetteville Fire Department (FFD). These recommendations should augment the current methodology of performance measurement.

Background:

These recommendations are the result of several months of work. Every option was thoroughly researched. Conducting a thorough literature review and ultimately surveying 93 comparable departments created some really good data to provide the recommendations below. This exposed a real void in the area of outcome based performance measurement. Further research will be completed in this area. For the time being the following recommendations are made:

Recommendations:

- The FFD must update its computer-aided dispatch (CAD) software. The following list is what the surveyed departments are utilizing. The name of the software is listed followed by the number of departments utilizing the software.
  - Sungard OSSI: 6
  - TriTech/Timberon: 5
  - New World: 4
  - Intergraph: 2
  - Spilliman: 2
  - Other: 1 each

        - Cassidian, HiTerm, IMC, Interact, Logistic Systems, Motorola Premier, PSSI, Real Time 911, Sothern Software, Visions Zole RMS, Zuercher Technologies

- Start tracking all the benchmarks set forth by the NFPA standards.
    - A portion of this is already tracked but the exact timestamps, as listed by NFPA, need to be adjusted.
    - The current CAD software will be a problem in the following areas.
        - Inability to timestamp:
            - Call time
            - Answer time
            - Automated dispatch time
    - The following minor adjustments can be made to facilitate a more accurate database:
        - A systematic way of recording the timestamps listed below. This should insure accuracy across the various dispatchers.
            - Answer time
            - Dispatch time
                - Per NFPA 1221 the dispatch time should not start until the verbal or electronic dispatch has started.
- Research what the accreditation model has to offer.
    - This may, or may not, be a viable option for the FFD but at very least their entire model should be explored.
- Explore what it would take to participate in the Cardiac Arrest Registry to Enhance Survival (CARES) database.

- This is a registry of cardiac emergencies. It tracks a patient from the onset of the problem to discharge from the hospital. It appears to be viable option for the FFD.

- Notes:

  The next research paper will delve into what causes emergency calls. In order to fully understand how to help the problem, we must first fully understand the source of the problem. After the source of the problem is determined, future research should be able to define how to accurately measure the performance of how well the FFD is addressing the problem.

Appendix J: List of Comparable Cities

City and State	City and State	City and State
Ames Iowa	Flagstaff Arizona	Moline Illinois
Ankeny Iowa	Florence South Carolina	Muncie Indiana
Asheville North Carolina	Fond du Lac Wisconsin	Murfreesboro Tennessee
Athens Georgia	Fort Smith Arkansas	Nampa Idaho
Avondale Arizona	Georgetown Texas	New Braunfels Texas
Battle Creek Michigan	Grand Forks North Dakota	Newark Ohio
Bellingham Washington	Great Falls Montana	Norman Oklahoma
Bend Oregon	Green Bay Wisconsin	North Fort Myers Florida
Bentonville Arkansas	Greenville North Carolina	North Little Rock Arkansas
Bethlehem Pennsylvania	Greenville South Carolina	Norwich Connecticut
Billings Montana	Gulfport Mississippi	Olympia Washington
Binghamton New York	Hickory North Carolina	Oshkosh Wisconsin
Blacksburg Virginia	High Point North Carolina	Pasco Washington
Bloomington Illinois	Iowa City Iowa	Pine Bluff Arkansas
Bossier City Louisiana	Jackson Tennessee	Pittsfield Massachusetts
Broken Arrow Oklahoma	Jacksonville North Carolina	Pueblo Colorado
Bryan Texas	Janesville Wisconsin	Rancho Cordova California
Caldwell Idaho	Jonesboro Arkansas	Rapid City South Dakota
Chicopee Massachusetts	Killeen Texas	Rochester Minnesota
College Station Texas	Kingsport Tennessee	San Angelo Texas
Columbia Missouri	Kokomo Indiana	Sioux City Iowa
Corvallis Oregon	La Crosse Wisconsin	Spring Hill Florida
Davenport Iowa	Lacey Washington	Temple Texas
Dearborn Michigan	Lawton Oklahoma	Troy New York
Decatur Illinois	Livonia Michigan	Tuscaloosa Alabama
DeKalb Illinois	Longview Texas	Tyler Texas
Dubuque Iowa	Lynchburg Virginia	Waterloo Iowa
East Lansing Michigan	Manchester New Hampshire	Wausau Wisconsin
Eau Claire Wisconsin	Manhattan Kansas	Westfield Massachusetts
Edinburg Texas	Maricopa Arizona	Wichita Falls Texas
Fargo North Dakota	Missoula Montana	Wilmington North Carolina
		Woodland California