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Turnout Time Analysis for South Metro Fire Rescue Authority

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Abstract

Understanding fire department response times requires the evaluation of the dispatch, turnout, and travel time components, each of which affects the ability of an organization to have a positive impact on the outcome of an emergency. The problem was that South Metro Fire Rescue Authority's (SMFRA) turnout times exceeded the criteria of the Commission on Fire Accreditation International. The purpose of this research was to conduct a detailed analysis of current turnout time performance in order to identify where improvement efforts should be focused. The research questions were (a) what are the detailed turnout times for SMFRA, (b) to what extent do technical factors contribute to extended turnout times at SMFRA, (c) to what extent do behavioral factors contribute to extended turnout times at SMFRA, and (d) what is a reasonable turnout time standard for SMFRA? A descriptive research method was utilized that included an analysis of past turnout time data and a questionnaire. Common factors were derived from the literature and grouped into 3 technical factors (data transferring systems, facilities, and reaction processes) and 2 behavioral factors (perception and motivation). Comparisons were conducted of previous years' performance, station size, type of call, time of day, call volume, type of apparatus, location at time of dispatch, and personnel assigned to upper- and lower-performing apparatus. Only slight correlations were found between turnout times and station size ($r=.19$) or call volume ($r=-.22$). Technology used in data transferring systems was shown to have the greatest benefit to turnout times. The questionnaire found that personnel perceptions did not match actual performance and that peer influence, personal satisfaction, and the potential outcome of the call were the biggest motivators. Recommendations included standardizing station alerting systems, adopting a new turnout time standard, and starting a focused campaign to improve turnout times.

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INTRODUCTION

A challenge for today's fire service is to achieve excellence in life safety and property protection through the process of continuous quality improvement (Commission on Fire Accreditation International [CFAI], 2006). The CFAI provides a framework for critical self evaluation where several key areas of the fire service are analyzed and a plan for improvement developed. One of those areas is the organization's response times, or the ability to respond quickly to an emergency. To fully understand response times requires the evaluation of the dispatch, turnout, and travel time components, each of which affects the ability of the organization to have a positive impact on the outcome of an emergency (CFAI, 2006).

The problem is that South Metro Fire Rescue Authority's (SMFRA) turnout times exceed the criteria of CFAI. These extended turnout times result in longer total response times to emergency incidents, which threaten the ability to successfully mitigate those emergencies. The purpose of this research is to conduct a detailed analysis of current turnout time performance in order to identify where improvement efforts should be focused. The research questions are (a) what are the detailed turnout times for SMFRA, (b) to what extent do technical factors contribute to extended turnout times at SMFRA, (c) to what extent do behavioral factors contribute to extended turnout times at SMFRA, and (d) what is a reasonable turnout time standard for SMFRA? A descriptive research method will be utilized that will include an analysis of past turnout time data. Common technical and behavioral factors will be derived from the literature and insight into their contribution to extended turnout times will be extracted through data analysis and a questionnaire.

BACKGROUND AND SIGNIFICANCE

SMFRA was formed in May, 2008 as a merger between two adjacent fire districts - South Metro Fire Rescue (SMFR) and Parker Fire Protection District (PFPD). Located south of Denver, Colorado, the new SMFRA serves approximately 176 square miles including the communities of Castle Pines North, Centennial, Cherry Hills Village, Foxfield, Greenwood Village, Lone Tree, Louviers, Parker and portions of unincorporated Arapahoe and Douglas Counties. SMFRA is a career department with 297 full-time firefighters staffing 17 fire stations on a 24-hour basis over three shifts. SMFRA is an all-hazards fire department providing fire suppression, emergency medical services (including advanced life support), patient transport, hazardous materials, technical rescue, aircraft rescue fire fighting, urban search and rescue, wildland firefighting, and water rescue and recovery (dive) capabilities. SMFRA also has 97 staff personnel that provide finance, human resources, information technology, fleet, facilities, risk management, and strategic planning support, as well as additional fire prevention, public education, emergency management, fire investigation, and community relations services.

SMFRA has a residential population of approximately 198,000 (MicroBuild, 2008) and an average daily business population of approximately 121,000 (Denver Regional Council of Governments, 2009). Using the population categories from CFAI (2006), approximately 63% of the population is located in urban areas, 31% in suburban, and 6% in rural (see Figure 1). The resident population is about 89% Caucasian, 5% Hispanic, 4% Asian, 22% in the age group 14 years old and below, and 8% in the age group 65 years old and above (MicroBuild, 2008).

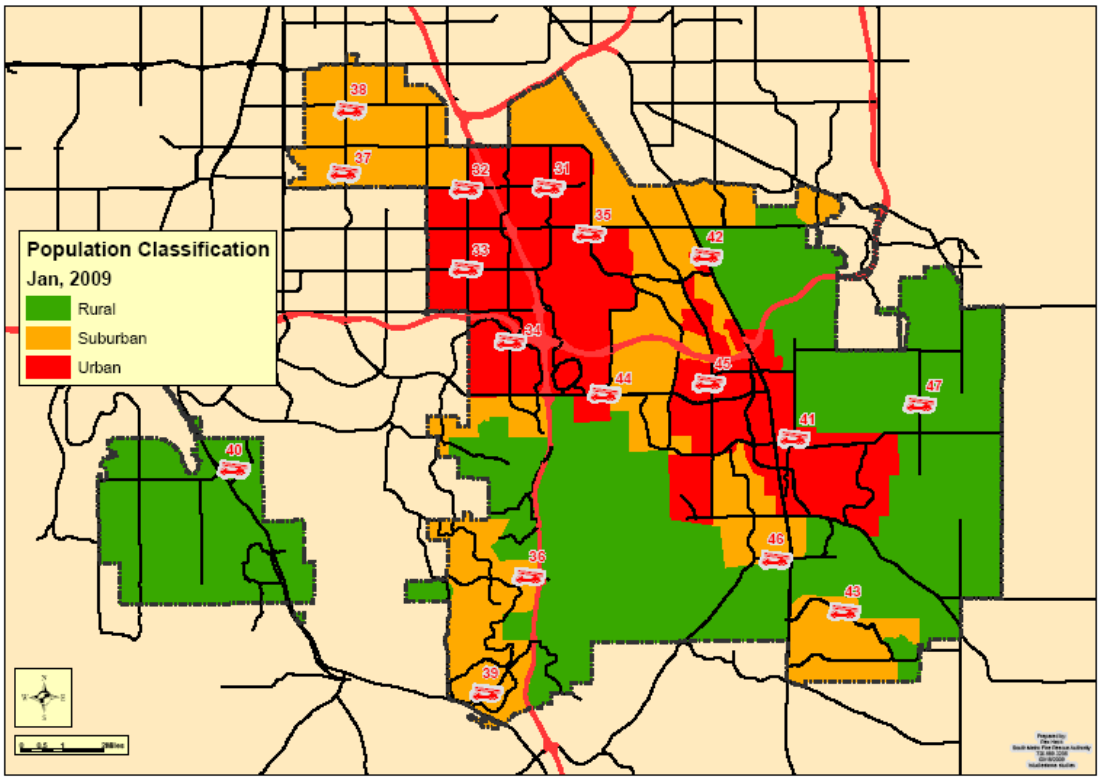


Figure 1. Rural, suburban, and urban populations within SMFRA's boundaries.

Prior to the formation of the fire authority, SMFR and PFPD were both accredited agencies by CFAI. The new organization is now in the process of becoming re-accredited as SMFRA. That process includes completing a detailed Fire & Emergency Service Self-Assessment Manual (CFAI, 2006) of performance indicators, as well as the completion of a Strategic Plan and Standard of Cover.

The Standard of Cover document provides a systematic method of evaluating the location and staffing of fire stations and equipment and serves as a planning tool for future resource deployment (CFAI, 2008). This is accomplished through the CFAI process by identifying community risks, determining the types and levels of service to be provided, analyzing current response capability in terms of time and on-scene performance, and developing performance standards. In preparation for SMFRA's Standards of Cover, an analysis of past response time

performance needed to be conducted in order to see the combined performance of the new fire authority and gain insight into what performance standards are reasonable and reliable for the organization.

Understanding past response time performance requires an understanding of all of the components of total response time. Each component or time segment, including notification/alarm processing time (a.k.a., dispatch time), turnout time and travel time, can be managed by the fire department and has a direct relationship to fire loss and survival rates for emergency medical incidents (Barr & Caputo, 2003). In other words, the quicker the fire department responds, the greater the chance for survival and property conservation (Barr & Caputo, 2003).

The impact of turnout time performance on total response times was experienced by this author when a detailed study of a fire station response area was being conducted in 2007/2008. The purpose of that study was to evaluate if re-locating the fire station would improve response times and avoid the need to construct an additional fire station in the area. While it was shown that travel times may be reduced with the station relocation, there was still the fact that the station's turnout times were in excess of 2 minutes, 90% of the time (Parker-South Metro Fire Rescue Authority, 2008). Therefore, even with the station relocation, the overall performance of the station would still not meet the desired total response time, in part because of the extended turnout times. Since the organization didn't have a good understanding of the causes of these extended turnout times or know what goal was reasonable and attainable, it was difficult to define the deployment strategy for the area and explain to the citizens how they were going to experience improved service.

In the past, both SMFR and PFPD had conducted several, extensive analyses of the travel time component in order to locate new fire stations and determine the best location for specific apparatus. The dispatch time component had also been studied thoroughly and eventually led to the formation of a dedicated fire and EMS dispatch center, MetCom, that decreased dispatch times and now meets the standards of National Fire Protection Association (NFPA) 1221 (2006). However, the attention that each organization gave to turnout times was not as consistent.

In recent years, the former SMFR had not thoroughly analyzed turnout times or established a formal plan for improvement. At most, there were occasional discussions where the battalion chiefs or station officers would raise the awareness of turnout time deficiencies, but with no mandated performance goals or formal analysis of the impact of those discussions (R. Barron, personal communication, May 11, 2009). In 2003, SMFR had instructed each station to time their turnout process from the day room to the apparatus with and without having to dress in personal protective equipment (PPE). When no PPE was included, turnout times were a little over 60 seconds. When PPE was included, turnout times ranged from about 90 to 120 seconds. It was found that stations with longer travel distances had longer turnout times, but that was more apparent when the day room was on the second floor of the station (B. Herdt, personal communication, June 3, 2009). The former PFPD gave the topic of turnout times more attention through similar time and motion studies in the early 2000's, monthly reporting to the stations and shifts, and emphasis from the Battalion Chiefs (V. Turner, personal communication, June 3, 2009).

Both organizations had also established Standards of Cover prior to the formation of the fire authority and each included specific turnout time goals. In particular, each included a 60-second turnout time component as part of the total response time goal; however, actual

performance was closer to 100 seconds on average (Parker Fire District, 2007; South Metro Fire Protection District, 2005). Even though turnout times were mentioned, most of the emphasis was placed on total response time, so it was unclear in the documents how the organizations were planning on addressing this gap in turnout time performance.

In 2008, SMFRA's dispatch center, MetCom, began a program that indirectly placed some importance on turnout times (V. Zecher, personal communication, May 28, 2009). MetCom had already been dispatching the "closest unit" to calls through the use of global positioning system (GPS) technology since 2006. This GPS information allowed the dispatch software to compute which apparatus was closest to the call based on predicted travel time. In 2008, the turnout time component was added to the decision-making process to help ensure that the closest and quickest station was dispatched to a call. For each station, the average turnout time including all front-line apparatus and shifts was calculated and compared to the 60-second standard. If the average was greater than the standard, then that difference would become the time delay for the station. At times, this led to a particular apparatus not being selected to respond to a call even though it was geographically closer.

The ability to decrease response times, improve life and property protection, determine a turnout time standard for the organization, improve the analysis of current and future resource capabilities, accurately represent service levels to the community, and optimize performance while avoiding unnecessary financial commitments are all reasons that a detailed understanding of turnout times is critical for SMFRA. This study aligns with the Executive Fire Officer Program's Executive Development course that focuses on the critical evaluation of fire service programs and constant improvement of service quality. This analysis of turnout times is also a timely topic as there is a national consensus process in progress that may establish new national

standards for acceptable turnout times (NFPA, 2008, 2009). Therefore, this study also aligns with the United States Fire Administration's Operational Objective #5 – to respond appropriately in a timely manner to emerging issues.

LITERATURE REVIEW

The turnout process consists of several major components including the transfer of the call from dispatch to the station or apparatus (e.g., via pager, radio, speakers, printer, apparatus computers), confirming the route to the call (e.g., via wall maps, unit computers), traveling to the apparatus (e.g., securing activities such as cooking or training, walking through station or from other activity), donning PPE, and boarding apparatus/preparing for departure (Pointon et al., 2005; Soptich, 2005). The Fire & Emergency Service Self-Assessment Manual (CFAI, 2006), which provides key performance criteria for accredited fire departments, and NFPA 1710 (NFPA, 2001), which contains minimum deployment requirements for career fire departments, are two major documents that define and set standards for turnout time. Turnout time is defined similarly by CFAI and NFPA 1710 as the amount of time between when units acknowledge receipt of an emergency call from the dispatch center and when travel starts. NFPA 1710 requires that a fire department establish a turnout time objective of 60 seconds, whereas CFAI requires 60 seconds between the hours of 0700 and 2200, and 90 seconds between 2201 and 0659. Both documents require compliance with these turnout time objectives 90% of the time.

These standards stress the importance of speed during the turnout process and Coleman (2004, ¶ 3) supports this philosophy by asserting "the only way to get to an incident faster is to get out of the house faster." However, several studies (Kitterman, 2008; MacCharles, 2008; Metcalf, 2002; Pointon et al., 2005; Soptich, 2005; Stauber, 2003; Weninger, 2004; West, 2008) have found that compliance with a 60-second turnout time standard is difficult. For instance,

Metcalf (North Lake Tahoe, CA) reported compliance only 28% of the time, Soptich (Eastside Fire & Rescue – Issaquah, WA) only 9% of the time, and Pointon et al. (Edmonton, Alberta) complied only 8-10% of the time. Even with a 90-second standard, MacCharles (Calgary, Alberta) and Weninger (Clackamas County, OR) reported compliance of only about 50% for fire and nighttime calls, respectively.

Turnout times, like many components of response time, are difficult to compare between fire departments due to the different methods that they are calculated (U.S. Fire Administration, 2006). Even the CFAI and NFPA 1710 definitions of turnout time lead to challenges with consistent calculations, as some fire departments don't "acknowledge notification of the emergency" (NFPA, 2001) immediately after they are alerted by dispatch (Stauber, 2003). The definition appears to introduce a third time stamp, somewhere between the moment of dispatch and the moment that travel starts, where the crews formally acknowledge the existence of the call. Additionally, some fire departments lack the ability to separate out turnout times in their data analysis (Castillo, 2002; Kitterman, 2008; Peterson, 2000; Soptich, 2005).

Despite the challenges in comparing data, the previously cited literature shows similar trends in turnout time performance and questions the feasibility of the 60-second turnout time standard. As part of the NFPA 1710 revision process, several alternative turnout time proposals have been submitted for inclusion in the 2010 edition of the standard (NFPA, 2008, 2009). The proposals have suggested allowing longer turnout times ranging from 80 to 120 seconds for fire calls and/or nighttime calls. As of the Report on Comments portion of the revision process, the committee was considering an 80-second turnout time for fire and special operations responses and a 60-second turnout time for EMS responses (NFPA, 2009). A final round of discussions will occur starting in June, 2009.

Based on the data included in the proposals, the NFPA 1710 technical committee acknowledged that turnout times are affected by many factors such as type of call, time of day, fire station configuration, and the methods used to record turnout times (NFPA, 2008, p. 1710-8). A review of additional literature sources found several other factors that may have an impact on turnout times. Many of the studies referenced below included a detailed analysis of the turnout process including timed observations of the various tasks to complete turnout, identification of potential causes for extended turnout times, and recommendations for improvement.

At the beginning point of turnout time, the speed of the process can immediately be affected by the various methods of alerting the station or apparatus of the call. Several studies (Castillo, 2002; Kitterman, 2008; Pointon et al., 2005; Soptich, 2005; Weninger, 2004) have found potential delays in the turnout process when there is a long series of audible tones to indicate which apparatus are assigned to the call, a need to write down address information, a long delay receiving information on the printer, the information is difficult to understand due to speaker clarity and volume, and too much information is given. Any attempts to improve the method of communication between the dispatch center and the fire station or apparatus can reduce the time required for crews to receive information and potentially reduce the turnout times (Barr & Caputo, 2003). Stauber (2003) and Pointon et al. recommended the installation of a station alerting system that would standardize the delivery of the voice dispatch information and include displays throughout the station that indicate the call address and units assigned.

Similar to concerns with the transfer of information at the start of turnout time, delays in turnout time can also result from the methods used by crews to indicate that they are enroute to the call, which signals the end of turnout time. Often, fire departments use manual methods to

record the time stamps associated with turnout time, which can lead to a significant margin of error (Coleman, 2006). Verbal transmission of enroute status (e.g., via radio) can result in turnout time delays based on how quickly the dispatcher acknowledges the information and whether too much radio traffic prohibits the transmission (Kitterman, 2008). Technology such as mobile data computers (MDC's) would allow call information to be transferred directly from dispatch to the unit and automatically record enroute status through the push of a button, resulting in reduced radio traffic and repetition of information exchange (Castillo, 2002). Kitterman (2008) estimated that having a similar acknowledgement button rather than using a verbal method could improve turnout times by 2 to 3 seconds. Surveys conducted by Soptich (2005) indicated that other fire departments also believed that electronic methods of transferring information to and from dispatch could reduce turnout times. West (2008) estimated delays in turnout times due to human input errors ranging from 10 to 45 seconds, but also noted these errors lead to a lack of accuracy in the data. In other words, whether or not MDC's or similar electronic technologies actually reduce turnout times, they would improve data accuracy and the fire department's ability to collect and analyze the data (Stauber, 2003; Weninger, 2004). Even this technology comes with potential accuracy problems stemming from concerns with weak wireless signals (Weninger, 2004) and human error when pushing the necessary buttons (MacCharles, 2008).

Once the call information is received, another important step in the turnout process is to select the route that will be taken to travel to the call. The location, accuracy, and ease-of-use of wall maps or map books, as well as the driver's familiarity with the district are all factors that can lead to extended turnout times (Kitterman, 2008; Pointon et al., 2005; Weninger, 2004). Kitterman, Pointon et al., and Weninger all recommended the use of electronic mapping

technology in the apparatus and Pointon et al. estimated an average reduction of 20 seconds in turnout time with this technology. Kitterman also estimated that such technology would eliminate a 20-second stop at the printer and wall maps, but noted that the actual turnout time reduction could be less due to multiple processes occurring at the same time.

Another frequent variable mentioned in the literature that may affect turnout times is the fire station design. This includes the travel distance from the sleeping and day areas of the station to the apparatus bay and any obstacles in between such as stairs, poles, doors, other apparatus, the route taken to receive printer or wall map information, and the opening/closing of bay doors. Stauber (2003) cited station design as a reason for extended turnout times and Kitterman (2008) conducted timed drills and found that station design had a large effect on turnout times. However, Soptich (2005) took measurements of travel distance, compared them to actual turnout time performance, and found no indication of a relationship between the two variables. Similarly, Weninger (2004) surveyed several fire departments that believed station design was a contributing factor, but Weninger found that the station with the shortest travel distance had the longest turnout time. There has been some hesitation in the literature to completely discount the impact of station design, seemingly because there is logic to the theory that longer travel distances and various obstacles would result in longer turnout times; however, it may not always be apparent when looking at actual performance. Pointon et al. (2005) took such caution in stating that the relationship between station design and turnout time was inconclusive but may be masked by printer and wall map issues.

The ability of the crews to turnout quickly may also be affected by the type of call they are responding to (Pointon et al., 2005; Soptich, 2005; Stauber, 2003; Weninger, 2004). The primary reason for this impact is the corresponding PPE that is required based on that call type.

That is, calls such as structure fires and certain rescue calls require crews to dress in full PPE, while many EMS calls can be responded to in regular uniforms or station wear. Soptich only found a random connection between type of call and turnout time, while MacCharles (2008) and Pointon et al. found a small difference between fire and medical calls. Weninger found that certain measures can make donning PPE a quicker process, such as having zippers on station boots for easy removal, and Pointon et al. observed that some crews would try to finish getting dressed while enroute to the call, raising safety concerns when the seat belt is removed.

Soptich (2005) found that donning PPE for various types of calls can be further complicated with the fact that most fire departments do not allow the PPE to be located in the living spaces of the fire station, which adds another step in getting dressed particularly at night. Therefore, time of day may also affect the speed of turnout due to the additional processes of waking and getting dressed into uniforms or station wear during the night (Kitterman, 2008; Soptich, 2005; Stauber, 2003; Weninger, 2004). Kitterman found a difference in turnout times when comparing day and night calls, with nighttime turnout times being 15 seconds longer than daytime on the average, Weninger found a 30-second average difference, Pointon et al. (2005) found a 34-second average difference, and Soptich found a 37-second difference.

A fire station's call volume has also been identified as a possible factor affecting the speed of turnout (Kitterman, 2008; Soptich, 2005; Stauber, 2003). Soptich found that stations with more calls had shorter turnout times, possibly due to the higher repetition of the turnout process leading to improved performance. Pointon et al. (2005), however, found no relationship between call volume and turnout time.

Several other factors, related to the technical aspects of turnout, are cited in the literature as affecting the speed of turnout times. The activities that the crew was involved in prior to

receipt of the call may have an effect and may vary depending on whether the crew is at the fire station or conducting some other outside activity such as training, pre-plan, public education, or fire prevention work (Pointon et al., 2005; Stauber, 2003; Weninger, 2004). Additional factors include the need to fasten seat belts, weather conditions which may necessitate additional clothing or other preparation of the apparatus (Stauber, 2003), the need to cross-staff units and move PPE and other equipment between them (Soptich, 2005), and complications associated with SCBA seats (Griffin, 2008).

Pointon et al. (2005) concluded that the key factors affecting turnout times are systemic rather than personnel issues. However, Weninger (2004) asserted that "proper preparation and employee motivation are key" (p. 3). Training has been identified as a component of proper preparation, either through rehearsal of the tasks associated with the turnout process or map and driver training to increase area familiarization (Kitterman, 2008; Pointon et al., 2005; Stauber, 2003; Weninger, 2004). Pointon et al., Stauber, and Weninger also cited employee physical capability, primarily related to age and speed, as an additional contributing factor that may affect the ability to react.

Motivation starts with having a clearly-defined standard or expectation for turnout time performance (Soptich, 2005; Weninger, 2004). Castillo (2002) and Soptich then suggested that performance needs to be measured, periodic reports provided which are based on consistent and reliable data, supervisors held accountable, proper incentives for good performance utilized, and best practices of high-performing crews identified. Using expectancy theory as a basis, Ivancevich and Matteson (1999) suggested that managers need to clearly define desired performance levels, ensure performance levels are attainable, learn what rewards are valued by employees, and clearly and purposefully provide the desired rewards when performance levels

have been achieved. Then, managers need to constantly monitor the program to ensure there are no conflicting expectancies, rewards are significant enough to motivate performance, and there is equity in the system. Ivancevich and Matteson further suggested that direct feedback from employees, such as through interviews and questionnaires, is the most effective method to ensure consistency between management perception and employee expectations.

By simply alerting personnel that turnout times are important to the organization, Soptich (2005) asserted that there is a corresponding positive impact on turnout times. Having specific goals that employees are aware of can have a powerful affect on employee motivation; however, goals can lose their potency over time, so care should be taken to ensure there is organizational commitment and maintenance of intensity (Ivancevich & Matteson, 1999). Pointon et al. (2005) also discovered that "crews were not really aware of how long their turnout process was taking" (p. 11) and recommended the use of timers or other visual displays that would provide the crews an immediate reflection on their performance as they leave the station.

A crew's motivation to turnout quickly may also be affected by their attitude toward particular types of calls. In particular, the crew's interpretation of the severity of the call may have an impact on turnout times (Weninger, 2004). Pointon et al. (2005) assumed that a higher priority call would result in more adrenaline and a corresponding reduction in turnout time; however, no substantial connection was found between call priority and turnout time. Kitterman (2008) recommended that an organization needs to increase personnel's appreciation for all call types.

Coleman (2006) stated that turnout time is a reflection to the citizens on whether you "care about what you're doing when you've been told to respond" (Turnout section, ¶ 1). This focus on caring and discussions about motivation and attitude are a stark contrast and less

scientific focus compared to the previous discussions on factors such as speaker volume, enroute buttons, and station designs. Heifetz and Linsky (2002) distinguished between these two areas of focus and referred to them as technical versus adaptive challenges. The technical challenges are the nuts-and-bolts and procedural issues that we often already have solutions for, such as fixing the station speakers, designing better stations, putting zippers on boots, and installing MDC's. Adaptive challenges are the issues associated with the culture, values and beliefs of the organization or individuals and require the development of new solutions to change attitudes and behaviors. Heifetz and Linsky stated that "the single most common source of leadership failure…is that people, especially those in positions of authority, treat adaptive challenges like technical problems" (p. 14) and so it is important to distinguish between the two types of challenges.

It is interesting to note that many of the major factors or recommendations identified in the literature focus on technical solution such as MDC's, station alerting, improved station designs, better printers, better speakers, electronic mapping, pagers, etc. Yet, while SMFRA already has much of the recommended technology, its turnout times in the past have been very similar to the literature and with correspondingly low compliance with the 60-second standard, suggesting that there may be a more complex behavioral component to the process. Therefore, in understanding the details of SMFRA's turnout time performance, this study will differentiate between the technical and behavioral (i.e., adaptive) challenges in improving those times.

The literature review has also shown that several studies have already conducted the time and motion studies and the surveys of fire departments to gather the long lists of all the factors that could affect turnout times. Therefore, this study will assume that the fire service has a

reliable knowledge base that can be applied locally. Within that knowledge base, there appear to be major categories that emerge and can be grouped for analysis purposes at the local level.

Based on the insight gained from the literature, this study will focus its analysis on three main, technical categories: (a) data transferring systems, or the technology associated with the transfer of call information from dispatch to the station or apparatus, the alerting of the crews at the station, electronic mapping, and acknowledging enroute status; (b) facilities, or the design and size of the fire stations; and (c) reaction processes, or the factors that affect the crew's ability to react once the call is received from dispatch such as other activities, the need to wake up at night, the call volume of the station, the need to don PPE, and the crew's preparation for the turnout process through training and area familiarization. This study will also focus on two, behavioral categories: (a) perception, or the crew's perceived impact of the various technical factors on their own performance; and (b) motivation, or the goals, incentives, attitudes, and other factors that motivate good performance. Appendix A shows a full list of factors identified in the literature and what category was assigned to it. Using these main categories, this study will evaluate the extent that these factors contribute to extended turnout times at SFMRA.

PROCEDURES

Definition of Terms

For the purposes of this study, turnout time will be defined as the time interval between when the call is dispatched and the apparatus begins traveling to the call.

General Procedures

The SMFRA dispatch center, MetCom, utilizes the TriTech VisiCAD Command Computer-Aided Dispatch (CAD) system to record all incident information including time stamps (V. Zecher, personal communication, May 28, 2009). That information is then sent to

SMFRA's records management system (RMS), The FireManager (2003). All of the data used in the analysis was taken from the RMS and then downloaded into an ArcGIS 9.3 geodatabase, where the data was validated for proper address, including city, county, station district, and fire jurisdiction. The validated data was then used to create maps to display spatial information. Microsoft Excel 2003 spreadsheets and Crystal Reports 11 were used to conduct specific analyses of the data.

Throughout 2008, all front-line apparatus, including the primary engines, trucks, and medic units that responded to the majority of calls, utilized Hub-Data911 M5 (versions 1 and 2) and M6 MDC's utilizing Tritech VisiNET Mobile software (J. Lanigan, personal communication, May 27, 2009). Each fire station acted as a network "hotspot" in order to provide a signal to the MDC's while the apparatus were at the fire station. Once the apparatus left the station, the MDC relied on normal cell phone coverage through the use of a phone card. The MDC equipment and software allowed the crews to see CAD information from the dispatchers and the call screen also contained a link to a live mapping system that could either choose a route to the call and provide instructions or just show the apparatus location in relation to the call location so that the user could choose the route. To support this technology, all apparatus were equipped with either Sierra Wireless Modems with Trimble Navigation Limited GPS receivers (for the M5 MDC's) or integral modems and GPS (for the M6 MDC's). The CAD system recorded a time stamp when the call was dispatched (the start of turnout time) and when the enroute button was pushed on the MDC (the end of turnout time).

Since the early 2000's, station alerting systems were also incorporated into each fire station using First-In Systems by Westnet, Inc. in the former PFPD stations 41-46 and Locution Systems, Inc. technology in the former SMFR stations 31-40 (J. Lanigan, personal

communication, May 27, 2009). Both of these systems received a signal from the dispatch center, which traveled through a network system to the specific I.P. address of the fire station. All stations assigned to a call could be alerted simultaneously. The station alerting systems activated an audible tone, including a feature to increase the tone at night to reduce startle effect, and turned on select station lights. Former PFPD stations also included a feature that muted the television and, in November, 2008, a feature that would only alert specific bedrooms to the call (SMFR station 34 already had similar technology). At that same time, the PFPD stations were outfitted with red lighting technology that improved night vision. LED displays were also utilized in former SMFR stations that displayed the unit assigned to the call. The station alerting systems were enhanced with the start of MetCom by utilizing Locution Systems, Inc. which uses recorded speech technology to relay the call information to the stations and eliminates the need for the dispatcher to verbally announce the call information over the radio.

What are the Detailed Turnout Times for SMFRA?

In order to evaluate the overall turnout time performance for SMFRA, call records from 2008 were sorted to include only those calls that occurred in SMFRA's jurisdiction, had an "emergent" response mode, the units were part of the initial dispatch or "Dispatch Order = 1", and a unit arrived on-scene. Only the first-on-scene unit's turnout times were selected. Call records were not included if the unit was canceled enroute or the call came in as a walk-in emergency. Calls having obvious errors with time stamps, improbable dispatch, turnout, or travel times, or other missing data that did not allow full analysis of the call were removed. Since PFPD and SMFR calls were recorded in separate RMS databases during the formation of the fire authority throughout 2008, any duplicate records that occurred when the databases were combined were removed. An additional field was added to the data indicating whether the call

occurred in an urban, suburban, or rural area of the fire authority. That information was generated using the MicroBuild (2008) database which provides population and demographic data at the street block level. The total number of calls was 10,106.

An apparatus-level analysis was then conducted to derive more specific information such as individual apparatus, shift and time of day performance. The data extracted included all apparatus assigned to a call, allowing for multiple responses to the same incident. Individual apparatus responses were then segmented for analysis to include only front-line apparatus that were initially assigned to the call (Dispatch Order = 1), had an emergent response mode, or the response mode was emergent initially (at least through the entire turnout process) and then changed to non-emergent during travel. Responses for "medic 45" and "medic 46" were removed, as their responses were related only to the 2008 Democratic National Convention and only accounted for three responses. Also, during the months of March and April, 2008, there was a dispatch console that was not recording the time change correctly and was adding 60 minutes to some of the turnout times. All of those 19 emergent records were removed from the database. The total number of responses included was 20,026.

To What Extent do Technical Factors Contribute to Extended Turnout Times at SMFRA?

Data transferring systems. The majority of the current technology used in the dispatch, station alerting, mapping, and acknowledgement processes had been in place since the organization began using MetCom as a dispatch center. This occurred in 2006 for SMFR and in 2008 for PFPD. Prior to MetCom, both SMFR and PFPD were dispatched by the Douglas County Sheriff's office where times were manually entered by dispatchers. Therefore, the year before each former organization started with MetCom was compared with the subsequent years during the use of MetCom to analyze the general trend in turnout times. Data from 2005 to 2007

was taken from previous analyses of overall turnout time performance for those years (M. Langello, personal communication, June 9, 2009) and the 2008 data was taken from the apparatus-level analysis discussed earlier and segmented between SMFR and PFPD. The data in years 2005 to 2007 was not analyzed to the depth or using the same criteria as the analysis of the 2008 data, which presents a potential limitation in this portion of the study.

Facilities. Response data from 2008 was compiled to analyze the effect of station design on turnout times. Only calls occurring when the apparatus were located at the station (i.e., in quarters) at the time of dispatch were used. In order to determine the location of the apparatus at the time of dispatch, MetCom provided a file of incident numbers, apparatus, and the latitude and longitude of the apparatus at the time the call was assigned. That data was then imported into an ArcGIS 9.3 geodatabase to plot the latitude and longitude points and show their location relative to the locations of the fire stations. In order to account for variations in accuracy with the locations of the apparatus and fire stations, all points within 500 feet of the fire station were considered "in quarters". This inaccuracy may present a limitation in the analysis. However, data from one fire station was evaluated to determine the accuracy of the GIS data and Table 1 shows that a consistent number of calls was accounted for between 200 and 1,000 feet of the station. Therefore, 500 feet was chosen as a reasonable approximation (R. Heck, personal communication, June 4, 2009).

The same data for the apparatus-level analysis discussed earlier was used for the in-quarters analysis. However, since the apparatus location at the time the call was assigned was not available for all responses, the number of responses was slightly lower than other queries, with a total of 19,952.

Table 1. *Number of Calls Captured using GIS Coordinates near Station 41.*

Distance (ft)	Number of Calls
50	64
100	359
150	581
200	2,072
250	2,103
300	2,117
400	2,136
500	2,146
750	2,160
1,000	2,183

The square footage of the station was chosen as the variable representing station design to reflect the fact that personnel could be located anywhere within the station when a call was received. While square footage is a generalization of the station and may present a limitation in the analysis, it was determined that its strength was in the fact it did provide a good overall representation of the station design and the associated travel distances, number of stories, proximity of common-use rooms to apparatus, etc. and would be less arbitrary than comparing a single travel distance measurement to all turnout times. The square footage values used in this analysis represented the total building area including all floor levels, basements and apparatus bays (see Table 2; R. Whipple, personal communication, June 4, 2009).

Table 2. *SMFRA Fire Station Sizes (Square Feet).*

Station	Square Feet	Station	Square Feet
31	3,842	39	9,229
32	11,572	40	6,094
33	6,802	41	15,130
34	18,500	42	7,523
35	19,232	43	15,000
36	4,500	44	9,000
37	6,700	45	9,647
38	3,093	46	15,130

In order to analyze the relationship between station square footage and turnout times, the Pearson Product Moment Correlation Coefficient, r, and the Spearman Rank Correlation, r_{ranks}, were calculated (Glass & Hopkins, 1996). Values of r or r_{ranks} range from -1 to +1, where a -1 or +1 indicates a perfectly negative or positive linear relationship and 0 indicates no correlation. The Spearman Rank Correlation should produce a similar result as the Pearson Product Moment Correlation Coefficient and is convenient when the variables are expressed as ranks. Both were used in order to evaluate the different methods of data analysis and to compare the results to check accuracy. These measures of correlation are appropriate when there is a linear relationship between square footage and turnout times, which was evaluated by plotting an X-coordinate representing the square footage of the station where the apparatus was assigned and a corresponding Y-coordinate representing the turnout times of each apparatus by shift. A limitation in the analysis will be present if that linear relationship is less than perfect. It is also

important to note that a correlation between two variables does not necessarily suggest a causal relationship (Glass & Hopkins, 1996). Rather, it shows that, to some degree, turnout time can be predicted by knowing something about the square footage of the station.

The Pearson Product Moment Correlation Coefficient, *r*, was calculated as:

$$r = \frac{s_{xy}}{s_x s_y} \tag{1}$$

where s_x and s_y were the standard deviations of the two variables and s_{xy} was the covariance of variable X and Y, defined as:

$$s_{xy} = \frac{\sum_i (X_i - \overline{X})(Y_i - \overline{Y})}{n-1} \tag{2}$$

where $\overline{X}$ was the mean square footage, $\overline{Y}$ was the mean turnout time, and *n* was the number of responses in the data set.

The Spearman Rank Correlation, r_{ranks}, was calculated by creating a table that ranks the turnout times in ascending order with its corresponding square footage (which was also ranked independently). When a tie occurred for either variable, the average of the ranks was used. Then, r_{ranks} was calculated by Equation 3.

$$r_{ranks} = 1 - \frac{6\sum_i D_i^2}{n(n^2-1)} \tag{3}$$

where D_i is the difference between the two ranks for the *i*th case of variables X and Y.

Reaction Processes. To determine the impact that other activities inside or outside the station might have on turnout times, the "in quarters" data discussed previously was used to determine the percent of calls that occur while the crews were in quarters versus out of quarters. Also, the impact of call volume, or how busy or slow the station or apparatus was, on turnout times was also analyzed to see if there was a relationship between the two variables. The same procedures used to compare square footage and turnout times were utilized for the call volume comparison, although only the Pearson Product Moment Correlation Coefficient, *r*, was calculated. The same data set discussed in the apparatus-level analysis was used for the call volume analysis, time of day (day versus night), and type of apparatus (medic versus engines).

To determine the impact that the type of call may have on turnout times, 2008 data was grouped by four major call types (alarms, EMS, fires, and others) and individual apparatus responses. Only responses that were dispatch order 1, emergent, emergent changing to non-emergent (after completed turnout), and front-line apparatus were included. A total of 20,015 responses was analyzed.

To What Extent do Behavioral Factors Contribute to Extended Turnout Times at SMFRA?

To analyze the effects of perception and motivation, turnout times were analyzed at the personnel level. Using the apparatus-level data discussed earlier, sorted between A, B and C shifts, the data was ranked according to 90% turnout times and divided into four quartiles (25% intervals) using formulas available in Microsoft Excel 2003. The upper and lower quartiles were further analyzed to evaluate which personnel were assigned to each apparatus. In order to determine which personnel were assigned to an apparatus, the "Default Unit Assignment" report

in the Human Resources module of the RMS (The FireManager, 2003) was queried for the first A, B, and C shifts of each quarter in 2008. Personnel were considered "primarily assigned" to an apparatus if they were on the roster for that apparatus for at least half of 2008. Only officers were considered for engine and truck apparatus, but all personnel assigned to medic units (i.e., paramedics and/or EMT's) were considered. Identification of personnel was not included in this paper.

A similar process of ranking apparatus performance was conducted for the first three months of 2009 using the same methods of data extraction as discussed for the 2008 apparatus-level analyses. The personnel primarily assigned to those apparatus were determined using staffing assignment spreadsheets provided by the SMFRA Operations Division. Apparatus and assigned personnel in the upper and lower quartiles of 2009 were compared to those same quartiles in 2008 to evaluate if specific apparatus (and their corresponding shift) performed similarly or if specific personnel performed similarly regardless of assigned apparatus.

The "primary" personnel assigned to apparatus in 2008 were sent a questionnaire designed to obtain feedback on their perceptions of the various factors discussed in this study, their own performance, their motivation to perform well, and the organization's contribution to good performance (see Appendix B for the complete questionnaire). Two groups of personnel (Group A and Group B) were sent the same questionnaire. The Group A personnel were assigned to apparatus in the top 25% (1st quartile) and the Group B personnel were assigned to apparatus in the bottom 25% (4th quartile) of turnout time performance. A total of 38 personnel were sent the questionnaire in Group A and 28 personnel in Group B. The personnel were given seven days to return the questionnaire and eight were received back from Group A and seven from Group B. Due to the low number of completed questionnaires, the deadline was extended

an additional three days resulting in 14 received back from Group A and 15 from Group B. Partial responses, where not all of the questions were answered, were included in the analysis. The questionnaire was created using the website "zoomerang.com" and each group was sent an e-mail with a link to the questionnaire. All names in the e-mail were hidden to the recipients by using the blind carbon copy method.

Perception. From the questionnaire, certain questions were designed to elicit feedback on the individual's perceptions of personal performance, areas for improvement, impact of technical factors on performance, and recommendations. The "perception" questions included questions 2-19, 25, 28, and 35-41.

Motivation. The remaining questions were designed to elicit feedback on the knowledge of organizational expectations and to explore various methods of motivation for the individual.

What is a Reasonable Turnout Time Standard for SMFRA?

The percent compliance with existing standards was calculated based on the apparatus-level response data. Compliance was measured against the 60-second NFPA 1710 (2001) standard, the 60-second daytime CFAI (2006) standard, and the 90-second nighttime CFAI standard. Recommendations for an alternate turnout time standard were based on input from the questionnaire, particularly questions 35-41, as well as identified areas of potential turnout time reduction from the previous analyses.

General Limitations

Some of the specific limitations of this study have been identified in the various procedures discussed above. In addition, one of the initial assumptions of this study was that the literature provided sufficient information on the causes of extended turnout times and therefore in-depth observations, time and motion studies, and collection of similar factors would not be

necessary locally. Also, that information was further sorted into major categories and only major themes within those categories were the focus of this study. These assumptions present potential limitations to this study, as much of that data in the literature was not scientifically based. However, there were similar trends and themes in the literature that suggest that much of the information is applicable outside of the originating fire departments.

Another limitation associated with this study is the fact that much of the analysis only used data from 2008, which was not randomly selected and the processes used to sort and clean the data may not have identified all sources of error. While a single year still provides a large amount of data, it would be more beneficial to perform a similar detailed analysis over multiple years to understand the trends and to add more data to the slower stations, allowing better comparisons to the busier stations and producing stronger conclusions.

RESULTS

What are the Detailed Turnout Times for SMFRA?

The overall turnout time for SMFRA during 2008 was 81 seconds on average and 129 seconds, 90% of the time. Table 3 shows the average and 90% turnout times for the urban, suburban, and rural areas of SMFRA. Figure 2 shows the 2008 turnout times by station district and Figure 3 further refines those station turnout times into the urban, suburban, and rural population areas.

Table 3. *SMFRA 2008 Turnout Times (seconds) by Population Categories.*

Measurement	Urban	Suburban	Rural
90%	126	129	147
Average	79	84	93

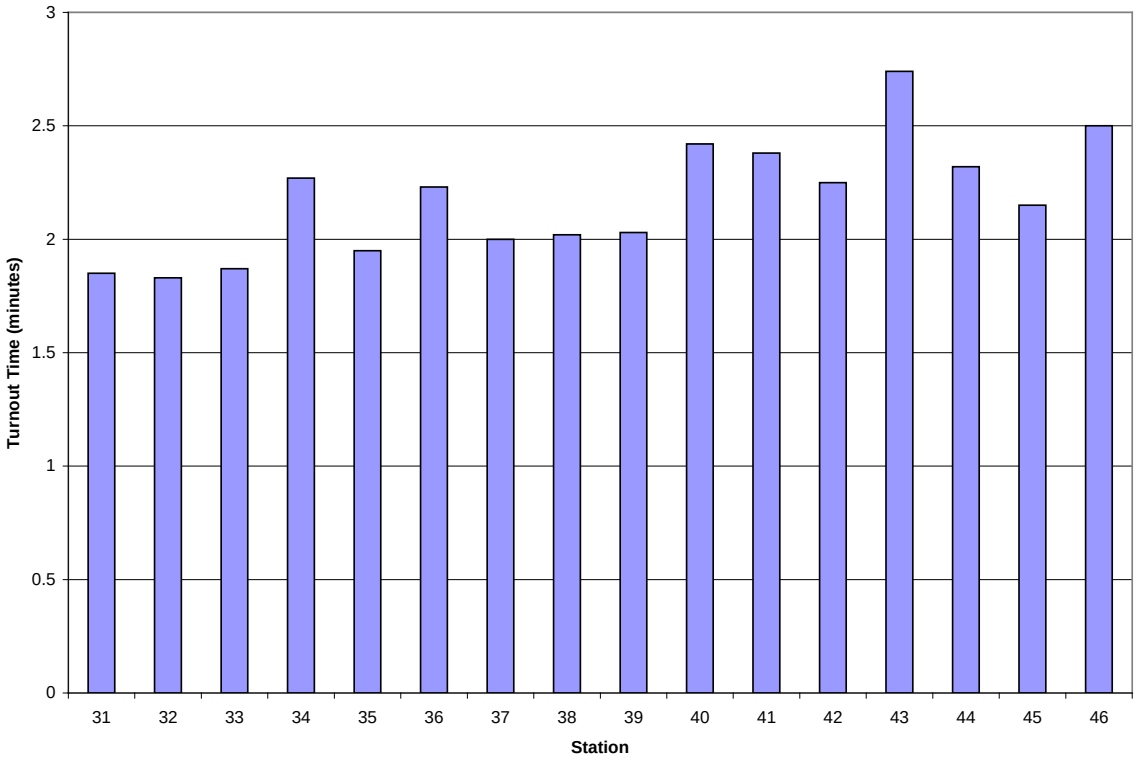
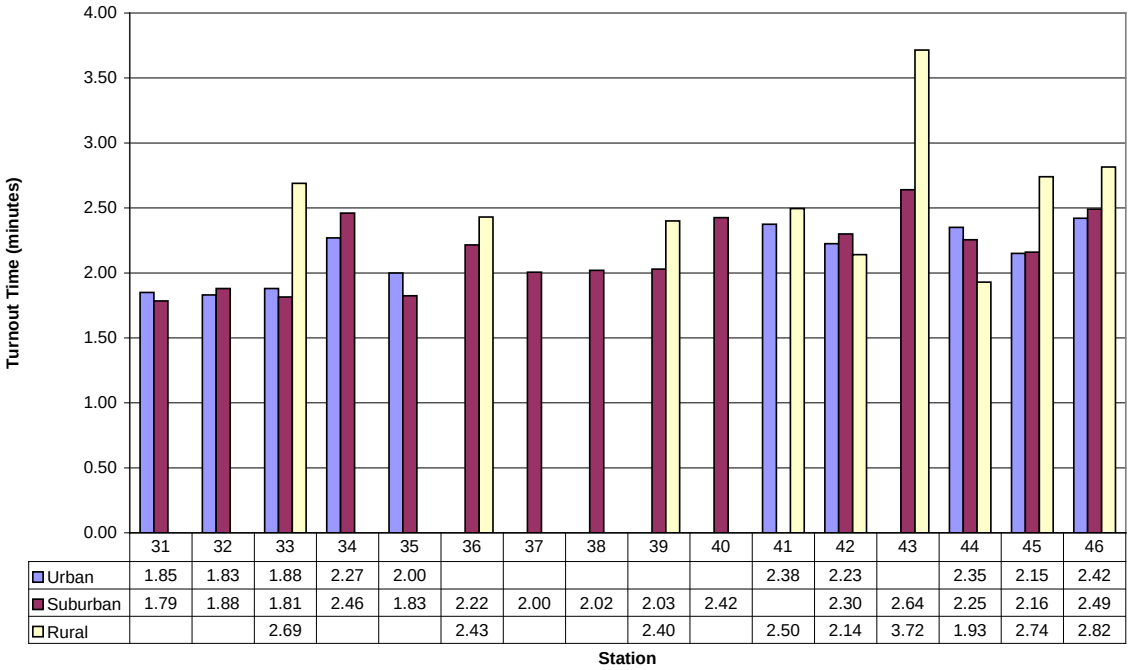


Figure 2. SMFRA 2008 90% turnout times by station district.



	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46
Urban	1.85	1.83	1.88	2.27	2.00						2.38	2.23		2.35	2.15	2.42
Suburban	1.79	1.88	1.81	2.46	1.83	2.22	2.00	2.02	2.03	2.42		2.30	2.64	2.25	2.16	2.49
Rural			2.69			2.43			2.40		2.50	2.14	3.72	1.93	2.74	2.82

Figure 3. SMFRA 2008 90% turnout times by station district and population categories.

Appendix C shows the apparatus-level data including overall apparatus and individual shift performance by number of responses and turnout times. To visualize the results better, Figures 4, 5, 6, and 7 show the overall and shift turnout times for each apparatus. Overall, A shift had a turnout time of 128 seconds, B shift had a turnout time of 130 seconds, and C shift had a turnout time of 133 seconds, 90% of the time.

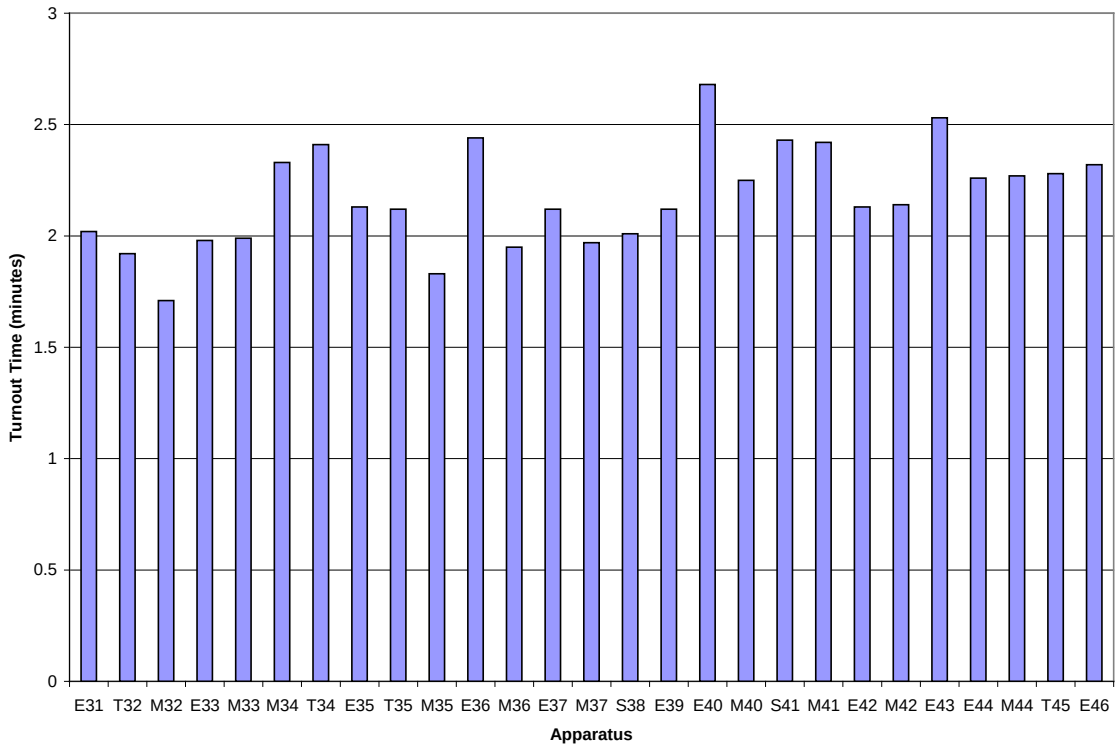


Figure 4. SMFRA 2008 90% turnout times by apparatus, all shifts.

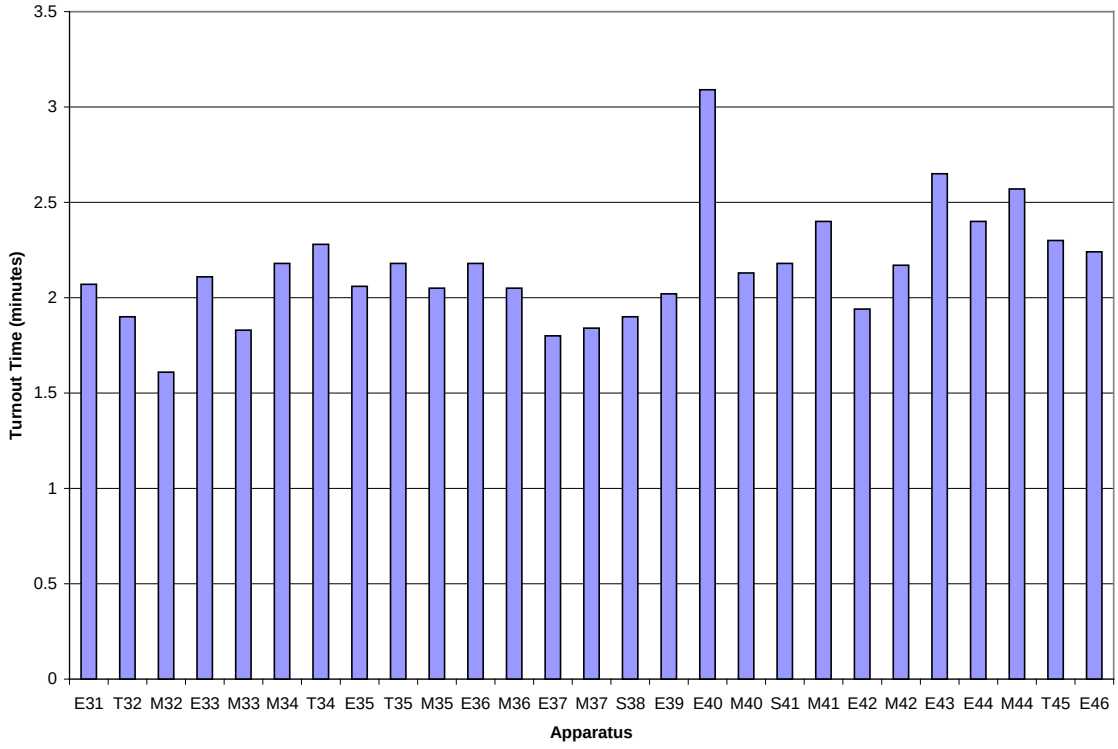


Figure 5. SMFRA 2008 90% turnout times by apparatus from A shift.

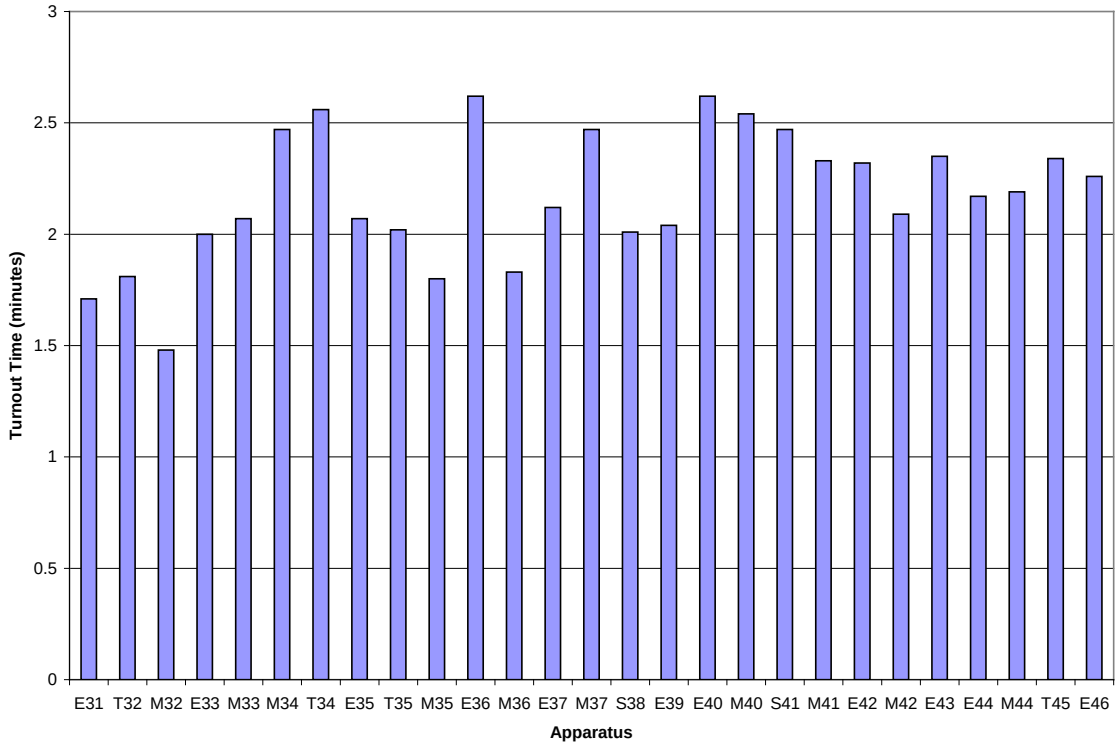


Figure 6. SMFRA 2008 90% turnout times by apparatus from B shift.

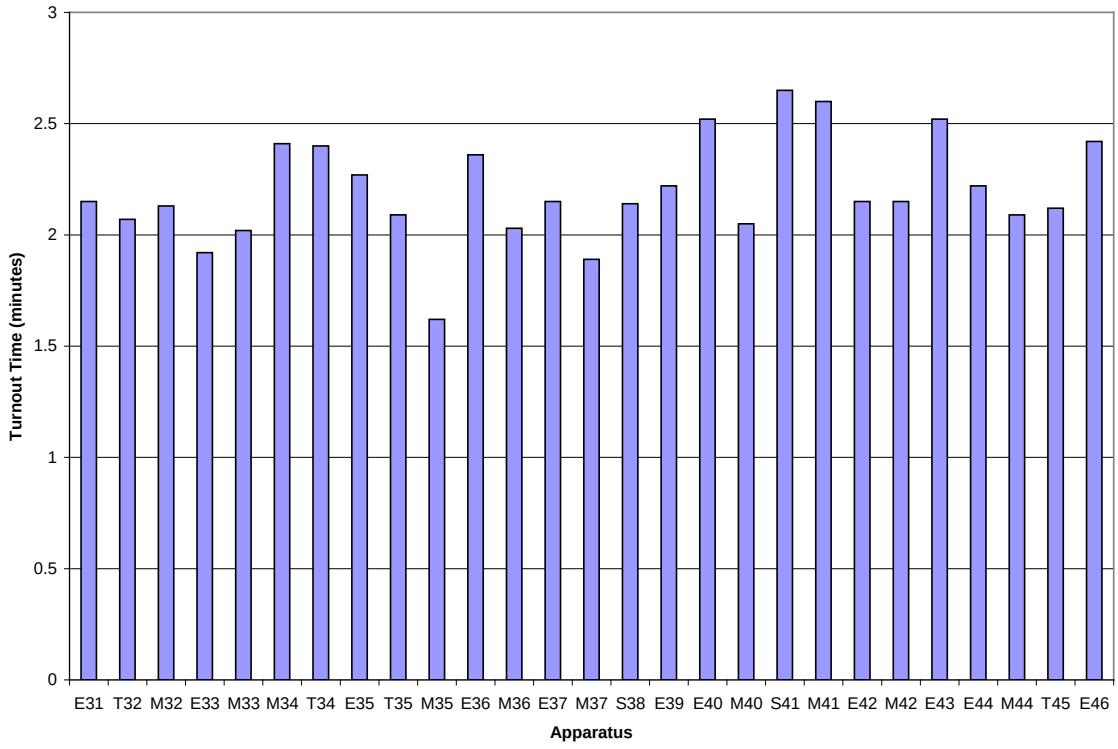


Figure 7. SMFRA 2008 90% turnout times by apparatus from C shift.

Between the hours of 0700 and 2200, the 90% turnout time was 115 seconds and from 2201 to 0659, the turnout time was 159 seconds.

To What Extent do Technical Factors Contribute to Extended Turnout Times at SMFRA?

Data transferring systems. Table 4 shows the turnout time performance for former SMFR and PFPD in the year before using the MetCom dispatch center and each subsequent year through 2008. The results showed that both organizations had similar 90% turnout times in the year before using MetCom. Once MetCom started dispatching and the associated technology utilized, the results show a general downward trend in turnout times; most notably when comparing 2005 to 2008 for SMFR. Although the difference in seconds is not dramatic, the results do show more extensive increases in the compliance rate with the standard, as seen in the 21% increase for SMFR over three years and 8% increase for PFPD over one year. These results

suggest that the use of improved data capturing systems through dispatch, GPS, and MDC's, enhanced station alerting systems, and electronic mapping systems has a positive impact on turnout times. The results also suggest that there may be a delay in those technological benefits where the full reduction in turnout times is not seen for two or three years. If the SMFR trend occurs for the PFPD personnel, then there should be an additional reduction in turnout times in the next year or two.

Table 4. *Turnout Time Performance Prior to and During Use of MetCom.*

	SMFR		PFPD	
Year	90% turnout time (seconds)	Compliance with 60-second standard (%)	90% turnout time (seconds)	Compliance with 60-second standard (%)
2005	145	15.7		
2006	148	21.5		
2007	136	30.6	147	9.3
2008	122	36.8	139	17.5

Facilities. Appendix D shows the number of responses, apparatus location at dispatch, and 90% turnout time for each apparatus included in this analysis. A comparison of Table 2 and Appendix D shows some examples of larger stations having longer turnout times, such as stations 34 and 43, and smaller stations having shorter turnout times, such as station 31. Similarly, T35 and S41 are located at the larger, 2-story stations with several use rooms on the 2nd floor and both had similar turnout times. However, there are several inconsistencies to that trend, such as station 40 being one of the smaller stations but having some of the longest turnout

times and station 32 being a mid-size station but having some of the shortest turnout times. Also, there is a great deal of variation between shifts, where there is as much as a 30- to 45-second difference for apparatus such as M32, M37, S41, and M44.

Figure 8 visually shows the relationship between turnout times and square footage. The concentration of the data appears to follow a roughly linear relationship, although as noted above, there are several outliers to that trend. However, the linear correlation measurement for the two variables appeared to be an appropriate tool (the trend line was inserted by the author for illustration purposes). The calculated *r* was .19 and r_{ranks} was .19, supporting Figure 8 that there is a minor, linear, and positive relationship between turnout times and square footage. Therefore, the size of the station does have a small affect on turnout times, where apparatus in stations with larger square footage tend to have slightly longer turnout times.

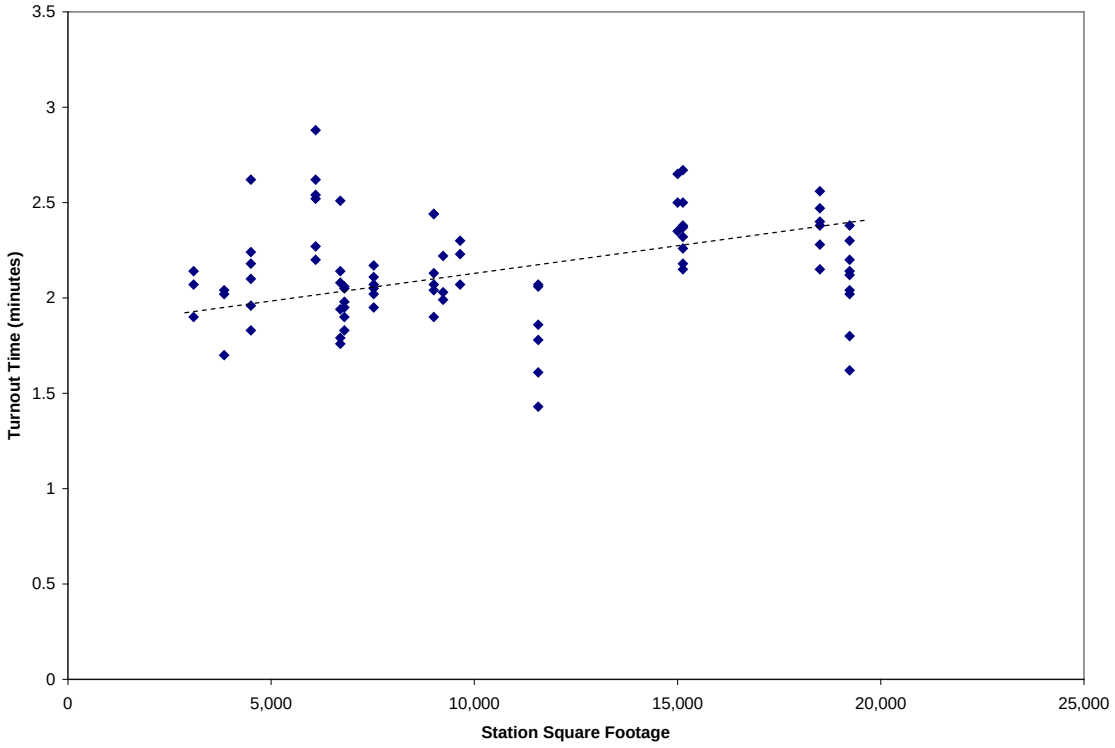


Figure 8. Scatterplot of turnout times and station square footage.

Reaction Processes. Part of the factors listed in Appendix A that affect a crew's ability to react to a call include the activities they are involved in when the call is dispatched. This can occur in or out of quarters. In order to analyze where most of these activities may occur, the difference between in-quarter and out-of-quarter turnout times was analyzed. The in-quarters, 90% turnout time was 129 seconds and the out-of-quarters turnout time was 147 seconds, suggesting that it takes longer to react to the call when involved in activities outside of the station. Therefore, activities prior to the call outside of the station do have a larger affect on turnout times when compared to activities occurring inside the station; however, activities in the station will have the most overall affect since 85% of the calls occur in quarters.

Another factor included in the ability of the crew to react to the call was the call volume of the apparatus. Figure 9 visually shows the relationship between turnout times and call volume, which was determined to have a minor, linear relationship (the trend line was inserted by the author for illustration purposes). The calculated r was -.22, supporting Figure 9 that there is a minor, linear, and negative relationship between turnout times and call volume. In other words, apparatus with larger call volumes tend to have slightly shorter turnout times.

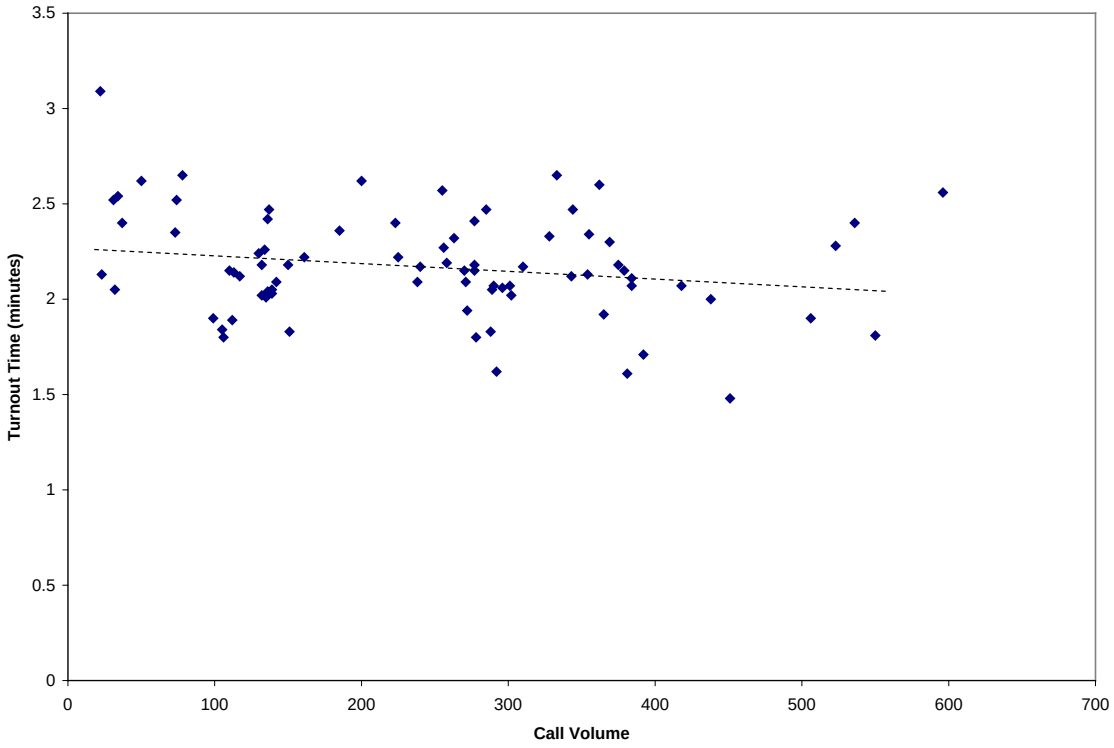


Figure 9. Scatterplot of turnout times and call volume.

The time of day when the call is dispatched was also included as a factor that affects the crew's ability to react to a call. The daytime and nighttime turnout times are shown in Table 5 which shows that it takes longer to turnout at night than during the day (about 45 seconds when comparing the 90% turnout times). Therefore, the time of day has a large affect on turnout times, although approximately 80% of all calls in the sample occurred during the daytime.

Table 5. *SMFRA 2008 Turnout Times (seconds) by Time of Day.*

Category	Number of responses	90% turnout time
All responses	20,026	130
Daytime	16,109	115
Nighttime	3,917	159

In order to reflect on the impact of call type on the crew's ability to react to the call, including the need to don PPE for certain call types, Table 6 shows the turnout times based on the four major categories of call types. The results show that turnout times for alarms and other calls were similar and there was not a large difference between either of those call types and EMS calls. However, there was a large difference (almost 30 seconds) between EMS and fire calls.

Table 6. *Number of Responses and 90% Turnout Times Based on Type of Call.*

Type of Call	Number of responses	90% turnout time (seconds)
Alarms	2,949	139
EMS	13,141	126
Fires	683	153
Other	3,242	133

To further analyze this difference, the turnout times of medic apparatus were compared to all other front-line apparatus (engines, trucks, squirts, towers, etc.). It was found that medic apparatus had a 90% turnout time of 127 seconds (with 7,314 total responses) and others had a turnout time of 132 seconds (with 12,712 total responses). This result is contrary to original assumptions that medic apparatus would turnout much faster than the others based on less need to don PPE prior to traveling to the call. Looking closer at Figure 4, similar results can be seen when comparing medics and other apparatus responding from the same station. While some pairs have differences close to 30 seconds, such as engine/medic 36 and 40, there are others that are nearly identical, such as engine/medic 33 and 44 and squirt/medic 41. These results suggest

that the type of call is a better predictor of turnout times than the type of apparatus responding to the call (at least when comparing medic apparatus to the others).

To What Extent do Behavioral Factors Contribute to Extended Turnout Times at SMFRA?

Appendix E shows the ranking of the apparatus and the separation into the four quartiles of performance for 2008 and Appendix F shows the same for 2009 (first three months only). When comparing the apparatus and shift found in each year's upper and lower quartiles, it was found that nine apparatus from the same shift showed up in both the 2008 and 2009 upper quartiles and eight showed up in both lower quartiles. In other words, of all the apparatus that showed up in either the upper or lower quartiles in both 2008 and 2009, about 23 to 25% of them were in that same quartile both years. Four apparatus slipped in performance by moving from the upper (first) quartile in 2008 to the lower (fourth) quartile in 2009. Also, two apparatus moved up from the lower quartile in 2008 to the upper quartile in 2009.

When comparing the personnel primarily assigned to apparatus in each year's upper and lower quartiles, it was found that nine personnel (approximately 14%) showed up in both the 2008 and 2009 upper quartiles and six personnel (approximately 12%) showed up in both lower quartiles. Five personnel slipped in performance by moving from the upper quartile in 2008 to the lower quartile in 2009. Also, six personnel moved up from the lower quartile in 2008 to the upper quartile in 2009. Overall, these results are inconclusive as to whether good turnout performance follows a particular person, regardless of the assigned apparatus.

Appendices G and H show the overall results of the Group A and Group B questionnaires for all questions except questions 39-41 and 43, which were fill-in-the-blank questions. Appendices I and J show each individual's responses for both groups including answers to fill-in-the-blank questions.

Perception. Questions 2 and 3 show that the Group A respondents were more aware of their personal turnout performance and rated that performance higher than those from Group B. However, both groups rated their performance high overall with no respondents choosing the inadequate end of the scale. The Group B respondents indicated that more improvement was needed in their personal performance than those from Group A (question 28), although Group B indicated their performance was slightly closer to maximum performance (question 35). Most of both groups felt their performance was the same or better than other crews (question 25) and that their performance could only improve 0-15 seconds (question 36).

While both groups tended to perceive that the data transferring systems helped to decrease turnout times, those from Group A gave more responses that indicated those systems actually increased turnout times (questions 4-8). Both groups perceived that the station design had a large influence on turnout times (questions 9-11), which was supported with several written comments (questions 39-41). Both groups were mostly neutral on the affect of being in or out of quarters during the turnout process (questions 12 and 13) and their responses to the impact of the type of call were fairly evenly distributed across the scale from 1-5 also indicating a neutral overall perception (question 14). Similarly, the impact of the call volume of the station was mostly neutral in both groups (questions 15 and 16). Both groups indicated that area familiarization had a moderate to high influence on turnout times (question 17). The organization's and individual's training efforts for the turnout process were viewed similarly in both groups, with most ratings in the mid-range to adequate (questions 18 and 19).

Motivation. Most respondents in both groups were familiar with SMFRA's current turnout time goals (question 1), but Group A respondents felt the 60-second standard was more reasonable than Group B (question 37). Group B rated the importance that SMFRA has given

turnout times slightly higher than Group A (question 20), but both groups gave similar reflections on their own level of importance assigned to the turnout process (question 24) which ranged from mid to very important. Written responses showed some diversity in the importance of turnout times ranging from "we continually strive for better turnout times, as we believe this has a huge effect on emergency response" (Group A, respondent 12, question 39) to other comments reminding of the need to be safe and "turnout times are important but not as important as getting to the call" (Group B, respondent 9, question 41). Both groups primarily indicated that they discuss turnout times with their crews or supervisor quarterly or less (questions 21 and 22).

Group A respondents were more motivated by the performance of their peers and felt their own performance influenced others (question 27 and 28). Both groups gave a strong indication that recognition and reward provide no motivation (question 29), but personal satisfaction was a high motivator (question 31). Competition tended to be a slightly higher motivator for Group A, but ratings ranged across the scale for both groups and Group B respondents tended toward competition providing no motivation (question 30). Public perception was also neutral or mildly motivational (question 34). The potential outcome of the call, however, was a high motivator for both groups (question 32). There was a similar result for the severity of the call (question 33) but less motivational overall. There was not a clear indication that either group wanted feedback on their performance, with about only half of respondents desiring feedback overall.

What is a Reasonable Turnout Time Standard for SMFRA?

Using the themes identified in this study, a reasonable turnout time standard would be one that is based on historical performance that reflects a reliable level of performance, recognizes additional areas for improvement as technical challenges are overcome, and motivates

personnel to constantly improve. Based on all 2008 apparatus-level responses included in the analysis, the 60-second NFPA 1710 (2001) standard was met 29% of the time. The 60-second daytime CFAI (2006) standard was met 34% of the time. The 90-second nighttime CFAI standard was met 24% of the time. Therefore, neither the CFAI day/night nor NFPA standards appeared to be feasible.

This study has not identified any substantial technical sources of time savings in the turnout process, although it is anticipated that the benefits of MetCom and associated technology in the stations and apparatus will continue to have a benefit. Another finding to consider is the actual performance of the upper quartile of 2008, ranging from 88 to 123 seconds, 90% of the time, which further improved in the first three months of 2009. Assuming all personnel have the potential to perform at that level, it may be reasonable to establish a standard that falls within the upper range. Finally, questionnaire respondents primarily felt their performance could only improve in the range of 0-15 seconds.

Two other findings may have an impact on the standard that is chosen; namely the type of call and time of day. There was about a 30-second difference (comparing 90% turnout times) between fire and EMS calls and about a 45-second difference (comparing 90% turnout times) between day and night calls. While these may be candidates for separate turnout standards, it should also be noted that only about 20% of calls occur at night and about 3.5% of calls are fires. Also, EMS turnout times were still in excess of 120 seconds, 90% of the time, and daytime turnout times were just under 120 seconds, 90% of the time. Therefore, establishing separate standards may not be beneficial at this time, since all performance is questionable.

Based on the potential performance seen in the upper quartile, the expected further benefit of technology, and an increased emphasis on the behavioral themes identified, it is

estimated that SMFRA could experience at least a15- to 30-second reduction in overall turnout times. Using CFAI's (2006) baseline and benchmark method of setting standards for travel time, a reasonable turnout time standard may be to set a benchmark of 90 seconds and a baseline that is 30% greater at 117 seconds, where the baseline becomes the minimal performance desired and the benchmark the ultimate goal for improvement. Based on 2008 performance, if all responses (day or night, all call types) were measured to a 90-second benchmark, that standard would have been met 62% of the time. A 117-second baseline would have been met 84% of the time.

DISCUSSION

The primary purpose of this study was to understand SMFRA's turnout time performance so that the major areas for improvement could be identified. That was accomplished by using apparatus responses from 2008 that were analyzed to determine the turnout times for the entire organization, each station, each shift and each apparatus. Further analysis showed turnout times based on time of day, type of call, type of apparatus, location at time of dispatch, call volume, and the performance of individuals. Feedback was also received through a questionnaire and, ultimately, a new strategy for establishing a turnout time standard was established.

The first major finding of this study supports the statement of Barr and Caputo (2003) that improved communications between dispatch and the stations and apparatus can reduce turnout times. The study categorized these various communication methods as data transferring systems and found that past technological advances with MDC's, station alerting, electronic voice dispatching, electronic mapping, and electronic acknowledgement of enroute status have contributed to the reduction in turnout times of nearly 25 seconds over a three-year period. This result is more conservative than West's (2008) assumption that human input errors alone can account for 10 to 45 seconds or Pointon et al.'s (2005) estimate that 20 seconds could be saved

on average with electronic mapping technology. Not only was there a reduction in SMFR's turnout times but also an improvement in compliance with the standard of over 21%. A similar trend with PFPD shows that there is the potential to further reduce turnout times based on the impact of this data transferring system technology alone.

It is unknown how much these data transferring systems actually reduce turnout times versus improve the accuracy of the data. Studies in the literature recognized that part of the benefit of better data capturing techniques is to improve the accuracy of the data and the analytical capabilities of the organization (Coleman, 2006; Stauber, 2003; Weninger, 2004; West, 2008). In fact, one of the main reasons for PFPD deciding to use MetCom as a dispatch center was to be able to obtain complete and accurate data that was not available previously (B. Baker, personal communication, June 17, 2009). Certainly, the recording of a data point electronically is going to improve its accuracy since it is being recorded immediately as the event is occurring, rather than waiting for a dispatcher to manually record it several seconds after it is voiced over the radio. However, that same technology also reduces turnout times since the human error component has been removed. Similarly, the fact that crews do not have to listen to a dispatcher repeat the address several times since they can now get the same information on the MDC, crews do not have to wait for an open channel on the radio to verbally give enroute status since they can now press a button, and crews do not have to rely on map books and wall maps as much since they now have electronic mapping on the MDC, are all reasons why the data is more reliable and turnout times are shorter. Over a three-year period, and lacking any other formal programs within the former SMFR to improve turnout times during that time, a conclusion can be made that the data transferring system technology was in fact a key contributor to the reduction in turnout times.

Another surprising finding of this study was the impact that the facilities, or station designs, have on turnout times. Similar to the literature (Stauber, 2003; Kitterman, 2008), the perception of SMFRA personnel is that the size and layout of the fire stations has a large influence on turnout times. However, this study found that there was very little relationship between these variables, where there is only a slight chance that turnout times will be longer in larger fire stations. This supports the findings of Pointon et al. (2005), Soptich (2005), and Weninger (2004) that, while logically there should be a strong relationship between station design and turnout times, actual performance does not support that assumption. Therefore, while care should be taken to design functional and efficient stations, all stations have nearly the same opportunity to perform well regardless of the size of the station.

It is important to note, however, that the results found for facilities may not hold true if the crews switch stations frequently. For instance, station 35 is the largest station and one of the more difficult station layouts with all day-use and sleeping rooms located on the second floor. Despite those challenges, five out of their nine shifts (three apparatus each shift) performed in the upper quartile in 2008 and none were in the lower quartile. However, in the first three months of 2009, station 35's performance dropped dramatically with only one shift in the upper quartile and four in the lower quartile. Since many of the personnel were assigned to different stations and apparatus starting on January 13, 2009 (as a part of the formation of the fire authority), these results suggest that some of the other technical factors such as area familiarization and turnout training specific to the new fire station may have had more influence on performance in early 2009. This is consistent with Weninger's (2004) conclusion that preparation is a key component in the reduction of turnout times.

Preparation is one of the reaction processes identified in the study. Call volume is similar to preparation in that it has been identified as a contributor to a crew's turnout speed through the process of repetition (Soptich, 2005). The literature was mixed about the effect of call volume on turnout time performance, though, as Pointon et al. (2005) found no conclusive evidence of the relationship. The study did find some correlation between call volume and turnout time but it was weak, suggesting that all stations have nearly the same opportunity to perform well regardless of the amount of calls experienced by the station or apparatus.

The activities occurring prior to the call can also impact turnout times and this study narrowed the focus of improvement effort on those activities and processes that occur within the fire stations. Within the stations, the need to don PPE appeared to be the largest source of variation in turnout times. This was seen when comparing the affect of the type of call on turnout times where a nearly 30-second difference (comparing 90% turnout times) was found between fire and EMS calls. This difference is a little more substantial than that found by Soptich (2005), MacCharles (2008), and Pointon et al. (2005).

When it comes to donning PPE, sometimes it is the little improvements that can make a difference, like Weninger (2004) concluded with the recommendation for zippered boots. One of the respondents from Group A stated that EMS responses were excessive and suggested that simply being in uniform most of the day (as opposed to shorts and t-shirts) will avoid the need to don PPE unnecessarily. This was supported by the data where EMS calls still had turnout times in excess of two minutes and there was little difference between the turnout times of medic apparatus versus engines and trucks. These findings, together with the fact that most calls are received while the crews are in quarters, may support the theory that PPE is being donned more often than necessary. It may also suggest that both the medic and engine/truck apparatus are

leaving the station at the same time (when dispatched to the same call), regardless of whether one of them is ready first.

There may be a similar PPE affect when comparing daytime and nighttime turnout times. Nighttime turnout times were about 45 seconds longer than daytime (comparing 90% turnout times), highlighting that the additional steps of dressing unnecessarily or dressing twice can have a substantial affect on turnout times. These time-of-day results were even more dramatic than Pointon et al. (2005), Soptich (2005), and Weninger (2004) who all found nighttime turnout times in excess of 30 seconds compared to daytime.

At this point, it can be concluded that, while there are some technical benefits and challenges in the turnout process, all personnel still have a similar opportunity to perform at the same level. So, it is also appropriate to ask the questions: if everyone has an opportunity to perform well regardless of which station they are assigned or the call volume of their apparatus, everyone is faced with the same challenges with PPE and nighttime calls, and everyone is in a similar environment (i.e., at the station) when a call is received, then why is there over a 1.5-minute difference between the top-performing and the bottom-performing apparatus? How are some personnel able to overcome technical challenges while others are not?

These questions led to a focus on the people that are performing the turnout process and understanding the behavioral processes that may improve their performance. It was hoped in this study that the questionnaire would provide some insight into the differences between the upper and lower performers and to identify some of the best practices from crews that perform well, as recommended by Soptich (2005). However, both groups responded similarly overall, although some insight into perceptions and motivation was gained from their combined responses.

Soptich (2005) and Weninger's (2004) assertion that motivation starts with a clearly-defined standard was highlighted by the questionnaire. Results showed that the current expectations of SMFRA are not clear, as there appeared to be a contradiction between the perception of the respondents and the reality of their performance. Respondents claimed that they were aware of SMFRA's standard and the standard was reasonable, but they didn't need to substantially improve their performance (even though none of the respondents were meeting the standard). This contradiction may be due to the confusion over the use of 90% turnout times as opposed to previous references to averages, 70%, and 80% turnout times commonly used in the former SMFR and PFPD. This feedback from the questionnaire also supports Pointon et al.'s (2005) suggestion that crews are often not aware of how much time passes during the turnout process.

Ivancevich and Matteson (1999) also reminded organizational leaders that the desired performance levels or standards need to be attainable. Both the literature review and the results of this study clearly showed that compliance with the NFPA 1710 (2001), CFAI (2006), and former SMFR/PFPD standards is not attainable. This study instead suggested that an alternate standard should be based on reliable performance levels with a realistic goal for improvement. The 117-second baseline appears to be a reliable measure of past performance for SMFRA and so it is reasonable to expect that all crews will perform minimally at this level over time. The 90-second benchmark serves as the ultimate goal to motivate the organization to constantly improve and is also reasonable as it is based on actual experience of top performers.

SMFRA could further refine the turnout standard by differentiating between the type of call, which is the potential direction in the NFPA 1710 revision process (NFPA, 2009). However, this study does not recommend that direction at this time until there is additional

understanding of why there is not a substantial difference between turnout times with different call types and why medic apparatus turnout times have not performed at a higher level overall. The turnout standard could also differentiate between time of day. That differentiation should be given consideration, as time of day did provide a substantial source of variation in turnout times. However, current nighttime performance is substantially off of the existing 90-second standard. It may be beneficial to first ensure that all technical challenges such as station alerting have been addressed and clear expectations established to see if performance improves any further. So far, the NFPA technical committee has not agreed with differentiating by time of day and stated "fire departments that experience significant differences…should evaluate what is going on during those periods and determine if there are ways to improve those response times" (NFPA, 2009, p. 1710-5).

Another challenge in establishing a new standard for turnout times is the impact it has on overall response times. While the NFPA 1710 turnout time standard may have been unrealistic for the past eight years, it was well justified by tying the total response time to fire growth curves and patient survival (Barr & Caputo, 2003; NFPA, 2001). Therefore, any attempts to increase that standard by 50 or 100%, even if justified by actual experience and maximum performance levels, will come under scrutiny and beg the question – what are you going to do with your total response times to make up for longer turnout times? This lack of comfort with changing the standard has been seen so far with the NFPA 1710 technical committee which has only increased fire turnout times to 80 seconds and kept EMS turnout times at 60 seconds (NFPA, 2009) despite the large amount of evidence that fire departments probably won't meet those standards either.

Once a clear and attainable standard is established for SMFRA, Ivancevich and Matteson (1999) suggested that managers need to learn what rewards are valued by employees, or what

will motivate good performance. Based on the questionnaire, respondents stated that they were not motivated by recognition and rewards, but were motivated the most by peer performance and personal satisfaction. Group A respondents were only slightly motivated by competition, whereas Group B respondents were generally not motivated by competition. Group B respondents did indicate, however, that the expectations of others affect their performance. These responses indicate that, no matter how it is classified, there is some competitive nature to performance, both on a personal level and amongst peers.

Ivancevich and Matteson (1999) further suggested that managers need to ensure the rewards are significant enough to motivate performance. Obviously, if the rewards are extreme such as saving a choking baby or successfully stopping a fire, there will most likely be a connection to the crews responding quickly to the emergency. Weninger (2004) suggested that the crew's interpretation of the severity of the call may have an impact on turnout times, although Pointon et al. (2005) found no substantial connection between call priority and turnout time. The results of SMFRA's questionnaire showed that the potential outcome of the call was a high motivator as well as the severity of the call. However, the analysis of call types did not show a substantial increase in turnout times for call types that might be considered less important, such as alarms and others. Further analysis would be necessary to separate all calls into additional types that might provide more insight into the impact of call severity. That effort may not be beneficial, as personnel need to develop an appreciation for all call types (Kitterman, 2008).

Overall, the behavioral component appears to have a substantial affect on turnout times, as seen with the wide range of performance and despite the relatively equal technical environment in which personnel perform. The study results would suggest that the positive,

technical aspects of the data transferring systems, existing station layouts, and PPE processes be maximized to ensure a common environment for all personnel. Then, a formal campaign to decrease turnout times can be initiated that focuses on the behavioral factors. As stated by Heifetz and Linsky (2002), this campaign will look very different than addressing the technical aspects and should establish a clear understanding of expectations, a focus on key elements that motivate individual performance, an effective reward system, and continual evaluation (Ivancevich & Matteson, 1999).

One of the major assumptions in this study was that the previous information gathered in the literature would provide all of the necessary insight to determine what factors affect turnout times at SMFRA. The literature focused mostly on technical factors and this study contributed to that body of knowledge by adding additional data analysis to validate the impact of those factors. The literature often speculated that there was a substantial human or behavioral component to turnout times, but had not developed much insight into the topic. This study began to formalize the analysis of the behavioral component and suggest methods that can be replicated in other fire departments. The future study of behavior appears to be the area that will provide the most additional insight into performance during the turnout process and hopefully this study provided a good starting point for debate and continued understanding.

RECOMMENDATIONS

In the short term (0-3 months), it is recommended that SMFRA continue with the development of the Standard of Cover which will include organizational goals for turnout times. As stated in the results, it is recommended that the turnout time goal include a baseline performance of 117 seconds, 90% of the time, and a benchmark performance of 90 seconds, 90% of the time. Also, existing stations should be evaluated to identify what technology related to

turnout times, particularly station alerting systems, is missing or needs to be standardized with other stations. An evaluation of the efficiency of the station can also be conducted to minimize obstacles to the turnout process, as well as a review of all policies and procedures related to the process, such as wearing uniforms.

Response strategies and technical differences between medic apparatus and engines/trucks should also be evaluated further to identify if there are any procedural changes necessary. These short-term tasks may best be accomplished by a work group composed of station, facilities maintenance, and training representatives that can develop a prioritized plan and budget for implementation.

In the mid term (3-6 months), and as these technical tasks are being completed, a formal campaign should be started that is focused on the reduction of turnout times. That campaign should start with a review of the results of this study, the status of technical upgrades, the new organizational performance standards, and the plan for improvement. That plan for improvement should start with a goal to have the organization performing at the baseline within six months. A series of performance reports should be produced on a quarterly basis that shows the turnout times of each station, shift, and apparatus, along with the expectation that crews and supervisors will have discussions at least once a tour to identify areas for improvement. A reward system should be implemented that emphasizes the effects of peer performance and a sense of competition, as well as highlights remarkable turnout time performance related to successful, significant calls.

In the long term (6+ months), the intensity of the competition and rewards needs to be maintained with the goal of constant improvement toward the benchmark standard. Continual analysis of the data should also occur to evaluate where maximum performance is being

achieved, where improvements are needed, and if the organizational standard is still valid. Detailed data collection needs to occur over several years to validate the trends that have been identified in this study. Direct interviews and/or questionnaires should be conducted periodically to obtain feedback on the effectiveness of reward systems and continue to check perceptions and identify obstacles to performance.

The former PFPD also purchased turnout timers that show a visual display of the elapsed time during the turnout process. Those devices need to be evaluated to see if they actually achieve that goal and if additional devices should be purchased. It is recommended that a controlled study be performed so that beneficial results can be achieved.

An additional long-term recommendation is to re-visit the station time delays used in the process of dispatching apparatus. Currently, that system is based on average turnout times compared to the 60-second standard. As more data is collected to measure compliance with the new standard, that system should be revised.

It is recommended that other researchers attempt to replicate the analyses in this study, particularly to quantify more relationships between station size and turnout times, perhaps with different variables than square footage. The differences between medic and other front-line apparatus turnout times should also be understood more and it may be interesting to compare the patterns of all-hazard departments such as SMFRA to dedicated EMS agencies. Also, much more research needs to be conducted on the behavioral aspects of turnout time. Such research should look for additional insight on differences between perception and performance, the impact of devices such as the turnout timers on perception, and the motivational differences that separate top and bottom performers.

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APPENDIX A

Main Categories and Factors Affecting Turnout Times from Literature

Data Transferring Systems	Facilities	Reaction Processes
Dispatcher delays, busy	Overall station design	Activity prior to call
Manual entering of info	Proximity to apparatus	Proximity to apparatus
Printer speed	Number of apparatus	Workload
Transfer from dispatch	Printer location	Type/amount of PPE
Dispatch message length	Direction of door swing	Seat belts
Dispatch message clarity	Distance to apparatus	Type of call
Dispatch accuracy	Slow bay doors	Time of day
Printer, tones timing	Turnout gear location	Cross-staffing units
Bad data		Donning PPE
Pager activation time	**Motivation**	Training
Write down address	Attitudes	Area familiarization
Radio delay for enroute	Slow personnel	Age
Check wall maps	Incentives	Physical capability
Check map books	Call severity	Preparation
Confirm call location	Age	
Poor sound quality	Physical capability	
Data capturing problems	Defined standards/goals	**Perception**
Outdated maps	Reasonable standards	Awareness of time lapse
User error	Awareness of goals	Perceived impact of technical factors
Poor alerting systems		

Format changes have been made to facilitate reproduction. While these research projects have been selected as outstanding, other NFA EFOP and APA format, style, and procedural issues may exist.

APPENDIX B

Turnout Time Questionnaire for Groups A and B

Turnout TIme Questionaire

As part of my Executive Fire Officer course, I am conducting research on SMFRA's turnout times and identifying factors that influence the turnout process. Your responses to this questionnaire will be very beneficial to that effort, as well as providing future guidance and direction to the organization. Your answers to the questionnaire are anonymous. Thank you very much for your time, efforts, and honest feedback.

1

How familiar are you with the current goals or adopted standards related to turnout times? Please rate from 1 to 5 with 1 being "not at all familiar" and 5 being "very familiar."

not at all familiar	Â	Â	Â	very familiar
1	2	3	4	5

2

How aware are you of your turnout time performance (e.g., average or percentile turnout times)? Please rate from 1 to 5 with 1 being "not at all aware" and 5 being "very aware".

not at all aware	Â	Â	Â	very aware
1	2	3	4	5

3

How would you rate your performance? Please rate from 1 to 5 with 1 being "inadequate" and 5 being "adequate".

inadequate	Â	Â	Â	adequate
1	2	3	4	5

4

To what extent do the current dispatch notification and information transfer methods affect your turnout times (e.g., MDT, pager, dispatcher automated voice)? Please rate from 1 to 5, 1=increase times and 5=decrease times

increase times	Â	Â	Â	decrease times
1	2	3	4	5

5

To what extent do the current station alerting systems affect your turnout times (e.g., lights, tones, unit display boards)?

increase times	Â	Â	Â	decrease times
1	2	3	4	5

6

To what extent do the current electronic mapping systems affect your turnout times?

increase times	Â	Â	Â	decrease times
1	2	3	4	5

7

To what extent do the current methods of acknowledging “enroute” status (e.g., using MDT) affect your turnout times?

increase times	Â	Â	Â	decrease times
1	2	3	4	5

8

To what extent has the current overall technology utilized by dispatch, on the apparatus, and in the stations affect your turnout times?

increase times	Â	Â	Â	decrease times
1	2	3	4	5

9

To what extent does the proximity of the day use areas of the station (e.g., offices, kitchen) to the apparatus affect your turnout times? Please rate from 1 to 5 with 1 being "no influence" and 5 being "large influence".

no influence	Â	Â	Â	large influence
1	2	3	4	5

10

To what extent does the proximity of the sleeping rooms of the station to the apparatus affect your turnout times?

no influence	Â	Â	Â	large influence
1	2	3	4	5

11

To what extent does the overall design of your station affect your turnout times?

no influence	Â	Â	Â	large influence
1	2	3	4	5

12

To what extent does being in quarters when a call is received affect your turnout times?

increase times	Â	Â	Â	decrease times
1	2	3	4	5

13

To what extent does being *out* of quarters when a call is received affect your turnout times?

increase times	Â	Â	Â	decrease times
1	2	3	4	5

14

To what extent does the type of call (e.g., alarm, EMS, fire, other) affect your turnout times?

no influence	Â	Â	Â	large influence
1	2	3	4	5

15

To what extent does being assigned to a slow station/unit (i.e., low call volume) affect your turnout times?

increase times	Â	Â	Â	decrease times
1	2	3	4	5

16

To what extent does being assigned to a busy station/unit (i.e., high call volume) affect your turnout times?

increase times	Â	Â	Â	decrease times
1	2	3	4	5

17

To what extent does your familiarity with the station's response area affect your turnout times?

no influence	Â	Â	Â	high influence
1	2	3	4	5

18

How would you rate SMFRA's training programs related to the preparation for turnout?

inadequate	Â	Â	Â	adequate
1	2	3	4	5

19

How would you rate your training efforts related to the preparation for turnout?

inadequate	Â	Â	Â	adequate
1	2	3	4	5

20

How would you rate the importance that SMFRA has given turnout times?

unimportant	Â	Â	Â	very important
1	2	3	4	5

21

How often does your supervisor discuss turnout times with you?

never	annually	quarterly	monthly	each shift/tour
1	2	3	4	5

22

How often does your crew discuss turnout times?

never	annually	quarterly	monthly	each shift/tour
1	2	3	4	5

23

To what extent do the expectations of others affect your turnout time performance?

no influence	Â	Â	Â	high influence
1	2	3	4	5

24

In your opinion, how important is the turnout time interval to total response times (i.e. dispatch, turnout, travel)?

not important	Â	Â	Â	very important
1	2	3	4	5

25

How is your overall turnout time performance compared to other front-line apparatus at SMFRA?

much worse	slightly worse	same	better	much better
1	2	3	4	5

26

To what extent does the performance of your peers affect your turnout time performance?

no influence	Â	Â	Â	high influence
1	2	3	4	5

27

To what extent does your turnout time performance affect the performance of your peers?

no influence	Â	Â	Â	high influence
1	2	3	4	5

28

To what extent does your turnout time performance need to improve?

substantial improvement needed	Â	Â	Â	no improvement needed
1	2	3	4	5

29

To what extent does being recognized or rewarded motivate your turnout time performance? Please rate with 1 being "no motivation" and 5 being "high motivation".

no motivation	Â	Â	Â	high motivation
1	2	3	4	5

30

To what extent does competition between stations/shifts/units motivate your turnout time performance?

no motivation	Â	Â	Â	high motivation
1	2	3	4	5

31

To what extent does personal satisfaction motivate your turnout time performance?

no motivation	Â	Â	Â	high motivation
1	2	3	4	5

32

To what extent does the potential outcome of an emergency motivate

your turnout time performance?

no motivation	Â	Â	Â	high motivation
1	2	3	4	5

33

To what extent does the severity of the call motivate your turnout time performance?

no motivation	Â	Â	Â	high motivation
1	2	3	4	5

34

To what extent does public perception motivate your turnout time performance?

no motivation	Â	Â	Â	high motivation
1	2	3	4	5

35

To what extent has your turnout time performance reached maximum potential?

not close to maximum potential	Â	Â	Â	has reached maximum potential
1	2	3	4	5

36

In 9 out of 10 calls, how much more improvement is possible in your

turnout time performance?

45-60 sec	30-45 sec	15-30 sec	0-15 sec	0 sec
1	2	3	4	5

37

To what extent is the NFPA 60-second, 90% of the time, turnout time expectation reasonable?

not at all	Â	Â	Â	very reasonable
1	2	3	4	5

38

Which of the following would you recommend as a turnout time (90% of the time) goal for SMFRA?

60 sec	90 sec	120 sec	150 sec	180 sec
1	2	3	4	5

39

What steps can you take to reduce your turnout times?

40

What are the obstacles to the success of your turnout time performance?

41

What are the top 3 things SMFRA should do to reduce turnout times?

42

Do you want feedback regarding your turnout time performance? (yes, no)

YES NO

43

If you answered "yes" to the question above, what type of feedback would you prefer?

44

Are you primarily assigned to a medic unit or engine (including trucks)?

- Medic Unit
- Engine/Truck

APPENDIX C

2008 Apparatus-Level Turnout Times

Apparatus	Number of Responses	90% Turnout Time (min)
E31	1,155	2.02
A	384	2.07
B	392	1.71
C	379	2.15
T32	1,474	1.92
A	506	1.90
B	550	1.81
C	418	2.07
M32	1,186	1.71
A	381	1.61
B	451	1.48
C	354	2.13
E33	1,187	1.98
A	384	2.11
B	438	2.00
C	365	1.92
M33	891	1.99
A	288	1.83
B	301	2.07

Apparatus	Number of Responses	90% Turnout Time (min)
C	302	2.02
M34	839	2.33
A	277	2.18
B	285	2.47
C	277	2.41
T34	1,655	2.41
A	523	2.28
B	596	2.56
C	536	2.40
E35	842	2.13
A	296	2.06
B	290	2.07
C	256	2.27
T35	406	2.12
A	132	2.18
B	132	2.02
C	142	2.09
M35	859	1.83
A	289	2.05
B	278	1.80
C	292	1.62

Apparatus	Number of Responses	90% Turnout Time (min)
E36	535	2.44
A	150	2.18
B	200	2.62
C	185	2.36
M36	429	1.95
A	139	2.05
B	151	1.83
C	139	2.03
E37	333	2.12
A	106	1.80
B	117	2.12
C	110	2.15
M37	354	1.97
A	105	1.84
B	137	2.47
C	112	1.89
S38	347	2.01
A	99	1.90
B	135	2.01
C	113	2.14
E39	431	2.12

Apparatus	Number of Responses	90% Turnout Time (min)
A	134	2.02
B	136	2.04
C	161	2.22
E40	103	2.68
A	22	3.09
B	50	2.62
C	31	2.52
M40	89	2.25
A	23	2.13
B	34	2.54
C	32	2.05
S41	1,052	2.43
A	375	2.18
B	344	2.47
C	333	2.65
M41	1,062	2.42
A	372	2.40
B	328	2.33
C	362	2.60
E42	812	2.13
A	272	1.94

Apparatus	Number of Responses	90% Turnout Time (min)
B	263	2.32
C	277	2.15
M42	851	2.14
A	310	2.17
B	271	2.09
C	270	2.15
E43	225	2.53
A	78	2.65
B	73	2.35
C	74	2.52
E44	688	2.26
A	223	2.40
B	240	2.17
C	225	2.22
M44	751	2.27
A	255	2.57
B	258	2.19
C	238	2.09
T45	1,067	2.28
A	369	2.30
B	355	2.34

Apparatus	Number of Responses	90% Turnout Time (min)
C	343	2.12
E46	400	2.32
A	130	2.24
B	134	2.26
C	136	2.42

Format changes have been made to facilitate reproduction. While these research projects have been selected as outstanding, other NFA EFOP and APA format, style, and procedural issues may exist.

APPENDIX D

2008 Apparatus-Level Turnout Times In Quarters and Out of Quarters

	In Quarters		Out of Quarters	
Apparatus	Number of Responses	90% Turnout Time (min)	Number of Responses	90% Turnout Time (min)
E31				
A	305	2.02	79	2.32
B	333	1.70	59	2.00
C	307	2.04	72	2.48
T32				
A	428	1.90	71	2.22
B	464	1.78	81	1.93
C	370	2.06	48	2.29
M32				
A	340	1.61	41	1.63
B	399	1.43	52	1.85
C	212	2.07	42	2.41
E33				
A	338	2.05	46	2.89
B	392	1.95	46	2.55
C	319	1.90	46	2.33
M33				
A	256	1.83	32	1.79

	In Quarters		Out of Quarters	
Apparatus	Number of Responses	90% Turnout Time (min)	Number of Responses	90% Turnout Time (min)
B	271	2.06	29	3.32
C	259	1.98	43	2.32
M34				
A	242	2.15	35	2.39
B	235	2.47	50	2.55
C	247	2.40	30	2.59
T34				
A	472	2.28	49	2.32
B	513	2.56	83	2.52
C	477	2.38	59	2.82
E35				
A	253	2.02	43	3.32
B	250	2.12	39	1.93
C	219	2.30	37	1.92
T35				
A	109	2.18	23	2.01
B	103	2.38	28	1.83
C	120	2.14	22	1.46
M35				
A	260	2.04	29	2.43

	In Quarters		Out of Quarters	
Apparatus	Number of Responses	90% Turnout Time (min)	Number of Responses	90% Turnout Time (min)
B	236	1.80	42	1.82
C	261	1.62	31	1.60
E36				
A	142	2.18	8	3.33
B	174	2.62	25	3.05
C	168	2.24	17	3.03
M36				
A	117	1.96	22	2.78
B	134	1.83	17	2.34
C	125	2.10	14	1.93
E37				
A	92	1.76	14	3.49
B	100	2.08	17	3.36
C	90	2.14	20	2.36
M37				
A	91	1.79	14	2.78
B	108	2.51	29	2.07
C	96	1.94	16	1.89
S38				
A	89	1.90	10	1.18

	In Quarters		Out of Quarters	
Apparatus	Number of Responses	90% Turnout Time (min)	Number of Responses	90% Turnout Time (min)
B	96	2.07	39	1.95
C	107	2.14	6	3.37
E39				
A	120	1.99	14	2.48
B	120	2.03	16	2.19
C	145	2.22	16	2.54
E40				
A	21	2.88	1	3.08
B	46	2.62	4	2.83
C	24	2.52	6	2.73
M40				
A	17	2.20	6	1.52
B	25	2.54	9	3.02
C	20	2.27	12	1.72
S41				
A	305	2.18	69	2.42
B	285	2.38	54	3.19
C	273	2.67	60	2.47
M41				
A	296	2.37	73	2.70

	In Quarters		Out of Quarters	
Apparatus	Number of Responses	90% Turnout Time (min)	Number of Responses	90% Turnout Time (min)
B	268	2.32	57	2.43
C	279	2.50	83	3.12
E42				
A	249	1.95	20	1.82
B	223	2.17	36	3.81
C	229	2.07	47	3.49
M42				
A	251	2.11	54	2.56
B	210	2.02	55	2.87
C	203	2.05	66	2.77
E43				
A	67	2.65	11	3.18
B	58	2.35	15	2.68
C	63	3.50	10	2.97
E44				
A	197	2.44	25	2.52
B	201	2.04	37	3.08
C	198	2.13	27	3.23
M44				
A	202	2.44	50	2.80

	In Quarters		Out of Quarters	
Apparatus	Number of Responses	90% Turnout Time (min)	Number of Responses	90% Turnout Time (min)
B	208	2.07	49	3.17
C	199	1.90	39	2.52
T45				
A	307	2.23	56	2.51
B	294	2.30	57	2.46
C	288	2.07	54	3.02
E46				
A	110	2.15	18	2.93
B	117	2.26	15	2.87
C	111	2.37	25	2.85

APPENDIX E

Quartile Turnout Time Performance for 2008

Rank	Unit	Shift	90% Turnout (min)	
1	MED32	B	1.48	Performance Quartile 1
2	MED32	A	1.62	
3	MED35	C	1.62	
4	E31	B	1.71	
5	E37	A	1.76	
6	L32	B	1.78	
7	MED35	B	1.80	
8	MED36	B	1.81	
9	MED37	A	1.83	
10	L32	A	1.87	
11	MED33	A	1.87	
12	E38	A	1.90	
13	E33	C	1.93	
14	E42	A	1.94	
15	MED37	C	1.97	
16	E38	B	1.99	
17	MED33	C	2.02	
18	L35	B	2.02	
19	E33	B	2.02	
20	MED35	A	2.03	
21	E35	A	2.04	
22	MED40	C	2.05	
23	E39	B	2.05	
24	L32	C	2.06	Performance Quartile 2
25	E31	A	2.07	
26	MED33	B	2.07	
27	E35	B	2.07	
28	E33	A	2.08	
29	MED36	A	2.08	
30	MED42	B	2.08	
31	MED44	C	2.09	
32	L35	C	2.09	
33	E39	A	2.09	
34	SQT44	B	2.09	
35	MED40	A	2.10	
36	E37	B	2.12	
37	E45	C	2.12	
38	MED32	C	2.13	
39	E42	C	2.14	
40	MED42	C	2.14	
41	MED36	C	2.15	
42	MED44	B	2.15	
43	E38	C	2.15	

Rank	Unit	Shift	90% Turnout (min)	
44	E31	C	2.17	Performance Quartile 3
45	MED34	A	2.18	
46	SQT44	C	2.18	
47	L35	A	2.18	
48	E36	A	2.18	
49	E41	A	2.18	
50	E37	C	2.19	
51	E39	C	2.19	
52	E43	B	2.19	
53	E34	A	2.20	
54	MED42	A	2.22	
55	E35	C	2.23	
56	Q46	A	2.23	
57	Q46	B	2.24	
58	E45	A	2.29	
59	E34	C	2.32	
60	MED41	B	2.32	
61	E42	B	2.33	
62	E45	B	2.34	
63	L34	A	2.37	
64	Q46	C	2.40	Performance Quartile 4
65	MED34	C	2.41	
66	E36	C	2.41	
67	MED37	B	2.41	
68	MED41	A	2.41	
69	MED34	B	2.42	
70	E41	B	2.45	
71	E34	B	2.48	
72	E43	C	2.50	
73	E40	C	2.52	
74	MED40	B	2.54	
75	SQT44	A	2.55	
76	L34	C	2.56	
77	MED44	A	2.60	
78	E36	B	2.62	
79	MED41	C	2.62	
80	E40	B	2.62	
81	E41	C	2.65	
82	E43	A	2.65	
83	L34	B	2.67	
84	E40	A	3.09	

APPENDIX F

Quartile Turnout Time Performance for 2009 (1st Three Months)

Rank	Unit	Shift	90% Turnout (min)	
1	Medic 46	A	1.23	Performance Quartile 1
2	Engine 47	A	1.33	
3	Medic 32	A	1.62	
4	Medic 32	B	1.66	
5	Medic 34	B	1.68	
6	Tower 34	A	1.68	
7	Tower 45	A	1.68	
8	Medic 40	A	1.69	
9	Engine 31	B	1.70	
10	Medic 35	B	1.74	
11	Squirt 38	C	1.77	
12	Engine 33	B	1.79	
13	Engine 43	B	1.79	
14	Engine 46	B	1.81	
15	Medic 33	C	1.82	
16	Medic 41	C	1.82	
17	Medic 34	A	1.83	
18	Tower 32	B	1.85	
19	Squirt 38	B	1.86	
20	Medic 33	A	1.87	
21	Tower 32	A	1.87	
22	Medic 32	C	1.90	
23	Engine 31	A	1.91	Performance Quartile 2
24	Medic 37	B	1.91	
25	Engine 31	C	1.92	
26	Squirt 38	A	1.92	
27	Engine 39	A	1.92	
28	Squirt 41	A	1.93	
29	Engine 36	B	1.95	
30	Medic 36	C	1.95	
31	Medic 42	A	1.97	
32	Engine 33	A	1.98	
33	Medic 41	B	2.00	
34	Medic 33	B	2.02	
35	Medic 42	B	2.02	
36	Medic 41	A	2.03	
37	Medic 44	B	2.03	
38	Engine 42	A	2.05	
39	Engine 43	C	2.06	
40	Medic 44	C	2.06	
41	Truck 35	A	2.10	
42	Engine 44	C	2.12	
43	Medic 35	A	2.12	

Rank	Unit	Shift	90% Turnout (min)	
44	Medic 36	B	2.13	
45	Engine 44	A	2.13	
46	Engine 33	C	2.14	Performance Quartile 3
47	Squirt 41	B	2.14	
48	Medic 37	A	2.14	
49	Engine 39	C	2.15	
50	Engine 42	B	2.15	
51	Tower 34	C	2.16	
52	Medic 44	A	2.17	
53	Engine 39	B	2.20	
54	Medic 35	C	2.20	
55	Tower 45	C	2.21	
56	Medic 42	C	2.23	
57	Tower 34	B	2.25	
58	Engine 35	A	2.26	
59	Tower 32	C	2.26	
60	Engine 46	A	2.28	
61	Medic 46	B	2.28	
62	Engine 43	A	2.30	
63	Tower 45	B	2.30	
64	Engine 36	A	2.34	
65	Engine 42	C	2.36	
66	Truck 35	B	2.37	Performance Quartile 4
67	Engine 35	B	2.38	
68	Medic 40	C	2.38	
69	Engine 44	B	2.39	
70	Medic 36	A	2.39	
71	Engine 40	B	2.40	
72	Squirt 41	C	2.40	
73	Engine 37	B	2.44	
74	Engine 35	C	2.47	
75	Medic 34	C	2.47	
76	Medic 37	C	2.47	
77	Engine 40	A	2.57	
78	Engine 46	C	2.63	
79	Engine 47	C	2.64	
80	Truck 35	C	2.64	
81	Engine 47	B	2.67	
82	Engine 36	C	2.68	
83	Engine 37	A	2.70	
84	Medic 40	B	2.76	
85	Engine 37	C	2.82	
86	Medic 46	C	2.82	
87	Engine 40	C	3.11	

APPENDIX G

Group A Questionnaire Response Overview

1. How familiar are you with the current goals or adopted standards related to turnout times? Please rate from 1 to 5 with 1 being "not at all familiar" and 5 being "very familiar."		
not at all familiar	0	0%
	1	7%
	4	29%
	4	29%
very familiar	5	36%
Total	14	100%

2. How aware are you of your turnout time performance (e.g., average or percentile turnout times)? Please rate from 1 to 5 with 1 being "not at all aware" and 5 being "very aware".		
not at all aware	0	0%
	0	0%
	1	7%
	7	50%
very aware	6	43%
Total	14	100%

3. How would you rate your performance? Please rate from 1 to 5 with 1 being "inadequate" and 5 being "adequate".		
inadequate	0	0%
	0	0%
	1	7%
	6	43%
adequate	7	50%
Total	14	100%

4. To what extent do the current dispatch notification and information transfer methods affect your turnout times (e.g., MDT, pager, dispatcher automated voice)? Please rate from 1 to 5, 1=increase times and 5=decrease times		
increase times	2	14%
	2	14%

	4	29%
	3	21%
decrease times	3	21%
Total	14	100%

5. To what extent do the current station alerting systems affect your turnout times (e.g., lights, tones, unit display boards)?

increase times	1	7%
	4	29%
	6	43%
	2	14%
decrease times	1	7%
Total	14	100%

6. To what extent do the current electronic mapping systems affect your turnout times?

increase times	2	14%
	1	7%
	4	29%
	2	14%
decrease times	5	36%
Total	14	100%

7. To what extent do the current methods of acknowledging “enroute” status (e.g., using MDT) affect your turnout times?

increase times	3	21%
	0	0%
	5	36%
	2	14%
decrease times	4	29%
Total	14	100%

8. To what extent has the current overall technology utilized by dispatch, on the apparatus, and in the stations affect your turnout times?

increase times	2	17%
	0	0%
	3	25%
	4	33%
decrease times	3	25%
Total	12	100%

9. To what extent does the proximity of the day use areas of the station (e.g., offices, kitchen) to the apparatus affect your turnout times? Please rate from 1 to 5 with 1 being "no influence" and 5 being "large influence".		
no influence	1	8%
	0	0%
	3	25%
	1	8%
large influence	7	58%
Total	12	100%

10. To what extent does the proximity of the sleeping rooms of the station to the apparatus affect your turnout times?		
no influence	1	8%
	0	0%
	3	25%
	2	17%
large influence	6	50%
Total	12	100%

11. To what extent does the overall design of your station affect your turnout times?		
no influence	1	8%
	0	0%
	3	25%
	1	8%
large influence	7	58%
Total	12	100%

12. To what extent does being in quarters when a call is received affect your turnout times?		
increase times	1	8%
	3	25%
	7	58%
	1	8%
decrease times	0	0%
Total	12	100%

13. To what extent does being out of quarters when a call is received affect your turnout times?		
increase times	2	17%
	0	0%
	6	50%
	3	25%
decrease times	1	8%
Total	12	100%

14. To what extent does the type of call (e.g., alarm, EMS, fire, other) affect your turnout times?		
no influence	4	33%
	1	8%
	1	8%
	3	25%
large influence	3	25%
Total	12	100%

15. To what extent does being assigned to a slow station/unit (i.e., low call volume) affect your turnout times?		
increase times	2	17%
	1	8%
	9	75%
	0	0%
decrease times	0	0%
Total	12	100%

16. To what extent does being assigned to a busy station/unit (i.e., high call volume) affect your turnout times?		
increase times	0	0%
	2	17%
	7	58%
	2	17%
decrease times	1	8%
Total	12	100%

17. To what extent does your familiarity with the station's response area affect your turnout times?		
no influence	1	8%
	1	8%
	1	8%
	5	42%
high influence	4	33%
Total	12	100%

18. How would you rate SMFRA's training programs related to the preparation for turnout?		
inadequate	2	17%
	1	8%
	4	33%
	1	8%
adequate	4	33%
Total	12	100%

19. How would you rate your training efforts related to the preparation for turnout?		
inadequate	1	8%
	2	17%
	3	25%
	2	17%

adequate	4	33%
Total	12	100%

20. How would you rate the importance that SMFRA has given turnout times?		
unimportant	0	0%
	3	25%
	1	8%
	3	25%
very important	5	42%
Total	12	100%

21. How often does your supervisor discuss turnout times with you?		
never	1	8%
annually	2	17%
quarterly	7	58%
monthly	1	8%
each shift/tour	1	8%
Total	12	100%

22. How often does your crew discuss turnout times?		
never	2	17%
annually	0	0%
quarterly	8	67%
monthly	1	8%
each shift/tour	1	8%
Total	12	100%

23. To what extent do the expectations of others affect your turnout time performance?		
no influence	4	33%
	1	8%

	2	17%
	2	17%
high influence	3	25%
Total	12	100%

24. In your opinion, how important is the turnout time interval to total response times (i.e. dispatch, turnout, travel)?

not important	1	8%
	0	0%
	4	33%
	2	17%
very important	5	42%
Total	12	100%

25. How is your overall turnout time performance compared to other front-line apparatus at SMFRA?

much worse	0	0%
slightly worse	0	0%
same	4	33%
better	5	42%
much better	3	25%
Total	12	100%

26. To what extent does the performance of your peers affect your turnout time performance?

no influence	2	17%
	0	0%
	0	0%
	6	50%
high influence	4	33%
Total	12	100%

27. To what extent does your turnout time performance affect the performance of your peers?

no influence	1	8%
	0	0%
	1	8%
	5	42%
high influence	5	42%
Total	12	100%

28. To what extent does your turnout time performance need to improve?		
substantial improvement needed	0	0%
	0	0%
	3	25%
	5	42%
no improvement needed	4	33%
Total	12	100%

29. To what extent does being recognized or rewarded motivate your turnout time performance? Please rate with 1 being "no motivation" and 5 being "high motivation".		
no motivation	6	50%
	1	8%
	1	8%
	2	17%
high motivation	2	17%
Total	12	100%

30. To what extent does competition between stations/shifts/units motivate your turnout time performance?		
no motivation	3	25%
	1	8%
	2	17%
	2	17%
high motivation	4	33%
Total	12	100%

31. To what extent does personal satisfaction motivate your turnout time performance?		
no motivation	1	8%
	0	0%
	1	8%
	3	25%
high motivation	7	58%
Total	12	100%

32. To what extent does the potential outcome of an emergency motivate your turnout time performance?		
no motivation	1	8%
	0	0%
	1	8%
	3	25%
high motivation	7	58%
Total	12	100%

33. To what extent does the severity of the call motivate your turnout time performance?		
no motivation	2	17%
	2	17%
	2	17%
	2	17%
high motivation	4	33%
Total	12	100%

34. To what extent does public perception motivate your turnout time performance?		
no motivation	3	27%
	0	0%
	4	36%
	2	18%
high motivation	2	18%
Total	11	100%

35. To what extent has your turnout time performance reached maximum potential?		
not close to maximum potential	0	0%
	0	0%
	5	42%
	4	33%
has reached maximum potential	3	25%
Total	12	100%

36. In 9 out of 10 calls, how much more improvement is possible in your turnout time performance?		
45-60 sec	0	0%
30-45 sec	0	0%
15-30 sec	3	27%
0-15 sec	7	64%
0 sec	1	9%
Total	11	100%

37. To what extent is the NFPA 60-second, 90% of the time, turnout time expectation reasonable?		
not at all	0	0%
	1	9%
	2	18%
	3	27%
very reasonable	5	45%
Total	11	100%

38. Which of the following would you recommend as a turnout time (90% of the time) goal for SMFRA?		
60 sec	7	64%
90 sec	2	18%
120 sec	2	18%
150 sec	0	0%

180 sec	0	0%
Total	11	100%

39. What steps can you take to reduce your turnout times?

9 Responses

40. What are the obstacles to the success of your turnout time performance?

8 Responses

41. What are the top 3 things SMFRA should do to reduce turnout times?

7 Responses

42. Do you want feedback regarding your turnout time performance? (yes, no)

Yes	5	45%
No	6	55%
Total	11	100%

43. If you answered "yes" to the question above, what type of feedback would you prefer?

5 Responses

44. Are you primarily assigned to a medic unit or engine (including trucks)?

Medic Unit	4	36%
Engine/Truck	7	64%
Total	11	100%

APPENDIX H

Group B Questionnaire Response Overview

1. How familiar are you with the current goals or adopted standards related to turnout times? Please rate from 1 to 5 with 1 being "not at all familiar" and 5 being "very familiar."		
not at all familiar	1	7%
	1	7%
	2	13%
	6	40%
very familiar	5	33%
Total	15	100%

2. How aware are you of your turnout time performance (e.g., average or percentile turnout times)? Please rate from 1 to 5 with 1 being "not at all aware" and 5 being "very aware".		
not at all aware	0	0%
	1	7%
	4	27%
	8	53%
very aware	2	13%
Total	15	100%

3. How would you rate your performance? Please rate from 1 to 5 with 1 being "inadequate" and 5 being "adequate".		
inadequate	0	0%
	0	0%
	2	14%
	10	71%
adequate	2	14%
Total	14	100%

4. To what extent do the current dispatch notification and information transfer methods affect your turnout times (e.g., MDT, pager, dispatcher automated voice)? Please rate from 1 to 5, 1=increase times and 5=decrease times		
increase times	1	7%
	0	0%

	5	33%
	5	33%
decrease times	4	27%
Total	15	100%

5. To what extent do the current station alerting systems affect your turnout times (e.g., lights, tones, unit display boards)?

increase times	0	0%
	0	0%
	4	27%
	8	53%
decrease times	3	20%
Total	15	100%

6. To what extent do the current electronic mapping systems affect your turnout times?

increase times	0	0%
	2	13%
	6	40%
	4	27%
decrease times	3	20%
Total	15	100%

7. To what extent do the current methods of acknowledging “enroute” status (e.g., using MDT) affect your turnout times?

increase times	0	0%
	3	20%
	4	27%
	6	40%
decrease times	2	13%
Total	15	100%

8. To what extent has the current overall technology utilized by dispatch, on the apparatus, and in the stations affect your turnout times?

increase times	1	7%
	0	0%
	2	14%
	9	64%
decrease times	2	14%
Total	14	100%

9. To what extent does the proximity of the day use areas of the station (e.g., offices, kitchen) to the apparatus affect your turnout times? Please rate from 1 to 5 with 1 being "no influence" and 5 being "large influence".		
no influence	1	7%
	0	0%
	1	7%
	3	21%
large influence	9	64%
Total	14	100%

10. To what extent does the proximity of the sleeping rooms of the station to the apparatus affect your turnout times?		
no influence	2	14%
	0	0%
	1	7%
	3	21%
large influence	8	57%
Total	14	100%

11. To what extent does the overall design of your station affect your turnout times?		
no influence	0	0%
	0	0%
	0	0%
	6	43%
large influence	8	57%
Total	14	100%

12. To what extent does being in quarters when a call is received affect your turnout times?		
increase times	1	8%
	1	8%
	7	54%
	3	23%
decrease times	1	8%
Total	13	100%

13. To what extent does being out of quarters when a call is received affect your turnout times?		
increase times	0	0%
	2	15%
	5	38%
	3	23%
decrease times	3	23%
Total	13	100%

14. To what extent does the type of call (e.g., alarm, EMS, fire, other) affect your turnout times?		
no influence	3	21%
	2	14%
	3	21%
	3	21%
large influence	3	21%
Total	14	100%

15. To what extent does being assigned to a slow station/unit (i.e., low call volume) affect your turnout times?		
increase times	0	0%
	3	21%
	8	57%
	1	7%
decrease times	2	14%
Total	14	100%

16. To what extent does being assigned to a busy station/unit (i.e., high call volume) affect your turnout times?		
increase times	0	0%
	0	0%
	6	46%
	5	38%
decrease times	2	15%
Total	13	100%

17. To what extent does your familiarity with the station's response area affect your turnout times?		
no influence	0	0%
	1	7%
	4	29%
	3	21%
high influence	6	43%
Total	14	100%

18. How would you rate SMFRA's training programs related to the preparation for turnout?		
inadequate	0	0%
	3	21%
	7	50%
	2	14%
adequate	2	14%
Total	14	100%

19. How would you rate your training efforts related to the preparation for turnout?		
inadequate	0	0%
	1	7%
	5	36%
	3	21%

adequate	5	36%
Total	14	100%

20. How would you rate the importance that SMFRA has given turnout times?		
unimportant	0	0%
	0	0%
	3	21%
	6	43%
very important	5	36%
Total	14	100%

21. How often does your supervisor discuss turnout times with you?		
never	3	21%
annually	4	29%
quarterly	5	36%
monthly	1	7%
each shift/tour	1	7%
Total	14	100%

22. How often does your crew discuss turnout times?		
never	3	21%
annually	1	7%
quarterly	6	43%
monthly	2	14%
each shift/tour	2	14%
Total	14	100%

23. To what extent do the expectations of others affect your turnout time performance?		
no influence	1	7%
	1	7%

	3	21%
	7	50%
high influence	2	14%
Total	14	100%

24. In your opinion, how important is the turnout time interval to total response times (i.e. dispatch, turnout, travel)?

not important	0	0%
	2	14%
	4	29%
	5	36%
very important	3	21%
Total	14	100%

25. How is your overall turnout time performance compared to other front-line apparatus at SMFRA?

much worse	0	0%
slightly worse	0	0%
same	6	46%
better	6	46%
much better	1	8%
Total	13	100%

26. To what extent does the performance of your peers affect your turnout time performance?

no influence	4	29%
	1	7%
	1	7%
	6	43%
high influence	2	14%
Total	14	100%

27. To what extent does your turnout time performance affect the performance of your peers?

no influence	1	7%
	2	14%
	7	50%
	2	14%
high influence	2	14%
Total	14	100%

28. To what extent does your turnout time performance need to improve?		
substantial improvement needed	1	8%
	2	15%
	3	23%
	7	54%
no improvement needed	0	0%
Total	13	100%

29. To what extent does being recognized or rewarded motivate your turnout time performance? Please rate with 1 being "no motivation" and 5 being "high motivation".		
no motivation	7	50%
	2	14%
	4	29%
	1	7%
high motivation	0	0%
Total	14	100%

30. To what extent does competition between stations/shifts/units motivate your turnout time performance?		
no motivation	6	46%
	2	15%
	1	8%
	2	15%
high motivation	2	15%
Total	13	100%

31. To what extent does personal satisfaction motivate your turnout time performance?		
no motivation	0	0%
	1	7%
	3	21%
	4	29%
high motivation	6	43%
Total	14	100%

32. To what extent does the potential outcome of an emergency motivate your turnout time performance?		
no motivation	0	0%
	0	0%
	2	14%
	6	43%
high motivation	6	43%
Total	14	100%

33. To what extent does the severity of the call motivate your turnout time performance?		
no motivation	0	0%
	1	7%
	5	36%
	3	21%
high motivation	5	36%
Total	14	100%

34. To what extent does public perception motivate your turnout time performance?		
no motivation	2	14%
	1	7%
	5	36%
	2	14%
high motivation	4	29%
Total	14	100%

35. To what extent has your turnout time performance reached maximum potential?		
not close to maximum potential	0	0%
	0	0%
	4	29%
	8	57%
has reached maximum potential	2	14%
Total	14	100%

36. In 9 out of 10 calls, how much more improvement is possible in your turnout time performance?		
45-60 sec	0	0%
30-45 sec	0	0%
15-30 sec	1	8%
0-15 sec	12	92%
0 sec	0	0%
Total	13	100%

37. To what extent is the NFPA 60-second, 90% of the time, turnout time expectation reasonable?		
not at all	1	7%
	3	21%
	5	36%
	3	21%
very reasonable	2	14%
Total	14	100%

38. Which of the following would you recommend as a turnout time (90% of the time) goal for SMFRA?		
60 sec	3	21%
90 sec	7	50%
120 sec	2	14%
150 sec	1	7%

180 sec	1	7%
Total	14	100%

39. What steps can you take to reduce your turnout times?

7 Responses

40. What are the obstacles to the success of your turnout time performance?

10 Responses

41. What are the top 3 things SMFRA should do to reduce turnout times?

10 Responses

42. Do you want feedback regarding your turnout time performance? (yes, no)

Yes	8	57%
No	6	43%
Total	14	100%

43. If you answered "yes" to the question above, what type of feedback would you prefer?

7 Responses

44. Are you primarily assigned to a medic unit or engine (including trucks)?

Medic Unit	4	29%
Engine/Truck	10	71%
Total	14	100%

Format changes have been made to facilitate reproduction. While these research projects have been selected as outstanding, other NFA EFOP and APA format, style, and procedural issues may exist.

APPENDIX I

Group A Questionnaire Individual Responses

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Q	3	5	5	4	5	5	3	1	2	5	4	4	4	4	4
Q2	2	5	4	4	4	4	3	3	3	5	4	4	4	3	4
Q3	4	5	4	4	4	4		4	4	5	4	3	4	3	4
Q4	4	4	5	5	3	3	4	4	4	5	5	1	3	3	3
Q5	3	4	5	4	3	3	4	4	4	5	4	3	5	4	4
Q6	5	5	2	4	3	3	3	4	4	5	3	3	4	3	2
Q7	3	5	4	4	4	2	4	3	4	5	3	3	4	2	2
Q8	4	5	4	4	4	3	4		4	5	4	1	3	4	4
Q9	5	5	5	5	5	3	4		1	5	5	5	5	4	4
Q10	5	5	3	5	5	1	4		1	5	5	5	5	4	4
Q11	5	5	5	4	5	4	4		4	5	5	5	5	4	4
Q12	3	3	3	4	1	4			3	5	2	4	3	3	3
Q13	3	5	2	4	5	2			3	5	4	3	4	3	3
Q14	5	1	3	1	4	1	2		3	5	3	5	4	4	2
Q15	3	5	4	3	2	3	3		3	5	2	3	3	2	3
Q16	3	5	3	3	4	3			3	5	4	3	4	4	4
Q17	5	3	5	4	3	5	5		4	5	3	3	5	4	2
Q18	3	4	2	3	5	3	3		3	5	2	3	3	2	4
Q19	5	5	3	4	5	5	3		3	5	4	3	3	2	4
Q20	5	5	4	4	4	5	3		3	5	5	4	4	4	3
Q21	1	5	4	2	3	2	2		3	3	2	1	1	3	3
Q22	1	5	4	2	3	1	5		3	3	4	1	3	3	3
Q23	3	5	4	2	3	4	5		4	4	4	3	1	4	4
Q24	2	3	2	5	4	3	3		4	5	5	3	4	4	4
Q25	3	4	3	4	4	3			4	5	4	3	3	3	4
Q26	4	1	1	1	3	4	5		4	5	2	4	1	4	4
Q27	2	1	3	3	3	3	5		4	5	2	4	3	3	3
Q28	3	4	4	4	4	3			4	4	4	2	2	1	3
Q29	1	2	1	1	1	3	1		1	3	3	4	1	2	3
Q30	1	5	1	1	2		5		1	3	4	1	1	4	2
Q31	3	5	2	4	5	3	5		4	4	5	3	5	4	5
Q32	3	5	4	4	5	3	4		4	5	5	4	5	4	5
Q33	3	5	3	3	5	3	4		3	5	2	4	5	5	4
Q34	1	5	3	3	3	3	5		3	5	2	4	1	5	4
Q35	5	5	4	4	4	3	3		4	4	3	4	3	4	4
Q36	4	4	4	4	4	3			4	4	4	4	4	4	4
Q37	1	5	2	3	4	5	2		3	3	4	2	3	4	3
Q38	4	2	2	3	1	2	3		2	5	1	2	2	1	2
Q39	live in the rig	station layout.			Ensure that equipment is laid out ready to go.		Data on turnout times				Better station design. I work at St.35 which makes is take longer to get to the apparatus.		area fam	Go on the tone. Not wait to see if is the medic or engine only.	
Q40	travel distance to rig	station layout.	station layout, room in bays-room on the rigs		lay out of station and where in the station you are at time of call. What are you doing when you recieve the call (ie. training, sleeping.)		station layout		Safety measures taken inside and equipment we wear		When station toning goes down.	Bunker coat zipper has decreased my turnout time.	MDT working	Putting on bunker gear. Calls after we have gone to bed. Calls during workouts or showers.	
Q41	encourage running redesogn stations to have shorter travel distances	publish results. reward performers. plan stations for response.	emphasize safety over the race		1. station design and lay out. 2. station tones and notification 3. give crews feed back as to what there turnout times are.		Provide data each tour Discuss the times that are needed in turnout. Currently I am not 100% sure of what the department is looking for in turnout times. is it 60 or 90 sec?		Turnout times are important but not as important as getting to the call if being tested and asked to move faster then one is comfortable just to improve a turnout time by 15-30 seconds we are missing the point.		Publish unit times monthly. Have B/C follow up with slower units. Ensure times are accurate, you can modify them when you complete the dispatch report.	More frequent reports	we rely on computers so much, make sure they work	Different colored lights helped. Pagers for all employees. Have someone else mow the lawn.	
Q42	No	Yes	No	No	Yes	Yes	Yes		No	No	Yes	Yes	No	Yes	Yes
Q43		all staions all aparatus.			What are the times. how do they compare to other shifts and other stations.		DATA				What my times were for my unit and the units at my station and how those compared to the other shifts at the same station and to all other stations.	Non punative reports would be ok.		Break down of fire response vs medical. 07:00 to 22:00 vs 22:00 to 07:00 times	Quarterly report.
Q44	Engine/Truck	Medic Unit	Engine/Truck	Medic Unit	Medic Unit	Medic Unit	Engine/Truck		Engine/Truck	Engine/ Truck	Engine/Truck	Engine/Truck	Engine/Tr uck	Engine/Truck	Engine/Tr uck

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APPENDIX J

Group B Questionnaire Individual Responses

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Q	3	5	5	4	5	5	3	1	2	5	4	4	4	4	4
Q2	2	5	4	4	4	4	3	3	3	5	4	4	4	3	4
Q3	4	5	4	4	4	4		4	4	5	4	3	4	3	4
Q4	4	4	5	5	3	3	4	4	4	5	5	1	3	3	3
Q5	3	4	5	4	3	3	4	4	4	5	4	3	5	4	4
Q6	5	5	2	4	3	3	3	4	4	5	3	3	4	3	2
Q7	3	5	4	4	4	2	4	3	4	5	3	3	4	2	2
Q8	4	5	4	4	4	3	4		4	5	4	1	3	4	4
Q9	5	5	5	5	5	3	4		1	5	5	5	5	4	4
Q10	5	5	3	5	5	1	4		1	5	5	5	5	4	4
Q11	5	5	5	4	5	4	4		4	5	5	5	5	4	4
Q12	3	3	3	4	1	4			3	5	2	4	3	3	3
Q13	3	5	2	4	5	2			3	5	4	3	4	3	3
Q14	5	1	3	1	4	1	2		3	5	3	5	4	4	2
Q15	3	5	4	3	2	3	3		3	5	2	3	3	2	3
Q16	3	5	3	3	4	3			3	5	4	3	4	4	4
Q17	5	3	5	4	3	5	5		4	5	3	3	5	4	2
Q18	3	4	2	3	5	3	3		3	5	2	3	3	2	4
Q19	5	5	3	4	5	5	3		3	5	4	3	3	2	4
Q20	5	5	4	4	4	5	3		3	5	5	4	4	4	3
Q21	1	5	4	2	3	2	2		3	3	2	1	1	3	3
Q22	1	5	4	2	3	1	5		3	3	4	1	3	3	3
Q23	3	5	4	2	3	4	5		4	4	4	3	1	4	4
Q24	2	3	2	5	4	3	3		4	5	5	3	4	4	4
Q25	3	4	3	4	4	3			4	5	4	3	3	3	4
Q26	4	1	1	1	3	4	5		4	5	2	4	1	4	4
Q27	2	1	3	3	3	3	5		4	5	2	4	3	3	3
Q28	3	4	4	4	4	3			4	4	4	2	2	1	3
Q29	1	2	1	1	1	3	1		1	3	3	4	1	2	3
Q30	1	5	1	1	2		5		1	3	4	1	1	4	2
Q31	3	5	2	4	5	3	5		4	4	5	3	5	4	5
Q32	3	5	4	4	5	3	4		4	5	5	4	5	4	5
Q33	3	5	3	3	5	3	4		3	5	2	4	5	5	4
Q34	1	5	3	3	3	3	5		3	5	2	4	1	5	4
Q35	5	5	4	4	4	3	3		4	4	3	4	3	4	4
Q36	4	4	4	4	4	3			4	4	4	4	4	4	4
Q37	1	5	2	3	4	5	2		3	3	4	2	3	4	3
Q38	4	2	2	3	1	2	3		2	5	1	2	2	1	2
Q39	live in the rig	station layout.			Ensure that equipment is laid out ready to go.		Data on turnout times				Better station design. I work at St.35 which makes is take longer to get to the apparatus.		area fam	Go on the tone. Not wait to see if is the medic or engine only.	
Q40	travel distance to rig	station layout.	station layout, room in bays-room on the rigs		lay out of station and where in the station you are at time of call. What are you doing when you recieve the call (ie. training, sleeping.)		station layout		Safety measures taken inside and equipment we wear		When station toning goes down.	Bunker coat zipper has decreased my turnout time.	MDT working	Putting on bunker gear. Calls after we have gone to bed. Calls during workouts or showers.	
Q41	encourage running redesogn stations to have shorter travel distances	publish results. reward performers. plan stations for response.	emphasize safety over the race		1. station design and lay out. 2. station tones and notification 3. give crews feed back as to what there turnout times are.		Provide data each tour Discuss the times that are needed in turnout. Currently I am not 100% sure of what the department is looking for in turnout times. is it 60 or 90 sec?		Turnout times are important but not as important as getting to the call if being tested and asked to move faster then one is comfortable just to improve a turnout time by 15-30 seconds we are missing the point.		Publish unit times monthly. Have B/C follow up with slower units. Ensure times are accurate, you can modify them when you complete the dispatch report.	More frequent reports	we rely on computers so much, make sure they work	Different colored lights helped. Pagers for all employees. Have someone else mow the lawn.	
Q42	No	Yes	No	No	Yes	Yes	Yes		No	No	Yes	Yes	No	Yes	Yes
Q43		all staions all aparatus.			What are the times. how do they compare to other shifts and other stations.		DATA				What my times were for my unit and the units at my station and how those compared to the other shifts at the same station and to all other stations.	Non punative reports would be ok.		Break down of fire response vs medical. 07:00 to 22:00 vs 22:00 to 07:00 times	Quarterly report.
Q44	Engine/Truck	Medic Unit	Engine/Truck	Medic Unit	Medic Unit	Medic Unit	Engine/Truck		Engine/Truck	Engine/ Truck	Engine/Truck	Engine/Truck	Engine/Truck	Engine/Truck	Engine/Truck