

Tennessee Fire Department Needs Assessment Survey

Rachael Guarnieri, MTAS Public Service Intern
Dennis Wolf, MTAS Fire Management Consultant
Frances Adams-O'Brien, MTAS Librarian
Lyndy Wibking, MTAS Senior Library Associate

June 2014

Executive Summary	1
Introduction	3
Methodology	3
Overview of Survey Results: Part I	5
Department Information	5
Replacement of Equipment	5
Budget	5
Personnel	6
Volunteer vs. Career Fire Departments	6
Departments by Population Group	7
Recruitment and Retention	7
Personnel Assigned to Engines	8
Structural Firefighting, Recruit Training and Certification	8
Firefighters Certified for Structural Firefighting	8
Firefighters Certified to Level I and II	9
Annual Training	9
Training for Structural Firefighting	10
Driver/Operator Certification	10
Officer Training	11
Emergency Medical Services	12
Wildland Firefighting Training	12
Fire Prevention and Code Enforcement	12
Fire prevention and code enforcement	13
Overview of Survey Results: Part II	14
Fire Department Facilities	15
Fire Department Equipment	16
Provision of Ambulance Services	18
Self-contained Breathing Apparatus	18
Portable Radios	20
Personal Protective Clothing	21
Communications	22
Communication Equipment	26
Technology	27
Report Conclusion	31

Executive Summary

In 2010, the National Fire Protection Association (NFPA) conducted its third Fire Service Needs Assessment Survey, having conducted previous surveys in 2001 and 2005. Even though the United States Fire Administration (USFA) and the National Fire Protection Association (NFPA) have conducted several national level fire service needs assessments, there has never been a comprehensive needs assessment conducted that focused solely on the Tennessee fire service. In addition, for the 2010 survey, the NFPA data subset for Tennessee erroneously included data from other states, so the picture for Tennessee was not accurate. Based on ad hoc, individual fire studies conducted by the Municipal Technical Advisory Service (MTAS) and the County Technical Assistance Service (CTAS), these departments are keenly aware that Tennessee fire services have extensive needs in many areas, especially in smaller communities, but there is a lack of quantifiable data on these needs. The purpose of this survey was to collect reliable data on needs of Tennessee fire departments as a whole.

Additionally, the response rate for Tennessee in national surveys has been low. In 2010, for example, the NFPA surveyed 247 of the 723 fire departments in Tennessee and of that, 247 only 80 fire departments responded. MTAS does not consider this a representative picture of the state's fire service. To get a better sample of data, MTAS theorized that a survey of Tennessee fire departments by a Tennessee organization, coupled with providing a way for participants to respond electronically, would result in an improved response rate. In fact, the response rate to MTAS' Tennessee Fire Needs Assessment Survey (TFNAS) was 23 percent, which is more than double the response rate to the national survey (11 percent).

This survey's major goal is to identify gaps in the needs of the Tennessee fire service by comparing what departments have, regarding efficient and effective firefighting practices, against consensus standards, government regulations, and other nationally recognized guidance. The specific goals of the Tennessee Fire Service Needs Assessment Survey are:

1. To serve as a resource for fire departments in all jurisdiction levels.
2. To provide a "yardstick" to measure one fire department against the results for all fire departments.
3. To identify the need for possible legislation to address statewide needs.
4. To identify possible projects for the Tennessee Fire Chiefs Association (TFCA) to focus on improving identified fire service deficiencies in Tennessee.
5. To identify training needs to assist the Tennessee Fire and Codes Academy in developing training programs and classes to better respond to the needs of its customers.
6. To assess compliance levels with national standards at the department level and statewide level.

The survey results indicate that the Tennessee fire service has many needs in many areas.

Examples of significant needs as identified in this study include:

Formal training:

- 55 percent of firefighters lack formal training that meets NFPA standards
- 38 percent of firefighters in Tennessee do not have Fire Fighter I certification, the minimum level of certification deemed necessary by the NFPA for a firefighter to function as an integral member of a firefighting team under direct supervision in hazardous conditions

Staffing:

- 54 percent of all fire departments with volunteers do not have a recruitment and retention plan in place
- 75 percent of fire departments with career personnel do not meet the NFPA recommended staffing level of four (4) firefighters per engine company
- 53 percent of firefighters in Tennessee do not receive the minimum number of annual training hours (192) in structural firefighting recommended by the Insurance Services Office
- 40 percent of new fire apparatus drivers do not receive 40 hours of training in driving and operating fire apparatus as recommended by ISO
- 48 percent of all fire officers lack the minimum certification level of Fire Officer I
- 68 percent of fire departments in Tennessee responding to wildland fires have personnel that lack formal training or certification in wildland firefighting

Programs offered to community:

- 26 percent of fire departments in Tennessee have no smoke alarm education/distribution program

Facilities:

- 61 percent of fire departments in Tennessee have at least one fire station that is more than 40 years old

Equipment:

- Approximately 33 percent of volunteer fire departments do not have enough SCBA for responding firefighters
- 72 percent of all fire departments (full, volunteer and mostly volunteer) have personal protective equipment that is ten (or more) years old

Introduction

According to the 2010 Census, the majority of Tennessee cities have populations below 10,000, with 148 having less than 5,000 inhabitants.¹ Furthermore, Tennessee is among the top six states in the nation with the highest relative risk of dying by fire, according to the U.S. Fire Administration.² This high risk may be attributed to many factors such as the high percentage of rural regions, poverty and low education levels. This poses a unique challenge for the 723 fire departments in the state with limited resources to be able to meet the array of fire service needs.

In order to identify gaps in fire needs and services, MTAS created a two-part survey and distributed it to fire departments across the state. The MTAS fire needs assessment study allows for a more accurate and up-to-date depiction of Tennessee fire services and illuminates areas in need of improvement and funding. The resulting information will highlight gaps in fire service coverage and suggest which jurisdictions might benefit most from programs such as the distribution of smoke alarms and improvements in fire prevention services.

Important features related to the existing level of fire protection and prevention services provided by the fire departments in Tennessee will emerge in the analysis of the survey results. Areas of need were identified by comparing the survey results to national standards and government regulations. The identification of these gaps will allow fire chiefs to make strategic decisions regarding resource allocation that will have the most impact in improving fire services. Additionally, the summary report of the survey results will be an asset to interested parties who lobby for funds in the legislature, which may improve fire services in the state.

Methodology

The questions in the MTAS survey were derived from the 2011 NFPA Needs Assessment Survey questions although MTAS has expanded and changed some questions to tailor the information to Tennessee fire services. The MTAS study is comprised of two separate surveys conducted in 2013 and 2014. The questions in the complete survey address seven categories of information related to fire services. The results from both surveys have been combined to offer a comprehensive analysis and representation of Tennessee's current fire service needs. These categories include:

Part 1 (Fall 2013)	Part 2 (Spring 2014)
Personnel	Fire department facilities and equipment
Structural firefighting, recruit training, and certification	Communication and communication equipment
Annual training	Technology
Fire prevention and Code enforcement	

The NFPA survey uses population groupings to compare data. Where it adds value, analysis by population is also provided in the MTAS report. Additionally, comparisons are provided to NFPA

¹ Department of Labor and Workforce Development, (July, 2012). The labor market report: population in Tennessee counties and cities. Nashville, Tennessee: <http://www.tn.gov/labor-wfd/lmr/pdf/2012/LMRJan2012.pdf>

² U.S. Fire Administration, (2013). State fire death rates and relative risk. Retrieved from website: <http://www.usfa.fema.gov/statistics/estimates/states.shtm>

standards and national findings in some cases in order to determine how Tennessee compares to fire services across the country.

The scope of the MTAS survey comprises fire services provided throughout the state of Tennessee in 2013 and 2014. Of the 723 fire stations in the state, 164 participated in the 2013 MTAS survey, representing nearly 23 percent of all fire departments. The response rate to the second part of the survey in 2014 was similar with 168 departments responding. The fire departments that responded to the survey served 41 percent of the state's total population of 6,495,978 individuals in 2013.³ As a result, MTAS can infer general conclusions about fire services in Tennessee.

We administered the survey electronically and conducted follow-up to increase response rate via email and phone. MTAS fire management consultant, Dennis Wolf, was available to help with any questions from participants. For both parts of the survey, the State Fire Marshal's office provided the contact information that was current as of 2013.

³ U.S. Census Bureau. (2013). Tennessee Quick Facts. Retrieved from website: <http://quickfacts.census.gov/qfd/states/47000.html>

Overview of Survey Results: Part I

Department Information

This section of the survey focuses on the structure of fire departments, apparatus policies in place, and funding. The answers to these questions may provide insight into areas of need regarding fire stations with assorted structures and funding.

57 percent of the stations responding classified themselves as full volunteer departments while 52 percent of all cities in the state have population with less than 2,000 individuals. It is probable that cities with fewer than 2,000 residents would have fire services provided by a full or mostly volunteer station and thus more than 50 percent of fire stations in the state would be operated by volunteer firefighters. This educated assumption enables broad interpretation of the data in order to make conclusions about all fire services in the state.

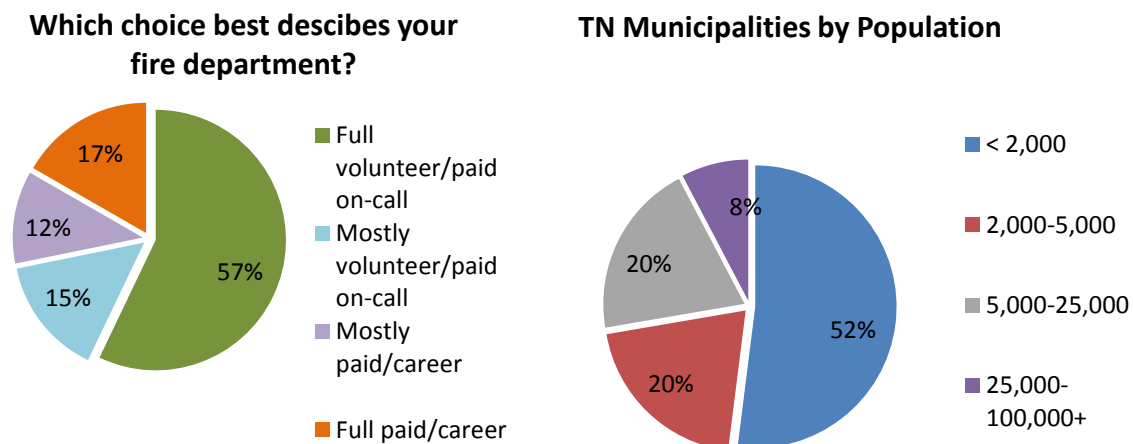


Figure 1: Tennessee fire departments compared to Tennessee city breakdown by population

Replacement of Equipment: Lack of success in meeting need: The majority (57 percent) of all fire departments in the survey are full volunteer. Furthermore, 70 percent of the total respondents do not have policies in place for replacement of the required equipment and apparatuses. The lack of an apparatus replacement plan, coupled with budgetary cuts to capital projects to finance fire department apparatus, illustrate the need for more proactive replacement plans. To further define the problem, the national cost of fire protection, including proper equipment, has risen 115 percent from 1986 to 2011.⁴

Budget: Lack of success in meeting need: In 2013, 88 percent of fire departments in Tennessee retained their total funded positions from the previous year. Of those that retained their budget, 57 percent reported their budgets have remained the same from FY 2012. The remaining departments saw an increase (30 percent) in their budgets while a portion of departments saw a decrease (13 percent), as shown in Figure 2. Tennessee reflects the national trend with a majority of fire departments not

⁴ Karter, Jr., M. J., & Stein, G. P. (2012). US Fire Department Profile 2012. Retrieved from National Fire Protection Association website: <http://www.nfpa.org/~media/files/research/nfpa%20reports/fire%20service%20statistics/osfdprofile.pdf>

receiving budget increases due to a sustained economic recession. When fire departments lack the necessary funding for proper training and equipment, there is an increased risk of firefighter and civilian injury and death, as well as increased property loss.⁵ This correlation poses a challenge for those fire chiefs who must effectively manage with inadequate budgets that may result in personnel and equipment shortages.

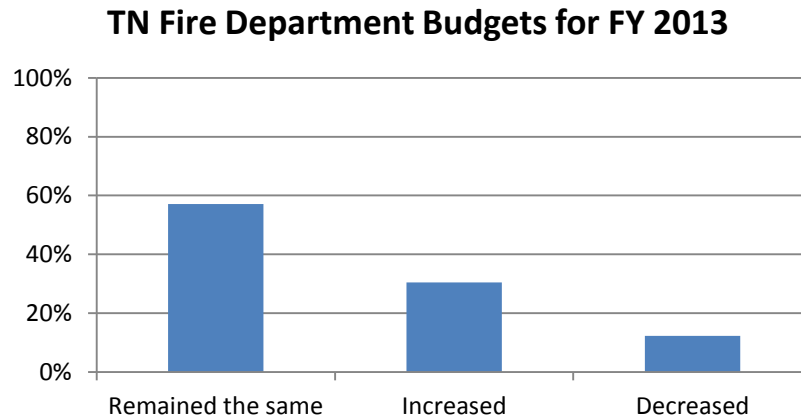


Figure 2: Tennessee fire department budgets for FY13

Personnel

An analysis of populations served by Tennessee fire departments creates a clear picture of fire service personnel needs in the state. Identifying the population protected by fire departments and classifying these departments as full volunteer, mostly volunteer, all career and mostly career allow for a better understanding of fire service needs. Furthermore, use of this data advances geographic deductions and allows for maximum comparability.

Volunteer vs. Career Fire Departments

The majority of fire departments in the state are “full volunteer” (57 percent). The remainder is mostly volunteer (15 percent), full career staff (17 percent), and mostly career or paid staff (12 percent). These findings are similar to national trends in which two-thirds of U.S. fire departments are all volunteer (70 percent).⁶ Figure 3 compares the percent of volunteer and career fire departments in Tennessee and nationally.

⁵ Urban Fire Forum, & Metropolitan Fire Chiefs (2011). Fire Service Deployment: Assessing Community Vulnerability. Retrieved from <http://www.nfpa.org/~media/Files/Member%20access/member%20sections/Metro%20Chiefs/UrbanFireVulnerability.pdf>

⁶ United States. (2012). U.S. Fire Administration. National Fire Department Census Quick Facts. By U.S Census Bureau. Web. <http://apps.usfa.fema.gov/census/summary.cfm#g>.

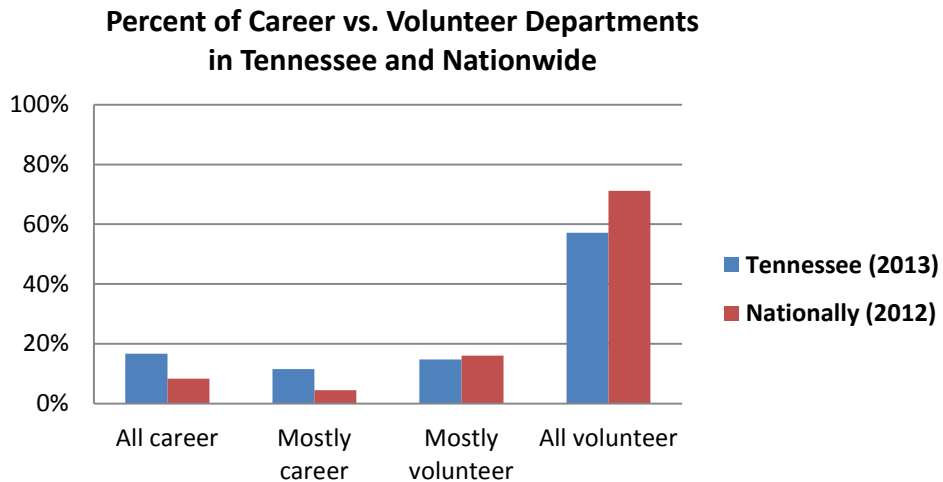


Figure 3: Percent of career vs. volunteer departments in Tennessee and Nationwide

Departments by Population Group

When evaluating the makeup of fire departments nationally and in relation to the population of communities, Tennessee is similar to the national breakdown. Fire departments serving communities of less than 2,000 in population are predominately volunteer, while communities of more than 100,000 in population are predominately all career fire departments. Figure 4 below illustrates the department type by the population of the jurisdiction protected and how Tennessee compares to the national findings.

Population Protected	All Career		Mostly Career		Mostly Volunteer		All Volunteer	
	National	Tenn.	National	Tenn.	National	Tenn.	National	Tenn.
Less than 2,000	1%	0%	.9%	0%	4.8%	11%	93.3%	89%
2,000-5,000	1.3%	6%	2.6%	8%	21.1%	14%	75%	72%
5,000-25,000	14.6%	15%	16.5%	17%	39.5%	14%	29.4%	54%
25,000-50,000	47.1%	42%	24.2%	5%	24.5%	37%	4.2%	16%
50,000+	77.2%	71%	17.6%	29%	5.2%	0%	0%	0%

Figure 4: Tennessee and national fire departments by department type and population protected

Recruitment and Retention: Lack of success in meeting need: There is a trend in the nation of declining volunteerism, which is evident in the fire service sector.⁷ Although 46 percent of fire departments in the state have a plan or policy in place for recruitment and retention of firefighters, the majority (54 percent) do not have such plans. Moreover, research shows that the average annual national savings

⁷ Retention and recruitment for the volunteer emergency services: Challenges and solutions. (2007). Emmetsburg, MD: United States Fire Administration, FEMA. Retrieved from <http://www.usfa.fema.gov/downloads/pdf/publications/fa-310.pdf>

resulting from using volunteer firefighters is \$37.3 billion total or \$45,000 saved per firefighter.⁸ The monetary and threats to service levels are too important to ignore the issue of retention and recruitment of trained firefighters.

Personnel Assigned to Engines: Lack of success in meeting need: NFPA requires a minimum of four firefighters assigned to an engine or pumper in a career fire department. Of the career departments in Tennessee, based on the results of this study, we see that 75 percent of these departments fail to comply with NFPA 1710, *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments*.⁹ Reduced/limited staffing on apparatus affects the ability of a fire department to fight a fire efficiently and effectively, as NFPA, the International City/County Management Association (ICMA), and the Insurance Services Office (ISO) all recommend a minimum of fifteen or sixteen firefighters on the scene of a low risk structure fire. To send this many firefighters to the scene when engine companies are staffed with just two or three personnel, additional fire engines will be required simply to transport firefighters to the scene.

Structural Firefighting, Recruit Training and Certification

It is crucial for all firefighters to have the proper skills and knowledge for all scenarios of firefighting. Ongoing continuing education enables firefighters to work together more effectively to save lives and property. This portion of the survey focuses on areas of need in structural firefighting training.

Firefighters Certified for Structural Firefighting: Lack of success in meeting need: Structural fires are a leading cause of death and injury in the U.S., with 83 percent of civilian fire deaths occurring in structural fires in 2012.¹⁰ Nearly 95 percent of the responding fire departments provide structural firefighting response services. Forty-five percent of those fire departments have not formally trained and certified all of their personnel. This leaves the majority of the firefighters in Tennessee responding to structural fires with no formal training per NFPA standards. Figure 5 below depicts the percent of the firefighters formally trained to fight structural fires categorized by department type. It is evident that mostly/all volunteer fire departments are less likely to have formally trained staff to deal with structural fires than fire departments with full career or mostly career staff.

⁸ Retention and recruitment for the volunteer emergency services: Challenges and solutions. (2007). Emmitsburg, MD: United States Fire Administration, FEMA. Retrieved from <http://www.usfa.fema.gov/downloads/pdf/publications/fa-310.pdf>

⁹ NFPA 1710, *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments* (National Fire Protection Agency 2010).

¹⁰ National Fire Protection Association. (2012). *An Overview of the U.S. Fire Problem*. Fire Analysis and Research. Retrieved from <http://www.nfpa.org/~media/Files/Research/Fact%20sheets/FireOverview.pdf>

Percent of Firefighters Certified to Fight Structural Fires by Department Type

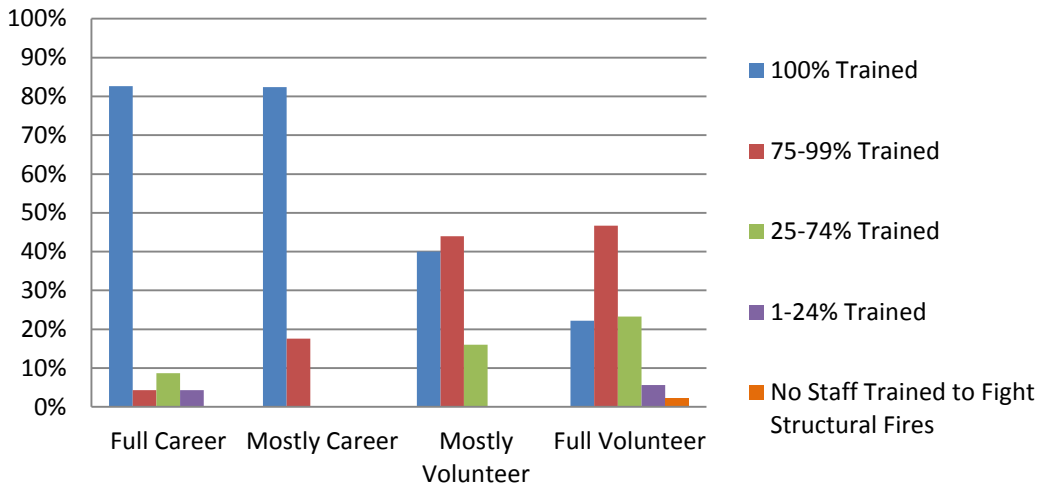


Figure 5: Percent of firefighters certified to fight structural fire by department type

Firefighters Certified to Level I and II: Limited success in meeting need: The NFPA 1001 standard identifies the minimum professional qualifications for firefighters. Seventy one percent of Tennessee fire departments have been successful in certifying the majority of firefighters to level one and two. However, there are still departments with no certified firefighters or a small percentage certified. Figure 7 shows the breakdown of firefighters with Level I and II certification in Tennessee.

Firefighter Certification Levels in 2013

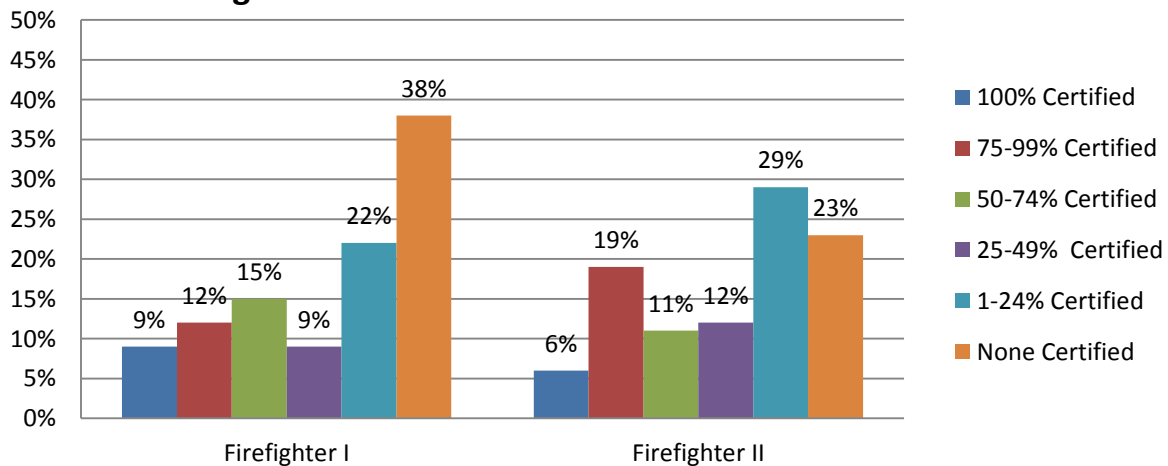


Figure 6: Percent of Tennessee firefighters trained to firefighter I and firefighter II certifications

Annual Training

Services that fire departments provide have broadened in recent years and encompass local, state and federal standards. Firefighters must perform their required tasks and activities in a professional and

competent manner, which requires continuous training in order to have the appropriate knowledge and skills for the job. Despite the importance of training, many departments do not have the funds to train all personnel to the highest possible level.

Training for Structural Firefighting: Lack of success in meeting need: Training for structural firefighting is essential for proper execution in managing these fires and safe rescue. The Insurance Service Office (ISO) recommends that departments provide at least 192 hours of structural related firefighting training each year. A significant number of departments in the state (47 percent) provide this amount of training, which is roughly equivalent to the percentage in the country (53 percent). Despite these positive numbers, there is still a need to train all staff that performs this dangerous task. Figure 8 emphasizes the lack of success in structural firefighting training.

Departments that provide at least 192 hours of structural firefighting training each year

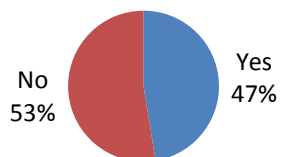


Figure 7: Percent of fire departments in Tennessee that annually provide 192 hours of structural firefighting training

Structural fires are among the highest cause of fire deaths in the nation.¹¹ Increased efforts to train all personnel who perform structural firefighting are imperative in order to save lives and property.

Driver/Operator Certification: Lack of success in meeting need: The proper operation of fire apparatuses is vital to accomplishing the job safely and with no harm to firefighters or citizens. Two-thirds (59 percent) of all driver and fire apparatus operators have been certified. This leaves over a quarter of drivers having no certification. Furthermore, 38 percent of new drivers of fire apparatuses are not trained for at least 40 hours in their first year. This is a major safety concern that can potentially cause increased safety issues in already dangerous situations. (Note: 163 fire departments responded to the survey—8 did not respond to this question).

¹¹ Federal Emergency Management Agency. (2012). U.S. Fire Administration: Fy2011 Annual Report to Congress (2012 ASI 8874-2). Retrieved from website: <http://si.conquestsystems.com/statistical/Pdf>

Certification of Fire Apparatus Operators in 2013

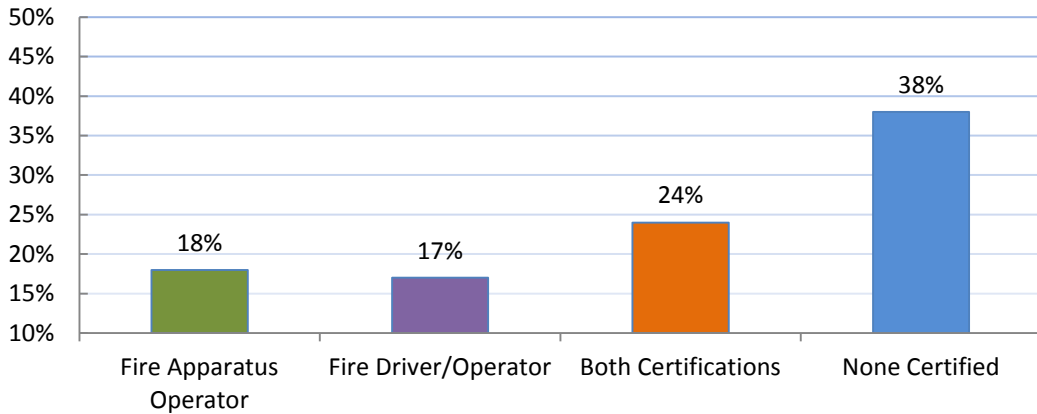


Figure 8: Percent of firefighters in Tennessee with fire apparatus certification

Officer Training: Lack of success in meeting need: Firefighting is a team effort and proper leadership is essential for a team to work cohesively in the most productive and efficient manner. Strong and informed leadership fosters positive team building and success. Informed decision-making and leadership is best attained through education and training. Nearly half (48 percent) of all company and command officers are receiving at least 12 hours of annual officer-level training. This still leaves over half of Tennessee command officers not participating in at least 12 hours of officer training per year. Certification of command officers is vital for these leaders to gain the proper skills. Figure 9 depicts the breakdown of certification levels of command officers in the state.

Command Officer Certification Levels in Tennessee

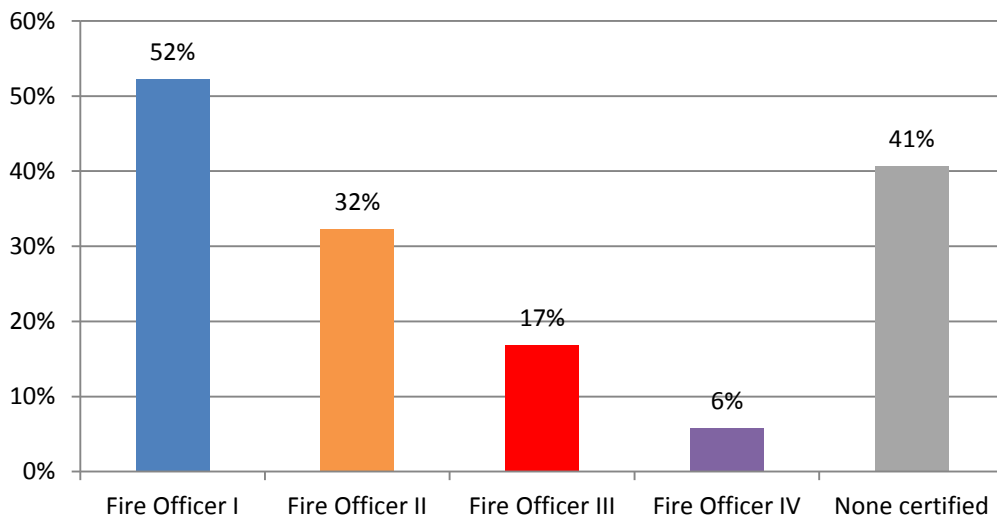


Figure 9: Percent of Tennessee command officer certification levels in 2013

The USFA and the National Fire Academy (NFA) strongly encourage education and training for all firefighters. The NFPA organizes the Fire and Emergency Services Higher Education Program (FESHE) which is a network of post-secondary institutions that provide degrees in emergency services education.¹²

Emergency Medical Services: Lack of success in meeting need: Emergency Medical Services (EMS) is increasingly a duty of fire departments in the state. Currently, more than half of the fire departments (59 percent) provide this service to residents. Of those personnel who perform this duty, 70 percent have received formal training for this task. Although the majority of personnel performing EMS have received training, there are still one fourth of these firefighters who have not. The proportion of departments performing EMS nationally (69 percent) is similar to Tennessee (59 percent), but there is one significant difference. While Tennessee has 25 percent of untrained personnel performing EMS, nationally, 48 percent of firefighters performing this task have no formal training.¹³ Although Tennessee is above the national average of trained EMS firefighters, there is still a need to have all personnel who perform EMS on residents trained for the task.

Wildland Firefighting Training: Lack of success in meeting need: Tennessee has vast rural regions throughout the state. Wildland fires are a common threat to the environment and our society, and 75 percent of all departments in the state report that they perform wildland firefighting. Nearly one-third (36 percent) of all departments in the state have personnel trained in wildland firefighting. This leaves the majority (68 percent) of fire departments in Tennessee responding to these fires with personnel who have no formal training or certification.

Certification for Wildland Firefighting

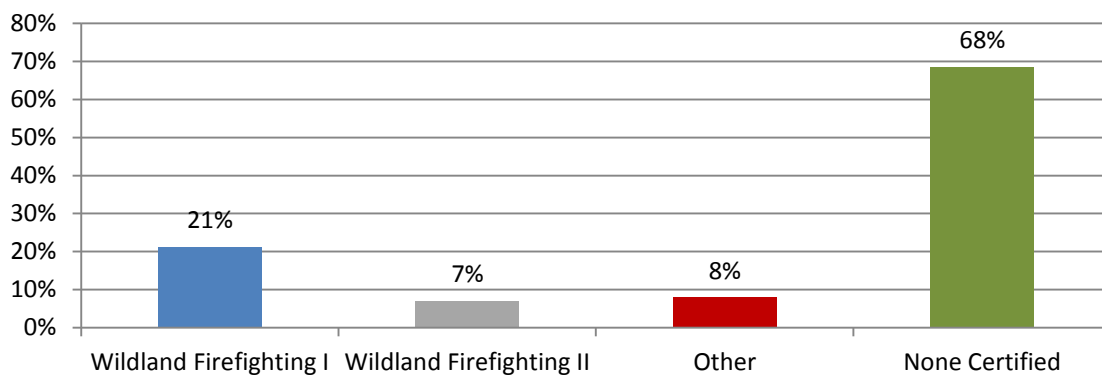


Figure 10: Percent of Tennessee firefighters performing wildland firefighting and certification levels

Fire Prevention and Code Enforcement

Fire prevention is a central concern and duty of fire departments. Increasingly, fire departments are taking on new roles and responsibilities, such as facilitating home fire safety inspection programs,

¹² U.S. Fire Administration | Working for a Fire-Safe America. (2014). Retrieved February 2014, from <http://www.usfa.fema.gov>

¹³ National Fire Protection Association (2011). Third Needs Assessment of the U.S Fire Services. Retrieved from Fire Analysis and Research Division website: <http://www.nfpa.org/osds>

educational programs, plans review and permit approval. Figure 11 depicts the common programs and services offered by Tennessee fire departments. Currently, 90 percent of fire departments in the state conduct at least one of the fire prevention and code enforcement activities listed in Figure 11. These programs illustrate some activities that help prevent fires and moderate the effects when fires do occur.

Programs Conducted by Fire Departments in TN in 2013

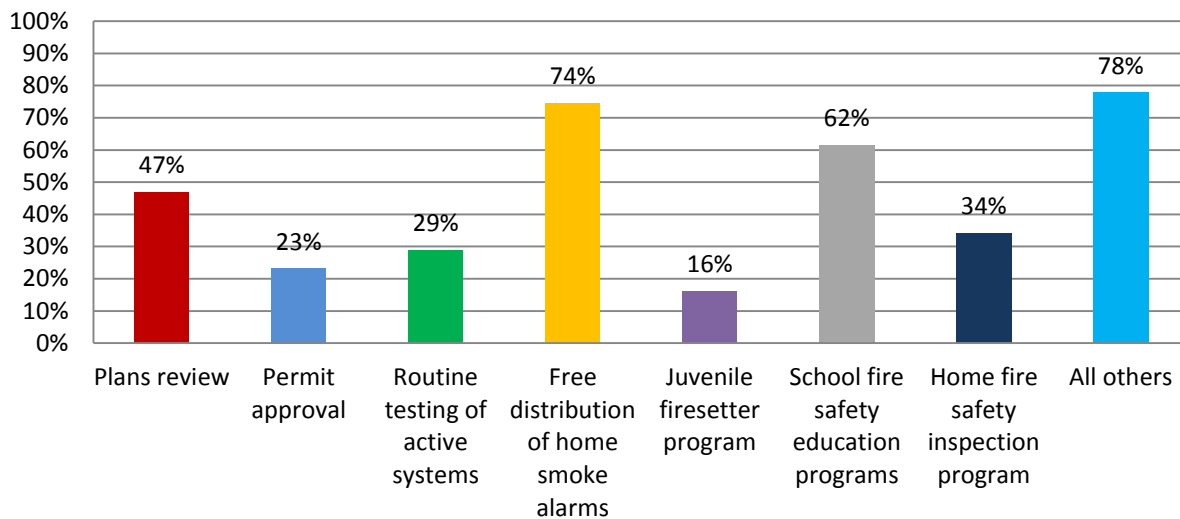


Figure 11: Percent of the most common programs conducted by Tennessee fire departments in 2013

Fire prevention and code enforcement: Limited success in meeting need: While it is very positive to see that 74 percent of departments have a free smoke alarm distribution program, with the proven success of a working smoke alarm contributing to reduced fire fatalities, fire service leaders in the state need to continue encouraging these programs for all departments.

Overview of Survey Results: Part II

Part II of the Tennessee Fire Needs Assessment Survey was conducted in spring 2014. Again, all fire departments in the state received a link to an in-depth survey online, and 166 departments responded. Comparing the samples from the first and second survey reveals that 101 departments participated in both studies and contributed to the vast similarities in the makeup of both samples.

The same methodology used in the first part of the study was employed in the second part to generalize findings to all Tennessee fire services. This second survey sample of 166 responding departments represents 23 percent of all 723 Tennessee fire departments. Furthermore, this sample represents fire departments that are protecting 51 percent of the state's total population and 36 percent of the land in the state.¹⁴

This summary is the product of an effort to create a current and comprehensive assessment of Tennessee's fire service needs. The response rate in both parts of the survey facilitates the ability to generalize about Tennessee fire departments. Figure 12 shows the population groupings that fire departments in the second survey protect and compares these populations with the classification of these departments.

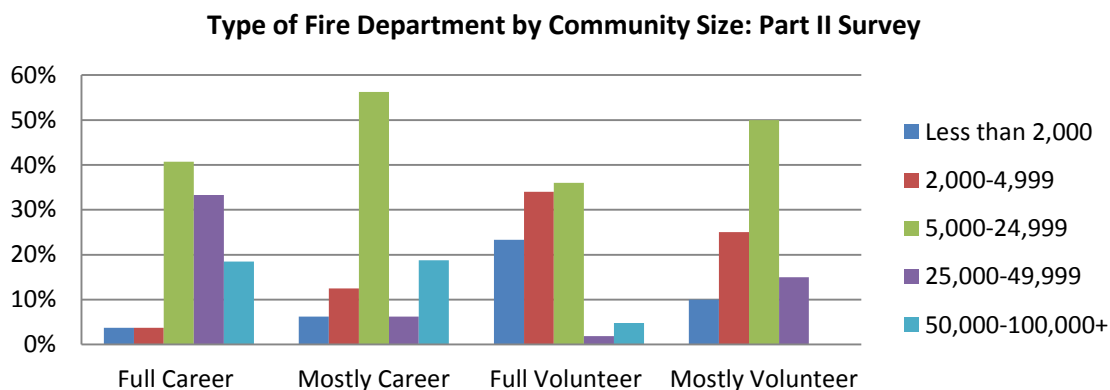


Figure 12: Type of Fire Department by Community Size

Of the sample, two departments reported the number of households protected opposed to the population the department protects. This number was converted to a population number by using the 2010 Census Bureau's reported average number of individuals in a household (2.59 per household).¹⁵

¹⁴ United States Census Bureau (2014). American Fact Finder. Retrieved from <http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml>

¹⁵ United States Census Bureau (2010, November 10). U.S. Census Bureau America's Families and Living Arrangements: 2010. Retrieved from <http://www.census.gov/population/www/socdemo/hh-fam/cps2010.html>

Fire Department Facilities

The facilities that a fire department utilizes are an important factor in operating efficiently in both emergency and non-emergency responses. Adequate facilities and accessible equipment are necessary for preparedness and reduction of life and property loss.

Nationally, 38 percent of fire departments in the country have at least one station that is 40 years old, in contrast to Tennessee where 61 percent of departments have at least one station that is more than 40 years old. The need for increased numbers of stations in a community is a trend in both the nation and Tennessee, which is driven by coverage area, ISO guidance, and modeled response distances. Figure 13 shows that Tennessee is substantially behind in having the proper facilities (including having facilities less than 40 years old), and in having sufficient backup power and exhaust emission controls in stations.

Further analysis of the data shows that communities of less than 25,000 are more prone to lack sufficient facilities and equipment in the nation and the state. Volunteer Fire Departments can attribute this lower level of resources and response capability in part to NFPA 1720 Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public.¹⁶ NFPA 1720 has less restrictive response time and staffing standards than are found in NFPA 1710, *Standard for the Organization and Deployment of Fire Suppression Operations, Emergency Medical Operations, and Special Operations to the Public by Career Fire Departments*, which means that fire departments serving smaller communities have longer response times than departments serving urban and suburban communities. However, low population density in these areas means that the number of people exposed to longer response times is small.

Fire Department Facilities: Lack of success in meeting need: All locations in Tennessee are subject to fires, severe weather, and various natural and manmade disasters. It is possible for portions of a community to go without power for days or weeks following a disaster. Many geographical areas of Tennessee are at risk for seismic events, yet most fire stations were constructed before building codes required even minimal seismic design. The collapse of a fire station could render apparatus unusable and injure or kill the occupants. Carbon monoxide and vehicle exhaust emissions pose health risks, yet most fire stations do not have the means to mitigate these risks. Fire stations should be useable 24/7, especially in times of emergency or disaster. Figure 13 illustrates that a high percentage of Tennessee's fire stations are older, lack emergency power systems to keep them functioning during a disaster, and lack vehicle exhaust mitigation systems to protect the health of firefighters.

¹⁶ National Fire Protection Association: Fire Analysis and Research Division (2011). Third Needs Assessment of the U.S. Fire Service (NFPA No. USS93-01).

Population Protected	Departments with at least one station that is over 40 years old		Departments with no backup power in all fire stations		Departments not equipped for exhaust emission control in all fire stations	
	National	Tenn.	National	Tenn.	National	Tenn.
Less than 2,000	36%	21%	50%	82%	47%	75%
2,000-4,999	14%	37%	16%	51%	18%	93%
5,000-24,999	27%	36%	21%	45%	24%	76%
25,000-49,999	7%	60%	4%	20%	5%	67%
50,000+	8%	69%	5%	23%	5%	38%

Figure 13: Selected Facilities Characteristics by Population Protected

Fire Department Equipment

A community needs reliable and safe fire apparatus to respond to fires and other emergencies. The role of the fire department has expanded from a department that just fights fires to an all-hazards department that responds to many types of emergencies in the community. This expanded role requires fire apparatus to carry additional tools and equipment, which requires compartment space. Federal motor vehicle laws, technology and safety concerns cause the design of fire apparatus to change and improve over time, and it is important that apparatus have the latest safety features and operating capabilities. NFPA recommends in Annex D of Standard 1901, *Standard for Automotive Fire Apparatus*, that once a fire apparatus reaches 15 years of age the fire department should place the apparatus in reserve service, provided the apparatus has been properly maintained and is in good working order. NFPA recommends that any apparatus that is more than 25 years old not be used for emergency response and be replaced.

Fire Department Engines and Pumpers

Figure 14 displays the age of Tennessee’s fire engines and pumpers that are in first-line service. Overall, we see a majority of the departments with a percentage close to 70 percent of their engines and pumpers less than 15 years old. The largest percentage of apparatus that are more than 25 years old reside in mostly volunteer or full volunteer departments. Conversely, we also see that highest percentages of newer equipment are in the full career and mostly volunteer departments.

Percentage of Engines/Pumpers in First-Line Service by Age and Department Type

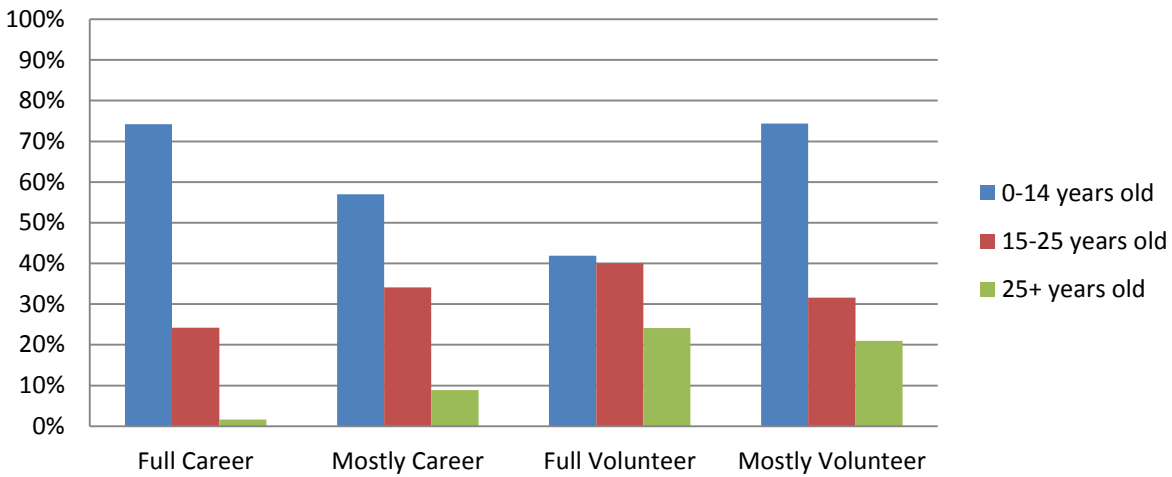


Figure 14: Engines/Pumpers in Service by Age and Department Type

Fire Department Ladder Trucks: Lack of success in meeting need: Ladder trucks are specialized apparatus that carry additional forcible entry and rescue tools, salvage equipment to lessen fire loss, and additional ground ladders to reach upper stories. The most specialized part of a ladder truck is the aerial ladder that ranges in height from 55 to 100 feet. Aerial ladders are complex machines that require constant and careful maintenance and annual testing to verify that the aerial ladder is safe to use. Ladder trucks are more expensive than fire engines, and some smaller communities cannot afford to purchase an aerial ladder truck, or if they have an aerial ladder truck, it is kept in service long past the recommended 25 year life because the community cannot afford to replace it as we see in figure 15.

Percentage of Ladder Trucks in First-Line Service by Age and Department Type

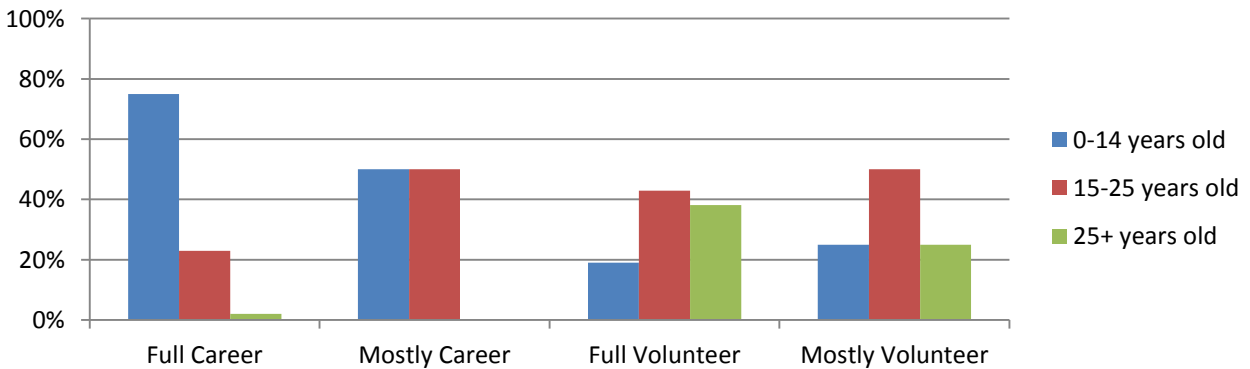


Figure 15: Ladder trucks in first-line service by age and department type

Lack of success in meeting need: The fire engine is the backbone of fire protection in a community and needs to be safe and reliable. The survey results show that most career departments have the ability to fund apparatus replacement programs, but that this capability decreases as the type of department moves toward all volunteer. Smaller communities and fire departments struggle to meet annual operating expenses, which leaves little to no money for an apparatus replacement program.

Provision of Ambulance Services

Pre-hospital emergency medical care is an essential service provided by America’s fire service. While providing first responder emergency medical service is very common for a fire department, providing transport ambulance service is not. The expense of providing, equipping, maintaining, and staffing an ambulance is considerable, and the ability to completely recover operating costs from transport fees is limited. The ability to fund and staff an ambulance 24/7 can be a challenge for smaller communities that struggle to find an adequate number of volunteers to respond to fires.

Figure 16 illustrates that the majority of fire departments in the state do not provide ambulance services. The departments that do provide this service are staffed with all career or mostly career firefighters. Furthermore, all nine of departments providing ambulance services have ambulances that are between 14 years old or less. Two of the nine departments also have one vehicle each that is between 15 and 25 years old.

Provision of Ambulance Services

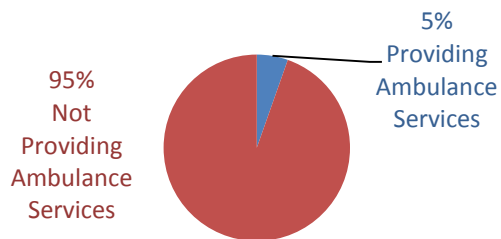


Figure 16: Provision of Ambulance Services

Self-contained Breathing Apparatus

The Occupational Safety and Health Administration (OSHA) requires the use of self-contained breathing apparatus (SCBA) for persons entering an atmosphere that is immediately dangerous to life and health (IDLH). Despite these OSHA regulations being in place for decades, many fire departments do not have enough SCBA to equip on-duty or on-scene firefighters as we see in Figure 17. Firefighters operating without SCBA at a structure fire are ineffective, as they cannot enter the burning building and are at a substantial risk when operating near the fire.

The lack of SCBA can also affect the ISO Rating for a community, as ISO expects every on-duty and on-scene firefighter to have a complete set of personal protective equipment, including SCBA. A fire

department will not receive full credit for personnel response and equipment if the department cannot provide SCBA for all on-scene firefighters.

SCBA Availability to On-duty Firefighters:

In looking at all responding departments, the information shows that 54 percent of departments are 100 percent equipped with SCBA. The remaining departments have less than 100 percent of their staff equipped with SCBA. Figure 17 looks at the provision of SCBA to firefighters by department type and shows which department types report having 100 percent of their staff provisioned with SCBA. The illustration indicates that the full career, mostly career and mostly volunteer have the highest percentages of their staff equipped with SCBA.

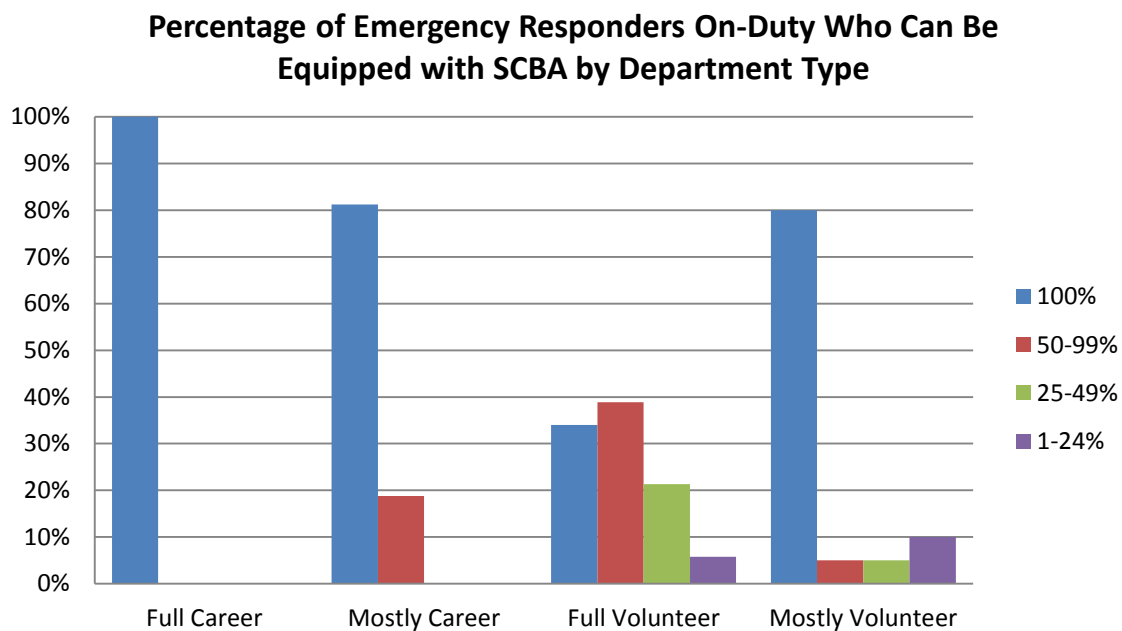


Figure 17: Emergency responders on duty with SCBA by Department Type

Age of SCBA Equipment: Limited success in meeting need: Figure 18 provides a representation of the age of equipment by type of fire department. As illustrated in figure 18 we see that of all departments responding, a high percentage are working with SCBA equipment that is 10 years old or older. We see that in general the volunteer (full or mostly) departments, are operating with the highest percentages of older SBCA equipment.

Age of SCBA Equipment by Department Type

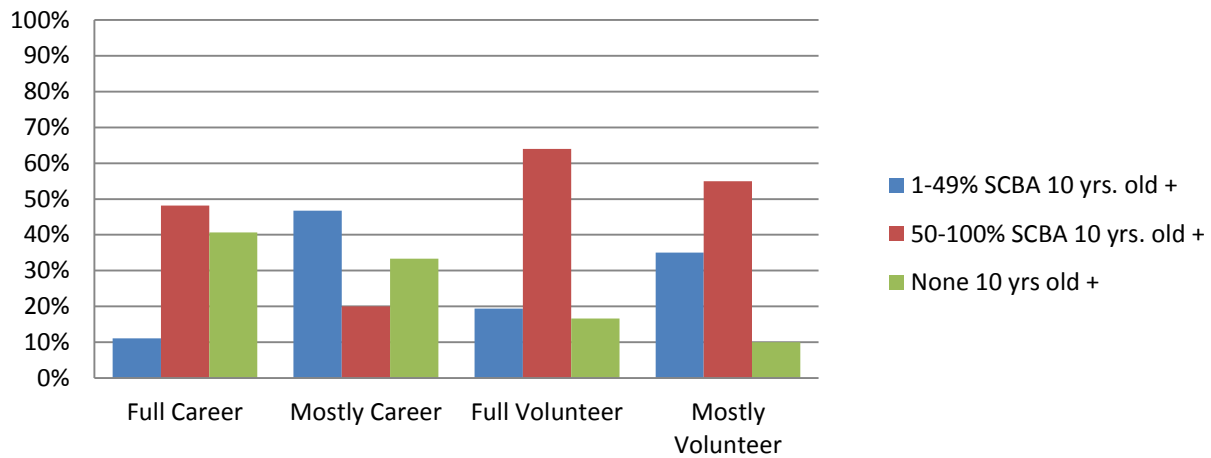


Figure 18: Age of SCBA by Department Type

SCBA are mechanical devices, and they break down and wear out over time. NFPA 1981, *Standard on Open-Circuit Self-Contained Breathing Apparatus for Emergency Services*, covers the design and technical capabilities of SCBA. The standard was just revised in 2013 to address safety features, including an emergency buddy breathing system and an issue with the lens in the facepiece when exposed to high heat. SCBA technology is changing rapidly, and older SCBA do not have as many safety features as newer SCBA. For these reasons, it is important for a fire department to have SCBA meeting current safety standards.

Portable Radios

This report provides a comparison of Tennessee fire departments to the NFPA national average regarding the equipping of staff with portable radios. Overall, Tennessee is equal to or better than the national average. Out of the 166 responding departments, 54 percent report that they provide portable radios to their firefighters. Additionally, it is worth noting that, in departments that serve the larger communities in Tennessee, more departments are *not* providing radios than departments nationally in community sizes of 50,000 and up. The NFPA studies report that nationally, departments went from “need” to “no-need” over the three surveys conducted.¹⁷ Perhaps a study of these data over time in Tennessee will also reveal similar information.

Portable Radios: Limited success in meeting need: Tennessee mirrors the national average in three population categories. In the 5,000 to 24,999 range, Tennessee is significantly better than the national average, but there is still a significant need. In the 50,000 and up population range, which includes roughly 51 percent of the total state population, Tennessee is much worse than the national average.

¹⁷ National Fire Protection Association: Fire Analysis and Research Division (2011). Third Needs Assessment of the U.S. Fire Service (NFPA No. USS93-01). p.74.

Population Protected	Departments where less than 100% of emergency responders have portable radios	
	NFPA National Average	Tennessee
Less than 2,000	51%	50%
2,000-4,999	55%	51%
5,000-24,999	70%	48%
25,000-49,999	19%	19%
50,000-100,000+	11%	38%

Figure 19: Departments where less than 100% of emergency responders have portable radios

The National Institute for Occupational Safety and Health (NIOSH) states, “It is critical for firefighters to communicate with one another within a structure and with units operating outside the structure, regardless of the building construction.”¹⁸ A portable radio allows each firefighter to immediately report, or receive notification of, any hazardous conditions or emergencies such as a missing or injured firefighter or potential or impending structural collapse. The incident commander can communicate a change in tactics or other important information to everyone on the scene. A firefighter with a portable radio can call for help if he or she is trapped or injured.

Personal Protective Clothing

Personal protection equipment, commonly called PPE or “turnouts,” is required for interior and proximity firefighting operations. OSHA Standard 1910.120 requires that employers provide employees with all proper protective equipment for the nature of the work performed. ISO requires that all firefighters on the fire ground have their own set of personal protective clothing in order for ISO to award credit for their response.

Provision of Personal Protective Clothing: Success in meeting need: Figure 20 provides a look at which types of departments are the most successful at providing protective clothing to firefighters. Overall, more departments are equipping a high percentage (75 to 100 percent) of their staff with protective clothing than those that are outfitting a lower percentage (74 percent and less) of their staff.

Provision of Personal Protective Clothing by Department Type					
	100%	75-99%	50-74%	25-49%	1-25%
Full Career	96%	4%	0	0	0
Mostly Career	75%	25%	0	0	0
Full Volunteer	71%	21%	3%	2%	3%
Mostly Volunteer	100%	0	0	0	0

Figure 20: Percentage of Emergency Responders Equipped with Personal Protective Clothing by Department Type

NFPA 1971, *Standard on Protective Ensembles for Structural Fire Fighting and Proximity Fire Fighting*, provides specifications for the design and manufacture of personal protection clothing used for

¹⁸ NIOSH: (2003). Current Status, Knowledge Gaps, and Research Needs Pertaining to Firefighter Radio Communication Systems. P.13

firefighting. Personal protective clothing is exposed routinely to high heat and chemicals and is subject to stress, abrasion, and tearing; therefore, departments should clean and inspect personal protective clothing regularly and repair or replace any defective clothing found. NFPA 1851, *Standard on Selection, Care, and Maintenance of Protective Ensembles for Structural Fire Fighting and Proximity Fire Fighting*, recommends retirement of personal protective clothing when the clothing reaches ten years of age.

Age of Personal Protective Clothing: Limited success in meeting need: Figure 21 illustrates the age of turnout gear by type of fire department. Data indicate that full volunteer departments have the highest percentage of turnouts older than 10 years old.

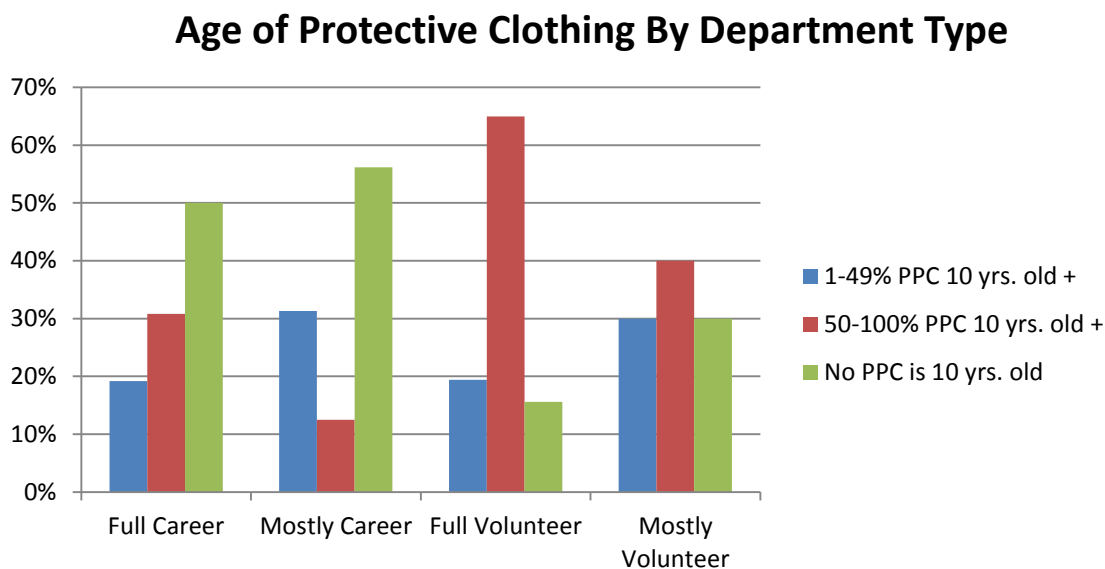


Figure 21: Age of personal protective clothing for full career and full volunteer departments

Communications

The response to, and management of, a large-scale emergency or disaster involves multiple agencies and organizations from the federal, state, and private sectors. Fire departments provide essential services and resources to respond to and mitigate emergencies, and fire personnel need the ability for real-time communication with incident command and control. Interoperability, defined as the ability to communicate effectively when needed at all levels of activity and with all public safety agencies on the scene of an emergency incident, is a key component of the National Incident Management System (NIMS).¹⁹

Communicate With Partners: Limited success in meeting need: It is surprising that after more than ten years of emphasis from the federal government on improving interoperability through the establishment of the National Incident Management System,²⁰ and considering the availability of grant

¹⁹ US Department of Homeland Security: (2009). IS-700.A: National Incident Management System, An Introduction. P.4.6.

²⁰ US Department of Homeland Security: (2011). National Incident Management System Training Program. P.vi and P.7

programs to foster improved interoperability,²¹ there are still fire departments in Tennessee that do not have interoperability capability. Additionally, 4 percent of reporting departments frequently do not know if they have that capability or not. The cost of needed equipment undoubtedly is part of the explanation for this lack of equipment. Furthermore, the lack of use of a national mapping system at the local level will hinder the response of outside agencies in a disaster.

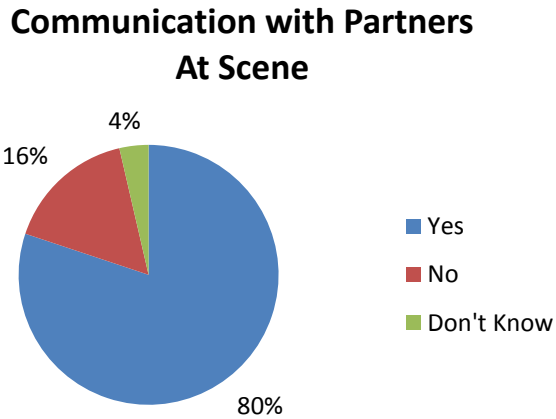


Figure 22: Communications with federal, state and local partners

As depicted in Figure 22, 80 percent of responding fire departments reported that they can communicate with partners at an emergency scene. Figure 23 illustrates the breakdown of that 80 percent positive response by department type. According to this illustration, it appears that volunteer departments are more successful at communicating with partners at the scene.

²¹ <http://www.safecomprogram.gov/> and <http://www.dhs.gov/interoperable-emergency-communications-grant-program>

Percent of Partners Departments Can Communicate With at the Scene

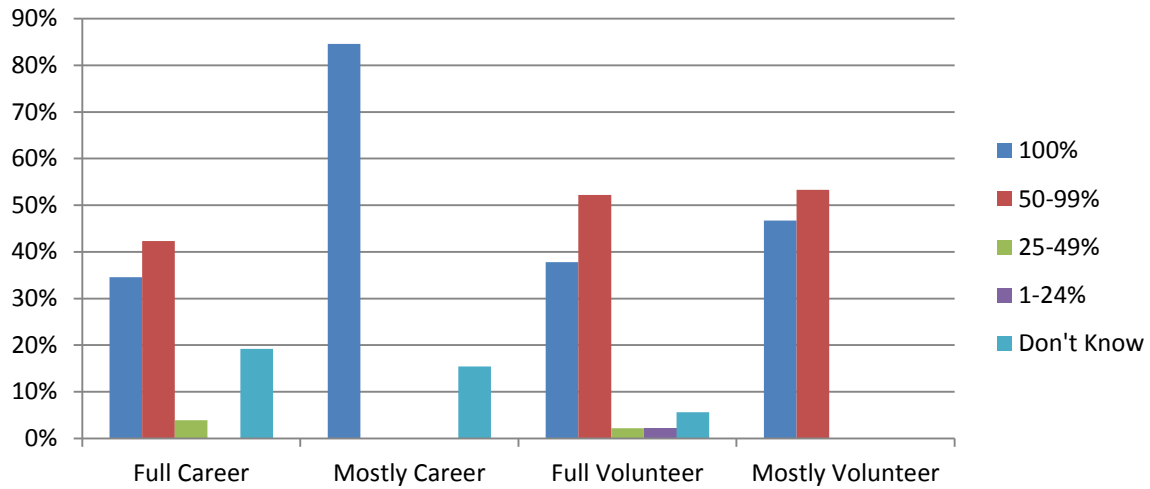


Figure 23: Communication with Partners by Department Type

Department Communication by Radio at an Incident Scene with Partners by Community Size						
Population Protected	Can communicate with federal, state and local partners		Cannot communicate with federal, state and local partners		Don't know if they can communicate with federal, state and local partners	
	National	Tenn.	National	Tenn.	National	Tenn.
Less than 1,999	85%	79%	12%	21%	4%	0%
2,000-4,999	81%	81%	15%	16%	4%	3%
5,000-24,999	82%	82%	15%	12%	3%	6%
25,000-49,999	84%	93%	13%	7%	3%	0%
50,000-100,000+	91%	62%	8%	39%	2%	0%

Figure 24: Interoperability Capability by Community Size

Do You Have a Map Coordination System to Direct Emergency Partners?

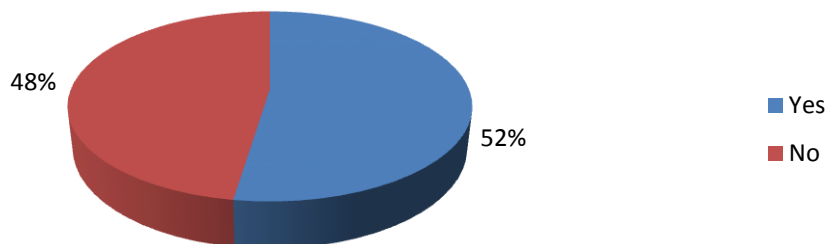


Figure 25: Map coordination system to direct emergency partners

Figure 25 illustrates that just over half of all Tennessee fire departments have a map coordinate system. National disasters, such as Hurricane Katrina, showed the need for a national map coordinate system so that outside agencies with no familiarity with local geography can locate individual addresses and buildings in an affected community.

Dispatch Communications

All of the firefighters, fire engines, ladder trucks, and other resources of the fire department cannot be effective when not dispatched in a timely fashion. The ability to receive a call for emergency assistance; process that call quickly and correctly; identify the resources that need to respond; alert those resources to respond to the emergency, and then communicate with those resources throughout the incident is essential for a good outcome.

Primary Responsibility for Dispatch: Limited success in meeting need: The arrival of the nationwide 9-1-1 system led to the creation of 9-1-1 districts and the establishment of public safety answering points (PSAPs) that have the needed primary and backup dispatch circuit (radios), backup power systems, and redundancy to help ensure reliable operation. Many communities have abandoned local dispatch offices in favor of call receiving and dispatch through combined or countywide 9-1-1 PSAPs. For maximum success, fire service leaders and communications/dispatch office leaders must work together to ensure that requests for fire department emergency response receive the appropriate dispatch priority and that the communications/dispatch center uses current dispatch protocols for fire department responses. Figure 26 confirms the trend towards county dispatch as the primary dispatch method for all department types in Tennessee.

Primary Responsibility for Dispatch Communication by Department Type

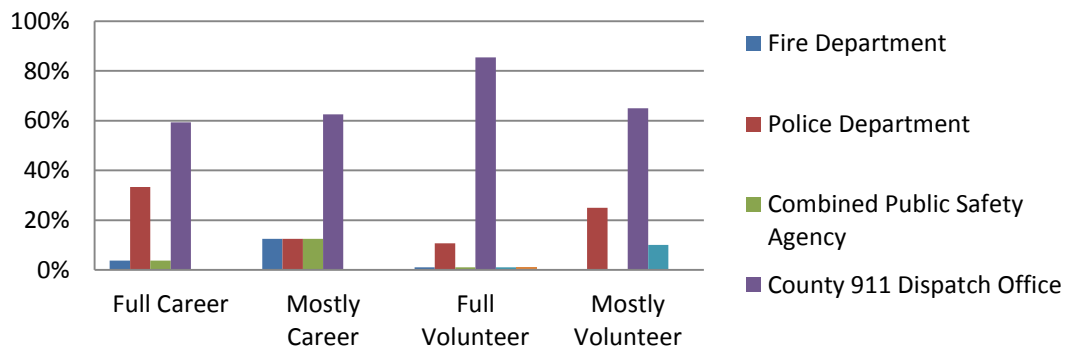


Figure 26: Primary Responsibility for Dispatch by Department Type

Communication Equipment

In cities of 5,000 or more population, Tennessee is doing better than the national average in terms of the use of Enhanced 9-1-1 systems, as seen in Figure 27. Nationally, approximately 75 percent of communication/dispatch offices have Enhanced 9-1-1 systems, whereas approximately 81 percent of Tennessee communication/dispatch offices have Enhanced 9-1-1 systems.²² The enhanced systems provide automatic number and location identification, which is a benefit for dispatchers and emergency responders. Though not covered in this survey, the increased use of cell phones poses a challenge for communication/dispatch offices because cell phones may not provide reliable location information. This challenge is being addressed through Next Generation 9-1-1 (abbreviated NG911) to update the 9-1-1 service infrastructure to allow improved communication with 9-1-1 centers from cell phones, internet protocol (IP) phones, and the ability of the public to transmit text, images, video and data to the 9-1-1 center.

Type of Telephone System: Success in meeting need: The high percentage of Enhanced 9-1-1 systems in Tennessee contributes to improved call processing times. The challenges posed by the increased use of wireless technology and IP phones are being addressed nationwide through improvements in infrastructure.

²² National Fire Protection Association: Fire Analysis and Research Division (2011). Third Needs Assessment of the U.S. Fire Service (NFPA No. USS93-01). p.170.

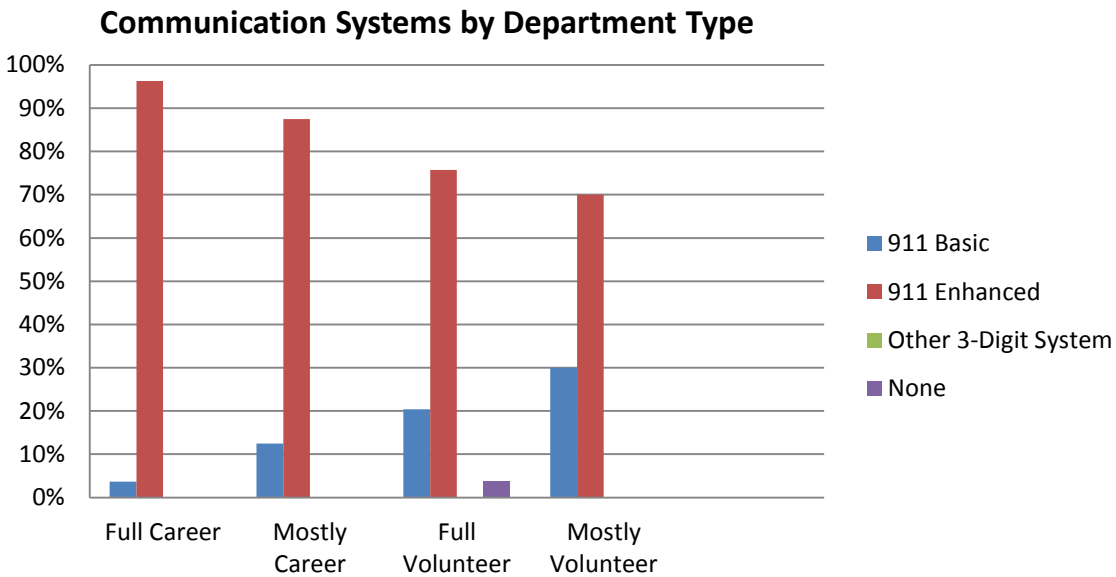


Figure 27: Type of telephone communication systems by department type

9-1-1 or Similar System Capabilities by Community Size								
Population Protected	9-1-1 Basic		9-1-1 Enhanced		Other 3-Digit System		None	
	National	Tenn.	National	Tenn.	National	Tenn.	National	Tenn.
Less than 2,000	32%	43%	66%	54%	.1%	0%	2%	3%
2,000-4,999	21%	26%	78%	70%	.1%	0%	.7%	4%
5,000-24,999	14%	9%	85%	89%	.2%	0%	.2%	2%
25,000-49,999	9%	0%	90%	100%	.2%	0%	.2%	0%
50,000+	9%	8%	90%	92%	.3%	0%	.3%	0%

Figure 28: Type of telephone communication systems by community size

Technology

Nationally in 2001, just 24 percent of fire departments had thermal imaging cameras. In Tennessee, 80 percent or more of career, mostly career, and mostly volunteer departments have thermal imaging cameras. Of departments that do not have the cameras, most have plans to acquire a camera in five years or less. However, a small percentage of fire departments have no plans to acquire the technology.

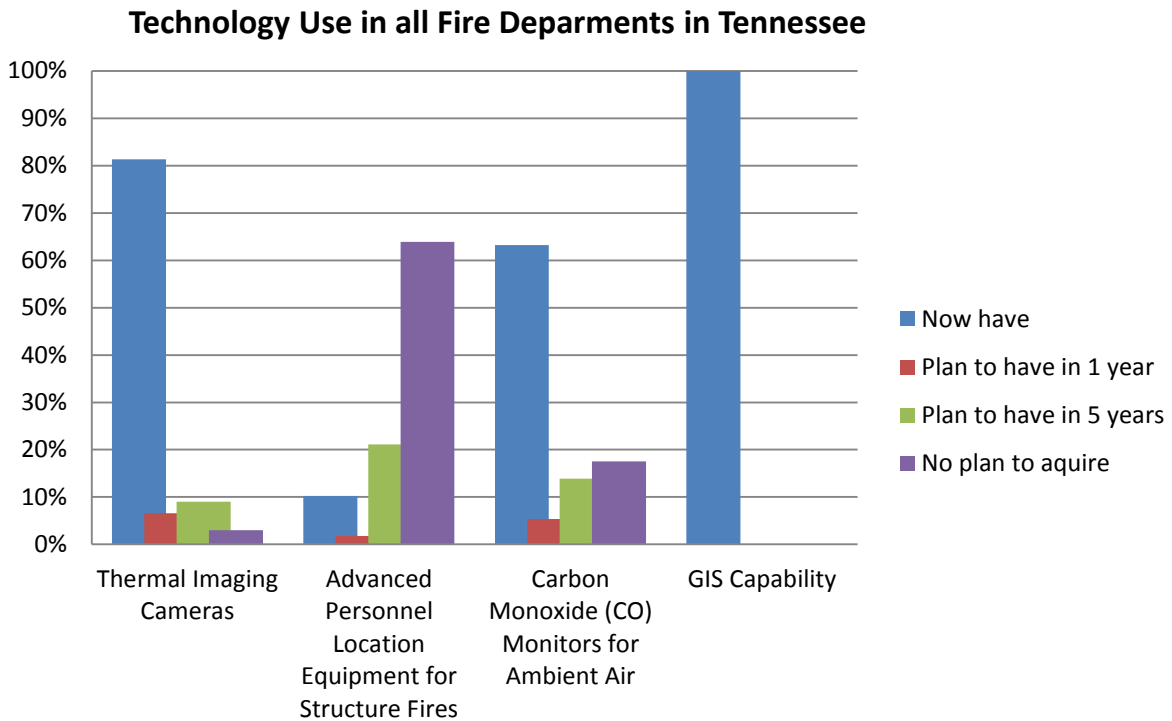


Figure 29: Technology use in all fire departments

Thermal Imaging Cameras: Success in meeting need: Figure 30 shows that a very high percentage of departments have this technology, which assists firefighters in locating trapped occupants, downed firefighters, and hidden fire during structural firefighting operations.

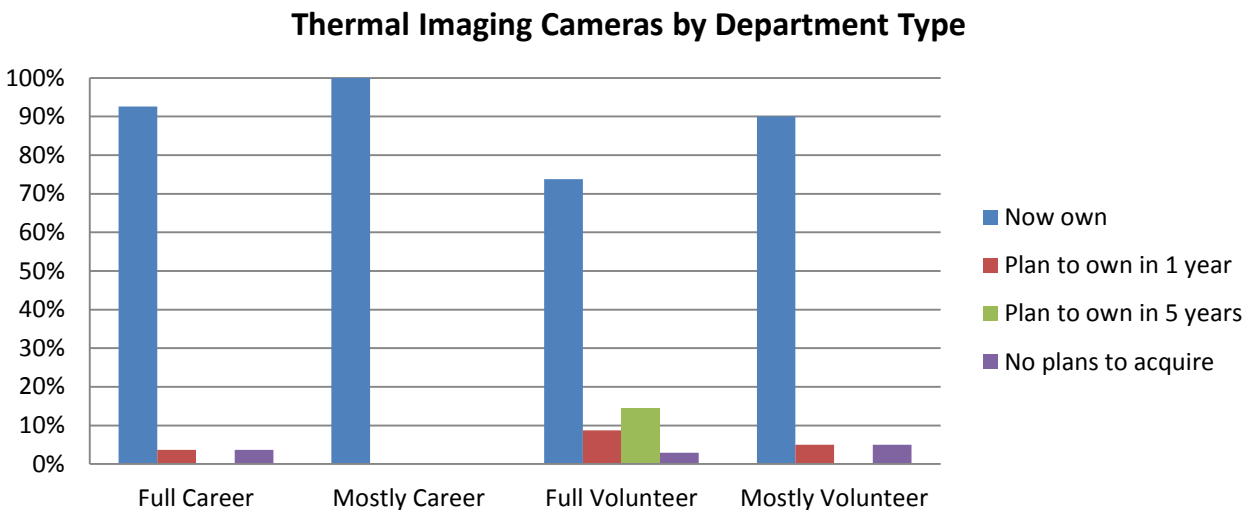


Figure 30: Thermal imaging cameras by department type

Advanced personnel location equipment to locate firefighters inside structures: Lack of success in meeting need: The risk to firefighters inside a structure fire is significant. If a firefighter goes down or gets lost inside the building, it can take other firefighters a long time to find that firefighter. Advanced personnel location equipment is available to assist the incident commander in tracking firefighters inside structures, yet very few fire departments have this technology. In Figure 29, we see that over 60 percent of fire departments have no plans to acquire this potentially lifesaving technology.

Carbon Monoxide Air Monitors: Limited success in meeting need: Carbon monoxide (CO) is a colorless and odorless gas and health hazard, which is present at all structure fires. Affordable air monitoring equipment is available that can detect the presence of CO. It is a common practice for firefighters to remove their protective breathing equipment once the fire is out and to breathe ambient air while performing salvage and overhaul operations. Studies have shown that CO and other toxic gases are present for prolonged periods during the overhaul operations that follow the extinguishment of flames.²³ While just over 60 percent of fire departments report having CO monitoring equipment, and another 13 percent report plans to acquire such equipment, approximately 17 percent of fire departments report no plans to acquire CO monitoring equipment (see Figure 29).

Geographic Information System (GIS) capability: Success in meeting need: As seen in Figure 29, all responding departments reported the ability to access Geographic Information System (GIS) capability for mapping, pre-fire planning, and other applications. This technology contributes to having relevant and current information nearby for use in planning and emergency response.

Many fire departments are actually all-hazard departments and are part of the homeland security response in their community. Transportation accidents involving hazardous chemicals are possible in every community, and the threat of terrorism includes the possibility of the use of chemical or biological weapons.

Chemical/biological sample collection capability: Limited success in meeting need: As illustrated in Figure 31, the results indicate that career and mostly career departments have the greatest capability, while volunteer and mostly volunteer departments have the least capability.

²³ Bolstad-Johnson, D. (2013). Firefighting: A Toxic Profession. The Synergist, October 2013, 24-27.

Equipment to Collect Chemical/Biological Samples for Analysis Elsewhere

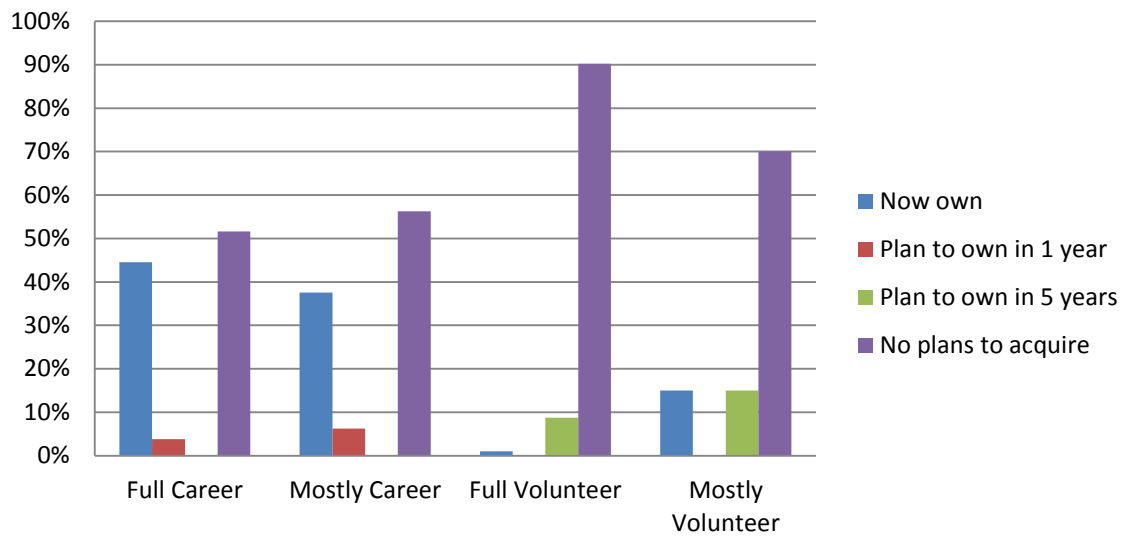


Figure 31: Equipment to collect chemical or biological samples for analysis elsewhere

Report Conclusion

Very few fire departments just respond to fires. Since the 1970s, fire departments have assumed more duties, from providing first-responder emergency medical services to being a major resource in homeland, and hometown, security.²⁴ The fire service assumed many of these duties because there was no other department or agency in the community that could, or was willing to, provide the service. Often, there was a lack of money to purchase the needed additional resources or to hire additional personnel to provide the service, so fire departments learned to improvise and adapt rather than say “no, we will not do that” to their customers. The result is a variety of unmet needs. While many career and mostly career departments have had some success in meeting these needs, departments protecting smaller communities to a large degree have not.

The results of this needs assessment survey indicate that typically, the smaller the community protected the greater the need. Progress in meeting these needs has been slow, and the past recession has certainly contributed to this lack of success. Grant programs, such as the Assistance to Firefighters Grants (AFG), are helpful, but grant programs are competitive and the dollars available through grants are limited. A city or fire department that expects to rely on grants to meet its needs is setting itself up for failure. For real progress, local communities must increase support and funding for the fire department.

Adequate funding of primary services of fire departments in smaller communities is a challenge, much less funding for additional services such as public education, technical rescue, hazardous materials response, and homeland security. Volunteer recruitment for smaller communities and departments is also an on-going challenge as departments struggle to recruit firefighters from a limited pool of qualified personnel. Once recruited, the volunteer must balance the demands of work, home, and the fire department and comply with bare minimum training and participation requirements.

Larger communities have the capability to be self-sufficient except for major emergencies, but smaller communities struggle with providing an adequate fire response. The use of interlocal agreements for automatic aid for outside resources can help address this need.

²⁴ Compton, D., & Granito, J. (2002). *Managing Fire and Rescue Services*. ICMA: Washington, DC. P.19.