



**WASHINGTON
FIRE CHIEFS**

*Investment in the Safety and
Health of Washington
Firefighters*

*Funding and support for this project has been provided by the State of Washington
Department of Labor & Industries, Safety & Health Investment Projects (SHIP)*

TABLE OF CONTENTS

Section 1	Introduction	Page 2
Section 2	Executive Summary	Page 11
Section 3	Background/Significance	Page 19
Section 4	Data Collection	Page 31
Section 5	Research Findings	Page 36
Section 6	Discussion of Recommendations	Page 77
Section 7	Conclusion	Page 83
Section 8	Acknowledgements	Page 87
Appendix A	Questionnaire	Page 88

SECTION 1 INTRODUCTION

The Washington State Department of Labor and Industries is dedicated to the safety, health, and security of the State of Washington's diverse 3.2 million person work force. A significant portion of that effort is directed towards the Division of Occupational Safety and Health (DOSH) who developed the Safety and Health Investment Projects (SHIP) Grant program which has a goal of preventing workplace injuries, illnesses, and fatalities in the state of Washington.

SAFETY & HEALTH GRANTS

Safety and Health Investment Projects (SHIP) grants are awarded for projects with the purpose of preventing workplace injuries, illness, and fatalities and the development and implementation of effective return-to-work programs for injured workers to reduce long-term disability in Washington State. The 2011 Legislature gave statutory authority to position the SHIP grant programs as a permanent program within the Division of Occupational Safety and Health at the Department of Labor and Industries. Previously, the SHIP grant program had operated with budget provisos from 2007 -2011. To date the program has funded forty-one safety and health grant projects. The materials and products developed through completed grant projects are available through the SHIP Program and on the Labor & Industries/DOSH website.

A goal of the SHIP grants is that the products, training, guidelines and other materials created under the grant program have the greatest possible impact. Products produced by SHIP grant

projects will be accessible for download from this website at no cost after the project is completed.¹

This specific SHIP Grant, Investment in the Safety and Health of Washington Firefighters, is a four-phase safety and health program with a goal of helping fire departments meet or exceed Washington Industrial Safety and Health requirements, change the existing firefighter safety culture, measure the frequency, severity and the costs of firefighter's injuries and provide assistance and guidance for the purpose of enhancing firefighter safety. This will be done by providing training materials to improve firefighter safety, sponsoring High Reliability Organization (HRO) training workshops at four locations around the state, and developing enhanced safety data for individual fire departments to utilize in comparing their department's injury statistics to national statistics as well as enabling these departments to compare their department's statistics to the injury statistics of peer departments in the state of Washington with the goal of improving their individual department's safety program and reducing line-of-duty injuries to Washington's firefighters. This grant was awarded to the Washington Fire Chiefs Association in October of 2011.

WASHINGTON FIRE CHIEFS PROFILE AND HISTORIC PERSPECTIVE

The Washington Fire Chief Association was established 81 years ago. The State of Washington has approximately 488 fire departments,² there are 360 current members of the Washington Fire Chiefs Association. At this time, there are approximately 8,000 career firefighters and

¹ <http://www.wa.gov/Safety/Topics/AtoZ/Grants/>

² Washington State Fire Marshal, 2010 Fire in Washington, Washington State Police Bureau, 2011.

17,000 volunteer firefighters in the state.³ This grant targeted all fire departments and firefighters across the State of Washington.

The Washington Fire Chiefs Association mission is to be a source of information and education to its members and to take a lead role in influencing issues affecting the fire service. The Washington Fire Chief's motto is: We Serve, Educate and Lead. This is our passion and the main focus of this grant.

It is recognized that the Washington Fire Departments are quite varied in that some are all career (full time paid employees), some all volunteer and some are combination (a mix of career and volunteers) departments. These departments receive their taxpayer supported funding through city budgets, fire protection district budgets, regional fire authority budgets as well as a small number of federally funded and privately funded fire departments. The training and statistical data were, at the onset of this project, considered a pivotal element in elevating the regional culture on safety where fire services are an integral part of the working force. Also as part of this project, it was recognized that many first responders statewide would be receiving the training developed through this grant. They are also members of our communities, both urban and rural, and represent a larger pool of workers that also work for employers outside of the fire services. It was felt that the benefits would be far reaching with positive implications for workers in the State of Washington.

³ Washington Fire Marshal, 2011.

KEY ELEMENTS

There were four key elements identified at the beginning of the project; 1) training classes specific to the Washington Industrial Safety and Health Act's Safety Standards for Firefighters, 2) monthly safety bulletins to enhance firefighter safety, 3) innovative trainings focused on High Reliability Organization (HRO) training, and 4) the review of accident/incident investigations, the collection and analysis of loss information, and the distribution of this information. Milestones were assigned to each of these tasks. In order to accomplish these deliverables, the Washington Fire Chiefs partnered with several contractors. Each contractor was tasked with a specific assignment, which would be evaluated at the end of the project for overall success. The training products and information developed from this grant would be distributed to all Washington fire departments and to the Washington State Department of Labor and Industries.

SHIP GRANT PARTNERS AND SUBCONTRACTORS

The Washington Fire Chiefs oversaw the SHIP Grant project and established a timeline for both completion and accountability. Each partner and subcontractor was chosen because of their expertise and knowledge within the fire services in the four key elements identified in this grant.

FIRE INSURANCE RISK ENTERPRISE, LLC (FIRE LLC)

FIRE LLC was tasked in developing the industry specific safety bulletins, developing several of the department trainings and the collection of the data with an accompanying report and recommendations.

This organization has been involved in enhanced risk management for firefighters for several years with the ownership having over thirty-two years of experience in risk management for the fire service industry. One of the study team members has forty years in the fire service with over thirty years as a Chief Officer. They were key players in the State of Oregon in developing a statewide risk management and safety program in 1991. They worked in collaboration with Special Districts Association of Oregon and the Oregon Fire District Director's Association and through their work Oregon moved from 26th in the nation of workers' compensation costs to the lowest worker's compensation rate for firefighters. Oregon maintained that status until the year 2001 when the state of New Mexico held this position for one year. Oregon regained the top ranking in 2001 and has continued to maintain one of the lowest workers compensation rate since that time. This ranking indicates this program is one of the leaders in the nation in loss prevention and loss mitigation. This grant will help position fire departments in the state of Washington in their efforts to reduce Line of Duty firefighter injuries and reduce worker's compensation costs.

OUTCOME ENGENUITY - HIGH RELIABILITY ORGANIZATION TRAINING

Paul LeSage

Paul has over 29 years in fire and emergency medical service, and recently retired from Tualatin Valley Fire & Rescue as the Assistant Chief of Operations. He currently is the Director of the State's second-largest 911 Dispatch Center in Washington County. Paul built a publishing business from the ground up, has published multiple Emergency Medical Services Field Guides, and is the author of a new publication on Crew Resource Management. Paul has successfully

applied non-traditional techniques to business, quality improvement, and crew deployment decisions, worked for over seven years as a Flight Paramedic and is a Clinical Assistant Professor at Oregon Health Sciences University.

Paul presents case examples to instruct managers and leaders in the emerging concept of High Reliability Organizations (HRO). Founded in the military and the airline industry, HRO training demonstrates how teams that make decisions in stressful, dynamic environments base their decision on pattern recognition rather than in-depth analysis, and focus on preventing mistakes and developing a just culture to enrich the training and education of employees to prevent recurrence of accidents/incidents. HRO training is designed for organizations that want to learn innovative methods for investigating adverse events, educating personnel and developing craftsmanship. Paul is a frequent speaker throughout the United States on issues related to the deployment process.

Jeff T. Dyar, NREMT-P, BS

Jeff began his career in the fire service in Brighton, Colorado in 1971 as a volunteer EMT. Since then, he has worked in private, public, academic, military and federal capacities and has authored four books. Jeff held the position of Program Chair for Emergency Medicine, Firefighter Health and Safety, and Counter-terrorism at the National Fire Academy in Emmitsburg, Maryland for 12 years.

Jeff has worked at some of the largest events in modern history, assisting local response agencies on behalf of FEMA and the U.S. Fire Administration including both World Trade Center

events, 18 hurricanes, the Columbine School shooting and the 2002 Winter Olympics. He was the Chief of Operations for the National Emergency Operation Center for FEMA and oversaw dozens of national events. He was recognized by the White House in two administrations for his outstanding service and is a recipient of the James O. Page Award for his national contribution to Fire Service EMS by the International Association of Fire Chiefs. Jeff currently resides in southern Colorado and serves as a Fire Commissioner and President of the Board for the Upper Pine Fire Protection District in Bayfield, Colorado.

COMPELLING TECHNOLOGIES, INC. (CTI)

Compelling Technologies is lead by public safety professionals, public safety veterans, and technology entrepreneurs committed to making America safer with highly relevant, useful safety education tools for public safety professionals. CTI blends authoritative safety education utilizing appealing and trusted learning solutions that are some of the most effective in the public safety sector arena. Technology, education and experience are combined by CTI to produce public safety solutions reaching maximum numbers of people that are both highly effective and cost efficient.

Rob Carnahan

Mr. Carnahan is a nationally known fire safety professional with a long history of service to both career and volunteer fire departments. He is the former Fire Chief of Oregon's Clackamas County Fire District 54 and Assistant Fire Chief of Clackamas County Fire District No. 1, a

consolidated fire and EMS district. Mr. Carnahan is also the author of "MANAGING AND CHANGING BEHAVIOR: Decreasing Firefighter Strain and Sprain Injuries".

SECTION 2 EXECUTIVE SUMMARY

Many organizations are putting a great deal of effort and funding into reducing firefighter injuries without producing a significant impact on the number of injuries that occur annually. The International Association of Fire Fighters, the International Association of Fire Chiefs, the National Volunteer Firefighter Council, the National Fire Protection Association, and the United States Fire Administration, among others are involved in data collection and analysis with the goal of reducing firefighter injuries. Their statistics and information and dissemination of recommendations have had little effect on the number of firefighter injuries per 1,000 fires. Many researchers contend that better understanding of how and why (firefighter) fatalities and injuries occur can help identify corrective action that will save lives.⁴ This reduction in fireground events that result in the loss of life will, by necessity, lead to a reduction in the number and severity of firefighter injuries.

Many fire departments do not even collect firefighter injury information for the purpose of analysis and preventing recurrence of the event. An even larger percentage of departments are not collecting near-miss information. Of those who do, a significant number of these departments are neither analyzing nor comparing firefighter near-miss data for the purpose of preventing firefighter injuries. When departments do collect and analyze this data there is a wide variance in the manner in which the department and indeed the individual firefighter utilize injury and near-misses statistics to impact firefighter safety.

⁴ Fire Loss in the United States, Michael J. Karter, Jr., National Fire Protection Association, 2012.

Many researchers contend that a better understanding of how and why firefighter fatalities and injuries occur can help identify corrective actions that will save lives.⁵ When a department does not collect or utilize injury or near-miss data for the purpose of preventing recurrence of these events it will be very difficult to identify and implement corrective actions to prevent additional firefighter injuries. “If the Fire Service and safety researchers have comprehensive, consistent, and accurate information about who is being injured, how they are being injured, and what types of injuries occur, then these injuries can be prevented.”⁶ When there is not an emphasis on firefighter safety within a department there are more injuries occurring in that department.

Everyone acknowledges that firefighting is dangerous. United States Bureau of Labor statistics show firefighting is one of the most dangerous professions in the United States. Bureau of Labor statistics indicate that firefighting is the 13th most dangerous profession in America.⁷

The following statistics from the National Fire Protection Association (NFPA) and from the United States Fire Administration (USFA) through the National Fire Incident Reporting System (NFIRS) both indicate how dangerous firefighting is. Statistics show that even though firefighter injuries have dropped from their highest numbers in the 1970’s and 1980’s, the number of annual firefighter injuries has never dropped below 70,000 firefighter injuries annually. Although though the number of firefighter injuries has been dropping, the number of firefighter

⁵ U.S. Firefighter Injuries – 2011, Karter, Jr., Michael, and Molis, Joseph, National Fire Protection Association, 2012.

⁶ FIRST, Drexel School of Public Health website, n.d., <http://publichealth.drexel.edu/first/>.

⁷ Gus Lubin, “The 15 Most Dangerous Jobs in America”, *Business Insider*, March 11, 2010.

injuries per 1,000 fires has not decreased significantly as the number of fires being responded to has decreased even more rapidly since reaching their high level, also in the 1970's and 1980's. During that period the United States fire service was responding to well in excess of 3,000,000 alarms during several different years. That number of responses has now dropped to approximately 1,514,000 responses per year. This number has held relatively constant during the most recent ten year period. In 2011, fire departments in the United States responded to 1,389,500 reported fires.⁸

During this same period, in the 1970's and 1980's, firefighter injuries were averaging well over 102,000 injuries per year. Since the 1970's and 1980's there has been a drastic improvement in firefighter safety in the United States Fire Service. Firefighters now have safer personal protective equipment, more advanced self-contained breathing apparatus, improved radio communications, enhanced Command and Control (the Incident Command System), improved firefighter accountability, and better firefighter health and wellness activities. In spite of all of these improvements the United States fire service continues to suffer over 70,000 firefighter injuries per year. There are thousands of injuries per year to firefighters in the State of Washington. Due to state budget cuts the State Fire Marshal's Office is no longer keeping NFIRS statistics for the state.⁹

It is recognized that the overwhelming majority of Washington Fire Departments are city fire departments or fire districts. These organizations consist of all career fire departments, all

⁸ Karter and Molis, National Fire Protection Association, 2012.

⁹ Washington State Fire Marshal, 2011.

volunteer fire departments and departments that have a combination of both career and volunteer firefighters. Since the training and statistical data were so crucial to the project in determining the statewide safety culture it was important to review a variety of fire departments. Eighteen departments were selected to participate in this study.

PROBLEM STATEMENT

The Washington Fire Chiefs recognized that their greatest responsibility to firefighters and to our communities is to have a safe and healthy workforce ready to respond to any emergency situation. They focus a tremendous amount of time and resources on influencing the safety culture for Washington's firefighters. In 2010, the Washington Fire Service was composed of 488 agencies that responded to over 615,000 total incidents. Of these incidents more than 443,000 were non-fire emergency service incidents (primarily Emergency Medical Services incidents) and there were over 20,000 fire incidents.¹⁰ As the call volume increases, the time available for training across the State of Washington, training on vertical standards for firefighters, diminishes. The safety culture becomes increasingly lax with a stigma that things will never change and the current method of data collection does not find the real cause of why injuries are occurring. The Washington Fire Chiefs Association is the subject matter expert on fire department issues and their needs in the state of Washington. The Chief's Association identified three areas where the most improvement is needed throughout the Washington Fire Service:

- 1) training on Labor & Industries vertical standards by qualified instructors,

¹⁰ Washington State Fire Marshal, 2011.

2) changing the safety culture within the Washington Fire Service, and

3) the need for expanded, usable data to identify the root cause of injuries and accidents.

Much of this report will deal with the third aspect of the grant – the need for expanded, usable data to identify the root cause of injuries and accidents and near-miss incidents.

QUESTIONS BEFORE THE STUDY TEAM

The four key elements that were identified at the beginning of the project were producing;

1) department safety bulletins, 2) delivering individual department trainings, 3) providing High Reliability Organization (HRO) training, and 4) the collection, analysis, and distribution of injury loss information. The SHIP Grant identified milestones with specific elements assigned to each milestone. A milestone was dedicated to the trainings, development and preparation of classes, handout materials, High Reliability Organization trainings and statistical data collection and analysis. Each milestone will be discussed individually in this report.

DATA COLLECTION

The firefighter injury data available today is clearly limited to a surface level approach and understanding of firefighter safety. Most of the data stops where effective safety analysis actually should start. For example, research reveals that 2,385 firefighters suffered burns in 2011.¹¹ The data does not tell us if the firefighters turnouts (personal protective equipment) failed, were defective, or whether or not they were even being worn at the time of the injury.

¹¹ Karter and Molis, National Fire Protection Association, 2012.

Lacking quality data that is developed from a root cause analysis limits a safety committees', and a fire departments, effectiveness in preventing recurrence of injuries to firefighters.

METHODOLOGY

The methodology that was used for the SHIP Grant is similar to the format utilized by the National Fire Protection Association (NFPA) and the United States Fire Administration (USFA) who utilizes the National Fire Incident Reporting System (NFIRS). These are the two most recognized sources for data collection and analysis of firefighter injuries on a national basis. One goal of this grant was to enable fire departments throughout the state of Washington to make an easy comparison of their injury statistics to the injury statistics of like size Washington departments and to compare their statistics to national injury statistics for the purpose of increasing firefighter safety. Department injury reports and Safety Committee minutes were reviewed and department members were contacted to determine additional information that would allow the study team to ascertain whether the root cause of injuries had been determined or if the investigation and analysis stopped at an indirect or surface cause of the injury.

KEY FINDINGS

To be consistent in the collection of data, there were crucial elements that were taken into consideration from the onset of this project. Each was a key factor in the data collection and

final analysis. What information was easily retrieved and what information access would not violate any rules or regulations on privacy. Where names did appear on reports they were redacted prior to the study team having any access to the reports.

The most recent national injury statistics (2011) indicate a decrease of 2.5% in the number of firefighter injuries from 2010. The 2011 injury statistics are the lowest number since 1981 when the National Fire Protection Association (NFPA) began extracting more accurate fire injury statistics. Since reaching their highest numbers in the late 1970's and early 1980's firefighter injuries have dropped significantly. The nearly 20% reduction in firefighter injuries during that period is the result of better personal protective equipment, improved tactics including the Incident Command System, and greater emphasis on firefighter health and wellness combined with a greater effort to change the current fire service culture to a much more safety orientated culture. The recent injury reduction in specific injury categories is due in part to the restructuring of the NFPA survey to create categories for exposures to infectious disease and exposure to hazardous conditions which were not included in earlier surveys. This change resulted in these exposures being removed from the categories where they were previously being reported. While this shifted some percentages there was no impact on the total number of reported injuries. In addition to the previous injury categories NFPA's most recent injury analysis reports that there were 9,000 exposures to infectious disease and 23,400 exposures to hazardous conditions during 2011. These figures translate to 0.5 exposures per 1,000

emergency medical responses and 21.2 exposures per 1,000 hazardous condition responses in 2011.¹²

¹² Karter and Molis, National Fire Protection Association, 2012.

SECTION 3 BACKGROUND/SIGNIFICANCE OF THE ISSUE

“Year after year there are notable advancements in the fire service industry. These advancements range from building code improvements to sprinklered buildings, from better personal protective gear to technologically advanced apparatus. Many profound advances have been made in both laws and programs designed to improve worker safety and health for all workers in the United States.”¹³ In spite of the best intentions and the impact of these laws and advancements, scores of firefighters continue to be injured in the line-of-duty every year.

According to the National Fire Protection Association (NFPA) and information from the United States Fire Administration’s (USFA) National Fire Incident Reporting System (NFIRS) there are still between 70,000¹⁴ and 80,000¹⁵ firefighters in the United States who suffer injuries as the result of fighting hostile fires, responding to emergency alarms, training for fire, medical, hazardous materials, and technical rescue emergencies, and providing mitigation of all types of emergencies each year. In addition, there are annually nearly 100 firefighters who suffer Line-of-Duty Deaths (LODD). These firefighter injuries and deaths are occurring in spite of the years of improvements in firefighting tactics, command and control, communication, training, health and wellness, personal protective equipment and emergency response tools and equipment.

“A review of the current literature suggests a pressing need for information and analysis that synthesizes diverse populations and incorporates the ways in which individual firefighter

¹³ Moore-Merrell, Zhou, McDonald-Valentine, Goldstein, Slocum, Contributing Factors To Firefighter Line-Of-Duty Injuries In Metropolitan Fire Departments in the United States, International Association of firefighters, 2008.

¹⁴ Karter, NFPA, 2012.

¹⁵ Fire-Related Firefighter Injuries Reported to NFIRS, (NA), U.S. Fire Administration, 2012.

fitness, fatigue over time, equipment performance and use, staffing, strategic protocols, incident command, teamwork, and changing environmental factors contribute to situations that protect firefighters or make them more vulnerable to line of duty injuries.”¹⁶

Fire departments have historically been very good at investigating accidents, fixing blame and assessing discipline. The department then cannot understand why employees do not report minor accidents and near-misses (incidents). The purpose of accident investigation should be to prevent recurrence not to assess blame. The purpose of investigating incidents as well as accidents promptly is to look for trends and to take corrective action quickly to prevent more serious injuries/accidents from occurring.¹⁷

Nearly every published paper on line of duty firefighter injuries refers to examining the dynamic of the fire department culture. Edgar H. Schein, a professor from the Massachusetts Institute of Technology, states that organizational culture can be defined as “A pattern of shared basic assumptions that was learned by a group as it solved the problems of external adaption and internal integration, that has worked well enough to be considered valid and, therefore, to be taught to new members as the correct way to perceive, think and feel in relation to those problems.” These assumptions produced enough group success to be considered valid enough to be taught to all new members of the department as the correct way (the correct behavior)

¹⁶ Moore-Merrell et al, 2008.

¹⁷ Paul LeSage and Jeff Dyar, *2013 High Reliability Organization Workshop*, Kelso, Wa., April 26-27, 2013, Safety and Health Improvement Projects, Washington Department of Labor and Industries.

and that if the behavior is violated the new member can be excluded from the group.¹⁸ Firefighter translation, “Why we do, what we do.”¹⁹ Firefighters adapt to and accept as their own culture the culture of the organization of which they are a member. Firefighters readily acknowledge that their primary goal on the fire department is to save lives and prevent the destruction of property and the environment. To accomplish these goals each department has developed its own culture of attitudes and beliefs on how to fight fires and respond to other emergencies. Schein goes on to say there are three segments to organizational culture. The American Fire Culture consists of; 1) artifacts, the things we see in a fire department (apparatus, hose, personal protective equipment), 2) espoused beliefs, the things we say we believe in (goal, policies, justifications, etc), and 3) underlying assumptions, our DNA (our unconscious, taken-for granted beliefs, perceptions, thoughts and feelings, the source of our values and actions).²⁰ All firefighters are aware of the risks they take. Firefighters need to enhance the emphasis that they place on firefighter safety as a key element in all of their evolutions and activities. If a firefighter is injured it will be more difficult for the fire company to complete the action that was determined to be appropriate and therefore, possibly not be able to save the life, or preserve the property or the environment, that we as firefighters have sworn to protect.

The National Fallen Firefighter Foundation has developed Sixteen Key Initiatives to reduce the loss of firefighter’s lives and decrease the annual number of firefighter injuries. The number

¹⁸ Schein, Edgar, *Organizational Culture and Leadership*, Josey-Bass, 4th edition, 2010.

¹⁹ Burton A. Clark, *American Fire Culture: Needs Gene Therapy*, YouTube, April 2013.

²⁰ Schein, Josey-Bass, 4th edition, 2010.

one initiative in the “Everyone Goes Home” Campaign is to “Define and advocate the need for a cultural change within the fire service relating to safety; incorporating leadership, management, supervision, accountability and personal responsibility.”²¹ Why is so much discussion being directed toward changing the fire service culture? One example comes from Dr. Burton Clark, Management Science Chair at the National Fire Academy and a firefighter for over forty years. Dr. Clark uses the example of an apparatus operator who was killed in the line of duty when he was ejected from the apparatus he was operating when it was involved in an accident, Clark then displays photos of a second MVA where the Lieutenant on an aerial truck was ejected from the apparatus when it was involved in an MVA while responding to an alarm and suffered fatal injuries as a result, then Clark moves to a third example where a firefighter was ejected from the aerial truck he was responding in and crushed by the apparatus when it rolled over on him. These three incidents happened on the same fire department in Illinois. The dates these incidents occurred were April 1893, April 2000, and March 2007. Seat belt usage would have likely prevented these three firefighter deaths. What has been that department’s response? What was the Illinois Legislature’s response?

In 2011, the Illinois Legislature passed a law, supported by the fire department, mandating seat belt use;

Illinois State Safety Belt Law January 1, 2012

²¹ National Fallen Firefighter Foundation, (NA), Sixteen Firefighter Life Safety Initiatives, Firefighter Life Safety Initiative – 1, National Fallen Firefighter Foundation, 2011.

(a) Each driver and passenger ... shall wear a properly adjusted and fastened seat safety belt. ...

(b) Paragraph (a) **shall not apply to** any of the following: ...

10. **A driver or passenger of an authorized emergency vehicle** (emphasis added).

The “logic” behind this decision was that firefighters and police officers have to be fast.

By the way, in 2012, ten firefighters were killed when they were ejected from responding vehicles that were involved in MVA’s. Not one of these firefighters was wearing a seat belt.

Our culture certainly runs deep.

Dr. Clark believes that today’s firefighters do what they do because of their DNA, their genes. He defines a gene as “a unit of heredity and is a region of DNA that influences a particular characteristic in an organism.”²² Dr. Clark goes on to say that the American Fire Culture has six genes that were developed in the earliest years of the American Fire Service that we have to overcome if we are going to reduce firefighter injuries and deaths. The genes are;

- 1) fast, early apparatus was pulled by hand by the youngest, fastest firefighters,
- 2) close, firefighters had to get close to the fire to throw the water on the flames,
- 3) wet, firefighters must have a good water supply,
- 4) risk, firefighters are expected to take significant risks by the public and their fellow firefighters,
- 5) injury, injury is an acceptable part of what firefighters do, and

²² Clark, *American Fire Culture: Needs Gene Therapy*, YouTube, 2013.

6) death, death is part of the job.

As Chief Edward Croker said at a funeral of five firefighters in New York City, “Firemen are going to get killed. When they join the fire department they face that fact. When a man becomes a fireman his greatest act of bravery has been accomplished. What he does after that is all in the line of work. They were not thinking of getting killed when they went where death lurked. They went there to put the fire out, and got killed. Firemen do not regard themselves as heroes because they do what the business requires.”²³ Chief Croker spoke these words in 1908. Let’s now review Clark’s six genes in more detail. Fast, there is still too much emphasis on firefighters being fast. We are still concerned with being fast. In 2012, both the New York City and Los Angeles Fire Departments were accused of skewing their response statistics to make it appear as if their units were arriving on the emergency scene faster than they actually were, not by minutes, but by seconds. How important is fast to the fire service? Also, in 2012, ten firefighters died while responding to emergencies in MVA’s. Not one of the ten firefighters who died was wearing a seat belt. Was not taking the time to put on a seat belt done to get to the scene of the emergency faster? Take the time to review the investigations of MVA’s involving fire apparatus occurring where the apparatus was travelling in excess of fifty miles per hour on a busy city street and then collided with another fire apparatus responding to the same alarm. Being fast receives too much emphasis in our culture.

Close, firefighters no longer have to be close enough to the fire to throw a bucket of water on the fire. We have better, more encapsulating personal protective equipment (PPE) than ever.

²³ Edward Croker, Speaking at the funeral of a deputy chief and four firefighters, FDNY, February, 1908.

Yet, firefighters are experiencing melting of face pieces, face pieces that are designed to withstand up to 536 degrees F. How close do we have to get to the fire? Particularly when the only lives at risk at a fire are those of the firefighters who are attempting to extinguish the fire.

Wet, we have to get the water on the fire to extinguish it. Recently two firefighters died at a large fire twenty-nine minutes after the fire was declared under control when a wall collapsed on them. They were not fighting the fire; they were inspecting the fire damage to the building after the fire was under control. In New York City, two firefighters died in the collapse of a building.²⁴ This was a high rise building that was being demolished as the result of damage that occurred from the 9-11 terrorist attack. It had taken the fire department nearly ninety minutes to secure an effective water supply and firefighters were still inside the building fighting the fire when the building collapse occurred.

Risk, firefighters are expected to take large risks by both the public and their fellow firefighters. Firefighters are always confronting risk. Every event that we respond to has risk. Because we are always facing risk we tend to simply accept risk. We often do not realize the degree of risk we are taking because we have done it so many times before. As we are successful, we accept more and more risk until an unexpected, negative consequence event occurs causing injury to firefighters. Firefighter injuries are to be expected, it is all part of the job. Too many firefighters have resigned themselves to the belief that there is nothing firefighters can do to prevent injuries. A large percentage of firefighter injuries occur in situations where the only risk

²⁴ Clark, *American Fire Culture: Needs Gene Therapy*, YouTube, 2013.

from the fire is to the firefighters who are attempting to extinguish the fire. Research reveals that these non-fatal injuries can be the result of behaviors, attitudes, and motivations deeply rooted in firefighter culture.²⁵

Death, “When fire kills us, our department typically conducts a huge ritualistic ceremony, engraves our name on the honor wall and makes us an eternal hero. Every line of duty death gets the same terminal ritual regardless if the firefighter was taking an appropriate risk to protect a savable life or was recreationally freelancing in a clearly defensible place. A Fire Chief would commit instant occupational suicide by saying that the reason everyone is here today in their dress blues is because the dearly departed failed to follow the department safety plan. **Genuine bravery and terminal stupidity both get the same eulogy** (emphasis added). Our young firefighters are motivated and inspired to attack even harder by the ceremonialization of our battleground deaths.”²⁶ These genes have been passed down in the American Fire Service from the time of Ben Franklin. Firefighters are not stupid. It is their DNA, the culture of the fire service that leads to many, if not most of our firefighter injuries. We must change our culture to reduce the occurrence and severity of firefighter injuries.

NFPA statistics indicate that the leading cause of death for firefighters less than twenty years of age and for the group of firefighters twenty to less than thirty years of age is motor vehicle accidents (MVA’s).²⁷ There would be little argument against the proposition that firefighter’s

²⁵ Moore-Merrell et al, 2008.

²⁶ Chief Alan Brunacini, Retired, Unpublished Speech, Phoenix Fire Department, 2008.

²⁷ Karter, NFPA, 2012.

inevitable practice is to take risks on the emergency scene to accomplish our goals. Prior to taking these risks though, firefighters must make an educated risk analysis of the situation they are being confronted with. Bill Manning the retired editor of Fire Engineering magazine spoke to the issue of motor vehicle accidents (MVA's) and firefighters. "Without regimented driving policies to reduce the number of fatal vehicular accidents while responding to emergencies, the fire service will continue to perpetuate a culture than condones human losses as being a part of the fire service - **just the way it is, always has been, and always will be**".²⁸ Improved driving policies, enhanced training, appropriate operator certifications, and enforcement of policies will reduce this statistic. In the period between 2003 and 2012 the average number of firefighter line of duty deaths that occurred while responding to the station, to the alarm or returning to the station was twenty-five deaths.²⁹ The following statistics will reinforce these comments. In three consecutive days, The Secret List listed the following events;

Day 1

EMT killed in the line of duty while responding to his station in a private vehicle,
19 year old firefighter was seriously injured in "horseplay" at a training activity,

Day 2

four firefighters and a wrecker driver were injured after inhaling fumes at a MVA,
three injuries as a driver swerved and struck a fire department ambulance,
two injuries as a fire department tender was rolled while responding,

Day 3

²⁸ Manning, Bill, Unpublished Presentation, FDIC-West, Sacramento, Ca., 1994.

²⁹ Firefighter Fatalities in the United States – 2012, Fahy, Rita, LeBlanc, Paul, and Molis, Joseph, National Fire Protection Association, 2013.

three firefighters suffered injuries when their quint (an aerial truck with a pump) rolled over while responding to a motor vehicle accident (MVA), three additional crashes occurred after firefighters were working to treat a patient and extinguish a car fire that resulted from the original MVA, and a firefighter suffered second degree burns and a broken ankle at a structure fire.³⁰

These are certainly not all of the firefighter injuries that occurred during this period of time but they are representative in that firefighter injuries are; often severe injuries (possibly career ending), often involve driving activities (vehicle speed is often a factor), and each of these events should serve to remind all of us to think more about safety, all of the time.

Currently, there is a dearth of published statistical information on firefighter injuries. Government and industry publications, which rely on voluntary incident reporting and annual survey projections, presently offer the broadest scope of information regarding fireground injuries (Karter 2007).³¹ If LOD injuries are to be evaluated and reduced, future research will have to consider more consistent reporting and greater detail at actual emergency scenes as well as trending by department, state, region, and nation. It is widely acknowledged that the National Fire Incident Reporting System (NFIRS) voluntary reporting system and NFPA's survey projections provide the most accurate and extensive reporting of firefighter injuries in the United States yet, their figures are not totally complete.³²

³⁰ The Secret List, <http://www.firefighterclosecalls.com>, May 22-24, 2013.

³¹ Moore-Merrell, et al, 2008.

³² Moore-Merrell, et al, 2008.

The leading type of injury, utilizing any format or source, is strain and sprain, which accounts for approximately 50% of all firefighter injuries. The leading cause of these injuries is overexertion/strain at nearly one-third of all injury causes. In 2011, statistics from the National Fire Protection Association indicate that 19.5% of all of the firefighter injuries resulted in lost time.³³ Firefighting is clearly acknowledged as a dangerous profession. When injuries occur there are significant impacts on the department. This is particularly true when a severe injury occurs to a department member. There is the impact on the employee and his or her family. There is the physical pain to the injured individual as well as mental stress for all members of their family, there is a possible financial impact, there is the provision of transportation to medical appointments, and there is also the issue of potential disability and being unable to return to the job.

There are multiple impacts on the department. There is decreased productivity, accident investigation costs, outside agency investigation costs (OSHA, NIOSH, etc.), retraining expenses, lowered department morale, litigation expenses, increased workers' compensation charges and increases in pension expenses if there is a disability. These are just a sampling of the effects on an entire department when a serious firefighter injury or death occurs.

³³ Karter, NFPA, 2012.

Aside from the moral implications of these statistics, there is also the financial impact that is the result of firefighter injuries.³⁴ The financial impact, on a national basis, will be discussed later. It is up to us, the American Fire Service to change these statistics. We need to place more emphasis on safety. We need to emphasize safety all the time, in every class and during every evolution.

³⁴ National Fallen Firefighter Foundation, 2011.

Section 4 Data Collection

SELECTION OF PARTICIPATING FIRE DEPARTMENTS

For the analysis portion of the study, eighteen fire departments were selected. The criterion was based on size of the department as well as their geographic location in Washington. The size criterion was based on the assessed value of the department. Six of the departments had an assessed value of less than \$4 million, six had an assessed value of \$4 – \$8 million and the remaining six departments had an assessed value greater than \$8 million.

TIME PERIOD TO BE EVALUATED

The Study Team determined that one full year of data would be the correct time frame for measurement purposes. Using an entire year provided more credibility to the data. The same factors such as the weather and related issues such as heat, cold, ice and precipitation would influence each department's information.

The information received from the departments did not utilize a specific starting date. This presented no problem for the study as long as the data collection period was a consecutive year. This was a requirement from the study team that the data provided be for a consecutive year. Not all departments had the same data available, which was understood from the onset of this project. It was determined that there was a wide variety of information being collected

and utilized by the various fire departments. The data received from each of the departments then needed to be assimilated into a single format to be utilized in the analysis.

COMMON REPORTING METHODOLOGIES

In the preliminary meetings, this issue was discussed at length. It was agreed that the OSHA 300A, as it is a mandatory reporting form that captures data for an entire year, would be the main source for collecting information on workers' injuries. The size and locale of each department would also not be a factor when using the OSHA 300A. Supporting documentation and ability to determine the root cause of each injury would be more subjective based on these two factors. It was found that many departments are not determining the root cause in all instances. Injury reports were another potential source of data. These reports would have provided more in-depth information that would have been of significant value with more determinate facts. The use of these documents was ruled out due to Health Insurance Portability and Accountability Act (HIPAA) rules and regulations on the privacy of this information.

A third source of information for both injuries and/or near-misses is the Safety Committee minutes. Minutes also detail how the safety committee investigates the incident, forwards their recommendations and creates and implements Best Practices. The minutes often indicated the success of the recommendations/actions taken by the Safety Committee that were forwarded to upper management and how they were handled and implemented in order to prevent recurrence of the event.

DETERMINING WHO SHOULD BE INTERVIEWED

The Departments were asked to provide information relating to injuries suffered by department members during the preceding twelve month time period. Due to Health Insurance Portability and Accountability Act (HIPAA) privacy regulations, it was made very clear to all the participating departments that no employees would be contacted for information or interviews. In fact, no injury reports were used for any portion of this project. All information utilized for this project was in the most generic format. The emphasis is on the comparison of the injuries in a fire department to peer departments and to national statistics and any information that could identify a specific individual was simply not needed for these purposes.

In order to take the OSHA 300A log of work-related injuries and illnesses and to delve into the facts behind the summary page information would require a single point of contact for each department. To evaluate if the root cause of an incident had been determined, it became apparent that ~~is~~ was necessary to discuss the Safety Committee information in a more in-depth manner with someone from the department.

Who was to be interviewed was left to the determination of each individual department. In some cases, the Safety Committee Chairperson was familiar with the incident and could provide more information. In other cases, the Human Resource Manager was the contact person. Other departments had a member of the Safety Committee available for interview and discussion of the department's accident investigation process.

DATA POINTS UTILIZED

The SHIP Grant is an ideal vehicle to gather, compare, and evaluate the frequency and severity of the firefighter injuries and their impact on workers' compensation overall costs. In workers' compensation insurance, it is known that the more an account experiences a high frequency of losses or near-misses that sooner or later, the department will experience a loss that is severe in nature and costs or could possibly result in a Line of Duty Death (LODD). To explore the root cause analysis, in depth information needed to be ascertained.

ANALYSIS

Descriptive data for each reported line-of-duty injury were compiled from reports describing the events preceding each injury as communicated by each victim and witnesses as described by each department's injury tracking procedure. This data was then applied to a standardized tracking mechanism and then compiled into a database for sorting and analysis. Data tables were prepared and analyzed. We were able to review and analyze the results of over 560 injuries.

METHODOLOGY

In order to be consistent and ask the same questions of each department, a questionnaire was developed to capture all of these data points mentioned in this report. (Appendix A)

SECTION 8 **AKNOWLEDGEMENTS**

To all of the participating Fire Chiefs, fire departments, and the personnel who took time out of their busy schedules to meet with the study team, locate and provide the information we requested and then provide clarification when it was needed by the study team. To each of you, Thank You so very much! We simply could not have done this without you.

To the Washington Fire Chiefs Association, Thank you for allowing us to partner with you. More importantly, thank you for your support, advice and wisdom. Your staff was truly wonderful to work with.

To the Washington Department of Labor and Industries, Safety and Health Investment Projects, thank you for developing and supporting such a worthwhile and productive program for the State of Washington. The impact from your efforts will have a significant impact on the safety of workers throughout the state.

The study team also wishes to make the point that we are indebted to the National Fire Protection association and the United States Fire Administration for the significant material of very important material that you collect, at significant expense, and then provide to fire service groups such as ourselves at no cost. You truly provide an important service to the American Fire Service.

SECTION 5 RESEARCH FINDINGS

OBSERVATIONS

Firefighting is dangerous work. Although there have been major advances in safety planning, technology, and personal protective equipment firefighter continue to get injured on the job. However, these injuries can be prevented if the Fire service and safety researchers have comprehensive, consistent, and accurate information about **who** is being injured, **how** they are being injured, and **what** types of injuries occur. While snapshots of firefighter injury exist and give us valuable insights on particular populations at particular points in time, there is currently no comprehensive national system for capturing firefighter injuries. Without a comprehensive system that provides consistent and accurate information, it is challenging to identify intervention opportunities which will effectively reduce or eliminate injury.³⁵

From the beginning of this project the validity of the previous paragraph was very clear. Locally there is little consistency in the reporting of workers' injuries/illnesses. There is not a single, easy to use electronic format for reporting firefighter injuries. There is no single location or program, statewide or nationally, for complete, accurate information on line of duty firefighter injury reports and as a result it is difficult to devise new safety policies, modify existing policies, craft appropriate interventions, and/or evaluate the success of such efforts.³⁶ The two most common reporting points are the National Fire Protection Association (NFPA) and the United

³⁵ Drexel School of Public Health website, <http://publichealth.drexel.edu/first/>

³⁶ Costco, Henry, "Safety First", *FireRescue Magazine*, December, 2011.

States Fire Administration (USFA) which utilizes the National Fire Incident Reporting System (NFIRS). Others have recognized this same problem and as a result Drexel University, through an Assistance to Firefighters Grant Program, has developed an electronic format to capture firefighter injury, hospitalization and lost time data. Drexel University will complete their study and publish their results in July of 2013.

To analyze data for this grant, the first task was to identify another means in addition to the NFPA and NFIRS to gather Washington statistics which would be common to all fire departments and would be consistent in the reporting of incidents, accidents and illnesses related to work. As noted, the one common report is the OSHA 300 log and OSHA 300A Summary Report which continually surfaced as the best source to use statewide.

OSHA REPORTS

Employers are required by law to complete the *Log of Work-Related Injuries and Illnesses* (OSHA Form 300). This log is used to classify not only injuries and illnesses, but the extent and severity of each incident. The Log is used to record specific details about what happened as well as how it happened. This Log does not include specific individual loss information relating to employee health and is used in a manner that will protect the confidentiality of the employee to the extent possible.

At the end of the year, it is mandatory to then post an OSHA 300A Summary Report from February 1st to April 30th. This report essentially summarizes the data listed on the OSHA 300 log with the exclusion of the names of individuals.

The data that needs to be recorded on the OSHA 300 Form and then is summarized in the OSHA 300A include:

- Employee Name (*not on OSHA 300A*)
- Job Title
- Date of the injury or onset of illness (mo./day)
- Where the event occurred
- Description of injury or illness, parts of body affected or object/substance that directly injured or made person ill
- Death
- Days away from work
 - Number of days away
- Remained at work
 - Job transfer or restriction
 - Other recordable cases
- Injury or Illness
 - Injury
 - Skin Disorder
 - Respiratory Condition
 - Poisoning
 - Hearing Loss
 - All other illnesses

Each of the participating departments provided a full year – and in some cases – several years of their OSHA 300 logs summaries along with Safety Committee Minutes and other ancillary reports. Thus, this was the starting point and the main source for our data.

DATA FROM THE OSHA 300

The actual reporting of injuries utilizing this summary varied from department to department. It was apparent that all of the agencies had filled out the OSHA 300A report to the best of their understanding and had posted the required form during the mandatory time frame. However, many injuries that should have been included were not listed and the verbiage used varied significantly from department to department. The information on the various OSHA 300 forms was not consistent in several ways. This made it more difficult to compile statistics that could be compared to NFPA and USFA statistics.

The most obvious inconsistency was in section (F). The OSHA form asks for a more complete description of the injury, body part or what the object/substance was that directly injured or made the person ill. One example of this was the various narratives used for documenting a back injury. The following are some of actual descriptions taken from multiple OSHA 300 logs describing a back injury. They were "Sprain/Strain Upper Back Area/Thoracic Area", "Thoracic back strain" "Lower lumbar pain radiating down leg" or simply "Lower Back. Some departments used the exact same language in describing each and every back injury that occurred during the year.

SAFETY COMMITTEE MINUTES

Safety committee minutes, when available, were reviewed in tandem with the OSHA 300 to determine if the root cause of the accidents had been sought. And if the root cause had been determined, what action was taken by the safety committee and the department to prevent

recurrence of the injury. Often the incident was thoroughly addressed and followed up in the subsequent safety committee minutes and it was noted if and when a safety recommendation or preventative action had been implemented. Best practices, were not always suggested, but when available, were included in the posted safety committee minutes so that all of the department's firefighters could read what action had taken place or understand what future actions would be taken in order to resolve the issue.

There were other instances where the investigation of the accident and any follow up was cursory at best. For some accidents, the posting of the minutes of the safety committee was the full extent of the effort to inform all department members of the event – and the accident might be just a one-line item. In some safety committee notes, no mention of any worker injuries is included. This would lead one to believe that an incident review was not part of the agenda for the safety committee.

In reviewing the ancillary reports, such as safety committee minutes or accident investigation reports, it was a surprise how many injuries had not been recorded on the OSHA 300 form that should have been. There could be two thoughts on why these injuries were not included in the mandatory reporting form. During the interview, the question was asked why some of the injuries that clearly should have been listed were omitted from the OSHA 300. It became clear that there was often confusion and/or questions as to which injuries were reportable or not reportable after reading the OSHA 300 form. It could also be suggested that the departments just do not want the incidents to be posted. There is no regulatory body that monitors the

employer's compliance with filling out the OSHA 300 on an annual basis. The OSHA log is often seen as a document needed for OSHA compliance, in case there is an OSHA inspection. Viewing it as just another form that needs to be completed with no consequences for not having it done correctly, this task is given to various departments and staff to complete. Some may or may not even know why they need to fill it out, let alone what information needs to be reported.

DATA POINTS

The expansion of this data was considered pertinent to the outcome. Just using the OSHA 300 data, still did not capture enough information to ensure a comprehensive report. The information that was collected was fluid in the sense that as more departments were furnishing their reports, new and interesting statistics were being collected and were being tracked by the specific fire departments. One example is the length of time on duty, the number of shifts worked consecutively prior to the injury. Some departments were documenting if the incident occurred after a firefighter had worked more than twenty-four consecutive hours. Other departments had expanded that information to note exactly how many consecutive hours had been worked when the injury occurred. Many of the people interviewed said that they could easily track this information and it would be of interest to them study if fatigue did have an impact on the occurrence of injury. Rather than not capture this information for future use, it was documented when available.

Other data points used were:

Medical treatment	Lost Time
Type of injury	Nature of Injury
Body part injured	Volunteer/Career
Time	Working Shift: 24, 48, 72 hours
Body Part	Treatment: None, First Aid, Doctor, Hospital
Witnesses Yes/No	Best Practice
Description of Incident	Policy in Place
Supervisory Training	

Below are other subsections that were considered. However, using the OSHA 300 log, it was known that this information would not be readily accessible. It was hoped that in the incident report or during the interviews, this data would be provided. Much of the following information, while important, was not captured nor easily accessible.

Management	Employee
Policy Enforcement	Trained
Hazard Recognition	Had previous injury
Accountability	Physical Capacity
Corrective Action	Safety Attitude
Proper Resources	Proper PPE
Hiring Practices	Took Short Cuts
Maintenance of Equipment	

Environment	
Proper Tool	Weather
Maintenance	Terrain
Visual Warnings	Ergonomics
Guarding	Lighting
Vehicle	Ventilation
Chemical	Housekeeping
Temperature	Shift
Noise	Biological
Radiation	

THE STUDY TEAM DETERMINED

A question that became apparent was, is non-reporting of injuries part of the fire service culture i.e., not wanting to report/discuss injuries in a public forum? This also begs the question as to whether the OSHA 300 and OSHA 300A are considered important enough to fill out correctly. The forms were filled out to the best of the reporting person's ability – but this task was given to a variety of personnel who may or may not have this type of job activity as a part of their normal and daily job functions which may be a partial explanation for the problems with the filling out the 300A form appropriately.

During our research we reviewed information concerning the Fire 20/20 process, which was completed in 2007, and involved three large metropolitan fire departments; the Austin (TX) Fire Department and Austin-Travis County Emergency Medical Services, the Milwaukee (WI) Fire Department, and the Seattle (WA) Fire Department. The Fire 20/20 report appears to indicate that there is a significant amount of under reporting of injuries or not reporting injuries at all. Information from both firefighter and paramedic surveys, interviews and group discussions indicates that injuries often go unreported due to fire service culture issues.

“Others indicated that reporting injuries had a financial impact due to reassignments to light duty, which meant giving up shifts and losing the opportunity to work overtime. If you don't finish recruit school you can't get hired.”³⁷ A concern about being labeled as “weak or not

³⁷ Collecting Injury and Near-Miss Data Can Improve Safety, Lauren Johnson, EFO Program, National Fire Academy, n. d.

tough enough” was a reason some female and minority male firefighters did not report injuries.³⁸

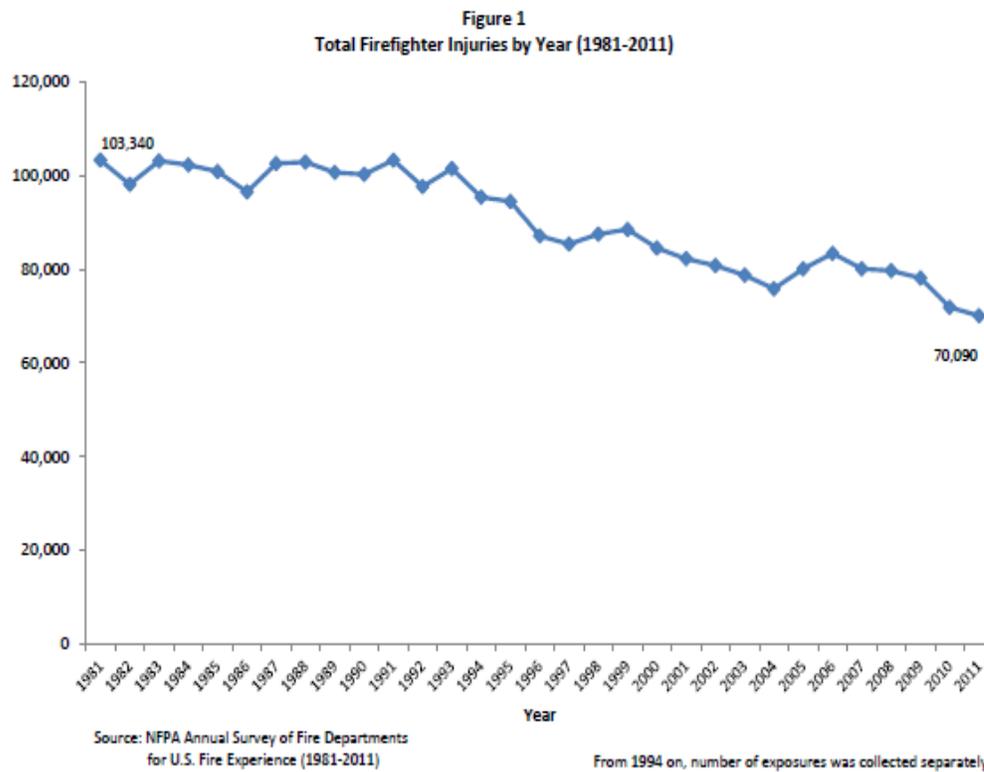
Using the commonly accepted national fire statistics, three components were common; Nature of the Injury, Cause of the Injury and Activity When the Injury Occurred. These three categories can be broken down to more pertinent information and allow the analyst to compare peer (similar sized department) statistics to statistics for the state of Washington to the national statistics.

The following is a guide to these three components, some categories have been combined to assist in comparison. Even though the fireground has always been where the highest number of firefighter injuries occur (nearly half), as previously stated, fireground and firefighter injuries are decreasing. Firefighter injuries reached their zenith in the late 1970's and early 1980's. During this period of time firefighter injuries were averaging in excess of 100,000 injuries annually. Since this period of time the number of annual firefighter injuries has been dropped significantly. The highest number of injuries in a year, well over 102,000 firefighter injuries, has decreased to a reported 70,090 firefighter injuries in 2011. Figure 1, page 44, demonstrates the decline in firefighter injuries from 1981 to 2011 (NFPA statistics). The United States Fire Administration, using the self-reporting NFIRS determined there were approximately 80,000 firefighter injuries in 2011. The most significant reason for this decline in firefighter injuries is the noteworthy decline in fire department responses to fires. Collectively, the American Fire

³⁸ Multicultural Health and Safety Research Project Final Report, Fire 20/20, 2007.

Service was responding to well in excess of 3,000,000 alarms annually in the 1970's and 1980's. Since that time responses to fires have dropped to approximately 1,514,000 responses per year. This number has remained relatively constant during the most recent ten year period. In 2011, fire departments in the United States responded to 1,389,500 reports of fire.³⁹

³⁹ Karter, NFPA, 2012.



The above Figure 1⁴⁰ demonstrates the significant reduction in firefighter injuries from 1981 through 2011 described on page 43. The 70,090 injuries in 2011 is the lowest number of firefighter injuries reported by the NFPA since 1981.

⁴⁰ Karter, NFPA, 2012.

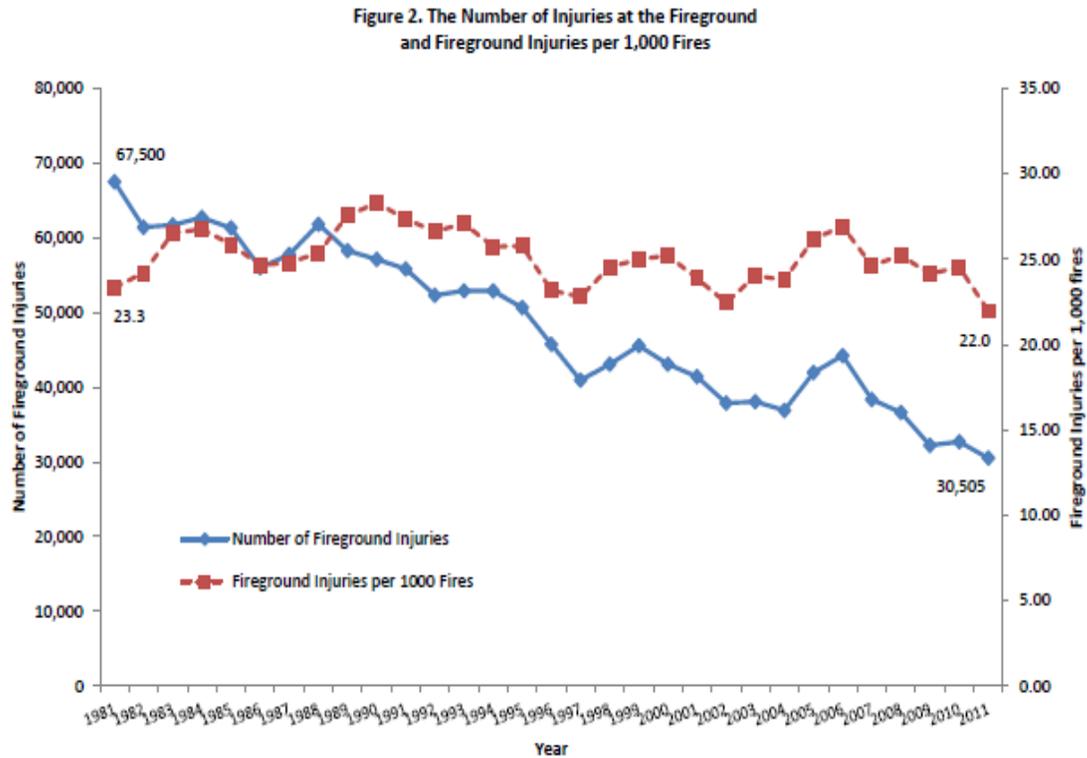


Figure 2⁴¹ represents the number of fireground, firefighter injuries per 1,000 fires for the period of 1981 to 2011. Due to the 54.8% reduction in fires discussed on page 44, the actual number of injuries per 1,000 fires has only decreased from 23.3 firefighter injuries (lower left of graph line) per 1,000 fires in 1981 to 22.0 firefighter injuries (upper right of the graph line) per 1,000 fires in 2011.

⁴¹ Karter, NFPA, 2012.



This figure⁴² on response trends represents how the number of fire responses has dropped between 1977 and 2011. Actual fires have dropped from 14.8 per 1,000 population in 1977 to 4.5 fires per 1,000 population in 2011. This is a seventy per cent reduction in fires per 1,000 population. This reduction has been impacted by improved building codes, requirements for early detection and protection devices i.e., smoke detectors and sprinklers, much more emphasis on public education activities, increased investigation and arson prevention activities, the percentage of housing units built since 1980, and the growing population. There was a 70.6% increase in the population of the United States from 220,200,000 in 1977 to 311,800,000 in 2011.

⁴² Levesque, Paula, Trends and Patterns of U.S. Fire Losses in 2011, National Fire Protection Association, 2013.

Figure 14. Fire Incidents, Medical Aid, and Mutual Aid Responses as Percentages of Fire Department Responses by Community Size 2010-2011

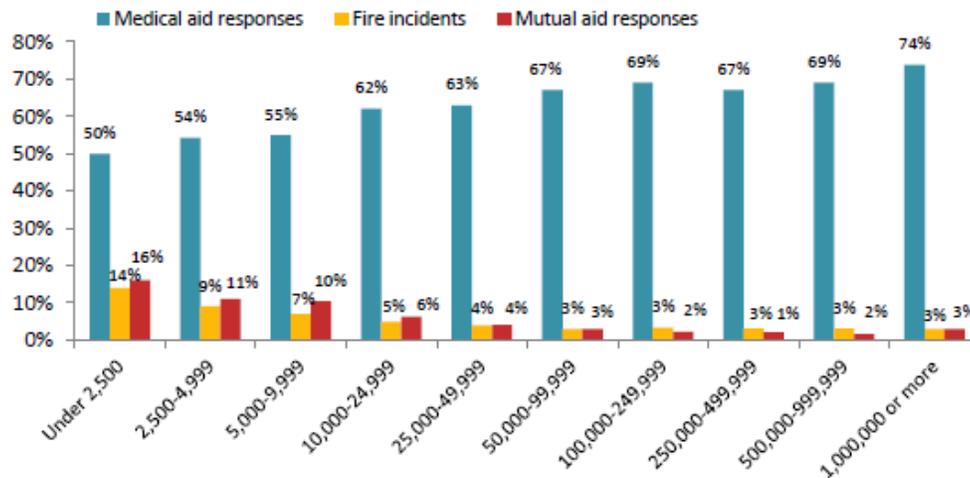


Figure 14⁴³, a graph from the NFIRS, demonstrates the percentage of fire department responses that are medical responses based on population of the community served by the fire department. It is clear that medical responses are an every increasing percentage of call volume as the population served by the department increases.

The percentage of responses that are fire incidents decreases from a high of 14% of incidents in communities of under 2,500 population to fire responses being 3% of incidents in communities of 50,000 to 99,999 population. The fire responses then hold steady at the 3% figure for all the larger population sizes.

⁴³ USFA, n.a., 2012.

Table 1.
The U.S. Fire Problem in 2011 Compared to 2010, 2001, 1991, and 1981

Reported to Fire Departments	2011	COMPARED TO			
		2010	2001*	1991	1981
Fire Incidents	1,389,500	Up 4%	Down 20%	Down 32%	Down 52%
Civilian Deaths	3,005	Down 4%	Down 20%	Down 33%	Down 55%
Firefighter Deaths	61	Down 16%	Down 41%	Down 44%	Down 55%
Civilian Injuries	17,500	Down 1%	Down 14%	Down 40%	Down 43%
Direct Property Damage	\$11,659,000,000	Up 1%	Up 10%	Up 23%	Up 75%
Adjusted for Inflation		Down 3%	Down 13%	Down 25 %	Down 29%
Civilian Deaths per Million Population	9.6	Down 5%	Down 28%	Down 46%	Down 67%
Civilian Deaths per Thousand Reported Home Structure Fires	6.9	Down 5%	Down 16%	Down 10%	Down 10%
Property Damage per Structure Fire	\$20,006	Down 1%	Up 18%	Up 54%	Up 24%
Adjusted for Inflation		Down 4%	Down 7%	Down 7%	Up 39%

*Excludes the events of September 11, 2001.

Sources:

Michael J. Karter, Jr. *Fire Loss in the United States* series, (1980, 1990, 2000, 2010, and 2011), Quincy, MA: NFPA, 1981, 1991, 2001, 2010, and 2012.

Rita F. Fahy, Paul R. LeBlanc, and Joe Molis, *Firefighter Fatalities in the United States – 2011*, Quincy, MA: NFPA, 2012.

U.S. Census Bureau

Inflation calculations were made with the Bureau of Labor Statistics Inflation Consumer Price Index Purchasing Power of the Dollar.

This chart⁴⁴ provides a comparison of fire statistics from 1981, 1991, 2001, 2010, and 2011. It provides you an opportunity to compare your departments trends with trends experience by United States fire departments as a whole.

⁴⁴ Levasque, NFPA, 2012.

Figure 3. The Number of Injuries at Nonfire Emergencies and Injuries per 1,000 Nonfire Emergencies

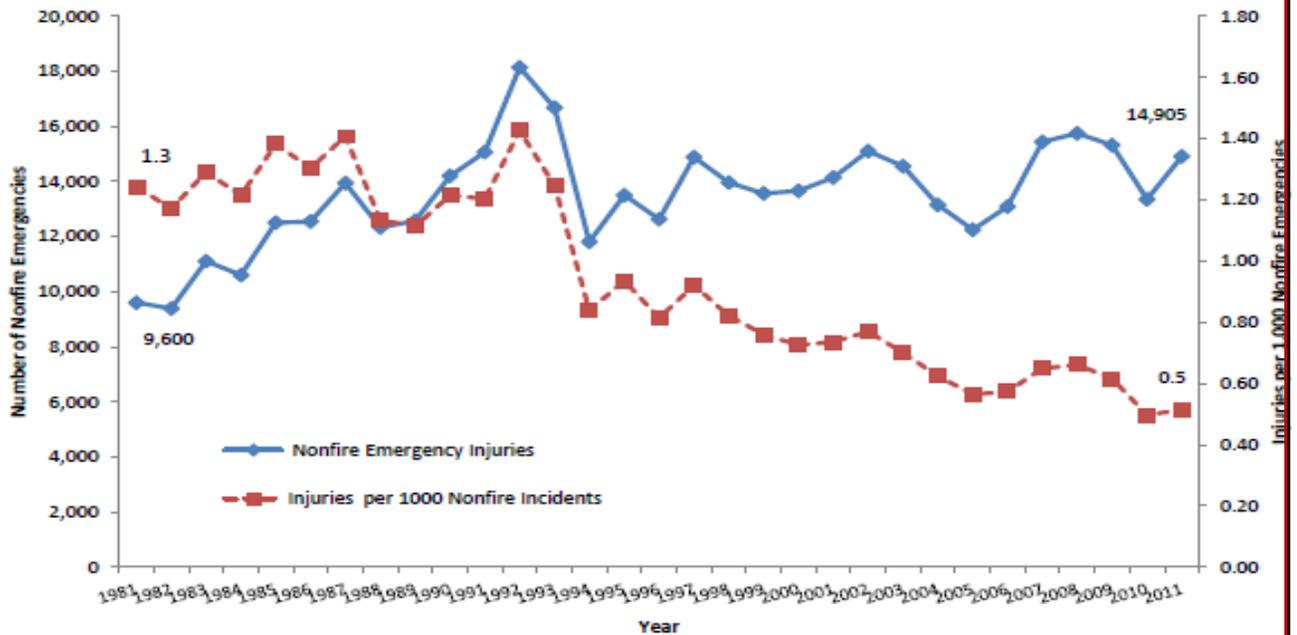


Figure 3⁴⁵ represents the number of firefighter injuries per 1,000 non-fire emergency responses. Non-fire emergencies are primarily Emergency Medical Service responses. Even though non-fire emergency firefighter injuries have increased from 9,600 in 1981 to 14,905 in 2011, a significant 55% increase, the number of injuries per 1,000 alarms has dropped dramatically as the number of responses has increased even more rapidly, a 274% increase since 1981. The non-fire emergency injuries have decreased from 1.3 injuries per 1,000 alarms in 1981 to 0.5 injuries per 1,000 alarms in 2011. This is a decrease in the number of non-fire injuries per 1,000 responses of 260%.

⁴⁵ Karter, NFPA, 2012.

Using the two most complete sources for national fire statistics, National Fire Protection Association and the United States Fire Administration, three components were common;

- 1) Nature of the Injury,
- 2) Cause of the Injury and
- 3) Activity When the Injury Occurred.

These three categories will allow a department to compare their statistics to peer (similar sized) Washington department's statistics as well as statistics for the entire state of Washington (those reporting departments) and to the national statistics. To allow the comparison of these three components, some categories will need to be combined for comparison. The study team utilized rounding and as a result not all columns total 100%.

What **Injury Type** best describes the injury that was suffered?

INJURY TYPE	NFPA ⁴⁶	NFIRS ⁴⁷	Washington	Our Department
Strain/Sprain	56.5%	23.5%	64.4%	
Heart Attack/Stroke	1.2%	2.4%	0.7%	
Burns	3.4%	14.0%	8.5%	
Wounds	14.6%	18.4%	13.7%	
Respiratory Distress	5.0%	7.1%	2.9%	
Dislocation/Fracture	2.7%	6.4%	2.0%	
Thermal Stress (Heat/Cold)	4.2%	NU	0.7%	
Other	12.4%	13.5%	7.1%	
Exhaustion/Dehydration	NU	12.6%	NU	
Illness	NU	2.1%	NU	
Total	100%	100%	100%	

NU not utilized in this format

An observation that one could make from this chart is that firefighters in Washington have more strains and sprains than firefighters nationally as a percentage of injuries. Actually this is the result of the fact that firefighters in Washington have a lesser percentage of more consequential injuries than do firefighters nationally. Washington firefighters have less heart attacks/strokes, respiratory distress, and thermal stress (which is often the lack of appropriate personal protective equipment) than firefighters from other regions of the nation. This

⁴⁶ Karter, 2012.

⁴⁷ USFA, 2012.

increases the percentage of injuries that are strains and sprains in Washington. Washington statistics are consistent with national statistics in the remaining categories.

WASHINGTON STATISTICS

What **Injury Type** best describes the injury that was suffered?

Injury Type	SMALL	MEDIUM	LARGE	Our Department
Strain/Sprain	46.4%	61.0%	64.0%	
Heart Attack/Stroke	3.6%	0.2%	0.9%	
Burns	0.2%	1.6%	1.5%	
Wounds	31.1%	11.8%	10.0%	
Respiratory Distress	7.2%	15.0%	5.6%	
Dislocation/Fracture	0.4%	1.6%	4.4%	
Thermal Stress (Heat/Cold)	0.4%	0.5%	0.6%	
Other	10.7%	8.4%	13.0%	
Total	100%	100.1%	100%	

This preceding page allows you to compare your department's statistics to peer departments in Washington.

What terminology best describes the **Cause of the Injury**?

CAUSE OF INJURY	NFPA ⁴⁸	NFIRS ⁴⁹	Washington	Our Department
Overexertion	28.4%	NU	46.9%	
Strain/Sprain	NU	24.9%	NU	
Fall/Jump	21.0%	22.4%	20.4%	
Exposure Fire Products	10.3%	20.0%	6.2%	
Other	19.1%	9.4%	11.2%	
Contact With Object	17.4%	15.8%	14.2%	
Struck or Assaulted	NU	7.4%	NU	
Thermal Stress (Heat/Cold)	3.7%	NU	1.0%	
Total	99.9%	99.9%	99.9%	

NU not utilized in this format

If we shift Strain/Sprain from NFIRS chart up to the Overexertion row of the NFPA column nearly all categories will be similar percentages with the exception of Exposure to Fire Products as the cause. Washington firefighters have significantly fewer injuries that are caused by Exposure to Fire Products and Thermal Stress. Thermal Stress, as the cause of injury, often results from not utilizing appropriate personal protective equipment at emergencies. Exposure to Fire Products is often the result of not using appropriate personal protective equipment, particularly the utilization of self contained breathing apparatus.

⁴⁸ Karter, 2012.

⁴⁹ USFA, 2012.

WASHINGTON STATISTICS

What terminology best describes the **Cause of the Injury**?

CAUSE OF INJURY	SMALL	MEDIUM	LARGE	Our Department
Overexertion	28.6%	48.4%	48.2%	
Fall/Jump	25.0%	14.0%	27.0%	
Exposure	7.2%	9.6%	3.5%	
Other	7.0%	15.6%	5.0%	
Contact with Object	14.3%	5.9%	2.8%	
Struck or Assaulted	17.9%	6.5%	12.1%	
Thermal Stress (Heat/Cold)	0.0%	0.0%	1.4%	
Total	100%	100%	100%	

This chart is provided to allow each Washington Fire Department to compare their individual statistics to those from similar sized departments in the State of Washington.

What terminology best describes the **Activity** at the time of the injury?

ACTIVITY	NFPA ⁵⁰	NFIRS ⁵¹	Washington	Our Department
Responding	5.5%	6.1%	2.7%	
Fireground	43.5%	62.1%	22.6%	
Non-fire Emergency	21.7%	28.2%	41.2%	
Training	10.7%	NU	21.3%	
Other on Duty	19.0%	3.6%	12.2%	
Total	100.4%	100%	100%	

NU not utilized in this format

Washington firefighters are significantly less likely to be injured while responding and returning from alarms than firefighters nationally. The study team attributes this difference to the implementation of the Emergency Vehicle Operator Certification (EVOC) program, specific additional driver training, and implementation and enforcement of response driving policies.

The fireground is nationally the most common location for firefighter injuries with non-fire emergency scenes being the second most common. In Washington these two activities are reversed.

Fireground injuries in Washington are 50% to 66% less than national statistics. This is due to emphasis on firefighter safety and the vertical standards developed by Labor and Industries.

The emphasis on firefighter fireground safety results in fewer fireground injuries. Washington firefighters are to be congratulated for this effort.

⁵⁰ Karter, 2012.

⁵⁰ USFA, 2012.

Washington firefighters experience a much higher percentage of non-fire emergency response injuries than firefighters nationally. These injuries most often result in back/muscle pain for the firefighter. These injuries frequently occur as the result of operating in confined spaces and/or lifting heavy patients. Another contributing factor is that EMS responses account for 72% of responses in the state (443,000 responses).⁵²

In addition, a large percentage of Washington injuries occurred during training activities, 21.3% of all injuries in Washington occurred during training compared to 10.7% of injuries nationally. Many of the Washington firefighter injuries occurred during physical fitness activities and involved a sport type ball, sports type activities or weight lifting. Departments should review their statistics in this category and take appropriate action.

WASHINGTON STATISTICS

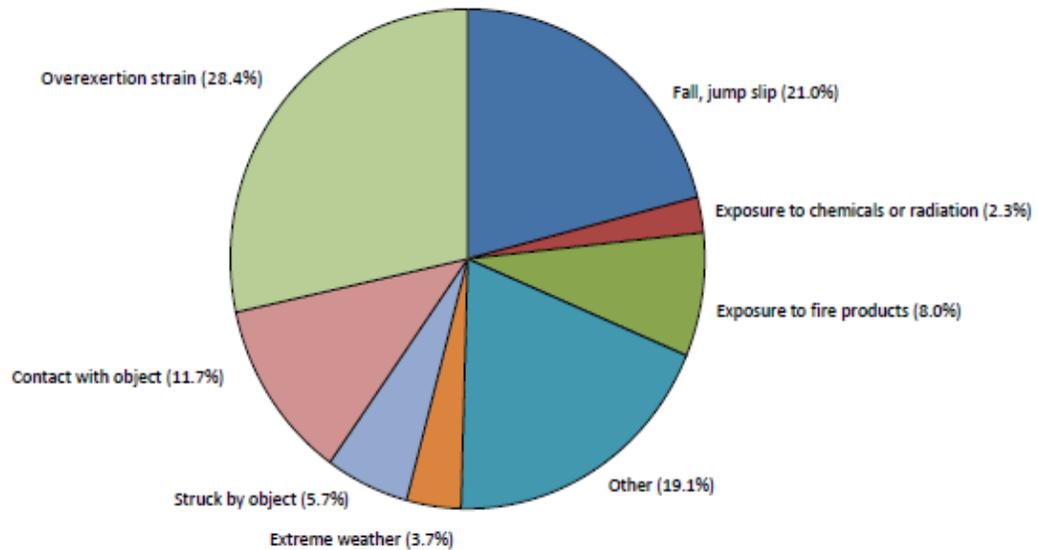
⁵² Washington State Fire Marshal, 2012.

What terminology best describes the **Activity** at the time of the injury?

ACTIVITY	SMALL	MEDIUM	LARGE	Our Department
Responding	0.0%	0.0%	0.3%	
Fireground	11.5%	21.4%	9.1%	
Non-fire Emergency	42.3%	48.1%	52.6%	
Training	23.1%	8.0%	12.6%	
Other on Duty	23.1%	22.5%	25.3%	
Total	100%	100%	99.9%	

Use this form to compare your department's statistics to peer departments.

Figure 5.
Fireground Injuries by Cause, 2011

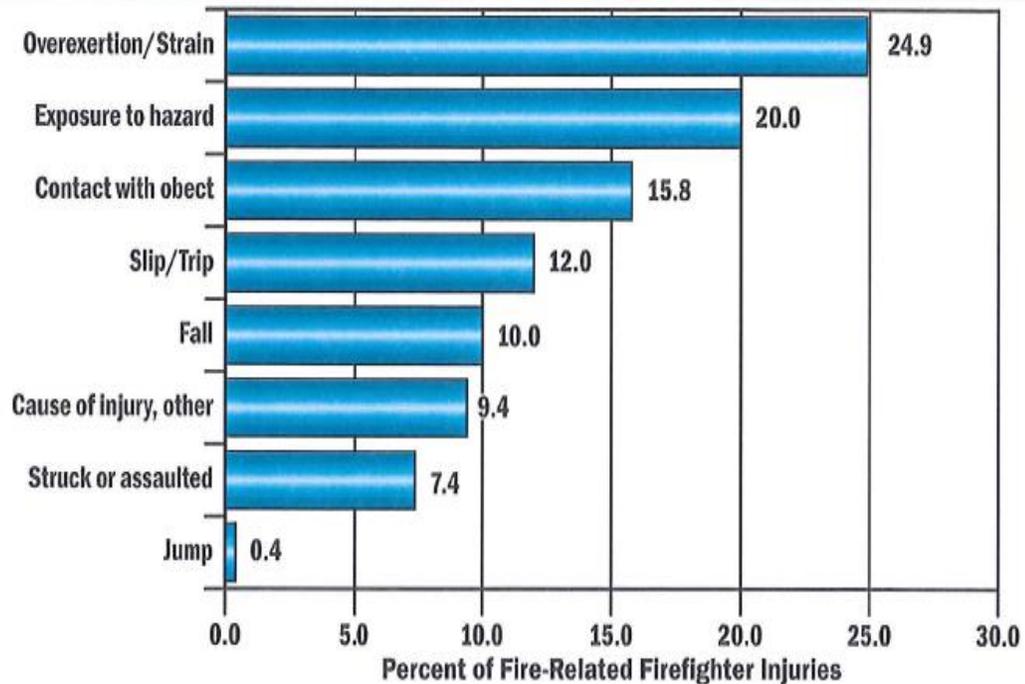


Source: NFPA Annual Survey of Fire Departments for U.S. Fire Experience (2011)

Figure 5⁵³ demonstrates that nearly 50% of our fireground injuries are the result of overexertion/strain or a fall, slip, or jump. This statistic has remained constant for more than twenty years. These are activities that, for the most part, are under the control of the individual firefighter.

⁵³ Karter, NFPA, 2012.

Figure 4. Fire-Related Firefighter Injuries by Cause of Injury (2006–2008)



Source: NFIRS 5.0.

Notes: Only includes injuries where cause of injury was provided. Total may not add to 100 percent due to rounding.

This graph⁵⁴ is from the NFIRS. If we view overexertion/strain as comparable to strain/sprain (NFPA) and fall/jump (NFPA) as comparable to slip/trip plus fall we would compare overexertion at 28.4% to strain/sprain at 24.9% and fall/jump at 21.0% to slip/trip plus fall at 22.4% of all injuries. The information on Injury Cause from NFPA and the NFIRS is shown side by side for comparison on page 54.

⁵⁴ USFA, 2012.

Statistics show that on a regional basis firefighter injuries are highest in the Northeast section of the United States.⁵⁵

	Northeast	Midwest	South	West
Injury Rate Per 100 Fires	5.3*	2.2	1.5	0.7

*Includes New York City, removing FDNY yields 3.5%,

These numbers speak to the safety culture of the fire service on a national basis. The Northeast region has nearly eight times the injury rate for the West region. The West region is comprised of the ten states of the Western Division of the International Association of Fire Chiefs plus the states of Colorado, New Mexico, and Wyoming. When FDNY is excluded the Northeast region still has an injury rate five times higher than the West region. From these statistics it is apparent that the safety culture and importance of firefighter safety for the West region firefighters is at a much higher level than that for firefighters in other geographic regions of the nation.

Firefighter Safety is a more important consideration in the West region than any other region of the nation.

The provision of fire and emergency medical services requires sporadic high levels of physical

⁵⁵ Karter, 2012.

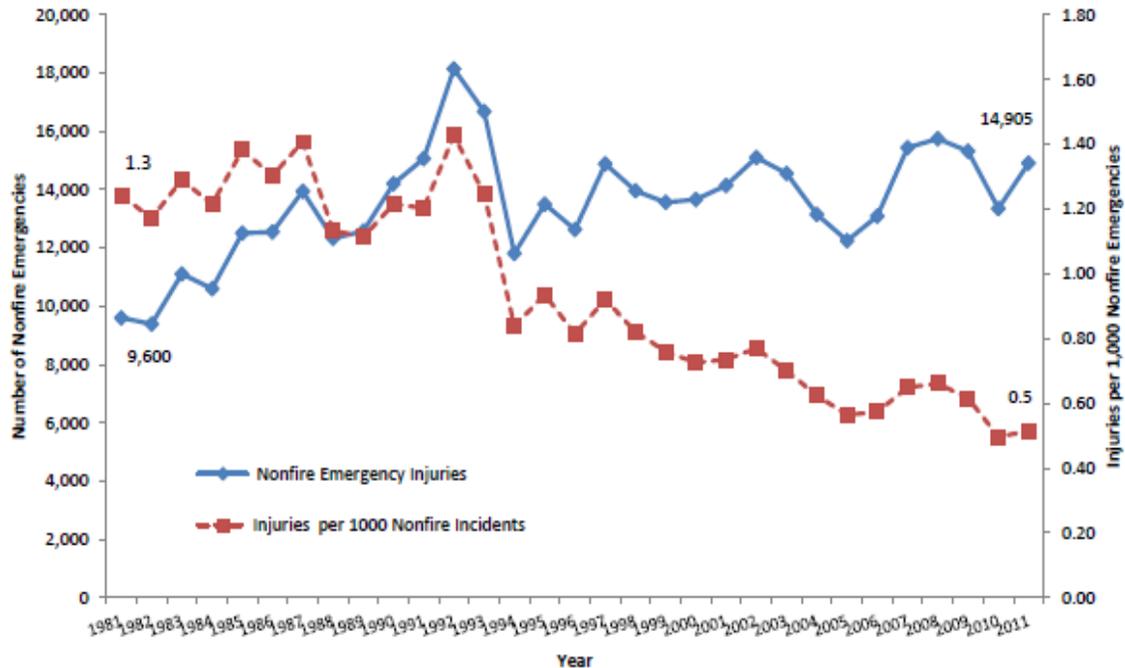
exertion while being subjected to extreme environmental exposures and extreme stress from enduring extreme human suffering. (Moore 2008).⁵⁶ These responses often test all of a firefighter's physical skills and mental capabilities. Today, more than ever before, emphasis is being placed on firefighter health, wellness and physical fitness. Firefighters experience inordinate numbers of line-of-duty injuries, injuries due to accidents and occupational disease many of which result in unplanned/unwanted retirements.

Existing research reveals that these non-fatal injuries can be the result of behaviors, attitudes, and motivations deeply rooted in the firefighter culture.⁵⁷

⁵⁶ Moore-Merrell et al, 2008.

⁵⁷ Moore-Merrell et al, 2008.

Figure 3. The Number of Injuries at Nonfire Emergencies and Injuries per 1,000 Nonfire Emergencies



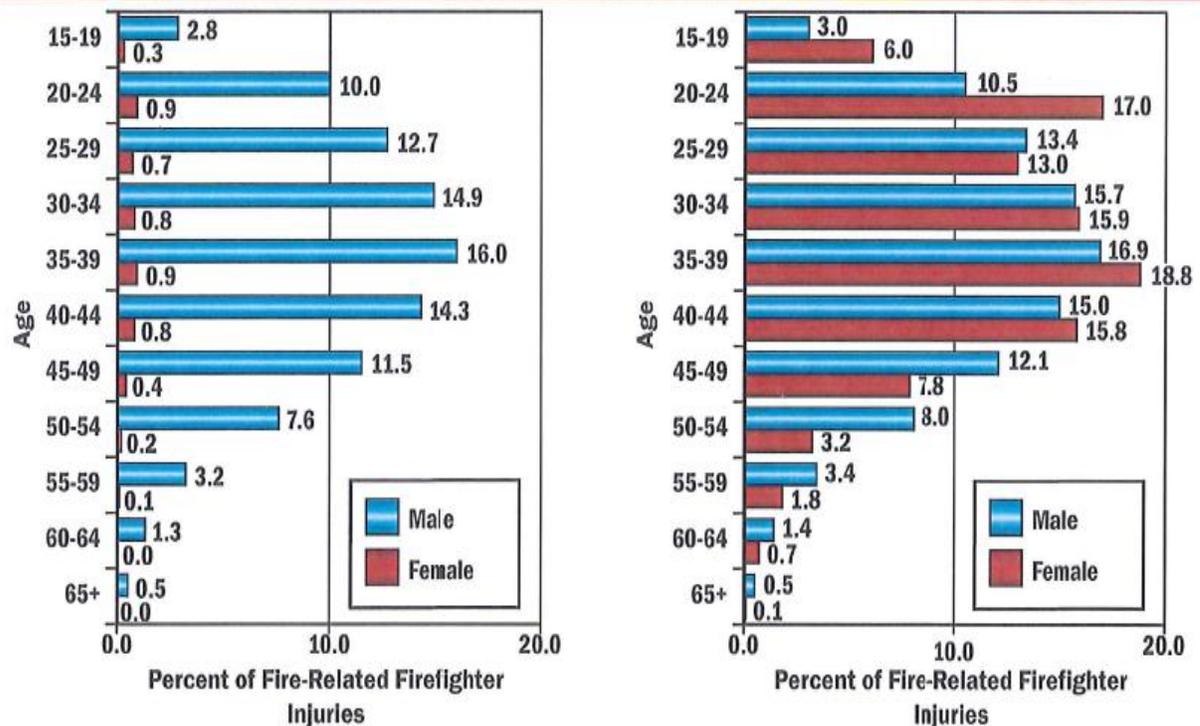
The statistics for non-fire emergencies, Figure 3⁵⁸, most typically emergency medical responses, are trending quite differently than fireground injuries. Non-fire emergency injuries have increased significantly over the past thirty years, from 9,600 in 1981 to 14,905 in 2011. This is an increase of 55% in the number of injuries over this thirty year period. During the same time frame, there has also been a 274% increase in the number of non-fire emergency alarms, primarily emergency medical responses. Due to the dramatic increase in the number non-fire emergencies, the rate of injuries has actually decreased from 1.24 per 1,000 non-fire

⁵⁸ Karter, NFPA, 2012.

emergency responses in 1981 to 0.50 injuries per 1,000 non-fire emergencies in 2011.⁵⁹ While the annual number of non-fire emergency injuries has remained relatively constant for the most recent twenty year period, at more than 14,000 injuries per year, there are too many of these injuries that could be prevented. In reviewing non-fire injuries in Washington a significant percentage are the result of lifting and maneuvering patients in confined areas and moving patients up/down stairs. Often these patients are quite heavy. One solution, to reduce these injuries, is to request additional resources prior to trying to move patients in these circumstances. Another solution may be to make greater use of the powered ambulance cots.

⁵⁹ Karter, 2012.

Figure 6. Fire-Related Firefighter Injuries by Age and Gender (2006–2008)



Source: NFIRS 5.0.

Notes: Only includes incidents where age and gender were provided. Totals may not add to 100 percent due to rounding.

Figure 6⁶⁰, is from NFIRS reports and is for the period 2006-2008. The graph on the right (injuries to male's equals 100%, injuries to female's equals 100%) indicates that for male firefighters the age group of 30-39 has the highest percentage of injuries at almost 33% of all male firefighter injuries. Each age group up to the 30-39 age group has an injury rate increase of approximately 3.5%. After the 30-39 age group, each age group has a corresponding decrease in the injury rate of approximately 3.5%. The age group of 30-39 years of age represents 26.6% of all firefighters nationally.

For female firefighters in this study the same age group, 30-39, sustains the highest number of firefighter injuries at nearly 35% of all injuries to female firefighters. The trend is for each age group to have a higher injury rate until reaching the highest level for the 30-39 age group and then decreasing for each age group beyond the 30-39 age group.

In the graph on the left all injuries to male and female firefighters added together equals 100%.

⁶⁰ USFA, 2012.

For this study there was inadequate gender data available to present a statistically valid observation of injuries by gender.

INJURIES TO VOLUNTEER FIREFIGHTERS IN WASHINGTON

What **Injury Type** best describes the injury that was suffered?

INJURY TYPE	NFPA ⁶¹	WASHINGTON	OUR DEPARTMENT
Strain/Sprain	36.3%	50.3%	
Heart Attack/Stroke	1.4%	1.7%	
Burn	5.1%	1.5%	
Wounds	21.0%	13.9%	
Respiratory Distress	9.0%	5.1%	
Dislocation/Fracture	5.3%	3.3%	
Thermal Stress (Heat/Cold)	12.0%	8.3%	
Other	9.9%	15.8%	
TOTAL	100%	99.9%	

This page is provided for you to utilize your department's statistics for comparison purposes.

Washington Volunteer Firefighters have a higher level of strains/sprains and injuries classified as other than volunteers on a national basis. In other categories Washington Volunteer Firefighters have a significantly lower percentage of burn, wound, respiratory distress, and

⁶¹ An Analysis of Volunteer Firefighter Injuries, 2009-2011, Karter, Jr., Michael, National Fire Protection Association, 2013.

dislocation/fracture injuries than volunteer firefighters on a national basis. The lower percentage of the more significant injuries to Washington Volunteers is a causative factor behind the higher percentage of strains/sprains.

INJURIES TO VOLUNTEER FIREFIGHTERS IN WASHINGTON

What terminology best describes the **Cause of the Injury** that was suffered?

CAUSE OF THE INJURY	NFPA ⁶²	WASHINGTON	OUR DEPARTMENT
Overexertion	4.4%	5.7%	
Strain/Sprain	40.3%	40.6%	
Fall/Jump	5.3%	3.3%	
Exposure	13.3%	20.6%	
Other	1.5%	6.5%	
Contact with Object	21.0%	21.8%	
Struck by Object	2.1%	1.6%	
Thermal Stress	12.0%	0.0%	
TOTAL	99.9%	100.1%	

Utilize your department's statistics for comparison. Overexertion and exposure to products of fire, as well as the other category are higher in Washington than nationally. Overexertion is impacted by firefighter health and wellness. More attention needs to be given to the area of a

⁶² Karter, National Fire Protection Association, 2013.

firefighter's whole body wellness, nutrition and fitness. Exposure to products of fire often comes from not utilizing all of a firefighter's personal protective gear, turnouts and/or self contained breathing apparatus.

INJURIES TO WASHINGTON VOLUNTEERS

What terminology best describes the **Activity** at the time of the injury?

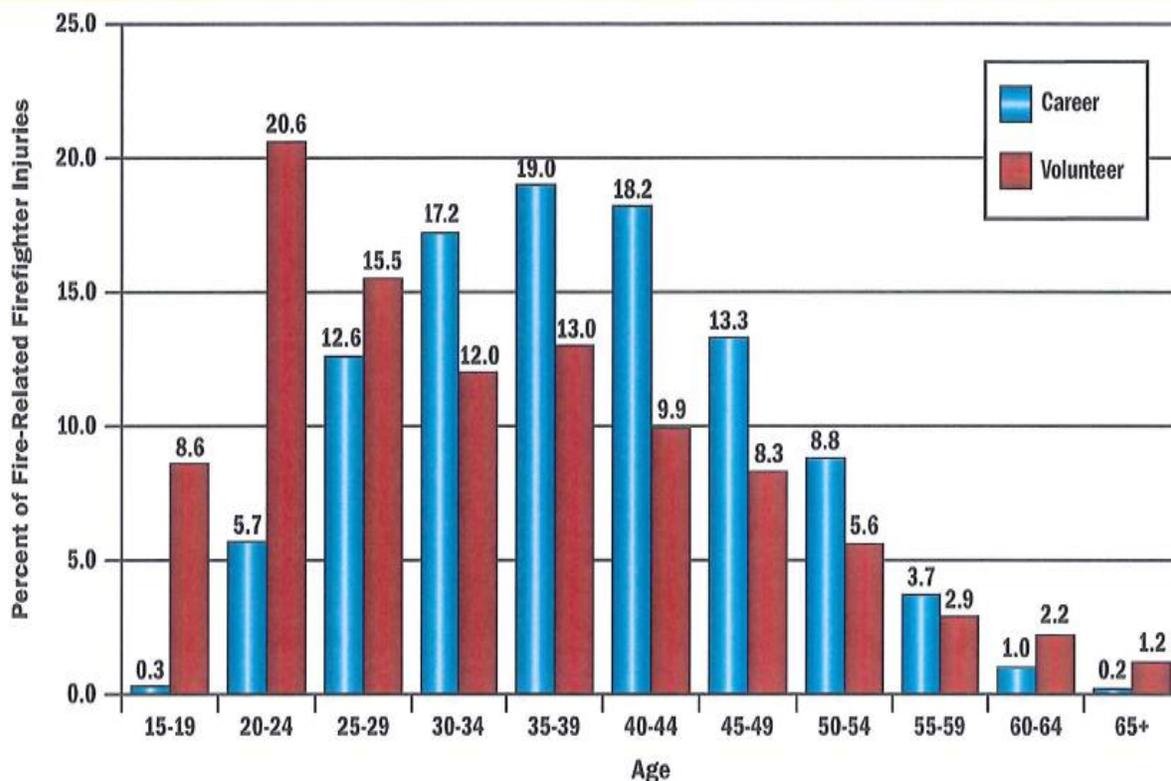
ACTIVITY	NFPA ⁶³	WASHINGTON	OUR DEPARTMENT
Responding	7.4%	8.7%	
Fireground	56.6%	26.9%	
Non-fireground Emergency	12.1%	24.8%	
Training	14.5%	26.3%	
Other On-Duty	9.4%	13.4%	
TOTAL	100%	100%	

Response injuries are 18% higher than the national figure. This number can be impacted by utilization of the EVOC program, increased driver training activities and development and enforcement of department emergency driving policies. Fire ground injuries are significantly lower which relates to training activities, the firefighter vertical standards, and enforcement of policies and procedures. Non-fire (principally EMS) injuries are over two times the national

⁶³ Karter, National Fire Protection Association, 2013.

statistic. This statistic can be lowered by having adequate personnel on scene and considering the use of powered ambulance cots. Training injuries are almost twice the national statistic. Over half of the training injuries analyzed were the result of physical fitness activities. It is important to analyze your department's statistics in this area and take appropriate action.

Figure 7. Career and Volunteer Fire-Related Firefighter Injuries by Age (2006–2008)



Source: NFIRS 5.0.

Notes: Only includes injuries where the age of the firefighter was between 15 and 99 and affiliation was provided. Totals may not add to 100 percent due to rounding.

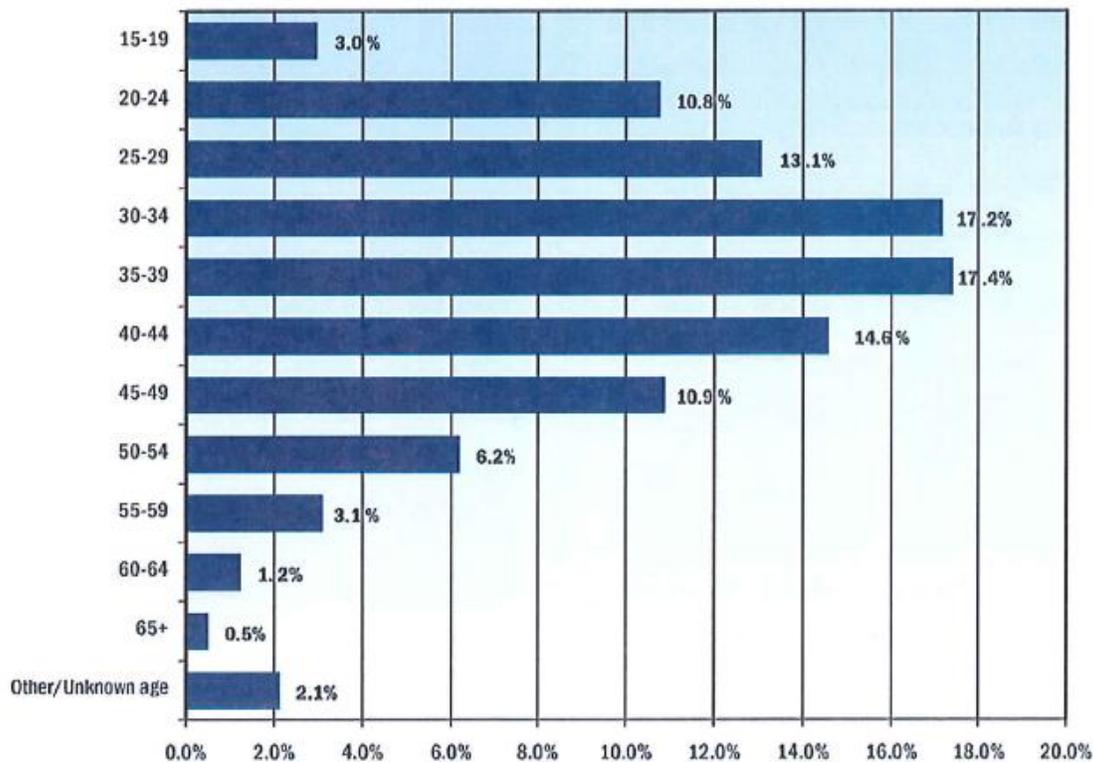
Figure 7⁶⁴ is a three year snap-shot comparing the number injuries by age groups to career firefighters to the number of injuries to the same age groups of volunteer firefighters. The group of 35-44 years of age suffers more than 37% of the total number of career firefighter

⁶⁴ USFA, 2012.

injuries. The group of 20-29 years of age sustains the highest percentage of injuries among volunteer firefighters with over 36% of the injuries to all volunteer firefighters.

These statistics are demonstrating one of the problems with firefighter injury statistics. There is not one common, easy to use, set of national injury statistics. These statistics come from the NFIRS which produces statistics in a different format than the statistics from the NFPA. This creates problems for organizations who are trying to analyze firefighter injury statistics.

Figure 12. Firefighter Injuries by Age, 2004



Source: 2004 NFIRS 5.0 data; based on 4,411 firefighter injuries; a valid age was not specified in 94 of the reported firefighter injury

Figure 12⁶⁵ from the USFA reinforces the information provided on the previous page. This graph indicates that nearly 35% of all firefighter injuries occur to the age group between 30 and

⁶⁵ USFA, 2012.

39 years of age. Combat firefighters above the age of sixty suffer almost 2% of all firefighter injuries. Departments should insure their personnel are physically fit and capable of performing the duties of a combat firefighter.

It is interesting that for all the age groups less than 30 years of age MVA's, responding to the station, responding to the alarm, and returning from the alarm are the leading cause of death. For every age group 40 and above, the leading cause of firefighter death is heart attack.

Firefighters as individuals have partial or complete control over both of these causes of firefighter death.

Existing research reveals that these non-fatal injuries can be the result of behaviors, attitudes, and motivations deeply rooted in the firefighter culture.⁶⁶ In the Moore-Merrell, et al study for the International Association of Firefighters the most often cited contributing factors for line of duty firefighter injuries were;

- 1) lack of situational awareness, 37.3%,
- 2) lack of wellness/fitness, 28.5%, and
- 3) human error, 10.6%.⁶⁷

⁶⁶ "MANAGING AND CHANGING BEHAVIOR: Decreasing Firefighter Strain and Sprain Injuries", Rob Carnahan, Compelling Technologies, 2008.

⁶⁷ Merrell-Moore, et al, 2008.

Much of the data for this study was not readily accessible nor was it developed and maintained in a consistent, easy to analyze format. The study team discovered that specific information about a firefighter injury is often lacking and/or incomplete. In addition, it is often in a format that is inconsistent and/or designed/formatted for the individual departments use. This in turn creates a significant challenge for anyone to do multi-department data collection and analysis.

This does not mean that we should be overcome by this challenge. There are several credible sources of firefighter injury statistics and more, well researched papers are being written on firefighter injuries every year. Individual fire departments need to determine what type of injuries are occurring, which injuries are causing the most concern, where the greatest cost benefit is, and from where is the greatest benefit derived. Is it in reducing fires? With fewer fires we would have less emergency responses with a corresponding decrease in injuries. Is it in increased training activities to prevent the most common injuries? Enhanced training yields more efficient, safer fireground evolutions. Or is it in a greater effort to reduce the possibility of burn injuries? Burn injuries can be one of the most devastating, impactful, and costly injuries to a fire department and its firefighters.

Statistics were compiled from the descriptive data for each reported line of duty injury. This information was obtained from reports describing the events preceding each injury as communicated by each victim and witnesses as provided by each department's injury tracking procedure. This data was then applied to a standardized tracking mechanism and then compiled into a database for sorting and analysis. Data tables were prepared and analyzed.

ROOT CAUSE ANALYSIS

The study team found that most departments were not completing true root cause analysis accident/incident investigations. The use of root cause analysis allows fire departments to determine what actually occurred, how the event happened, and why the event happened. It is a method that is used to analyze incidents (near-misses) as well as accidents that result in personal injury or property damage with the goal of determining the root (basic) cause of the event that can be impacted by management. This enables the safety committee to make recommendations that will prevent recurrence of the near-miss or the accident that resulted in personal injury or property damage. An organization will utilize root cause analysis to correct or eliminate the basic cause of the event and prevent the incident/accident from recurring in the future. Simply stated, it is finding the core cause of the problem and dealing with the core cause rather than simply continuing to deal with the symptoms and having recurrence of the same, or similar injuries and accidents. If we can remove and/or correct the root cause we will likely remove the majority of the symptoms that lead to the accident or incident. To complete a root cause analysis we need to accomplish four steps; 1) collect data, 2) analyze the data, i.e. develop casual factor charting, 3) identify the root cause, and 4) develop and implement recommendations.

Determining the root cause is determining the real cause of the problem and correcting the problem dealing with it rather than simply continuing to deal with the symptoms. If the investigation points to a person or a thing, it is probably a surface cause. A surface cause is the specific/unique hazardous conditions and/or unsafe actions that directly produce or contribute

to an accident. There may be multiple surface causes. These surface causes may or may not be controllable by management. A program design weaknesses is the result of a failure to develop/implement effective safety policies, programs, plans, processes, procedures, or practices for the department. Performance flaws are failures to effectively carryout safety policies, programs, plans, processes, procedures, or practices. They result in common or repeated hazardous conditions and unsafe/inappropriate performance. The root cause is the basic cause of the accident. It is either the result of a program design weaknesses or the result of performance flaws.⁶⁸

UNEXPECTED INFORMATION

THE ECONOMIC COST OF FIREFIGHTER INJURIES

When we look at the total cost of firefighter injuries in the United States, on an annual basis, the numbers become staggering. The complete cost of injuries as estimated by TriData Corporation is that the annual expenditure, nationally, for firefighter injuries and the effort to reduce firefighter injuries is between a low of \$2.8 and a high of \$7.8 billion per year.⁶⁹ Workplace costs, direct cost of lost time and overtime payments for substitute personnel; administrative costs, completing and filing paperwork, etc.; insurance costs, in the form of potentially increased premiums; pension costs, in the form of increased payments due to disability and/or early retirement expenses; cost to train replacement personnel, in the form of new employee expenses and the loss of a trained employee; and increased prevention costs, in

⁶⁸ LeSage and Dyar, April 26- 27, 2013.

⁶⁹ The Economic Consequences of Firefighter Injuries and Their Prevention, Tri-Data Corporation, August 2004.

an effort to prevent a recurrence of the injury that occurred to initiate this process are all part of the total cost of a fire department injury.

The vast majority of firefighter injuries are minor yet there continues to be each year a significant number of career ending injuries as well. In addition, the state of Washington has been averaging approximately one structural firefighter death per year.⁷⁰

Recently, there has been a great amount of fire service research that demonstrates that too many firefighter injuries are the result of a fire service culture that continues to encourage risk taking.

⁷⁰ Washington State Fire Marshal, 2011.

SECTION 6 DISCUSSION OF RECOMMENDATIONS

One of the goals of the Safety and Health Investment Project through the Washington State Department of Labor and Industries is preventing/reducing work place injuries. This particular grant to the Washington Fire Chiefs Association was developed to improve firefighter safety by enhancing the emphasis on firefighter safety, improving firefighter safety training, provide high reliability organization training, and to complete an analysis of the cause of firefighter injuries in the State of Washington.

It was felt that this is a larger problem than just this sampling – many agencies are not clear on the use of the OSHA 300A log. This, in spite of the fact, that there is a clarifying statement on the report form stating that significant work-related injuries and illnesses that are diagnosed by a physician or if there was restricted work activity, days away from work or medical treatment beyond first aid that the event must be logged, was often not the case.

Much of the data for this study was not readily accessible nor was it in a consistent, complete format. Often specific information about a firefighter injury is lacking and/or incomplete.

Despite the massive amount of data collection on firefighter injuries little progress is being made in reducing these injuries on a national basis. Each department we met with varied in their reporting procedures. There was not an Incident/Accident Report that was common. Many of the incident reports had been modified over the years. Some were quite detailed

while others were more generic in nature. Different information was documented by different agencies. Some forms were used to report all accidents/ incidents that involved personal injury, property or vehicle damage or potential third party liability while other departments separated the property and vehicle information by using a different form. It was hard to get many of the data points that would assist in the analysis of firefighter injuries to members of the Washington Fire Service. In interviews, the study team reviewed the information being requested and many felt there were some good areas that would help them in determining the root causes of their incidents (near-misses) and their accidents. There was incredible confirmation that a consistent statewide report would be of significant value.

People want to know how they compare to their peers and to national statistics. However, without the correct information being requested and provided there is an overwhelming desire to do what we have always done, that which is the easiest. It is also continuing this type of effort that produces no tangible, positive result. In the Fire Services industry, the need for documentation is paramount. The OSHA 300 form is an example. It is more of a need for clarification, training or calling Labor & Industries for assistance when questions develop. This is a report that agencies should be confident in completing the OSHA 300A and having it available to pull data from.

- 1) Utilize Labor and Industries staff when you are not sure about a safety issue. Labor & Industries staff is there to assist you and your agency.

Much of the data for this study was not readily accessible nor was it in a consistent, complete format. Often specific information about a firefighter injury was lacking and/or incomplete. Despite the massive amount of data collection on firefighter injuries little progress is being made in reducing these injuries on a national basis. Each department we met with varied in their reporting procedures. There was not a common Incident/Accident Report being utilized. Many of the incident reports had been modified over the years to suit the specific needs of the department. Some forms were quite detailed while others were very generic in nature. Different information was documented by different agencies. Some forms were used to report all accidents/incidents that involved personal injury, property or vehicle damage, or potential third party liability while other departments separated the property and vehicle information and utilized a completely different form. It was hard to retrieve many of the data points that would assist in the analysis of firefighter injuries to members of the Washington Fire Service. In interviews, the study team reviewed the information provided and assisted agencies in developing the format to determine the root causes of their incidents (near-misses) and accidents. There was incredible confirmation that a consistent statewide report would be of significant value to all of the Washington Fire Service.

People want to know how they compare to their peers and to national statistics. However, without the correct information being easily accessible there is an overwhelming desire to do what we have always done, to take the easiest path. It is also continuing this type of effort that produces no tangible, positive result.

- 2) There is not one easy-to-access, electronic site that is utilized for fire statistic reporting. The fire service needs a single firefighter injury reporting format.

The majority of fire agencies are not reviewing near-miss incidents to prevent their recurrence and there are agencies that do not have good, accurate records/reports of their own injuries, accidents, and near-misses. The use of near-miss reporting was limited. This needs to change.

- 3) Accurate reporting of injuries, accidents and near-misses needs to be mandatory to receive grants, government funding, etc.

Behavioral norms in the fire service are generally impacted by both local and national fire service culture. Indeed, studies have discovered that both local culture and national fire service culture contribute greatly to the tacit acceptance of injuries in the profession.⁷¹ Prevention of firefighter injuries is not a high priority for many fire agencies. Our fire service culture does not require it. In fact, many fire department cultures encourage very aggressive risk taking.

- 4) We need to expend the effort to change the fire service culture and consider assigning positive mentors to assist new department members in acclimating themselves to the department and to changing the department's culture.

Volunteer information appeared to be even more difficult to capture in an accurate and timely manner than that for career employees. There was often confusion on the filling out and

⁷¹ Compelling Technologies, 2008.

routing of forms from volunteer members. In some instances there was no review by the safety committee of volunteer accident/injury information. Other department's safety committee would review every incident and/or accident with the investigation and recommendations being forwarded to a supervisor and to appropriate administrative personnel. Several of the participating agencies completed excellent write-ups, investigations and in-depth reviews of incidents that resulted in recommendations being followed and Best Practices being developed for the department.

- 5) Provide additional training and incentives for every firefighter to fill out injury, accident, and near-miss reporting forms in an accurate and prompt manner.

Often specific information about a firefighter injury is lacking and/or incomplete due to lack of enforcement of policies and procedures. The vast majority of firefighter injuries are minor yet there continues to be a significant number of career ending injuries each year. In addition, there has been approximately one Line of Duty Death for the past ten year period in the state of Washington.⁷² We all know this is too many firefighter deaths. One firefighter death is too many.

- 6) Change the fire service culture to eliminate firefighter injuries and deaths in the state of Washington.

⁷² US Fire Administration, Firefighter Fatalities by State, 2011.

Activities and processes to change the fire service culture and reduce firefighter injuries need to be implemented by every fire department. One alternative is to place more emphasis on firefighter safety in all of a department's activities.

- 7) Recommendations to accomplish this include; 1) begin the shift by discussing a safety topic, 2) hold discussions of safety committee minutes, investigations, and recommendations, 3) review near-miss information from near-miss reporting sites, 4) discuss accident investigations from investigative agencies, OSHA, NIOSH, etc., 5) discuss near-misses and accidents that occur to department members, 6) emphasize safety at every level of training in the department, whether classroom or drill ground, and communicate and talk about improved firefighter safety each and every day. There are certainly many more activities and processes that a department could implement in this area that will produce very positive results. We need to emphasize safety more than what we do currently if we are going to reduce firefighter injuries.

SECTION 7 CONCLUSION

THE FUTURE

Much of the research into firefighter injuries recommends that developing a better understanding of how and why firefighter injuries occur is the beginning of reducing firefighter injuries in the United States. Many fire departments do not collect injury or near-miss data for reporting in a manner/format that is conducive to indentifying appropriate actions to reduce firefighter line-of-duty injuries and deaths. There is not any one source of statistical information that can be considered to be the definitive source on firefighter injuries. The fire service does not have a common national or statewide format for reporting and analyzing injuries or near-miss data. As a result individual fire departments and firefighters utilize injury data in a myriad of ways, some of which are effective in impacting firefighter injuries while other methods are totally ineffective.

The fire service needs to work toward the development of one reporting entity with a consistent format, with the requirement that every injury, accident, and near-miss be reported and investigated. Every agency should involve their personnel and develop and implement policies, procedures, and training to prevent firefighter injuries and accidents. The agency then needs to ensure that there is consistent enforcement of the policies, procedures, and training to prevent accidents/injuries. Everyone in the fire service must work to change the current fire

service culture that places entirely too much emphasis on risk and not a great enough emphasis on firefighter safety.

The fire service must report, investigate, and utilize all near-misses incidents to prevent recurrence and to prevent injuries and accidents. We must thoroughly investigate and seek root causes of all injuries and accidents. The goal of our Safety Committees needs to be to keep everyone safe and not to be absorbed with placing blame.

The Study Team found safety committees did not exist/function at several levels. Some departments have an inadequate number of safety committee meetings, there is often a lack of appropriate record keeping, accident investigation does not get to the root cause, there is almost no near-miss analysis, and there is often a lack of department emphasis on and commitment to firefighter safety

In a study by the International Association of Firefighters it was found that one-third of firefighter injuries were attributable to factors under the direct control of the individual firefighter and chief officers.⁷³ This is a significant number of firefighter injuries that we, the fire service, have direct control over. Think how much safer we would all be if we could collectively eliminate one out of every three firefighter injuries.

⁷³ Moore-Merrell, et al, 2008.

This does not mean that we should be overcome by this challenge. There are several credible sources of firefighter injury statistics and more, well researched papers are being written on firefighter injuries every year.

Individual fire departments need to determine what type of injuries are occurring, which injuries are causing the most concern, where the greatest cost benefit is, and from where the greatest benefit is derived. Is it in reducing fires? With fewer fires we would have less emergency responses with a corresponding decrease in injuries. Is it in increased training activities to prevent the most common injuries? Enhanced training yields more efficient, safer fireground evolutions. Or is it in a greater effort to reduce the possibility of burn injuries? Burn injuries can be one of the most devastating and costly injuries to a fire department and its firefighters.

It is very simply up to us. We have a choice to make.

Many organizations are putting a great deal of effort and funding into reducing firefighter injuries without producing a significant impact on the number of injuries that occur annually. The International Association of Fire fighters, the International Association of Fire Chiefs, the National Volunteer Firefighter Council, the National Fire Protection Association, the United States Fire Administration, among others. There is a great amount of fire service research that demonstrates that too many injuries are the result of a fire service culture.

Much of the research into firefighter injuries recommends that developing a better understanding of how and why firefighter injuries occur is the beginning of reducing firefighter injuries in the United States. Many fire departments do not collect injury or near-miss data for reporting in a manner/format that is conducive to indentifying appropriate actions to reduce firefighter injuries death. There is not any one source of statistic information that can be considered to be the definitive source on firefighter injuries. There is not a common national or statewide format for reporting injury or near-miss data. As a result individual fire departments and firefighters utilize injury data in a myriad of ways some of which are effective in impacting firefighter injuries while other methods are ineffective.

SECTION 8 AKNOWLEDGEMENTS

To all of the participating Fire Chiefs, fire departments, and the personnel who took time out of their busy schedules to meet with the study team, locate and provide the information we requested and then provide clarification when it was needed by the study team. To each of you, Thank You so very much! We simply could not have done this without you.

To the Washington Fire Chiefs Association, Thank you for allowing us to partner with you. More importantly, thank you for your support, advice and wisdom. Your staff was truly wonderful to work with.

To the Washington Department of Labor and Industries, Safety and Health Improvement Projects, thank you for developing and supporting such a worthwhile and productive program for the State of Washington. The impact from your efforts will have a significant impact on the safety of workers throughout the state.

The study team also wishes to make the point that we are indebted to the National Fire Protection association and the United States Fire Administration for the significant material of very important material that you collect, at significant expense, and then provide to fire service groups such as ourselves at no cost. You truly provide an important service to the American Fire Service.

APPENDIX A

Department:

Occupation/Department:

Describe Incident Completely:

Where Incident Occurred: _____ Date/Time: _____
am/pm

Had the injured employee worked more than 24 – 48 - 72 straight hours when the injury occurred?

Yes No

Source of Injury:

Body Part

Nature of Injury:

Treatment: None First Aid Only Doctor Hospital

Witnesses:

Management: (Do we have)

- Policy Enforcement
- Hazard Recognition
- Accountability
- Supervisor Training
- Corrective Action
- Proper Resources
- Job Safety Training
- Hiring Practices
- Maintenance of Equipment
- Adequate Staffing

Employee: (Was the employee)

Training
Previous Injury
Mental Ability
Physical Capacity
Safety Attitude
PPE Worn
Short Cuts

Equipment: (Do we have)

Proper Tool Selection
Tool Availability
Maintenance
Visual Warnings
Guarding
Vehicle

Environment: (What about)

Chemical
Temperature
Noise
Radiation
Weather
Terrain
Vibration
Ergonomics
Lighting
Ventilation
Housekeeping
Biological
Shift

Additional Causal Factors:

Faulty Equipment
Non-Employee
Prior Injury
Off –the – Job Injury
District Property Destroyed
Private Property Destroyed
District Property Lost
Private Property Lost

Best Practice to prevent reoccurrence:

BIBLIOGRAPHY

- 1 wa.gov/Safety/Topics/AtoZ/Grants/
- 2 Washington State Fire Marshal, 2010 Fire in Washington, Washington State Police Bureau, 2011.
- 3 Washington State Fire Marshal, 2011.
- 4 Fire Loss in the United States, Michael J. Karter, Jr., National Fire Protection Association, 2012.
- 5 U.S. Firefighter Injuries – 2011, Karter, Jr., Michael, and Molis, Joseph, National Fire Protection Association, 2012.
- 6 FIRST, Drexel School of Public Health website, n.d., <http://publichealth.drexel.edu/first/>
- 7 Gus Lubin, “The 15 Most Dangerous Jobs in America”, *Business Insider*, March 11, 2010.
- 8 Karter and Molis, National Fire Protection Association, 2012.
- 9 Washington State Fire Marshal, 2011.
- 10 Washington State Fire Marshal, 2011.
- 11 Karter and Molis, National Fire Protection Association, 2012.
- 12 Karter and Molis, National Fire Protection Association, 2012.
- 13 Moore-Merrell, Zhou, McDonald-Valentine, Goldstein, Slocum, Contributing Factors To Firefighter Line-of-Duty Injuries in Metropolitan Departments in the United States, International Association of Firefighters, 2008.
- 14 Karter, NFPA, 2012.
- 15 Fire-Related Firefighter Injuries Reported to NFIRS, (NA), U.S. Fire Administration, 2012.
- 16 Moore-Merrell et al, 2008.
- 17 Paul LeSage and Jeff Dyar, *High Reliability Organization Workshop*, Kelso, WA, April 26- 27, 2013.
- 18 Schein, Edgar, Organizational Culture and Leadership, Josey-Bass, 4th edition, 2010.
- 19 Burton A. Clark, *American Fire Culture: Needs Gene Therapy*, YouTube, April 2013.
- 20 Schein, Josey-Bass, 4th edition, 2010.
- 21 National Fallen Firefighter Foundation, (NA), Sixteen Firefighter Life Safety Initiatives, Firefighter Life Safety Initiative - 1, National Fallen Firefighters foundation, 2011.
- 22 Clark, *American Fire Culture: Needs Gene Therapy*, YouTube, 2013.
- 23 Edward Croker, Speaking at the funeral of a deputy chief and four firefighters, FDNY, February, 1908.
- 24 Clark, *American Fire Culture: Needs Gene Therapy*, YouTube, 2013.
- 25 Moore-Merrell et al, 2008.
- 26 Chief Alan Brunacini, Retired, Unpublished Speech, Phoenix Fire Department, 2008.
- 27 Karter, Michael, NFPA, 2012.
- 28 Manning, Bill, Unpublished Presentation, FDIC-West, Sacramento, Ca., 1994.
- 29 Firefighter Fatalities in the United States – 2012, Fahy, Rita, LeBlanc, Paul, and Molis, Joseph, National Fire Protection Association, 2013.
- 30 The Secret List, <http://www.firefighterclosecalls.com>, May 22-24, 2013.
- 31 Moore-Merrell, et al, 2008.

- 32 Moore-Merrell, et al, 2008.
- 33 Karter, NFPA, 2012.
- 34 National Fallen Firefighter Foundation, 2011.
- 35 Drexel School of Public Health website, <http://publichealth.drexel.edu/first/>
- 36 Costco, Henry, "Safety First", *FireRescue Magazine*, December, 2011.
- 37 Collecting Injury and Near-Miss Data Can Improve Safety, Lauren Johnson, EFO Program, National Fire Academy, n.d.
- 38 Multicultural Health and Safety Research Project Final Report, Fire 20/20, 2007.
- 39 Karter, NFPA, 2012.
- 40 Karter, NFPA, 2012.
- 41 Karter, NFPA, 2012.
- 42 Levesque, Paula, Trends and Patterns of U,S, Fire Losses in 2011, National Fire Protection Association, 2012.
- 43 USFA, 2012.
- 44 Levasque, NFPA, 2012.rter, NFPA, 2012.
- 45 Karter, NFPA, 2012.
- 46 Karter, NFPA, 2012.
- 47 USFA, 2012.
- 48 Karter, NFPA, 2012.
- 49 USFA, 2012.
- 50 Karter, NFPA, 2012.
- 51 USFA, 2012.
- 52 Washington State Fire Marshal, 2012.
- 53 Karter, NFPA, 2012.
- 54 USFA, 2012.
- 55 Karter, NFPA, 2012.
- 56 Moore-Merrell, et al, 2008.
- 57 Moore-Merrell, et al, 2008.
- 58 Karter, NFPA, 2012.
- 59 Karter, NFPA, 2012.
- 60 USFA, 2012.
- 61 An Analysis of Volunteer Firefighter Injuries, 2009-2011, Karter, Jr., Michael J., National Fire Protection Association, 2013.
- 62 Karter, National Fire Protection Association, 2013.
- 63 Karter, National Fire Protection Association, 2013.
- 64 USFA, 2012.
- 65 USFA, 2012.
- 66 "MANAGING AND CHANGING BEHAVIOR: Decreasing Firefighter Strain and Sprain Injuries", Rob Carnahan, Compelling Technologies, 2008.
- 67 Moore-Merrell, et al, 2008.
- 68 LeSage and Dyar, April 26- 27, 2013.
- 69 The Economic Consequences of Firefighter Injuries and Their Prevention, Tri-Data Corporation, August, 2004.
- 70 Washington State Fire Marshal, 2011.

71 Compelling Technologies, 2008.

72 US Fire Administration, Firefighter Fatalities by State, 2011.

73 Moore-Merrell, et al, 2008.