MT Worker Health

Montana Occupational Health & Safety Surveillance

Firefighters in Montana: Health & Safety Issues

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Montana Department of LABOR & INDUSTRY

Table of Contents

Report Summary 3

Background: Firefighter Health & Safety 4

Data Review: Firefighter Health & Safety Issues 7

- Workers' Compensation Claims Summary - Firefighters, Montana 2007-2017 8
- Claim Injury Types for Specific Firefighter Services 13
- Injury Spotlight: Back Strains from Lifting 15
- OSHA Recordable Injuries – Firefighters 17
- Firefighter Fatalities in Montana 18
- Cancer in Firefighters 19

Resources: Firefighter Health & Safety Issues 20

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Montana Occupational Health & Safety Surveillance Program (MOHSS)

For more information on health and safety issues impacting Montana, or for questions about this report, please visit our research program's webpage at **www.mtworkerhealth.com**.

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Report Summary

The job of a firefighter encompasses many duties and presents many challenges. Every fire and emergency call is unique and sometimes unpredictable, presenting numerous opportunities for injury and illness on the job. The purpose of this report is to reveal the lessons learned from examining occupational health data on the exposures and risks that firefighters face on the job in Montana.

MAJOR TAKEAWAYS FROM THE DATA:

Emergency or medical services accounted for about 22% of all workers' compensation claims filed by firefighters.

- Structural firefighting services and wildland firefighting services each resulted in about 11% of all firefighter claims.

The months of injury with the highest percentage of firefighter claims were August (12%), May (10%), and July (10%).

Back strains from lifting were the most common specific injury for all firefighter claims (9%).

- Over half of back strain injuries from lifting occurred during emergency/EMS/medical services.
- Firefighters aged 35-44 had the highest proportion (45%) of back strain injuries from lifting (78 out of 174 total claims with back strains from lifting).

The top two cancers diagnosed in firefighters in Montana from 2011 to 2015 were prostate (14% of total cancers diagnosed) and lung & bronchus (11% of total cancers diagnosed).

- The most frequent cancers diagnosed in firefighters were also among the top cancers among men in all other occupations.

There were 5 deaths among firefighters on the job in Montana from 2007 to 2017.

- The situations leading to these worker deaths included a plane crash, a helicopter crash, a truck collision, and two events of firefighters being struck by falling trees.

Background: Firefighter Health & Safety

The job duties of a firefighter include controlling and extinguishing fires, as well as responding to emergencies where the environment, property, or a life is in danger or at risk. Firefighters work in conditions and environments that potentially increase the risk of injuries, illnesses, and fatalities. Firefighters may be involved in a variety of tasks, including search and rescue, emergency response and medical services, disaster assistance, fire prevention, and hazardous material response.[1]

Based on the 2016 National Fire Experience Survey, an estimated 62,085 injuries among firefighters occurred in the line of duty in the United States in 2016.[2] These injuries occurred more frequently at the fireground (39.2%), which includes all activities from arrival at the fire scene to departure, and includes structure fires, brush fires, vehicle fires, and other fires.[2] The most common injuries during fireground operations were strains, sprains, and muscular pain (45.7%).[2] Overexertion or strains were the leading cause of fireground injuries nationally (27.1%).2 Falls, jumps, or slips resulted in 21.0% of injuries, and exposure to fire products resulted in 13.6% of fireground injuries.[2]

The fire service industry has higher rates of non-fatal injuries compared to other occupations in the United States.[3] Firefighters face various harmful health conditions, including respiratory issues, ergonomic issues, and exposure to extreme temperatures. Firefighters often need to place their bodies in awkward positions that can strain muscles. Back injuries are a common injury, often resulting from overexertion or poor ergonomics that can be difficult to address in firefighter's unique work environments.[4] Back injuries can result from many activities, including the lifting of patients.[4] Firefighters are required to wear protective clothing to shield them from harsh working conditions. The required clothing is typically heavy and bulky with limited ability for sweat to evaporate.[5] The multi-layered clothing adds weight to the individual that can add strain on the cardiovascular system.[6] Exposure to uneven or tough terrain may have the potential to increase musculoskeletal diseases.[7] A survey of 545 current wildland firefighters showed evidence of a significant relationship between longer work histories of wildland firefighting and high blood pressure, heart arrhythmia, and previous knee surgery.[7]

Firefighters in the United States have an increased risk of cancers due to exposures in the work environment. Specific types of cancer that are prevalent include digestive, oral, respiratory, and urinary cancer.[8] Malignant mesothelioma, a rare cancer linked to asbestos exposure, has also been shown to occur more frequently in firefighters.[8]

Respirators are often used to control for inhalable particles, but can cause discomfort if not fitted properly. According to the National Institute for Occupational Safety and Health (NIOSH), the only acceptable respiratory protection is a full-face pressure demand self-contained breathing apparatus (SCBA).[9] SCBAs are not always practical in the field of firefighting due to weight, limited service life, and bulk. Firefighters may also show a decreased work capacity when wearing a respirator due to increased breathing resistance, heat stress, and respirator weight.[9] Currently, neither NIOSH nor the National Fire Protection Association have any standards regarding respirator use for wildland firefighters.[9] In addition to challenges in respirator use, exposure to various types of building materials has become more of a health concern in recent decades.[10] Firefighters may inhale toxic airborne particles from chemical-based synthetic products during the burning process if they are not wearing a proper respirator in the correct way.[10]

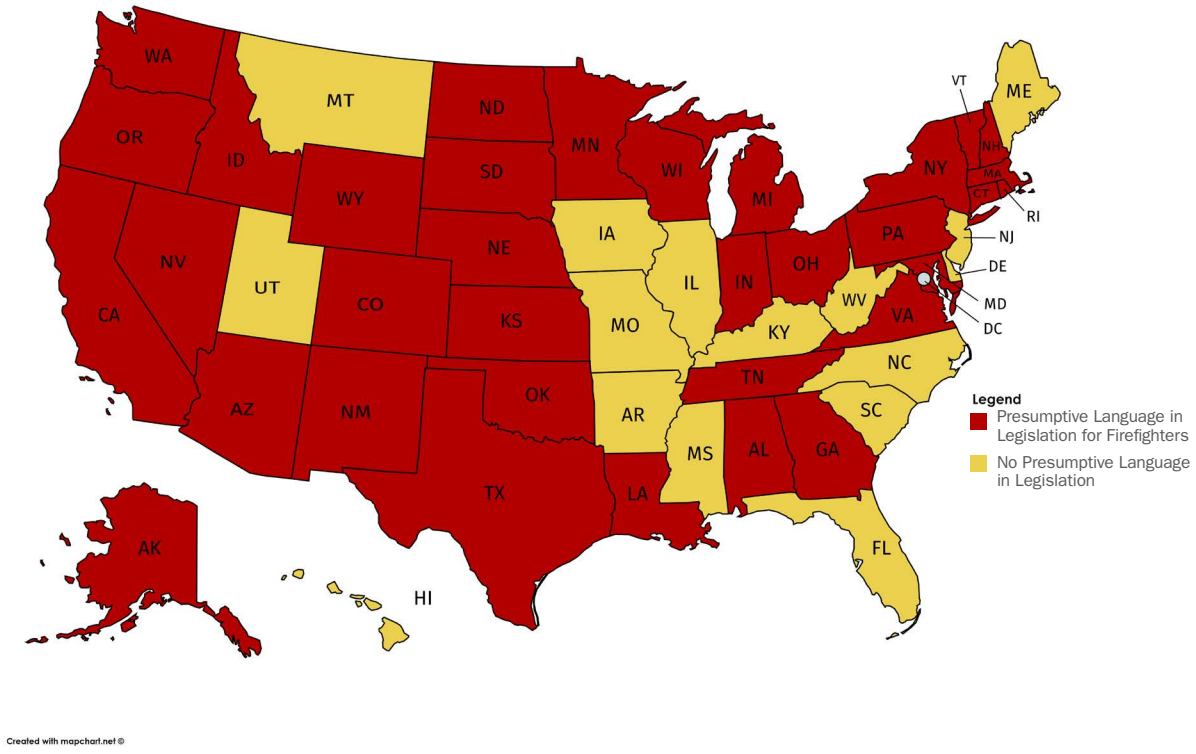
Firefighting is not only a physically challenging career, but also a mentally demanding one. The job responsibilities of firefighters have changed throughout the decades. Today, firefighters are heavily relied upon in a variety of situations, specifically for emergency response.[11] Some emergencies may involve harmed children, severe injuries, death, and other traumatic events. Repeated exposure to traumatic events can negatively impact a firefighter's mental health.[11] Repeated exposure to trauma has been associated with depression in firefighters, and includes higher rates of alcohol use and binge drinking when compared to the public.[11] Although there are firefighters who report one specific event that leads to negative impacts, many firefighters claim that several events negatively affect their mental health.[11]

The job of a firefighter encompasses many duties and presents many challenges. Every fire and emergency call is unique and sometimes unpredictable, presenting numerous opportunities for injury and illness on the job. The purpose of this report is to reveal the lessons learned from examining occupational health data on the exposures and risks that firefighters face on the job in Montana. Studying and understanding the exposures and outcomes that Montana firefighters face can lead to further education and preventative actions to reduce the dangers and risks that are involved in firefighting.

Presumptive Illness for Firefighters in Montana

In recent legislative sessions in Montana, attempts have been made to pass a "presumptive illness" bill for firefighters diagnosed with certain diseases. The purpose of a "presumptive illness" bill is to cover expenses that firefighters incur if they are diagnosed with certain lung diseases. Payment is based on completed years of service. Numerous states have presumptive legislation for firefighters (in red in the map below), including 33 states that cover one or more cancers under workers' compensation. In 2017, Senate Bill 72 was introduced to cover these presumptive illnesses under workers' compensation, but the bill ultimately died in committee (full details of SB 72 can be found at **http://leg.mt.gov/bills/2017**).

Presumptive Legislation Coverage for Firefighters in the United States



Source: First Responder Center for Excellence – Presumptive Legislation for Firefighter Cancer

Data Review: Firefighter Health & Safety Issues

Workers' Compensation Claims Summary - Firefighters, Montana 2007-2017

There were 1,989 total workers' compensation claims filed by firefighters with dates of injury between 2007 and 2017 in Montana. Workers' compensation claims data can provide useful details on work-related injuries that resulted in a claim being filed. However, not every injury results in a workers' compensation claim being filed, and this data reflects information as reported on workers' compensation claims. Claims filed by federal government employees are not included in the Montana workers' compensation data. The claim counts and descriptions in this section were for all claims filed, including claims that were filed for injuries but not necessarily accepted by the workers' compensation insurance company as an accepted claim. All claims data was queried from the workers' compensation data system (WCAN) at the Montana Department of Labor & Industry.

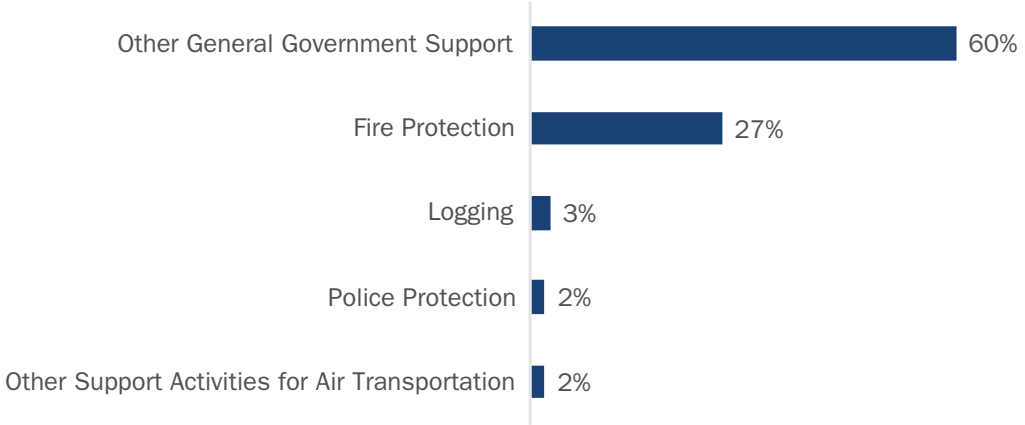
These firefighter claims were selected by searching for these workers' compensation occupation class codes in the workers' compensation claims database:

- Firefighters & drivers *(occupation class code 7704)*
- Forest or wildland firefighting *(occupation class code 7710)*
- Firefighters and drivers – volunteers *(occupation class code 7711)*
- Aviation – aerial firefighting – flying crew *(occupation class code 7420)*

The majority of the firefighter claims (97%) were under the firefighter & drivers (7704) class code.

Total Number of Workers' Compensation Claims Filed by Year of Injury, Montana 2007-2017

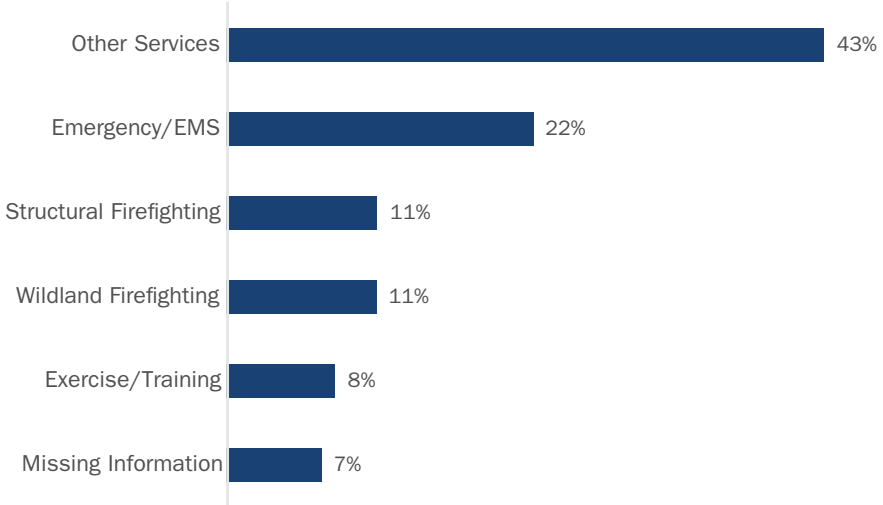
Percent of Firefighter Claims by Industry (NAICS 6 Digit Codes), Montana 2007-2017



Note: The "Other General Government Support" industry class includes general services provided by local government entities (e.g. cities, counties), which encompasses firefighters employed by cities or counties.

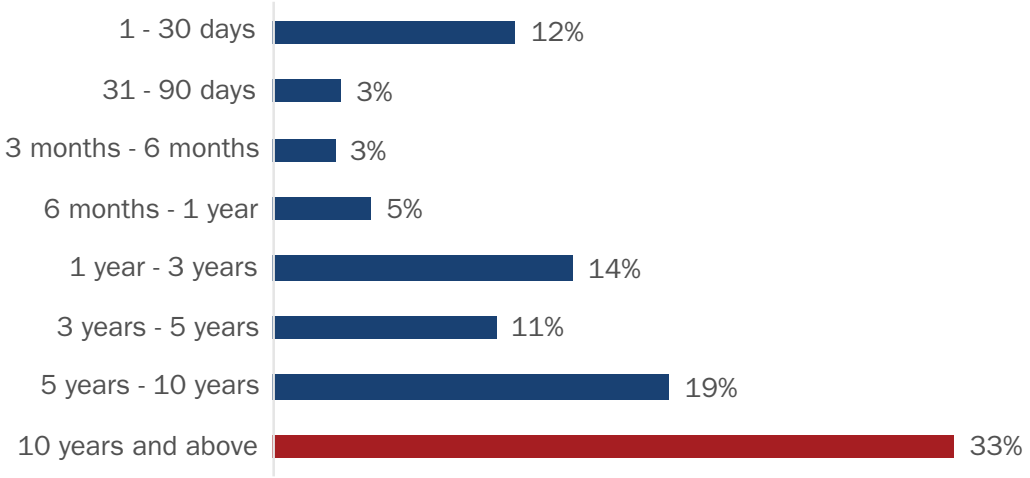
The firefighter claims were also put into different "service type" categories to further investigate the circumstances surrounding these injuries that resulted in claims. Service Type was determined using multiple factors by researchers, but was primarily based on available accident descriptions and employer information. The classification group of "other services" included claims that were not otherwise classified by the service type categories (e.g. snow removal, maintenance, cooking, etc.), or claims that did not contain enough information to determine the service type.

Percent of Firefighter Claims by Assigned Service Type, Montana 2007-2017

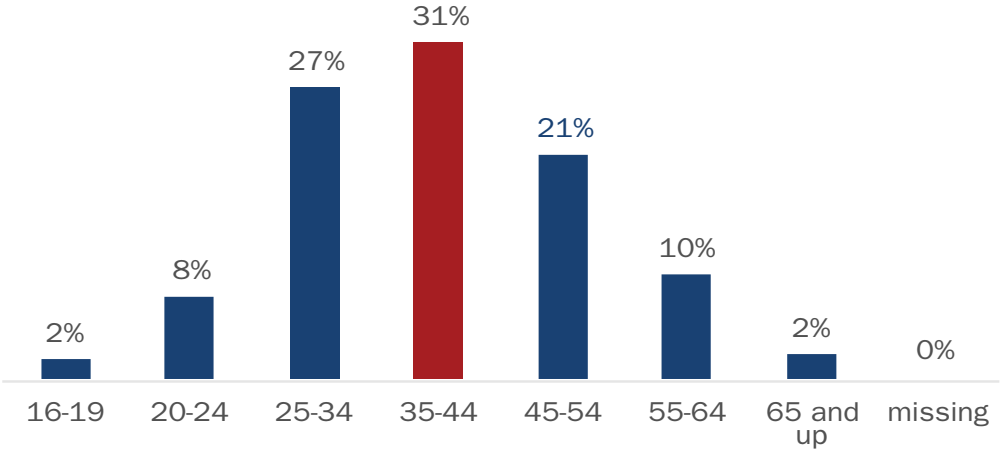


About 22% of all firefighter claims were filed for injuries that occurred during emergency or medic services. Structural firefighting services and wildland firefighting services each resulted in about 11% of all firefighter claims.

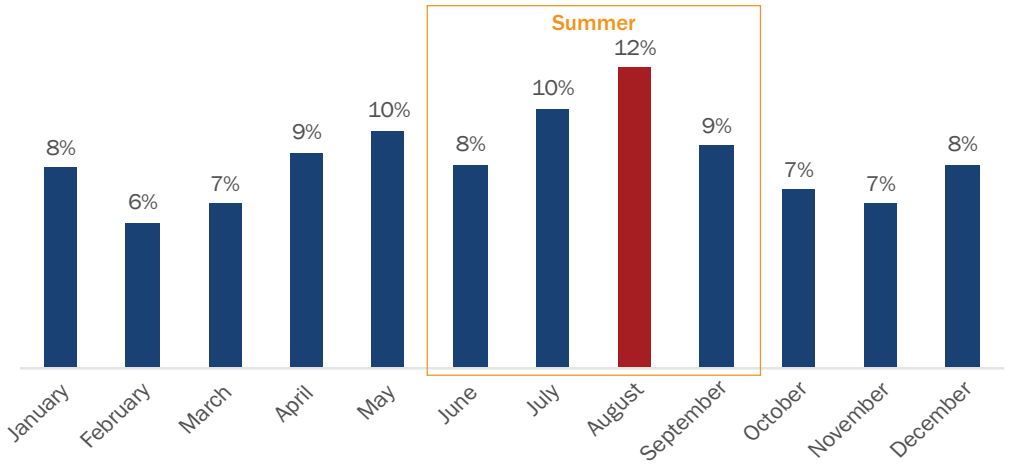
Percent of Firefighter Claims by Time with Employer (Based on Hire Date), Montana 2007-2017



Percent of Firefighter Claims by Age Group, Montana 2007-2017

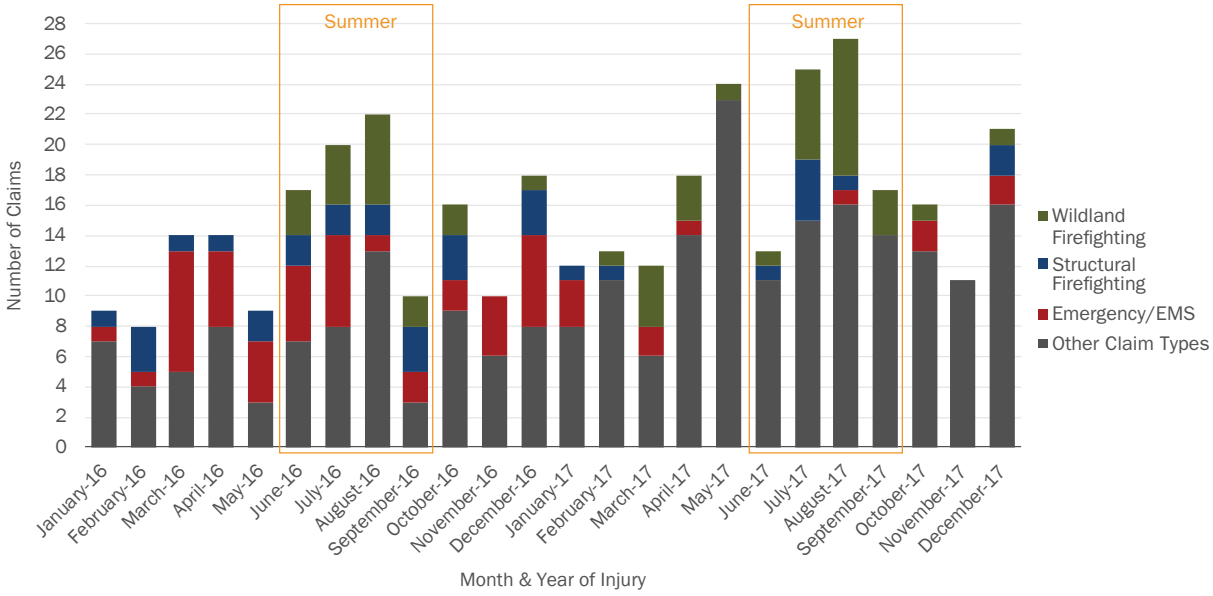


Percent of Firefighter Claims by Month of Injury Montana 2007-2017



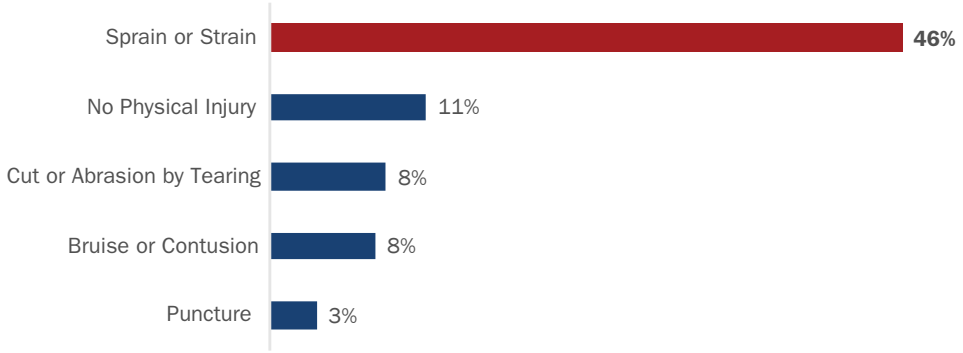
The months with the highest percentage of firefighter claims were August (12%), May (10%), and July (10%) from 2007 to 2017 (based on date of injury).

Count of Firefighter Claims by Assigned Service Type by Month, Montana 2016-2017



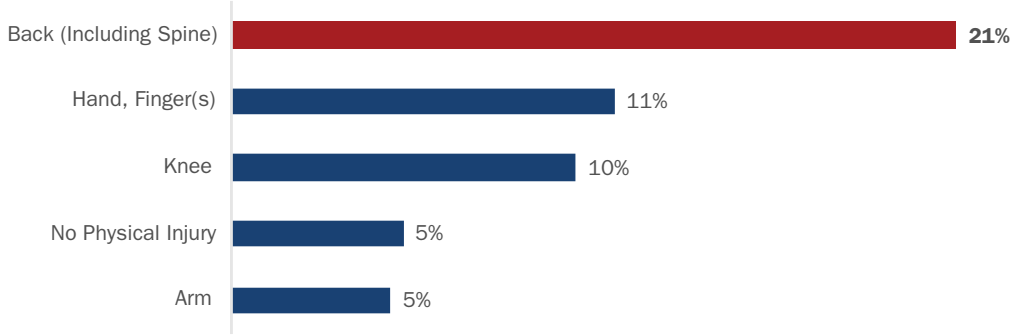
The 2017 fire season was Montana's most severe fire season on record. In 2017, 2,420 fires burned 1.4 million acres across the state, according to the Northern Rockies Coordination Center (NRCC). This extreme fire season was reflected in the increased number of firefighting claims in the summer of 2017.

Top Five Natures of Injury (Percent of All Firefighter Claims), Montana 2007-2017



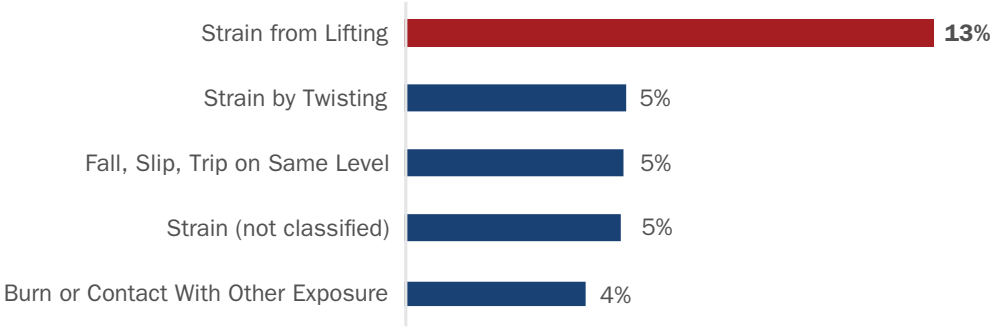
Note: "No Physical Injury" include natures such as exposure to bodily fluids or diseases, traumatic experiences, exposure to harmful substances, or dizziness.

Top Five Parts of Body (Percent of All Firefighter Claims), Montana 2007-2017



Note: "No Physical Injury" in the part of body description includes mental health issues (not a specific physical part).

Top Five Causes of Injury (Percent of All Firefighter Claims), Montana 2007-2017



The most common nature of injury among firefighter claims was **sprain or strain.** The most common part of body injured was the **back, including the spine.** The most common cause of injury was **strain from lifting.**

Claim Injury Types for Specific Firefighter Services

When a workers' compensation claim for an injury is filed, the injury is classified by the part of body affected, cause of the injury, and the nature of the injury. *Claims filed for injuries that are classified below as "no physical injury" may include claims where a patient was exposed to an infectious disease or agent.*

Top 3 Parts of Body for Each Firefighter Service Type (% of Service Type), Montana 2007-2017

	Emergency/ EMS		Structural Firefighting		Wildland Firefighting		Exercise/ Training		Other Services	
Part of Body	Back, including spine	31%	Back, including spine	19%	Back, including spine	12%	Back, including spine	25%	Back, including spine	18%
	Hands, finger(s)	15%	Lungs	18%	Internal organs	11%	Knee	12%	Knee	12%
	No physical injury	12%	Knee	10%	Knee	9%	Internal organs	9%	Hands, finger(s)	12%

Injuries of the **back, including the spine,** were the most frequent injury types across all service types. Knee injuries were the second most common injury across multiple firefighter service types.

Top 3 Causes of Injury for Each Firefighter Service Type (% of Service Type), Montana 2007-2017

	Emergency/ EMS		Structural Firefighting		Wildland Firefighting		Exercise/ Training		Other Services	
Cause of Injury	Strain from lifting	28%	Dust, gas, or fumes (inhaled or contact)	12%	Fall, slip, or trip on same level	11%	Strain (not otherwise classified)	20%	Strain from lifting	7%
	Burn or contact with other exposure	12%	Strain by twisting	9%	Radiation burn or exposure	10%	Strain from lifting	17%	Fall, slip, or trip on ice or snow	6%
	Puncture, cut, or scrape (not otherwise classified)	7%	Fall, slip, or trip on same level	7%	Strain by twisting	7%	Strain by twisting	7%	Strain by twisting	5%

Strains from lifting and strains from **twisting** were the most common injury types across multiple firefighter service types.

Top 3 Natures of Injury for Each Firefighter Service Type (% of Service Type), Montana 2007-2017

	Emergency/ EMS		Structural Firefighting		Wildland Firefighting		Exercise/ Training		Other Services	
Nature of Injury	Sprain, strain	48%	Sprain, strain	45%	Sprain, strain	34%	Sprain, strain	61%	Sprain, strain	47%
	No physical injury	22%	No physical injury	20%	Cut or abrasion by tearing	12%	Bruise or contusion	8%	Bruise or contusion	10%
	Puncture	9%	Bruise or contusion	7%	Bruise or contusion	9%	No physical injury	8%	Cut or abrasion by tearing	10%

Sprains and **strains** were the most common nature of injury for each firefighter service type. Bruises or contusions were also common across multiple service groups. Sprains and strains occur at high rates across workers' compensation in Montana and the nation as a whole.[12, 13]

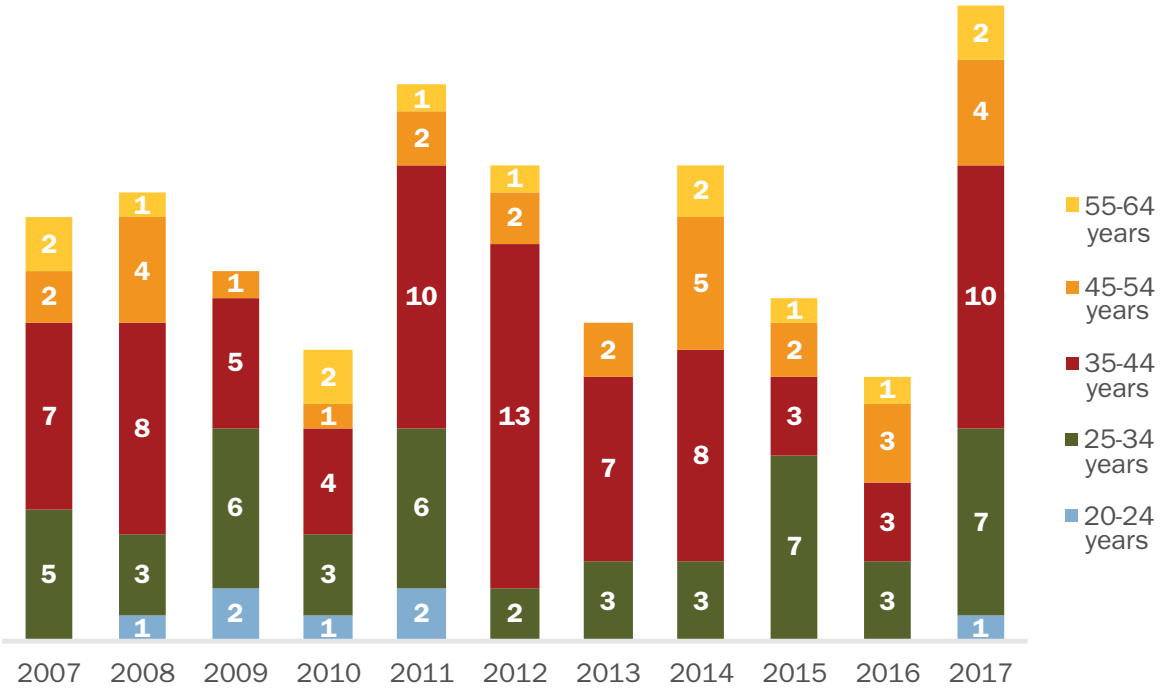
Injury Spotlight: Back Strains from Lifting

Top 15 Injury Types (Combining Part, Cause, and Nature of Injury), All Firefighter Claims, 2007-2017

Specific Injury Description	Count	Percent of All Claims
Back Strain from Lifting	**174**	**9%**
Contact with Harmful Substances or Bodily Fluids	34	2%
Knee Strain (cause not classified)	32	2%
Knee Strain from Twisting	29	1%
Back Strain Pushing or Pulling	29	1%
Back Strain Holding or Carrying	25	1%
Psychological Stress, Shock, or Trauma	24	1%
Back Strain (cause not classified)	24	1%
Shoulder Strain from Lifting	24	1%
Foreign Matter in Eye(s)	22	1%
Inhalation of Dust, Gas, or Fumes (Lungs)	22	1%
Back Sprain or Strain from a Fall, Slip, or Trip on Ice or Snow	22	1%
Puncture, Cut, or Scrape of Hand or Fingers	21	1%
Back Strain by Twisting	21	1%
Knee Sprain or Strain from a Fall, Slip, or Trip from Elevation	19	1%

Back strains from lifting were the most common specific injury for all firefighter claims (9%).

Back Strain Injuries from Lifting by Age Group, All Firefighters, 2007-2017



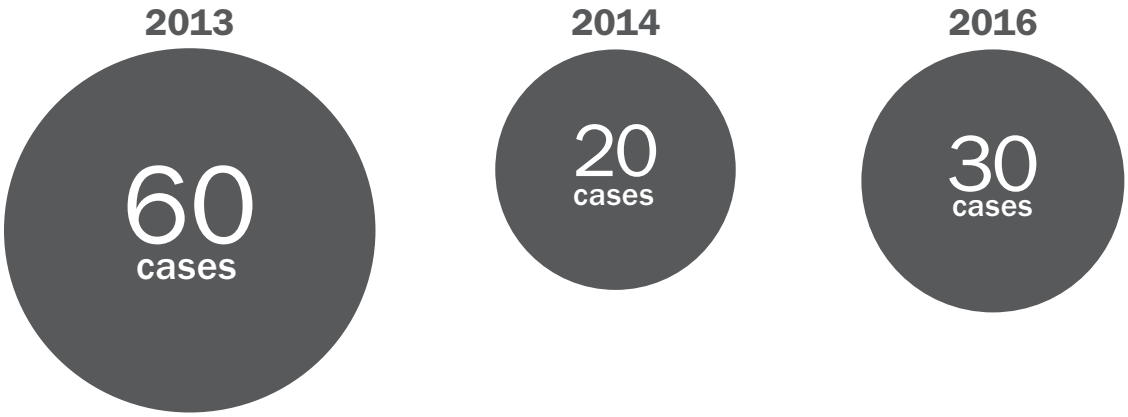
Firefighters aged **35-44** had the highest number of back strain injuries from lifting (78 claims).

Over half of back strain injuries from lifting occurred during **emergency/EMS/ medical services.**

OSHA Recordable Injuries – Firefighters

The Bureau of Labor Statistics Survey of Occupational Injuries and Illnesses (SOII) uses data collected from employers on OSHA recordable injuries to describe work-related injuries for different industries and occupations across the country. This survey is mandatory for private employers, but is voluntary for state and local government, and does not include federal government employees. Given the nature of employment for firefighters in Montana, this data source may not provide the most complete picture of firefighter injuries, but insights can still be made into the health and safety issues that Montana firefighters face.

Non-Fatal Work-Related Injuries Involving Days Away from Work for Firefighters in Montana



Note: Specific summary data was not published by BLS SOII for firefighters in 2011, 2012, or 2015.

Of the 110 cases among firefighters reported by the BLS SOII data during 2013, 2014, and 2016:

91%
- worked over 5 years with the employer (100 cases)

55%
- musculoskeletal disorders (60 cases)
- overexertion and bodily reaction events (60 cases)

45%
- sprains, strains, or tears (50 cases)

36%
- workers 35-44 years old (40 cases)

18%
- workers 45-54 years old (20 cases)
- involved 11-20 days away from work (20 cases)
- involved 21 or more days away from work (20 cases)
- fall, slip, or trip events (20 cases)
- trunk injuries (20 cases)
- upper extremities injuries (20 cases)

Firefighter Fatalities in Montana

From 2007 to 2017, there were 5 deaths among firefighters on the job in Montana. The circumstances leading to these worker deaths included a plane crash, a helicopter crash, a truck collision, and two events of firefighters being struck by falling trees. This information is based on publishable death certificate data from the Vital Statistics Analysis Unit at the Montana Department of Public Health and Human Services.

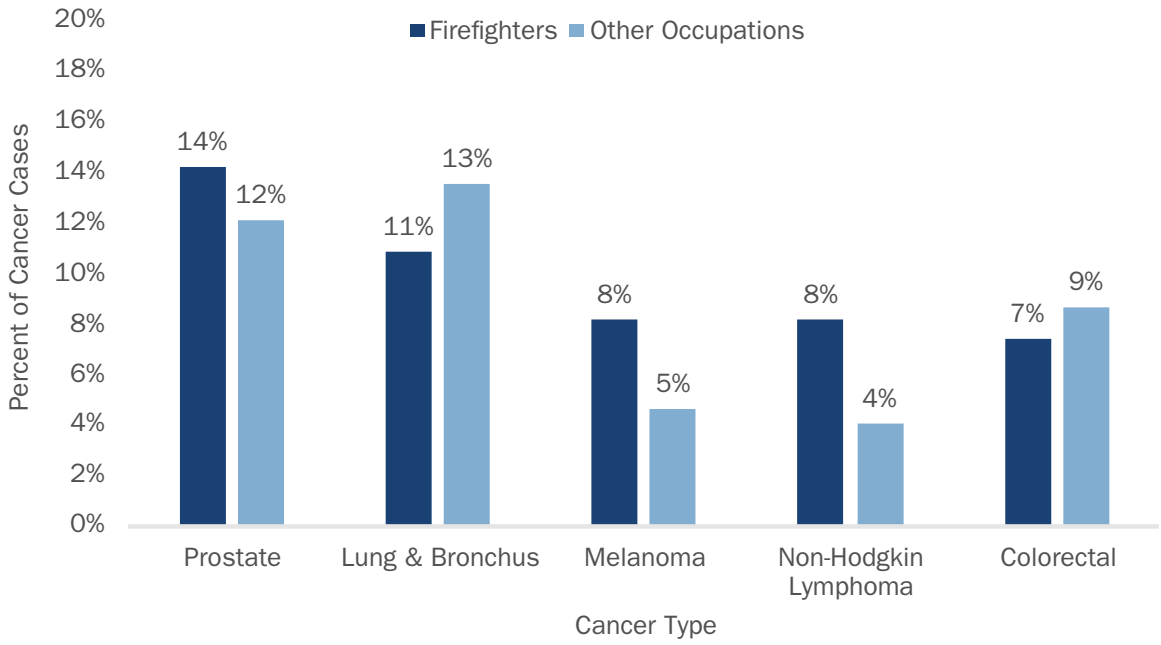
Cancer in Firefighters

From 2011 to 2015, there were 148 cases of cancer diagnosed in Montana where the occupation provided was "firefighter," according to the Montana Central Tumor Registry (0.5% of all cancers diagnosed). Other occupations were listed in 38% of the diagnosed cases, and 61% of diagnosed cases did not have a known occupation listed.

The top two cancers for firefighters were prostate (14%) and lung and bronchus (11%). The top two cancers for all other occupations were breast (15%) and lung and bronchus (14%). The majority of cancer diagnoses for firefighters were among males (89%), while a little over half of the cancer diagnoses for the other occupations were male (52%). According to the Bureau of Labor Statistics Current Population Survey, only 17% of all firefighters employed in Montana in 2016 were female, which is reflected in the demographics of the cancer diagnoses among firefighters compared to other occupations.

It is important to note that 60% of the cancer diagnoses in the tumor registry did not have a known occupation listed, so the data presented on firefighters and other occupations only represents information for 40% of all cancer diagnoses from 2011-2015.

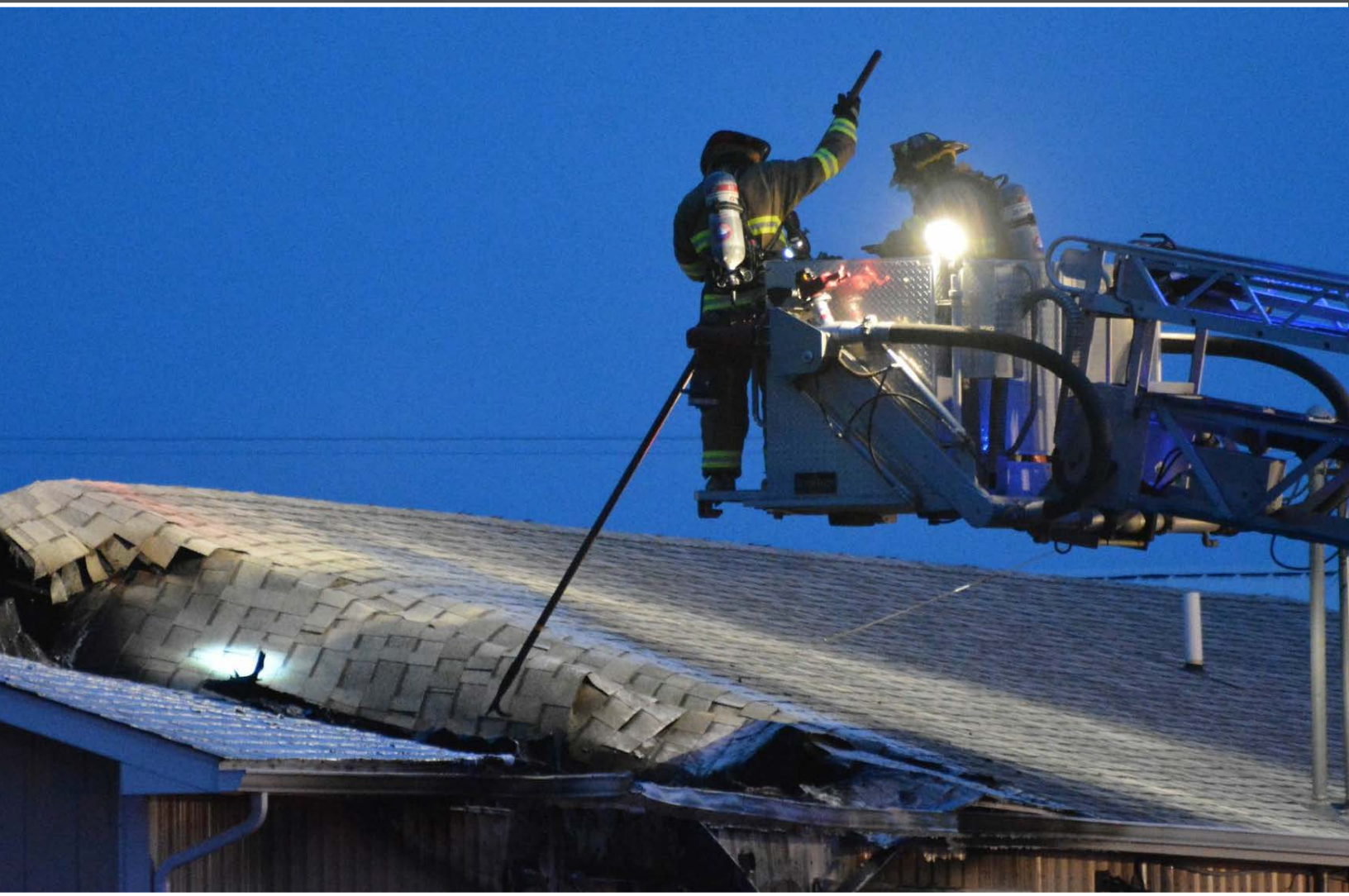
Top 5 Cancers for Firefighters, Compared to Other Occupations in Montana, 2011-2015



Data Source: Montana Central Tumor Registry

The most frequent cancers diagnosed in firefighters were also among the top cancers among men in all other occupations from 2011-2015. The top two cancers for firefighters were prostate (14%) and lung & bronchus (11%).

Resources: Firefighter Health & Safety Issues



Ergonomics

Musculoskeletal injuries are one of the most common injuries among firefighters in Montana, based on our review of workers' compensation claims and Bureau of Labor Statistics data. In particular, sprain and strain injuries and injuries of the back affect many firefighters each year. The high numbers of these types of injuries among firefighters can be explained by the physically-intensive work of firefighters. However, ergonomic interventions can help prevent some of these musculoskeletal injuries. The United States Fire Administration states that "it is through learning to recognize poorly designed equipment and unsafe job practices that improvements can be made, and injury and lost time be lessened."

- An ergonomics training program for fire and emergency medical personnel from the University of Oregon is available at **https://osha.oregon.gov/edu/grants/train/Pages/Firefighter-and-Emergency-Medical-Services–Ergonomics-Curriculum.aspx**. The program includes an instructor's guide, slides, and handouts on ergonomic hazard analysis, ergonomic solutions, body mechanics and back health, and command staff ergonomics.
- The Oregon Coalition for HealthCare Ergonomics has collection of safe patient handling resources specifically targeted for firefighters and emergency medical services personnel (**www.hcergo.org/ems**).

Exposure to Harmful Substances

Firefighters and other emergency medical personnel may be exposed to bloodborne pathogens when working with subjects on emergency calls. In our review of the workers' compensation claims data, there were 34 noted cases of exposure to harmful substances or bodily fluids from 2007 to 2017. Closer examination of those claims revealed that firefighters were frequently exposed to blood and other bodily fluids from patients on an emergency call.

- A helpful fact sheet on preventing exposures to bloodborne pathogens among paramedics is available from the National Institute for Occupational Safety and Health. The lessons learned from this fact sheet might be helpful for firefighters on emergency calls as well (**https://www.cdc.gov/niosh/docs/wp-solutions/2010-139**).

Emergency first responders, including firefighters, have the potential to come in contact with fentanyl while responding to calls. Fentanyl and its analogues come in powder, tablet, and liquid forms, and "potential routes of greatest concern include inhalation, mucous membrane contact, ingestion, and percutaneous exposure (e.g., needlestick)," according to NIOSH. Firefighters responding to emergency medical calls may come into contact with these harmful substances if there are drugs or drug paraphernalia around the patients.

- Fact sheets on safe handling of suspected drugs by first responders by job type are available via the Fentanyl Safety for First Responders webpage (**https://www.fentanylsafety.com/job-specific**).
- Detailed information on preventing occupational exposure to fentanyl and its analogues among first responders is available from the National Institute for Occupational Safety and Health (**https://www.cdc.gov/niosh/topics/fentanyl/risk.html**).

Wildland Firefighting

Wildland firefighters face unique hazards ranging from burnovers and entrapments, heat-related illnesses, cardiac deaths, and rhabdomyolysis. The job of a wildland firefighter involves prolonged physical exertion, extremely hot environments, and remote work sites. These factors put wildland firefighters at high risk for poor nutrition, overexertion, and dangerous heat-related conditions. Rhabdomyolysis is a very serious condition that results from the rapid breakdown of damaged muscle tissue. Wildland firefighters have an increased risk of "rhabdo." Early detection and treatment of rhabdomyolysis is critical to prevent serious heart and kidney damage.

- A new fact sheet on "What Wildland Firefighters Need to Know About Rhabdomyolysis" is available from NIOSH - **https://www.cdc.gov/niosh/topics/firefighting**
- The "Wildland Fire Fighting - Hot Tips to Stay Safe and Health" fact sheet from NIOSH provides helpful information on hazards faced on the fireline, recommended health and safety practices, and information for supervisors - **https://www.cdc.gov/niosh/docs/2013-158**
- Structural firefighters are also at high risk for rhabdomyolysis, the serious medical condition discussed previously for wildland firefighters. A similar fact sheet from NIOSH is available on rhabdomyolysis for structural firefighters (**https://www.cdc.gov/niosh/docs/2018-133**).

Other Health & Safety Resources

- In addition to the resources provided in this report, NIOSH has an entire page devoted to health & safety resources for firefighters, and can be found at **https://www.cdc.gov/niosh/firefighters/default.html**.
- Self-Contained Breathing Apparatus (SCBA) Evaluation in Support of Fire Service **https://www.cdc.gov/niosh/npptl/ppe-fireservice/default.html**
    - This National Personal Protective Technology program at NIOSH shares SCBA performance with firefighters and other stakeholders.
- Preventing Fire Fighter Fatalities Due to Heart Attacks and Other Sudden Cardiovascular Events **https://www.cdc.gov/niosh/docs/2007-133**
    - This NIOSH Health Alert shares critical information on how fire departments can prevent deadly cardiovascular events on the job.

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