TITLE PAGE

Award Closeout Report
National Institute for Occupational Safety and Health (NIOSH)
Centers for Disease Control and Prevention (CDC)

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List of Terms and Abbreviations:

- IFSAC = International Fire Service Accreditation Congress
- NFCS = National Firefighter Cancer Symposium
- NFPA = National Fire Protection Association
- NIOSH = National Institute for Occupational Safety and Health
- USPTF = United States Preventive Services Task Force

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ABSTRACT

Project Title: 2019 State of the Science Firefighter Cancer Symposium

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The Inaugural 2019 State of the Science Firefighter Cancer Symposium was held on Monday, June 10, 2019 and Tuesday, June 11, 2019 from 7:00 AM to 5:45 PM each day at the Donna E. Shalala Complex Center located in the University of Miami Coral Gables campus, Miami Florida. The primary goal of 2019 State of the Science Firefighter Cancer Symposium was to support foster conversation and knowledge sharing on the reduction of cancer risk in the U.S. fire service by addressing critical barriers in scientific knowledge including the development of uniform data collection instruments, exposure assessment, better understanding of cancer mechanisms, effective cancer screening and inclusion of potentially vulnerable groups such as women and racial/ethnic minority firefighters. During the Inaugural 2019 State of the Science Firefighter Cancer Symposium, 307 attendees were invited to participate in breakout discussion sessions following the plenary and panel speakers each day. Among all registered attendees, 46.9% were from the Fire Service, 24.4% were from Academia, 12.1% from Industry and 16.6% self-identified as Other (i.e., Healthcare entity, federal/state government, etc.). Attendees were invited to participate in breakout discussion sessions following the plenary and panel speakers each day. Attendees were able to choose their discussion group based on topic. All groups were facilitated by experts in the field specific to the topic of interest. The scientific presentations guided the topics of discussion including: Epidemiology of Cancer in Firefighters, Biomedical Studies, Exposure Studies, Cancer Screening and Prevention, Survivorship, Firefighter Subgroups, Modifiable Risk Factors and Education and Training. All breakout sessions were audio recorded and then transcribed word for word. Data were analyzed by a process guided by the principles of thematic analysis. The main theme that emerged from all group discussions was “Communication is essential for progress.” Although, each group’s topics were different, the key theme that emerged was the need to increase communication. It was suggested that communication could be improved between the leaders in academia and the fire service as well as members of the fire service and their leadership. In addition to these organizational lines of communication, it was reported that communication at an individual level between co-workers and family members would help improve the outcomes in firefighter cancer. We see this theme throughout the breakout sessions. Attendees consistently report that significant and ground-breaking work is being done in the scientific community, however it usually takes a significant amount of time to reach the fire service. Following the inaugural 2019 firefighter cancer symposium, planning began for the 2020 national firefighter cancer symposium and was held February 27-29, 2020 in Miami, Florida (http://sylvester.org/firefighters/nfcs). This NIOSH R13 catalyzed the need for further national research symposium to update the fire service on the latest science on cancer prevention for the firefighter workforce. Summary discussions of the conference were circulated by various firefighter professional organizations, government entities, insurance companies, and academic institutions.

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SECTION #1

Significant or Key Findings: The of 2019 State of the Science Firefighter Cancer Symposium took place on Monday, June 10, 2019 and Tuesday, June 11, 2019 from 7:00 AM to 5:45 PM each day. The conference venue was the Donna E. Shalala Complex Center, a 120,000-square-foot meeting facility located in the University of Miami Coral Gables campus, Miami Florida. The primary goal of 2019 State of the Science Firefighter Cancer Symposium was to support foster conversation and knowledge sharing on the reduction of cancer risk in the U.S. fire service by addressing critical barriers in scientific knowledge including the development of uniform data collection instruments, exposure assessment, better understanding of cancer mechanisms, effective cancer screening and inclusion of potentially vulnerable groups such as women and racial/ethnic minority firefighters. During the Inaugural 2019 State of the Science Firefighter Cancer Symposium, 307 attendees were invited to participate in breakout discussion sessions following the plenary and panel speakers each day. Attendees were able to choose their discussion group based on topic. All groups were facilitated by experts in the field specific to the topic of interest. The scientific presentations guided the topics of discussion including: Epidemiology of Cancer in Firefighters, Biomedical Studies, Exposure Studies, Cancer Screening and Prevention, Survivorship, Firefighter Subgroups, Modifiable Risk Factors and Education and Training. All breakout sessions were audio recorded and then transcribed word for word. Data were analyzed by a process guided by the principles of thematic analysis.

Translation of Findings: The symposium website (www.2019firefightercancersymposium.com) also has as a dedicated/permanent home at the Sylvester Firefighter Cancer Initiative website: http://sylvester.org/firefighters/nfcs/. The website will serve as a repository of the program agenda, scientific presentations, poster session materials, and presentation slides. The major discussions that occurred throughout the symposium are described in the scientific report section of this NIOSH R13 grant final report. Among all registered attendees, 46.9% were from the Fire Service, 24.4% were from Academia, 12.1% from Industry and 16.6% self-identified as Other (i.e., Healthcare entity, federal/state government, etc.). Summary discussions of the conference were circulated by various firefighter professional organizations, government entities, insurance companies, and academic institutions.

Research Outcomes/Impact: The main theme that emerged from all group discussions was "Communication is essential for progress." Although, each group's topics were different, the key theme that emerged was the need to increase communication. It was suggested that communication could be improved between the leaders in academia and the fire service as well as members of the fire service and their leadership. In addition to these organizational lines of communication, it was reported that communication at an individual level between co-workers and family members would help improve the outcomes in firefighter cancer. We see this theme throughout the breakout sessions. Attendees consistently reported that significant and ground-breaking work is being done in the scientific community, however it usually takes a significant amount of time to reach the fire service. Following the inaugural 2019 firefighter cancer symposium, planning began for the 2020 national firefighter cancer symposium and was held February 27-29, 2020 in Miami, Florida (http://sylvester.org/firefighters/nfcs). This NIOSH R13 catalyzed the need for further national research symposium to update the fire service on the latest science on cancer prevention for the firefighter workforce.

SECTION #2

Scientific Report

The Inaugural 2019 State of the Science Firefighter Cancer Symposium was held on Monday, June 10, 2019 and Tuesday, June 11, 2019 from 7:00 AM to 5:45 PM each day at the Donna E. Shalala Complex Center located in the University of Miami Coral Gables campus, Miami Florida. A total of 307 attendees participated in breakout discussion sessions following the plenary and panel speakers each day. Among all registered attendees, 46.9% were from the Fire Service, 24.4% were from Academia, 12.1% from Industry and 16.6% self-identified as Other (i.e., Healthcare entity, federal/state government, etc.). Plenary sessions recordings, the agenda and poster sessions are permanently located here:

- Recorded Plenary sessions: https://livestream.com/accounts/2263400/events/8684640
- Professional Pictures of the Event: https://www.jennyabreu.com/University-of-Miami-Events/Sylvester-Cancer-Center/2019/SSNFCS-2019
- Scientific poster sessions: https://www.2019firefightercancersymposium.com/copy-of-accepted-abstracts
- Program: https://www.2019firefightercancersymposium.com/schedule

Attendees were able to choose their discussion group based on topic. All groups were facilitated by experts in the field specific to the topic of interest. The scientific presentations guided the topics of discussion including: Epidemiology of Cancer in Firefighters, Biomedical Studies, Exposure Studies, Cancer Screening and Prevention, Survivorship, Firefighter Subgroups, Modifiable Risk Factors and Education and Training. All breakout sessions were audio recorded and then transcribed word for word. Data were analyzed by a process guided by the principles of thematic analysis. Initial codes were generated from each topic's first discussion group and each new discussion was coded and compared to the previous until saturation was met. Following line by line coding and initial code development, common themes emerged and were identified. Given our inductive approach, themes were informed by the data and participants. Each of the groups were asked the same questions including: "what are your thoughts on the information presented this morning?" "what are some of the gaps in the literature related to this topic?" and "how can we improve this issue in the fire service?"

The main theme that emerged from all group discussions was "Communication is essential for progress." Although, each group's topics were different, the key theme that emerged was the need to increase communication. It was suggested that communication could be improved between the leaders in academia and the fire service as well as members of the fire service and their leadership. In addition to these organizational lines of communication, it was reported that communication at an individual level between co-workers and family members would help improve the outcomes in firefighter cancer. We see this theme throughout the breakout sessions. Attendees consistently report that significant and ground-breaking work is being done in the scientific community, however it usually takes a significant amount of time to reach the fire service.

Cancer Epidemiology: In the group discussing firefighter cancer epidemiology, it was evident that a major concern was lack of awareness. Many firefighters reported that they did not know what epidemiology meant and how it pertained to their current cancer risk. Additionally, members of the group mentioned that the scientific data presented although very insightful, it is very hard to follow. It was suggested that the scientific data be presented in a manner that was easier for lay people (i.e. firefighters). As one attendee reported, "communication between fire service and academia need to be at the same level." There is an overall belief that there is a disconnect from the research that is being conducted and what is reaching the firefighters. Many attendees stated that everyone is siloed into their

own profession or area, thus hindering growth. It was suggested there be a communication loop following this conference and every other conference. Additionally, attendees noted that it is difficult to collect epidemiological data regarding the fire service due to the large number of variables related to cancer risk that exist in the fire industry (i.e. exposure, sleep, diet). Furthermore, attendees valued progression of where the science has moved, but were stuck on seeing the bigger picture and how it related to their fire department.

Biomedical and Exposure Studies: Another key topic of discussion during the breakout sessions were the current biomedical studies being conducted across the country. There was a strong interest in the new projects examining PFAS exposure and its long-term effect on firefighters' health. It was mentioned several times during this breakout session that biomarker collection was the future in firefighter cancer research and the only way to see the long-term effects of fire exposure. The overall impression was very positive. A majority of the participants believed this data is essential to understand cancer risk in the fire service. As one attendee stated,

> *So, it's great to get surface data, but ultimately, we want to know what's getting into the body, and that's where biomarker data really gets to that point of the effect of exposure. Getting that exposure level is great, but also figuring out the effect and how that will eventually influence your risk of disease is more important.*

Participants also noted that multiple sources of exposure should be collected. For example, urine samples are just as important as blood samples and they recommend both should be considered in exposure studies. In collecting urine samples, scientists are able to investigate the chemicals that are released in the urine and how the combination of these chemicals may create higher toxicity in the body of the firefighters. Questions also arose regarding the accumulation of products and bi-products within the firefighters' system over time. Additionally, firefighter attendees wanted to know how this information would be shared with them at the ground level. Again, the main concern of the firefighters in attendance centered around the communication of results to active members and firefighter leadership. As one attendee asked, "What is the difference between blood sampling? Tissue sampling? Cancer tissue sampling?" Based on these responses, it was evident that firefighters were interested in the studies taking place but lacked the awareness of what consisted of biomarker collection and research.

Cancer Screening and Prevention: The cancer screening and prevention group discussed the barriers and opportunities for cancer screening in the fire service. The main topics that were discussed included: deploying cancer screenings at a national level, updating the USPTF guidelines to widen the opportunities for firefighters related to cancer screening and the importance of documenting exposures.

Attendees noted that cancer screening recommendations were inconsistent and not well mandated at a national level. One attendee stated that, "NFPA 1582 cancer screening recommendation are not required to be followed by the fire departments but are a good way to encourage screenings." The most common stated barriers to cancer screening were cost and lack of time for firefighters. Many attendees stated that the US prevention task force recommendations needed to be changed. As one attendee stated:

> *It's limiting the effectiveness of the research that's being able to be completed because we can't do it until people have already*

been diagnosed, in some cases. So, as a result, because cancers are happening earlier in this particular population, and you can't catch them early if you're only following the guidelines that are currently in existence, which is what insurance follows.

In addition to changes needed at the organizational level, conference attendees reported that more education and communication is needed at the individual level of the fire service. It is believed that firefighters often forgo cancer screenings due to the perception of high false positive results. Moreover, many firefighters across the country are reluctant to have cancer screenings and yearly physicals out of fear of losing their jobs. As a result, many firefighters have been experimenting with alternative cancer screenings instead of following the USPTF guidelines. Lastly, attendees discussed the need to inform active fire members the importance of tracking their exposures. Although tracking is not considered cancer screening, records are needed to receive their state's benefit. It was reported that due to lack of tracking, many claims were being denied. It is currently a critical time in which occupational health leaders should coordinate regular informational sessions and conferences related to cancer screening recommendations and ways to inform firefighters at the individual level

Survivorship: A recent topic of interest in the fire service is cancer survivorship. One of the first comments stated was, "the diagnosis of cancer with a firefighter is not a short-term issue. It is a long-term issue that has long-term effects." The need for more communication and education related to cancer survivorship was the most evident in this session. Attendees stated that dialogue needed to occur at so many levels, including: family members, firefighters with their colleagues, firefighters with leadership and leadership with human resources and benefits. It was reported that there is a lack of training for cancer peer support at most departments and when members get diagnosed they often don't know where to go. At the same time, co-workers of those who have been diagnosed often feel that they don't know what to do or say. Some suggestions included using what has been done for mental health peer support as a model to emulate. When asked how we can fill this gap, one attendee reported:

So, from my perspective, I think there is an abundance of need to actually survey firefighters that have been diagnosed with cancer and ask them what is it that concerns you and is needed at this time point in your experience. And then that could help guide some answers.

Some final thoughts of the group focused on taking the research being conducted, such as the epidemiologic data, and sharing this with firefighters. As mentioned in previous groups, the information should be presented in a way that is easy to understand. However, the purpose of sharing this data would not only be for general knowledge, but to help firefighters understand their risk and the importance of follow-up care if there is a slight abnormality in lab/test results.

Firefighter Subgroups

Modifiable Risk Factors: The modifiable risk factor discussion followed two well-renowned speakers in the area of sleep and nutrition. Both being very hot topics in the fire service as key risk factors to their long-term health and cancer risk. In the first part of the group session, sleep was extensively discussed. When initially asked what were the challenges related to sleep in the fire service, firefighter culture was the first topic mentioned. A participant stated a common phrase in the fire service is,"I'll sleep when I'm

dead, sleep is for the weak." Many attendees noted that a culture change has to happen in order for sleep habits and policy changes to occur. Some examples include negative perception of napping while at the station and perceived belief to stay up as long as physically possible to get a "good, deep sleep" when off-shift. However, similar to the other groups lack of awareness was a prominent issue. As one attendee noted, "The average firefighter does not know he or she has a problem with sleep." Another group member agreed there is a need to educate firefighters on importance of sleep, he stated, "I like your topic of education on this topic (sleep). Most firefighters – and I was a career firefighter, most firefighters have no idea about the negative impacts of lack of sleep – none."

The discussion then transitioned to the perceived lack of research being conducted on sleep in the fire service. Participants of the group believed that not much research has been done on adrenaline and the difficulty falling asleep after a call as well as the impact poor sleep patterns have on hormone production. Participants brought up the need to conduct biomonitoring studies to better understand the challenges firefighters face in regard to sleep as well as studies examining thyroid and testosterone studies.

Finally, in discussing how to address challenges related to sleep, attendees believe that it needs to start at the organizational level. Some suggestions included: educating fire chiefs on the importance of sleep through infographics or visual data; designing fire stations that is more conducive to healthy sleeping and using a non-habit-forming approach to improve sleep, such as blackout shades on windows. Furthermore, policy changes to allow firefighters downtime to improve sleep was said to be necessary and educating firefighters on sleep hygiene and the effects of the effects of testosterone pills, sleep aids, caffeine and energy drinks.

The second focus of the discussion group was nutrition and its long-term impact on firefighters' health. The rapid evolving science around nutrition was identified as a problem for firefighters trying to eat healthier; a curated list of science-based research to help guide firefighters about best practices in nutrition was suggested as a solution during the breakout session. Other key opportunities that came up during the discussion were the education of firefighters and their families on proper nutrition, policy change and partnerships to encourage healthy eating habits among firefighters.

Members of the group discussed a need for healthy eating stakeholders and experts to design interventions, implement them and test them. Many of the nutrition challenges in the fire service centered around stress of the job, busy shift schedules and lack of healthy options while on shift. Firefighters report that fad diets often sweep through the stations and have short-term changes. Attendees pointed out that the only way to be successful in changing one's eating habits is to take a holistic approach that looks at nutrition, mental resilience, mental health, mindfulness and sleep. In addition, policy changes should occur at the department level to promote healthy eating options while on shift and at department meetings (i.e. fruit options instead of sweets).

Education and Training: The final discussion group focused on the education and training of firefighters. Key topics that were discussed in this session included: educating firefighters' family members about cancer in the fire service to promote healthier behaviors while on and off shift; changing policies and standards for firefighter training specifically at the recruit level; and enforcing decontamination practices at the leadership level. The participants also suggested to educate the medical community about cancer in firefighters. Collaboration and open communication between firefighters and researchers was again noted as a key factor in making changes at the individual and organizational level of the fire service.

As attendees began the discussion firefighter training, educating the family members as well as changing the perspective of the firefighter to not only think of their personal risk, but how their actions may impact their families. As one attendee said, “We get more buy-in from the firefighters that they’re worried about their children. Interestingly enough, we also get a greater concern for people who then have a child on the fire. They’re not worried about themselves, they’re worried about their children.” It was suggested that firefighters need to be educated on the risk the pose to their families if not properly decontaminating their gear; “They expose other people to carcinogens on turnout gear unknowingly, for example, babies, kids at home, kids visiting the fire station, etc.” Also, by bringing family members into the conversation on firefighter health and cancer prevention creates good allies in ensuring the firefighters are following best practices even while at home.

It was emphasized by several attendees that education specific to cancer risk and prevention should begin at the very beginning of training, (i.e. new recruit or academy cadet). It was suggested to add to a cancer section to the firefighter guidelines and standards (i.e. NFPA, IFSAC Control Board) if we wanted to see a change. This would benefit new recruits greatly since cancer in the fire service is oftentimes discussed very briefly during training, this would put it in the forefront and new recruits would know how to mitigate their risks before even seeing their first fire. As one attendee reported, “Change will happen with education, but it has to be part of a standard. I do think it is important to note that the way we change the fire service is in the education, specifically the new recruits. If it’s in the standard, you have to do that to get certified.” These changes have started to occur in certain parts of the country and as a result, it was noted that the younger firefighter generation is helping in making changes.

In addition to didactic education, hands on training (i.e. decontamination practices) was stressed as a necessary change to decrease cancer risk in the fire service. Many attendees first stated that there needed to be a culture change, as one individual said, “Wait a minute, you put your turnouts on something other than a fire?” I’m like, ‘Yeah, we go shopping in it. If it’s cold, we throw our turnout jacket on.’ They’re like, ‘What?’ Then I show them a picture of a newborn baby one of the guys with the baby on the turnout jacket. They all went – but it’s the culture. It’s knowing that it’s bad stuff.” While many attendees were unaware of changes occurring, as one attendee stated “Two weeks ago, we had our first captain’s class about the buckets. I knew nothing about the buckets,” other departments are making strides in policy changes within their department. A large county department in attendance stated that they had implemented these changes and it was now required that all members complete on site decontamination after every fire incident. It was suggested that assignments for preparing decontamination on site was critical to its implementation.

Lastly, the attendees stressed that best practices need to be research based. A key challenge for fires service leadership is knowing what information is correct, as one member stated, “And all of our best practices should be research-based. Part of it, is swimming through the endless stream of information, particularly from companies that are trying to make money off of this.” Some suggestions include bringing firefighters and researchers together to speak in a way they can both understand education. Attendees proposed firefighters need to find research collaborators to work on education together as well as find firefighters with science degrees to include them in education development.