

# Frequently Asked Questions: NIOSH Fire Fighter Cancer Study

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Fire fighters face many hazards in the line of duty. The risks of severe and potentially fatal injuries from the dangerous environment of a fire scene are well known. Additionally, fires generate toxic contaminants, some that are known or suspected to cause cancer. Less is known about long term health effects fire fighters may experience as a result of such work-related exposures. One question is whether or not fire fighters are more at risk for developing cancer.

In 2010, the National Institute for Occupational Safety and Health (NIOSH) embarked on a multi-year effort to conduct a large-scale study to better understand the potential link between fire fighting and cancer. Initial findings were recently published in *Occupational and Environmental Medicine*. We found that a combined population of fire fighters from three large U.S. cities showed higher-than-expected rates of certain types of cancer than the general U.S. population. Our findings suggest that fire fighters may be at higher risk of digestive, oral, respiratory, and urinary system cancers than the general population.

In summary, these findings strengthen the evidence that fire fighting may increase cancer risks. The current findings are the first product from the study. Our next step is to examine the relationship between work-related exposures and cancer among the fire fighters in our study. We hope to have this assessment completed within the next year. See below for further details about the study and results.

## Background

### Q: Who conducted the study?

A: The study was led by researchers from the National Institute for Occupational Safety and Health (NIOSH) and conducted in collaboration with researchers at the National Cancer Institute (NCI) and the Department of Public Health Sciences at the University of California - Davis. Primary funding was provided by NIOSH with supplemental funding from the U.S. Fire Administration.

### Q: Why was the study done?

A: The study was done to better understand the potential link between fire fighting and cancer. Fires generate toxic combustion products, some of which are known or suspected to cause cancer. Fire fighters may be exposed to these toxins as a consequence of their job duties. Cancer risk among fire fighters has been evaluated in previous studies – however conclusions from those studies were limited by relatively small study populations and short follow-up periods. This study has fewer of the limitations found in previous studies; cancer incidence and deaths were analyzed among a large number of career fire fighters over a 60-year period.

### Q: How was the study done?

A: The study is divided into two phases, the first of which is presented in the recent publication. In Phase I, we:

- Assembled the study group: Fire fighters from San Francisco, Chicago, or Philadelphia who were employed for at least one day since 1950.
- Collected employment information for each fire fighter from 1950 to 2009 through fire department records.
- Determined causes of death and cancer diagnoses from previous studies, the National Death Index, death certificates, and 11 state cancer registries.
- Compared mortality and cancer incidence in the study group with that in the U.S. population.

Phase II of the study will examine the relation between information on workplace exposure and cancers among these fire fighters. Exposures will be estimated from employment records of fire runs (that is, records of runs to fight fires) and station assignments for each participating fire fighter.

**Q. Why were these fire departments chosen for the study and not others?**

A. Our aim was to gather enough information to effectively examine health effects among career fire fighters. In planning the study, we approached several fire departments in U.S. cities about participating. We chose fire departments that maximized scientific validity and efficiency. We considered a number of factors, such as department size and location, work experience, availability of records, and the willingness of labor and city management to participate. The fire departments of these three cities best met all of those criteria.

**Q: Why didn't you include more fire departments?**

A: We wanted to ensure that we would be able to complete the study in a timely manner with the resources available. There is a point in designing a study when the advantages of increasing study size are outweighed by the resources and time required to collect, manage, and process additional information. The current study is the largest conducted on this topic, yet its design was optimized for a timely completion.

**Q: All departments selected serve large metropolitan areas. What about fire fighters working in small municipalities or fighting wildland fires?**

A: Our first research goal is to determine if there is a causal relation between fire fighter exposures and disease. To meet this goal, it was important to select a large group of fire fighters who face similar work experiences; therefore, we limited participation to career fire fighters employed in large cities. Nevertheless, the question of whether fire fighter cancer risks differ by work experience (e.g., career or volunteer, department size, and fire type) is important and should be considered in future research.

## **Findings**

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**Q: What did we find?**

A: Among notable study findings:

- Fire fighters had more cancer deaths and cancer cases than expected.
- This increase in cancer was primarily due to digestive, oral, respiratory, and urinary cancers.
- There were about twice as many malignant mesothelioma cases than expected. Asbestos exposure is likely in fire fighting and is the primary cause of this disease.
- Some cancers occurred at a higher-than-expected rate among younger fighters. For example, fire fighters who were less than 65 years of age had more bladder and prostate cancers than expected.
- Increased bladder cancer mortality and incidence was observed among women fire fighters, although there were few bladder cancers observed.
- The number of deaths from all causes combined (i.e., not just cancer) among fire fighters did not differ from the expected number based on death rates in the general population.

**Q: What should we conclude from the results?**

A: The findings suggest fire fighters are at higher risk of cancers of the digestive, oral, respiratory, and urinary systems when compared to the general population.

**Q: Does this mean that your study conclusively proves that cancer is an occupational consequence of fire fighting?**

A: One study cannot conclusively prove any outcome. However, this study strengthens the scientific evidence that fire fighters are at increased risk of cancer.

**Q: What are the strengths of the study?**

A: There are several notable strengths:

- The study group is the largest assembled to examine fire fighter cancer risks. The large sample size (~30,000 fire fighters) and long follow-up period (1950-2009) improves our ability to observe an effect.
- Studying fire fighters from multiple cities better represents the U.S. fire service as a whole.
- The study group includes all races and both genders.
- In contrast to most previous studies that looked at death information only, we also examined the numbers of cancer cases (cancer incidence). Examining cancer incidence is preferred for cancers that tend to have higher survival, such as testicular, bladder, breast, and prostate cancers.
- The study design provides the framework for future studies, such as in-depth looks at single outcomes. The study also lends itself well to continued follow-up and expansion by including fire fighters from other departments.

**Q: What are the limitations of the current study?**

A: In designing and carrying out the study, we were careful to ensure that risk estimates were precise and unbiased. Nevertheless, observational studies are inherently limited. Some potential limitations are:

- Although the study is among the largest on this topic, our ability to observe increased risk is still limited, especially for rare cancers. This is because the size of the excess risk is relatively small.
- Relatively few women and minorities were in the study group. The smaller numbers limit the ability to examine cancer risk among these groups.
- Incomplete or imperfect data sources can be a source of error. For example, death certificates and states' cancer registries do not necessarily capture all cancer cases that occur.
- Fire fighters may have been exposed to cancer causing agents outside of fire fighting. Also, some cancers are modified by lifestyle choices, such as diet, exercise, smoking habits and alcohol use. Information on other risk factors was not available.

**Implications of the Findings**

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**Q: If I'm a fire fighter and I have cancer, does this mean that my service caused my cancer?**

A: This study cannot determine if an individual's cancer is service-related. In addition to exposures that you may have encountered as a fire fighter, there are other factors that may influence whether or not you may have developed a particular cancer, such as:

- Personal characteristics such as age, sex, and race;
- Family history of cancer;
- Diet and personal habits such as cigarette smoking and alcohol consumption;

- The presence of certain medical conditions; and
- Exposure to cancer-causing agents in the environment (outside the workplace).

If you are an active or retired fire fighter and are worried about your health, share this information with your doctor at your next visit. It is important that your doctor is kept aware of possible job-related health concerns.

**Q: If I'm a fire fighter and I'm healthy right now, does this mean I'll get cancer?**

A: We don't know, simply from this study, whether or not you will get cancer. Instead, our study found that fire fighters, on average, have a higher risk of certain types of cancer compared to the general population.

**Q: What should the fire service do with this information?**

A: This study provides further evidence that fire fighters are at increased risk of certain types of cancer as a result of occupational exposure. Raised awareness and exposure prevention efforts are cost-effective means to reduce occupational cancer risk. Thus, the fire service should increase efforts to educate members about safe work practices. This includes proper training, proper use of protective clothing, and proper use of approved respiratory protection during all phases of fire fighting.

**Q: What should I do with this information?**

A: If you are an active or retired fire fighter and are worried about your health, share this information with your doctor at your next visit. It is important that your doctor is kept aware of possible job-related health concerns.

**Q: Should I undergo cancer screening tests?**

A: All fire fighters should consult with their physician regarding cancer screening tests.

**Q: What comes next in this research?**

A: Phase II of the study will further examine employment records from the three fire departments to derive information on occupational exposures and to compare cancer risks of higher-exposed fire fighters to lower-exposed fire fighters. The results from Phase II are expected to be released in late 2014.