

The National Firefighter Registry

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Brothers Helping Brothers: Firefighter Health and Wellness Symposium

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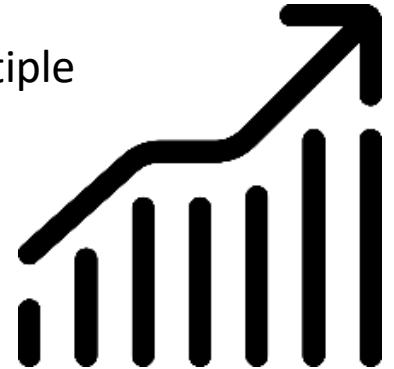
NFR National
Firefighter
Registry

The findings and conclusions in this presentation are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health.

Epidemiologic studies

Various studies have reported a link between firefighting and cancer

- LeMasters et al., 2006¹
 - Reviewed 32 previous studies
 - 4 cancers with increased relative risks
 - Testes, prostate, Non Hodgkin's lymphoma (NHL), Multiple Myeloma (MM)



¹LeMasters et al. J Occup Environ Med 2006;48:1189–1202.

International Agency for Research on Cancer (IARC)

2010 review:

- 44 previous studies
- Testes, prostate, NHL

Occupation of firefighting²



IARC agent classifications¹

Group	Description
1	Carcinogenic to humans
2A	<u>Probably</u> carcinogenic to humans
2B	<u>Possibly</u> carcinogenic to humans
3	Not classifiable as to its carcinogenicity to humans
4	Probably not carcinogenic to humans

1. <http://monographs.iarc.fr/ENG/Classification/>

2. IARC monographs on the evaluation of carcinogenic risks to humans, volume 96.

NIOSH Firefighter Cancer Study Daniels et al. 2014



San Francisco



Chicago



Philadelphia

- Retrospective cohort study
 - Career structural firefighters employed from 1950–2009
 - 97% male; 81% white
- Records-based data
 - Employment records
 - Death certificates
 - State cancer registries (11 states)

NIOSH Firefighter Cancer Study Daniels et al. 2014

14% more cancer deaths than expected

9% more cancer diagnoses than expected

Elevations in **digestive, lung, urinary, and oral cancers**

Weight of evidence

Cancer	NIOSH	Nordic	Australian	Korean	French ³
all-cancers	X	X	X		
prostate	X	X	X		
lung	X	X			
mesothelioma	X	X			
melanoma		X	X		
kidney	X			X	
bladder	X			X	
colon	X			X	
oral cancers	X				X
rectum/anus	X				X

Limitations of past epidemiologic studies

Most past research on cancer in firefighters:

- career, structural, metropolitan, white, male

But not representative of U.S. Fire Service as a whole...



65%
volunteer



48%
Rural departments



~20% minority FFs
~5-10% female FFs



Wildland
Instructors
Other subspecialties

Exposure studies

Combustion Products Measured at Fires

Acetaldehyde
Acrolein
Aldehydes (mixed)
Alkanes, straight chain (inc. propane)
Alkenes, straight chain (inc. propene,
1-butene/2-methylpropene)
Arsenic
Asbestos
Benz[a]anthracene
Benzene*
Benzaldehyde
Brominated hydrocarbons (low)
1,3-Butadiene
Carbon dioxide
Carbon monoxide
Chlorinated alkanes (low)
Chlorobenzenes (low)
Cycloalkanes
Cyclopentenes
Dioxins and furans (including
2,3,7,8-dibenzodioxin and -furan*)
Dichlorofluoromethane



Ethylbenzene
Formaldehyde
Glutaraldehyde
Hydrogen chloride/cyanide/fluoride
Isopropylbenzene
Isovaleraldehyde
Methylene chloride
Naphthalene (a PAH)
Nitriles (mixed)
Nitroarenes (analogues of PAHs)
Nitrogen dioxide
Particulate matter (fine)
Phosgene
Polycyclic aromatic hydrocarbons
(mixture, including naphthalene)
Sulfur dioxide
Styrene
Tetrachloroethylene
Toluene*
Trichloroethylene
Vinyl chloride
Xylenes (including o-xylene)

Adapted from Guidotti 2014 AOHC

Measured “Chemicals” in the Breathing Zone of FFs at the Fireground

IARC Group 1 – known carcinogen

Arsenic	Asbestos
Benzene	Benzo[a]pyrene
1,3-Butadiene	Cadmium
Formaldehyde	Sulfuric acid
Silica (crystalline)	2,3,7,8 TCDD
Radioactivity (α, β, γ)	Diesel exhaust



Measured “Chemicals” in the Breathing Zone of FFs at the Fireground

IARC Group 2A – probable carcinogen

Dibenz[a,h]anthracene

Lead (inorganic)

Polychlorinated biphenols (PCBs)

Tetrachlorethylene (perc)

Trichlorethylene

IARC Group 2B – possible carcinogen

18 Chemicals



IARC's 2019 High Priority Agents

Agents previously evaluated by IARC Monographs†

Automotive gasoline (leaded and unleaded), carbaryl, malaria

New human cancer, bioassay, and mechanistic evidence to warrant re-evaluation of the classification

Acrylamide*, acrylonitrile, some anthracyclines, coal dust, combustion of biomass, domestic talc products, firefighting exposure, metallic nickel, some pyrethroids (ie, permethrin, cypermethrin, deltamethrin)

New human cancer and mechanistic evidence to warrant re-evaluation of the classification

Aniline, acrolein, methyl eugenol and isoeugenol*, multi-walled carbon nanotubes*, non-ionising radiation (radiofrequency)*, some perfluorinated compounds (eg, perfluorooctanoic acid)

New bioassay and mechanistic evidence to warrant re-evaluation of the classification

Oestrogen:oestradiol and oestrogen-progestogens‡, hydrochlorothiazide, Merkel cell polyomavirus, perchloroethylene, very hot foods and beverages

New human cancer evidence to warrant re-evaluation of the classification

1,1,1-trichloroethane, weapons-grade alloy (tungsten, nickel, and cobalt)

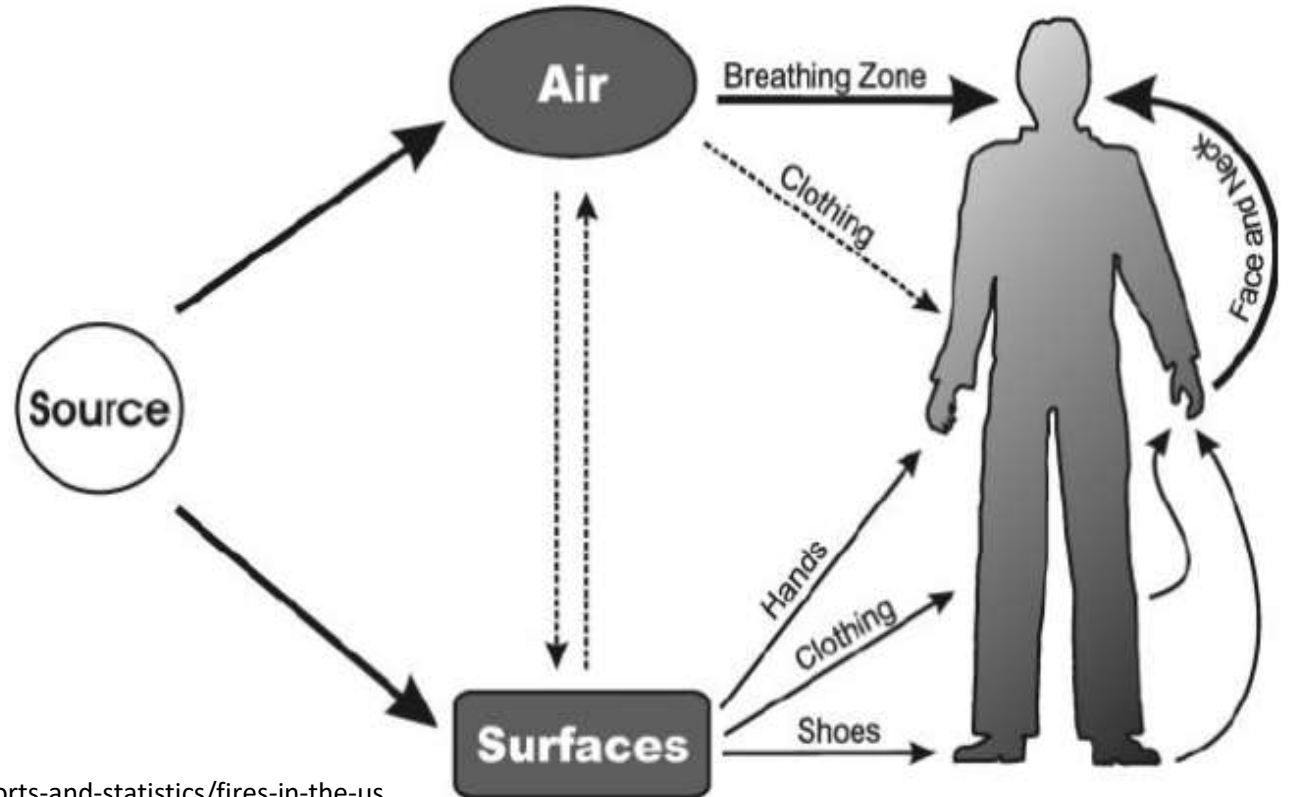
New bioassay evidence to warrant re-evaluation of the classification

Acetaldehyde, bisphenol A*, cobalt and cobalt compounds, crotonaldehyde, cyclopeptide cyanotoxins, fumonisin B₁, inorganic lead compounds, isoprene, o-anisidine

New mechanistic evidence to warrant re-evaluation of the classification

How are firefighters exposed?

- 1.4 million fires in the US/yr
- 0.5 million structure fires
- ~1-5% of a FF time is spent at structure fires (20-100 hrs/yr)



Studies of biological absorption

- Several studies have found absorption of PAHs (and other combustion byproducts) during residential/structure fires¹⁻³ and training fires⁴⁻⁸
- In some cases, the firefighters were wearing full ensembles (including SCBA) throughout the response
- Dermal exposure appears to play an important role
- Decontamination practices may help reduce exposures⁹⁻¹¹



1. Fent et al. 2019 (J Exp Sci Environ Epi)

2. Keir et al. et al. 2017

3. Caux et al. 2002

4. Fent et al. 2019 (Int J Hyg Environ Health)

5. Feunekes et al. 1997

6. Laitinen et al. 2010

7. Stec et al. 2018

8. M. H. G. Andersen et al. 2017

9. Fent et al. 2017

10. Mayer et al. 2019

11. Park et al. 2015

Exposures may vary by:

- **Department:** urban, rural, geographic location
- **Type of firefighter:** career, paid on-call, volunteer
- **Type of fires:** structure, vehicle, vegetation, etc.
- **Work factors:** job assignment, tactics, age & maintenance of equipment
- **Demographics:** male, female, minority
- **Controls:** Use of SCBA and other control interventions
- **Sub-specialties:** arson investigators, instructors, wildland, airport rescue, etc.



National Firefighter Registry

to Better Understand Firefighters' Risk of Cancer



cdc.gov/niosh/firefighters/health.html

Why is the Registry being created?

- The Firefighter Cancer Registry Act of 2018
- Previous studies, including a study completed by NIOSH, indicate that career firefighters are at higher risk of cancer.
- Studies are limited by the inclusion of small numbers of women and minorities, and a lack of data on volunteer firefighters.
- Goal is to track firefighters' cancer risk over time to better understand the link between workplace exposures and cancer.

H. R. 931

One Hundred Fifteenth Congress
of the
United States of America

AT THE SECOND SESSION

Began and held at the City of Washington on Wednesday,
the third day of January, two thousand and eighteen

An Act

To require the Secretary of Health and Human Services to develop a voluntary
registry to collect data on cancer incidence among firefighters.

Be it enacted by the Senate and House of Representatives of
the United States of America in Congress assembled,

SECTION 1. SHORT TITLE.

This Act may be cited as the Firefighter Cancer Registry Act
of 2018.

SEC. 1. VOLUNTARY REGISTRY FOR FIREFIGHTER CANCER
INCIDENCE.

(a) IN GENERAL.—The Secretary of Health and Human Services
(referred to in this section as the Secretary), acting through the
Director of the Centers for Disease Control and Prevention and
in coordination with other agencies as the Secretary determines
appropriate, shall develop and maintain, directly or through a grant
or cooperative agreement, a voluntary registry of firefighters
(referred to in this section as the Firefighter Registry) to collect
relevant health and occupational information of such firefighters
for purposes of determining cancer incidence.

(b) USE OF FIREFIGHTER REGISTRY.—The Firefighter Registry
may be used for the following purposes:

(1) To improve data collection and data coordination activi-
ties related to the nationwide monitoring of the incidence of
cancer among firefighters.

(2) To collect, consolidate, and maintain, consistent with
subsection (c), epidemiological information and analysis related
to cancer incidence and trends among firefighters.

(c) RELEVANT DATA.—

(1) DATA COLLECTION.—In carrying out the voluntary data
collection for purposes of inclusion under the Firefighter Reg-
istry, the Secretary may collect the following:

(A) Information, as determined by the Secretary under
subsection (d)(1), of volunteer, paid-on-call, and career fire-
fighters, independent of career status or diagnosis.

(B) Individual risk factors and occupational history
of firefighters.

(C) Information, if available, related to—

(i) Insite demographic information, including—
(I) the age of the firefighter involved during
the relevant date of occupation as a firefighter;
and

(II) the age of cancer diagnosis.

Who will be included?

- The Firefighter Registry will represent ALL firefighters, not just those with a cancer diagnosis.
- Minority, female, and volunteer firefighters
- Also interested in sub-specialties like:
 - Instructors
 - Wildland firefighters
 - Arson investigators
- Goal is to enroll 200K



What will registration look like?

- Registration web-portal is still in development
- Will be secure (two-factor authentication)
- Will require informed consent
- Will likely collect the following information:
 - Demographics (name, DOB, etc.)
 - Fire department(s)
 - Work history / exposures
 - Use of control measures
 - Other risk factors
- All personal information will be kept in accordance with Federal privacy laws



How will firefighters be recruited?

1. Open Enrollment Through Web-Portal
 - A. All firefighters would be able to participate
 - B. May not be representative of the firefighter population
2. Organization-Level Promotion
 - A. Recruit participants through professional associations (IAFF, NVFC, etc.)
 - B. Should be able to reach various groups of firefighters
3. Work Directly with Fire Departments
 - A. Most time and resource intensive approach
 - B. Sample representative of the firefighter population
 - C. **Access to fire-department records**



What will the Registry address?

- Firefighters have increased risk of certain cancers, but questions remain:
- How does cancer risk vary
 - Among the different groups of firefighters
 - Among more recent firefighters
(with increasing synthetic materials in buildings)
 - With adoption of control interventions
 - Consistent use of SCBA, decontamination measures, laundering, hood exchange programs, etc.
 - Geographically
 - With increasing exposures, including major events



How will cancer risk be determined & communicated

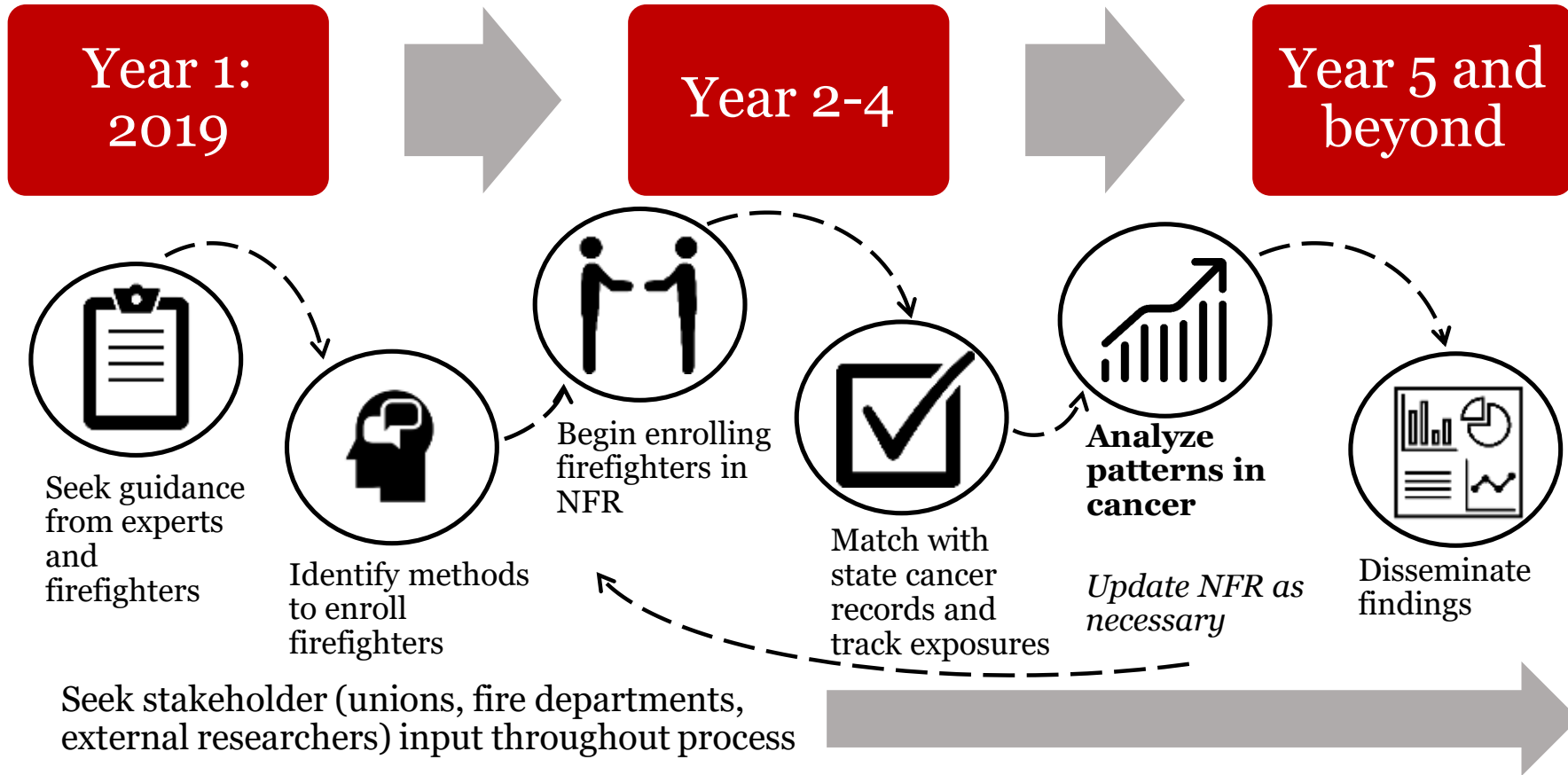
Cancer evaluation

- Link registrants to state/federal records using individual identifiers
 - State cancer registries
 - National Death Index
- Compare cancer rates to general population
- Explore differences in cancer rates by various factors
 - Exposure – enrollment survey, department incident records (NFIRS), self-reports (NFORS)
 - Adoption of control measures
 - Different groups of firefighters

Disseminate findings

- Share via scientific publications and communications to the public/fire service
- Make de-identified (i.e., maintaining privacy) data available for researchers

NFR Timeline



Thank You!

For more information on these studies:

<https://www.cdc.gov/niosh/firefighters/health.html>

Email Address:

NFRegistry@cdc.gov

For more information, contact CDC
1-800-CDC-INFO (232-4636)
TTY: 1-888-232-6348 www.cdc.gov

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