

Wildland Firefighter Exposures and Health

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Acknowledgements

- Confidential wildland firefighters
- Student research assistants: Erin Grossman, Ben Stein, and Lola Folk
- Researchers with the US Forest Service Wildfire Risk Management Science Team

Wildland Firefighters

- Federal, state, and local government agencies (seasonal and year-round)
- Non-firefighter agency employees
- Private contractors (on call)
- Volunteers



Forest Service

U.S. DEPARTMENT OF AGRICULTURE

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Careers in Wildland Fire



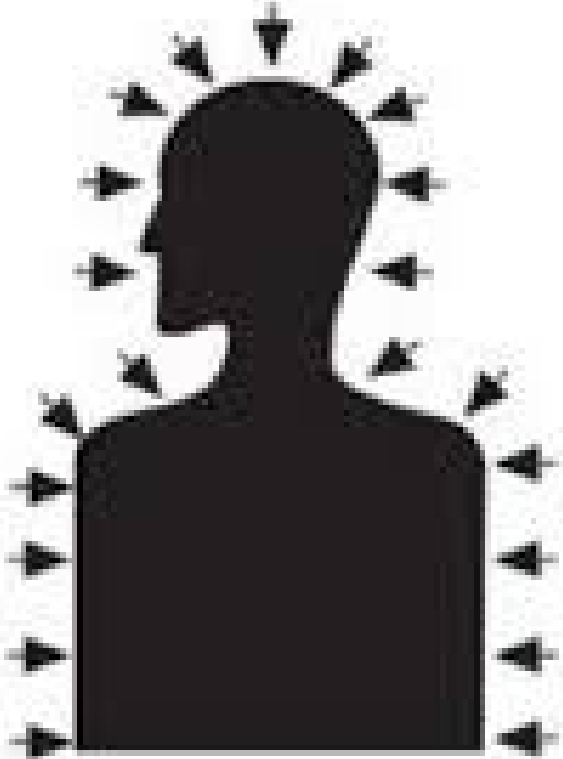
My Research

- 2015-present
- Participant observation and in-depth interviews with wildland firefighters and fire managers in the Pacific Northwest
- Red Carded FFT2 volunteer with Walla Walla County Fire District #4



Environmental Health Hazards

Exposure pathways:



Contact

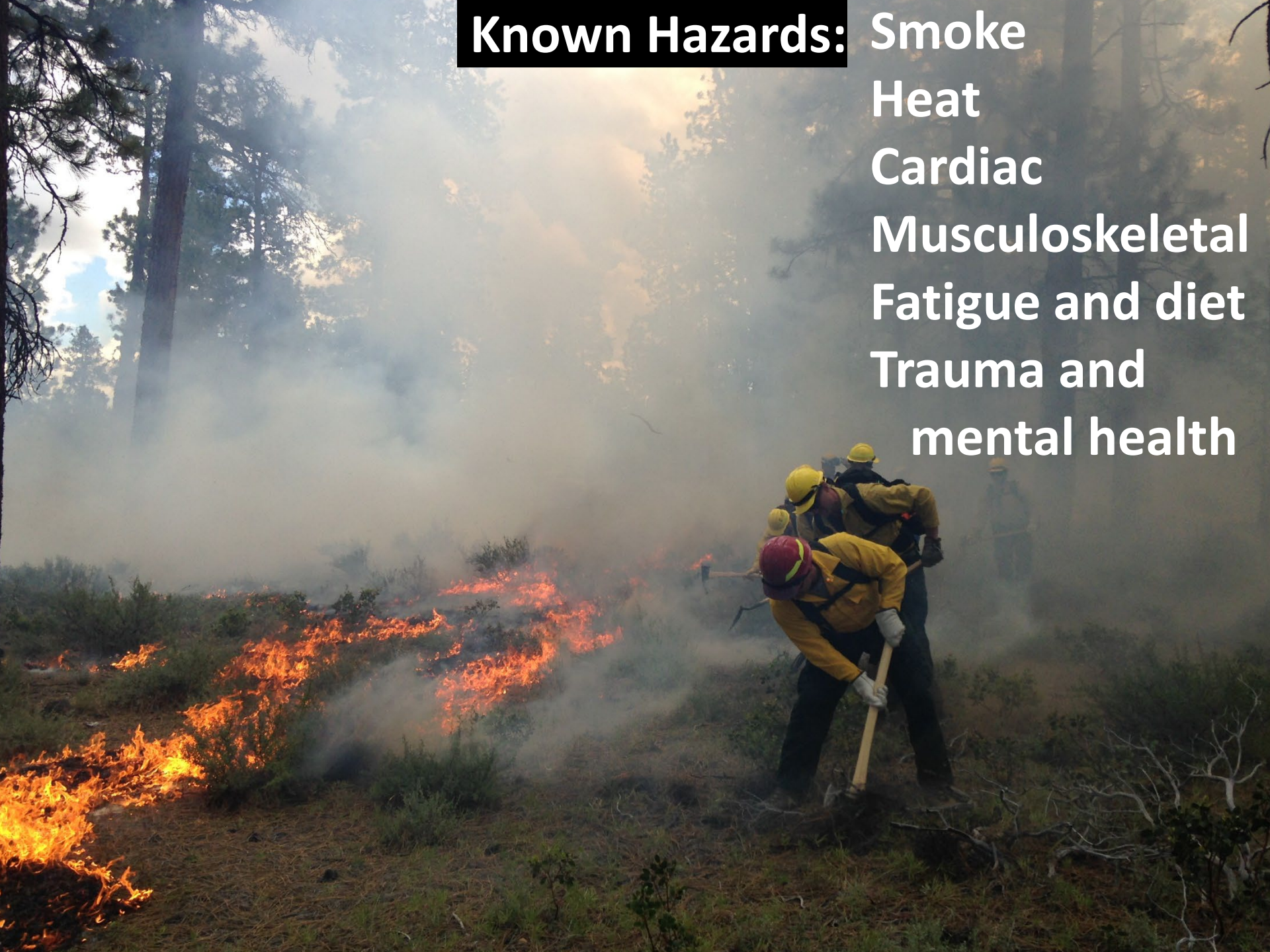


Ingestion



Inhalation

Known Hazards: Smoke
Heat
Cardiac
Musculoskeletal
Fatigue and diet
Trauma and
mental health



Little attention to other hazards



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Fire Ecology

RESEARCH

Open Access



Environmental health hazards and wildland firefighting: a qualitative analysis

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Abstract

Background Despite growing attention to wildland firefighter safety, little is known about the full scope of environmental health hazards experienced occupationally. Previous research has documented exposures to carcinogens and combustion byproducts from smoke, dust, ash, engine exhaust, ignition devices, and location-specific chemical and radiological hazards. With growing attention to firefighters' health outcomes, more research is needed on the environmental health hazards that they experience routinely and non-routinely. Qualitative research is well suited for exploratory investigations of environmental hazards. This study draws on a long-term ethnographic research project with federal wildland firefighters in Oregon to identify the environmental health hazards that wildland firefighters experience. I took detailed fieldnotes during participant observation working as a wildland firefighter with federal engine and handcrews. I also shadowed an incident management team, attended relevant meetings and trainings, and conducted 22 semi-structured interviews. I analyzed all data in NVivo, a computer program for coding qualitative data.

Results Wildland firefighters were aware of commonly identified hazards of their work, including smoke exposure, heat, and "human factors" such as fatigue and diet. Firefighters experience additional hazards that are rarely discussed. Routine but generally unacknowledged hazards include non-vegetation smoke, dust, chemicals in gear and equipment, and fuels and exhaust. Incident- and location-specific hazards include food and water quality concerns, hazards in government housing, and military, radiation, industrial, and mining hazards. Addressing these hazards is challenging because of both practical and cultural barriers.

Conclusion This exploratory cataloguing of the environmental health hazards faced by wildland firefighters is unlikely to be surprising to firefighters themselves, yet most of these hazards are underrecognized by land management agencies and researchers, and are incompletely mitigated in the work environment. Many of these hazards are (largely) invisible to those not working on the fireline or are only discussed in isolation, rather than as part of a cumulative or holistic understanding of firefighter health and safety. More attention by fire management agencies, fire leadership, and researchers is needed to the full range of hazards experienced by wildland firefighters.

Keywords Environmental health, Environmental and workplace hazards, Hazard mitigation, Wildland firefighter health and safety

Resumen

Antecedentes A pesar de la creciente atención que existe sobre la seguridad de los combatientes de incendios (i.e. brigadistas), se conoce poco sobre el conjunto de factores y los riesgos que implican en la salud ambiental que éstos experimentan en su trabajo. Investigaciones previas han documentado exposiciones a productos cancerígenos y de

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Non-vegetation smoke



Fieldnotes:

We kept our heads away from the smoke as much as possible, but I still got a bit of the nasty, chemical, rubber-tasting smoke. It was like it coated my tongue with burnt rubber

Non-vegetation smoke



The Nacimiento Guard Station, Los Padres National Forest, September 8

Dolan Fire Learning Review

Fieldnotes:

(What burned?)
Engines, buildings,
RoundUp, spray paint,
propane tanks, bar oil,
and all their personal
possessions

Dust



Fieldnotes:

Everything smelled like burning pine and dust, a fine silt that coats the teeth and the nostril hairs.

Chemicals in personal protective equipment



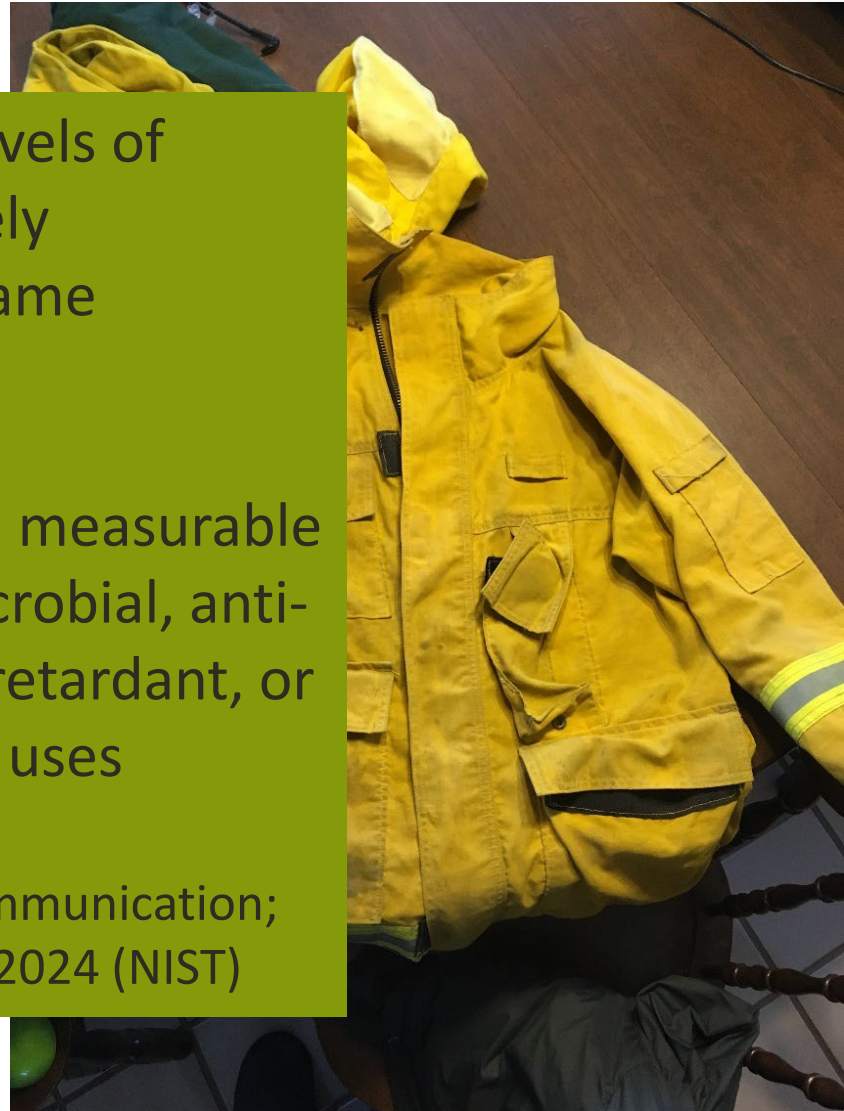
Chemicals in personal protective equipment



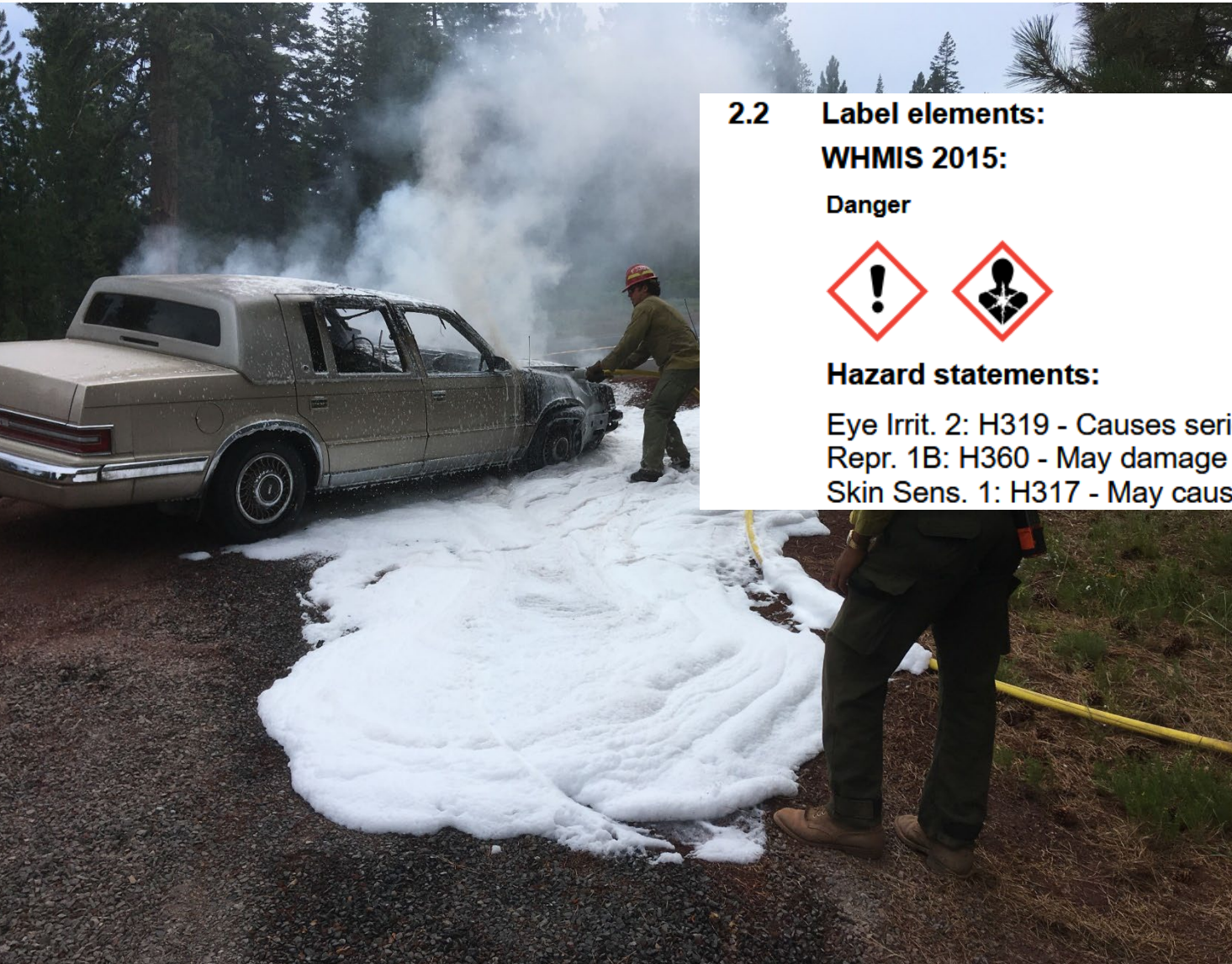
Jacket: high levels of **Bromine** – likely brominated flame retardant

All four items: measurable **Zinc** – anti-microbial, anti-fungal, flame retardant, or UV protection uses

Peaslee pers. communication;
Thompson et al. 2024 (NIST)



Chemicals in foam, retardant, and other equipment



2.2 Label elements:

WHMIS 2015:

Danger



Hazard statements:

Eye Irrit. 2: H319 - Causes serious eye irritation.

Repr. 1B: H360 - May damage fertility or the unborn child.

Skin Sens. 1: H317 - May cause an allergic skin reaction.

Fuels, exhaust, and hazardous materials



Small engine exhaust
Vehicle exhaust
Diesel fuel and gasoline
Mixed fuel (gas and oil)
Engine oil
Transmission oil
Chainsaw bar oil
Pesticides
Paints and stains



Location-specific hazards

- Radiation
- Munitions
- Industrial waste and exposures
- Mining waste and abandoned mines
- Cannabis grow sites
- Insects and animals
- Plants
- Violence

The Smokey Wire : National Forest News and Views

Community Sourced, Shared and Supported

Menu

Little death bombs': Illegal cannabis farms poison California's forests. Who's cleaning them up?: CalMatters

February 11, 2026 by Sharon



A trash pile surrounded by barbed wire to keep bears out sits at an illegal cannabis site in the Shasta-Trinity National Forest on Nov. 12, 2025. Photo by Fred Greaves for CalMatters

Hazardous food and water



Image: Wildfire Today

Engine Captain:

“It seems like we’re back to the lowest bidder, so you get ‘rainbow meat’ and moldy bread.”

Government housing

“... And You
May Find
Yourself Living
In A Shotgun
Shack”

Can Fed Fire Ever Be Taken Seriously If We Cant
Afford Our People Any Housing, Let Alone Good
Quality Housing!?!?

Including:

Asbestos

Black mold

Lead

Animal and insect
infestations

Broken appliances

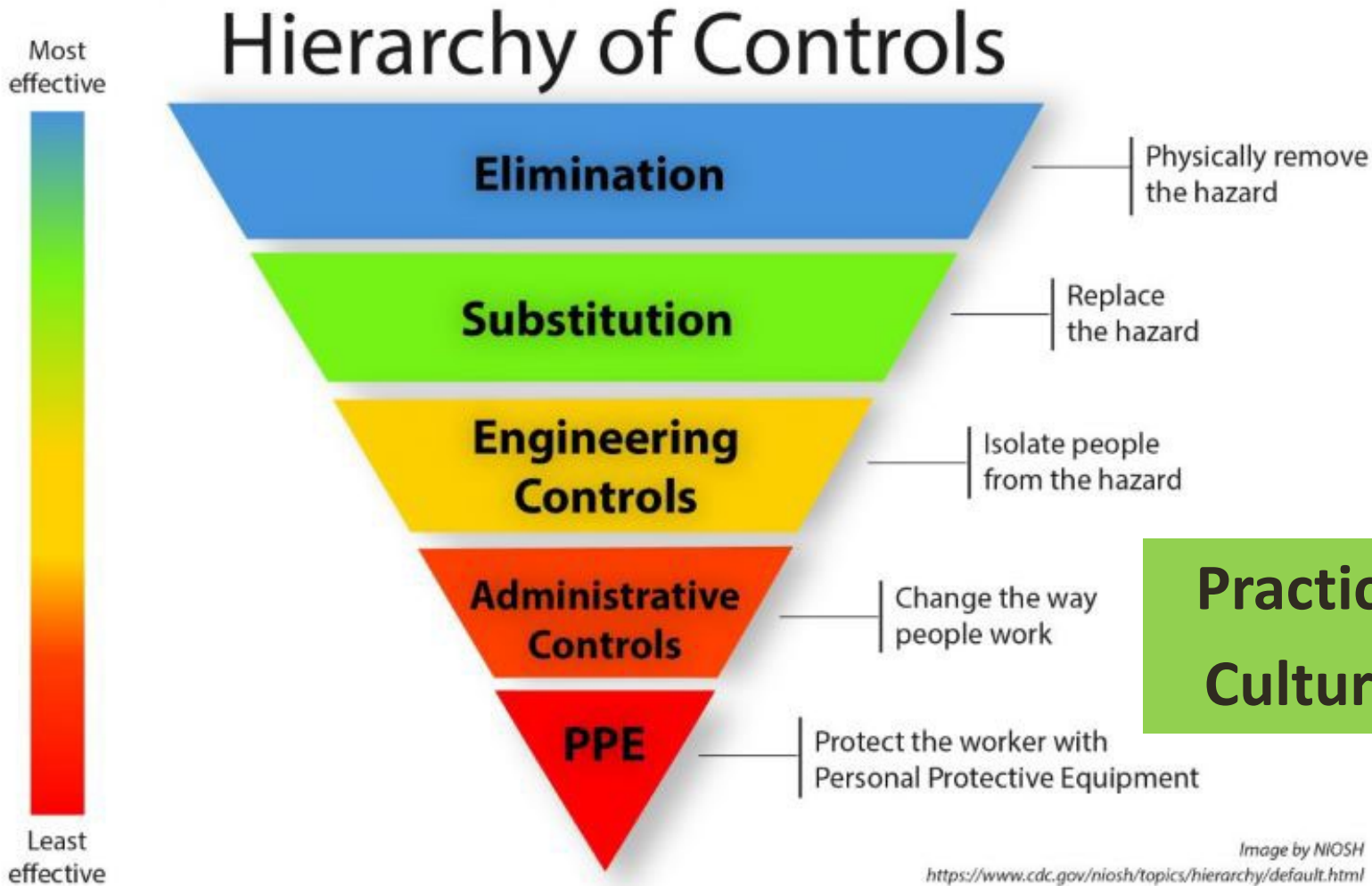
Leaking roofs

Filth

♡ 369 💬 32 🚩 10



Barriers to addressing hazards



Practical barriers
Cultural barriers

Wildland firefighter health



Wildland firefighter health is understudied

- Largely seasonal workforce
- “multi-dimensional careers” – multiple agencies, employer types, frequent job changes
- Largely un-unionized
- Variety in job types and exposures
- Inconsistent medical coverage
- Very recent presumptive illness regulations for federal firefighters (2023)
- Most research is cross-sectional and/or small samples

Wildland firefighter health



International Agency for
Research on Cancer:

Working as a firefighter is
“carcinogenic to humans”

IARC 2023; DeBono et al. 2023

Wildland firefighter health

- Physical injuries
- Infectious diseases
- Respiratory and cardiovascular illnesses, including risk of lung cancer
- Mesothelioma, melanoma, non-Hodgkin lymphoma, and bladder, colon, prostate, and testis cancers
- Reproductive harm
- Elevated rates of post-traumatic stress disorder, depression, anxiety, suicide risk, and substance use disorder

Belval et al. 2024; DeBono et al. 2023; Granberg et al. 2023; Held et al. 2024; IARC 2023; Navarro et al. 2019, 2021; Verble et al. 2024; Wagner et al. 2025; West et al. 2024; White et al. 2025; Withen 2015

Key research and policy needs

- Prioritize firefighter health, on- and off-incident
- Develop plans to reduce exposures to routine hazards
- Develop plans to improve cleanliness protocols while on extended incidents
- Researcher and agency attention to all workplace hazards
- Prospective and retrospective epidemiological studies with broad inclusion criteria

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