

Advancing the rigor, relevance, and reach of exposure science through community driven research.

Heather Buren, Lieutenant, SF Fire Department and President, United Fire Service Women

Rachel Morello-Frosch, UC Berkeley School of Public Health and Department of Environmental Science, Policy and Management

Tony Stefani, President, SF Firefighter Cancer Prevention Foundation

SFFD has one of the **largest populations of women** among its ranks in the US ($N = ^2225$)



Mounting concern among SF firefighters about rates of premenopausal breast cancer among the women in their ranks.



Concern grows in firefighters, others after cancer-causing flame retardants found in test subjects



Nahiku at their home in Davis, are sitting on a couch with flame retardant chemicals. Manny Crisostom

mcrisostomo@sacbee.com

The Examiner

Breast cancer rate alarms SFFD female firefighters

v Will Reisman



MIKE KOOZMIN/THE S.F. EXAMINE

Fighting: San Francisco Fire Department firefighter Jeanine Nicholson, seen at her Berkeley home, has undergone a double mastectomy and chemotherapy.

Firefighters Sound Alarm On Toxic Chemicals



Former San Francisco firefighter and cancer survivor Denise Elarms waits Wednesday to speak during a remembrance ceremony held for San Francisco firefighters who have died of cancer. (Photo by Justin Sullivan/Getty Images)

Women Firefighter Biomonitoring Collaborative Team

Firefighter Organizations:

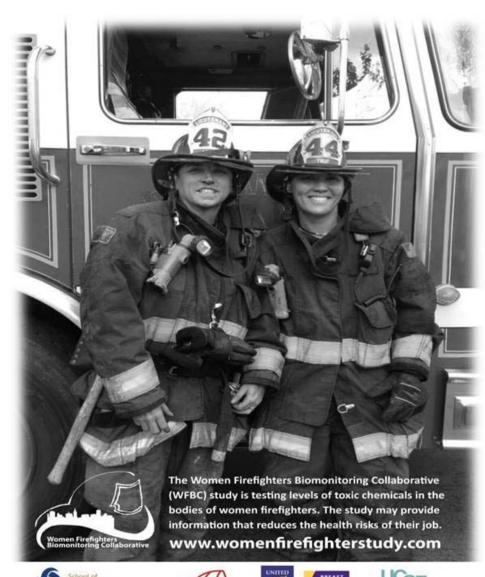
- United Fire Service Women
- San Francisco Firefighters Ca Prevention Foundation

Science Team:

- UC Berkeley
- UC San Francisco
- Silent Spring Institute

Environmental Health Advocat

- Commonweal
- Breast Cancer Fund











Previous studies show firefighters have higher exposures to:

- Polycyclic Aromatic Hydrocarbons (PAHs)
 - Products of combustion
- Diesel exhaust nitro-PAHs
 - Fire equipment
- Flame retardants
 - burning furniture, protective clothing, etc.
- Perfluorinated chemicals
 - Chemical in firefighter turnouts
- Dioxins and Furans
 - Combustion by-products during fire events

Studies almost exclusively on men.





Photo: Terray Sylvester / The Chronicle Lieutenant Patty Lui http://www.sfgate.com/health/article/S-F-Fir e-Department-joins-study-into-breast-58338 37.php#photo-7019384

Environmental Factors in Breast Cancer

Supplement to Cancer

Chemicals Causing Mammary Gland Tumors in Animals Signal New Directions for Epidemiology, Chemicals Testing, and Risk Assessment for Breast Cancer Prevention

Ruthann A. Rudel, MS Kathleen R. Attfield, BS Jessica N. Schifano, BA Julia Green Brody, PhD Identifying chemical carcinogens in animal studies is currently the primary means of anticipating cancer effects in humans. Animal studies to evaluate potential chemical carcinogenicity are particularly important for breast cancer because environmental and occupational epidemiologic research is sparse.



Many of these chemicals have been shown to be mammary carcinogens in animal toxicology studies and warrant further study.

- Characterize exposures in humans.
- Inform regulatory, occupational and individual actions to reduce exposures.

What we want to learn:

- Are chemicals known or suspected to cause mammary tumors more elevated among women firefighters than non-firefighters?
- Are there other unknown or unmeasured chemicals that are higher among women firefighters?
- Is higher chemical exposure or exposure to night shift work associated with early health effect biomarkers of potential relevance for breast cancer?
 - thyroid hormone disruption
 - altered melatonin levels
 - telomere length

Study Aim 1

Measure and compare levels of environmental chemicals between women firefighters (N=80) and non-firefighter female controls (N=80)

Targeted analysis:

- Flame retardants
 - Polybrominated Biphenyl Ethers (PBDEs) and their metabolites (OH-PBDEs)
 - Firemaster 550 and other current use flame retardants
- Perfluorinated Compounds (PFCs)
- Polycyclic Aromatic Hydrocarbons (PAHs & nitro-PAHs)

Non-targeted chemical analysis:

- Time of Flight (TOF) LC/MS
- Reveals exposures we might not have thought about

Biospecimen Collection



Firefighter Karen Heald bleeding for a cause. WFBC team provided b lood and urine samples to help with methods development to measure chemicals.







Chief Joanne Hayes-White and colleague having their blood drawn.

Sample processing at UCSF Lab





(R-L): Jessica Trowbridge, WFBC Study Coordinator (UCB), Emily O'Rourke (UFSW) & Nancy Carmona (UCB), processing blood and urine samples.

Exposure Assessment Interview







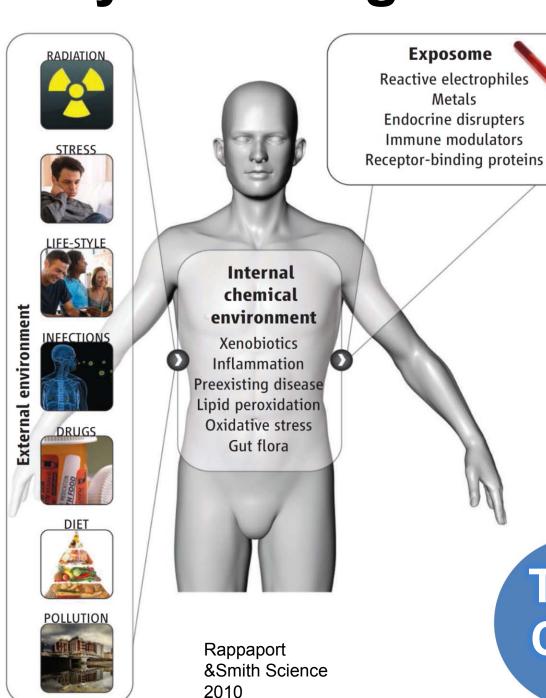
- Occupation and work activities
- Shift work and sleep
- Chronic stress
- Diet
- Personal product use
- Consumer and home products, hobbies, etc.



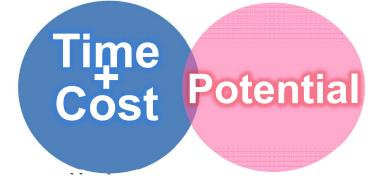




Why Non-Targeted Analysis?



- Discovery-driven approach to screening biospecimens for novel environmental chemicals
- 2. Not limited *a priori* selection of chemical targets
- 3. General suspect screening optimizes selection of chemicals for confirmation and quantification



Study Aim 2

Evaluate the impact of chemical exposures and chronic exposure to night shift work on biomarkers of early effect of potential relevance to breast cancer

- Night shift work and melatonin
- PBDE and OH-PBDE exposures and thyroid hormone disruption (T4 and TSH)
- Chemical exposure and shortened telomere length (Exploratory)

Study Aim3

Report back individual—level and aggregate results to study participants who want them

- Focus groups and usability testing with study participants to develop report-back materials
- Aggregate dissemination to broader firefighter community, decision-makers, policy arena, and broader public

Digital Report-back Interface



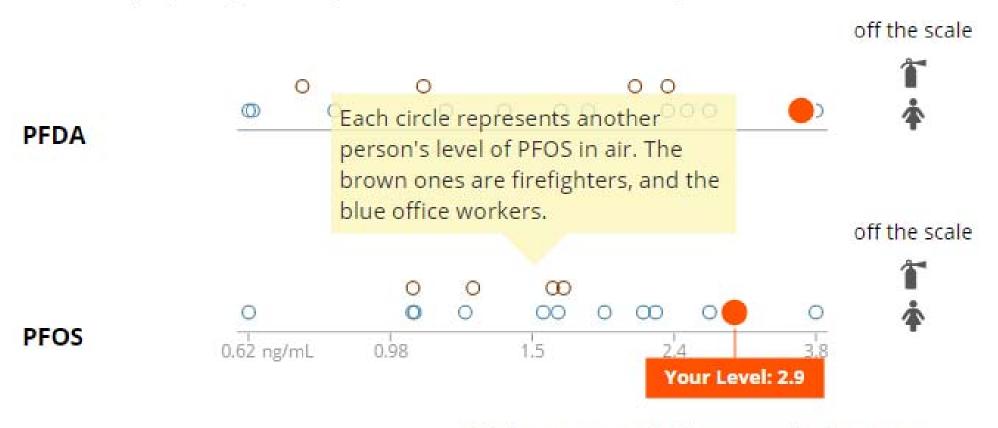
This web site provides your study results from the Women Firefighters
Biomonitoring Collaborative Study. It shows:

- + The levels of chemicals found in your samples.
- + How your levels compare with other people.
- + Where these chemicals come from.
- + How they can affect health.
- + How you can reduce levels of these chemicals in your body, your home, and at work.

Start Here

More PFASs than most others.

Your samples had more PFASs than most others in the study. PFASs can come from non-stick sprays on pots and pans or in stain-resistant clothing.



Click here to see all of your results for PFASs

Tip: Mouse over your graphs to learn how to read them. Each circle represents another person's level of PFDA in air. The brown ones are firefighters, and the **PFDA** blue office workers. off the scale 0 0 0 0 000 0 0 0 0 0 0 0.21 0.23 0.25 0.19 ng/mL Your Level: 0.27 **PFOS** off the scale 0 0 00 0 0 0 00 0 00 0 **PFOA** off the scale

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WFBC Emphasizes Prevention Evidence

Biological mechanism



Human exposure

Basis for action

Education
Policy
Regulation
Reformulation

Extinguishing Breast Cancer from the Fire Service



Implications for policy

- LOCAL: Changes to protective equipment policies, station design for any new stations, purchasing ordinances
- OCCUPATION-SPECIFIC: Policy work with state, national, and federal firefighting organizations to develop appropriate worker exposure protections
- STATE & FEDERAL: Chemicals Policy Reform. If the products that burn in fires are less toxic, then firefighters will have fewer exposures

Impact - Rigor, Relevance & Reach

Rigor: Advance biomonitoring science in new directions

- First study to examine the range of exposures to potential breast carcinogens and other EDCs among women firefighters compared to female controls
- Measuring biomarkers potentially relevant to breast cancer risk.
- Use of non-targeted biomonitoring techniques in a firefighter population

Relevance: Potential to extend to other female occupational groups

 Future recruitment of women from other occupations, such as nursing, nail salon workers, teachers, etc.

Reach: Disseminate results to diverse audiences

- Leverage research results to inform policy change
- Report-back to study participants



Women Firefighters Biomonitoring Collaborative



Collaborative Partners:

















Funders:

- CBCRP: Community Research Collaboration Fund
- San Francisco Firefighters Cancer Prevention Foundation
- International Association of Firefighters (IAFF), Local 798