

# ***Female Firefighters & Breast Cancer Risk***

## Presented by:

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San Francisco Fire Department and  
United Fire Service Women

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UC Berkeley School of Public  
Health & Department of Environmental  
Science, Policy and Management

**Connie Engel**

Breast Cancer Fund



# Agenda

- How the study developed
- What we know and don't know
- About the Women's Firefighters  
Biomonitoring Collaborative Study
- Translating Science
- Policy Implications



# Our Mission & Vision

To achieve health justice for all  
women at risk of and living  
with breast cancer

**VISION:** A world where lives and communities  
aren't threatened by breast cancer.



# BCAction's Core Values

- Health justice
- Honesty, fearlessness, and truth-telling
- Honoring diverse voices
- People's health and well-being
- Transparency and accountability
- Collective action
- Freedom from conflict of interest



# Our Commitment to Social Justice

- Unequal burden of disease
- Root Causes
- Intersectionality
- Allyship



# BCAction's Strategic Priorities

- 1) Breast Cancer Screening, Diagnosis and Treatment
- 2) Root Causes of Breast Cancer
- 3) Pink Ribbon Marketing and Culture



# Rachel Morello-Frosch, PhD, MPH



Professor, UC Berkeley School of Public Health and Department of Environmental Science, Policy and Management & Principal Investigator



# Connie Engel, PhD



Science & Education  
Manager, Breast Cancer Fund



# Lt. Heather Buren



Lieutenant & Paramedic, San  
Francisco Fire Department and  
United Fire Service Women  
President



# Women Firefighters Biomonitoring Collaborative

# Who?

- **San Francisco Firefighter Cancer Prevention Foundation**
- **United Fire Service Women**
- **UC Berkeley School of Public Health**
- **UC San Francisco**
- **Silent Spring Institute**
- **Breast Cancer Fund**
- **Commonweal**

# What?

**A Biomonitoring study that will examine exposures to chemicals linked to breast cancer, including carcinogens and chemicals that disrupt the body's normal hormone function.**

# How?

## **California Breast Cancer Research Foundation**

- The mission of the California Breast Cancer Research Program is to prevent and eliminate breast cancer by leading innovation in research, communication, and collaboration in the California scientific and lay communities.

# Why?













# A little about the job of fighting fire.



# What can we control/change?

- Personal protective equipment (PPE)
- Wearing Air packs
- Being healthy and fit
- Cleaning PPE after exposures
- Standard operating procedures (SOP)

# What we can not control?

- What's burning \*\*
- Length of time exposed to smoke/toxins
- Intensity

\*\*Toxicity of fuel load can be changed through policy regarding what chemicals can/cant be used in manufacturing.







# Moving forward

- Ongoing education
- Prevention



# Women Firefighters Biomonitoring Collaborative



## Collaborative Partners:



COMMONWEAL



## Funders:



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

Studies in multiple countries of male firefighters and other first responders indicate elevated risk of certain cancers, such as thyroid, bladder, kidney, prostate, testicular, breast, brain, digestive, multiple myeloma, and non-Hodgkin's lymphoma compared to the general population.

**Some studies have linked these diseases to occupational exposures**

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



## Breast cancer rate alarms SFFD female firefighters

By Will Reisman



MIKE KOOZMIN/THE S.F. EXAMINER

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



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)

## Firefighters Sound Alarm On Toxic Chemicals

Posted: 03/27/2014 7:40 am EDT | Updated: 04/08/2014 1:59 pm EDT



# 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



Photo: Terray Sylvester / The Chronicle  
Lieutenant Patty Lui  
<http://www.sfgate.com/health/article/S-F-Fire-Department-joins-study-into-breast-5833837.php#photo-7019384>

Studies so far almost exclusively on men.

## **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.

SFFD has one of the **largest populations of women** among its ranks in the US (N = ~ 225)



# Women Firefighter Biomonitoring Collaborative Team

## Firefighter Organizations:

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

## Science Team:

- UC Berkeley
- UC San Francisco
- Silent Spring Institute

## Environmental Health Advocates:

- Commonweal
- Breast Cancer Fund



(L-R) Heather Buren (United Fire Service Women - UFSW), Connie Engel (Breast Cancer Fund), Rachel Morello-Frosch (UC Berkeley), Catherine Dodd (SF Health Services System-HSS), Tony Stefani (San Francisco Firefighter Cancer Prevention Foundation), Margaret O'Sullivan (SF HSS), Natasha Parks (UFSW), Sharyle Patton (Commonweal).



(L-R) Rachel Morello-Frosch (UCB), Sharyle Patton (Commonweal), and Heather Buren, (President, UFSW), drumming up support for the WFBC by presenting on the study at SFFD Training Center

# 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

# 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)

# Exposure Assessment Interview



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



# Biospecimen Collection



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



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



# 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

# WFBC participants recruited, interviewed & samples collected so far...

Goal is 160 participants (80 firefighters and 80 female “controls”)

	<i><b>Recruited and eligible</b></i>	<i><b>Enrolled and interviewed</b></i>	<i><b>Samples collected</b></i>
<i><b>Firefighters</b></i>	<i><b>97</b></i>	<i><b>86</b></i>	<i><b>56</b></i>
<i><b>Non-firefighter (Controls)</b></i>	<i><b>115</b></i>	<i><b>83</b></i>	<i><b>75</b></i>
<i><b>Total</b></i>	<i><b>212</b></i>	<i><b>169</b></i>	<i><b>131</b></i>

# WFBC Emphasizes Prevention Evidence

**Biological  
mechanism**

**+**

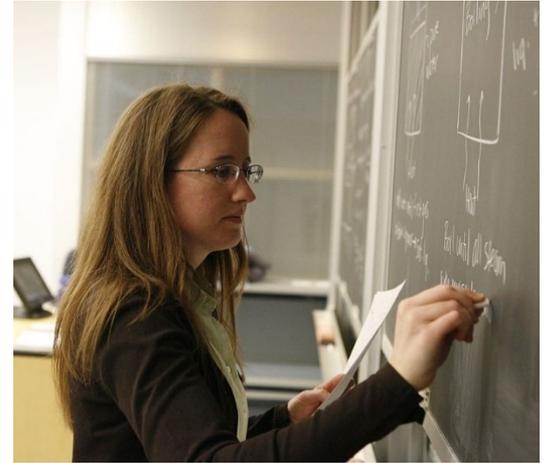
**Human  
exposure**

**Basis for  
action**

**Education  
Policy  
Regulation  
Reformulation**

# Future work may extend study to include other female occupational groups

- Nurses, nail salon workers, teachers, etc.



# 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

# Thank you!



SFFD Firefighters & WFBC Members (L-R): Anita Paratley, Heather Buren, Lisa Holdcroft, Karen Stone, & Karen Heald

# Women Firefighters Biomonitoring Study

- Communication
- Results report-back
- Potential policy implications

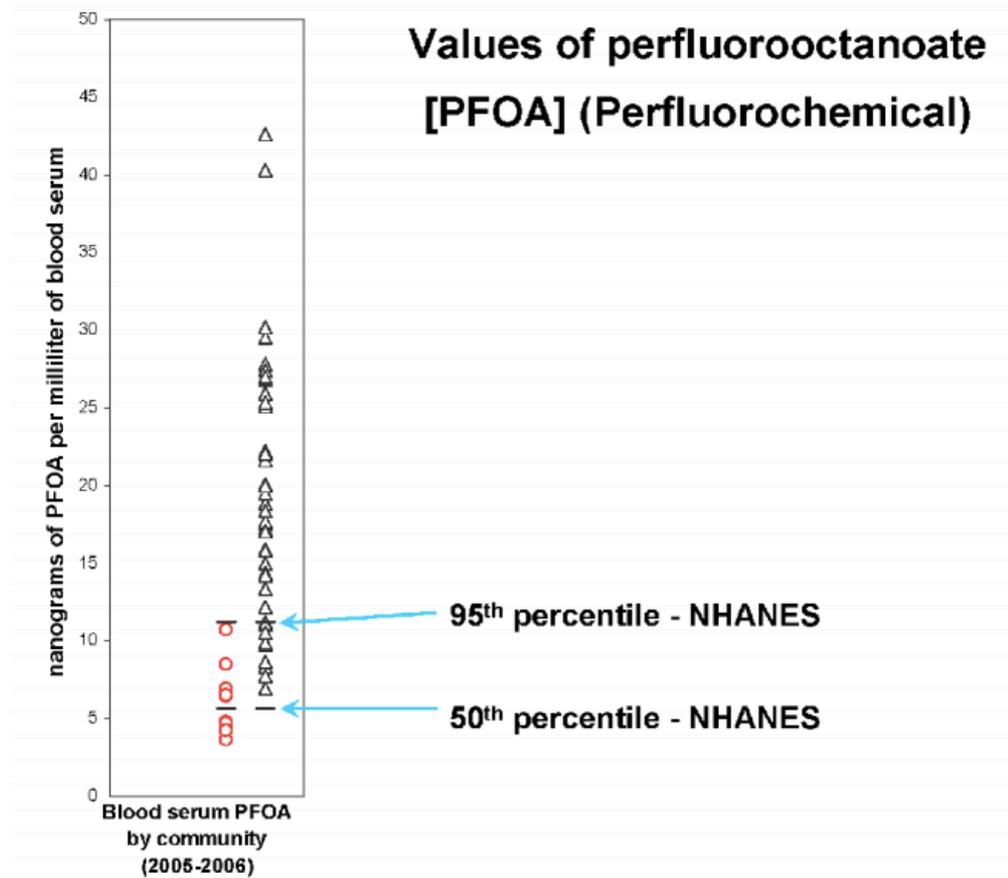
# Communication

- Ongoing with firefighter community
- Biggest asset here has truly been our firefighter team
- One-on-one engagement
- Website
- Events
- Possible education and training

# Results report-back

- Focus groups
- Individual results for those who opted-in
- Aggregate report-back to the anyone from the two occupational communities who wants to attend
- Will include results, educational component, and policy implications

# Results report-back



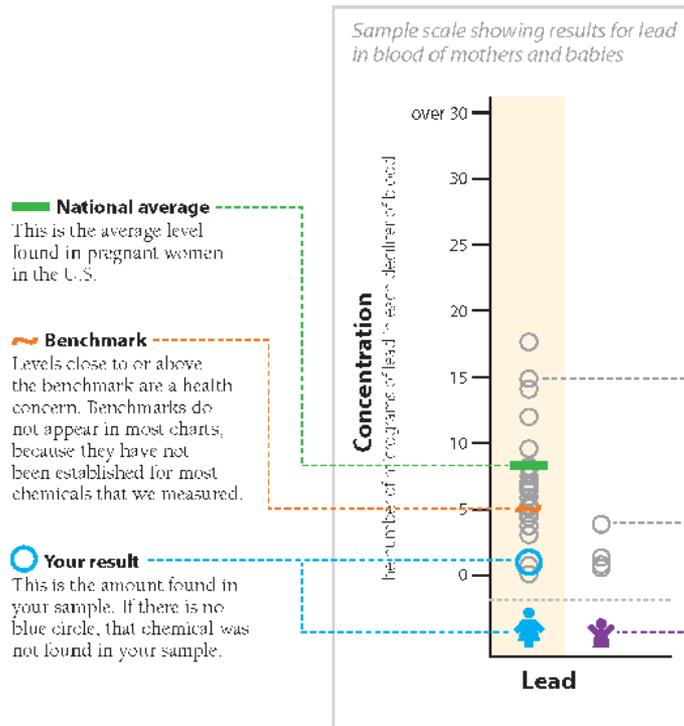
[http://silentspring.org/sites/default/files/personal\\_exposure\\_report\\_handbook.pdf](http://silentspring.org/sites/default/files/personal_exposure_report_handbook.pdf)

# Results report-back

## How to Read the Results Charts for You and Your Baby

There are xx Results Charts. The charts show the amount, or level, of each chemical found in your blood or urine or in your baby's blood. Some charts show results for both you and your baby. Some show the results for you only. This is because we tested both blood and urine samples from mothers, but only blood samples from babies.

### What the Symbols Mean:



### Understanding Averages and Benchmarks

You can compare your results to the levels for other people in this study or for pregnant women nationwide. The national averages are taken from the National Health and Nutrition Examination Survey (NHANES). This survey was conducted by the Centers for Disease Control and Prevention, a federal agency.

You can also compare your results to benchmarks when they exist. Benchmarks are established by different government agencies, such as the U.S. Environmental Protection Agency (EPA) and California's EPA. Levels close to or above the benchmark are a possible health concern. Benchmarks have not been established for most chemicals that we measured.

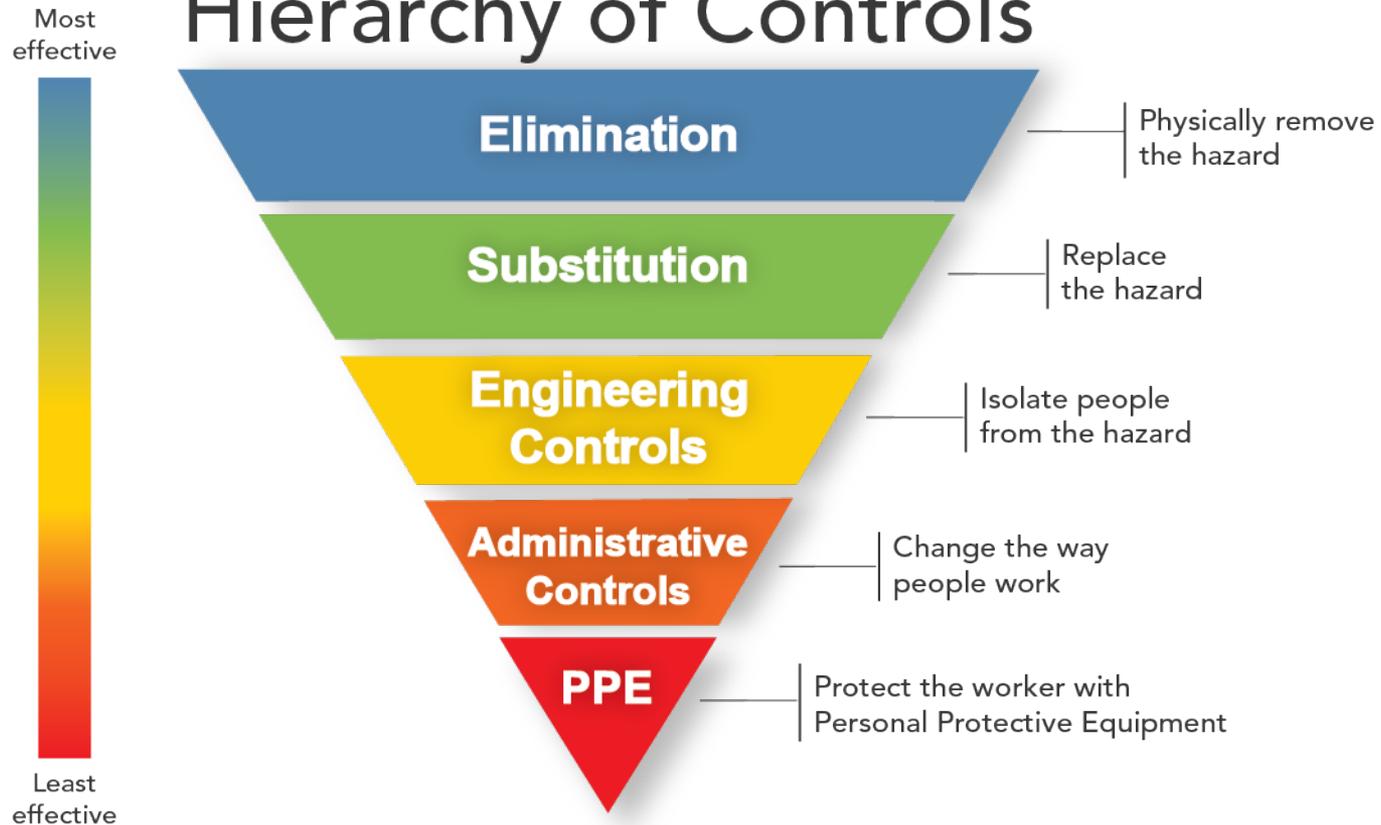
[http://silentspring.org/sites/default/files/personal\\_exposure\\_report\\_handbook.pdf](http://silentspring.org/sites/default/files/personal_exposure_report_handbook.pdf)

# Policy Implications

- We anticipate the findings could have implications for public policy on multiple levels.
- Depending upon study results, these could include:
  - **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

# Policy Implications

## Hierarchy of Controls



# Review resources mentioned in the presentation

- Women's Firefighter Biomonitoring Collaborative <http://womenfirefighterstudy.com/>
- San Francisco Firefighters Cancer Prevention Foundation <http://www.sffcpf.org/wp/>
- United Fire Service Women <http://ufsw.org/>
- Toxic Hot Seat <http://www.toxichotseatmovie.com/>
- Breast Cancer Fund [www.breastcancerfund.org/](http://www.breastcancerfund.org/)
- Silent Spring <http://sciencereview.silentspring.org/>
- California Breast Cancer Research Program <http://cbcrp.org/>



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# Breast Cancer Action

*Challenging Assumptions. Inspiring Change.*

[www.bcaction.org](http://www.bcaction.org)

[www.thinkbeforeyoupink.org](http://www.thinkbeforeyoupink.org)

