Firefighter Cancer Initiative: Project Overview and Update

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UNIVERSITY OF MIAMI HEALTH SYSTEM

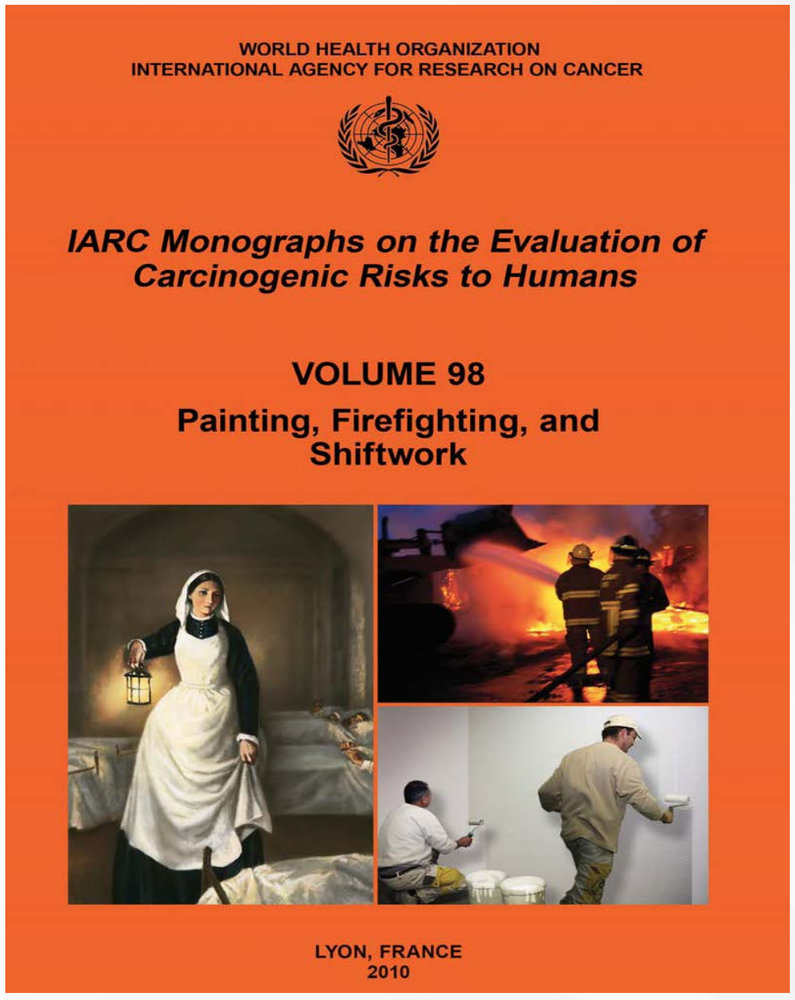
“Cancer is the No. 1 health concern in the firefighting profession today”

Harold A. Schaitberger, General President, International Association of Fire Fighters

Occupational exposure as a firefighter is “possibly carcinogenic to humans”

Large variations in exposure across different types of fires and different groups of firefighters. RR’s consistently increased for:

- testicular
- prostate
- non-Hodgkin lymphoma



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Relevant Epidemiologic Studies

- LeMasters, JOEM, 2006
  - Combined data in 32 studies of fire fighters for 20 different cancer types

  - Cancers probably elevated in firefighters are:
    - Multiple myeloma
    - Non-Hodgkin's lymphoma
    - Prostate cancer
    - Testicular cancer

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Cancers Related to Firefighting

Cancer Site	IARC Report	LeMasters Meta-Analysis	≥2 Recent Reports
Testicular	X	X	X
Prostate	X	X	X
Non-Hodgkin Lymphoma	X	X	
Multiple Myeloma		X	X
Colon/Rectum			X
Brain			X
Lung			X
Mesothelioma			X
Melanoma			X
Kidney			X
Esophageal			X

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Previous Florida Linkage

Cancer Incidence in Florida Professional Firefighters, 1981 to 1999

Fangchao Ma, MD, PhD
Lora E. Fleming, MD, PhD
David J. Lee, PhD
Edward Trapido, ScD
Terence A. Gerace, PhD

Objective: *The objective of this study was to examine the cancer risk associated with firefighting.* ***Methods:*** *Standardized incidence ratio analysis (SIR) was used to determine the relative cancer risk for firefighters as compared with the Florida general population.* ***Results:*** *Among 34,796 male (413,022 person-years) and 2,017 female (18,843 person-years) firefighters, 970 male and 52 female cases of cancer were identified. Male firefighters had significantly increased incidence rates of bladder (SIR = 1.29; 95% confidence interval = 1.01–1.62), testicular (1.60; 1.20–2.09), and thyroid cancers (1.77; 1.08–2.73). Female firefighters had significantly increased incidence rates of overall cancer (1.63; 1.22–2.14), cervical (5.24; 2.93–8.65), and thyroid cancer (3.97; 1.45–8.65) and Hodgkin disease (6.25; 1.26–18.26).* ***Conclusions:*** *Firefighting may be associated with an increased risk of selected site-specific cancers in males and females, including an overall increased cancer risk in female firefighters.* (J Occup Environ Med. *2006;48:883–888*)

Firefighters are routinely exposed to various carcinogens during firefighting and overhaul (ie, time period for searching and extinguishing hidden fires after the main fire is brought under control).[1] Carcinogens such as benzene and polycyclic aromatic hydrocarbons (PAHs) have been frequently detected in fire smoke.[2] Epidemiologic studies have demonstrated an increased risk for several cancers that can be plausibly linked to carcinogens encountered by firefighters in the course of their work.[3,4] There is evidence of excess mortality from leukemia, non-Hodgkin lymphoma, multiple myeloma, and cancers of the brain and bladder. Weaker but still plausible evidence has linked firefighting to increased mortality risks from melanoma and cancer of the rectum, colon, stomach, prostate, and lung.[4–11] Because most previous studies of firefighters and cancer were based on mortality data, the full extent of their cancer risk, in particular the risk of being diagnosed with cancer, is not yet known. This retrospective co-

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Previous Florida Linkage

Male Firefighters were at increased risk of:

- Bladder
- Thyroid
- Testicular

Female Firefighters were at increased risk of:

- Thyroid
- Cervical
- Hodgkin’s Lymphoma

Sylvester Comprehensive Cancer Center

Part of **UHealth** – the University of Miami Health System and the **University of Miami Miller School of Medicine**

- More than 120 cancer researchers and 130 cancer specialists
- A member of the elite Alliance of Dedicated Cancer Centers
- South Florida's only Cancer Center of Excellence

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Firefighter Cancer Initiative

UM to study why so many PB firefighters get

By age 60, twice as many firefighters die from cancer as heart atta

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ORLANDOS

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UM Sylvester Cancer Center Teams Up With Firefighters To Study 'Silent Killer'

Miami-Dade Fire Rescue and the UM Sylvester Comprehensive Cancer Center are joining…

MIAMI.CBSLOCAL.COM | BY CBS MIAMI

Palm Beach County Fire Re

Palm Beach County Fire Rescue has pa
Sylvester Comprehensive Cancer Cent
learn more about the increased risk of c

WPBF.COM | BY STEPHANIE BERZINSKI

Researchers study cancer in local firefighters

Battling fires is one thing - battling cancer however is a different story.

WPTV.COM | BY JASON HACKETT WPTV

Participate in Cancer Risk Study

Three years after losing a 24-year-old firefighter to cancer, Orange County Fire Rescue members are prepared to take part in a cancer risk study.

FIREHOUSE.COM

Broward Firefighters Take Part In Cancer Research Study

Broward Sheriff Fire Rescue is one of several fire rescue departments in South Florida included in the U.M. Sylvester Comprehensive Cancer Center study investigating the higher-than-normal cancer rates among firefighters. | iHeartRadio

IHEART.COM

Firefighters and Cancer Risk

- Sylvester Comprehensive Cancer Center & University of Miami state legislative priority
- State Representative Jeanette Nuñez, District 119
  - Chair, Government Operations Appropriations Subcommittee

2015-2016: $ 965,000

Miami Dade Fire Rescue
Palm Beach County Fire Rescue
City of Miami Fire Rescue
Broward County Fire Rescue
31 municipal fire departments in South Florida

2016-2017: $ 1.5 million

Expansion to Martin, Orange, Hillsborough, and Pasco Counties

2017-2018: $ 1 million

Expansion to all fire departments in state of Florida (volunteer and career)

Firefighter Cancer Initiative Projects

Year One

1. Health Communication
2. Exposure App Development
3. Exposure App User Experience
4. Biochemistry Breath Analysis
5. Environmental Sampling Program
6. FCDS Linkage
7. Annual Cancer Survey and Biobanking
8. Cancer Screening/Testing

Year Two

9. AERIAL – Firefighter Retirees
10. PBDE & Thyroid Function
11. Guardrails
12. Tumor Bank

Year Three

13. Mouse Model
14. Train the Trainer

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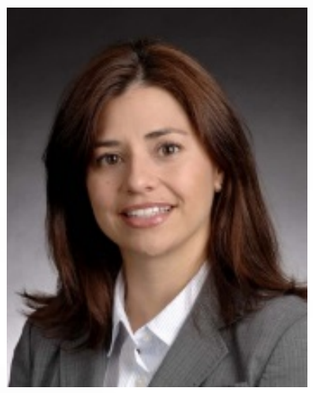
Firefighter Cancer Initiative Research Team











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Cancer Control Continuum

Prevention

Detection

Diagnosis

Treatment

Survivorship

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Prevention

Cancer Screening

Guardrails

AERIAL

Personal Exposure Reporting Application

Exposure Repo... Clay Ewin

Create a Report

Incident Information

Incident Number:

Incident Type: Fire

⚠ Please take care to select the correct incident type as this selection will populate the related report fields. If you do change the incident type, you will lose all information previously entered for this PER.

Incident Date: mm/dd/yyyy

Incident Zip Code:

Alarm Time: --:-- --

Were you asleep at alarm time?

How long were you at the incident?

Unit Number:

Education

Annual Cancer Survey

Purpose: Understand cancer risks specific to Florida Firefighters
Create a database of the risks and behaviors of all Florida Firefighters

- **Comprehensive Baseline Questionnaire:**
  - Medical History
  - Cancer History
  - Cancer Risk Behaviors
  - Cancer Screening Behaviors
  - Occupational History
  - Environmental Exposures

- All Florida firefighters are invited to participate

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Annual Cancer Survey

- 3,152 completed surveys
- 504 completed Year 2 follow-up surveys
- Mean age= 40.4 years (±9.1 years)
- 90.0% male
- 39.4% were Hispanic
- Average tenure= 14 years (±8.6) as a firefighter

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Annual Cancer Survey Findings

Table 1. Skin cancer and sun-protective practices among non-probabilistic sample of Florida firefighters

	Skin Cancer Type				
	All	**Melanoma**	**Non-Melanoma**	**Unknown Type**	**No Skin Cancer**
Characteristics	n (%) [2]	n (%) [2]	n (%) [2]	n (%) [2]	n (%) [2]
All [1]	2,399	17 (0.7)	84 (3.5)	20 (0.8)	2,290 (95.5)
Age at Diagnosis					
Mean (Std)	--	42.2 (6.8)	38.3 (10.8)	42.4 (8.5)	--
Years as a Firefighter					
Mean (Std)	15.1 (8.2)	22.3 (8.9)	22.5 (8.5)	21.0 (7.9)	14.7 (8.0)
Gender					
Male	2,156 (90.0)	12 (75.0)	73 (86.9)	19 (95.0)	2062 (90.2)
Female	239 (10.0)	4 (25.0)	11 (13.1)	1 (5.0)	225 (9.8)
Ethnicity					
Non-Hispanic	1,438 (60.6)	16 (94.1)	73 (89.0)	18 (90.0)	1,343 (59.3)
Hispanic	934 (39.4)	1 (5.9)	9 (11.0)	2 (10.0)	922 (40.7)
Skin Cancer Prevention & Sun Protection Practices					
Ever used a tanning bed?					
Yes	568 (23.8)	6 (35.3)	23 (27.4)	6 (30.0)	535 (23.5)
No	1,817 (76.2)	11 (64.7)	61 (72.6)	14 (70.0)	1,741 (76.5)
Skin Type					
More likely to burn	1,464 (63.6)	16 (94.1)	81 (96.4)	18 (94.7)	1,361 (62.1)
More likely to tan	837 (36.4)	1 (5.9)	3 (3.6)	1 (5.3)	832 (37.9)
Ever had full skin check?					
Yes	1,164 (49.6)	17 (100.0)	82 (97.6)	19 (95.0)	1,058 (47.3)
No	1,183 (50.4)	0 (0.0)	2 (2.4)	1 (5.0)	1,180 (52.7)
Number of Sunburns in past year					
Mean (Std)	1.6 (2.7)	1.8 (1.9)	2.4 (3.1)	1.2 (1.1)	1.6 (2.7)
Sun Protection Practices[3]					
Use Sunscreen[1]	826 (34.4)	9 (52.9)	45 (53.6)	5 (25.0)	772 (33.7)
Wear hat[1]	451 (18.8)	5 (29.4)	21 (25.0)	6 (30.0)	424 (18.5)
Wear long-sleeved shirt[1]	440 (18.3)	7 (41.2)	20 (23.8)	4 (20.0)	414 (18.1)
Wear long pants[1]	338 (14.1)	2 (11.8)	10 (11.9)	3 (15.0)	325 (14.1)
Stay in shade[1]	713 (29.7)	4 (23.5)	26 (31.0)	6 (30.0)	679 (29.7)

[1] Row percentages; [2] Column Percentages; [3] Proportion of firefighters who follow these sun protection practices "always" or "most of the time" when in the sun for more than 1 hour; Std = standard deviation
*Differences in sub-total due to item non-response or missing values in the sample

- Elevated prevalence of melanoma (0.7%) compared to the Florida adult melanoma prevalence (0.011%)
- Younger age of diagnosis (42 years) compared to general US population (64 years)

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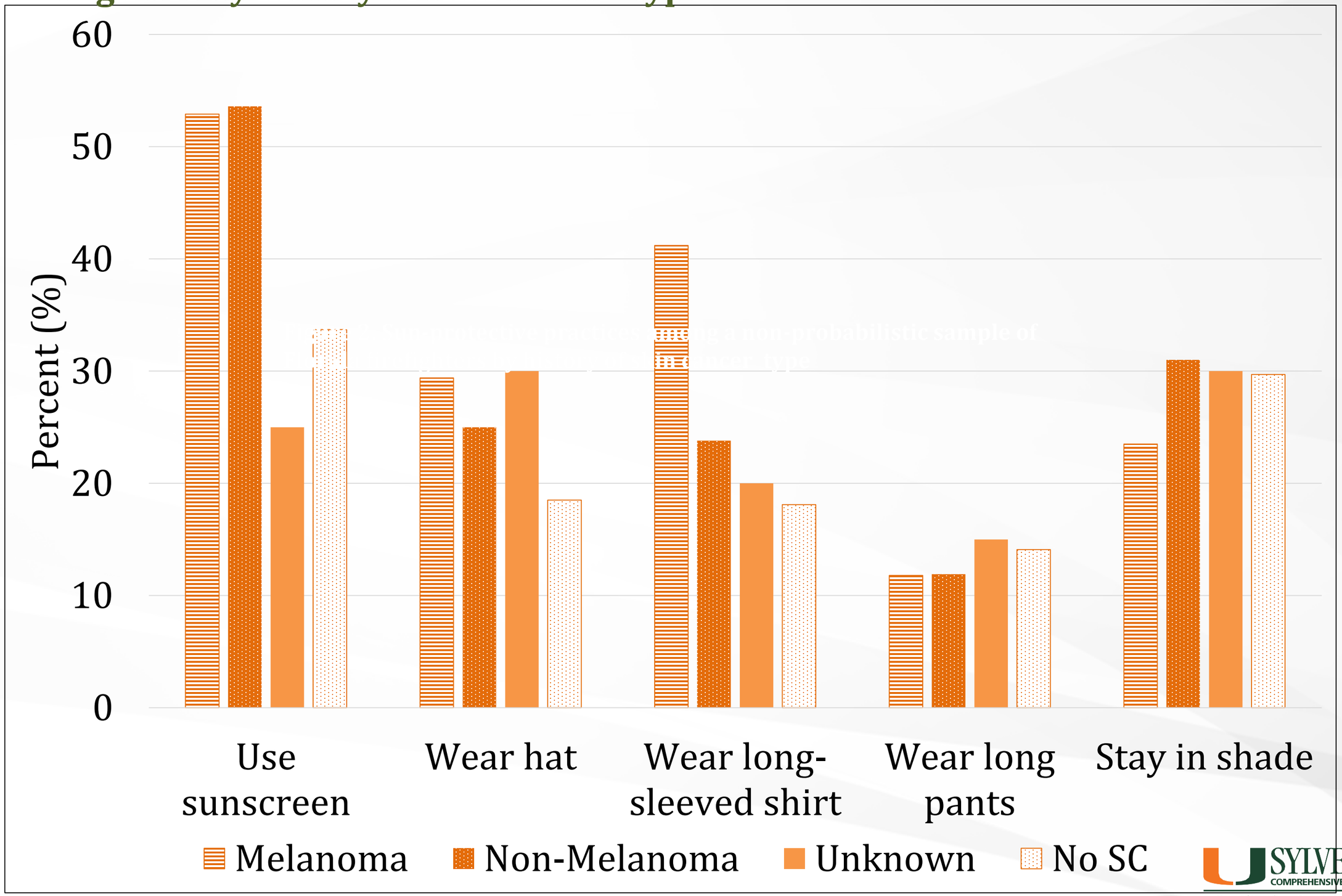
Annual Cancer Survey Findings

Sun-protective practices among a non-probabilistic sample of Florida firefighters by history of skin cancer type



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Moore, K., Caban-Martinez, A.J., Kirsner, R.S., **Schaefer Solle, N.,** Lee, D., Koru-Sengul, T., & Kobetz, E. Firefighter Skin Cancer and Sun Protection Practices: Evidence from the Florida Firefighter Cancer Initiative. *Journal of American Medical Association (JAMA) Dermatology*

Annual Cancer Survey Link

To complete the Annual Cancer Survey visit:

www.tinyURL.com/ACSfirefighter

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AERIAL Survey and Retiree Focus Groups

- 162 completed surveys
- Mean age= 60 years
- 90.7% male
- Average tenure= 30 years as a firefighter

- Focus groups themes:
  - Occupational exposures
  - Cancer as an inevitable outcome
  - Challenges of cross contamination
  - Improvements in policy surveillance for increased protection

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AERIAL Survey Link

To complete the AERIAL Survey visit:

www.tinyURL.com/AERIALfirefighters

Colorectal Cancer Screening Project

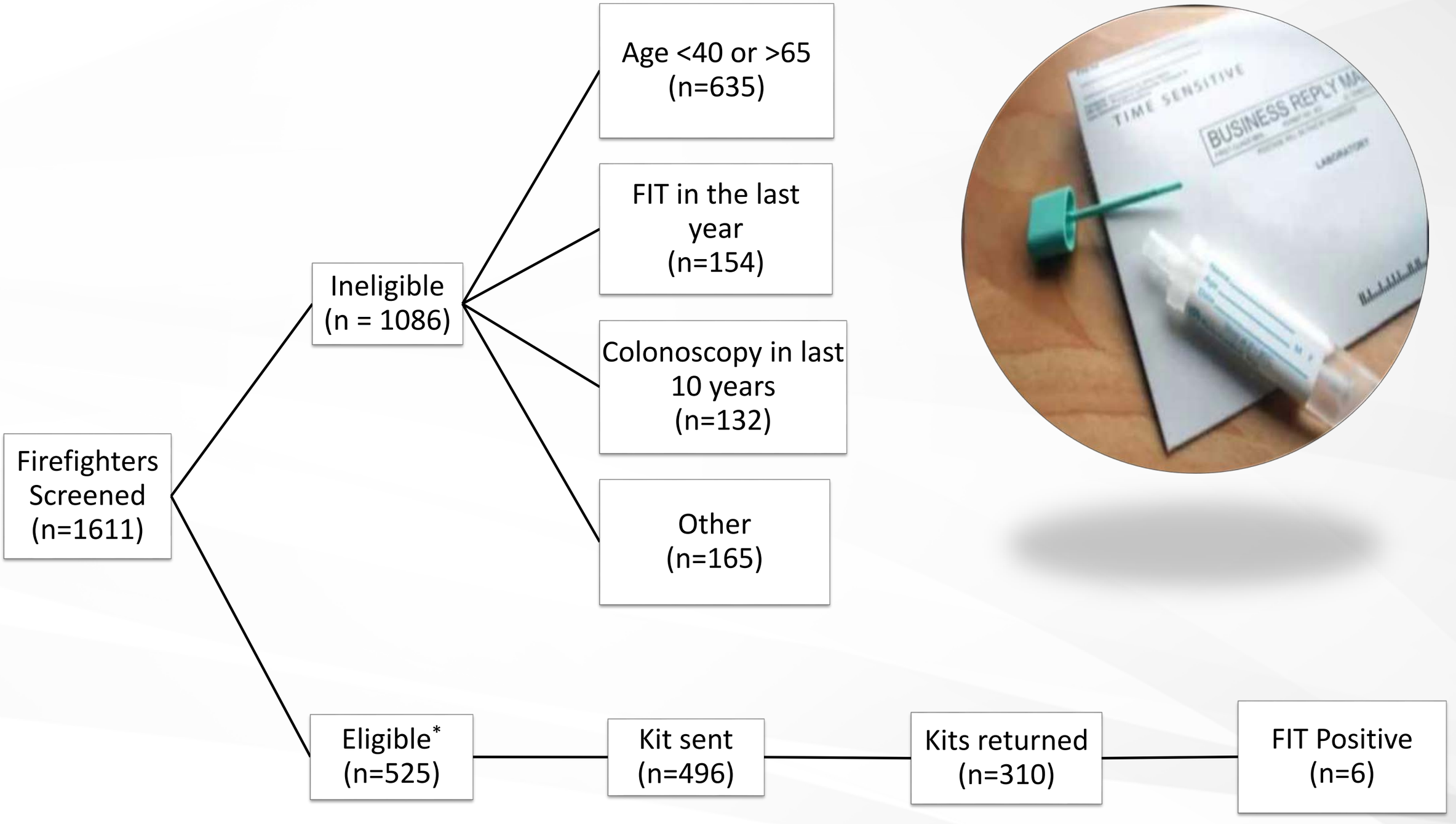
•Recruitment of South Florida firefighters through workplace email and promotion during station visits.

•Screened for eligibility through the Annual Cancer Survey
- Active firefighter
- 40-65 years old
- Not up to date with CRC screening.

•Firefighters were mailed a FIT kit and screening results were reported via phone.

•Firefighters who screened positive were referred for colonoscopy at a tertiary care center

Colorectal Cancer Screening



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Detection, Diagnosis, and Treatment

Tumor Bank

Cell Line

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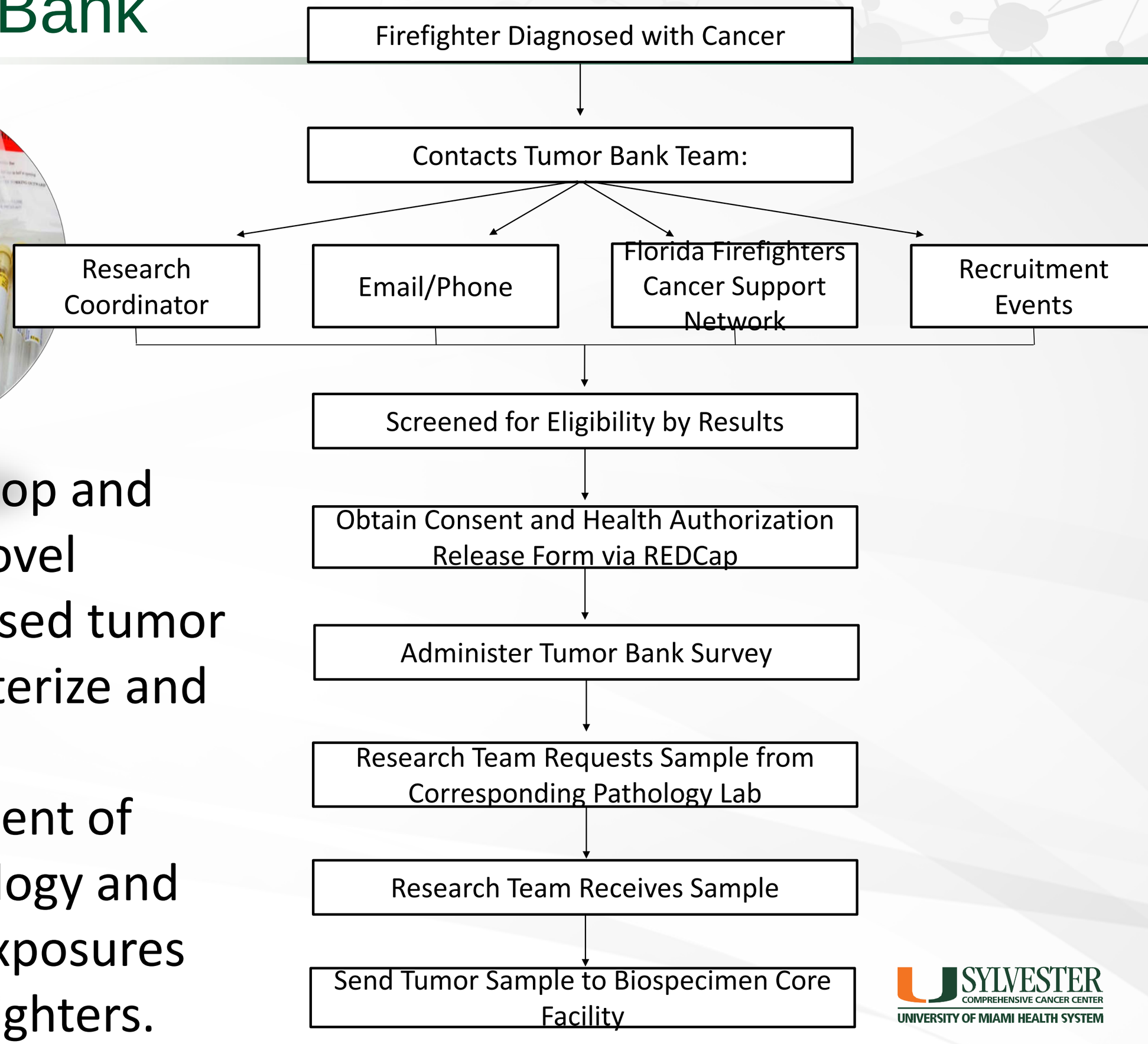
Tumor Bank

Purpose: Develop and implement a novel firefighter-focused tumor bank to characterize and examine the microenvironment of tumor morphology and work-related exposures specific to firefighters.



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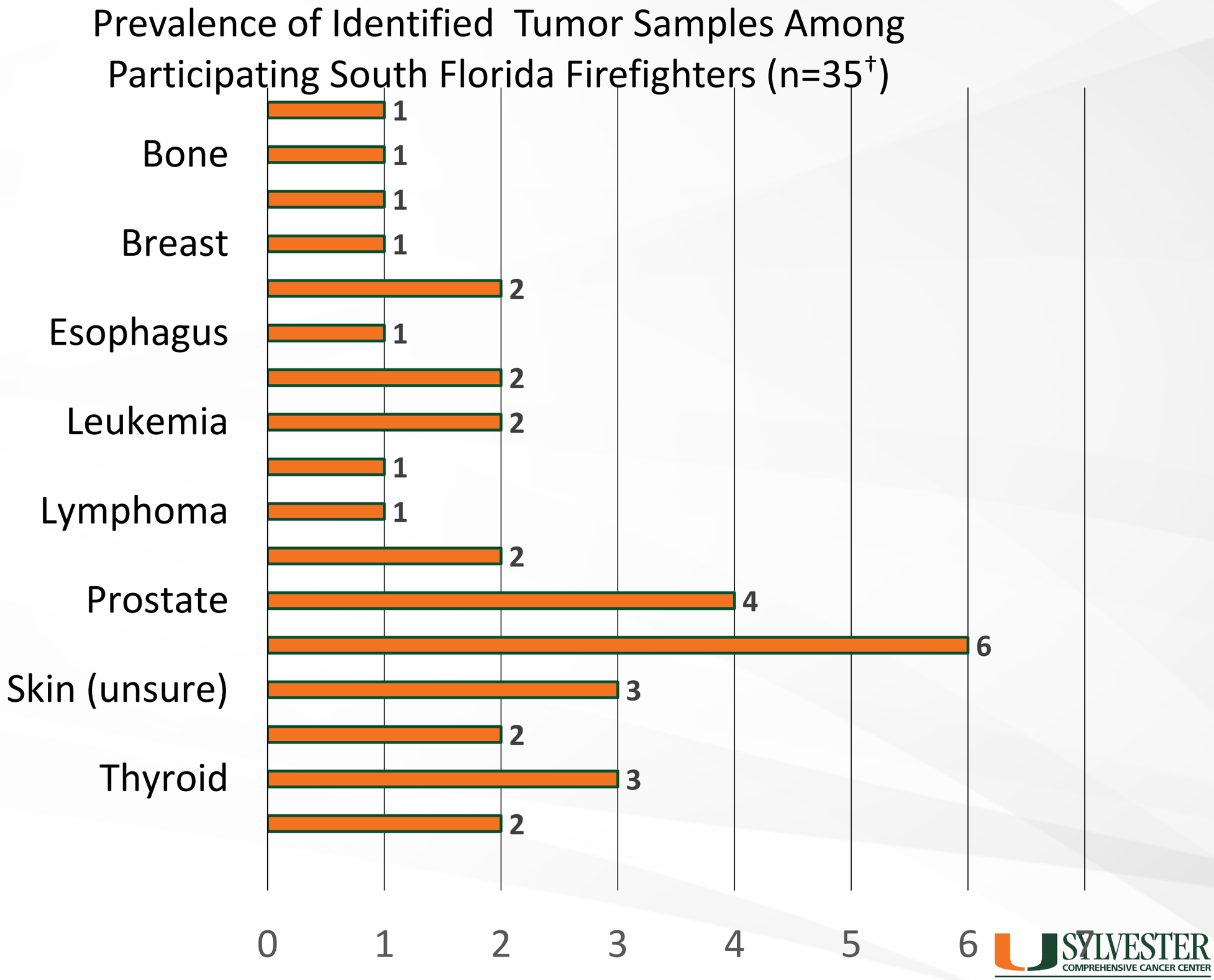
Tumor Bank



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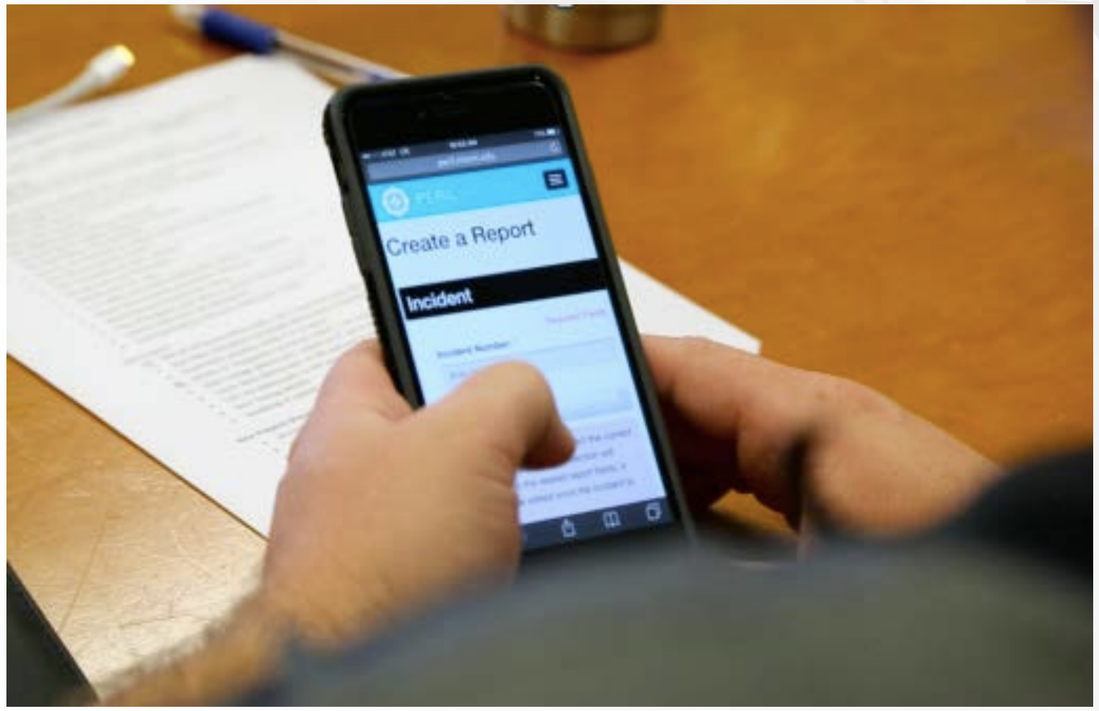
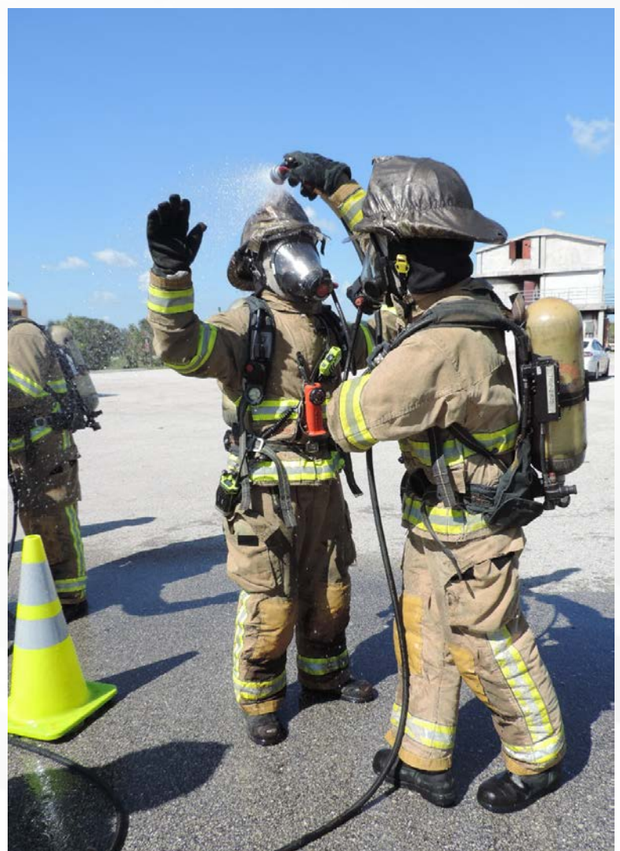
Implementing Change





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Firefighter Personal Exposure Reporting System

http://per.miami.edu

[redacted]

[redacted]

[redacted]

- Dashboard
- View Reports
- Create Report
- Profile

Personal Reported Incident Types

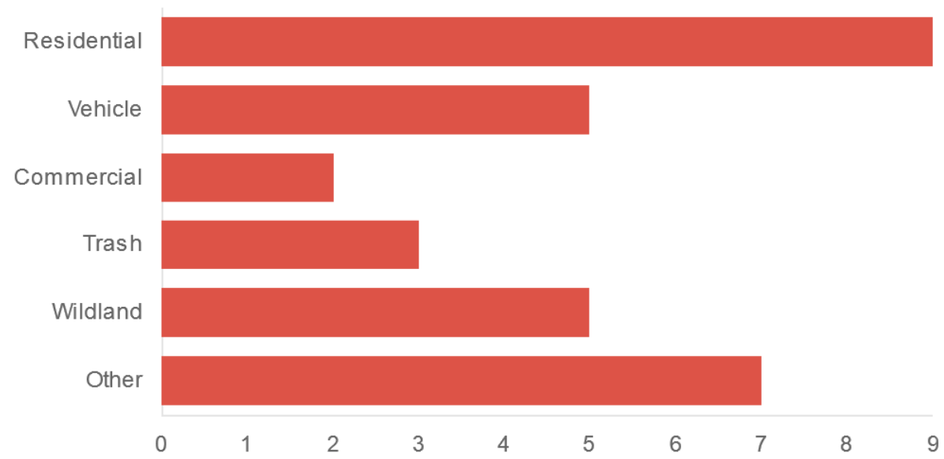
Year - 2017

Showing: Personal Year - 2017

40 Incidents | 37 Incidents | 11 Incidents | 2 Incidents

Fire | Hazardous Materials | Water Rescue | Aircraft

Fire Incident Types



Top 3 Symptoms for Fire Incidents

Rank	Symptom
1	Skin Irritation / Rash
2	Skin Burn
3	Muscle Cramps

Personal Exposure Reporter Application

Department Onboarding:

- Contact FCI with request to get your department started.
  - Email: firefighterstudy@miami.edu

- Complete FCI form with information required:
  - Department logo
  - Incident number format
  - Station list
  - Headquarter address

- Once confirmation of onboarding is received, start using the app!
  - Tutorial available at www.sylvester.org/firefighters
  - App website: http://per.miami.edu

Train the Trainer

- **Goal:** Provide firefighters the **knowledge and tools** necessary to implement cancer risk reduction training and practices at their departments and stations.

- Partnering with the Michael S. Gordon Center for Research in Medical Education

- Incorporates:
  - Focus group feedback
  - Research findings
  - Tools developed by FCI investigators and local firefighters
  - Hands on demonstration of decontamination procedures

- Pilot to be completed May 2018

Health Communication and Education Campaign

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Organizational-Level Factors that Influence Cancer Screening Activities within the Fire Service

Policies, programs, and practices	All Fire Departments N (%)†	Cancer Screening Available N (%)†	Cancer Screening not-available N (%)†	p-value
OSH Program present	106 (86.9)	52 (92.9)	54 (81.8)	**0.052**
OSH Program updated regularly	68 (60.2)	38 (74.5)	30 (48.4)	**0.005**
Written OSH Program Policy Statement	80 (73.4)	39 (81.3)	41 (67.2)	**0.049**
Management sets safety goals at worksite	66 (56.9)	30 (56.6)	36 (57.1)	0.953
Managers held accountable for OSH	78 (70.3)	39 (76.5)	39 (65.0)	0.188
Employees can report safety hazards/problems	117 (95.9)	53 (96.4)	64 (95.5)	0.816
Feedback to employees reporting hazards/problems	77 (75.5)	37 (82.2)	40 (70.2)	0.160
Supervisors/Managers provided OSH training	45 (42.5)	22 (43.1)	23 (41.8)	0.891

†Differences in sub-total population sample due to item non-response or missing.

EPIGENETICS CASE-CONTROL STUDY

High / Low Florida Firefighter Exposures

Probe ID	Chr #	Estimate	p-value	Gene Name & Function
cg08412885	6p21.33	0.347	0.017	**LY6G5C**: Tumor suppression and inflammatory response
cg27435646	7q21.3	0.105	0.005	**PEG10**: Overexpression associated with hepatocellular carcinoma and B-cell lymphocytic leukemia
cg16184495	19p13.12	0.197	0.000	**EPHX3**: Protein coding gene for hydrolase activity. Associated with prostate cancer
cg22705386	7q32.2	0.191	0.047	**MEST**: Encodes alpha/beta hydrolase superfamily. Associated with the following cancers Kidney, Uterine, Breast, Lung Wilms Tumor, Cervical cancer and Eewing's sarcoma
cg06212135	7q32.2	0.163	0.013	**MESTIT1**: Encodes for antisense RNA. Associated with lung adenocarcinomas, colon cancer, and beast cancer
cg24089209	14q32.2	0.782	0.059	**MEG3**: Inhibits tumor cell proliferation
cg00964321	16p13.11	0.122	0.047	**PDXDC1**: Gene for pyridoxal phosphate binding and carboxy-lyase activity. Associated with colorectal cancer cells.

†Estimates of controls (n=37 low exposure) compared to cases (n=39 high exposures), adjusted for age, ethnicity, smoking status cancer status and cell type.

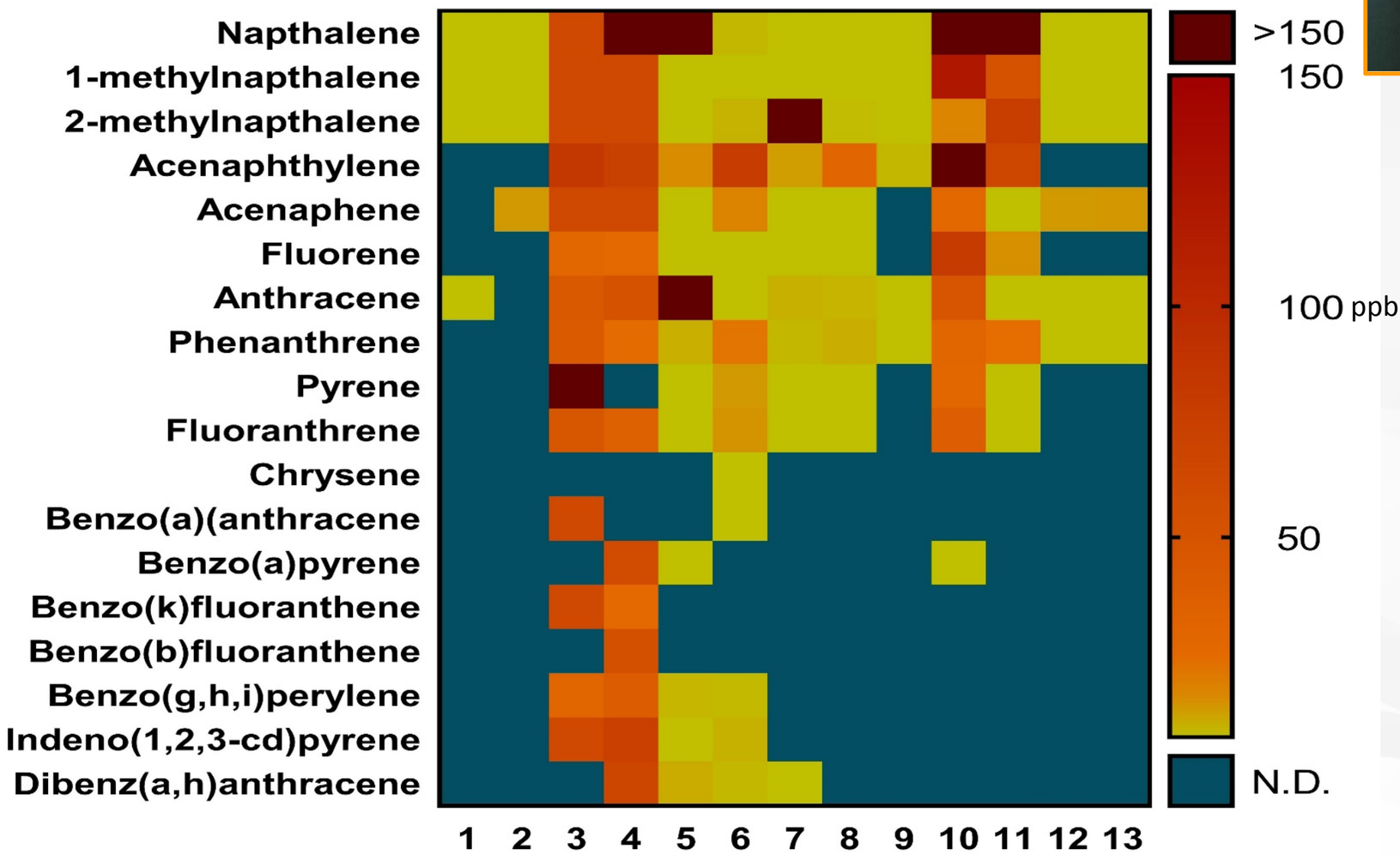
PAH Detection from Wristbands

OSHA guidelines Permissible exposure limit (PEL)
PAHs 35.4 ppb
PAHs in water 0.2 ppb (EPA)

Chemicals identified in samples can pose a health threat and were found at levels much higher than OSHA permitted levels of exposure.

PAH Detection in Fire Stations in South Florida

Heat Map of PAH quantity



PAH Quantity detected using treated silicone wristbands placed throughout a fire station for 24hrs. For comparison, the maximum EPA permitted level of PAHs in drinking water is 0.2 ppb; these samples exceed this limit 40-fold or more.

Survivorship: Partnering for a Healthier Future

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Thank You

Questions?

For any additional questions:

firefighterstudy@med.miami.edu

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