

# Firefighter Cancer Linkage Project Update

David J. Lee<sup>1,2,3</sup>, Tulay Koru-Sengul<sup>1,2,3</sup>, Monique N. Hernandez<sup>1</sup>, Jill A. MacKinnon<sup>1</sup>  
Alberto Caban-Martinez<sup>2,3</sup>, Laura A. McClure<sup>1,3</sup>, Erin Kobetz<sup>4</sup>

<sup>1</sup>Florida Cancer Data System (FCDS), University of Miami Miller School of Medicine

<sup>2</sup>Department Public Health Sciences, University of Miami Miller School of Medicine

<sup>3</sup>Sylvester Comprehensive Cancer Center, University of Miami Miller School of Medicine

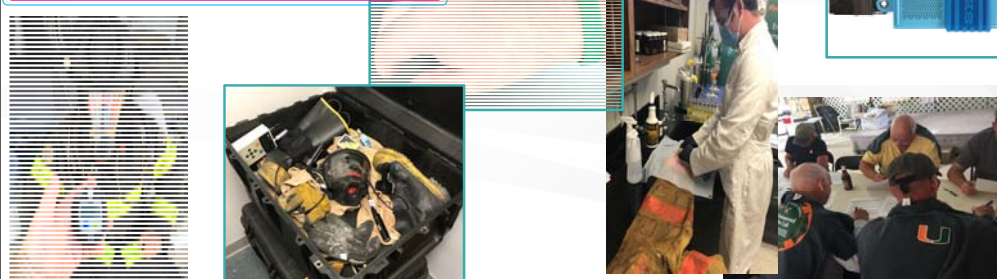
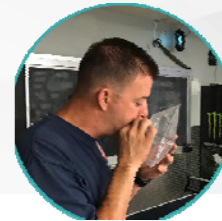
<sup>4</sup>Department Medicine, University of Miami Miller School of Medicine



This work was supported by State of Florida appropriation #2382A

## Firefighter Cancer Initiative (FCI) Goals

- To monitor, understand and address the excess burden of cancer among firefighters
- 13 interlocking projects designed to move innovative research from “bench” to “trench”

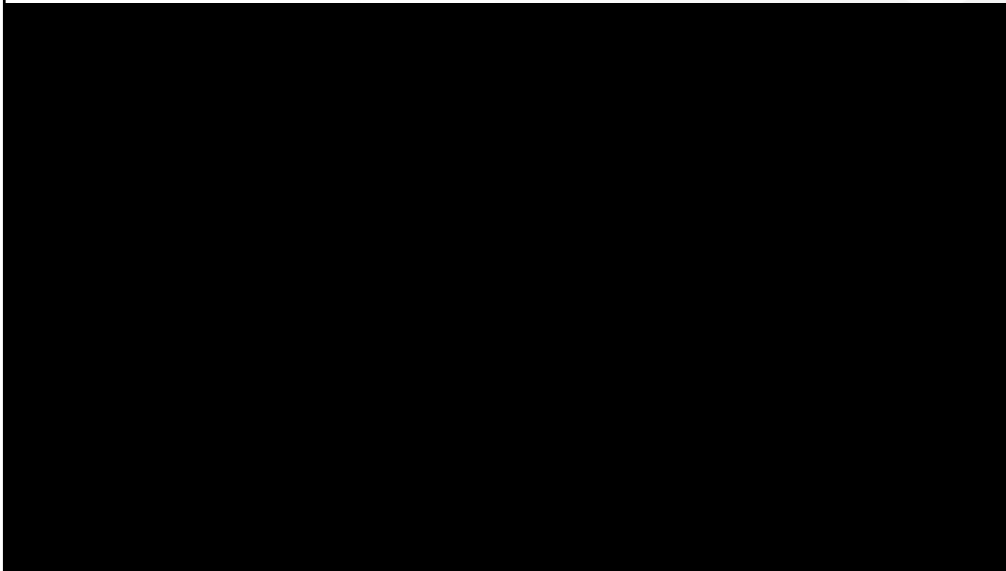


## Annual Cancer Survey and Exposure Reporting

- Annually collect health information and cancer risk factors of active and retired Florida firefighters (n > 1000)
- Long-term goal is to use data to identify occupational and other exposures linked to cancer risk



## Personal Exposure Reporting Incident Logger



## Previous Research Using FCDS

data

### 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).<sup>1</sup> Carcinogens such as benzene and polycyclic aromatic hydrocarbons (PAHs) have been frequently detected in fire smoke.<sup>2</sup> 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.<sup>3,4</sup> 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.<sup>4-11</sup> 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-



## Initial Linkage Attempt



- Year one efforts were hampered by a state regulation preventing release of social security number (including partial SS)
- A deterministic match with FCDS data (1981-2013) using first name, last name, date of birth, gender, state, county, and city was attempted but returned only 53 tumor record matches



## Year Two Methods

- In year two granted permission to link certification file to Lexis-Nexis to obtain SS # (& other missing information)



## Year Two Methods

- 28% of the firefighter certification records were not submitted to LexisNexis because of incomplete information
- In addition to name you need one of following:
  - SS #
  - Home phone #
  - Home address

**FIREFIGHTERS**  
 Florida State Fire Marshall's  
 Office, 1972-2017  
 n=108,772

Records missing key linkage  
 variables = 30,833



## Results

- Obtained excellent return on submitted file
- Also obtained information on race, gender, and home address

77,939 Sent to Lexis Nexis for linkage:

98% return of SS #  
58% return on missing DOB  
(1,841 of 3,138)

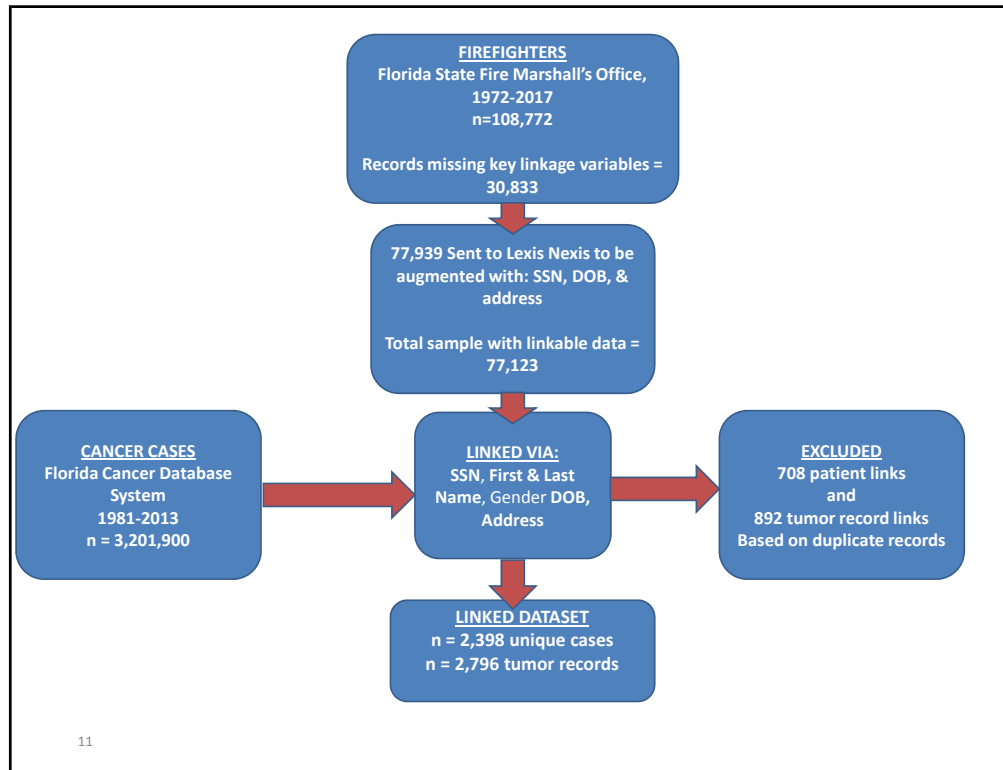


## Results

- However cost for look-up is large, especially if you are seeking social security #
- Cost based on batch look-up, not on returned records

Variable	Cost per look-up	# submitted records	Cost
Social security number	0.32	77939	24,940.48
Home Address	0.07	77939	5,455.73
Race and Gender	0.06	77939	4,676.34
Date of Birth	0.05	3138	156.90
		<b>Total charge:</b>	<b>\$35,229.45</b>





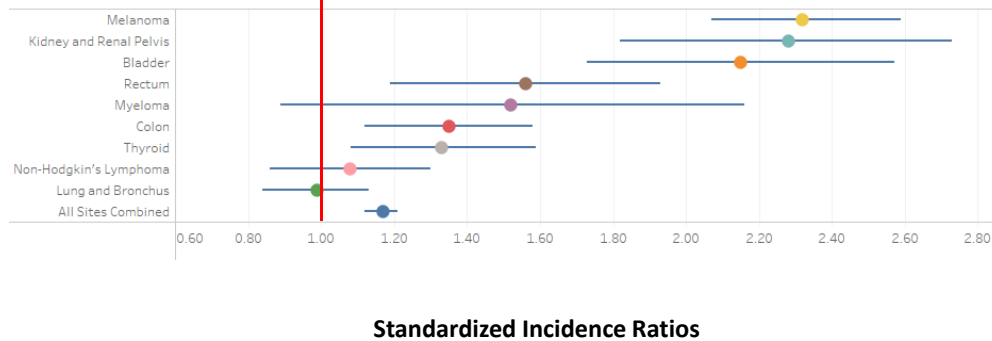
## Linkage details

- Stata (v. 14.2) was used for pre-processing/clerical review
- A probabilistic linkage using R (v. 3.3) was undertaken using:
  - SSN
  - Address (A)
  - DOB (D)
  - Gender (G)
  - Name (N)
- Five data passes were run with blocking on (1) SSN, (2) A-D-G-N, (3) A-D-G, (4) A-D-N, and (5) D-N-G.



## Results

### Select High-Priority Cancer Standardized Incidence Ratios: FCDS Years 1981-2013



## Future Direction 2017-18

- Recent statute modification now allows for release of SS #; may help 'recover' cases among the 30,000 records we could not link
  - Will enable us to include vital missing female cases and will further strengthen case counts for males
- Relink with the cancer registry and undertake linkage with mortality file

633.516 ~~Division to make study of firefighter-employee occupational diseases. Studies of occupational diseases of firefighters or persons in other fire-related fields. — The division shall make a continuous study of~~ is authorized to contract for studies, subject to the availability of funding, of firefighter-employee occupational diseases of firefighters or persons in other fire-related fields and the ways and means for their the control and prevention of such occupational diseases, and shall adopt rules as necessary for such control and prevention. For this purpose, the division is authorized to cooperate with firefighter-employers, firefighter-employees and insurers and with the Department of Health. For such studies, as well as other studies of firefighter or persons in other fire-related fields, that are funded, in whole or in part, under an agreement, including contracts or grants, with the department, the division is authorized to release confidential information for such firefighter or persons in other fire-related fields, to parties who have entered agreements, with associated security measures, with the department when the study being conducted tracks diseases on an individual.



