



Early assessment of cancer outcomes in New York City firefighters after the 9/11 attacks: an observational cohort study

Rachel Zeig-Owens

October 13th 2011



Background

Cancer and Firefighting

- Previous studies have been inconsistent in showing risk, both overall and in specific cancers:
 - Some have shown elevated cancer risk for firefighters
 - Others have shown firefighters are less likely to develop cancer



Background – WTC exposures

- The attacks on the World Trade Center (WTC) on 9/11/2001 resulted in a massive dust cloud and subsequent fires that burned for months
- Exposures included:
 - glass fibers
 - asbestos
 - polycyclic aromatic hydrocarbons (PAHs)
 - polychlorinated biphenyls (PCBs)
 - burning jet and diesel fuel (dioxins)



Background – WTC and Cancer

Only one previous study:

- 8 cases of multiple myeloma in WTC responders
- 4 cases under the age of 45



FDNY Study Cohort (n=9,853)

- Active FDNY firefighters on 1/1/1996
- Male
- White, Black, or Hispanic
- Employed at FDNY for at least 18 months
- Had known WTC exposure status (exposed or non-exposed)
- Were or would have been under age 60 on 9/11
 - too few people who were over 60 and worked at WTC



Study Cohort Demographics

Cohort (n=9853)	
Race and ethnic origin	
Non-Hispanic white	9289 (94%)
Non-Hispanic black	294 (3%)
Hispanic	270 (3%)
Self-reported never smokers by end of study (n=8467)	5313 (63%)
Retired as of 9/11	1482 (15%)
Mean age as of 9/11 (years)	44.0 (6.7)
Mean age at start of follow-up (years)	38.4 (6.7)
Mean years of service as FDNY firefighters	20.8 (5.9)
Mean length of follow-up (years)	12.7 (1.2)
Data are number (%) or mean (SD). 9/11=Sept 11, 2001. FDNY=Fire Department of the City of New York.	

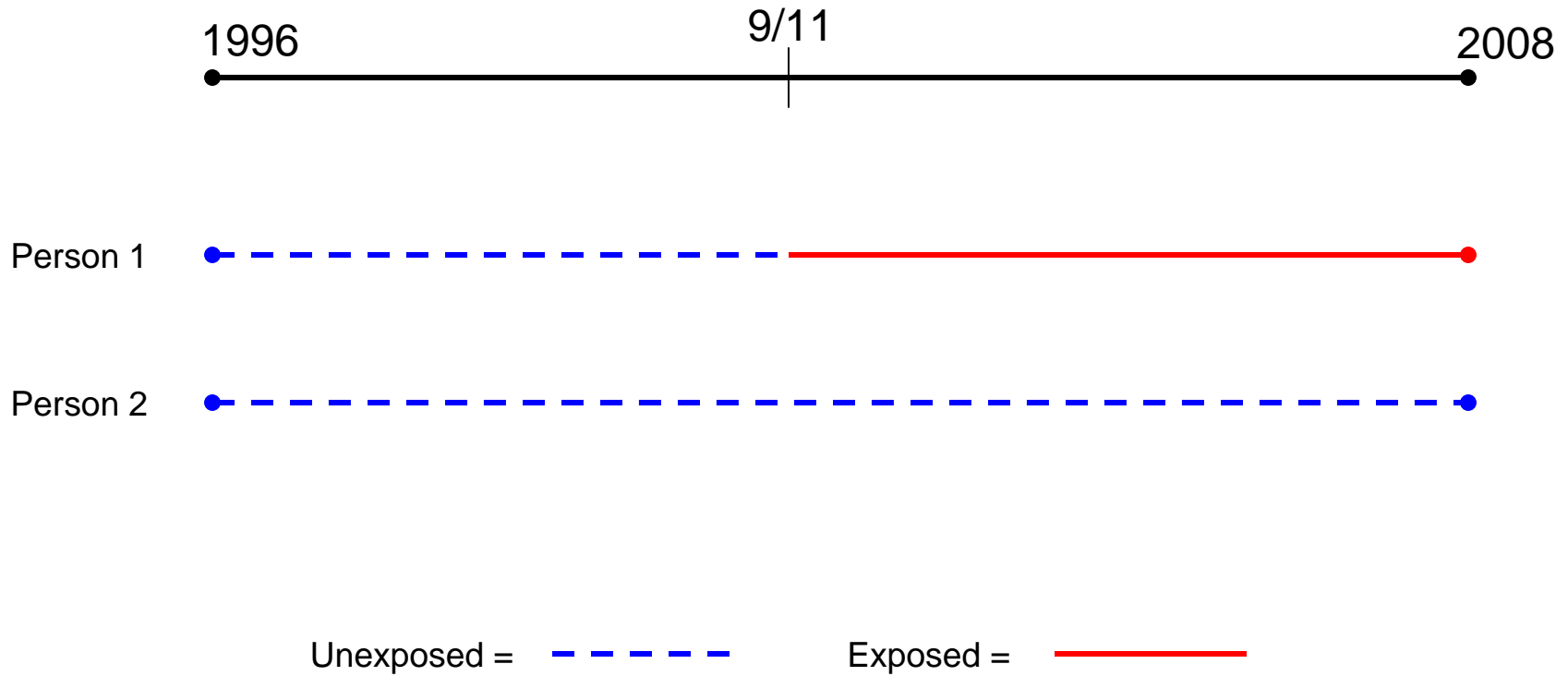


Exposure

	Number of WTC-exposed firefighters (N=8927*)
→ FDNY exposure categories†—time of first arrival at WTC site	
Morning of 9/11	1600 (18%)
Afternoon of 9/11	4409 (49%)
Day of Sept 12, 2001	1616 (18%)
Any day between Sept 13, 2001, and Sept 24, 2001	1211 (14%)
Any day between Sept 25, 2001 and July 25, 2002	91 (1%)
→ Common exposure categories‡—type of exposure on day of 9/11	
Heavily exposed to the dust cloud	1702 (19%)
Working on the pile but not heavily exposed to dust cloud	4218 (47%)
Present but not working on the pile and not heavily exposed to the dust cloud	123 (1%)
Not present in lower Manhattan on 9/11	2700 (30%)
Missing type of exposure information	184 (2%)



Exposure





Data collection

- Linked to state cancer registries in New York, Florida, Pennsylvania, North Carolina, and Virginia
 - Match on various identifying factors such as:
 - Social Security Number (100% of our cohort)
 - First and Last Name
 - Date of Birth
 - Over 90% of those who are currently retired
- Confirmed self-reported cases
 - Verified with medical records



Comparison Groups

- Compared to the US population (general population)
 - Used data from SEER
 - Rates by age group, gender, race, calendar year
- Compared to FDNY firefighters not at WTC



Standardized Incidence Ratios (SIRs)

$$\text{SIR} = \frac{\text{Observed Number of Cases}}{\text{Expected Number of Cases}}$$

$$\text{SIR ratio} = \frac{\text{Exposed SIR}}{\text{Unexposed SIR}}$$



Results

All Cancer Sites

	Observed	Expected	SIR (95% CI)
All sites			
Exposed (61 884 person-years)	263	238	1.10 (0.98–1.25)
Non-exposed (60 761 person-years)	135	161	0.84 (0.71–0.99)
SIR ratio*	..	..	1.32 (1.07–1.62)



Surveillance Bias

- When cancer screening rates differ between comparison populations
- FDNY annual medical exams may detect cancer
 - lung, liver, thyroid, kidney, prostate, blood cancers
- We corrected for potential bias in 2 ways
 - Delaying diagnosis date by two years (all cancer sites SIR=1.21)
 - Delaying diagnosis date until after 2008 (all cancer sites SIR=1.19)



Results

Non-Hodgkin Lymphoma

	Observed	Expected	SIR (95% CI)
Non-Hodgkin lymphoma			
Exposed	21	13	1.58 (1.03-2.42)
Non-exposed	9	11	0.83 (0.43-1.60)
SIR ratio*	..	..	1.90 (0.87-4.15) ←
Non-Hodgkin lymphoma (corrected)†			
Exposed	20	13	1.50 (0.97-2.33)
Non-exposed	9	11	0.83 (0.43-1.60)
SIR ratio*	..	..	1.81 (0.82-3.97) ←

Note: We had fewer than 5 cases of Multiple Myeloma during the study period and were unable to calculate the SIRs



Results

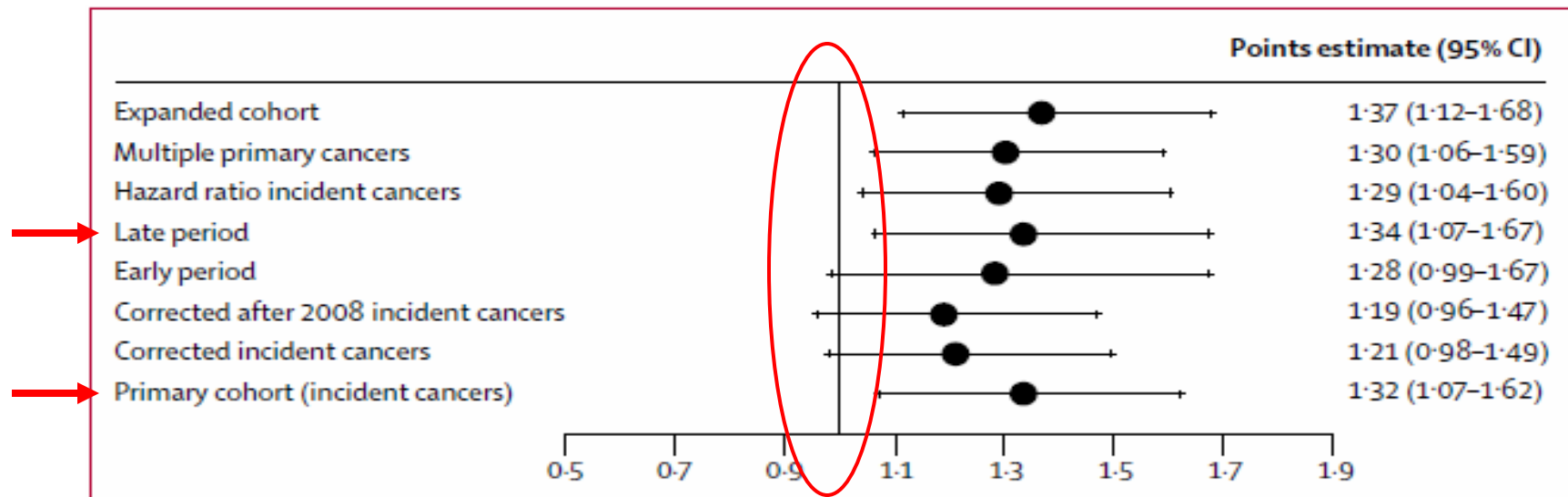
Lung

	Observed	Expected	SIR (95% CI)
Lung			
Exposed	9	21	0.42 (0.20-0.86)
Non-exposed	8	15	0.52 (0.26-1.05)
SIR ratio*	..	..	0.80 (0.29-2.18)
Lung (corrected)†			
Exposed	6	21	0.28 (0.13-0.62)
Non-exposed	8	15	0.52 (0.26-1.05)
SIR ratio*	..	..	0.53 (0.18-1.54)

FDNY firefighters have lower rates of smoking than NYC



Results





WTC - Exposures and Cancer

Hypotheses for biologic plausibility:

- Presence of known carcinogens at WTC
 - polycyclic aromatic hydrocarbons (PAHs)
 - polychlorinated biphenyls (PCBs)
- WTC exposure is associated with acute and chronic inflammation which, in turn, has been associated with various specific cancers (non-Hodgkin lymphoma, prostate, thyroid, melanoma)



Take Home Message

- There is a signal that Cancer and WTC exposure may be associated
- Not able to say WTC exposure *caused* cancer
- Future work needs to
 - Study additional populations
 - For longer amounts of time (studies in the future)
- Continued follow-up is important



Thank you

Mayris Webber, Charles Hall, Theresa Schwartz,
Nadia Jaber, Jessica Weakley, Thomas E Rohan,
Hillel Cohen, Olga Derman, Thomas Aldrich,
Kerry Kelly, and David Prezant

The full article can be found online at
TheLancet.com in the September 3rd 2011 issue