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Weight Gain and Lung Function Recovery in World Trade Center Rescue/Recovery Workers

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The dust cloud at the World Trade Center site

- partially combusted and/or pulverized wood, paper, and jet fuel
- pulverized construction materials including asbestos, glass, silica, fiberglass, and concrete
- complex organic chemicals
- lead
- other metals



Thousands of rescue/recovery workers were exposed to this dust cloud. ²

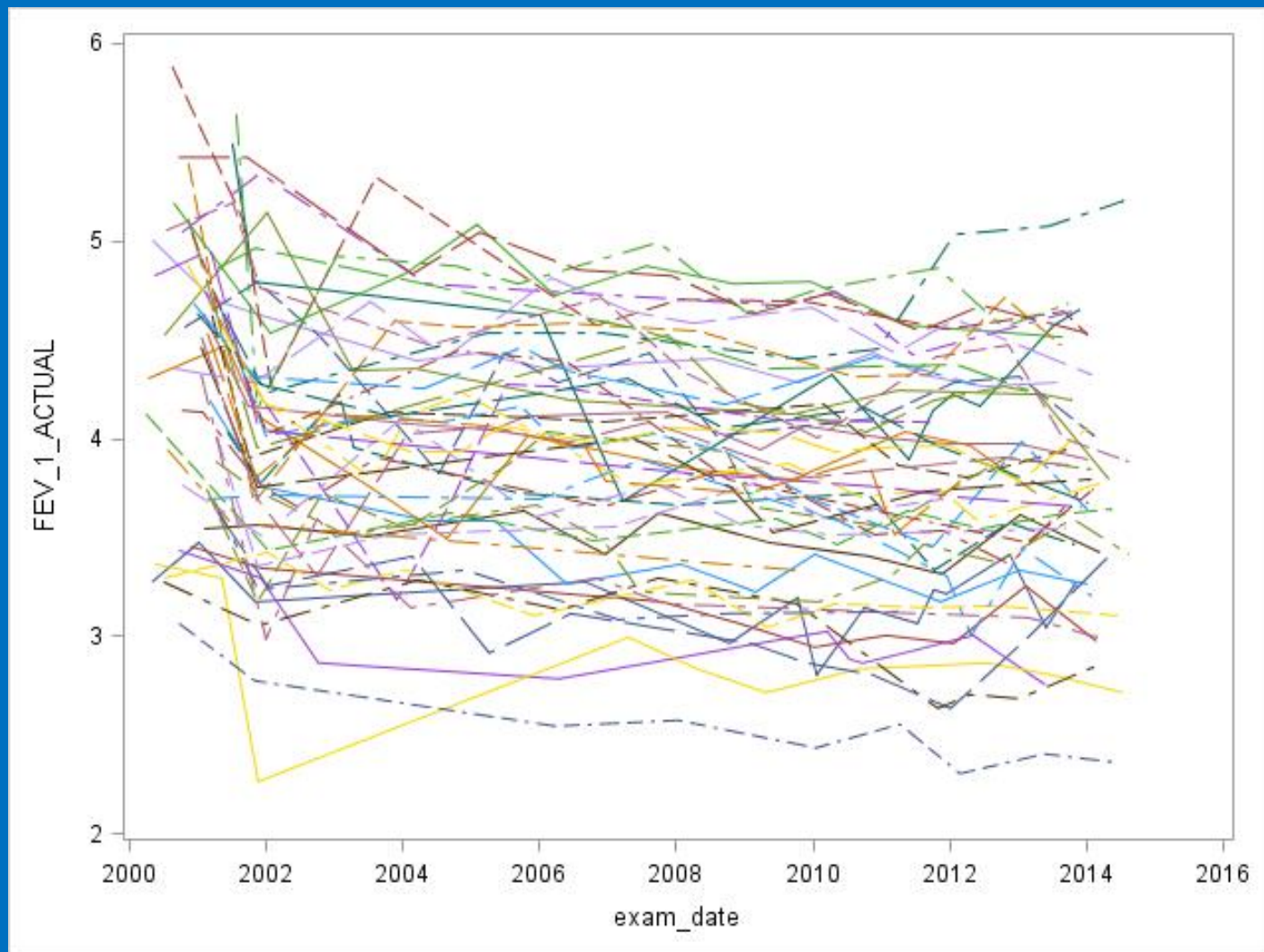
Lung Function and WTC dust exposure

- Thousands of rescue/recovery workers were exposed to the dust cloud.
- Most rescue/recovery workers from the Fire Department of the City of New York experienced substantial decline in pulmonary function during the first year after 9/11/2001.
- On average, there has been little recovery in pulmonary function.

Lung Function and WTC dust exposure

- And a small number of rescue/recovery workers have experienced some lung function improvement since 9/11.
- Others have continued to experience lung function decline.
- The purpose of this research is to investigate reasons for the heterogeneity in post-2001 pulmonary function trajectories.

Trajectories of pulmonary function



Study Cohort

5,515 male FDNY firefighters who met the following criteria:

- Arrived at the World Trade Center site by 9/24/2001
- Consented to research
- Have known smoking status and weight information
- At least one pre-9/11 pulmonary function test
- At least one pulmonary function test between 9/11 and 9/10/2002
- At least one pulmonary function test after 9/11/2009
- Excluded those with more than 30 lb weight loss or more than 60 lb weight gain (need numbers) between first post-9/11 exam to last post-9/11 exam.

Cohort characteristics

- 52,596 pulmonary function tests (mean 9.5, median 10, range 3-20).
- 94.3% non-Hispanic white
- Mean age 39.4 years (range 21.3-64.1) as of 9/11/2001
- Mean BMI 28.5 shortly after 9/11 (range 18.2-47.9)
- Median length of follow-up 12.3 years
- 52.6% retired by end of follow-up
- 15.8% present at WTC site morning of 9/11 (highest exposure)
- 72.1% arrived afternoon of 9/11 or any time 9/12/2001

Cohort comorbidities, N (%)

	Pre-9/11/2001	Post-9/11/2001
Asthma	96 (1.7)	1153 (20.9)
Chronic Bronchitis	317 (5.8)	519 (9.4)
COPD	0	62 (1.1)
Sinusitis	154 (2.8)	1865 (33.8)
GERD	141 (2.6)	1714 (31.1)
Interstitial Lung Disease*	13 (0.2)	31 (0.6)
Cancer	43 (0.8)	294 (5.3)

*Includes sarcoidosis, asbestosis (lung or pleura), pneumonitis (unspecified), and pulmonary fibrosis.

Definitions

- FEV1 is Forced Expiratory Volume in 1 second
- Increase FEV1 from first post-9/11 PFT to last PFT is “improved”
- FEV1 loss > 780 ml from first post-9/11 PFT to last PFT is “substantial decline”

More about the cohort

- Median decline in FEV1 of 390 ml between first post-9/11 PFT and last PFT in follow-up. (Mean 409 ml, IQR 150-630ml, range 1.32 liter gain to 3.2 liter decline)
- 727/5515 or 13.2% “Improved”
- 821/5515 or 14.9% “Substantial decline” (> 780 ml)

- Median time between first post-9/11 PFT and last PFT in follow-up 12.1 years. (Mean 11.8 years, IQR 11.5-12.4 years, range 7.8-12.9 years.)

Weight gain

	Frequency	Percent
Lost weight or stayed the same weight	1667	30.23
Gained Weight, 30 lbs. or less	3406	61.76
Gained Weight, Over 30 lbs.	442	8.01

Median weight gain 8.0 lbs.

Smoking Status

	Frequency	Percent
Never Smokers	3806	69.01
Quit Before 9/11/01	730	13.24
Quit Between 9/11/01 and 3/10/08	514	9.32
Quit After 3/10/08	302	5.48
Current Smokers	163	2.96

Analyses

- Logistic regressions with FEV1 “improved” and FEV1 “substantial decline” as outcomes (Y/N).
- Weight gain (lbs.) is predictor of interest.
- Smoking, age, race, WTC arrival time, initial weight, and initial (pre- 9/11/2001 to post-9/11/2001) FEV1 decline included as predictors.
- Secondary analyses restricted to never-smokers.

Results

Weight gain associated with lower odds of FEV1 improvement
OR 0.74 [95% CI 0.70-0.79] per ten pounds of weight gain.

Weight gain associated with increased odds of FEV1 substantial decline
OR 1.28 [95% CI 1.21-1.36] per ten pounds of weight gain.

- Pre- to post- 9/11 change highly significant – more decline prior to exposure, the less after exposure.
- Race and WTC arrival time not associated with improvement or substantial decline.
- Smoking strongly associated with substantial decline ($p < 0.001$) but not improvement ($p = 0.06$).

Results for analysis of never-smokers only

Weight gain associated with lower odds of FEV1 improvement

OR 0.75 [95% CI 0.70-0.81] per ten pounds of weight gain.

Weight gain associated with increased odds of FEV1 substantial decline

OR 1.31 [95% CI 1.22-1.41] per ten pounds of weight gain.

- Pre- to post- 9/11 change highly significant – more decline prior to exposure, the less after exposure.
- Race and WTC arrival time were not associated with improvement or substantial decline.

Conclusions

- Even modest weight gain was associated with lower odds of pulmonary function improvement and increased odds of substantial decline in pulmonary function in FDNY WTC-exposed firefighters, even after controlling for smoking.
- The effect of weight change needs to be considered in studies of pulmonary function after acute pulmonary exposures.

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Thank you!

FDNY/Montefiore Medical Center research team:

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The FDNY members who save lives every day.

And remember the 343 FDNY members who died on 9/11/2001.