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.
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.
• 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 (%)

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Asthma</td>
<td>96 (1.7)</td>
<td>1153 (20.9)</td>
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<tr>
<td>Chronic Bronchitis</td>
<td>317 (5.8)</td>
<td>519 (9.4)</td>
</tr>
<tr>
<td>COPD</td>
<td>0</td>
<td>62 (1.1)</td>
</tr>
<tr>
<td>Sinusitis</td>
<td>154 (2.8)</td>
<td>1865 (33.8)</td>
</tr>
<tr>
<td>GERD</td>
<td>141 (2.6)</td>
<td>1714 (31.1)</td>
</tr>
<tr>
<td>Interstitial Lung Disease*</td>
<td>13 (0.2)</td>
<td>31 (0.6)</td>
</tr>
<tr>
<td>Cancer</td>
<td>43 (0.8)</td>
<td>294 (5.3)</td>
</tr>
</tbody>
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*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

<table>
<thead>
<tr>
<th>Category</th>
<th>Frequency</th>
<th>Percent</th>
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<tbody>
<tr>
<td>Lost weight or stayed the same weight</td>
<td>1667</td>
<td>30.23</td>
</tr>
<tr>
<td>Gained Weight, 30 lbs. or less</td>
<td>3406</td>
<td>61.76</td>
</tr>
<tr>
<td>Gained Weight, Over 30 lbs.</td>
<td>442</td>
<td>8.01</td>
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</tbody>
</table>

Median weight gain 8.0 lbs.
## Smoking Status

<table>
<thead>
<tr>
<th>Smoking Status</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never Smokers</td>
<td>3806</td>
<td>69.01</td>
</tr>
<tr>
<td>Quit Before 9/11/01</td>
<td>730</td>
<td>13.24</td>
</tr>
<tr>
<td>Quit Between 9/11/01 and 3/10/08</td>
<td>514</td>
<td>9.32</td>
</tr>
<tr>
<td>Quit After 3/10/08</td>
<td>302</td>
<td>5.48</td>
</tr>
<tr>
<td>Current Smokers</td>
<td>163</td>
<td>2.96</td>
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</tbody>
</table>
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 considered in studies of pulmonary function after acute pulmonary exposures.
Thank you!

FDNY/Montefiore Medical Center research team:

Thomas K. Aldrich, Madeline Vossbrinck, Rachel Zeig-Owens, Mayris P. Webber, Brianne L. Olivieri, Theresa Schwartz, David J. Prezant

The FDNY members who save lives every day.

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