

Post 9/11: High Asthma Rates Among Children in Chinatown, New York

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Disclosures

Support

- **Stony Brook MD with Recognition in Research Program for student funding**
- **NSpire Corp. who loaned 3 spirometers**
- **NYC Department of Education for approval of study**
- **NYS Department of Environmental Conservation for air pollution data**



Post 9/11: High Asthma Rates Among Children in Chinatown, NY

- **Background**
- **Hypotheses**
- **Study Population**
- **Methods/Data Collection**
- **Results**
- **Conclusions**

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NYC Households With At Least One Person With Asthma (2000 Census data)

• Non-Hispanic white	11.0
• Non-Hispanic black	15.8
• Puerto Rican	28.0
• Dominican	14.8
• Central/South American	13.0
• Mexican	5.0
• Other Hispanic (Cuban)	16.8
• Chinese	6.8
• Asian Indian	7.3
• Other Asian	11.7

Other Asian comprises Korean, Japanese, Filipino, Vietnamese, and other Pacific Islanders)

Rosenbaum E. Racial/ethnic differences in asthma prevalence: the role of housing and neighborhood environments. *J Health Soc Behav.* 2008 Jun;49(2):131-45.

Composition of Dust and Smoke Aerosol from the Collapse of the WTC

(collected on September 16 and 17, 2001)

- **Calcium**
- **Phthalate esters**
- **Plastic**
- **Combusted Jet Fuel**
- **Soot**
- **Inorganic metals**
- **Radionuclides**
- **Ionic species**
- **Asbestos (0.8%-3.0% of the mass)**

Lioy P, Weisel CP, Millette JR, et al. Characterization of the dust/smoke aerosol that settled east of the World Trade center (WTC) in Lower Manhattan after the collapse of the WTC 11 September 2001. *Environ Health Perspect* 2002;110:703-

Increased Asthma Severity After 9/11

- Chinese-American children with pre-existing asthma had more asthma-related clinic visits overall. ($p=.002$)
- Asthmatic children living within 5 miles of Ground Zero had more clinic visits compared to those living further away. ($p=.013$).
- There were more prescriptions for asthma medications. ($p=.018$)

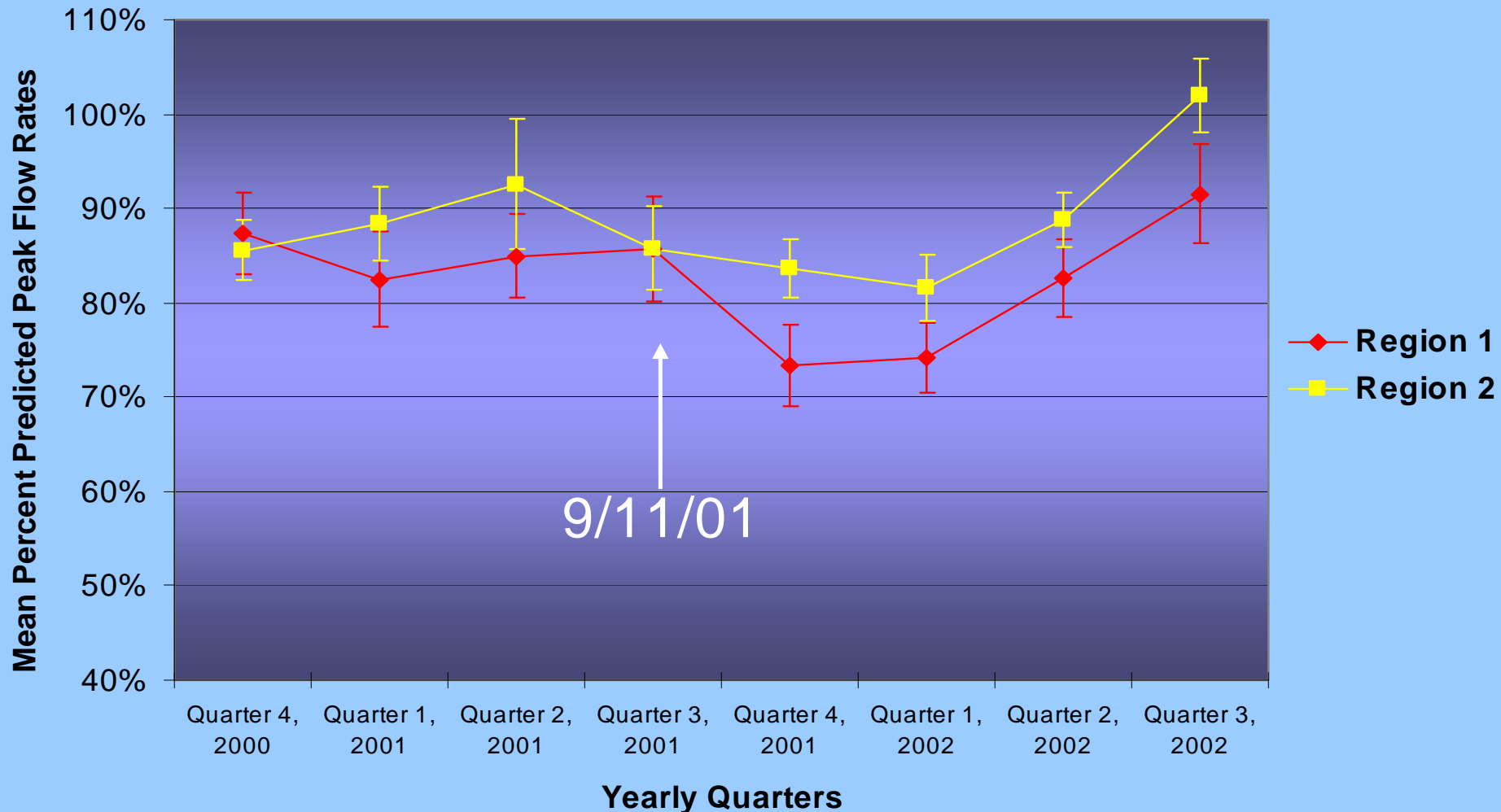
Szema AM, Khedkar M, Maloney PF, et al. Clinical deterioration in pediatric asthmatic patients after September 11, 2001. *J Allergy Clin Immunol*. 2004 Mar;113(3):420-6.



Map of New York City with zip codes from patients seen at the Charles B. Wang Community Health Center.

Asthma in Chinatown 1 year after 9/11

Mean Percent Predicted Peak Flow Rates By Quarter



Lin, *et al.* found

- **Self-reported asthma rates among 476 second-graders at 4 Chinatown elementary school students of 16% in 2005 and 21.6% in 2006.**
- **Redline screening questionnaire yielded rates of 46.1% and 52%, respectively.**
- **1/3 of students who underwent spirometry had airway obstruction.**

Lin DH, Au L, and Ko D. Asthma prevalence in Lower Manhattan public primary schools. American Public Health Association Meeting, Washington, DC, November 3-7, 2007.

Post 9/11: High Asthma Rates Among Children in Chinatown, NY

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HYPOTHESES

- 1. Chinatown asthma rates are still higher than that reported for other ethnic groups in the 2000 Census.**
- 2. The rate of asthma in Chinatown is persistently high and did not decrease since the previous studies.**

Post 9/11: High Asthma Rates Among Children in Chinatown, NY

- Background
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Study Population

1000 students attending the closest, ethnically, and socioeconomically homogeneous elementary school proximal to the World Trade Center.

ASTHMA IN CHINATOWN AFTER 9/11

- Background
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Methods/Data Collection

June/July 2008

- **Questionnaires**
- **Spirometry**
- **Air pollution data**

Questionnaire

- Distributed to parents
- Demographic data: age, gender, weight, height
- Presence of household smokers
- Use of asthma medication
- Diagnosis of asthma by a pediatrician
- Alternative medicine (herbal, moxibustion) for asthma

Spirometry



- Required parental consent
- Required student assent
- Equipment:
 - Koko Legend Portable Office Spirometers

Spirometry

- Spirometry calibrated daily and results adjusted for temperature, barometric pressure, age, height, gender, and race.
- A minimum of 8 forced vital capacity (FVC) maneuvers were performed to achieve 3 acceptable flow-volume loops with 2 being within 200 mL for FVC and forced expiratory volume at 1 second (FEV1).
- The value assigned to a participant was the largest acceptable value within 200 mL of a second value.

Outdoor Air Pollution



Thermo Scientific 1400ab TEOM monitor.

2 fine particulate sampler monitors were deployed on the roof (14m above ground) of the elementary school.

Installed by NYS Department of Environmental Conservation, 2.5 μm -sized particulate mass samples collected continuously every 3 days.

Indoor Air Pollution - Aeroallergens

- Using a DUSTREAM™ vacuum collection system, dust from around the school was collected and sent to Indoor Biotechnologies (Charlottesville, VA) to be analyzed by ELISA for concentrations of antigens
 - Mouse
 - Rat
 - Feline (cat)
 - Cockroach
 - 3 groups of dust mites
 - Dog



Post 9/11: High asthma rates among children in Chinatown, NY

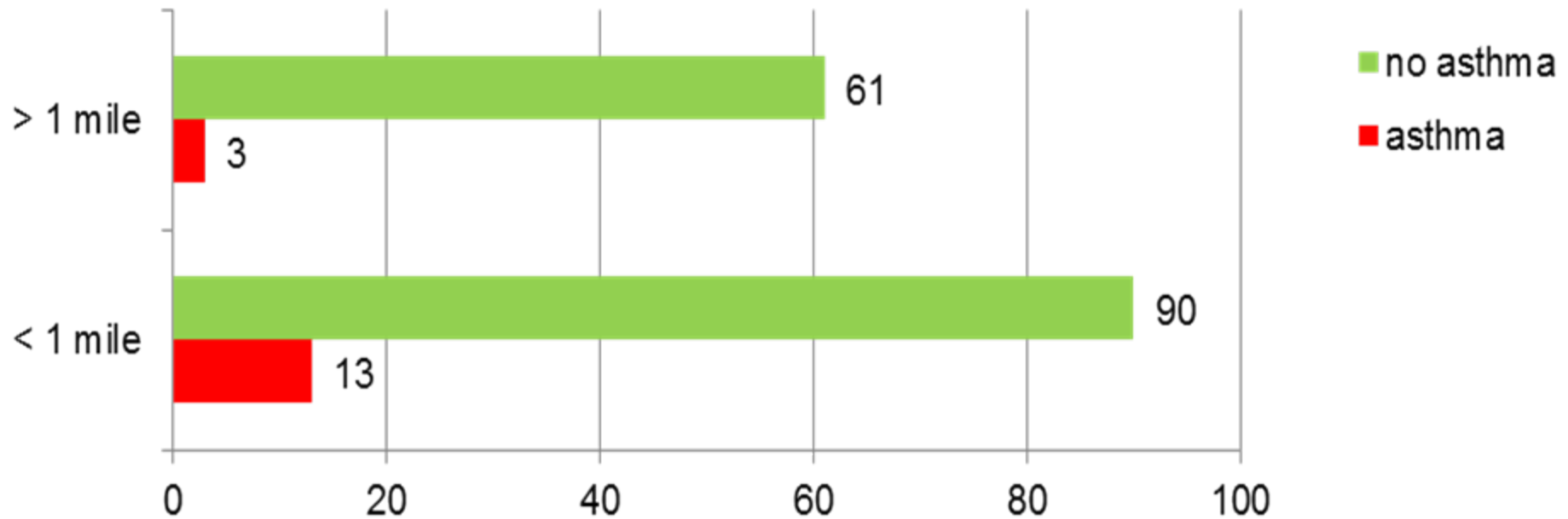
- Background
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Results

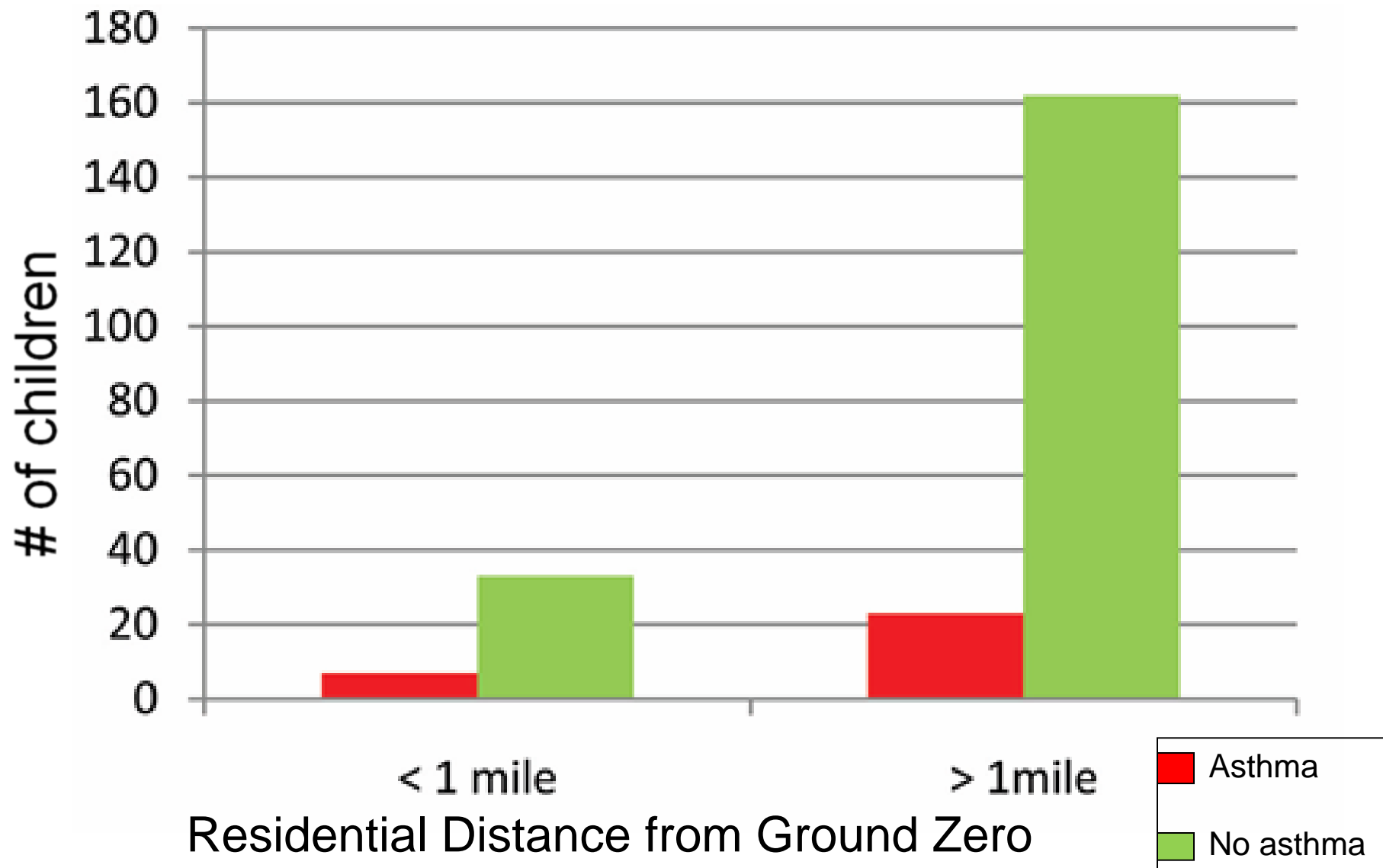
- We received 353 questionnaires from parents of children at an elementary school in Chinatown.
- We conducted spirometry on 202 students.

Self-Reported Asthma Rates Among Students Without Spirometry

12.6% for those Living < 1 Mile from Ground Zero
vs. 4.8% for those living further away

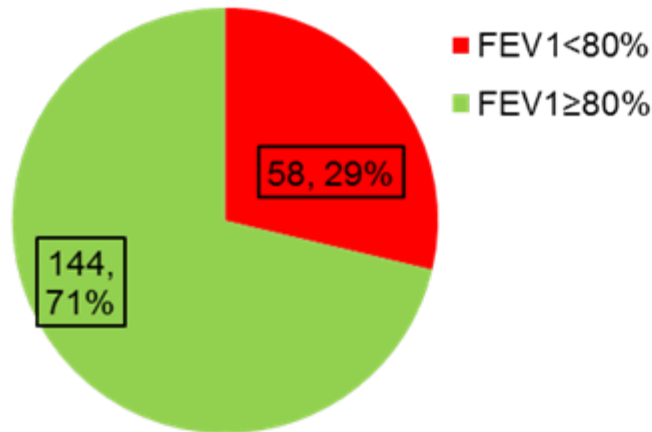


Self Reported Asthma From Children with Spirometry

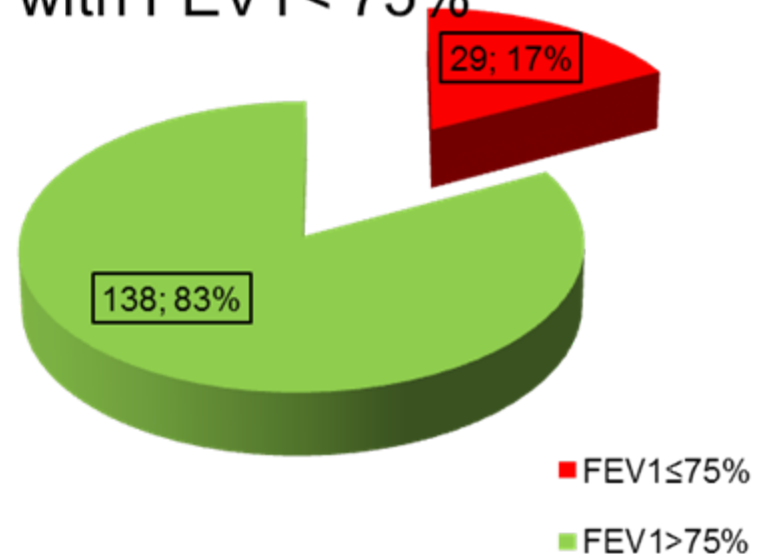


Post 9/11: High asthma rates among children in Chinatown, NY

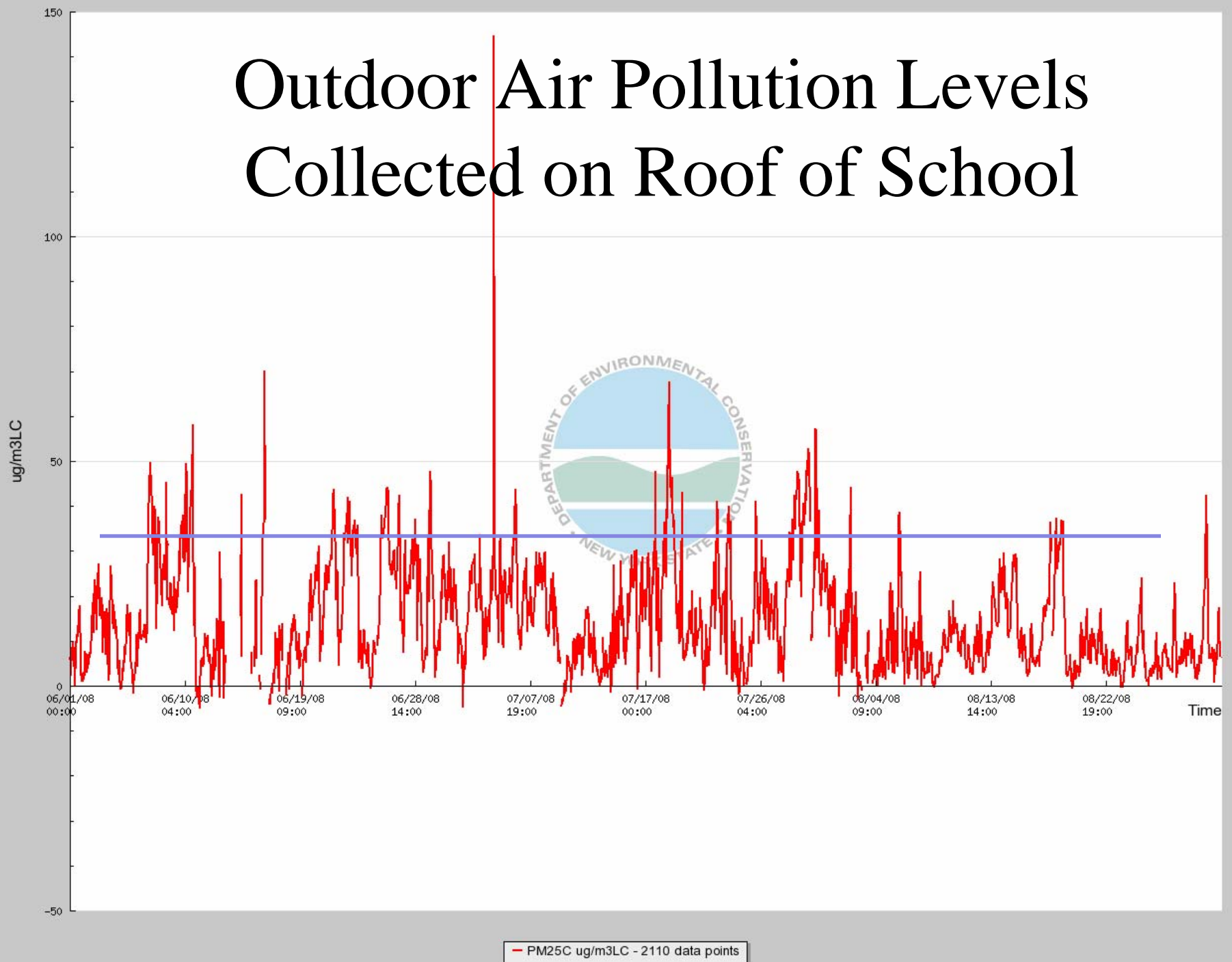
58/202 or 29% of
Students 4-12 Years
Old With FEV1 <80%
(72%±6.8% S.D.)



Spirometric Values for
Children ≥ 7 Years Old
with FEV1 < 75%



Outdoor Air Pollution Levels Collected on Roof of School



Indoor Aeroallergens

Mite Allergens			Cat	Dog	Cockroach	Rat	Mouse
Der p 1	Per f 1	Mite Group 2	Fel d 1	Can f 1	Bla g 2	Rat n 1	Mus m 1
0	0	0	0.31	0	0	0	0.068

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Conclusions

- 1. Chinatown asthma rates are still higher than other groups (29% vs. the NYC reference rate of 13%). These rates indicate persistence of elevated rates, as suggested by Lin and colleagues.**
- 2. Air pollution levels exceed EPA standards and are unhealthy ($> 35 \mu\text{g}/\text{m}^3/\text{d}$). This may account for increased asthma incidence. It is possible that exposure to various toxins on 9/11 accentuated the effect of subsequent exposure to air pollution.**
- 3. The difference between parent-reported prevalence of asthma (12.6%) and tested prevalence (29% overall) corresponds to those reported by the Harlem Children's Zone Asthma Initiative and suggests a high degree of unmet need for asthma treatment and lower-than-necessary child well-being and health status.**

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References

1. Szema AM, Khedker M, Maloney PF, et al. Clinical deterioration in pediatric asthmatic patients after September 11, 2001. *J Allergy Clin Immunol* 113(3): 420–426, 2004.
2. Thomas CW, Vanderford ML, and Crouse Quinn S. Evaluating emergency risk communications: A dialogue with the experts. *Health Promot Pract* 9: 5S–12S, 2008.
3. Rosenbaum E. Racial/ethnic differences in asthma prevalence: The role of housing and neighborhood environments. *J Health Soc Behav* 49:131–145, 2008.
4. Redline S, Gruchella RS, Wolf ML, et al. Development and validation of school-based asthma and allergy screening questionnaires in a 4-city study. *Ann Allergy Asthma Immunol* 93:36–48, 2004.
5. Brusasco V, Crapo R, and Viegi G (Eds). ATS/ERS Task Force: Standardisation of lung function testing. *Eur Respir J* 26:319– 538, 2005.
6. Polgar C, and Promodhat V. Pulmonary function in children: Techniques and standards. 3rd ed. Philadelphia, PA: WB Saunders. 1971.
7. Environmental Protection Agency. Final designations for the 24-hour Fine Particle Standard established in 2006. Available online at www.epa.gov/pmdesignations/2006standards/documents/2008-12-22/factsheet.htm; last accessed September 1, 2009.
8. Lin DH, Au L, and Ko D. Asthma prevalence in Lower Manhattan public primary schools. In American Public Health Association Meeting, Washington, DC, November 3-7, 2007.
9. Earle CD, King EM, Tsay A, et al. High-throughput fluorescent multiplex array for indoor allergen exposure assessment. *J Allergy Clin Immunol* 119:428–433, 2007.
10. Claudio L, Stingone JA, and Godbold J. Prevalence of childhood asthma in urban communities: The impact of ethnicity and income. *Ann Epidemiol* 16:332–340, 2006.
11. Nicholas SW, Jean-Louis B, Ortiz B, et al., Addressing the childhood asthma crisis in Harlem: The Harlem Children's Zone Asthma Initiative. *Am J Pub Health* 95: 245–249, 2005.
12. Banauch GI, Izbicki G, Christodovlou V, et al., Pulmonary function after exposure to the world trade center collapse in the New York City Fire Department. *Am J Respir Crit Care Med* 174:312–319, 2006.
13. Banauch GI, Izbicki G, Christodovlou V, et al., Trial of prophylactic inhaled steroids to prevent or reduce pulmonary function decline, pulmonary symptoms, and airway hyperreactivity in firefighters at the world trade center site. *Disast Med Pub Health Prep* 2:33–39, 2008.
14. Szema, A, Savary, K, Ying, B, Lai, K, Post 9/11: High Asthma Rates in Manhattan's Chinatown, AAP, 2009.

ALLERGY SYMPTOMS & ELEVATED AIRWAYS RESISTANCE AMONG CHILDREN LIVING NEAR THE WORLD TRADE CENTER



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Disclosures

Support

- **Stony Brook MD with Recognition in Research Program for student funding**
- **NYC Department of Education for approval of study**
- **NYS Department of Environmental Conservation for air pollution data**
- **Carefusion Corporation for Impulse Oscillometer agreement**

Allergy Symptoms, Airway Resistance Near the WTC

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Allergy Symptoms, Airway Resistance Near the WTC

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Background

- Allergy symptoms have not been studied in the cohort of children attending school near the World Trade Center, which has been a dusty construction site since 9/11.
- Impulse Oscillometry (IOS) of the small airways as a measure of peripheral airways lung function and airway hyper-responsiveness has not been studied in those children alive on 9/11 and those born and raised in the area thereafter, where asthma rates are high even using less-sensitive spirometry.
- The specific chemical composition of air pollution particles currently in the neighborhood has not been examined.

Allergy Symptoms, Airway Resistance Near the WTC

- Background
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- Results
- Conclusions

Hypotheses

1. Allergy symptoms are common among children attending school near the World Trade Center.
2. Impulse Oscillometry (IOS) will show small airways function deficits and airway hyper-responsiveness not only among those children alive on 9/11, but also those born and raised in the area thereafter.
3. The specific chemical composition of air pollution particles will yield harmful levels of lead.

Allergy Symptoms, Airway Resistance Near the WTC

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Study Population

1000 students attending the closest, ethnically, and socioeconomically homogeneous elementary school proximal to the World Trade Center were surveyed.

158 completed both student and parental surveys. 129 completed impulse oscillometry.

Study Sample

- **Inclusion Criteria**

Student at elementary school (K-5)

Chinese-American (~99% of school)

- **Exclusion Criteria**

Special education students

Allergy Symptoms, Airway Resistance Near the WTC

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Methods/Data Collection

June/July 2008

- **Redline Questionnaires**
- **Impulse Oscillometry**
- **Speciated Air Pollution data**

Redline Questionnaires

STUDENT QUESTIONNAIRE			
Name _____	Age _____	Grade _____	Teacher _____
Race: <input type="checkbox"/> African American <input type="checkbox"/> Asian American <input type="checkbox"/> Hispanic <input type="checkbox"/> White <input type="checkbox"/> Native American <input type="checkbox"/> Other			
Please tell us how often you have any of the following:			
1. My breathing sounds noisy or wheezy.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	NEVER	SOMETIMES	A LOT
2. It is hard to take a deep breath.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	NEVER	SOMETIMES	A LOT
3. It is hard for me to stop coughing.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	NEVER	SOMETIMES	A LOT
4. My chest feels tight or hurts after I run, play hard, or do sports.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	NEVER	SOMETIMES	A LOT
5. I wake up at night coughing.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	NEVER	SOMETIMES	A LOT
6. I wake up at night because I have trouble breathing.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	NEVER	SOMETIMES	A LOT
7. I cough when I run, climb stairs or play sports.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	NEVER	SOMETIMES	A LOT
8. My eyes get itchy, puffy or burn.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	NEVER	SOMETIMES	A LOT
9. I have problems with a runny or stuffy nose.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
	NEVER	SOMETIMES	A LOT
Please answer the following questions:			
10. A doctor or nurse told me that I have asthma.	<input type="radio"/>	<input type="radio"/>	
	YES	NO	
11. I stayed in the hospital overnight for asthma or trouble breathing this past year.	<input type="radio"/>	<input type="radio"/>	
	YES	NO	
12. I take medicine or use an inhaler for asthma.	<input type="radio"/>	<input type="radio"/>	
	YES	NO	
13. I take medicine for allergies.	<input type="radio"/>	<input type="radio"/>	
	YES	NO	

PARENT OR GUARDIAN QUESTIONNAIRE

Student's Name _____ Age _____ Grade _____ Teacher _____

Student's Race: ☐ African American ☐ Asian American ☐ Hispanic ☐ White ☐ Native American ☐ Other

Please tell us how often your child has any of the following. (If your child has more problems in some seasons of the year, please tell us about problems during the worst season.) Does your child . . .

1. Make noisy or wheezy sounds when breathing?	<input type="radio"/> NEVER	<input type="radio"/> SOMETIMES	<input checked="" type="radio"/> A LOT	<input type="checkbox"/> Don't Know
2. Have a hard time taking a deep breath?	<input type="radio"/> NEVER	<input type="radio"/> SOMETIMES	<input checked="" type="radio"/> A LOT	<input type="checkbox"/> Don't Know
3. Develop coughs that won't go away?	<input type="radio"/> NEVER	<input type="radio"/> SOMETIMES	<input checked="" type="radio"/> A LOT	<input type="checkbox"/> Don't Know
4. Complain about a chest that feels tight or hurts after running, playing hard, or doing sports?	<input type="radio"/> NEVER	<input type="radio"/> SOMETIMES	<input checked="" type="radio"/> A LOT	<input type="checkbox"/> Don't Know
5. Wake up at night coughing?	<input type="radio"/> NEVER	<input type="radio"/> SOMETIMES	<input checked="" type="radio"/> A LOT	<input type="checkbox"/> Don't Know
6. Wake up at night because of trouble breathing?	<input type="radio"/> NEVER	<input type="radio"/> SOMETIMES	<input checked="" type="radio"/> A LOT	<input type="checkbox"/> Don't Know
7. Cough when running, climbing stairs or playing sports?	<input type="radio"/> NEVER	<input type="radio"/> SOMETIMES	<input checked="" type="radio"/> A LOT	<input type="checkbox"/> Don't Know
8. Miss days of school (absent from school) because of breathing problems?	<input type="radio"/> NEVER	<input type="radio"/> SOMETIMES	<input checked="" type="radio"/> A LOT	<input type="checkbox"/> Don't Know
9. Have eyes that itch, get puffy or burn.	<input type="radio"/> NEVER	<input type="radio"/> SOMETIMES	<input checked="" type="radio"/> A LOT	<input type="checkbox"/> Don't Know
10. Have problems with a runny, stuffy nose.	<input type="radio"/> NEVER	<input type="radio"/> SOMETIMES	<input checked="" type="radio"/> A LOT	<input type="checkbox"/> Don't Know

Please answer the following questions about your child:

11. Has a doctor or nurse told you that your child has asthma, reactive airway disease or wheezy bronchitis?	<input type="radio"/> YES	<input type="radio"/> NO	<input type="checkbox"/> Don't Know
12. Has your child stayed in the hospital overnight for asthma or for trouble breathing this past year?	<input type="radio"/> YES	<input type="radio"/> NO	<input type="checkbox"/> Don't Know
13. Does your child take medicine (or use an inhaler) for asthma?	<input type="radio"/> YES	<input type="radio"/> NO	<input type="checkbox"/> Don't Know
14. Does your child take medicine for allergies?	<input type="radio"/> YES	<input type="radio"/> NO	<input type="checkbox"/> Don't Know

家長或監護人問卷調查 (7歲以下小孩)

學生姓名 _____ 年齡 _____ 年級 _____ 教師姓名 _____

學生種族: ☐ 非裔美國人 ☐ 亞裔美國人 ☐ 西班牙裔美國人 ☐ 白人 ☐ 美洲印第安人 ☐ 其他

請告訴我們你是否經常發現你孩子有以下特徵。(如果你的孩子在某些季節裡產生特別多的問題, 請告訴我們在哪些季節裡有這些問題。) 你的孩子有.....

- | | | | | |
|----------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| 1. 呼吸不暢順或有雜音嗎? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| | 從來沒有 | 有時 | 很多 | 不知道 |
| 2. 深呼吸困難嗎? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| | 從來沒有 | 有時 | 很多 | 不知道 |
| 3. 是否有長時間性的咳嗽? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| | 從來沒有 | 有時 | 很多 | 不知道 |
| 4. 在跑完步玩得很激烈或運動完 之後, 抱怨胸口緊或不舒服嗎? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| | 從來沒有 | 有時 | 很多 | 不知道 |
| 5. 在半夜因咳嗽而醒來嗎? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| | 從來沒有 | 有時 | 很多 | 不知道 |
| 6. 因呼吸不順而導致半夜起床嗎? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| | 從來沒有 | 有時 | 很多 | 不知道 |
| 7. 在跑步, 爬樓梯或運動時咳嗽嗎? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| | 從來沒有 | 有時 | 很多 | 不知道 |
| 8. 因呼吸道的問題而不上學 (缺席) 嗎? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| | 從來沒有 | 有時 | 很多 | 不知道 |
| 9. 覺得眼睛發癢, 紅腫, 刺痛嗎? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| | 從來沒有 | 有時 | 很多 | 不知道 |
| 10. 流鼻涕或鼻塞的問題嗎? | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| | 從來沒有 | 有時 | 很多 | 不知道 |

請回答以下有關於你孩子的問題:

- | | | | |
|------------------------------------|-----------------------|-----------------------|--------------------------|
| 11. 是否曾經有醫生或護士有告訴過你, 你孩子有哮喘病? | <input type="radio"/> | <input type="radio"/> | <input type="checkbox"/> |
| | 是 | 否 | 不知道 |
| 12. 在過去的一年, 你孩子是否曾經因哮喘病或呼吸 性疾病而住院? | <input type="radio"/> | <input type="radio"/> | <input type="checkbox"/> |
| | 是 | 否 | 不知道 |
| 13. 你孩子是否服用哮喘病藥物或使用哮喘噴霧器? | <input type="radio"/> | <input type="radio"/> | <input type="checkbox"/> |
| | 是 | 否 | 不知道 |
| 14. 你孩子有否因過敏而服用藥物嗎? | <input type="radio"/> | <input type="radio"/> | <input type="checkbox"/> |
| | 有 | 否 | 不知道 |

學生問卷調查 (7至14歲)

姓名 _____ 年齡 _____ 年級 _____ 教師姓名 _____

種族 ☐ 非裔美國人 ☐ 亞裔美國人 ☐ 西班牙裔美國人 ☐ 白人 ☐ 美洲印第安人 ☐ 其他 _____

- | | | | |
|-------------------------------------|-----------------------|-----------------------|-----------------------|
| 1. 呼吸不暢順或有雜音。 | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| | 沒有/沒有 | 有時 | 經常 |
| <hr/> | | | |
| 2. 深呼吸有困難。 | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| | 沒有/沒有 | 有時 | 經常 |
| <hr/> | | | |
| 3. 我咳嗽時，咳嗽不會容易停止。 | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| | 沒有/沒有 | 有時 | 經常 |
| <hr/> | | | |
| 4. 當跑完步，玩得激烈，或運動完之後，
會覺得胸口緊或不舒服。 | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| | 沒有/沒有 | 有時 | 經常 |
| <hr/> | | | |
| 5. 我會在半夜因咳嗽而醒來。 | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| | 沒有/沒有 | 有時 | 經常 |
| <hr/> | | | |
| 6. 我會因為呼吸不順而導致半夜起床。 | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| | 沒有/沒有 | 有時 | 經常 |
| <hr/> | | | |
| 7. 當我跑步，爬樓梯或運動時，我會咳嗽。 | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| | 沒有/沒有 | 有時 | 經常 |
| <hr/> | | | |
| 8. 我的眼睛會覺得發癢，紅腫，刺痛。 | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| | 沒有/沒有 | 有時 | 經常 |
| <hr/> | | | |
| 9. 我有流鼻涕或鼻塞問題。 | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| | 沒有/沒有 | 有時 | 經常 |

請回答以下問題：

- | | | |
|----------------------------------|-----------------------|-----------------------|
| 10. 曾經有醫生或護士告訴我，我有哮喘病。 | <input type="radio"/> | <input type="radio"/> |
| | 有 | 沒有 |
| <hr/> | | |
| 11. 在過去的一年，我曾經因哮喘病或呼吸
性疾病而住院。 | <input type="radio"/> | <input type="radio"/> |
| | 有 | 沒有 |
| <hr/> | | |
| 12. 我有服用哮喘病藥物或使用哮喘噴霧器。 | <input type="radio"/> | <input type="radio"/> |
| | 有 | 沒有 |
| <hr/> | | |
| 13. 我因過敏而服用藥物。 | <input type="radio"/> | <input type="radio"/> |
| | 有 | 沒有 |

Impulse Oscillometry



R5



- **A Jaeger MasterScreen Impulse Oscillometry system (CareFusion Germany 234 GmbH) was loaned by CareFusion Corporation and training was provided by Steven Spungen, M.S.**
- **The IOS requires three trials of twenty seconds each to take 100 complete measurements.**
- **A loudspeaker delivers pulse-shaped pressure flow excitation to the respiratory system.**
- **The overall impedance of the pulse is due to the resistive and viscoelastic forces of the respiratory system.**

- IOS is reported as resistance and reactance measured in cm of water per liter per second.
- The Jaeger IOS was calibrated with a reference resistor (2 cm H₂O/L/s) according to the manufacturer's instructions.
- Multifrequency impulses were applied over twenty second trials to the airway through the mouthpiece during tidal breathing. Children used a noseclip.
- Three reproducible trials were obtained if they lacked artifacts from coughing, breath holding, swallowing or vocalization.

Allergy Symptoms, Airway Resistance Near the WTC

- Background
- Hypotheses
- Study Population
- Methods/Data Collection
- **Results**
- Conclusions

Results

Table 1. Correlations of Parent and Child Responses for Asthma and All Allergy Symptoms from the Validation Sample*(n = 158)

Student Question# (Paired with Parent Questions**)	Sample Size	Responses Spearman r	Two-sided P value
Making noisy or wheezing (1)	87	0.748	<0.001
Hard to take a deep breath (2)	84	0.895	<0.001
Hard to stop coughing (3)	90	0.646	<0.001
Chest feels tight after run (4)	85	0.880	<0.001
Wake up at night coughing (5)	93	0.749	<0.001
Wake up at night because of Trouble breathing (6)	87	0.713	<0.001
Cough when climbing stairs (7)	85	0.738	<0.001
Have eyes itch, get puffy (8)	89	0.870	<0.001
Have problems with a runny, Stuffy nose (9)	89	0.824	<0.001
A doctor or nurse told me that I have asthma (10)	89	0.935	<0.001
Stayed in hospital overnight (11) * **			
Take medicine for asthma (12)	90	0.848	<0.001
Take medicine for allergies (13)	93	0.832	<0.001

R5 is a measure of Total Resp System Resistance and includes central vs. peripheral airways (small airways) and is decreased linearly with increase in height among: 1) students with a self-diagnosis of asthma (S_group); 2) students whose parents noted the child has asthma (P_group); 3) those with both student and parent diagnosis of asthma (In_group) and 4) those students who believe they do not have asthma and their parents agree with then (Ex_group).

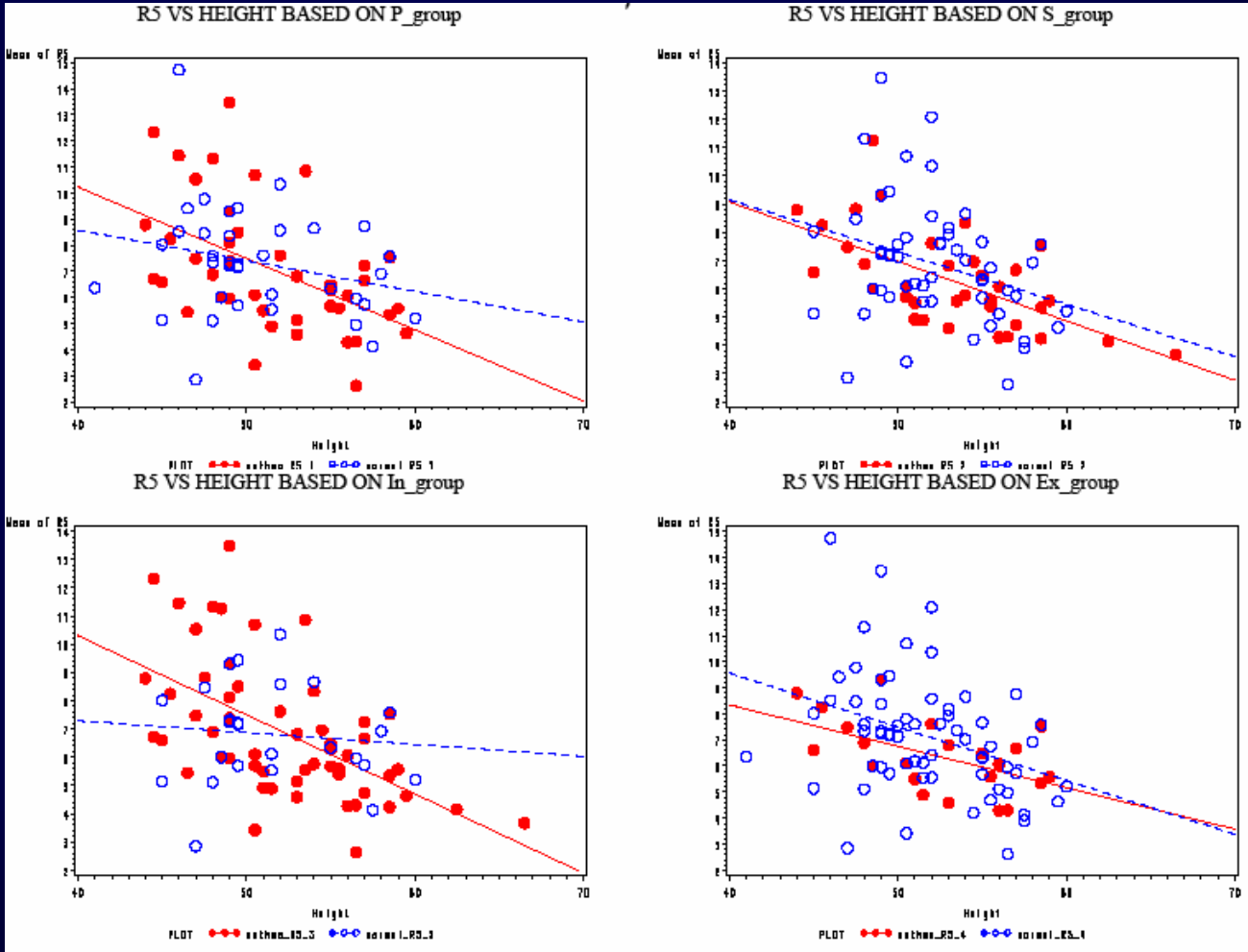


Table1 (n = 114)

Variables	Boys(57) Means \pm SD	Girls(57) Means \pm SD
Age(year)	8.20\pm1.86	8.35\pm1.79
Height(cm)	131.57\pm11.65	132.28\pm11.08
Weight(kg)	31.24\pm8.92	30.08\pm8.66
Mean_R5	7.24\pm2.14	6.74\pm2.28
Mean_R20	3.42\pm1.13	3.28\pm0.80
Mean_x5	-2.77\pm2.58	-2.74\pm2.94

When comparing boys higher vs. girls

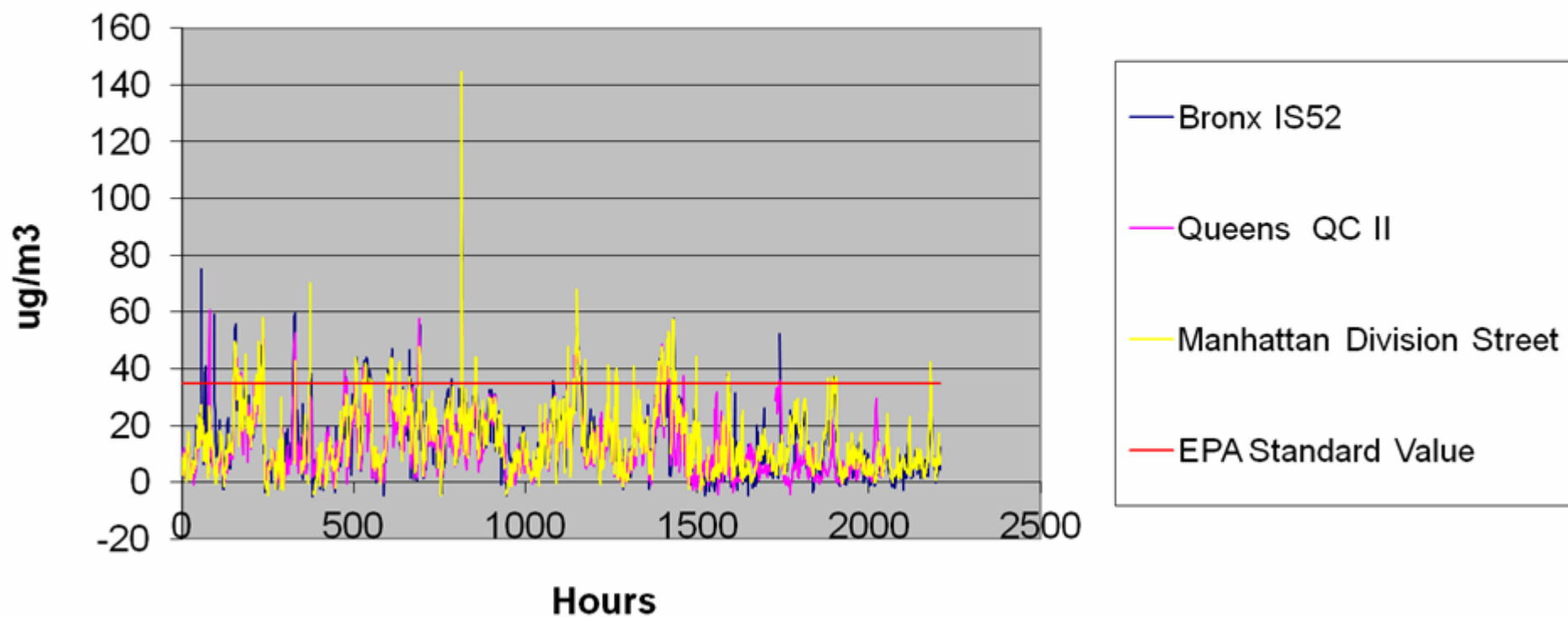
Results

- Mean R5, X5 and R20 (resistance at 5 Hz, reactance at 5 Hz, and resistance at 20 Hz, respectively) given in centimeters of H₂O per liter per second were high.
- Boys and girls with average ages of 8 years, height of 132 cm, and weight 31 kg, had: Boys values of R5=7.2, X5=-2, and R20=3; and Girls values of R5=6.7, X5=-2.7, R20=3.2.
- Mean values for the entire group of boys and girls were: R5=6.99, X5=-2.75, R20=3.35.

R5, Resistance at 5 Hz; X5, reactance at 5 Hz; R20, Resistance at 20 Hz

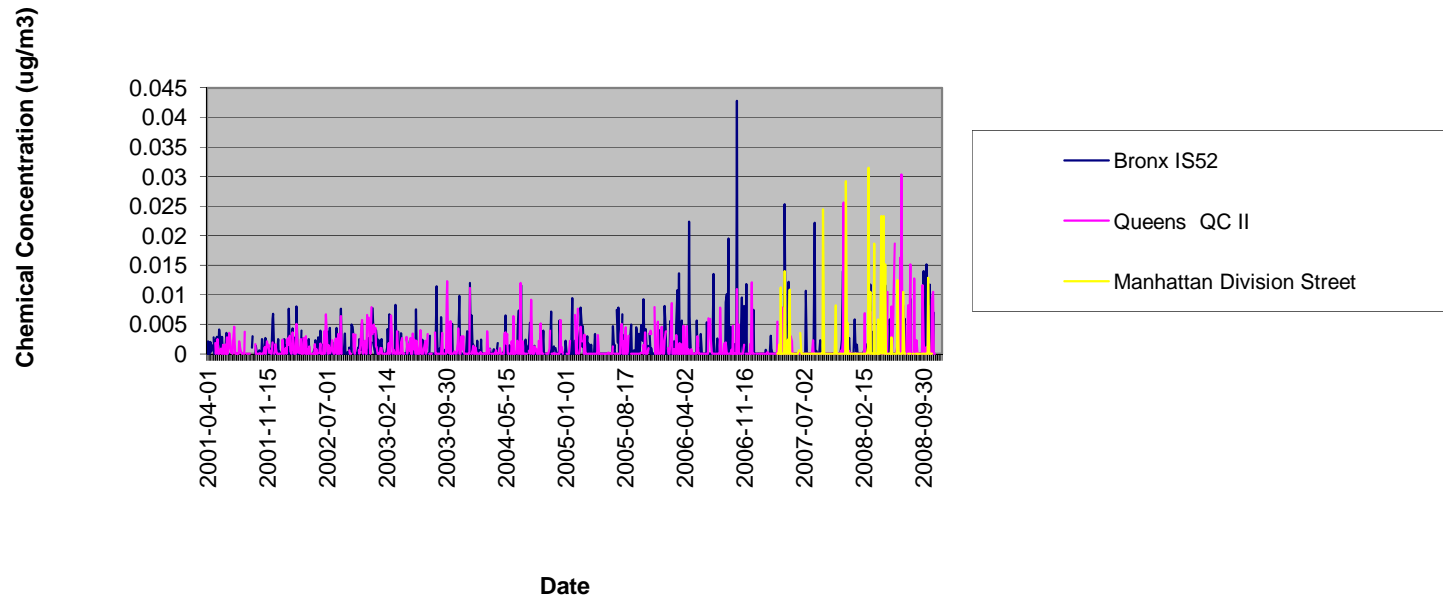
†IOS measurements are given in centimeters of H₂O per liter per second, except for resonant frequency, which is given in Hertz. IOS measurements are given as resistance and reactance at 5 and 20 Hz.

Total PM2.5 Levels from 6/1/08 to 8/31/08 at the Bronx, Queens, and Manhattan Sites



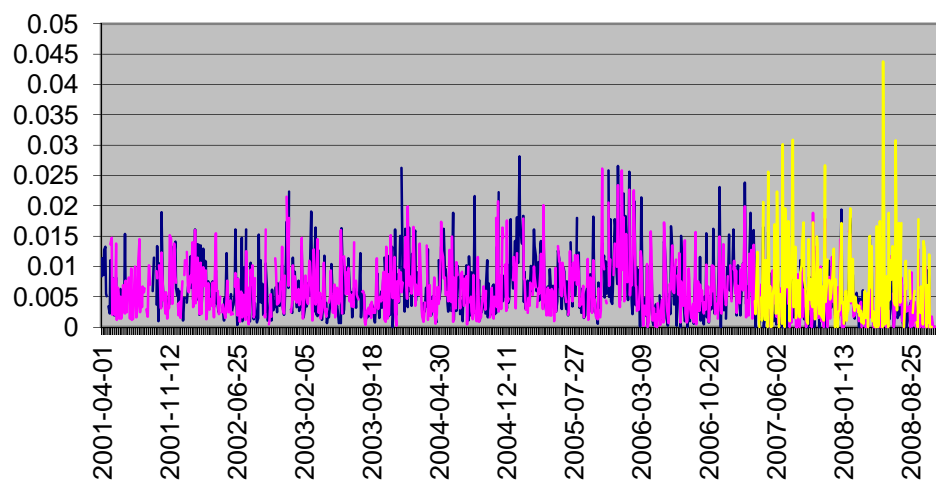
Speciated Air Pollution Data

Indium Concentrations at the Bronx, Queens, and Manhattan Sites



Vanadium Concentrations at the Bronx, Queens, and Manhattan Sites

Chemical Concentration (ug/m3)



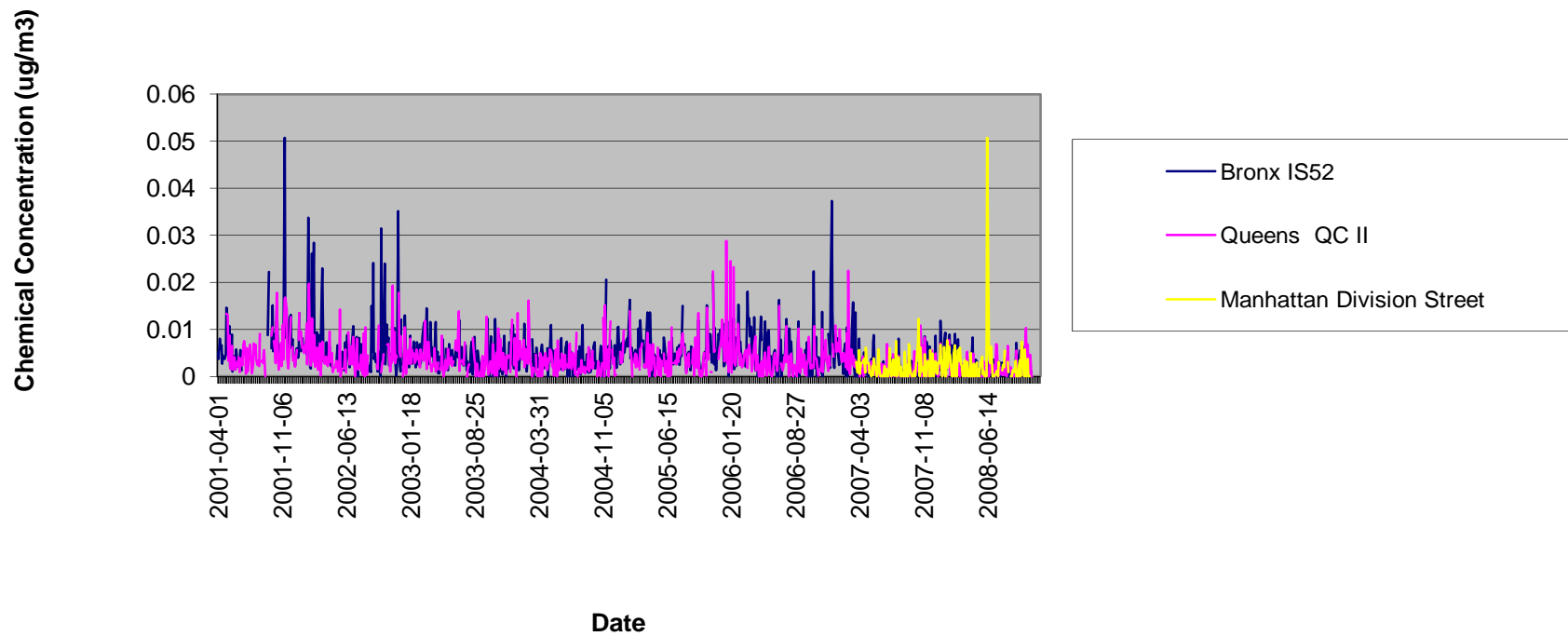
Date

— Bronx IS52

— Queens QC II

— Manhattan Division Street

Lead Concentrations at the Bronx, Queens, and Manhattan Sites



Allergy Symptoms, Airway Resistance Near the WTC

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Conclusions

- Allergy and respiratory symptoms are common among those children (confirmed by parents) responding to the survey distributed among classrooms at the closest elementary school to the World Trade Center site.
- There were strong correlations between responses from children and their parents.
- Frequent severe symptoms such as wheezing and chest tightness, juxtaposed with use of allergy and asthma medications, supports the concept that these patients are not clinically well-controlled.

Conclusions

- Boys and girls in this cohort had increased values of airway resistance at 5 Hz, with boys having higher values than girls.
- Frequency dependence between resistance values at 5 Hz and 20 Hz suggest small airways dysfunction rather than central airways narrowing.

Conclusions

- Air pollution levels are high and contain detectable lead, vanadium, and indium.