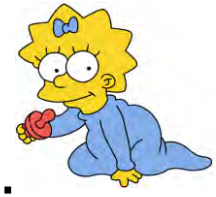
Citizen Science In Action

NC BREATHE, Citizen Science Breakout Session
UNC Charlotte Center City, 8 April 2016



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Acknowledgements for "Citizen Science In Action", NC BREATHE, Citizen Science Breakout Session, UNC Charlotte Center City, 8 April 2016

UNC Charlotte: Brian Magi brian.magi@uncc.edu @brianmagi, Alisa Wickliff (Center for STEM Education), Meg Whalen (College of Arts and Architecture), Crista Cammarato (College of Arts and Architecture), Keeping Watch on Air (keepingwatch.org)

K-12 teachers: Pioneer Springs Community School (Mary Mix, Marina Bedir), Kannapolis Middle School (Carrie Johnson), Palisades Park Elementary (Jennifer Cyr), Marie G. Davis MGLA (Sana Chakra), Parkside Elementary (Susan Davis), Steele Creek Elementary (Gregg Petty), Mountain Island Academy (Patty Towler), Endhaven Elementary (Dee Chinault), and **all the students!**

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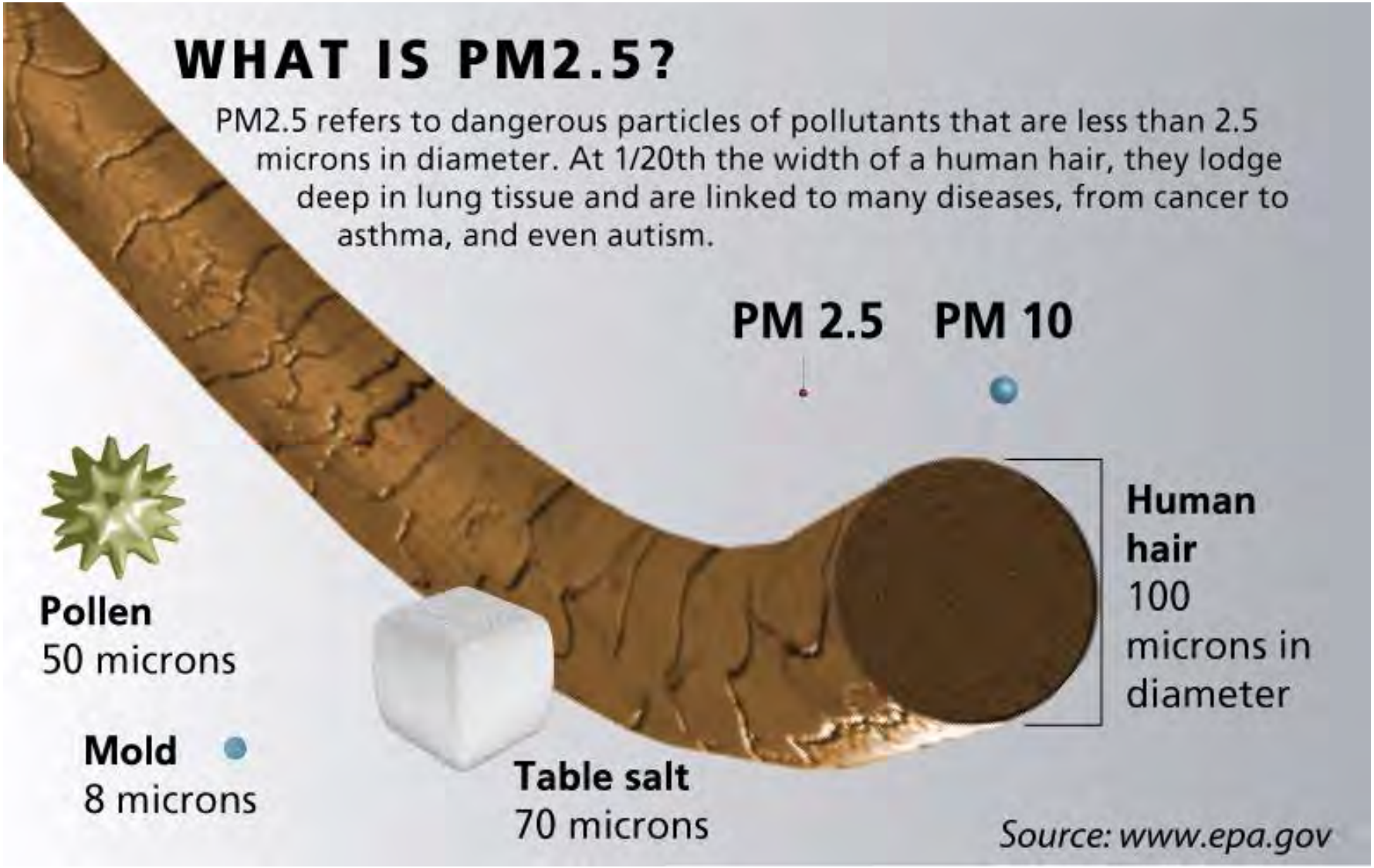

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Effects of elevated PM on human health

The NEW ENGLAND JOURNAL of MEDICINE

Fine-Particulate Air Pollution and Life Expectancy in the United States

C. Arden Pope III, Ph.D., Majid Ezzati, Ph.D., and Douglas W. Dockery, Sc.D.

BACKGROUND

Exposure to fine-particulate air pollution has been associated with increased morbidity and mortality, suggesting that sustained reductions in pollution exposure should result in improved life expectancy. This study directly evaluated the changes in life expectancy associated with differential changes in fine particulate air pollution that occurred in the United States during the 1980s and 1990s.

International Journal of COPD

Dovepress

ORIGINAL RESEARCH

Long-term dynamics of death rates of emphysema, asthma, and pneumonia and improving air quality

Julia Kravchenko[1]
Igor Akushevich[2]
Amy P Abernethy[3]
Sheila Holman[4]
William G Ross Jr[5]
H Kim Lyerly[1,6]

Background: The respiratory tract is a major target of exposure to air pollutants, and respiratory diseases are associated with both short- and long-term exposures. We hypothesized that improved air quality in North Carolina was associated with reduced rates of death from respiratory diseases in local populations.

Materials and methods: We analyzed the trends of emphysema, asthma, and pneumonia mortality and changes of the levels of ozone, sulfur dioxide (SO_2), nitrogen dioxide (NO_2), carbon monoxide (CO), and particulate matters ($PM_{..}$ and $PM_{..}$) using monthly data measurements

Visibility, air quality and daily mortality in Shanghai, China

Wei Huang [a], Jianguo Tan [b], Haidong Kan [c,*], Ni Zhao [d], Weimin Song [c], Guixiang Song
Lili Jiang [e], Cheng Jiang [e], Renjie Chen [c], Bingheng Chen [c]

PNAS

Evidence on the impact of sustained exposure to air pollution on life expectancy from China's Huai River policy

Yuyu Chen[a,1], Avraham Ebenstein[b,1], Michael Greenstone[c,d,1,2], and Hongbin Li[e,1]

[a]Applied Economics Department, Guanghua School of Management, Peking University, Beijing 100871, China; [b]Department of Economics, Hebrew University of Jerusalem, Mount Scopus 91905, Israel; [c]Department of Economics, Massachusetts Institute of Technology, Cambridge, MA 02142; [d]National Bureau of Economic Research, Cambridge, MA 02138; and [e]China Data Center and Department of Economics, School of Economics and Management, Tsinghua University, Beijing 100084, China

This paper's findings suggest that an arbitrary Chinese policy that greatly increases total suspended particulates (TSPs) air pollution is causing the 500 million residents of Northern China to lose more than 2.5 billion life years of life expectancy. The quasi-experimental empirical approach is based on China's Huai River policy, which provided free winter heating via the provision of coal for boilers in cities north of the Huai River but denied heat to the south. Using a regression discontinuity design based on distance from the Huai River, we find that ambient concentrations of TSPs are about 184

The New England
Journal of Medicine

Volume 329 DECEMBER 9, 1993 Number 24

AN ASSOCIATION BETWEEN AIR POLLUTION AND MORTALITY IN SIX U.S. CITIES

Douglas W. Dockery, Sc.D., C. Arden Pope III, Ph.D., Xiping Xu, M.D., Ph.D.,
John D. Spengler, Ph.D., James H. Ware, Ph.D., Martha E. Fay, M.P.H.,
Benjamin G. Ferris, Jr., M.D., and Frank E. Speizer, M.D.

OPEN ACCESS
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ENVIRONMENTAL RESEARCH LETTERS
Environ. Res. Lett. 8 (2013) 034005 (11pp)
doi:10.1088/1748-9326/8/3/034005

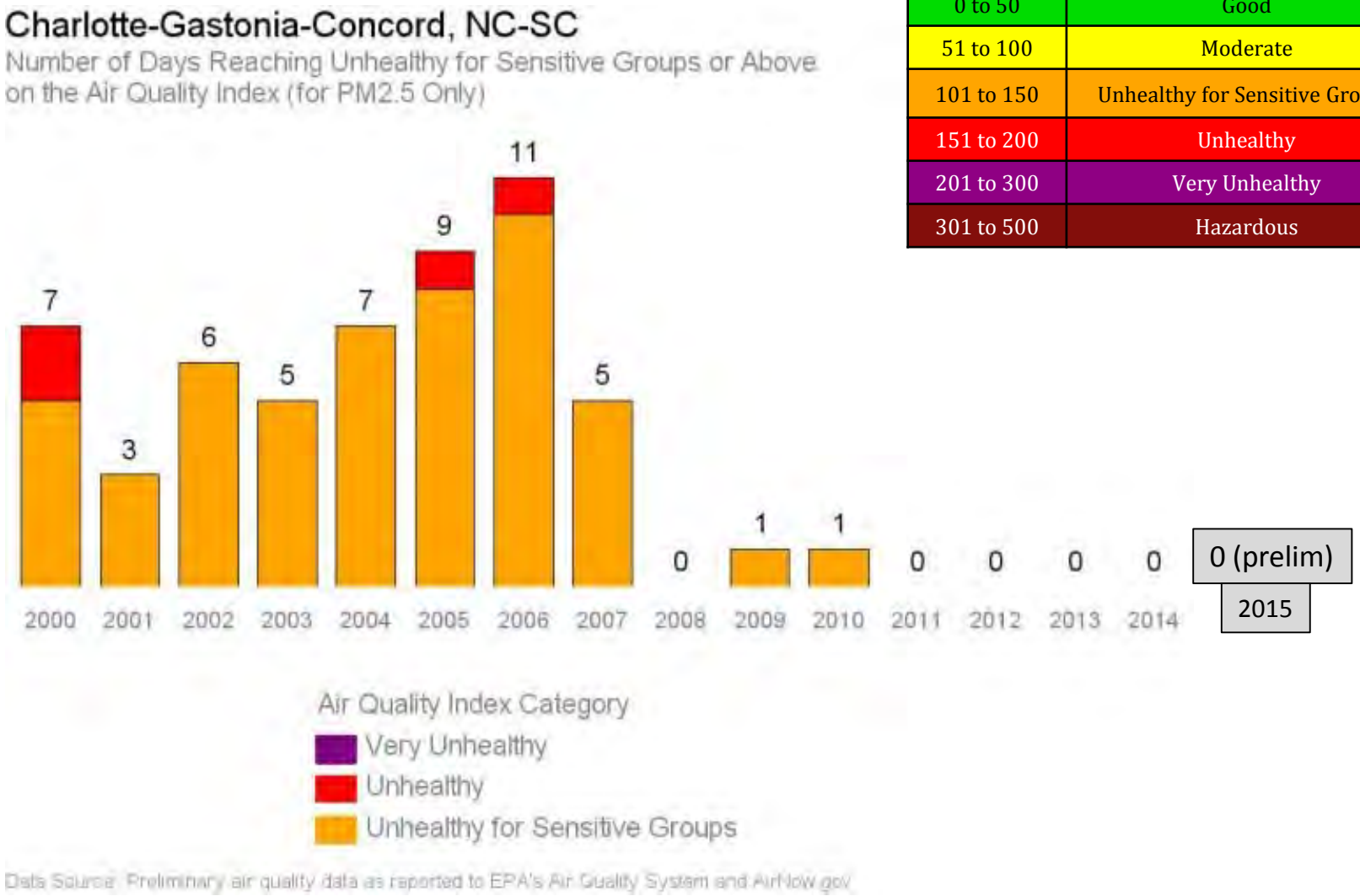
Global premature mortality due to anthropogenic outdoor air pollution and the contribution of past climate change

Raquel A Silva[1], J Jason West[1,23], Yuqiang Zhang[1], Susan C Anenberg[2],

An Estimate of the Global Burden of Anthropogenic Ozone and Fine Particulate Matter on Premature Human Mortality Using Atmospheric Modeling

Susan C. Anenberg,[1] Larry W. Horowitz,[2] Daniel Q. Tong,[3,] and J. Jason West[1]*

AQI Values	Pollution Level
0 to 50	Good
51 to 100	Moderate
101 to 150	Unhealthy for Sensitive Groups
151 to 200	Unhealthy
201 to 300	Very Unhealthy
301 to 500	Hazardous



EPA GIS maps of cities PM2.5 air quality: http://1.usa.gov/1SLMgCJ

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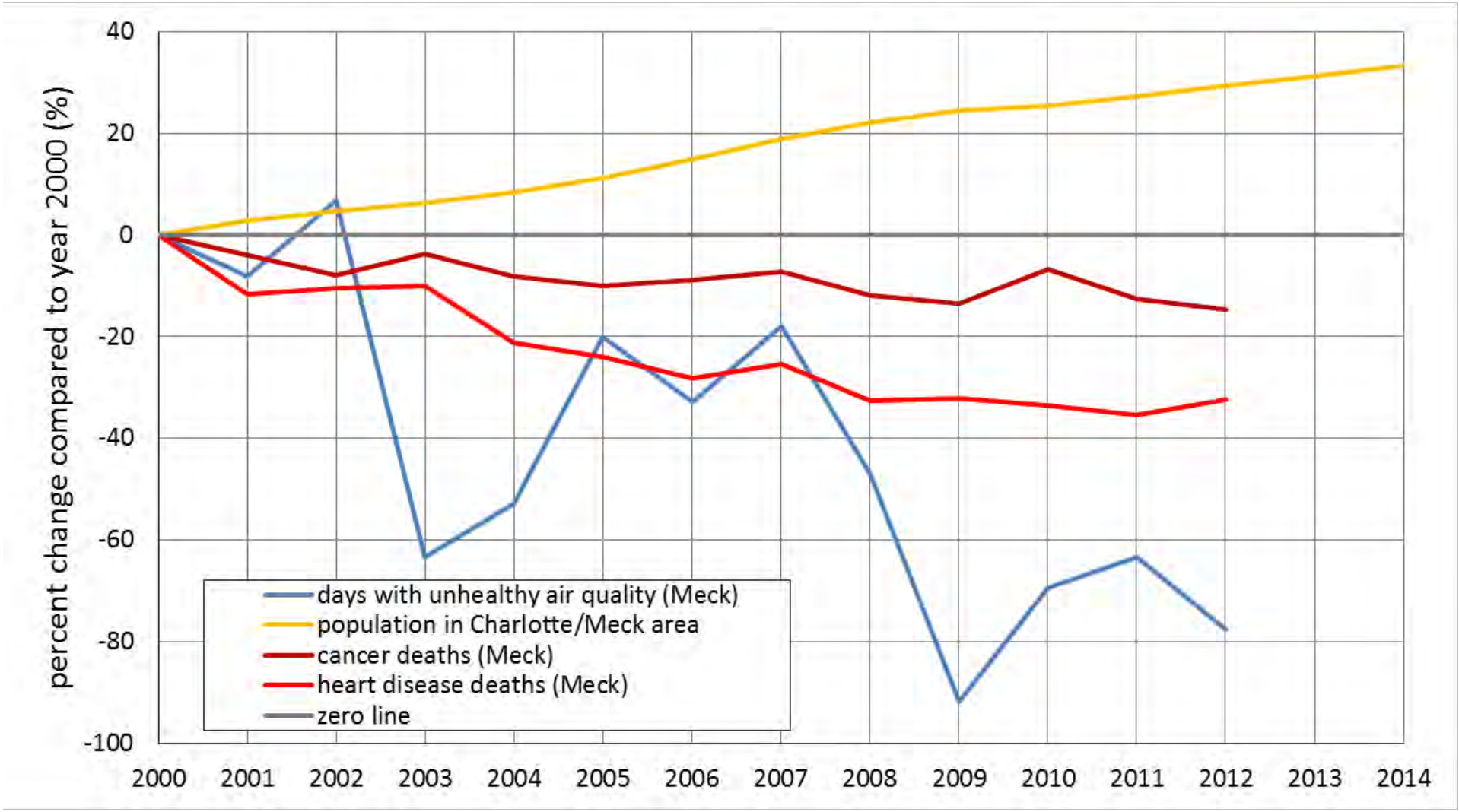

Data source: UNC Charlotte Urban Institute http://ui.uncc.edu/data/topic/environment and http://ui.uncc.edu/data/topic/demographics

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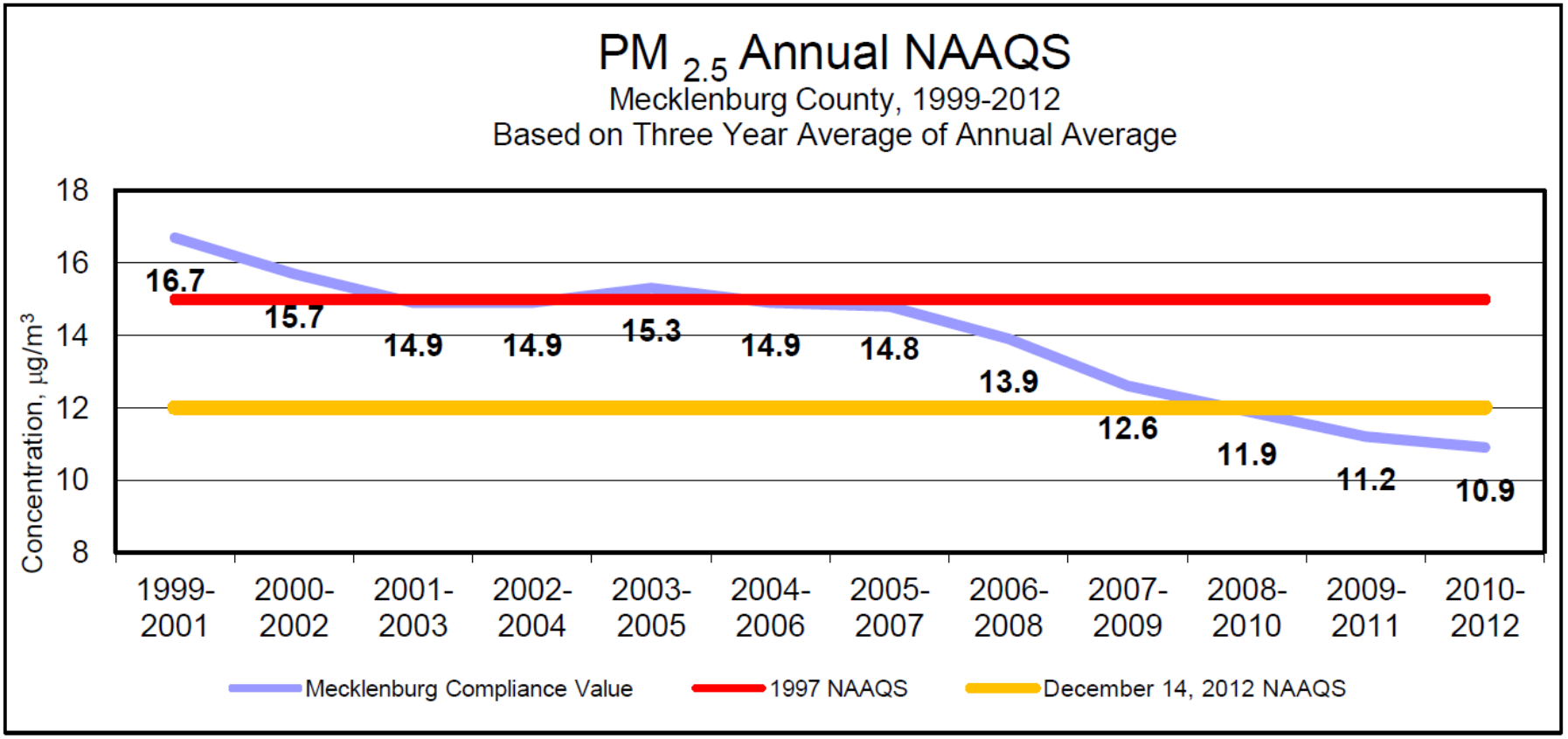

Figures from Review of Air Quality in Mecklenburg County, by Mecklenburg County Air Quality Commission (advisory board), July 2014, available at http://charmeck.org/mecklenburg/county/LUESA/AirQuality/EducationandOutreach/Pages/AQC.aspx

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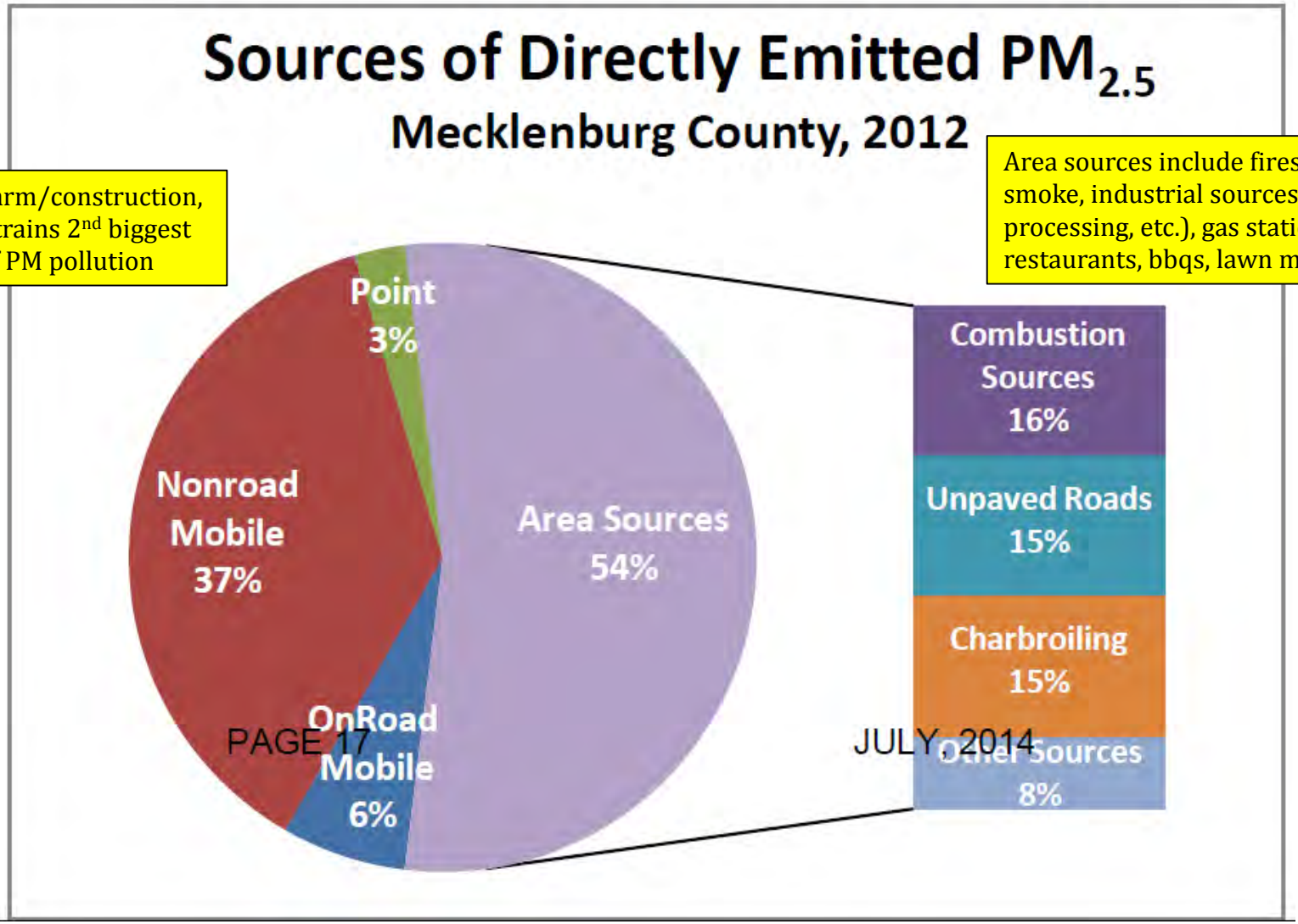
Boats, farm/construction, planes, trains 2nd biggest cause of PM pollution

Area sources include fires, dust, smoke, industrial sources (solvents, processing, etc.), gas stations, restaurants, bbqs, lawn mowers, etc.



Figures from Review of Air Quality in Mecklenburg County, by Mecklenburg County Air Quality Commission (advisory board), July 2014, available at http://charmeck.org/mecklenburg/county/LUESA/AirQuality/EducationandOutreach/Pages/AQC.aspx

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ENVIRONMENTAL Science & Technology

Feature

pubs.acs.org/est

The Changing Paradigm of Air Pollution Monitoring

Emily G. Snyder,*[†] Timothy H. Watkins,[†] Paul A. Solomon,[‡] Eben D. Thoma,[†] Ronald W. Williams,[†] Gayle S. W. Hagler,[†] David Shelow,[§] David A. Hindin,[∥] Vasu J. Kilaru,[†] and Peter W. Preuss[⊥]

[†]U.S. Environmental Protection Agency, Office of Research and Development, Research Triangle Park, North Carolina, 27711, United States

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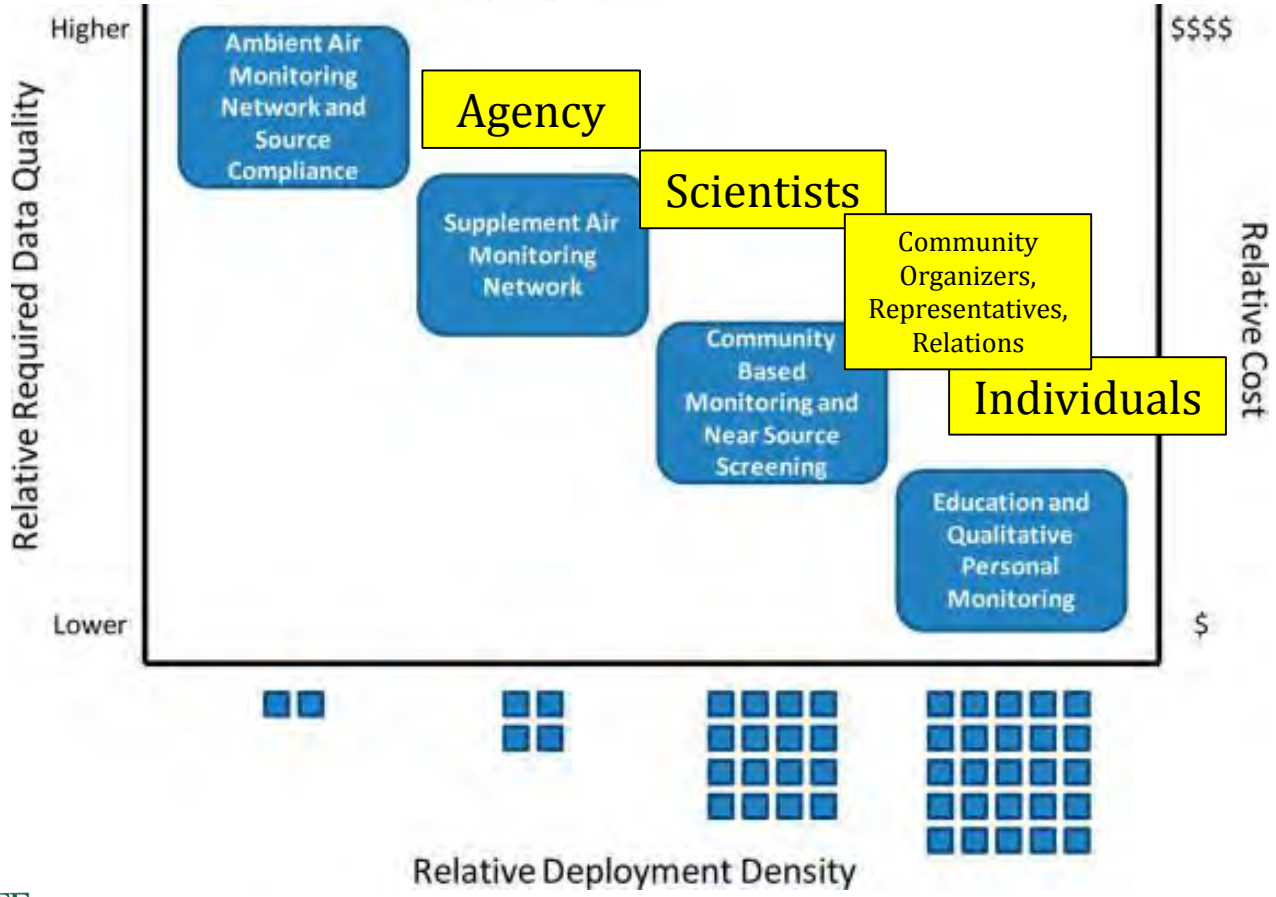
[∥]U.S. Environmental Protection Agency, Office of Enforcement and Compliance Assurance, Washington, District of Columbia, 20460, United States

[⊥]U.S. Environmental Protection Agency, Office of Research and Development, Washington, District of Columbia, 20460, United States

Original figure below is in the article at:
http://pubs.acs.org/doi/abs/10.1021/es4022602



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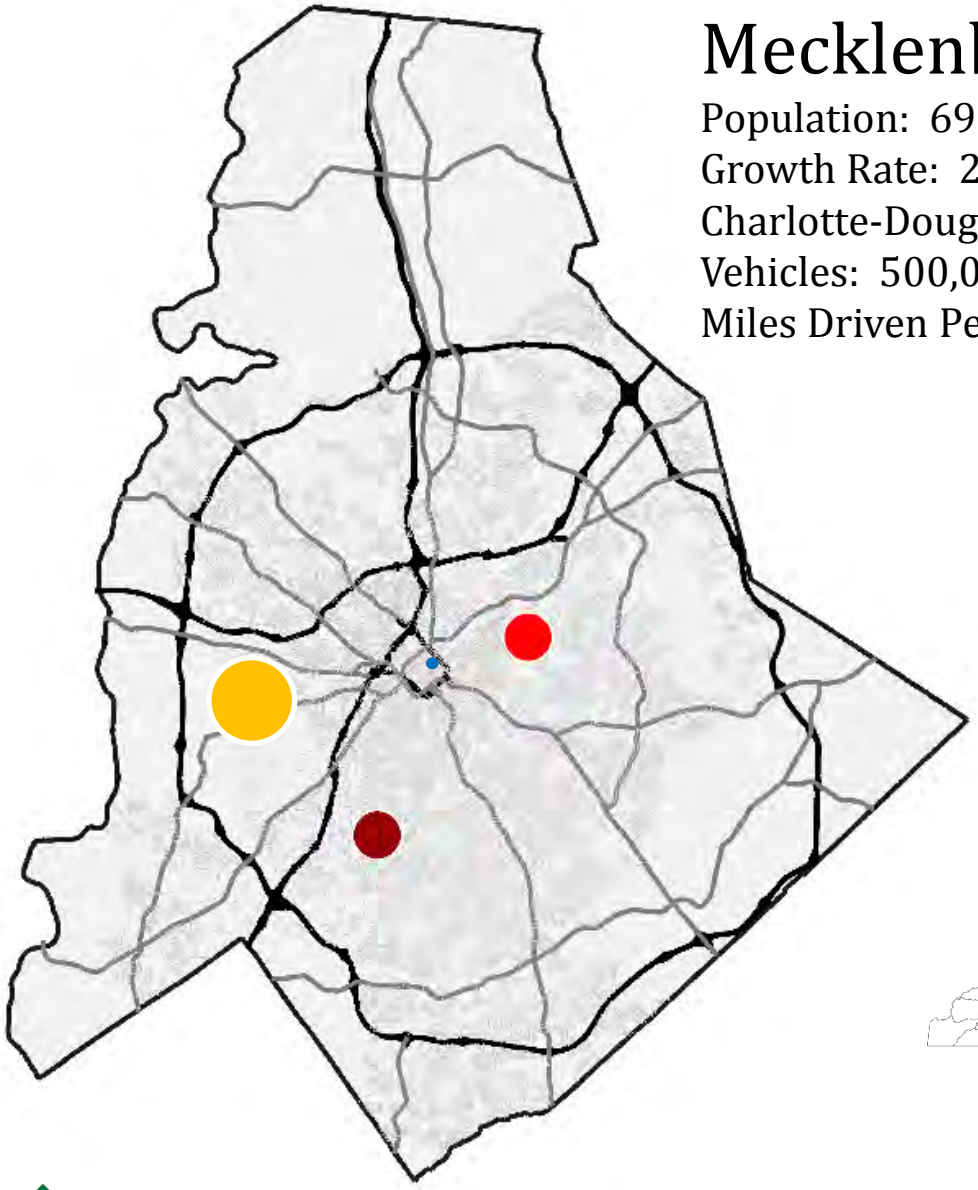
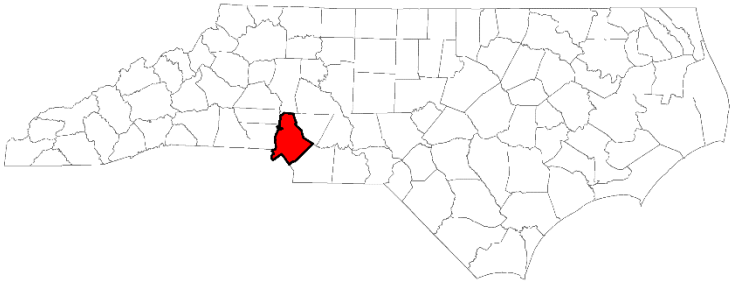


Mecklenburg County

Population: 695,000 in 2000 and 1,012,500 in 2014
Growth Rate: 20,000+ per year
Charlotte-Douglas Airport: 8th busiest in USA in 2014
Vehicles: 500,000 in 2000 and 1,000,000+ in 2014
Miles Driven Per Person: Increased about 30%



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Stats from UNC Charlotte Urban Institute, Wikipedia, and Mecklenburg County Air Quality "Mobile Source Indicators" report for 2014.

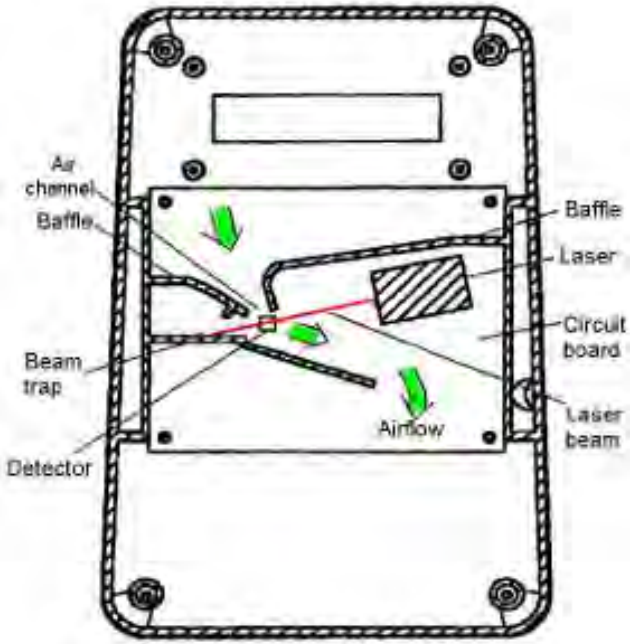
Dylos DC1700 Particle Counter

Price: $425

Built-in battery (4-8 hours life)

Data logger (10,000 minutes, or about 7 days capacity)

Data includes time/date stamp



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Citizen Science Protocol

Instruments: 10 DC1700 (my instruments)
Data goal: 30 hours from January-February
Sampling window: 9am to 2pm
Sampling locations: Near school, trees, bus/car lines
Record environmental observations

K-12 Teacher Network

Established contacts via Alisa Wickliff at UNC Charlotte Center for STEM Education and GLOBE outreach

Data Collection Period

All schools collect data over multiple different days

Data Analysis Period

Scientist (me!) takes lead in synthesizing results
Account for different sample locations, days
Attempt to quality control (challenge step!)
Account for RH, estimate PM2.5 mass and AQI

Results!

Target audience is UNC Charlotte initiative called Keeping Watch on Air (see the gallery)

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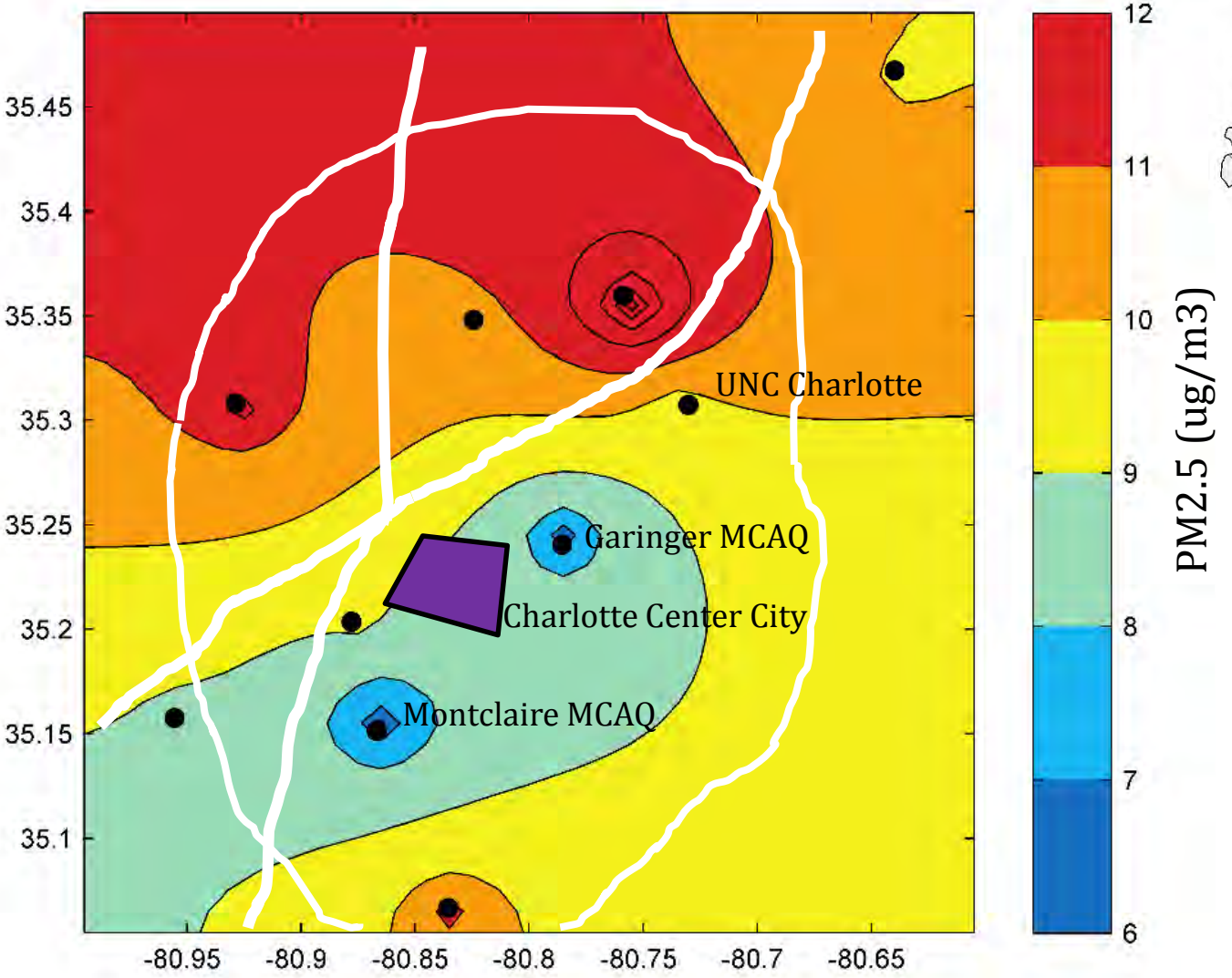
Average PM2.5 Concentration (Preliminary)



● Participating K-12 Schools

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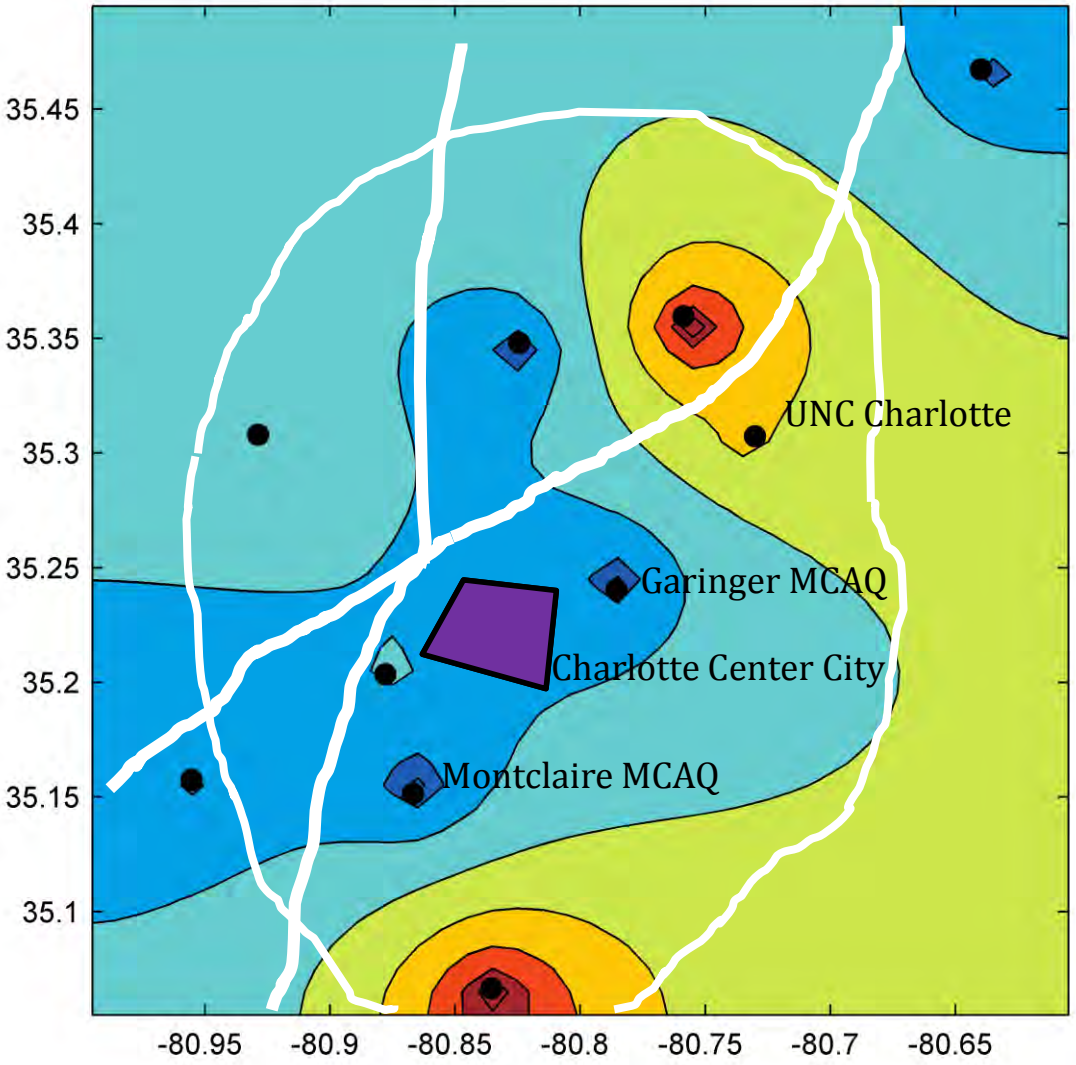
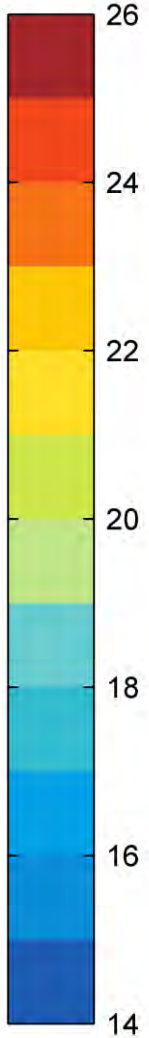
Polluted PM2.5 Concentration (Preliminary)





● Participating K-12 Schools

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Summary

Citizen science project achieved multiple objectives related to (a.) the multi-partner Keeping Watch on Air initiative, (b.) advocacy-oriented Clean Air Carolina, and (c.) research-oriented UNC Charlotte:

1. Raised awareness of nearly invisible air pollution
2. Raised awareness of how we should protect good air quality
3. Initial field testing of a low-cost particle counter
4. Testing how robust relationship between particle counts and PM2.5 mass is
5. Began process of understanding variability in air quality between established monitoring site

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