

2018

NC BREATHE

CONNECTING AIR QUALITY TO COMMUNITY HEALTH

REPORT AND RECOMMENDATIONS

MAHA

Clean Air
Carolina

Executive Summary

On Thursday, March 8, 2018, academics, students, medical and health professionals, state, federal and local environmental agencies and community groups gathered at the fourth annual NC BREATHE conference hosted by Clean Air Carolina at Wake Forest University in Winston-Salem. Sponsored by Clean Air Carolina, Medical Advocates for Healthy Air, the Sustainability Graduate Programs at Wake Forest University and the Duke Environmental Health Scholars Program, the conference provided a forum for North Carolinians to share the latest research about the impacts of air pollution on human health, the environment and the economy, and to discuss the critical role policymaking plays.

The conference opened with a series of keynotes considering the health outcomes of the Clean Smokestacks Act, the health impacts of wildfire smoke and the economic benefits of reducing air pollution. These opening talks provided background information and updates on the emerging health impacts of air pollution and how we calculate economic costs as it relates to human health.

During the breakout sessions, attendees discussed key recommendations from the 2017 NC BREATHE conference: how to involve vulnerable communities in research; how to improve the quality and access to air and health data; and how to include health impact analysis in policymaking. From these discussions, six recommendations arose:

- **Science communication:** Researchers need to understand the importance of science communication and be trained, so their research is accessible to community members and policymakers.
- **Hyperlocal monitoring and citizen science:** Hyperlocal monitoring and citizen science should be supported, and its data should be meaningfully used by and communicated to communities, policymakers and scientists.
- **Community research and outreach:** Community research and outreach needs to include input from the community. To do this, researchers need to take the time to establish a rapport with the community.
- **Environmental training for health professionals:** Environmental health should be integrated into medical training for all health professionals.
- **Interoperable databases:** Health and air datasets should be designed with interdisciplinary collaboration in mind, so these data are more accurate, relevant, timely and accessible for analysis.
- **Multi-pollutant effect:** Researchers should investigate multi-pollutant exposures to better understand the cumulative risk and health outcomes found in the real-world.

All of these recommendations relate to each other and will help build stronger research studies, better policies and healthier communities. The NC BREATHE participants recommend policymakers, researchers and communities work together to implement these recommendations.

Table of Contents

	1
Executive Summary	1
Introduction	3
Recommendations	3
Science communication	3
Hyperlocal monitoring and citizen science	5
Community research and outreach	5
Environmental training for health professionals	6
Interoperable databases	7
Multi-pollutant effect	7
Future Direction for NC BREATHE	8
Acknowledgments	8
References	9
Appendix	10
2018 NC BREATHE Planning Committee	10
2018 NC BREATHE Agenda	11

Introduction

On Thursday, March 8, 2018, academics, students, medical and health professionals, state, federal and local environmental agencies and community groups gathered at the fourth annual NC BREATHE conference hosted by Clean Air Carolina at Wake Forest University in Winston-Salem. Sponsored by Clean Air Carolina, Medical Advocates for Healthy Air, the Sustainability Graduate Programs at Wake Forest University, and the Duke Environmental Health Scholars Program, the conference provided a forum for North Carolinians to share the latest research about the impacts of air pollution on human health, the environment and the economy, and to discuss the critical role policymaking plays. Funding for the conference was provided by Fred and Alice Stanback.

The opening talks provided background information and updates on the emerging health impacts of air pollution and how we calculate the costs of air pollution and health.

- [“New Research in Air Quality Health”](#) - H. Kim Lyerly, M.D., and Julia Kravchenko, M.D., Ph.D., of Duke University
- [“Wildland Fire: A Growing Public Health Concern”](#) - Wayne Cascio, M.D., of the U.S. Environmental Protection Agency
- [“It’s Gonna Burn: Addressing Health Impacts of Landfire Smoke”](#) - Lauren Thie, M.S.P.H., of the N.C. Department of Public Health
- [“For What It’s Worth: Why and How We Put a Dollar Value on Clean Air”](#) - Bryan Hubbell, Ph.D., of the U.S. Environmental Protection Agency

Following the opening presentations, attendees participated in breakout sessions to develop recommendations for further action and research. This report explores the key results of those breakout sessions. We hope policymakers and research directors will review these recommendations and consider integrating them into policies and research projects to protect public health and air quality in North Carolina.

Recommendations

During the breakout sessions, attendees discussed key recommendations from the 2017 NC BREATHE conference: how to involve vulnerable communities in research; how to improve the quality and access to air and health data; and how to include health impact analysis in policymaking. Six recommendations stemmed from these discussions. Of these recommendations, science communication and citizen science arose independently in each session. All of these recommendations relate to each other and will help build stronger research studies, better policies and healthier communities.

Science communication

In 1985, the Royal Society of London said, “Scientists must learn to communicate with the public, be willing to do so, and indeed consider it their duty to do so”¹. More than 30 years later, it is clear from this conference proceedings, science communication training for scientists is still needed.

Throughout the conference participants emphasized the need for training in and focus on science communication. This enables researchers to better explain the importance of their work to policymakers and the public. Most science training programs focus on teaching students how to conduct rigorous scientific research but spend little time on how to communicate the scientific work. Many students write scientific papers, present scientific posters and give formal presentations, but very few receive training or guidance on how to improve their presentations or to communicate to different audiences.

According to the American Association for the Advancement of Science (AAAS), many scientists are trained to present their research in precise detail before explaining the importance and conclusion of the work². This is the opposite of how research should be presented to the public (Figure 1)². Not only should scientists consider the order they present their research, but also their communication goal. This will help scientists define and understand their audience and presentation style.

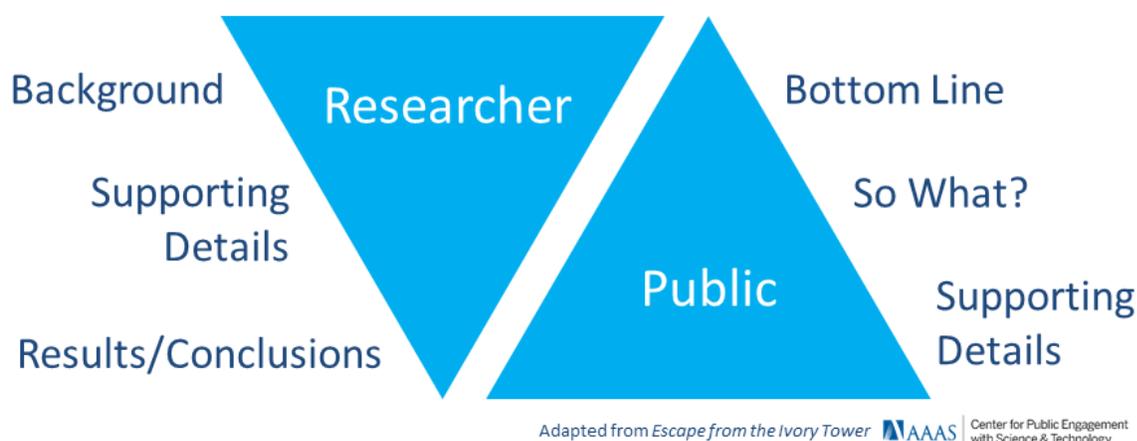


Figure 1: Researchers and the public have different communication styles. It is important for researchers to recognize this and learn to adapt their style to more effectively communicate with the public and policymakers. This figure is from the AAAS Science Communication Toolkit².

The lack of communication training can be detrimental to burgeoning and established scientists. Without proper communication skills, scientists are unable to adequately explain the importance of their research to non-scientists or even to scientists in other fields. Since the majority of scientific funding comes from the public, poor science communication skills can reduce a scientist’s ability to obtain funding and limit the trust of communities that are crucial to research efforts^{1,3}.

The NC BREATHE participants recommend all scientists are trained to communicate their work to other scientists, community groups and policymakers. Communication training will improve researchers’ ability to acquire funding, work with community members and share the importance of their work with policymakers.

Researchers need to understand the importance of science communication and be trained, so their research is accessible to community members and policymakers.

Hyperlocal monitoring and citizen science

Hyperlocal monitoring and citizen science are complements that can collect localized air quality data and help scientists learn how to better communicate to the public. While North Carolina operates air monitors across the state, many residents live, work or play in areas where there is not monitor coverage. For example, there are 23 particulate matter monitors across the 100 counties in North Carolina⁴. While interpolation can be used to estimate pollution in different areas, it does not give a measurement of the air pollution. These monitors are also located in more populated areas, leaving large data gaps for rural and minority populations. Hyperlocal monitoring places multiple monitors in communities and gives real-time air quality data with higher granularity and finer resolution. It is important to note that hyperlocal monitors are not meant to replace or compete with the state monitors, but they can be used to give a better overall picture of air quality.

Utilizing citizen scientists to host hyperlocal monitors to collect data can reduce administrative costs and engage communities through a sense of ownership of their air quality⁵. It will help community members learn about and track their air quality in real-time. If a community member is having a bad asthma day, the individual could check the hyperlocal monitor to see if they should reduce their exposure.

To ensure prolonged engagement, data collection must be conducted and communicated in a manner that makes measurements meaningful to the researchers, community members, government regulatory agencies and policymakers. Data collection and analysis can be very complex and take time. Scientists should work with citizen scientists to explain the data and help them understand what the data mean. This can be particularly meaningful to policymakers who want to help their constituents and understand the air quality data in their district.

The NC BREATHE participants recommend the use of hyperlocal monitoring and citizen science to increase the breadth of air quality data and communicate the importance of the measurements to the public and policymakers.

Hyperlocal monitoring and citizen science should be supported, and its data should be meaningfully used by and communicated to communities, policymakers and scientists.

Community research and outreach

For many years, research has been done on a particular community, but not necessarily with or for communities. Recent focus on citizen science and community based-participatory research methods are changing this approach. However, many community research studies still fall into the old habits of conducting studies with minimal community feedback and inadequate report-back to communities.

There are many reasons this may happen such as time-frame and resources. Gaining a community's trust can take a long time that extends beyond the initial research timeline. It can also require unanticipated resources. Some key principles⁶ for community research can help address these issues:

- Be clear with the community about the research purpose and goals
- Learn about a community’s background, culture and norms
- Establish relationships and build trust with the community
- Empower the community to be part of the research by making them part of the decision process

It is also important to establish the type of community research to be conducted. Figure 2 shows the spectrum of community research. Community outreach involves the community the least in decision-making and research design. Next is community-based participatory research which requires building a trusting relationship between the community and researcher, but the researcher still leads the work. Finally, there is community-led research, where the community drives and develops the research with or without a trained scientist.



Figure 2: The level of community involvement in research varies across a continuum from presenting information to the community (community outreach) to having the community lead the research (community-led research).

The NC BREATHE participants recommend more research involve communities in the research process to improve overall health outcomes and affect lasting change. This can be time consuming and increase resource needs, but the results will be more realistic and actionable.

Community research and outreach needs to include input from the community. To do this, researchers need to take the time to establish a rapport with the community.

Environmental training for health professionals

Environmental health is a pillar of public health, but it is not a focus in medical training. Three of the top five leading causes of death in North Carolina are exacerbated by air pollution⁷. The World Health Organization says that air pollution causes three million premature deaths every year⁸. Many public health professionals are aware of the impact air pollution has on asthma, but few are aware of the adverse effects air pollution can have on heart disease, child development, mental illness and other respiratory diseases. Public health officials can avert some of these premature deaths by using education and advocacy as preventive medicine.

Public health professionals are not just in an excellent position to be effective advocates for their patients, but also their communities. According to a Gallup poll, they are the most trusted professions⁹. They also see first-hand the effects of air pollution on their patients. This gives them an authoritative voice in policy discussions and working toward clean air policies makes their job as providers more effective.

The NC BREATHE participants recommend that the health impacts of air pollution be included in medical training of all physicians, nurses and other health care providers.

Environmental health should be integrated into medical training for all health professionals.

Interoperable databases

In the era of big data, consumers, policymakers and the public want data and information readily available. While there may be vast amounts of data, databases are not necessarily interoperable. This is particularly evident when using national air monitoring data and county health data. Both are regularly collected and updated, but there is no easy way for the different datasets to be brought together. They are located on different websites and in different formats. It can take a significant amount of time to pull the data into a singular format and database before any analysis can occur. However, once the original dataset is updated the combined database is no longer the most up-to-date and the long process must start again.

A similar issue is arising in the field of systematic review. Here, interdisciplinary researchers are working with computer automation and machine learning to collect and compare thousands of studies for a systematic review¹⁰. They are also working with scientific publishers to create a standardized format for research papers to be submitted and published. This new format would allow computer automation and machine learning to more readily and accurately gather and analyze studies.

Creating a standard format for health, monitoring and exposure data would allow more thorough and rigorous review of outcomes and analysis. This could save researchers and the public more time when comparing endpoints for their community, as well as expand the scope of understanding between disciplines. It may be helpful to follow the lead of the systematic review field and consider automated ways to more readily combine and update datasets.

The NC BREATHE participants recommend that government agencies and researchers work together to make health, monitoring and exposure datasets easier to access and analyze.

Health and air datasets should be designed with interdisciplinary collaboration in mind, so these data are more accurate, relevant, timely and accessible for analysis.

Multi-pollutant effect

Everyday individuals are exposed to a myriad of pollutants that affect their health and underlying conditions. Unfortunately, regulations and most studies only look at a single pollutant exposure. While single-pollutant models have provided useful and necessary information on health issues and possible mechanisms, they do not offer a full picture of an individual's exposure. Individuals are not only being exposed to a single pollutant like ozone, but to a combination of pollutants that interact with each other.

Research studies should look at multi-pollutant exposure that mirror the real-world and consider the cumulative risk. Some groups have been doing this, but it is expensive and not how we regulate our

pollutants, so funding can be limited^{11,12}. Funding agencies need to encourage multi-pollutant study design to ensure a comprehensive exposure and health outcome is investigated. This will improve the knowledge of how exposure affects health impacts and further protect public health.

The NC BREATHE participants recommend researchers investigate multi-pollutant exposure to determine the cumulative health risk.

Researchers should investigate multipollutant exposures to better understand the cumulative risk and health outcomes found in the real-world.

Future Direction for NC BREATHE

The NC BREATHE conference planning team led by Clean Air Carolina will work with our partners at the federal, state and local government and colleges and universities to promote the recommendations outlined in this report. A key outcome from the conference that was not discussed in the recommendations is the need to prioritize and focus on environmental justice issues in North Carolina. To begin to address this concern, the 2019 NC BREATHE conference will be centered around an environmental justice theme. The conference will incorporate environmental justice impacts on public health, the environment, the economy and policymaking into each session. The conference planning team invites speaker and panelist suggestions.

For more information on NC BREATHE, please contact Rachel McIntosh-Kastrinsky, Medical Advocates for Healthy Air Manager at Clean Air Carolina, at rachel@cleanaircarolina.org.

Acknowledgments

The NC BREATHE Conference would not have been a success without the support and dedication of the conference planning team, speakers, panelists, participants and Clean Air Carolina staff. The conference organizers would like to extend a special thank you to the Sustainability Graduate Programs at Wake Forest University for hosting the conference, joining the planning team and providing exceptional logistical support. Finally, the organizers would like to thank Fred and Alice Stanback for their financial support and commitment to the public health and the environment.

References

1. The Royal Society of London. *The Public Understanding of Science.*; 1985. doi:10.1038/340011a0.
2. AAAS. Communicating to Engage. <https://www.aaas.org/comm-toolkit>. Published 2018. Accessed May 9, 2018.
3. Jucan MS, Jucan CN. The Power of Science Communication. *Procedia - Soc Behav Sci*. 2014;149:461-466. doi:10.1016/j.sbspro.2014.08.288.
4. NC Department of Environmental Quality. Air Quality Monitoring. <https://deq.nc.gov/about/divisions/air-quality/air-quality-monitoring>. Published 2018. Accessed May 22, 2018.
5. Snyder EG, Watkins TH, Solomon PA, et al. The Changing Paradigm of Air Pollution Monitoring. *Environ Sci Technol*. 2013;47(20):11369-11377. doi:10.1021/es4022602.
6. Clinical and Translational Science Awards (CTSA) Consortium's Community Engagement Key Function Committee Task Force. *Principles of Community Engagement.*; 2011. doi:10.1016/j.jenvman.2015.04.014.
7. North Carolina Department of Health and Human Services. NC SCHS: Interactive Health Data: Health Data Query System. <http://www.schs.state.nc.us/interactive/query/lcd/lcd.cfm>. Published 2017. Accessed September 18, 2017.
8. Lelieveld J, Evans JS, Fnais M, Giannadaki D, Pozzer A. The contribution of outdoor air pollution sources to premature mortality on a global scale. *Nature*. 2015;525(7569):367-371. <http://dx.doi.org/10.1038/nature15371>.
9. Riffkin R. Americans Rate Nurses Highest on Honesty, Ethical Standards | Gallup. Gallup. <http://www.gallup.com/poll/180260/americans-rate-nurses-highest-honesty-ethical-standards.aspx>. Published 2014. Accessed August 23, 2017.
10. O'Connor AM, Tsafnat G, Gilbert SB, Thayer KA, Wolfe MS. Moving toward the automation of the systematic review process: A summary of discussions at the second meeting of International Collaboration for the Automation of Systematic Reviews (ICASR). *Syst Rev*. 2018;7(1):3-7. doi:10.1186/s13643-017-0667-4.
11. Dominici F, Peng RD, Bell ML. Protecting human health from air pollution: shifting from a single-pollutant to a multi-pollutant approach. *Epidemiology*. 2010;21(2):187-194. doi:10.1097/EDE.0b013e3181cc86e8.Protecting.
12. McIntosh-Kastrinsky R, Diaz-Sanchez D, Sexton KG, et al. Photochemically Altered Air Pollution Mixtures and Contractile Parameters in Isolated Murine Hearts before and after Ischemia. *Environ Health Perspect*. 2013;advanced e(October):1344-1348. doi:10.1289/ehp.1306609.

Appendix

2018 NC BREATHE Planning Committee

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2018 NC BREATHE Agenda

AGENDA

- 8:00 AM **BREAKFAST & REGISTRATION**
- 8:30 AM **WELCOME AND OPENING REMARKS**
 - June Blotnick, M.Ed., *Clean Air Carolina*
 - Jon Clift, M.E.M., *Wake Forest University*
- 9:00 AM **NEW RESEARCH IN AIR QUALITY HEALTH**
 - Julia Kravchenko, M.D., Ph.D., *Duke University*
 - Kim Lyerly, M.D., *Duke University*
- 10:00 AM **WILDFIRES, CLIMATE CHANGE, AND HEALTH**
 - Wayne Cascio, M.D., *U.S. Environmental Protection Agency*
 - Lauren Thie, M.S.P.H., *N.C. Department of Health and Human Services*
- 11:00 AM **BREAK, VISIT POSTERS AND EXHIBITS**
- 11:30 AM **ECONOMICS OF AIR QUALITY HEALTH EFFECTS**
 - Bryan Hubbell, Ph.D., *U.S. Environmental Protection Agency*
- 12:15 PM **LUNCH, VISIT POSTERS AND EXHIBITS**
- 12:45 PM **AIR QUALITY POLICY IN NORTH CAROLINA**
 - Robin Smith, J.D., *SmithEnvironment*
- 1:45 PM **BREAKOUT SESSIONS**
 - Engaging Vulnerable Communities in Research
 - Health and Air Monitoring Data Needs
 - Air Quality Impact and Data Analysis
- 2:45 PM **BREAK, VISIT POSTERS AND EXHIBITS**
- 3:15 PM **PRACTICING TRANSLATION: AN EXERCISE IN MEDIA RELATIONS**
 - Liam O'Fallon, M.A., *National Institute of Environmental Health Sciences*
 - Gayle Hagler, Ph.D., *Air, Climate, and Energy, U.S. Environmental Protection Agency*
 - Brian Southwell, Ph.D., *RTI*
 - Steve Wall, J.D., *N.C. Policy Collaboratory at UNC Chapel Hill*
- 4:15 PM **POSTER AWARDS AND CLOSING REMARKS**
 - Ellen Kिरrane, Ph.D., *U.S. Environmental Protection Agency*
 - June Blotnick, M.Ed., *Clean Air Carolina*
- 4:30 PM **ADJOURN**