

**U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
CENTERS FOR DISEASE CONTROL AND PREVENTION
National Center for Environmental Health/
Agency for Toxic Substances and Disease Registry**



**Board of Scientific Counselors Meeting
December 1-2, 2015
Atlanta, Georgia**

Record of the Proceedings

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Executive Summary

The U.S. Department of Health and Human Services and the Centers for Disease Control and Prevention (CDC) National Center for Environmental Health/Agency for Toxic Substances and Disease Registry (NCEH/ATSDR) convened a meeting of the Board of Scientific Counselors (BSC) on December 1-2, 2015 at the CDC Chamblee Campus in Atlanta, Georgia.

The Designated Federal Official (DFO) conducted the meeting in accordance with all rules and regulations of the Federal Advisory Committee Act. The DFO verified that the voting members and *ex-officio* members constituted a quorum for the BSC to conduct its business on both days of the meeting. The DFO announced that BSC meetings are open to the public and all comments made during the proceedings are a matter of public record.

The DFO reminded the BSC voting members of their individual responsibility to identify potential conflicts of interest with any of the published agenda items and recuse themselves from participating in or voting on these matters. None of the BSC voting members publicly disclosed any conflicts of interest for the record. The DFO called for public comment at all times noted on the published agenda for the December 1-2, 2015 BSC meeting.

During the opening session on December 1, 2015, the DFO described efforts that are underway to fill the current vacancies on the BSC and replace an additional four members whose terms will expire on June 2, 2016. The BSC Chair reviewed the process for individual members, as private citizens, to communicate with their Congressional representatives regarding proposed cuts to the NCEH/ATSDR budget.

The NCEH/ATSDR Director covered the following topics in his Office of the Director's (OD) report to the BSC.

- NCEH/ATSDR's significant funding challenges
- Education and outreach to Congressional staff, key partners and stakeholders
- Changes in NCEH/ATSDR Leadership
- NCEH/ATSDR's ongoing strategic planning efforts
- NCEH's collaborations with other CDC centers, institutes and offices
- ATSDR's longstanding investigation, public health assessment (PHA) process and other site-specific activities at Camp Lejeune
- CDC's collaboration with federal partners to address the safety of rubber tire crumbs

NCEH/ATSDR OD and program staff presented an extensive set of responses to the BSC's overall guidance, input on key presentations and action items raised during the June 2015 meeting.

The NCEH/ATSDR Acting Deputy Director presented an update on recent strategic discussions, including the purpose and process, operational challenges and gaps, the role of OD, and leadership priorities in NCEH/ATSDR's strategic directions. NCEH/ATSDR leadership ranked the top three issues that NCEH/ATSDR should immediately prioritize: a stronger ATSDR infrastructure, CDC's National Asthma Control Program, and the NCEH Clean Water for Health Program. NCEH/ATSDR staff volunteered to serve as champions for each strategic priority.

ATSDR proposed to conduct two major activities to more formally address community exposures to perfluorinated compounds (PFCs) at multiple sites that used aqueous film-forming firefighting foam. Community Advisory Boards would be formed for a longer period of time with more representation by community members. A multi-site feasibility assessment would be conducted with several components. The BSC agreed by general consensus for ATSDR to begin conducting the PFC feasibility assessment.

NCEH described its collaboration with the National Center for Immunization and Respiratory Diseases (NCIRD) to incorporate environmental health (EH) into CDC's overall *Legionella* response and prevention activities. The successful NCIRD/NCEH partnership has enhanced the focus on prevention through EH and resulted in several new products.

- CDC's revised *Legionella* Environmental Assessment Tool
- Development and dissemination of *Legionella* outbreak response videos to state and local health departments to provide just-in-time training
- New publications

The BSC agreed by general consensus to go on record with strong support for CDC's focus on prevention, education, outreach and communications in enhancing the role of EH services in Legionnaires' disease.

NCEH presented the results of its ecological analysis of 107 U.S. cities in the context of parking prices and active commuting to work. The study found that walking to work was much more common than bicycling to work in all but four cities. Off-street parking prices for commuters were lowest in El Paso, Texas and highest in New York City. A significant association between walking to work and daily parking prices was observed in more densely populated cities only.

The BSC agreed by general consensus to go on record with overwhelming support for NCEH to continue to devote resources to its Health Community Design Initiative study to improve the quality of life of a large proportion of the American population.

The BSC *ex-officio* members provided updates on recently completed or ongoing EPH activities of their respective agencies.

- The National Institute of Environmental Health Sciences, National Toxicology Program summarized its upcoming publications on various chemicals, peer reviews of candidate topics that have been nominated, and future meetings in 2016.
- The National Institute for Occupational Safety and Health highlighted its leadership and organizational changes, recent and upcoming publications, new electronic methods to disseminate workplace safety and health information, and a new database on worker fatalities in the U.S. oil and gas extraction industry.
- The U.S. Department of Energy described the PHA that ATSDR completed in October

2015 to address community health concerns at a Superfund site. In 1973, 7,900 tons of leached barium sulfate were mixed with 35,000 tons of soil and dumped at the West Lake Landfill in St. Louis, Missouri.

- The U.S. Environmental Protection Agency summarized the FY2016-FY2019 Strategic Research Action Plan that was completed by all six research programs in the Office of Research and Development.

The BSC provided extensive guidance over the course of the meeting in direct response to specific questions posed by the NCEH/ATSDR programs. The Chair moderated an open discussion for the BSC to review action items, propose new agenda items, and suggest changes to improve the structure and format of BSC meetings.

The next BSC meeting will be held on June 28, 29 or 30, 2016 or July 12, 13 or 14, 2016. NCEH/ATSDR OD staff will poll the BSC members via e-mail to confirm the date.



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**BOARD OF SCIENTIFIC COUNSELORS MEETING
December 1-2, 2015
Atlanta, Georgia**

Minutes of the Meeting

The U.S. Department of Health and Human Services (HHS) and the Centers for Disease Control and Prevention (CDC) National Center for Environmental Health/Agency for Toxic Substances and Disease Registry (NCEH/ATSDR) convened a meeting of the Board of Scientific Counselors (BSC). The proceedings were held on December 1-2, 2015 in Building 110 of the CDC Chamblee Campus in Atlanta, Georgia.

The BSC is a Federal Advisory Committee that is chartered to provide advice and guidance to the Secretary of HHS, Director of CDC, and Director of NCEH/ATSDR regarding program goals, objectives, strategies and priorities in fulfillment of the agencies' mission to protect and promote persons' health. The BSC provides advice and guidance to assist NCEH/ATSDR in ensuring the scientific quality, timeliness, utility and dissemination of results. The BSC also provides guidance to help NCEH/ATSDR work more efficiently and effectively with its various constituents to fulfill its mission to protect America's health.

Information for the public to attend the BSC meeting in person or participate remotely via teleconference was published in the *Federal Register* in accordance with Federal Advisory Committee Act regulations. All sessions of the meeting were open to the public (*Attachment 1: Participants' Directory*).

**December 1, 2015 Opening Session: Welcome, Introductions and
Agenda Review for Conflict-of-Interest Topics**

William Cibulas, Jr., PhD, MS
Acting Associate Director for Science, NCEH/ATSDR
BSC Designated Federal Official (DFO)

Dr. Cibulas opened the floor for introductions and confirmed that the 13 voting members and *ex-officio* members (or their alternates) in attendance constituted a quorum for the BSC to conduct its business on December 1, 2015. He called the proceedings to order at 8:33 a.m. and welcomed the participants to day 1 of the BSC meeting.

Dr. Cibulas announced that BSC meetings are open to the public and all comments made during the proceedings are a matter of public record. He reminded the voting members of their responsibility to disclose any potential individual and/or institutional conflicts of interest for the public record and recuse themselves from voting or participating in these matters. None of the BSC voting members publicly disclosed conflicts of interest for any of the items on the December 1, 2015 published agenda.

Dr. Cibulas noted that NCEH/ATSDR nominated five new members to fill the current vacancies on the BSC. The nominations package was distributed to the HHS Secretary for final approval. Efforts also are underway to obtain final approval from HHS on nominees to replace four BSC members whose terms will expire on June 2, 2016. NCEH/ATSDR anticipates that the next meeting will include participation by the full BSC membership of 20 members.

Dr. Cibulas was proud to announce that several NCEH/ATSDR scientists compiled 18 posters presented at scientific conferences and meetings over the past year. He pointed out that the posters would be available for the BSC members to view over the course of the meeting.

Melissa Perry, ScD, MHS, BSC Chair

Chair, Department of Environmental and Occupational Health
George Washington University School of Public Health and Health Services

Dr. Perry also welcomed the participants to the BSC meeting. She thanked the BSC members for continuing to take time from their busy professional and personal lives to serve on the BSC and contribute their valuable expertise to NCEH/ATSDR. She also acknowledged the important environmental health (EH) studies, research and other activities the BSC members conduct in the field.

Dr. Perry reminded the BSC of its external advisory role to provide provocative, honest and candid guidance to drive CDC's agency-wide environmental public health (EPH) portfolio in new and innovative directions. She informed the BSC of two mechanisms that are available to provide advice. At the NCEH/ATSDR level, individual BSC members can provide immediate, real-time feedback in response to specific questions posed by leadership and staff. At the HHS Secretary and CDC Director levels, the full BSC membership can draft, vote to approve, and submit formal resolutions/recommendations for specific actions to be taken. She encouraged the BSC to continue to provide NCEH/ATSDR with constructive guidance.

Dr. Perry announced that as a private citizen, she provided her BSC colleagues with a draft letter to be customized and sent to Congressional representatives in their individual states. The letter emphasizes the vulnerability of essential EPH programs due to severe cuts to the NCEH/ ATSDR budget. She reminded the BSC members that their communications with state or local Congressional representatives must be made as private citizens.

Dr. Perry clarified that BSC members can apply their individual expertise and knowledge of the critical importance of NCEH/ATSDR's EPH activities in their communications with state senators or local policymakers. However, the use of their role as Special Government Employees or

principal investigators of federal grants at their respective institutions is prohibited. She planned to provide the BSC members with contact information of additional decision-makers in Washington, DC who should receive a customized letter with a strong rationale not to approve the proposed cuts of \$34.9 million to the FY2016 NCEH/ATSDR budget.

NCEH/ATSDR Office of the Director Updates

Patrick Breyse, PhD, CIH

Director, NCEH/ATSDR
Centers for Disease Control and Prevention

Dr. Breyse covered the following topics in his NCEH/ATSDR Office of the Director's (OD) report to the BSC.

NCEH/ATSDR Funding. Dr. Breyse planned to immediately launch new programmatic activities and other initiatives in his new position as the NCEH/ATSDR Director. In reviewing the budget, however, he recognized that NCEH/ATSDR's significant funding challenges would need to be addressed at the outset. Most notably, cuts to the FY2016 NCEH/ATSDR budget proposed by both the House and Senate would particularly threaten four core programs: Climate Health Program, Clean Water for Health Program, National EPH Tracking Network, and Healthy Community Design Initiative. The proposed cuts of ~\$35 million would devastate CDC's essential EPH portfolio.

Dr. Breyse and other leadership have been meeting with Congressional staff, key partners and stakeholders to provide education on the purpose of and continued need for NCEH/ATSDR's programs. In NCEH/ATSDR's outreach and education to Congressional staff, the primary focus has been on restoring the Tracking Network and Clean Water Program budgets in FY2016. To assist in this effort, NCEH/ATSDR circulated program impact statements to the American Public Health Association (APHA) and other key stakeholders for broader distribution. Preliminary feedback indicates that NCEH/ATSDR's outreach and education to Congressional staff likely will be successful in restoring the Tracking Network and Clean Water Program budgets in FY2016.

NCEH/ATSDR's ability to restore, sustain or increase program budgets is limited. Government employees are prohibited from lobbying Congress for funding and are restricted to playing an advocacy or educational role. As a result, NCEH/ATSDR relies on its non-governmental partners and stakeholders in this regard. Despite these challenges, NCEH/ATSDR expects that its extensive outreach and education will produce long-term benefits.

NCEH/ATSDR realized that its written materials or testimony on the Tracking Network did not make an appreciable impact on Congressional staff. However, in-person demonstrations of the program were found to be extremely impressive, particularly for Congressional staff that used the Tracking Network to gather EPH data at their individual zip code levels. To date, NCEH/ATSDR has conducted three demonstrations of the Tracking Network to Congressional staff.

NCEH/ATSDR's focus on restoring the Tracking Network budget has been critical. The program provides a strong foundation for virtually all EPH programs throughout CDC and serves as a key resource to both funded and non-funded states. However, NCEH/ATSDR recognizes that tremendous advancements and investments in the Tracking Network are needed to strengthen

its role as a world leader in EPH. NCEH/ATSDR also is aware of the need to target its education and outreach efforts to the Climate Health Program in the near future because both the House and Senate proposed \$0 funding for this initiative.

ATSDR's flat budget over the past 10 years is another funding challenge that NCEH/ATSDR leadership is addressing at this time. An aggressive approach is needed to increase the ATSDR budget because the current funding level does not match the actual demand for investigating chemical releases, responding to complex problems caused by hazardous waste sites, and conducting other site-specific activities in communities across the country. Most notably, ATSDR is continuing to support NCEH grantees that have a strong interest in adding a hydraulic fracturing component to their state tracking programs. However, the Superfund legislation prohibits ATSDR from investigating chemical releases that involve petroleum.

NCEH/ATSDR Leadership. NCEH/ATSDR's current leadership is outlined below.

- Dr. Donna Knutson is serving in dual roles as the Acting NCEH/ATSDR Deputy Director and Acting Associate Director of the NCEH/ATSDR Office of Policy, Planning and Evaluation.
- Dr. John Decker was appointed as the NCEH/ATSDR Associate Director for Science and will start his new position later in the month.
- Ms. Laurie Johnson was appointed as the Deputy Director of the NCEH Division of Emergency and Environmental Health Services (EEHS).
- Dr. Ileana Arias was appointed as the Director of the ATSDR Division of Community Health Investigations (DCHI).

NCEH/ATSDR Strategic Planning Efforts. NCEH/ATSDR initiated an aggressive review of its programs. Each division and office made a presentation to OD that covered the following topics:

- Primary role, purpose and function of the program
- Key successes and areas of improvement of the program
- Examples of the program's integration with other parts of NCEH/ATSDR
- Alignment of the program's budget with its current activities and NCEH/ATSDR's Strategic Plan priorities

At the program level, NCEH/ATSDR convened a staff retreat to thoroughly review the findings of the program presentations, ensure alignment between current programmatic activities and the Strategic Plan priorities, and develop an action plan for next steps. At the OD level, NCEH/ATSDR convened an external panel to conduct an independent program review of the Policy Office. Organizational changes recommended by the panel are expected to be implemented no later than the spring of 2016.

NCEH/ATSDR reorganized, re-envisioned and renamed the Office of Environmental Health Emergencies as the "Office of Environmental Health and Emergency Management" (OEHEM). The new branding will provide OEHEM with a broader coordinating role to address center-wide emergency response activities. The new OEHEM Director will be officially announced in the near future. An update on NCEH/ATSDR's recent strategic planning discussions will be presented to the BSC later in the meeting.

NCEH and ATSDR Highlights. The NCEH Division of Laboratory Sciences (DLS) is continuing to serve as a key resource for laboratory expertise in both internal and external EH programs throughout the country. Most notably, DLS is providing leadership in building a scientific evidence base on health impacts from e-cigarettes and marijuana.

NCEH is continuing to strengthen internal partnerships with other CDC centers, institutes and offices (CIOs). The NCEH Division of Environmental Hazards and Health Effects (EHHE) integrated its surveillance system for hazardous algal blooms into the National Center for Emerging and Zoonotic Infectious Diseases (NCEZID) outbreak surveillance system. The new module will be implemented in the near future. NCEH/EEHS and the National Center for Immunization and Respiratory Diseases (NCIRD) are collaborating to enhance CDC's response to the prevention of Legionnaires' disease. An overview of this initiative will be presented to the BSC during the meeting. NCEH also is coordinating joint efforts with other CIOs on its food safety activities.

ATSDR is continuing its longstanding investigation, public health assessment (PHA) process and other site-specific activities at Camp Lejeune that began in 1993. The detection of volatile organic compounds in drinking water sources at the site represents one of the largest EPH disasters in U.S. history in terms of the magnitude and extent of contamination. The investigation showed that >1 million persons potentially were exposed, including Marines, their family members and other civilians.

ATSDR's major challenges at Camp Lejeune over the past 22 years include its efforts to accurately document health impacts from contaminated drinking water at the site to individuals; build and sustain effective working relationships with the U.S. Department of Defense (DoD) and U.S. Department of Veterans Affairs (VA); and develop and maintain trust with the community. ATSDR obtains ongoing input from the public through regular meetings with the Camp Lejeune Community Assistance Panel (CAP). The next CAP meeting and Camp Lejeune public meeting will be held on December 4-5, 2015 in Tampa, Florida.

To justify its recommendation to compensate Camp Lejeune residents who were exposed, ATSDR recently attended a meeting and submitted a detailed literature review to the VA. The document outlined specific solvents detected in contaminated drinking water at the site and described the relationship between exposure to these chemicals and adverse health outcomes. The VA Secretary and Congressional staff who also attended the meeting directed VA staff to develop a sensible compensation program. ATSDR staff was asked to provide medical and scientific justification to support this effort. The VA is expected to announce a medical compensation program for affected Camp Lejeune residents in the near future.

ATSDR awarded the current cycle of lead poisoning prevention grants to state and local health departments in FY2015. ATSDR is continuing its partnership with DoD to determine potential health effects from contaminated drinking water on numerous military bases due to the use of aqueous film-forming firefighting foam. ATSDR is responding to overwhelming public interest regarding potential health effects from rubber tire crumbs that are being recycled and included in AstroTurf as padding to reduce injuries to athletes and children at playgrounds.

CDC, the U.S. Environmental Protection Agency (EPA), and U.S. Consumer Product Safety Commission (CPSC) attended meetings at the White House to discuss uncertainties related to the safety of rubber tire crumbs and identify current knowledge gaps in potential health effects

from the use of this product. Rubber tire crumbs recently were anecdotally reported as a source of cancer clusters, but no scientific evidence has been gathered to date to support these cases.

The federal partners intend to submit an interagency proposal to the White House over the next year to address these issues. To support their evidence-based response to the White House, the federal partners plan to leverage expertise from the National Institute of Environmental Health Sciences (NIEHS), the National Institute for Occupational Safety and Health (NIOSH), and six states, including California.

Dr. Breyse concluded his update by reiterating his intention for NCEH/ATSDR to launch new programmatic activities and other initiatives. He has encouraged NCEH/ATSDR staff to aggressively pursue scientific efforts and other research in EPH issues that are not necessarily priorities, but will respond to tremendous public health concerns. For example, ATSDR received numerous requests from the White House, U.S. senators, state governors and parents to conduct studies on the potential health effects from rubber tire crumbs in AstroTurf. However, he acknowledged that limited time and resources for NCEH/ATSDR staff to conduct its routine programmatic activities hinder the ability to pursue new and innovative EPH research.

BSC DISCUSSION: NCEH/ATSDR UPDATES

Dr. Breyse and other staff provided additional details on NCEH/ATSDR's recent activities and key areas of focus in response to the BSC's specific questions.

- Efforts by CDC and its federal partners to engage industry in ongoing research at the outset to quantify potential health effects from the use of rubber tire crumbs in AstroTurf.
- The likelihood of restoring funding to NCEH/ATSDR programs in FY2016 after the continuing resolution ends on December 11, 2015; the possibility of Congress approving a \$10 million cut to the Tracking Network in the FY2017 budget; and potential strategies to increase the impact of ATSDR's site-specific activities despite its flat funding level over the past 10 years.
- Communications and outreach strategies for individual BSC members to broadly raise awareness of the \$35 million proposed cut to the FY2016 NCEH/ATSDR budget through their existing memberships on key professional organizations: APHA, Association of State and Territorial Health Officials, National Association of County and City Health Officials, and National Environmental Health Association (NEHA).

BSC GUIDANCE

The BSC congratulated NCEH/ATSDR on its recent publications in *Environmental Research* in partnership with academia. The members were impressed that the studies featured in-depth, cutting-edge methods developed with Tracking Network data.

The BSC advised NCEH/ATSDR to provide Congressional staff with clear linkages between its routine programmatic activities and "un-funded" EPH issues, such as issues of concern to the public, issues perceived as a risk, issues that are important or relevant to the public, or issues with extensive media coverage. The BSC noted that efforts to demonstrate a clear linkage between NCEH/ATSDR's existing programmatic activities and un-funded EPH issues might encourage Congress to allocate funding to support new research.

Dr. Breyse agreed with the BSC's suggestion for NCEH/ATSDR to show the relationship between its programmatic activities and new, un-funded research areas that are of interest to the public and media. In response to a *60 Minutes* interview, for example, Lumber Liquidators

conducted emissions testing to measure formaldehyde levels in its flooring products. ATSDR and CPSC currently are reviewing these data from a public health perspective and expect to release a report on potential health risks from Lumber Liquidators flooring products by January 31, 2016.

In response to Dr. Perry's request for a status report, Dr. Breyse confirmed that NCEH/ATSDR will take action on two recommendations the BSC formally approved during the August 2014 teleconference. First, the nine members of the new BSC Lead Subcommittee, including Dr. Matthew Strickland as chair, have been identified. Second, the membership of the new BSC Fracking Workgroup will be appointed. NCEH/ATSDR will provide support for both groups to convene their first teleconference meetings in 2016.

NCEH/ATSDR Program Responses to BSC Guidance and Action Items

William Cibulas, Jr., PhD, MS
 Acting Associate Director for Science, NCEH/ATSDR
 BSC Designated Federal Official (DFO)

Dr. Cibulas presented NCEH/ATSDR OD's responses to action items and guidance the BSC proposed during the June 2015 meeting.

BSC ACTION ITEMS AND GUIDANCE	
BSC Request	NCEH/ATSDR OD Response
1. Invite Dr. Thomas Frieden, Director of CDC, to a BSC meeting to provide his perspectives on alignment between CDC-wide and NCEH/ATSDR EPH priorities.	Dr. Frieden was unable to attend the current BSC meeting due to scheduling conflicts. NCEH/ATSDR is continuing to coordinate efforts with Dr. Frieden's staff to confirm his attendance at the next BSC meeting.
2. Schedule a site visit of the NCEH laboratory during the next BSC meeting.	The current meeting agenda includes 1.5 hours after lunch for the BSC members to tour the NCEH laboratory.
3. Provide more details on NCEH/ATSDR's reorganization of its emergency preparedness and response (EPR) program.	The NCEH/ATSDR Program Response to the BSC's guidance will include an update on the reorganization of the EPR program.
4. Provide a status report on the new BSC Fracking Workgroup.	Dr. Breyse confirmed that NCEH/ATSDR will take action on establishing the membership and formal charge of the new Fracking Workgroup in 2016.
5. Initiate further discussion on public concerns related to industry funding to CDC.	CDC's current policy on accepting gifts from industry and other sources is outlined as follows. CDC has delegated authority to accept gifts directly and through the CDC Foundation. CDC's six-member Conflict of Interest Review Panel holds monthly meetings to ensure compliance with the

BSC ACTION ITEMS AND GUIDANCE

BSC Request	NCEH/ATSDR OD Response
	<p>policy. The panel's decisions to accept or reject gifts are based on several factors, including presentations by and follow-up discussions with principal investigators, background checks on proposed donors, and closed-session deliberations on each individual gift. The panel has reviewed >120 proposed gifts to CDC since August 2014. Due to increased public scrutiny of industry funding to CDC, the Advisory Committee to the CDC Director formed the Ethical Considerations for Public/ Private Partnerships Workgroup in April 2015. The workgroup was charged with reviewing existing policies and practices related to CDC's acceptance or rejection of external gifts. The workgroup submitted a report of its findings to the Advisory Committee to the CDC Director in October 2015. The report emphasized the need for additional transparency, more clearly defined conflict of interest standards, a more comprehensive review process in collaboration with the CDC Foundation, and a discussion on potential sources that should be prohibited from providing gifts to CDC. The report is expected to be finalized in February 2016. The Advisory Committee to the CDC Director informed NCEH/ATSDR of its availability to present its findings and recommendations to the BSC during a future meeting.</p>
6. Provide routine updates on the 2014-2016 NCEH/ATSDR Strategic Plan.	The current meeting agenda includes an update on the Strategic Plan.
7. Provide an update on the Camp Lejeune soil vapor intrusion (SVI) assessment.	ATSDR is continuing to collect data on the Camp Lejeune SVI assessment. After the data collection phase is complete, ATSDR will present an update on this research during one of the two BSC meetings in 2016.
8. Provide an update on the availability of the joint ATSDR/NIEHS guidance manual on developing a new chemical mixtures ToxProfile™.	ATSDR and NIEHS are updating a guidance manual on assessing joint toxic actions related to chemical mixtures. After the guidance manual is finalized, the document will be distributed to the BSC for review.
9. Provide an update on CDC's climate and health activities.	The Climate Health Program will present an update to the BSC during a future meeting.

BSC ACTION ITEMS AND GUIDANCE	
BSC Request	NCEH/ATSDR OD Response
10. Provide links to NCEH/EHHE's recent publications.	NCEH/ATSDR responded to this request by distributing the actual documents to the BSC during the June 2015 meeting or providing the BSC with links to the papers on the FTP site.

In response to item 8, Dr. Cory-Slechta advised NCEH/ATSDR and NIEHS to include EPA in their interagency partnership on chemical mixtures. She announced that EPA convened a workshop on its current cumulative risk assessment activities and will host a follow-up meeting on this topic later in December 2015.

Dr. Cibulas introduced the panel of NCEH/ATSDR program staff that would present responses to the BSC's guidance on key presentations made during the June 2015 meeting.

- Lindsey de Beer, MPH; Health Scientist, NCEH/ATSDR Office of Science
- Elizabeth Herman, MD, MPH; Senior Scientist, NCEH Division of Environmental Hazards and Health Effects (EHHE)
- Herbert Wolfe, PhD, MHS-PA; Senior Advisor, NCEH/ATSDR OD & Acting Western Branch Chief, ATSDR/DCHI
- Andrew Dent, MA, MBA; Program Director, Geospatial Research, Analysis and Services Program, ATSDR Division of Toxicology and Human Health Services
- Patrick Wall, BS; Informatics Team Leader, NCEH/EHHE
- Suzanne Cordovado, PhD; Team Lead, Molecular Quality Improvement Program, NCEH/DLS

BSC GUIDANCE ON KEY PRESENTATIONS	
BSC SUGGESTION	NCEH/ATSDR PROGRAM RESPONSE
<i>CDC's Activities on Household Air Pollution and Cleaner Cookstoves</i>	
1. Use "time spent cooking," "time spent gathering fuel" and similar metrics to quantitatively measure the role of cookstoves in the development and empowerment of local women.	Women's empowerment is a key focus area of the Global Alliance for Clean Cookstoves. CDC includes women's issues in its focus group and interview questionnaires as well. Moreover, CDC and its partners are empowering women entrepreneurs in Guatemala to sell and market cookstoves. This effort has allowed more local women to gain employment and play an integral role in the movement toward cleaner fuels, cleaner cookstoves and other safe technologies.

BSC GUIDANCE ON KEY PRESENTATIONS

BSC SUGGESTION	NCEH/ATSDR PROGRAM RESPONSE
<p>2. Focus on risk perception, self-protection, hazard reduction and improved health outcomes in children to promote behavior change, overcome practical barriers to widespread adoption of cookstoves, and achieve long-term health benefits in local communities.</p>	<p>CDC, its partners and consultants in Guatemala developed educational materials that are culturally and linguistically appropriate. Illustrators designed a booklet with pictures to provide instructions on correctly connecting and using cookstoves. The booklet also includes pictures on fire safety and proper ventilation to protect children from smoke in the home. The Guatemala educational and outreach project will be replicated and targeted to families in India and Cameroon in early 2016. CDC and India entered into a memorandum of understanding to jointly address EH and occupational health issues, including indoor/outdoor air pollution and the provision of cleaner fuels. Dr. Breyse will co-chair a new workgroup for this initiative that will convene its first meeting in the winter of 2016. Bloomberg Philanthropies and the Gates Foundation also have expressed a strong interest in increasing access to clean fuels in India. A major focus of the household air pollution and cleaner cookstove activities will be to conduct qualitative research to better understand cultural barriers to adopting new cooking methods.</p>
<p>3. Provide fuel at no cost or at a highly subsidized price to achieve the goal of 100 million families adopting clean, efficient and safe cooking by 2020.</p>	<p>CDC and its partners are shifting the focus on cookstoves to include the use of alternative fuels, particularly induction cooking. Because these new technologies are extremely expensive, CDC is partnering with banks and financing organizations in various countries to identify creative financing streams. Funding and/or subsidized programs would allow ~2 billion persons worldwide who are emerging from poverty to transition from using biomass fuels to alternative fuels. CDC also will continue to partner with humanitarian organizations to provide fuel at no cost in certain settings.</p>
<p><i>Public Health/Health Care Collaboration: CDC's National Asthma Control Program</i></p>	
<p>4. Showcase asthma as one of CDC's six priority conditions to advance public health/healthcare collaboration.</p>	<p>Asthma is included in CDC's 618 Initiative (<i>i.e.</i>, 6 conditions/18 interventions) to strengthen collaboration between public health and the healthcare system. Asthma,</p>

BSC GUIDANCE ON KEY PRESENTATIONS

BSC SUGGESTION	NCEH/ATSDR PROGRAM RESPONSE
	<p>smoking cessation and teen pregnancy were selected as the three 618 conditions that will be the subject of an intensive policy collaborative with state Medicaid agencies over the next year. The two key objectives of the policy collaborative will be to accelerate evidence into action and improve health without increasing cost. CDC's role in this effort will be to provide evidence to and analyze data for purchasers, payers and providers to inform their decision-making on the risks and benefits when determining coverage and investment options. These strategies will be designed to have the greatest impact on population health outcomes and cost control. CDC and its state partners are engaging in numerous discussions on next steps: (1) select states to include in the pilot; (2) develop a process to analyze Medicaid data and target interventions to improve asthma medication adherence; and (3) create population-level performance measures to track healthcare/public health collaboration and health system transformation. CDC and its state partners will convene the first in-person meeting on the policy collaborative in February 2016.</p>
<p>5. Consider the heterogeneity of disease and multiple phenotypes in developing asthma quality measures.</p>	<p>CDC will take action on the BSC's suggestion in the future, particularly as electronic health records (EHRs) become more sophisticated and the use of ICD-10 codes becomes more widespread. In the interim, CDC and its federal partners are developing and promoting a core set of asthma quality measures and incentives to improve the quality of care. CDC and its federal partners will meet with the Asthma Disparities Workgroup later in December 2016 to reach consensus on a core set of asthma quality measures.</p>
<p>6. Provide state asthma program grantees with guidance on data sharing.</p>	<p>CDC has incorporated data sharing guidance into plans for its 23 state asthma program grantees to collect and analyze mandatory performance measures.</p>

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BSC SUGGESTION	NCEH/ATSDR PROGRAM RESPONSE
<i>NCEH/ATSDR EPR Transformation Initiative</i>	
7. Provide an update on NCEH/ATSDR's reorganization of its EPR program as a result of the Transformation Initiative.	<p>NCEH/ATSDR OD conducted a series of staff interviews and meetings from February-August 2015 to obtain candid input on all aspects of the EPR program. NCEH/ATSDR OD formed a Core Team, Executive Team and Executive Steering Committee to review and analyze the staff input at multiple levels. Based on the findings, NCEH/ATSDR OD determined that its EPR program should be maintained as a centralized, consolidated and coordinated body for the divisions. NCEH/ATSDR OD reached consensus on identifying five core functions for the centralized EPR program: (1) strategic alignment, (2) incident management and operations coordination, (3) situational awareness and operations communication, (4) training, education and exercises, and (5) hazards and risk assessment. The Transformation Initiative also provided NCEH/ATSDR with an opportunity to clearly differentiate between activities that should be conducted during the preparedness/planning phase versus the response phase. To date, the Transformation Initiative has been completed for the Office of Environmental Health Emergencies and will soon be launched in other NCEH/ATSDR divisions and regions with significant EPR activities. NCEH/ATSDR will continue its longstanding collaborations with its EPR partners at the federal level.</p>
<i>ATSDR Geospatial Research, Analysis and Services Program (GRASP)</i>	
8. Link GRASP data with National Health and Nutrition Examination Survey (NHANES) health and exposure data.	ATSDR will implement the BSC's suggestion to link GRASP and NHANES data in the future.
9. Use GRASP data to assist CDC and its state asthma program grantees in developing new asthma quality measures.	ATSDR currently is determining whether the Healthy People 2020 school siting goal is making an impact on improving asthma outcomes. The Healthy People 2020 goal aims to reduce the siting of schools within 150 meters of major highways. ATSDR will compare new information on school locations

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BSC SUGGESTION	NCEH/ATSDR PROGRAM RESPONSE
	to existing asthma results to determine impact.
10. Partner with EPA to build stronger interagency geographic information system (GIS) capacity.	ATSDR has no formal interagency relationship with EPA on GIS activities, but several EPA colleagues were contacted to initiate discussions in this regard. ATSDR agrees with the BSC's guidance and will continue to explore potential synergies between its environmental burden index (EBI) and EPA's environmental quality index.
11. Examine the impact of coastal area topographies on vulnerable populations and healthcare facilities.	ATSDR is gathering data and developing coastal area topography maps at this time. ATSDR will share the maps with federal, state and local partners to strengthen their capacity to rapidly respond to flooding, hurricanes or other coastal emergencies.
12. Decrease the 15 sociodemographic variables that are included in the social vulnerability index.	ATSDR's position is that all 15 sociodemographic variables in the social vulnerability index are needed. Some variables are specific to a particular type of event. For example, access to transportation potentially could be merged with poverty or another measure. However, access to transportation is an important variable for evacuation from a hurricane or other natural disaster and should stand alone. These data also are shared with partners in the field during an event.
13. Incorporate analyses of chemical mixtures and interactions into the EBI.	ATSDR's existing data on chemical mixtures are not nationally representative at this time and cannot be easily integrated into the EBI. However, ATSDR will continue to determine the feasibility of this effort as more data on chemical mixtures are collected over time.
<i>CDC's National EPH Tracking Network</i>	
14. Map, align and link tracking content areas to a broader range of health outcomes.	CDC agrees with the BSC that the ToxProfiles™ are an excellent resource to prioritize health outcomes. CDC will identify additional opportunities in the future to expand the use of ToxProfiles™ in the EPH Tracking Network.
15. Collect tracking data to examine the relationship between environmental home exposures and neurological diseases.	The House passed the 21st Century Cures Act in July 2015 that calls for the establishment of a new National Neurological Diseases Surveillance System. The

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BSC SUGGESTION	NCEH/ATSDR PROGRAM RESPONSE
	proposed bill also recommends increased funding to the National Institutes of Health (NIH) and the U.S. Food and Drug Administration, but CDC's potential role in this initiative has not been identified to date. CDC will provide the BSC with additional details after the Senate approves or rejects the proposed bill.
16. Collect tracking data on neonicotinoid pesticides.	CDC agrees with the BSC that the EPH Tracking Network should be expanded with pesticide data. At this time, CDC only monitors pesticide poisonings with Poison Control Center data.
17. Give more attention to the validity, accuracy and quality of hospitalization data that are entered into EHRs for the EPH Tracking Network.	CDC awarded funding to four state and local tracking grantees to pilot EHRs. The grantees were required to implement innovative EHR approaches, document lessons learned, and demonstrate the feasibility of integrating EHRs into the EPH Tracking Network. CDC is developing a white paper of the lessons learned, experiences and findings of the tracking grantees. CDC will distribute the white paper to the BSC for review.
18. Limit "success stories" to those in which the EPH Tracking Network directly advances public health action or generates innovative research.	CDC agrees with the BSC to demonstrate a stronger and more direct link between the use of tracking data and public health action. For example, Maine used tracking data to pass a new carbon monoxide detector law in 2009. In accordance with the BSC's guidance, CDC's success story should be based on the following results: (1) an evaluation of the impact of the new law on the occurrence of carbon monoxide poisoning cases in Maine and (2) an assessment of whether carbon monoxide detector laws or policies were easier to enact in tracking versus non-tracking states. In FY2016 and thereafter, CDC will devote more tracking resources to research, public health practice and dissemination of success stories.
19. Increase the focus on prevention to make the EPH Tracking Network a national program.	CDC is taking action to ensure that prevention is retained as a key component of the EPH Tracking Network mission statement. For example, CDC will include language in all

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	new funding opportunity announcements requiring tracking grantees to expand their EH information footprints. CDC reconvened the Tracking Content Workgroup with diverse representation by CDC subject-matter experts, governmental partners, tracking grantees and non-governmental organizations.
<i>Advances in Laboratory Methods: Molecular Newborn Screening Tests</i>	
20. Take action on the existing plan to develop a next-generation sequencing severe combined immunodeficiency (SCID) gene panel.	DLS recently awarded a three-year cooperative agreement (CoAg) to New York State to develop next-generation sequencing technology to identify SCID mutations. New York State will closely collaborate with DLS in all aspects of the research project, including the development of appropriate quality assurance materials and implementation of the pilot in New York State.
21. Provide education on molecular newborn screening to other groups beyond public health professionals.	<p>The Health Resources and Services Administration (HRSA) is the lead federal agency on providing molecular newborn screening education to the public and has implemented several initiatives in this regard. However, DLS is actively leveraging its existing partnerships, targeting resources, and conducting other activities to assist HRSA in broadening awareness of molecular newborn screening.</p> <ul style="list-style-type: none"> • DLS and the Association of Public Health Laboratories co-sponsored meetings to target education and outreach to state attorneys, parent organizations and other stakeholders. • DLS hosted a stakeholder webinar in the fall of 2015 to discuss the impact of a new common rule on consent for molecular newborn screening. • DLS established a subcommittee to specifically focus on issues related to molecular newborn screening. The subcommittee currently is developing a white paper on incorporating next-generation sequencing into molecular newborn screening.

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	<ul style="list-style-type: none"> • DLS will launch its updated web page on the CDC.gov website in the fall of 2016 to provide more information on molecular newborn screening. • DLS will meet with state laboratories in either 2016 or 2017 to provide ongoing guidance as next-generation sequencing becomes more widely utilized in molecular newborn screening. • DLS will convene a meeting with public health professionals in either 2016 or 2017 to obtain external expertise on including next-generation sequencing in molecular newborn screening. • DLS will make a presentation on molecular newborn screening during the 2017 Conference of the Association of Women's Health, Obstetric and Neonatal Nurses. • DLS will continue to present exhibits on molecular newborn screening to the broader clinical community during conferences of the American College of Medical Genetics and Genomics.
<p>22. Include rigorous safeguards to protect the privacy and confidentiality of specific and unique genomics data during the development of a laboratory infrastructure for genome/ exome sequencing.</p>	<p>The Office for Human Research Protections (OHRP) is the lead federal agency for the protection of human research subjects. OHRP recently released a notice of proposed rule-making that calls for revisions to the common rule on the use of genetics information in research. DLS is closely collaborating with OHRP in this effort because revisions to the common rule likely will impact newborn screening laboratories, including informed consent of newborn screening collection materials. OHRP currently is addressing issues and concerns that were raised during the recent webinar on the notice of proposed rule-making.</p>

The NCEH/ATSDR presenters thanked the BSC for providing comprehensive, thoughtful and insightful guidance in response to their specific programmatic questions during the June 2015 meeting. However, Dr. Breyse asked the BSC to take a more strategic approach in providing advice to NCEH/ATSDR. During the current session, for example, several BSC members raised the possibility of using tracking data to support evaluations by healthcare systems in determining population-level risks to patients who are discharged from hospitals.

Dr. Breyse agreed that this new dataset would be extremely beneficial to the EPH Tracking Network, but the addition of a single data element costs ~\$40,000. However, he and Dr. Knutson agreed to explore the feasibility of implementing the BSC's suggestion to launch a "Behavioral Risk Factor Surveillance System-like" model in which non-CDC resources would be leveraged to support the inclusion of new data elements in the EPH Tracking Network.

Overview of NCEH/ATSDR's Strategic Discussions

Donna Knutson, PhD

Acting Deputy Director, NCEH/ATSDR
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Dr. Knutson reported that NCEH/ATSDR leadership met with Dr. Breyse soon after his appointment as the NCEH/ATSDR Director to initiate strategic discussions. The strategic discussions were categorized into four distinct sections.

Section I focused on the purpose and process of NCEH/ATSDR's strategic directions. In terms of the purpose, NCEH/ATSDR leadership aimed to achieve six major objectives:

- Foster cross-office understanding
- Present the "big picture" to leadership
- Challenge existing assumptions
- Assess operational opportunities to improve alignment
- Evaluate operational barriers to achieving strategic goals
- Determine whether to refresh the 2014-2016 Strategic Plan based on new assumptions

In terms of the process, NCEH/ATSDR leadership utilized four key components. For the "program review" component, the divisions completed and submitted a standardized template to provide information in a consistent and systematic manner. The program reviews were designed to collect information on funding, full-time equivalents, accomplishments and the status on major programmatic activities. For the "OD reflections" component, NCEH/ATSDR leadership convened a meeting with the division directors on November 17, 2015 to communicate key findings from the program reviews.

For the "action plan" component, champions from the divisions were identified to lead specific activities and ensure adherence to timelines. For the "review" component, NCEH/ATSDR leadership will hold ongoing meetings with the champions to track interim achievements and ensure that the activities are important, measurable and impactful.

Section II focused on operational challenges and gaps in NCEH/ATSDR's strategic directions. The divisions reported that NCEH/ATSDR's personnel system is sub-optimal and is in need of improvements in several areas. Most notably, the ability to hire new and qualified staff in a timely fashion is limited. Staff roles and responsibilities are not clearly defined. Certain activities conducted by the divisions overlap, such as initiatives related to EPR, tracking and GRASP. Managers do not receive specialized training for their job descriptions. Staff that volunteered to serve as champions in addressing challenges and gaps related to personnel will submit a report with a one-year plan to NCEH/ATSDR OD by December 20, 2015.

The divisions reported that strategic planning, prioritization and metrics change after a turnover in leadership. Consensus was reached on the need for NCEH/ATSDR OD to clearly define priorities, ensure that activities are conducted in accordance with Congressional mandates and budget line-items, and provide the divisions with as much flexibility as possible. Agreement also was reached on the need for NCEH/ATSDR's current programmatic output to be valuable and impactful to stakeholders and the nation. Staff that volunteered to serve as champions in addressing challenges and gaps related to strategic planning, prioritization and metrics will submit a report with a one-year plan to NCEH/ATSDR OD by December 20, 2015.

The divisions reported that collaboration needs to be strengthened with both internal and external stakeholders. For example, food and water safety activities conducted by NCEH/ ATSDR, NCEZID and other CDC National Centers are not coordinated. Traditional partnerships with EPA and NIH also need to be enhanced, but non-traditional relationships with industry and foundations need to be established as well.

The divisions emphasized the need to improve the impact and understanding of NCEH/ ATSDR's partnerships. Most notably, differences between the roles, expectations and outcomes of "partners" and "stakeholders" need to be clearly defined and quantified. Staff that volunteered to serve as champions in addressing challenges and gaps related to internal/ external collaboration will implement new Congressional outreach and partnership strategies. Dr. Breyse and other CDC National Center Directors also will continue to convene quarterly meetings.

The divisions reported that the CDC and NCEH/ATSDR clearance processes are burdensome and confusing in certain areas. The lengthy clearance processes also delay the release of NCEH/ATSDR publications and other products in a timely manner. Staff that volunteered to serve as champions in addressing challenges and gaps related to the NCEH/ATSDR clearance process will propose a new and more streamlined approach.

The divisions emphasized the need to improve the communications and clear writing processes to ensure NCEH/ATSDR materials are developed and disseminated in a manner that is appropriate for and beneficial to target audiences and stakeholders. Staff that volunteered to serve as champions in addressing challenges and gaps related to the communications and clear writing processes will propose a new approach to ensure NCEH/ATSDR's products to partners, stakeholders and the general public are clear, relevant and actionable.

Section III focused on role of OD in NCEH/ATSDR's strategic directions. The NCEH/ATSDR OD is unique from ODs of other CDC National Centers due to its budget line-items for both NCEH and ATSDR from two separate Congressional appropriations. However, NCEH has a much stronger infrastructure than ATSDR. The divisions emphasized the need for increased bi-directional communications between OD and individual divisions. For example, policy issues, communications and other activities overlap between NCEH and ATSDR. The level of support and services provided by OD is inconsistent across NCEH and ATSDR divisions. The roles and responsibilities of OD staff are not clearly understood. Drs. Breyse and Knutson will create an OD optimization plan to clarify the role of OD in NCEH/ATSDR's strategic directions. Most notably, OD already has reduced its operational budget by \$3 million.

Section IV focused on leadership priorities in NCEH/ATSDR's strategic directions. Dr. Breyse ranked the top three issues that NCEH/ATSDR should immediately prioritize. Priority 1 is a stronger ATSDR infrastructure. A 2009 U.S. Government Accountability Office report was extremely critical of ATSDR and its overall process to conduct activities, but no organizational

changes have been implemented to date to resolve these problems. Communities across the country have an overwhelming need for ATSDR's site-specific expertise and other EPH services, but the existing infrastructure in terms of staff and resources is not sufficient at this time to meet public demand.

EPA Regional Administrators have reported that in some cases, ATSDR regional staff issues a PHA report years after the initial site investigation. Key stakeholders and impacted communities have expressed tremendous concerns regarding vague and ambiguous conclusions in some of ATSDR's PHA reports. ATSDR's petition process needs to be reorganized with a more systematic and formalized approach. ATSDR's site investigations primarily rely on data collected by EPA for purposes other than addressing EH concerns in communities.

ATSDR's engagement of and partnership with communities in all aspects of site investigations need to be strengthened. ATSDR has inadequate resources to conduct exposure investigations. The role of ToxProfiles™ and their screening values are not clearly delineated for routine users of these data. Staff that volunteered to serve as champions in developing a stronger ATSDR infrastructure will submit a plan to NCEH/ATSDR OD by January 11, 2016.

Priority 2 is CDC's National Asthma Control Program. Staff that volunteered to serve as champions will propose a plan to ensure that the asthma program has a larger and more innovative scope in the future. Priority 3 is the NCEH Clean Water for Health Program. Staff that volunteered to serve as champions will propose a strategy to create a more meaningful and formalized safe water program and coordinate this effort with other CDC National Centers.

NCEH/ATSDR leadership also identified a second set of priority areas that will warrant more attention in the near future. Laboratory services will be expanded as an international resource for both EH and non-EH research and activities. Biomonitoring will be used in a more effective and appropriate manner. DLS's studies and other products will be widely disseminated in more diverse venues.

The EPH Tracking Network will be more extensively integrated into activities by all NCEH/ ATSDR divisions and other CDC National Centers. GRASP is a fee-for-service program that is under-utilized, but will have a stronger presence in NCEH/ATSDR programs in the future. A division champion will be identified to transform children's EH activities from an informal ad hoc approach to a formal programmatic strategy that will be coordinated across NCEH/ATSDR. The Climate Health Program might be re-branded or integrated with another initiative in the future, but this activity will be retained as a priority regardless of cuts to the NCEH/ATSDR budget or changes in political will.

Dr. Knutson concluded that NCEH/ATSDR leadership extensively discussed the BSC's role in developing and implementing the 2014-2016 Strategic Plan. Consensus was reached on the need to continue to solicit the BSC's expertise and guidance on an ongoing basis as the division champions present their strategic approaches, particularly in the area of partnerships. For example, the possibility was raised of utilizing interagency personnel agreements in which external staff with EH expertise could be deployed to NCEH/ATSDR for a period of 6-12 months.

BSC DISCUSSION: NCEH/ATSDR STRATEGIC DISCUSSIONS

Dr. Knutson, Dr. Breyse and other leadership provided additional details on NCEH/ATSDR's strategic discussions in response to the BSC's specific questions.

- NCEH/ATSDR's ongoing and new efforts to support the children's EH priority: partnerships with EPA and NIEHS on children's EH training and research; existing memberships on interagency children's EH groups at the federal level; and a potential new collaboration with the National Toxicology Program (NTP) on rubber tire crumbs research and children's developmental studies.
- The inability of some state and local health departments to provide essential EH services, such as lead poisoning prevention and surveillance, due to cuts to the NCEH/ ATSDR budget at the federal level.
- NCEH/ATSDR's new strategic direction to strengthen its partnership with NEHA.
- NCEH/ATSDR's plans to improve interagency coordination, generate efficiencies and minimize duplication in research or other activities that overlap with those of its federal partners, such as synergies among ATSDR's ToxProfiles™, EPA's literature-based analyses, NTP's Report on Carcinogens, and NIOSH's new systematic literature review process.
- NCEH/ATSDR's new "Tracking 2020" initiative that will be launched in FY2016, including an economic analysis and a strategic plan to expand partnerships, to demonstrate the economic benefits of the EPH Tracking Network.

BSC GUIDANCE

The BSC made a key suggestion for NCEH/ATSDR to consider in addressing the challenges and gaps related to the communications and clear writing processes. NCEH/ATSDR should deliver clear and relevant messages to communicate the value of its EPH activities in a strategic, targeted and concise manner to various audiences. For the professional audience, for example, a large proportion of the broader EH community has no knowledge of the epigenetics literature that demonstrates a clear linkage between the environment and health and the impact of the environment on the genome and virtually every disease. For the lay audience, a significant proportion of the general public has no knowledge of the role of the environment on asthma triggers and adverse outcomes.

ATSDR's Activities to Address Community Exposures to Perfluorinated Compounds

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Advice Requested from the BSC by ATSDR:

1. Does the BSC endorse ATSDR's programmatic emphasis on perfluorinated compounds (PFCs)?
2. What additional partners should ATSDR engage in this effort?
3. What types of health studies are most appropriate for ATSDR to undertake?

Ms. Worley and Dr. Bove presented an overview of ATSDR's current and future efforts to address community exposures to PFCs. The properties of PFCs include a carbon chain that is surrounded

by fluorine atoms and acid groups. Multiple PFC species have been documented in the literature, but the two major classes are perfluorocarboxylic acids and perfluorosulfonates. PFCs serve as excellent surfactants and dispersants due to their unique ability to repel water and oil. However, PFCs are extraordinarily persistent in the environment and bioaccumulative in humans. PFCs were routinely used in the manufacture of non-stick cookware, carpet and clothing treatments, paper and cardboard packaging, and aqueous film-forming firefighting foam (AFFF).

PFC contamination is well documented in the literature, including waste from manufacturing facilities since the 1950s, the use of AFFF at military installations from 1970-1990, and the use of PFC-containing sludge from wastewater treatment plants as a soil amendment in agricultural fields. The major pathways of exposure to PFCs include drinking water from private residential wells and municipal water systems, consumption of contaminated fish, and accidental ingestion of consumer products (e.g., food containers and wrapping, clothing and cookware).

ATSDR is focusing on PFCs due to interest by the EH and broader scientific communities. The 2011 Shin, *et al.* study and the 2013 Eshauzier, *et al.* study reported that PFCs are found worldwide in the environment, wildlife and individuals. DLS also documented widespread human exposure to PFCs through measurable concentrations of multiple PFC species in the blood of nearly every individual tested in NHANES. The long half-lives of PFC species in humans range from 3.8-8.5 years. EPA classifies PFCs as contaminants of emerging concern and requires municipal water systems to be tested as part of its Unregulated Contaminant Monitoring Rule (UCMR).

EPA established provisional health advisory levels in January 2009 to assess potential risks from short-term exposure to PFCs via drinking water:

- 0.2 µg/L for perfluorooctane sulfonate (PFOS)
- 0.4 µg/L for perfluorooctanoic acid (PFOA)

EPA will finalize the provisional screening levels for PFCs in drinking water by the end of December 2015. As part of the Third UCMR in May 2012, EPA required all community water systems that serve >10,000 customers to monitor and test for PFCs twice in 12-month periods from 2013-2015. ATSDR released the draft PFC ToxProfile™ in August 2015 with a public comment period that will close on December 1, 2015.

The literature has documented mixed and inconclusive findings on health outcomes related to PFCs due to differences between animal and human pharmacokinetics studies. In 2003, EPA nominated PFOA and other PFC species for two-year bioassays conducted by NTP. The EPA Science Advisory Board recently found that PFOA likely is carcinogenic in humans. Several short-term and chronic studies conducted from 1978-2009 reported increased liver weight as a critical effect in animals. Other effects in animals reported by these studies included changes in the spleen and thymus as well as developmental endpoints. Cancer studies found relationships between exposure to PFOA/PFOS and the development of tumors in the liver, testis and pancreas of rats.

Strong evidence has been gathered to document that the mechanism of toxic action leading to these endpoints is the interaction of PFCs with peroxisome proliferator-activated receptor-alpha. Exposure that impacts genes related to lipid metabolism, apoptosis and cell differentiation leads to selective clonal expansion and tumor growth. Increased liver weight has been reported as a critical effect in animals.

Epidemiologic studies of PFCs have been conducted in large populations in Ohio and West Virginia residing near a DuPont facility. Non-cancer health effects reported by these studies included a potential relationship between PFC exposure and high cholesterol, hypertension, changes in kidneys, liver function and disease, and low birth weight. Occupational cancer studies conducted in worker populations found an association between PFC exposure and cancer of the kidney, bladder, testis and prostate. However, these results should be interpreted with caution because the studies did not control for smoking or other confounders.

Efforts are underway to fill existing data gaps related to PFCs. The Environmental Workgroup designed an online, interactive map for communities to show the level of PFCs in their municipal water systems at the county level. EPA collected fish tissue from nationally representative rivers in both urban and non-urban areas across the country and detected PFCs in 80% of samples. However, additional data are still needed to better understand and strengthen the scientific evidence base on PFCs in the following areas.

- Mechanisms of toxicologic actions of PFCs, particularly their mechanisms of toxic action in humans
- Interpretation of animal studies in the context of human health
- Potential health effects from PFC species detected in blood and environmental samples
- Health effects of short-chain PFCs
- The level of pharmacokinetic variability in human populations

ATSDR's ongoing efforts to address community exposures to PFCs include exposure investigations at sites in Alabama, Alaska, New Hampshire, New Jersey and Pennsylvania. ATSDR also is advancing the science on PFCs through the development of physiologically-based pharmacokinetic (PBPK) modeling and health studies. Moreover, ATSDR is partnering with DLS, EPA, U.S. Fish and Wildlife Service, state environmental and public health agencies, and municipal water companies.

Key outcomes from ATSDR's exposure investigations of PFCs at two sites are highlighted as follows. ATSDR launched an investigation at the Decatur, Alabama site in 2010 to determine if unusual exposures to PFCs were occurring. The community is located downstream of several PFC manufacturing facilities. Blood samples were collected from 153 persons with a high potential for exposure to measure eight PFC species. Inclusion criteria were based on an individual's consumption of contaminated private well water, exposure to municipal water systems, or residence near agricultural fields contaminated by PFC sludge.

ATSDR's investigation found that serum levels of PFOA, PFOS and perfluorohexanesulfonate (PFHxS) were above NHANES measures in the cohort. Persons who consumed water from the West Morgan/East Lawrence water system or contaminated private wells had the highest PFC serum concentrations. ATSDR's follow-up investigation with the same cohort that participated in the 2010 study is underway and includes biological sampling of blood and urine. ATSDR will compare the cohort's current PFC serum concentrations to their 2010 levels and 2011-2012 NHANES measures. Biological half-lives will be calculated for all eight PFC species in each study participant. The existence of non-drinking water exposure pathways in the community will be evaluated with PBPK modeling.

ATSDR launched an investigation at the Pease Tradeport, New Hampshire site in 2013 in response to a request for technical assistance by the New Hampshire Department of Health and

Human Services (NHDHHS) and Congressional staff. NHDHHS informed ATSDR of PFC contamination in the water supply due to past military use of AFFF. The former Air Force base (AFB) was developed into 250 businesses, including two daycare centers, that have a regular population of ~9,450 workers and visitors.

ATSDR's sampling in May-October 2014 found elevated levels of PFOS above EPA's provisional health advisory levels in one onsite public drinking water well and one offsite private drinking water well. However, ATSDR detected PFCs in 18 wells overall. Residents were immediately provided with bottled water. A water treatment system to remove PFCs from the entire home was later installed in October 2014. Both NCEH and ATSDR are providing scientific and technical support to NHDHHS in the areas of biomonitoring, laboratory analyses of ~800 samples, evaluations of exposure to PFC contamination through private and public water supplies, and assessments of potential health study approaches for the community.

ATSDR's collection of historical information showed that the use of AFFF at the Pease Tradeport site likely caused contamination as early as the 1980s and potentially exposed active duty service personnel and civilian workers when the property was an AFB. NHDHHS conducted biomonitoring in June 2015 to compare mean serum concentrations of PFOS among the Pease Tradeport site, other exposed communities and the general U.S. population. PFOS levels were slightly elevated at some sites, but PFHxS levels were found to be significantly elevated in both adults and children. A survey was administered with a limited set of questions to obtain feedback on PFC levels in the blood only.

- Do you work at Pease Tradeport? If so, what dates?
- Does your child attend daycare centers at Pease Tradeport? If so, what dates?
- Do you drink water from the Pease Tradeport supply? If so, how many cups per day on average?
- Do you have a private well that tested positive for PFOA/PFOS? If so, how many cups per day on average were consumed?

NHDHHS established a Community Advisory Board (CAB) in May 2015 to serve as a liaison between the Pease Tradeport community and the health department. During the October 2015 meeting, the CAB posed several questions to ATSDR on a broad range of issues.

- Long-term health effects, particularly to children who attended the daycare centers
- The most appropriate ATSDR study to monitor short-/long-term health effects
- Strategies to ensure that ATSDR and its partners maintain ongoing communications with the community
- The number of other water systems in the United States with PFC contamination
- Proactive steps that individuals can take to screen for and prevent adverse health effects from PFC drinking water exposures to their families

ATSDR is now proposing to conduct two major activities to more formally address community exposures to PFC contamination in drinking water at Pease Tradeport and other sites that used AFFF. First, CAPs would be formed for a longer period of time with more representation by community members. Second, a multi-site feasibility assessment would be conducted with several components.

- A literature review to identify candidate health outcomes

- A preliminary exposure assessment to strengthen knowledge of existing drinking water systems
- Collection of additional sampling and hydrogeologic data to reconstruct preliminary historical exposures in communities
- Collection of data to locate, quantify and track impacted populations over time, including workers, children at the daycare centers, and military service personnel/civilian workers
- Collection of additional environmental exposure and health outcome data to inform the design of modeling studies
- Establishment of criteria to calculate the power of sample sizes across sites and determine whether the health study or other activities will be of public health significance or scientifically important

ATSDR is considering the possibility of including two types of populations in its cohort studies. The recently exposed cohort at Pease Tradeport would include persons with exposures to PFC contamination in drinking water over the past 5-9 years, such as ~9,450 employees in 250 businesses, children at the two daycare centers, and residents served by contaminated private wells. Persons exposed to PFCs via drinking water at other sites would include the two Pennsylvania sites and recently exposed military service/civilian workers at Eielson AFB, Alaska.

ATSDR would estimate past and present exposures at other sites by collecting blood samples and/or historically reconstructing drinking water contamination levels and predicting historical serum levels using water consumption assumptions and PBPK modeling. The health outcomes of interest in the cohort studies could include chronic diseases, cancer incidence, adverse birth outcomes and laboratory measures (e.g., lipids, immune/inflammatory markers, and liver, kidney and thyroid function). Other diseases self-reported on a health survey would be verified. The feasibility study will determine which health outcomes will be evaluated.

ATSDR would conduct epidemiologic studies of past exposures to contaminated drinking water among service personnel and civilian workers at military bases. Exposures to other contaminants in drinking water, such as trichloroethylene at the Pease AFB through the mid-1980s, would be considered. The new epidemiologic studies would be designed with a similar approach as the Camp Lejeune studies. ATSDR would establish a CAP to ensure ongoing, bi-directional communications with the community, share new study findings, and directly target information to physicians and other healthcare providers.

ATSDR's next steps in this effort will be to analyze gaps in existing PFOS and PFHxS studies, evaluate current blood sampling and questionnaire data, historically reconstruct drinking water contamination, collaborate with the community on refining the research questions, and gather more information on other sites with similar PFC exposures.

BSC GUIDANCE

Question 1: BSC Endorsement of the Proposed Approach

- ATSDR should take the necessary next steps to investigate health effects from PFCs due to current evidence that documents heightened levels of exposure. Although the proposed studies will not serve as the definitive research initiative to fill all existing data gaps related to PFCs, ATSDR's design of high-quality, rigorous studies will play a significant role in strengthening the literature.

- ATSDR's proposed health study should include the use of the new total oxidation method to analyze, characterize and quantify exposures to total PFC rather than solely focusing on PFOA and PFOS.
- ATSDR should ensure that its new health studies are thoughtfully designed to actually address health effects in communities instead of merely adding to the inconsistent scientific evidence base on PFCs. Health endpoints from PFCs that are in most need of new exposure data include cancers, low birth weight and male/female reproductive outcomes.
- ATSDR should optimize the use of biomarkers at the Pease Tradeport site to improve inconsistent PFC findings from previous studies and enhance the ability to thoroughly and completely monitor former military personnel and civilian workers over time.

Question 2: Additional Partners

- ATSDR should partner with the Strategic Environmental Research and Development Program (SERDP) in its proposed research agenda. SERDP is allocating a portion of its federal funding from DoD, EPA and the U.S. Department of Energy (DOE) to support numerous PFC studies.
- ATSDR should contact the NTP Office of Health Assessment and Translation to obtain information on a new systematic literature-based peer review that will be initiated in 2016 focusing on the association between PFOS exposures and immunotoxicity endpoints.

Question 3: Appropriate Types of Health Studies

- ATSDR should use the feasibility assessment as an opportunity to conduct more in-depth due diligence. For example, the design of the proposed PFC health studies as a retrospective or prospective cohort study, cross-sectional study or community exposure investigation has not been clearly delineated. Each of these potential designs will require major efforts from ATSDR in terms of staff and time as well as significant DoD funding. Moreover, issues related to the power of sample sizes across sites and the ability to track cohorts over time have not been addressed.

GENERAL CONSENSUS: The BSC advised ATSDR to begin conducting the PFC feasibility assessment and present an update during the next meeting. To provide additional justification in leveraging funding, Dr. Breyse will inform DoD that NCEH/ATSDR's external advisory body strongly supported the PFC studies as an important research area to pursue.

Public Comment Period

Dr. Cibulas opened the floor for public comments; no participants responded.

With no further discussion or business brought before the BSC, Dr. Cibulas recessed the meeting at 4:32 p.m. on December 1, 2015.

December 2, 2015 Opening Session: Welcome-BSC Meeting Reconvenes

William Cibulas, Jr., PhD, MS

Acting Associate Director for Science, NCEH/ATSDR
BSC Designated Federal Official (DFO)

Dr. Cibulas opened the floor for introductions and confirmed that the 12 voting members and *ex-officio* members in attendance constituted a quorum for the BSC to conduct its business on December 2, 2015. He reconvened the proceedings at 8:36 a.m. and welcomed the participants to day 2 of the BSC meeting.

Dr. Cibulas announced that BSC meetings are open to the public and all comments made during the proceedings are a matter of public record. He reminded the voting members of their responsibility to disclose any potential individual and/or institutional conflicts of interest for the public record and recuse themselves from voting or participating in these matters. None of the BSC voting members publicly disclosed conflicts of interest for any of the items on the December 2, 2015 published agenda.

The Role of Environmental Health Services in Legionnaires' Disease

CDR Jasen Kunz, MPH, RHES

NCEH Division of Emergency and Environmental Health Services
Centers for Disease Control and Prevention

Advice Requested from the BSC by NCEH/EEHS:

1. Based on the identified gaps, what strategies should the Environmental Health Services Branch (EHSB) implement to prioritize the development of targeted EH related to *Legionella* training and guidance specific to state and local EH? What steps can EHSB take to maximize the likelihood that such training will be effective and sustainable over time?
2. Based on critical needs, what is the BSC's guidance on EHSB's unique role in supporting CDC's overall *Legionella* response and prevention activities? What steps can EHSB take to maximize the likelihood that its contributions to *Legionella* prevention will be impactful and enduring?

Cdr. Kunz described the role of EH services in Legionnaires' disease. *Legionella* lives in, thrives in and is transmitted into the environment by water. Because *Legionella* is not vaccine-preventable, vector-borne or transmitted from person-to-person, the environment must be controlled. The environmental factors that allow *Legionella* bacteria to survive and reach a susceptible host must be understood to prevent Legionellosis. Laboratory, epidemiologic and environmental interventions are all needed to identify and control *Legionella*-associated outbreaks. The development and adoption of evidence-based environmental prevention practices will reduce the incidence of disease.

Legionellosis is a respiratory disease that is caused by *Legionella* bacteria. Legionnaires' disease is caused by bacteria that infect the lungs and develop into pneumonia. Pontiac fever is caused

by bacteria that develop into less serious infections, such as a mild case of influenza. The burden of Legionnaires' disease is estimated to include hospitalizations of 8,000-18,000 persons annually.

Legionella bacteria are ubiquitous in the environment and typically are found in warm water. Persons develop Legionnaires' disease or Pontiac fever by breathing in small droplets of water in the air that are contaminated with *Legionella* bacteria. A key intervention in preventing infection is to keep *Legionella* out of building water supplies, cooling towers, pools, hot tubs and fountains.

Legionellosis was first detected during a convention in Philadelphia in 1976. The outbreak of 221 cases was the largest in U.S. history and resulted in 34 deaths. The cooling system was suspected to be the source of the outbreak. However, Legionnaires' disease outbreaks of various sizes in diverse settings are still reported to CDC. The national incidence of Legionellosis has dramatically increased from 1998-2014. Most notably, the number of cases reported increased by 250% from 2000-2011 alone.

CDC has made several assumptions regarding the increased incidence of Legionellosis over time. The availability of the urine antigen test in the 1990s enhanced the ability to diagnose Legionellosis. CDC and state health departments strengthened their surveillance capacity. The Council of State and Territorial Epidemiologists issued a position statement in 2005 that emphasized travel-associated cluster detection. Susceptibility of the population has increased due to persons living longer with chronic health conditions. The presence of *Legionella* has increased in the environment due to aging infrastructures and energy-/water-saving modifications to building water systems. Legionellosis prevention practices are not widely implemented in the United States.

The burden of Legionellosis includes community-associated cases (69%), travel-associated cases (24%), and healthcare-associated cases (7%). After Legionellosis became a reportable disease to CDC in 2001, the number of outbreaks steadily increased and cluster detection improved at federal and state levels. Outbreaks from cooling towers are the cause of the largest number of community-associated cases, but with a lower fatality rate. Outbreaks from potable water and whirlpool spas are the cause of a smaller number of travel-associated cases in hotels and on ships with a lower fatality rate.

Outbreaks from potable water alone are the cause of the smallest number of healthcare-associated cases, but with the highest fatality rate. Overall, potable water accounts for the vast majority of all Legionellosis outbreaks. *Legionella* bacteria were the cause of 66% of the 32 waterborne disease outbreaks associated with drinking water reported in 2011-2012. The role of *Legionella* in 885 drinking water-associated outbreaks in the United States also has increased over time from 1971-2011.

NCIRD asked EHSB to provide EH support and expertise on responding to and preventing Legionellosis outbreaks beginning in 2012. However, EHSB has limited staff and other resources to devote to *Legionella*-related activities. The phases of a Legionellosis outbreak response are highlighted below.

- Outbreak detection
- Environmental assessment and sampling
- Immediate response (e.g., point-of-use filters)

- Laboratory confirmation to link clinical and environmental isolates and confirm the source identified in the environmental assessment
- Implementation of environmental interventions (e.g., additional use of chlorine or disinfectants or modification of the building's plumbing system)
- Additional environmental testing and follow-up to determine the effectiveness of environmental interventions

CDC's focus on prevention is designed to transform lessons learned from an outbreak response and findings of an environmental assessment to action and guidance for the field. To develop and support prevention programs over time, the effectiveness of environmental interventions are continuously monitored and reviewed. Evidence-based environmental interventions are adopted as prevention practices in the field to reduce the incidence of disease.

The NCIRD/EHSB partnership has enhanced the focus on prevention through EH. Since 2012, EHSB has provided environmental expertise in support of six Epi-Aids and one large outbreak. These efforts led to the identification of environmental system failures (e.g., biocide delivery failures in cooling towers) and corrective actions to stop outbreaks, and prevent their reoccurrence. EHSB also has provided key EH guidance on ~20 requests from state and local health departments.

The successful NCIRD/EHSB partnership has resulted in a number of new products. Lessons learned from the NCIRD/EHSB outbreak response protocol were used to revise the CDC *Legionella* Environmental Assessment Tool. *Legionella* outbreak response videos were developed and distributed to state and local health departments to provide just-in-time training. The December 2015 edition of the *Journal of Environmental Health* featured a paper by CDC and its partners, "*Legionella*: Learning from a Past Outbreak to Prevent Future Ones." All of these resources are available on CDC's updated *Legionella* website.

NCIRD and EHSB will release a paper in the near future to describe lessons learned in CDC's *Legionella* Epi-Aids over the past 15 years. EHSB is continuing its commitment to combating *Legionella* and played an integral role in investigating a recent outbreak in New York City. Environmental system failures of a water cooling tower in a South Bronx hotel were found to be the source of the large *Legionella* outbreak.

BSC DISCUSSION: THE ROLE OF EH SERVICES IN LEGIONNAIRES' DISEASE

Cdr. Kunz and his NCIRD colleagues provided additional details on the role of EH services in Legionnaires' disease in response to the BSC's specific questions.

- The feasibility of recommending point-of-use filters as standard equipment in water systems.
- The absence of a U.S. mandate that requires facilities to regularly monitor their water systems for *Legionella* prevention.
- Guidance provided by water system manufacturers on maintenance of their products.
- CDC's dissemination of surveys and other efforts to obtain input from state/local health departments on effective *Legionella* training.
- CDC's review of international data from Australia and European countries to determine whether the rate of Legionnaires' disease also has increased globally.
- The potential for workers, particularly building maintenance staff, to have higher rates of Legionnaires' disease due to their increased exposure to building water systems.

- EPA's role in regulating water systems.
- CDC's plans to evaluate its new *Legionella* outbreak response training videos to determine their role in strengthening state and local capacity to decrease the incidence of disease over time.
- Existing capacity to accurately ascertain the incidence of Legionnaires' disease in the United States due to the larger number of sporadic cases and the high likelihood of inaccurate diagnoses.

BSC GUIDANCE

Question 1: EH-Related Legionella Training and Guidance

- EHSB should apply NCEH's lessons learned, experiences and successful models in providing EH training and guidance to state/local health departments, such as training to restaurant handlers to prevent foodborne outbreaks and training on the Model Aquatic Health Code.
- EHSB should collaborate with the American Society of Heating, Refrigerating and Air Conditioning Engineers and similar professional organizations to increase outreach to and raise awareness of *Legionella* among building water system operators, maintenance staff and contractors. EHSB should provide these professional societies with plain-language *Legionella* prevention guidance to distribute to their members.
- EHSB should explore the possibility of adapting and piloting London's water cooling tower regulations as new building codes in the South Bronx hotel that was the source of the large *Legionella* outbreak in New York City.

Question 2: EHSB's Unique Role in Legionella Response and Prevention

- EHSB should use existing data on susceptible populations during its ongoing efforts to shift from an outbreak response to prevention of sporadic cases. For example, the limited resources that are available to *Legionella* prevention should be targeted to high-risk populations in healthcare settings, such as elderly and immunocompromised persons in nursing homes and VA facilities.
- EHSB should improve the collection of EH data. For example, *Legionella* outbreaks and sporadic cases should be reported to a centralized source to ensure that all data are aggregated. This approach will be helpful in establishing an accurate baseline; measuring the progress of EH efforts in reducing Legionnaires' disease over time; and providing effective prevention interventions to building owners, communities and individual homeowners.
- EHSB should ensure that a process is implemented to allow for effective and ongoing communications with and outreach to impacted communities. After an outbreak of Legionnaires' disease in September 2015 at a large VA facility, for example, the Quincy, Illinois community was extremely concerned about the lack of communications regarding the completion of remediation efforts and follow-up interventions.

GENERAL CONSENSUS: The BSC expressed strong support for CDC's focus on prevention, education, outreach and communications in enhancing the role of EH services in Legionnaires' disease. Several BSC members, as individual citizens, raised the possibility of citing the increased incidence of Legionnaires' disease outbreaks as further justification to maintain or increase funding for the NCEH/ATSDR Clean Water for Health Program. The BSC members could briefly describe the impact and burden of these outbreaks on communities in letters to their Congressional representatives.

Ecological Analysis of U.S. Cities: Parking Prices and Active Commuting

Geoffrey Whitfield, PhD, MEd

Epidemiologist, NCEH Healthy Community Design Initiative
Centers for Disease Control and Prevention

Advice Requested from the BSC by NCEH:

1. Is conducting policy-related analyses to inform built environment decision-making an appropriate strategy to advance the mission of the Healthy Community Design Initiative (HCDI)?
2. What methods or approaches should NCEH examine regarding the role of local policies in environmental determinants of health? Would ecological analyses be an appropriate first step?

Dr. Whitfield presented an overview of an ecological analysis that NCEH conducted to identify an association between parking prices and walking or bicycling to work. The mission of HCDI is to prevent disease and injury by creating built environments that provide convenient and safe opportunities for persons to walk, bicycle or use public transit system.

HCDI is the only federal program that solely focuses on the built environment and its impact on public health. Although the built environment covers land use, building codes and other topics, NCEH agreed to focus on the transportation built environment as an integral part of the HCDI mission. Transportation is a behavior that is undertaken by individuals on a daily basis worldwide and plays an important role in physical activity, air pollution, and injuries and fatalities associated with collisions. Moreover, NCEH recognizes that the potential impact of changing transportation systems through the built environment is tremendous.

The HCDI staff applies its diverse expertise in epidemiology, urban planning, landscape architecture and project management to achieve the HCDI goals, strategies and activities. Collaboration is fostered among public health, transportation and land use professionals, including the American Planning Association, U.S. Department of Transportation (DOT), National Park Service and metropolitan planning organizations in various cities. Support is provided to develop and use science-based tools to inform community planning decisions.

CoAgs have been awarded to six state and local health departments to build their capacity in conducting health impact assessments (HIAs). Transportation and health modeling and active transportation surveillance are conducted. An online transportation and health tool recently was released in collaboration with DOT for persons to obtain information on transportation and health statistics for their individual states and metropolitan areas.

Cross-sector education and awareness are promoted through an online HIA training course at no charge, HIA technical assistance, and the HCDI website (www.cdc.gov/healthyplaces). Targeted analyses and evaluations on the built environment and health are conducted through a national active transportation surveillance summary, data on bicyclist fatality trends, and information on parking prices and active commuting.

The *Physical Activity Guidelines* were released in 2008 and called for adults to engage in 150 minutes of at least moderate intensity aerobic activity per week in increments of ≥ 10 minutes.

However, separate guidelines were issued specifically for children. Physical activities typically are categorized into four domains: leisure time activities, domestic activities, occupational physical activities and transportation-related physical activities. For the purpose of its scientific study, NCEH defined “commuting” as travel to and from the workplace.

The 2009 Carlson, *et al.* study analyzed data from three CDC surveillance systems and found that meeting the guidelines through leisure time physical activity alone has remained relatively stable in the United States from 1998-2007. In all three surveillance systems, the study reported that <50% of the U.S. adult population met the guidelines through leisure time physical activity alone. The study indicates the difficulty in changing physical activity behaviors through exercise or leisure time physical activity alone.

A 2012 systematic review reported that the United States has a much lower prevalence of walking or bicycling to work than China and several European countries. The 2015 Whitfield, *et al.* study analyzed surveillance system data and found that in the general U.S. population, 25%-30% of persons walked or rode a bicycle in the past week or month as a transportation method, but only 3%-3.5% of persons walked or rode a bicycle as their primary mode of transportation to work in the past week.

The 2012 Martin, *et al.* study examined complex transportation, behavioral, policy and economic factors that influence individual decision-making on methods to commute to work. The study reported a 10% increase in pedestrian activity and a 30% increase in bicycled distances in the United Kingdom as well as a 25% decrease in car trips in Sweden after demand-based tolls were implemented in these countries.

A statistically significant association was observed between increased gasoline prices and a higher level of physical activity persons achieved in their daily lives in a U.S. cohort that was followed for 15 years. The number of employees who bicycled to work increased by three-fold after their free parking privileges were eliminated at the Manchester Airport in the United Kingdom. The 2014 Auchincloss, *et al.* study catalogued parking prices and fines in 107 U.S. cities and reported a direct association between parking prices and the number of miles traveled via transit systems in densely populated cities.

NCEH expanded these previous studies to identify a correlation between parking prices and active commuting in U.S. cities. Independent variables of city parking prices were obtained from the Drexel University Central Business District Public Parking Study. NCEH’s HCIDI study design included an online or printed questionnaire to gather information on off-/on-street parking prices and fines in 2009. Of 125 cities that were invited to participate in the study, 107 cities were available for analyses.

The dependent variable of commuting mode was obtained from the 2009 American Community Survey (ACS). ACS is a nationally representative survey of the U.S. population that the U.S. Census Bureau administers to ~3 million households each year. Outstanding follow-up of the ACS has ensured an extremely high completion rate of ~95%. For purposes of its study, NCEH focused on the single or most common mode of transportation that persons ≥ 16 years of age used to commute to work in the past week. NCEH used these data to calculate the percentage of persons who walked, bicycled or walked/bicycled to work. A “city” value (e.g., incorporated place) was used as the geographical unit to analyze the data.

Covariates that were important to active transportation at the national level in the 2010 decennial census and the 2009 ACS also played a key role in NCEH's HCIDI study at the city level: population density, median age, percent of males, percent of non-Hispanic whites, average household size, median family income, and percent of families at or below the Federal Poverty Level. NCEH's statistical methods included bivariate associations among transportation and parking price variables, weighted linear regression modeling of mean values, and model building for stepwise elimination.

The results of NCEH's HCIDI study are highlighted as follows. Of all 107 U.S. cities included in the study, the median population was 304,000 persons and the median annual family income was \$55,000. NCEH acknowledges that its larger, more affluent convenience sample is not nationally representative of U.S. cities or populations. In terms of the median commuting mode, walking to work (3.5%) was much more common than bicycling to work (0.8%). Bicycling to work was more commonly reported in only four cities in Colorado, Idaho and Oregon.

In terms of median parking prices, the off-street price for commuters was \$11.38/day with a range of \$3.00/day in El Paso, Texas to \$35.40/day in New York City. In an unadjusted model, an association was observed between walking to work and parking prices. The prevalence of walking to work was 3.9% higher across cities for each additional \$1 charged to park.

In a model that was adjusted for population density, median age and average household size, a statistically significant interaction was observed between walking to work and parking prices in densely populated cities with at least 3,500 persons/square mile. The prevalence of walking to work was 3.4% higher in densely populated cities for each additional \$1 charged to park. No association was observed between parking prices and walking to work in less densely populated cities after the model was adjusted for the same covariates.

In an unadjusted model, a statistically significant association was observed between bicycling to work and parking prices. The prevalence of bicycling to work was 3.8% higher across cities for each additional \$1 charged to park. In a model that was adjusted for population density, average household size and median family income, the association between bicycling to work and parking prices was completely nullified.

Overall, NCEH's HCIDI study found a significant association between walking to work and daily parking prices in more densely populated cities only. Distance likely played a key role in this finding because previous research has documented proximity as a key driver in walking to work. Cities should consider the potential impact on important transportation and health behaviors in their decision-making on changing parking prices. However, NCEH has taken caution in over-interpreting the results due to the ecological design of the study and incomplete covariates.

NCEH recognizes that policies have the potential to impact health on a broad scale by directly or indirectly influencing behaviors in response to built environment changes. Both direct and indirect health consequences should be considered in establishing or changing policies outside of the traditional public health sector. Policymakers at all levels should be given surveillance and evaluation data on potential health impacts to make informed decisions.

BSC DISCUSSION: PARKING PRICES AND ACTIVE COMMUTING

Dr. Whitfield provided additional details on NCEH's HCIDI study on parking prices and active commuting in U.S. cities in response to the BSC's specific questions.

- NCEH's new effort with DOT to create four transportation variables at the national level based on road network analyses.
- The role of socioeconomic factors (e.g., aesthetics or crime statistics of neighborhoods) in individual decision-making to commute to work by driving/parking, walking, bicycling or using public transportation.
- The feasibility of combining the CDC and DOT surveillance system datasets to produce a more robust study.

BSC GUIDANCE

Question 1: Policy-Related Analyses to Inform Built Environment Decision-Making

- NCEH should adjust its models with a stronger focus on median age. For example, the association between walking or bicycling to work and parking prices might be less statistically significant in younger persons who purchase \$5 cups of coffee on a daily basis.
- NCEH should adjust its models to determine whether the availability of more walking and bicycling paths in the built environment would increase active commuting to work. In densely populated U.S. cities, for example, bicyclists are unsafe and face a tremendous amount of danger from collisions with vehicles. NCEH should partner with ATSDR on its GIS efforts to determine whether GRASP could be used to address safety issues related to bicycling to work.
- NCEH recognizes that its larger, more affluent convenience sample is not nationally representative of U.S. cities or populations. As a result, NCEH should collect additional data to fill this gap. For example, NCEH's proposed policies on the transportation built environment to walk or bicycle to work would not necessarily apply to rural areas of the country where the distance is too great, regions of the country with extended seasons of inclement weather, or persons with disabilities.

Question 2: Impact of Local Policies on Environmental Determinants of Health

- The ACS is designed to capture data on persons who walk or bicycle to work as their single or most common mode of transportation. However, NCEH should collect data on commuting methods other than walking or bicycling alone that also benefit health and the environment. For example, persons who routinely combine using the public transit system and walking to work decrease their individual contribution to air pollution and gain health benefits from regular physical activity.
- NCEH should partner with its colleagues in the Climate Health Program to recommend effective policies on reducing greenhouse gas emissions and issuing carbon credits as a result of increased walking or bicycling to work.

GENERAL CONSENSUS: The BSC expressed overwhelming support for NCEH to continue to devote resources to its HCDE study to improve the quality of life of a large proportion of the American population.

Public Comment Period

Dr. Cibulas opened the floor for public comments; no participants responded.

Updates by the BSC *Ex-Officio* Members

Ruth Lunn, DrPH¹

Director, Office of the Report on Carcinogens
National Institute of Environmental Health Sciences, National Toxicology Program

Dr. Lunn reported that NTP finalized and released a monograph on identifying research needs for assessing the safe use of high intake of folic acid in August 2015. NTP will initiate new systematic literature-based peer reviews in 2016 focusing on occupational exposures to chemotherapeutics and the association between PFOS exposures and immunotoxicity endpoints. NTP will present concept reviews of two nominations during the meeting with its BSC on December 1-2, 2015: (1) fluoride exposure and the potential for developmental neurobehavioral effects and (2) health impacts on the local community from mountaintop removal mining.

NTP recently completed an evaluation of cobalt compounds that release cobalt ions *in vivo*. NTP will report key outcomes of the peer review meeting on this topic during the December 2015 meeting with its BSC. NTP's upcoming peer review meeting in mid-December 2015 will focus on monographs for five different viruses. NTP currently is conducting an evaluation of a candidate topic that was nominated, "Shift Work at Night, Light at Night and Circadian Disruption." NTP expects to submit the 14th Report on Carcinogens to the HHS Secretary by December 2016.

NTP conducted a peer review of the DE-71 flame retardant mixture in June 2015 and found clear evidence of liver tumors in rats. NTP will release a series of toxicity reports that will highlight findings of 13-day studies of various chemicals. NTP will convene a peer review meeting in February 2016 on antimony trioxide and the TRIM® metalworking compound. NTP expects to release the first in a series of reports on technical and reproductive toxicity endpoints in 2016. NTP will convene a workshop in April 2016 on botanical dietary supplements. The key topics of discussion will include mixtures and differences in formulations and dosages between animals and humans. NTP received new funding from the National Children's Study that primarily will be used to support the "Toxicology Testing in the 21st Century" Study and other research.

John Decker, RPh, CIH

Senior Scientist, Office of the Director
National Institute for Occupational Safety and Health

Dr. Decker reported that the mission of NIOSH is to provide leadership in research to prevent work-related illness, injury, disability and death. NIOSH's resources include 1,158 staff and a budget of ~\$290 million that has remained relatively flat over the past few years. Proposals have been included in the President's budget to cut funding to the Education and Research Centers and the Agriculture, Forestry and Fishing Program.

Dr. John Howard was reappointed as the NIOSH Director in September 2015. NIOSH recently was reorganized with the Pittsburgh and Spokane Mining Research Divisions. The Division of Respiratory Disease Studies was renamed as the "Respiratory Health Division" with an expanded

¹The NIEHS/NTP update is captured in the minutes along with the other three *ex-officio* updates that were presented on December 2, 2015. However, Dr. Ruth Lunn, the alternate for Dr. Kristina Thayer, actually presented the NIEHS/NTP update on December 1, 2015 due to her absence on day 2 of the BSC meeting.

mission. NIOSH established three new virtual centers: Total Worker Health Center, Center for Productive Aging and Work, and Center for Maritime Safety and Health Studies.

NIOSH released its new *Research Rounds Newsletter* and eDoc publication to communicate research projects and disseminate workplace safety and health information in plain-language, easily accessible and electronic formats. NIOSH has significantly increased its social media presence and public outreach over the past year. NIOSH's most recent publications covered diverse topics.

- Acute occupational pesticide-related illness and injury
- Elevated blood lead levels among employed adults
- Silicosis surveillance
- Engineering controls, work practices and exposure monitoring for occupational exposure to diacetyl and 2,3-pentanedione
- New skin notation profiles
- New analytical methods
- A series of 10 manuscripts regarding occupational exposure limits and the assessment and control of chemicals and other hazards

NIOSH's upcoming publications will include criteria for recommended standards, intelligence bulletins and a hazard alert. These publications will cover heat and hot environments, diacetyl and 2,3-pentanedione, 1-bromopropane, neurological effects of manganese exposure to welders, the NIOSH carcinogen classification and target risk level policy for chemical hazards, and health and safety risks of workers at oil and gas extraction sites.

NIOSH developed a new database to collect and maintain data on worker fatalities in the U.S. oil and gas extraction industry. From 2010-2014, nine fatalities were identified. The database is available on the CDC.gov/NIOSH website. NIOSH is continuing to conduct nanomaterial exposure assessments. This research involves field teams that evaluate the handling and characterize the risk of various nanomaterials in the workplace.

Dr. Decker announced that a new NIOSH *ex-officio* member will be appointed to serve on the BSC due to his new position as the NCEH/ATSDR Associate Director for Science.

Bonnie Richter, PhD, MPH

Senior Epidemiologist, Office of Environment, Health, Safety and Security
U.S. Department of Energy

Dr. Richter reported that DOE operated the Mallinckrodt Chemical Works Uranium Enrichment Program from 1942-1957. Beginning in the 1940s, the Mallinckrodt facility had insufficient storage space for radioactive waste and other chemical products. As a result, 7,900 tons of leached barium sulfate were mixed with 35,000 tons of soil and dumped at the West Lake Landfill in St. Louis, Missouri in 1973. The landfill was listed as a Superfund site in August 1990.

DOE provided funding to ATSDR to conduct several activities to address community health concerns, including PHAs and consultations, public meetings, health education, and evaluations of Missouri cancer registry data and reports. ATSDR evaluated radiation in groundwater and air at the Westlake Landfill and completed the PHA in October 2015. The key health concerns that

were addressed included groundwater contamination, offsite soil contamination, radioactive dust and radon migration.

ATSDR found no completed exposure pathway and concluded that the groundwater presented no harm to human health. Radioactive contaminants in offsite wells were found to be well below the regulatory limits for drinking water. However, ATSDR recommended continued monitoring of onsite and offsite wells.

Wayne Cascio, MD

Director, Environmental Public Health Division
U.S. Environmental Protection Agency

Dr. Cascio reported that the EPA Office of Research and Development (ORD) closely collaborates with other EPA programs and regional offices, federal and state agencies, public and private stakeholders, and the broader scientific community to identify research priorities. In terms of leadership changes, Dr. Thomas Burke was appointed as the ORD Deputy Assistant Administrator and Dr. Thomas Sinks was appointed as Director of the Office of the Science Advisor.

ORD recently completed its FY2016-FY2019 Strategic Research Action Plan. All six ORD research programs have posted their plans on the EPA.gov website with clearly delineated strategic goals and future directions. The Air, Climate and Energy Research Program will continue to support external research programs, but stronger emphasis will be placed on the impact of climate change on air pollution. The Safe and Sustainable Water Resources Research Program will collaborate with federal partners to use novel approaches, including satellite imaging, to detect harmful algal blooms and formulate recommendations regarding their toxicity.

The Sustainable and Healthy Communities Research Program will continue to update the EnviroAtlas mapping tool to support community decision-making in assessing the benefits of nature. The Human Health Risk Assessment Program will continue to conduct integrated science assessments and oversee the Integrated Risk Information System (IRIS). IRIS will be used to implement recommendations by the National Research Council to improve the process for developing IRIS assessments, including enhanced stakeholder engagement.

Plans developed by the Chemical Safety for Sustainability Research Program and the Homeland Security Research Program also are available on the EPA.gov website. EPA created four roadmaps for children's health, climate change, environmental justice, and nitrogen and co-pollutants to highlight priorities and integrate agency-wide research on these topics.

BSC Open Discussion

Melissa Perry, ScD, MHS, BSC Chair

Chair, Department of Environmental and Occupational Health
George Washington University School of Public Health and Health Services

Dr. Perry led the BSC in a review of future agenda topics and action items that were raised over the course of the meeting.

AGENDA TOPICS AND ACTION ITEMS	
Presenter	Topic
NCEH	Update on the Climate Health Program, including budget issues
ATSDR/DCHI	Update on the PFC feasibility assessment
NCEH/ATSDR OD	Status report on the new BSC Fracking Workgroup, including its membership, charge and first teleconference meeting date
NCEH/ATSDR Programs	Update on activities to support Dr. Breyse's top 3 leadership priorities: stronger ATSDR infrastructure, the CDC National Asthma Control Program, and the NCEH Clean Water for Health Program
Responsibility	Action Step
NCEH/ATSDR OD	Provide the BSC with the program impact statements that were distributed to APHA.

Dr. Perry moderated the open discussion for the BSC to propose suggestions to improve the format and organizational structure of meetings.

- The BSC members should have more involvement and input in developing meeting agendas. Most notably, PowerPoint slide sets and other materials should be circulated to the BSC members well in advance of meetings. This approach would allow for shorter presentations during meetings and longer discussion periods for the BSC to provide more concrete and relevant guidance in response to NCEH/ATSDR's programmatic questions.
- NCEH/ATSDR should make stronger efforts to confirm Dr. Frieden's attendance at the next BSC meeting. If Dr. Frieden's schedule does not permit his attendance, however, the BSC should outline its key priorities and focus areas in a letter to Dr. Frieden on BSC letterhead.
- The BSC formally approved the establishment of a new Fracking Workgroup during the August 2014 teleconference meeting, but NCEH/ATSDR has taken no action on this recommendation to date. NCEH/ATSDR should present a status report on the new BSC Fracking Workgroup during the next meeting, including its membership, charge and first teleconference meeting date.
- The BSC proposed several suggestions during the June 2015 meeting to improve the format and organizational structure of meetings. NCEH/ATSDR should provide a status report during the next meeting on its progress in implementing the BSC's guidance (*June 3-4, 2015 BSC Meeting Minutes*, pages 49-50).

Dr. Breyse clarified that Dr. Frieden's inability to attend meetings of the BSC or other CDC advisory groups due to his busy schedule should not be viewed as a lack of support. Dr. Frieden's assistance to Dr. Breyse over the past year in establishing important contacts both within and outside of CDC has played an integral role in leveraging additional expertise, resources and support for NCEH/ATSDR's EPH portfolio. He confirmed that he would personally extend an invitation to Dr. Anne Schuchat, the CDC Deputy Director, to attend the next BSC meeting.

Similar to the overview of the NCEH/NCIRD collaboration on Legionnaires' disease, Dr. Breyse made a commitment for NCEH/ATSDR staff and their colleagues in other CDC National Centers

to make joint presentations on other collaborative efforts. He concluded that he would meet with Drs. Cibulas and Decker to explore strategies to obtain expertise and guidance from the BSC in a more effective and productive manner.

Closing Session and Adjournment

Several acknowledgements were made during the closing session. The BSC members were thanked for taking time from their busy schedules to attend meetings and provide NCEH/ ATSDR with valuable guidance. Dr. Perry was commended for her outstanding leadership as the BSC Chair. Dr. Cibulas was thanked for his high level of responsiveness to the BSC as the DFO. Ms. Sandra Malcom, Ms. Shirley Little and other NCEH/ATSDR OD staff were applauded for providing excellent logistical and administrative support to the BSC meetings.

The next BSC meeting will be held on June 28, 29 or 30, 2016 or July 12, 13 or 14, 2016. NCEH/ATSDR OD staff will poll the BSC members via e-mail to confirm the date.

With no further discussion or business brought before the BSC, Dr. Cibulas adjourned the meeting at 11:37 a.m. on December 2, 2015.

I hereby certify that to the best of my knowledge, the foregoing Minutes of the proceedings are accurate and complete.

Date

Melissa Perry, ScD, MHS
Chair, NCEH/ATSDR Board of Scientific
Counselors



Attachment 1: Participants' Directory

BSC Members Present

Dr. Melissa Perry, Chair
Dr. Lisa Alvarez-Cohen
Dr. Deborah Cory-Slechta
Dr. Kim Dietrich
Dr. Sharon LaFollette
Sanjay Ranchod, Esq.
Dr. Matthew Strickland
Dr. Robert Wright
Dr. Phillip Williams

BSC Members Absent

Dr. Hillary Carpenter
Ms. Nsedu Witherspoon

BSC Ex-Officio Members Present

Dr. Wayne Cascio
U.S. Environmental Protection Agency

Dr. John Decker
National Institute for Occupational Safety
and Health

Dr. Ruth Lunn
(Alternate for Dr. Kristina Thayer)
National Institute of Environmental Health
Sciences, National Toxicology Program

Dr. Bonnie Richter
U.S. Department of Energy

BSC Ex-Officio Member Absent

Dr. Kristina Thayer
National Institute of Environmental Health
Sciences, National Toxicology Program

Designated Federal Official

Dr. William Cibulas, Jr.
Acting Associate Director for Science,
NCEH/ATSDR

NCEH/ATSDR Director

Dr. Patrick Breyse

CDC/NCEH/ATSDR Representatives

Dr. Ileana Arias
Dr. Lina Balluz
Dr. Tegan Boehmer
Dr. Frank Bove
Mr. Barry Brooks
Dr. Sharunda Buchanan
Ms. Yulia Carroll
Dr. Selene Chou
Dr. Suzanne Cordovado
Ms. Lindsey de Beer
Dr. Rey de Castro
Dr. Scott Deitchman
Mr. Andrew Dent
Ms. Laurel Garrison
Dr. Kim Gehle
Ms. Cherie Gray
Ms. Olivia Harris
Dr. Elizabeth Herman
Mr. James Holler
Ms. Michele Howard
Dr. Robin Ikeda
Ms. Susan Ingber
Ms. Diane Jackson
Dr. Vikas Kapil
Dr. Donna Knutson
CDR Jasen Kunz
Dr. Preeti Kuty

Ms. Caroline Lagoy
Ms. Shirley Little
Ms. Sandra Malcom
Dr. Josephine Malilay
Ms. Sarah Merkle
Dr. Mary Mortensen
Dr. Moiz Mumtaz
Dr. Edward Murray
Mr. James Nowicki
Dr. Jona Ogden
Mr. Antonio Perkins
Dr. James Pirkle
Dr. Samuel Posner
Dr. Judith Qualters

Mr. Von Roebuck
Ms. Lovisa Romanoff
CAPT John Sarisky
Dr. Jerry Thomas
Ms. Emily Ussery
Mr. Patrick Wall
Dr. Geoffrey Whitfield
Dr. Lynn Wilder
Dr. Sharon Williams-Fleetwood
Dr. David Williamson
Dr. Herbert Wolfe
Ms. Rachel Worley



Attachment 2: Glossary of Acronyms

ACS	American Community Survey
AFB	Air Force Base
AFFF	Aqueous Film-Forming Firefighting Foam
APHA	American Public Health Association
BSC	Board of Scientific Counselors
CAB	Community Advisory Board
CAP	Community Assistance Panel
CDC	Centers for Disease Control and Prevention
CIOs	Centers, Institutes and Offices
CoAg	Cooperative Agreement
CPSC	U.S. Consumer Product Safety Commission
DCHI	Division of Community Health Investigations
DFO	Designated Federal Official
DLS	Division of Laboratory Sciences
DoD	U.S. Department of Defense
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
EBI	Environmental Burden Index
EEHS	Emergency and Environmental Health Services
EH; EPH	Environmental Health; Environmental Public Health
EHHE	Environmental Hazards and Health Effects
EHRs	Electronic Health Records
EHSB	Environmental Health Services Branch
EPA	U.S. Environmental Protection Agency
EPR	Emergency Preparedness and Response
GIS	Geographic Information System
GRASP	Geospatial Research, Analysis and Services Program
HCDI	Healthy Community Design Initiative
HIAs	Health Impact Assessments
HRSA	Health Resources and Services Administration
IRIS	Integrated Risk Information System
NCEH/ATSDR	National Center for Environmental Health/

	Agency for Toxic Substances and Disease Registry
NCEZID	National Center for Emerging and Zoonotic Infectious Diseases
NCIRD	National Center for Immunization and Respiratory Diseases
NEHA	National Environmental Health Association
NHANES	National Health and Nutrition Examination Survey
NHDHHS	New Hampshire Department of Health and Human Services
NIEHS	National Institute of Environmental Health Sciences
NIH	National Institutes of Health
NIOSH	National Institute for Occupational Safety and Health
NTP	National Toxicology Program
OD	Office of the Director
OEHEM	Office of Environmental Health and Emergency Management
OHRP	Office for Human Research Protections
ORD	Office of Research and Development
PBPK	Physiologically-Based Pharmacokinetics
PFCs	Perfluorinated Compounds
PFHxS	Perfluorohexanesulfonate
PFOA	Perfluorooctanoic Acid
PFOS	Perfluorooctane Sulfonate
PHA	Public Health Assessment
SCID	Severe Combined Immunodeficiency
SERDP	Strategic Environmental Research and Development Program
SVI	Soil Vapor Intrusion
UCMR	Unregulated Contaminant Monitoring Rule
VA	U.S. Department of Veterans Affairs