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
June 3-4, 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 June 3-4, 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 June 3-4, 2015 BSC meeting.

During the opening session on June 3, 2015, the participants welcomed three new BSC members and the new *ex-officio* member for the U.S. Environmental Protection Agency. The DFO presented certificates of appreciation to three outgoing BSC members.

The Deputy Director of the CDC Office of Noncommunicable Diseases, Injury and Environmental Health presented an update on three topics that are major areas of focus for CDC at this time: the ebola response, laboratory safety issues, and concerns related to CDC's receipt of funding and gifts from industry.

The new NCEH/ATSDR Director was formally introduced and welcomed to his first meeting. He covered the following topics in his first Office of the Director's (OD) report to the BSC.

NCEH/ATSDR OD Highlights

- Current leadership
- Congressional briefings and meetings to discuss ongoing environmental public health (EPH) activities
- Meetings with the Partnership Council and Camp Lejeune Community Assistance Panel
- Status report on the protocol for the Camp Lejeune Cancer Incidence Panel
- Formation of a new workgroup to address EPH issues related to hydraulic fracturing
- Participation on the President's Task Force on Environmental Health and Safety Risks to Children

- Provision of public health expertise and technical assistance in response to high levels of formaldehyde detected in Lumber Liquidator wood flooring
- Responses to multiple inquiries regarding the potential development of cancer clusters as a result of exposure to crushed rubber products in artificial turfs

ATSDR Highlights

- An epidemiologic investigation of methyl bromide poisoning in the U.S. Virgin Islands
- A new campaign to protect communities impacted by environmental odors
- Activities to improve EPH issues at three federal facilities
- A new "Soil Screening, Health, Outreach, Partnership" (soilSHOP) health education and outreach tool
- Efforts to make ToxProfiles™ more accessible and consumer-friendly to the public
- A new five-year Funding Opportunity Announcement (FOA) for Pediatric Environmental Health Specialty Units
- Publication of the new *Emergency Response Guide*
- Publication of the "Camp Lejeune Adverse Birth Outcomes Study"

NCEH Highlights

- New FOAs for state, local and tribal health departments to improve food and drinking water safety
- Co-authorship of the "Educational Interventions for Children Affected by Lead" report
- Support of the White House's climate and health initiatives
- Publication of the *Guide to Operating Public Shelters in a Radiation Emergency*
- Involvement in domestic and international responses to environmental epidemiologic investigations
- An update to the *Fourth National Report on Human Exposure to Environmental Chemicals, 2009*
- Publication of an analysis of a potential new strain of *Clostridium botulinum*

The NCEH/ATSDR Director presented an overview of CDC's activities to improve household air pollution and provide cleaner cookstoves in low- and middle-income countries. The overview included data from clinical trials and a description of CDC's role as a founding member of the Global Alliance for Clean Cookstoves. CDC and its global partners have established a goal for 100 million families to adopt clean, efficient and safe cooking by 2020.

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 November 2014 meeting.

The NCEH Division of Environmental Hazards and Health Effects (EHHE) presented an overview of CDC's National Asthma Control Program as a model to advance public health/ healthcare collaboration. CDC described its three-prong approach to achieve this goal: (1) ongoing funding of state Asthma Control Programs; (2) collaboration with federal partners to identify, recommend and promote a core set of common asthma quality measures; and (3) provision of information to policymakers to ensure that interventions are implemented and coordinated in the field and resources are available to support comprehensive asthma control services.

NCEH/ATSDR OD presented an overview of the new Transformation Initiative that was launched to improve its emergency preparedness and response activities. The overview highlighted the goals, priorities, performance measures, key outcomes, governance structure and solutions of this new initiative.

The ATSDR Division of Toxicology and Human Health Services presented an overview of the Geospatial Research, Analysis and Services Program (GRASP). The overview covered key GRASP components and features, the use of sociodemographic variables to characterize the social vulnerability of U.S. populations, collaborations with domestic and international partners, accomplishments to date, and next steps to increase the reach of GRASP in the future.

The NCEH Division of Emergency and Environmental Health Sciences (EEHS) presented an update on the CDC Vessel Sanitation Program (VSP). The four key components of VSP's organizational structure were highlighted: gastrointestinal illness surveillance and outbreak investigations aboard cruise ships; consultations to review construction and renovation plans of cruise ships; training and consultation on global improvements in cruise ship safety and public health practices; and unannounced and scheduled inspections to address operational sanitation and construction issues.

NCEH/EEHS described the current status and future directions of the CDC Model Aquatic Health Code (MAHC). The MAHC is a free guidance document that government agencies, private companies, industry and other entities can use to create new or update existing codes for public swimming pools, spray fountains and water parks. Details were provided on the Conference for the Model Aquatic Health Code (CMAHC) that was established in 2013 as a non-profit organization. The function of CMAHC is to ensure that the MAHC remains up-to-date and evidence-based to support healthy and safe aquatic experiences and promote broad use by pool programs across the country.

NCEH/EHHE presented an update on the CDC National EPH Tracking Network, including the program's three key components, five major goals, three data types, and step-wise process to add new data and content. The update included accomplishments to date, future challenges that will be addressed, and a live demonstration of the functions and features of the EPH Tracking Network.

The NCEH Division of Laboratory Sciences presented an overview of CDC's laboratory methods and techniques to advance molecular newborn screening technology. The overview included CDC's technical assistance, training and other services provided to 560 public health laboratories; major successes in the use of molecular testing; and future plans to advance to genome and exome sequencing.

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

- The U.S. Department of Energy (DOE) described its evolution over time from research and development of nuclear weapons to environmental cleanup of the nuclear weapons complex and non-proliferation and stewardship of the nuclear stockpile. DOE's long and rich history of funding CDC and ATSDR to conduct research and activities at DOE sites was highlighted as well.
- The National Toxicology Program (NTP) described its upcoming meetings, peer reviews and workshops. These events will include a peer review of the pentabromodiphenyl

ether mixture draft technical report; the "Statistical Approaches to Assessing Health Effects of Environmental Chemical Mixtures in Epidemiology Studies" Workshop; and a peer review of the carcinogens monograph on cobalt and certain cobalt compounds. Presentations during the upcoming NTP Board of Scientific Counselors meeting will include NTP's response to the West Virginia chemical spill; NTP's tools for systematic reviews; and updates to the NTP Office of Health Assessment and Translation level of concern categories.

- The U.S. Environmental Protection Agency (EPA) described its recent collaboration with partners to update *Wildfire Smoke: A Guide for Public Health Officials*. Ongoing efforts by the EPA Office of Research and Development (ORD) to develop strategic action plans, research projects and budgets for the FY2016-FY2019 cycle were highlighted as well.
- The National Institute for Occupational Safety and Health described its organizational structure, current budget, traditional programmatic areas and functions, social media presence and priority issues (e.g., a nanomaterial exposure assessment and a strong focus on hydraulic fracturing).

The BSC provided extensive guidance over the course of the meeting in direct response to specific questions posed by NCEH/ATSDR presenters. 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.

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BOARD OF SCIENTIFIC COUNSELORS MEETING
June 3-4, 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 June 3-4, 2015 in Building 106, Conference Room 1A, of the CDC Chamblee Campus in Atlanta, Georgia.

The BSC 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 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*).

June 3, 2015 Opening Session: Welcome, Introductions, Awarding of Certificates, and Agenda Review for Conflict-of-Interest Topics

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

Dr. Cibulas opened the floor for introductions and confirmed that the 16 voting members and *ex-officio* members in attendance constituted a quorum for the BSC to conduct its business on June 3, 2015. He called the proceedings to order at 8:34 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 June 3, 2015 published agenda.

Dr. Cibulas asked the participants to join him in welcoming three new BSC members and the new *ex-officio* member for the U.S. Environmental Protection Agency (EPA).

- Wayne Cascio, MD, FACC, FAHA; Director, Environmental Public Health Division, EPA Office of Research and Development,
- Deborah Cory-Slechta, PhD; Professor, Department of Environmental Medicine and Pediatrics, University of Rochester School of Medicine
- Kim Dietrich, PhD; Professor, Department of Environmental Health, University of Cincinnati College of Medicine
- Sharon LaFollette, PhD; Emeriti Professor and Chair, University of Illinois at Springfield, Department of Public Health

Dr. Cibulas announced that the terms of three BSC members expired on June 2, 2015: Drs. Julia Gohlke, Ewa King and Kenneth Ramos. He presented certificates of appreciation to the three members. The participants applauded the tremendous contributions of the outgoing members to environmental health (EH) during their tenures on the BSC. Dr. Cibulas noted that members of Federal Advisory Committees are allowed to serve an additional 180 days after the expiration of their terms. He intended to invite the three outgoing members to the next BSC meeting before their 180-day extensions expired in December 2015.

Dr. Cibulas also announced that Dr. Rebecca Head and Mr. Himanshu Jani resigned from the BSC due to other commitments. CDC will initiate a search to fill the current vacancies, but he asked the BSC members to propose qualified candidates in the interim.

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. For the benefit of the new members, she explained that the BSC plays an important role in supporting NCEH/ATSDR's environmental public health (EPH) portfolio and providing advice to guide its programs, research and activities.

Dr. Perry also informed the new members that the BSC's scientific expertise and input are critical components in NCEH/ATSDR's decision-making process to undertake new efforts or modify existing programs and activities. For example, one of the standing agenda items is a report of specific actions that NCEH/ATSDR will take in direct response to the BSC's guidance.

Due to NCEH/ATSDR's strong commitment to ensure ongoing follow-up with the BSC, she asked the new members to provide strategic, concrete and constructive feedback.

CDC Updates

Robin Ikeda, MD, MPH, USPHS RADM
Deputy Director, Office of Noncommunicable Diseases, Injury and Environmental Health
Centers for Disease Control and Prevention

Dr. Ikeda presented an update on three topics that are major areas of focus for CDC at this time.

Ebola Response. The World Health Organization (WHO) declared Liberia as "ebola-free" in May 2015, but CDC is maintaining its in-country office to ensure that no new cases are reported. Efforts are underway to address measles and other health issues that have reemerged in Liberia due to the sole focus on the ebola outbreak.

CDC is continuing to closely collaborate with its global health partners to eliminate ebola in Sierra Leone and Guinea. The massive global outbreak has included >16,000 reported ebola cases and resulted in >6,300 deaths to date. CDC provided leadership at the outset of the ebola outbreak by activating its Emergency Operations Center (EOC); deploying >1,000 staff to Sierra Leone, Liberia and Guinea; and assigning hundreds of staff to support the ebola response in the United States.

Laboratory Safety. CDC took several actions to improve laboratory safety in response to incidents that have occurred over the past year. A national search is underway to appoint and house a new Associate Director for Laboratory Science and Safety in the CDC Office of the Director. The Associate Director will oversee the following activities.

- Expand biosafety training for laboratory scientists
- Solicit external accreditation for CDC laboratories
- Provide administrative oversight for a newly established Laboratory Safety Review Board
- Engage an external Laboratory Safety Workgroup

Dr. James Pirkle, Director of the NCEH Division of Laboratory Sciences (DLS), represents NCEH/ATSDR in all discussions, decisions and matters related to CDC's new laboratory safety initiatives. The BSC was provided with a two-page summary of CDC's activities to improve laboratory safety, but the document also is available on the CDC.gov website.

Industry Funding to CDC. CDC was the subject of a May 15, 2015 article published by *The BMJ*, "Centers for Disease Control and Prevention: Protecting the Private Good?" The article questioned whether CDC's direct and indirect receipt of millions of dollars of industry funding and gifts impacts its scientific decision-making and development of clinical guidelines. Questions regarding CDC's potential conflicts of interest also were raised in the article. For example, three examples were described in which CDC received industry funding and issued recommendations that were favorable to industry.

CDC emphasized its longstanding commitment to transparency in terms of receiving industry funding. Most notably, the CDC Foundation was established in 1995 to encourage relationships between CDC and industry. CDC receives conditional funding from corporations, philanthropic organizations, private individuals and other sources that are earmarked for specific projects. As a result of *The BMJ* article, however, CDC is taking steps to become even more accountable to the public.

CDC is conducting a robust review of its internal funding policies and procedures to improve transparency and accountability in certain areas. For example, CDC is exploring the possibility of maintaining an up-to-date, online inventory of all of its industry funding and gifts that would be available to the public. The CDC Foundation is conducting an in-depth evaluation of its existing funding policies and procedures as well.

Dr. Thomas Frieden, Director of CDC, asked the Advisory Committee to the Director to form a new workgroup to review and respond to issues raised in *The BMJ* article. The workgroup will be asked to present its findings to the NCEH/ATSDR BSC and advisory committees in other CDC National Centers. Because CDC has no regulatory authority, implementation of and compliance with its guidelines in the field are solely based on CDC's scientific reputation and integrity. *The BMJ* article was distributed to the BSC for review.

Dr. Ikeda concluded her update by asking the participants to join her in welcoming Dr. Patrick Breysse, the new NCEH/ATSDR Director. In her formal introduction, she highlighted key milestones in Dr. Breysse's distinguished career at Johns Hopkins Bloomberg School of Public Health, Johns Hopkins School of Medicine, and Johns Hopkins Whiting School of Engineering.

BSC Guidance

- Dr. Perry agreed with CDC's proposed strategy to maintain an up-to-date, online inventory of its industry funding and gifts. However, she advised CDC to place all data associated with industry funding in the public domain as well. A transparent approach to demonstrate that data are collected and scientific conclusions are reached with the utmost scrutiny, rigor and objectivity will help to sustain a high level of public trust in CDC over time.

NCEH/ATSDR Office of the Director Updates

Patrick Breysse, PhD, CIH
Director, NCEH/ATSDR

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

Leadership Updates. NCEH/ATSDR's current leadership is set forth below.

Name	NCEH/ATSDR Position
Patrick Breysse, PhD, CIH	NCEH/ATSDR Director
Donna Knutson, PhD	Acting Deputy Director, NCEH/ATSDR OD
Herbert Wolfe, PhD	Senior Advisor. NCEH/ATSDR OD
Jona Ogden, MPH	Special Assistant to the Director, NCEH/ATSDR OD
Christian Scheel, MS	Acting Associate Director, NCEH/ATSDR Office of Communication
John Tibbs, MBA	Management Officer, NCEH/ATSDR Office of Financial, Administrative and Information Services
Sascha Chaney, BA	Associate Director, NCEH/ATSDR Office of Policy, Planning and Evaluation
William Cibulas, Jr., PhD, MS	Acting Associate Director, NCEH/ATSDR Office of Science
RADM Scott Deitchman, MD, MPH	Associate Director, NCEH/ATSDR Office of Environmental Health Emergencies
James Stephens, PhD	Acting Director, ATSDR Division of Community Health Investigations (DCHI)
Tina Forrester, PhD	Deputy Director, ATSDR/DCHI
James Stephens, PhD	Director, ATSDR Division of Toxicology and Human Health Services (DTHHS)
Edward Murray, PhD	Deputy Director, ATSDR/DTHHS
Dennis Lenaway, PhD	Acting Director, NCEH Division of Emergency and Environmental Health Services (EEHS)
Laurie Johnson, MPH	Acting Deputy Director, NCEH/EEHS
Judith Qualters, PhD	Director, NCEH Division of Environmental Hazards and Health Effects (EHHE)
Peter Edwards, MPA	Deputy Director, NCEH/EHHE
Dr. James Pirkle, MD, PhD	Director, NCEH Division of Laboratory Sciences

Briefings and Meetings. NCEH/ATSDR recently participated in several briefings and meetings to discuss several ongoing EPH activities that are of interest to Congressional staff.

- Artificial turf
- Camp Lejeune
- Amyotrophic Lateral Sclerosis Registry
- National Asthma Control Program
- National Environmental Public Health Tracking Network
- Biomonitoring activities
- Pease International Tradeport

NCEH/ATSDR convened its Partnership Council meeting in March 2015. Dr. Breysse also is continuing to hold one-on-one meetings to introduce himself to key partners and ensure that these important relationships are sustained over time. ATSDR held its most recent meetings with the Camp Lejeune Community Assistance Panel (CAP) in January and May 2015 to continue to obtain input from local residents on activities to date in addressing site-specific concerns. The next CAP meeting will be held in August 2015 and will be open to the public. Links to transcripts and videos of all previous CAP meetings are available on the CDC.gov website.

The protocol for the Camp Lejeune Cancer Incidence Panel is under review at this time. ATSDR's next steps in this effort will be to complete the CDC Institutional Review Board (IRB) process, initiate contract procurement activities and award the contract. IRB approvals of cancer registries also will be obtained from participating states and the U.S. Department of Veteran Affairs to obtain data on >90% of the Camp Lejeune cohort.

NCEH and ATSDR Highlights. ATSDR assisted EPA and the U.S. Virgin Islands Department of Health with an epidemiologic investigation of methyl bromide poisoning after four members of a family became seriously ill while on vacation, including two teens who remain in critical condition. The investigation rapidly showed that a pest control company inappropriately used the pesticide in an indoor residential setting. Of 37 additional individuals who were identified with possible exposure, 16 have completed questionnaires to date. Some of the respondents reported headaches, fatigue and other post-exposure symptoms. ATSDR and EPA are closely collaborating to develop clearance criteria to reoccupy the condominium.

ATSDR launched a web-based and video campaign to protect communities impacted by environmental odors. The campaign includes the following features: answers to common questions about environmental odors and health; approaches to reduce environmental odors in communities; guidance on reporting environmental odor problems to state/local health departments; methods to conduct odor complaint investigations; and strategies to involve community members and other groups in odor management decisions.

ATSDR conducted activities to improve specific EPH issues at three federal facilities. The Cyprus Tohono Tribe was informed of arsenic and fluoride hazards in its drinking water. ATSDR released the Cyprus Tohono Corporation Mine health consultation for public comment in January 2015. The Fillmore, California Planning Department was urged to protect public health during the redevelopment of a recently remediated Superfund site. ATSDR released the "Evaluation of Airborne Dust and Site Soils" health consultation in May 2015 for public comment. The U.S. Department of Defense (DoD) was provided with a draft letter of a health consultation that lists 113 historic references to help protect persons who might disturb soils at a former munitions site in Lakehurst, New Jersey.

ATSDR developed the innovative "Soil Screening, Health, Outreach, Partnership" (soilSHOP) health education and outreach tool with three basic components. Residents submit soil samples. Staff screens the samples for lead. Health educators provide counseling to residents. The benefits of soilSHOP include its capacity to address a wide range of community concerns regarding lead, urban gardening, environmental justice issues and children's health. Moreover, creative and synergistic resources are stimulated and leveraged. Collaboration among multiple organizations is encouraged. The capacity of local personnel and programs is enhanced. Stakeholders are empowered to initiate and sustain soilSHOP events.

ATSDR is continuing its efforts to make ToxProfiles™ more accessible to the public with consumer-friendly products. Facts from ToxProfiles™ are posted on the ATSDR Tox Zone Facebook page three times per week. ToxZine is a condensed 20-page ToxProfile™ for the general public. Tox Kids is a new series of booklets to make information on toxic substances and human health effects understandable to children.

ATSDR characterized the usage and assessed the impact and influence of its ToxProfiles™ on public health. Based on the collection and analysis of 2014 data, ToxProfiles™ informed 55 policy actions by state health departments and were used in 79 site assessments as part of risk

assessments. Moreover, ToxProfiles™ or ToxFAQs™ were cited in 913 publications, including 801 peer-reviewed journal articles and books, graduate theses, reports, conference papers and proceedings, blogs, patents and government hearings. ATSDR will apply findings from the assessment to inform the update and release of ToxProfiles™ in the future.

ATSDR released a new five-year Funding Opportunity Announcement (FOA) in 2014 for Pediatric Environmental Health Specialty Units (PEHSUs) to expand their reproductive and developmental EH activities to protect children at the earliest development point, including preconception counseling and prenatal care. ATSDR funded the American Academy of Pediatrics and the American College of Medical Toxicology (ACMT) in September 2014 to provide national leadership to PEHSUs. The PEHSUs and American Congress of Obstetricians and Gynecologists agreed to develop guidance for 47,000 physicians to conduct exposure assessments and risk reduction counseling. ATSDR is collaborating with the CDC Division of Reproductive Health in these efforts.

ATSDR drafted an *Emergency Response Guide* with four overarching goals: (1) more clearly define the role of Emergency Response Teams in responding to incidents; (2) better integrate individual teams to achieve a more effective response; (3) provide an organizational structure for other supporting documents; and (4) closely align response efforts with the NCEH/ATSDR Transformation Initiative.

ATSDR published the "Camp Lejeune Adverse Birth Outcomes Study" in the *Journal of Environmental Health* in November 2014. The purpose of the study was to determine whether maternal exposures to contaminants in drinking water at Camp Lejeune were associated with preterm birth and fetal growth retardation. The study concluded that exposures to benzene, perchloroethylene and tetrachloroethylene in the womb were correlated with preterm birth before 37 weeks of pregnancy, low-birth weight and other adverse outcomes.

NCEH released new FOAs for state, local and tribal health departments. Food Safety Program grantees will be funded to conduct practice-based research to improve food safety by developing and sustaining a network of EH specialists. Drinking Water Safety Program grantees will be funded to provide EH support to public health drinking water programs to reduce exposures. Support provided by the grantees will achieve three key outcomes: (1) strengthen capacity to identify and address gaps in the performance of drinking water programs; (2) enhance the efficiency and effectiveness of drinking water programs; and (3) identify and reduce exposures leading to contaminated drinking water.

A panel of NCEH and non-CDC experts co-authored the "Educational Interventions for Children Affected by Lead" report that was released in April 2015. The report reviews the current knowledge and practices of early care and educational systems and also describes key strategies for these systems to support improved outcomes for lead-exposed children.

Dr. Geoffrey Whitfield received the Mitch Signal Excellence in Occupational and Environmental Health Award. The purpose of the award is to recognize a current Epidemic Intelligence Service Officer for excellence in an oral presentation that best exemplifies the effective application of a public health issue to an investigation of an occupational or EH issue. Dr. Whitfield's presentation, "Parking Prices and Walking and Bicycling to Work in U.S. Cities," found that daily off-street parking prices at the city level were significantly associated with walking to work in more densely populated cities.

NCEH is supporting the White House's climate and health initiatives, such as publishing an interim national climate assessment and providing data for the President's Climate Data Initiative. Guidance documents were published to assist in the implementation of CDC's Building Resilience Against Climate Effects (BRACE) framework. If the FY2016 President's budget request for a $10 million increase for BRACE programs is approved, CDC will expand climate change funding to include up to 50 state/local health department grantees.

NCEH published the *Guide to Operating Public Shelters in a Radiation Emergency* in February 2015. The guide was developed in collaboration with multiple partners to assist with planning and response efforts. NCEH was involved in domestic and international responses to environmental epidemiologic investigations, including illnesses associated with synthetic marijuana in Mississippi and a cluster of >70 deaths associated with the consumption of local beer in Mozambique.

NCEH released an update to the *Fourth National Report on Human Exposure to Environmental Chemicals, 2009* in August 2014. The update covers the 2011-2012 National Health and Nutrition Examination Survey (NHANES) and includes 65 new chemicals and 139 existing chemicals. Findings of the Fourth Report are summarized as follows. Serum cotinine concentrations in non-smokers have continued to decline. Urinary metabolites of several phthalates have decreased over time in the U.S. population. Serum concentrations of perfluoroalkyl compounds (e.g., perfluorooctanoic acid (PFOA) and perfluorooctane sulfonate (PFOS)) have decreased. Blood total and methyl mercury concentrations of Asians were ~5 times higher than those in non-Hispanic blacks.

The NCEH and National Center for Emerging and Zoonotic Infectious Diseases laboratories collaborated in analyzing a potential new strain of *Clostridium botulinum*. The new strain appears to be a hybrid of F and A serotypes due to the production of a typical Type B toxin and novel Types F/A hybrid toxins. The current heptavalent antibody treatment product was found to provide protection to exposed animals. The analysis was published in *Analytical Chemistry*.

Emerging Topics of Interest. NCEH/ATSDR is forming a new workgroup to systematically respond to increasing requests to address EPH issues related to hydraulic fracturing. The BSC's role in the new workgroup will be discussed over the course of the meeting. NCEH/ ATSDR is exploring the possibility of developing and maintaining a new registry of health effects associated with perfluorinated compounds. NCEH/ATSDR's first step in this effort will be to conduct a multi-site investigation to identify PFOA and PFOS exposures to populations.

NCEH/ATSDR is extensively involved in the President's Task Force on Environmental Health and Safety Risks to Children that EPA recently reenergized. NCEH/ATSDR is providing public health expertise and technical assistance (TA) to the U.S. Consumer Product Safety Commission (CPSC) in response to high levels of formaldehyde that have been measured in Lumber Liquidator wood flooring.

NCEH/ATSDR is responding to multiple inquiries regarding the potential development of cancer clusters as a result of exposure to crushed rubber products in artificial turfs of recreational ball fields for soccer, lacrosse, field hockey and other sports. As a result of these health concerns, CPSC recently deleted guidance from its website that supported the use of crushed rubber products in artificial turfs in reducing injuries.

NCEH/ATSDR is exploring the possibility of collecting biomonitoring data from persons who extensively play on artificial turfs with crushed rubber products to identify internal exposures. Because cancer clusters are difficult to investigate, ATSDR will first collaborate with EPA to conduct biological and exposure monitoring on a pilot sample of soccer tournament players.

Dr. Breysse concluded his update by describing his personal perspectives. Instead of further advancing his career in academia and research, he decided to apply for the position of the NCEH/ATSDR Director to have an actual impact on public health. This decision was driven by his strong interest in translating science into policy and practice to affect the daily lives of individuals and communities. Dr. Breysse confirmed that he is committed to meeting the challenges of his new position and is extremely pleased to be a part of NCEH/ATSDR's exciting future.

BSC Discussion

Dr. Breysse and NCEH/ATSDR staff provided additional details on the OD report in response to the BSC's specific questions.

- ATSDR's strategies to establish priorities for ToxProfiles™, including ATSDR-specific issues, ATSDR/EPA overlapping issues, and a chemical mixtures ToxProfile™.
- NCEH/ATSDR's formal and systematic process to engage ACMT medical toxicologists in the clinical consultation, diagnosis, management and treatment of health outcomes detected in environmental epidemiologic investigations (e.g., methyl bromide poisoning in the U.S. Virgin Islands and deaths related to beer consumption in Mozambique).
- ATSDR's risk communication messaging and materials to the public to address the correlation between environmental odors and health effects.
- Dr. Breysse's insights on updating or revising the 2014-2016 NCEH/ATSDR Strategic Plan.
- ATSDR's mechanisms to obtain ongoing feedback from the broader veteran and civilian communities beyond the CAP in terms of their satisfaction, support and endorsement of the Camp Lejeune studies and other site-specific activities.
- ATSDR's collaborative efforts with DoD to obtain data from environmental exposure studies of active-duty soldiers during the Gulf War (e.g., vaccinations, oil fires, munitions and widespread use of solvents) to inform the Camp Lejeune studies.

Dr. Breysse made several remarks in response to the BSC's questions regarding his insights on the 2014-2016 NCEH/ATSDR Strategic Plan. As the new NCEH/ATSDR Director, one of his first priorities was to determine the appropriateness of one overarching strategic plan. Both NCEH and ATSDR have leadership roles in CDC's EPH portfolio, but their Congressional mandates, missions and funding streams are distinct and separate.

To guide the decision-making process on retaining the combined NCEH/ATSDR Strategic Plan or creating new NCEH-specific and ATSDR-specific strategic plans, Dr. Breysse pointed out that internal retreats would be convened throughout the summer and fall of 2015 for staff to solely focus on ATSDR's mission, strategic focus and activities. The same approach would be repeated for NCEH. Because this process would require a significant amount of time, he confirmed that updates on these efforts would be presented during BSC meetings on an ongoing basis.

Overview of CDC's Activities on Household Air Pollution and Cleaner Cookstoves

Patrick Breysse, PhD, CIH
Director, NCEH/ATSDR

Advice Requested from the BSC by NCEH/ATSDR OD:

1. What are the best strategies for CDC to integrate quantitative and qualitative findings (e.g., those from the Kenya stove evaluation) to assess the potential success of interventions?
2. What is the best design of cooking programs to ensure that new cooking technologies are adopted and sustained over time to achieve desired long-term health benefits?
3. What approaches can be taken to successfully make clean technologies and fuels more accessible, affordable and usable by women in low- and middle-income countries?

Dr. Breysse described CDC's activities to address household air pollution (HAP) and provide cleaner cookstoves. Data on the global burden of disease show that HAP accounts for ~4 million deaths annually and >6% of global deaths. The major causes of morbidity are child pneumonia, chronic obstructive pulmonary disease, lung cancer and cardiovascular disease.

In addition to poor indoor air quality, HAP also contributes to ambient air pollution. Global household emissions contribute ~15% of particulate matter (PM), but the contribution is substantially higher in some regions. For example, HAP contributes to 25%-30% of outdoor air pollution in India. Black carbon emissions from cooking with biomass contribute to global climate change as well. HAP also is an EH problem domestically, particularly in Alaska Native villages, tribal lands, poor Appalachian communities and other populations that use older woodstoves for cooking or heating inside the home.

Several clean cookstove clinical trials are underway to provide safer cooking approaches, decrease HAP and reduce health effects. The Nepal study has a step-wedge design that placed improved biomass stoves with liquefied petroleum gas (LPG) in ~3,000 homes. Dr. Breysse presented slides to illustrate differences between the improved biomass stove and the traditional mud stove in the Nepal study. The Ghana study has a step-wedge design that placed improved biomass stoves with LPG in ~1,000 homes. The Nigeria study placed kerosene stoves in 300 homes.

Data collected from the clinical trials showed that the mean $PM_{2.5}$ concentration decreased from 1,380 $\mu g/m^3$ in 2,963 homes pre-stove installation to 936 $\mu g/m^3$ in 2,752 homes post-stove installation. The mean carbon monoxide level decreased from 11 ppm in 2,011 homes pre-stove installation to 6.7 ppm in 1,848 homes post-stove installation. Reductions of these pollutants as a result of the stove installations were much lower than expected.

In a smaller trial, the mean $PM_{2.5}$ concentration decreased from 885 $\mu g/m^3$ in 659 homes with enhanced cookstoves to 443 $\mu g/m^3$ in 661 homes with LPG cookstoves. The mean carbon monoxide level decreased from 5.5 ppm in 526 homes with enhanced cookstoves to 1.7 ppm in 522 homes with LPG cookstoves. These data showed that a shift to LPG or another type of clean fuel will be necessary to achieve a meaningful reduction in HAP.

CDC is a founding member of the Global Alliance for Clean Cookstoves (GACC) that was established in 2010. The overarching goal of GACC is for 100 million families to adopt clean, efficient and safe cooking by 2020. CDC's role in GACC covers five major areas: (1) provide an evidence base to inform policy decisions on specific clean cookstoves that would be most efficient for improving health and reducing pollution; (2) conduct field evaluations of potential new biomass stove technologies; (3) provide TA to GACC and its partners; (4) engage country Ministries of Health to promote clean and safe cooking; and (5) assess the potential of scaling up new technologies and capacity.

NCEH conducted a number of activities in 2010-2014 to support CDC's role in GACC. A comprehensive field evaluation of six new biomass stoves was launched in Kenya. A promising new Plancha Stove was evaluated in Guatemala. A burns surveillance pilot project was developed in India. TA was provided to develop a GACC Health Agenda and WHO Indoor Air Quality Guidelines. A pilot project was implemented to scale-up LPG in peri-urban communities in Guatemala. Laboratory expertise was provided to evaluate polycyclic aromatic hydrocarbon (PAH) levels of 216 asthmatic children in Montana and ~100 women in Peru and Kenya following improved cookstove ventilation.

The key objectives of the Kenya study were to assess six improved cookstoves and their effectiveness in reducing HAP exposure and also to evaluate factors influencing acceptability to local users in a setting of daily use. Various types of stoves, designs and combustion chambers were included in the study. The crossover study was conducted in the Nyanza Province from July 2012 to February 2013. Of 43 households that were recruited from all eligible households, 5-6 improved stoves were assigned per household.

The exposure assessment component of the study included monitoring of ambient and indoor air pollution, $PM_{2.5}$ and carbon monoxide; personal air pollution monitoring of carbon monoxide; a kitchen performance test to evaluate fuel consumption and moisture; a biommarker to measure urinary PAH levels; and the Stove Use Monitor Systems. Data from the study showed that some stoves produced a statistically significant reduction, but none of the stoves met the WHO 24-hour ambient air quality guideline of 25 $\mu g/m^3$.

Qualitative study findings showed that local women expressed a general interest in owning improved cookstoves and accepted all six stoves. However, long-term use of the stoves six months post-installation was not observed. Efforts to address the limitations of all six stoves could result in more exclusive use and widespread adoption. These issues include a longer time to light stoves, a longer time to reach boiling, the heat and adjustability of stoves, stability of pots, ability to cook local foods, and special features (e.g., cell phone charger and double burners).

The cookstoves community is changing its focus and future directions to achieve cleaner and safer cooking in global communities. Several studies are exploring strategies to make LPG or other clean fuel technologies accessible to these populations. The emphasis on stove safety is increasing. Factors that influence more widespread stove adoption and use are being evaluated.

A number of efforts are underway at CDC to decrease HAP and increase the use of cleaner cookstoves. Clean fuel technologies are being promoted and evaluated as a public health intervention. Support is being provided to demonstrate health benefits through field evaluations. Collaborations with countries are being enhanced to increase burns surveillance and prevention

efforts. Partnerships among GACC, CDC's country offices and Ministries of Health are being strengthened to promote clean and safe cooking globally.

BSC Discussion

Dr. Breysse provided additional details on studies and activities by CDC and its global partners to improve HAP and increase the use of cleaner cookstoves in response to the BSC's specific questions.

- Payment models for improved cookstoves (e.g., subsidized prices or government-sponsored programs to distribute stoves to families at no cost).
- Challenges in conducting exposure assessments due to the ability of cookstoves to be used both indoors and outdoors.
- CDC's collaborative efforts with its GACC partners, particularly the EPA National Risk Management Research Laboratory (e.g., testing of various cookstoves and laboratory-based animal toxicology studies to determine differential toxicities of fuel types).
- Potential tradeoffs as a result of cookstoves (e.g., a larger mosquito problem indoors, poorer ambient air quality outdoors, limited access to renewable fuels and adverse ecological effects).

BSC Guidance

Question 1: Quantitative and Qualitative Findings

- CDC should 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. For example, women who spend less time on these tasks could improve their individual health and safety, pursue educational goals and increase their household incomes with work outside of the home.

Question 2: Long-Term Health Benefits

- CDC should 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. For example, pictures should be used to illustrate the absorption of PM in the body, respiratory infections, physical inhalation of particles, burns and other hazards to children and their families.

Question 3: Broader Accessibility and Affordability

- CDC and its GACC partners will not be able to achieve the goal of 100 million families adopting clean, efficient and safe cooking by 2020 without providing fuel at no cost or at a highly subsidized price. Solar electricity, induction heating and other technologies should be piloted as alternatives to fuel for cookstoves.

NCEH/ATSDR Program Responses to BSC Guidance and Action Items

William Cibulas, PhD, MS, CAPT USPHS
Acting Associate Director for Science, NCEH/ATSDR
BSC Designated Federal Official

Dr. Cibulas presented NCEH/ATSDR OD's responses to action items and guidance the BSC proposed during the November 2014 meeting.

BSC ACTION ITEMS AND GUIDANCE	
BSC Request	**NCEH/ATSDR OD Response**
1. Distribute end-of-year reports for asthma, tracking and lead grantees to improve cross-grantee integration.	NCEH/ATSDR will distribute end-of-year reports to the BSC after the grantees complete their year 1 activities in the current FOAs.
2. Distribute a list of the Camp Lejeune Cancer Incidence Panel membership.	NCEH/ATSDR distributed a list of the membership to the BSC.
3. Distribute materials related to the CDC budget process: • NCEH/ATSDR's active interagency funding agreements with partners. • A summary of trends in the NCEH/ATSDR budget over the past five years.	NCEH/ATSDR distributed the budget materials to the BSC.
4. Provide the link to "Crisis and Emergency Risk Communication: Lessons from the Elk River Spill" publication.	NCEH/ATSDR provided the link to the BSC.
5. Distribute ATSDR's implementation strategy for the Safe Childcare Siting Initiative for the BSC's review and comment.	NCEH/ATSDR distributed the implementation strategy to the BSC.
6. Provide links to early studies that have documented the health effects of flavored e-juice for the BSC to identify research gaps.	No response given.
7. Distribute a more readable version of the 2014 ebola organizational chart.	NCEH/ATSDR distributed a larger chart to the BSC.
8. Ensure that EH is represented in all six conditions CDC grantees are required to target to increase synergy between public health and health care.	NCEH/ATSDR scheduled an overview on the current agenda to demonstrate public health/ healthcare collaboration. CDC's National Asthma Control Program will be highlighted as a model in the presentation.
9. Create a systematic process to compile and disseminate lessons learned and best practices to grantees.	NCEH/ATSDR is still considering an appropriate mechanism that could achieve this goal.

BSC ACTION ITEMS AND GUIDANCE	
BSC Request	**NCEH/ATSDR OD Response**
10. Include undergraduate public health programs as a target audience for new food safety tools.	NCEH/ATSDR has been a partner and primary funder of the Association of Environmental Health Academic Programs (AEHAP) since 2000. AEHAP promotes and supports EH degree programs that are accredited by the National Environmental Health Science and Protection Accreditation Council. AEHAP includes 39 member programs that support 31 accredited EH undergraduate degree programs and 8 EH graduate degree programs. AEHAP has shared NCEH/ATSDR's food safety promotional materials with its member programs, faculty and students.
11. Encourage public health partners to use explicit scientific language rather than slang when discussing e-cigarettes.	NCEH/ATSDR is collaborating with the CDC Office on Smoking and Health to develop guidance to support this effort.
12. Explore strategies to issue interim guidance to states in implementing e-cigarette legislation while the federal regulatory process is underway.	NCEH/ATSDR has no regulatory authority to take action in this regard.

Dr. Cibulas described the status of two formal recommendations the BSC unanimously approved during a previous meeting. In terms of the new BSC Lead Subcommittee, NCEH/ATSDR approved nine nominees to serve as members. NCEH/ATSDR expects to convene the first subcommittee meeting in the near future. In terms of the new Fracking Workgroup, the BSC's role in this effort is still under discussion. During his OD report, Dr. Breysse emphasized the need to form a new internal workgroup due to the increasing number of requests for NCEH/ATSDR to address EPH issues related to hydraulic fracturing.

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 November 2014 meeting.

- Richard Gillig, MCP; Central Branch Chief, ATSDR/DCHI
- Tina Forrester, PhD; Acting Director, ATSDR/DCHI
- Christian Scheel, MS; Acting Associate Director
  NCEH/ATSDR Office of Communication

BSC GUIDANCE ON KEY PRESENTATIONS	
BSC Suggestion	**NCEH/ATSDR Program Response**
ATSDR's Soil Vapor Intrusion (SVI) Assessment at Camp Lejeune	
1. Identify qualitative and quantitative sources of error in the SVI assessment to improve scenario modeling. Collect additional data by including all Camp Lejeune buildings in the SVI assessment.	ATSDR outlined specific tasks in the Camp Lejeune SVI Work Plan (e.g., document and present uncertainties and analyze sensitive populations in on-base schools and daycare centers). The BSC's suggestion to collect additional data by including all Camp Lejeune buildings in the SVI assessment is not a resource-efficient approach. With the exception of unenclosed and non-occupied structures, however, all other Camp Lejeune buildings are included in the screening process. The SVI assessment requires buildings to be in close proximity to a soil gas contamination or groundwater source. As a result, the SVI assessment will focus on a subset of >1,000 Camp Lejeune buildings: (1) buildings within 100 feet of a contaminant plume and (2) buildings for which SVI is likely based on measurements of groundwater, soil gas and indoor air contaminant concentrations. ATSDR distributed the Camp Lejeune SVI Work Plan to the BSC for review.
2. Clearly communicate areas of uncertainty to the Camp Lejeune community and the broader public in the final report of the SVI assessment.	ATSDR will incorporate the BSC's guidance into the final SVI health assessment. All pertinent sources of uncertainties will be presented. Public health hazards will be determined by modeling specific exposures to potential SVI contaminants. However, uncertainties regarding the collection, analyses and modeling of samples are inherent with each process. ATSDR will document and evaluate uncertainties to the fullest extent possible through Monte Carlo analyses.
3. Publish uncertainty data from Camp Lejeune to strengthen capacity at other sites and train the next generation of the EPH workforce.	ATSDR will include uncertainty data in its SVI guidance document.
4. Gather data on HVAC system parameters in the Camp Lejeune buildings to include seasonal/temporal variability of ambient and indoor air concentrations in the SVI assessment.	ATSDR will include seasonal variability of indoor air concentrations, temporal variability of groundwater measurements, and survey data of the Camp Lejeune buildings in the SVI assessment.

BSC GUIDANCE ON KEY PRESENTATIONS	
BSC Suggestion	**NCEH/ATSDR Program Response**
5. Translate, communicate and disseminate scientifically complex data from the SVI assessment for the lay public.	ATSDR will develop the Camp Lejeune public health assessment with understandable language that clearly conveys analyses and findings. ATSDR recently received funding from the U.S. Navy to review >23,000 documents that potentially could be included in the Camp Lejeune SVI assessment. The documents will be summarized and analyzed to identify spatial and temporal trends of indoor air, soil gas and groundwater data. ATSDR anticipates that an additional 18 months will be required to produce the public health assessment.
6. Conduct the SVI assessment with a broader pool of EH experts (e.g., toxicologists, cancer epidemiologists and risk assessors).	ATSDR distributed the Camp Lejeune SVI Work Plan to numerous subject-matter experts for review. However, additional experts will be engaged if ATSDR health assessors determine that SVI has resulted in potential exposures of public health significance. Health screening procedures and tools developed by ATSDR health professionals will be used to make this determination.
NCEH/ATSDR Priority Area: Children's Environmental Health	
7. Offer incentives for states to adopt safe childcare siting screening practices.	ATSDR will administer a survey to 12 states that currently implement EH strategies to address contamination at childcare sites. Findings from the survey will be used to determine whether an incentive-based, voluntary or regulatory model is most effective. Because implementation in the field will depend on childcare center licensure requirements in each state, ATSDR will need to pilot these potential models and analyze the data before recommending a specific approach.

BSC GUIDANCE ON KEY PRESENTATIONS	
BSC Suggestion	**NCEH/ATSDR Program Response**
8. Conduct an economic impact analysis to determine the burden of the safe siting initiative on small childcare centers.	ATSDR's position is that the safe siting initiative should not cause an economic burden on licensing new childcare centers. The following data would need to be collected on newly-licensed childcare centers to prevent environmental exposures prior to their occurrence: history of the use of the property; locations of toxic waste sites and environmental hazards in close proximity to the property; and previous incidents of chemical exposures. Although the economic burden of improperly sited childcare centers could be tremendous, principal responsible parties for the contamination rather than owners of childcare centers would bear the cost of remediating the property.
9. Design the evaluation of the safe siting initiative at a meta-level rather than at an individual childcare center level.	ATSDR is considering two evaluation designs at this time for the safe siting initiative. A proactive evaluation design in which siting of the facility was mitigated or prevented would include two key measures: the number of childcare centers with identified environmental hazards and the number of children who were not exposed to a hazard. A reactive evaluation design in which environmental hazards were identified at a currently sited facility would include three key measures: number of children exposed, health outcomes and long-term health effects. ATSDR could apply findings from the reactive evaluation to conduct health economic analyses.
10. Engage a wide range of partners in the safe siting initiative.	ATSDR will engage the U.S. Department of Education in accordance with the BSC's guidance. Other partners in this effort will include state and local health departments, environmental quality agencies, EPA, the National Institute of Environmental Health Sciences (NIEHS) and childcare licensing boards.

BSC GUIDANCE ON KEY PRESENTATIONS	
BSC Suggestion	**NCEH/ATSDR Program Response**
11. Include a new portal on the CDC.gov website for parents and other stakeholders to express their concerns regarding the proximity of local childcare centers to hazardous substances.	ATSDR, as a federal agency, cannot provide the public with a platform to report their concerns because the licensure of childcare centers is under state rather than federal control. For example, stakeholders would need to report their concerns directly to the state board with responsibility for a particular childcare center. However, any member of the public is welcome to submit a petition to ATSDR with a request to investigate environmental hazards of concern, including those identified at childcare centers.
12. Create and target a new version of the Don't Mess With Mercury Campaign to children <9 years of age.	ATSDR will update its website with educational materials on mercury that are appropriate for children 6 years of age.
West Virginia Water Contamination	
13. Explore other venues to highlight NCEH/ ATSDR's role as the "Marines" of immediate and reliable preparedness and response to EH emergencies.	NCEH/ATSDR uses various platforms to communicate its emergency preparedness and response (EPR) activities. • NCEH/ATSDR's response to the Elk River chemical spill will be featured in three new *Morbidity and Mortality Weekly Report* articles. • NCEH/ATSDR's weekly blog, "Your Health, Your Environment," highlights its success in responding to recent environmental exposures, features scientists who were involved in the response, and provides emergency preparedness guidance on upcoming natural disasters or other weather-related events. NCEH/ATSDR compiles the weekly blogs into a monthly digest that is disseminated to partners. • NCEH/ATSDR extensively uses social media and produces daily Tweets that cover various EH topics. NCEH/ATSDR has >13,000 Twitter followers at this time, including public health professionals, federal partners, clinicians, non-governmental organizations and academic institutions. • NCEH/ATSDR uses its longstanding partnerships (e.g., the National Public Health Information Coalition) to broadly communicate ongoing EH activities, provide updates on recent emergency preparedness

BSC GUIDANCE ON KEY PRESENTATIONS	
BSC Suggestion	**NCEH/ATSDR Program Response**
	efforts, and rapidly disseminate guidance and tools to state and local responders. • NCEH/ATSDR recently partnered with the American Public Health Association to broadcast a five-part webinar series. The webinars will showcase NCEH/ATSDR's essential role in addressing chemical threats and other EH concerns to protect communities, children and other vulnerable populations, and Native American tribes. • NCEH/ATSDR is exploring options to communicate its EPR expertise to the media in advance of disasters that occur by season or geographic location. A stronger relationship with the media will raise public awareness of NCEH/ATSDR's integral role in an emergency response.
14. Replicate planning, communications and preparedness for the Elk River chemical spill response in drills and training exercises.	The NCEH/ATSDR Office of Communications and Office of Environmental Health Emergencies are closely collaborating in planning tabletop exercises. Most notably, lessons learned from the Elk River chemical spill response will be used to develop scenarios for the upcoming hurricane annex exercise.
15. Engage the community as partners in communications of future events at the outset of the response.	NCEH/ATSDR will continue to extensively engage all stakeholders in each response to ensure timely, accurate and appropriate communications. However, NCEH/ATSDR's ability to have leadership of communications and messaging to the affected community is dependent on its specific role in a particular response. At some sites, for example, NCEH/ ATSDR partners with the federal, state or local agency that has primary oversight and responsibility for the response.

Public Health/Health Care Collaboration: CDC's National Asthma Control Program

Elizabeth Herman, MD, MPH
Senior Scientist, Air Pollution and Respiratory Health Branch, NCEH/EHHE
Centers for Disease Control and Prevention

Advice Requested from the BSC by NCEH/EHHE:

1. What are the BSC's recommendations regarding resources, processes or partners to accelerate CDC's activities on promoting common asthma quality measures and informing policymakers?
2. What risks should be avoided when engaging in public health/healthcare collaboration, particularly at the state level?
3. What is the BSC's advice regarding sharing data across sectors, particularly issues related to confidentiality and interoperability?

Dr. Herman presented an overview of CDC's National Asthma Control Program to demonstrate public health/healthcare collaboration. The traditional approach of public health and primary care groups conducting activities in competitive silos did not reflect the intricate connection between community and individual health. As a result, the integration of public health and primary care resources was needed to enhance the capacity of both groups to improve health outcomes.

Several changes in the healthcare environment have emphasized the critical need for public health/healthcare collaboration at this time, such as the impact of social determinants of health, increasing rates of chronic diseases, and the rise in healthcare costs. Moreover, the availability of healthcare research and data is unprecedented and provides new opportunities to better understand and address community-level health concerns. The Affordable Care Act (ACA) has placed stronger emphasis on patient-centered medical homes, accountable care organizations and other innovative models to provide and reimburse care. Broader use of electronic health records (EHRs) has enhanced capacity to coordinate care and share information across sectors.

These factors led to a national call to action for public health/healthcare collaboration. CDC and the Health Resources and Services Administration (HRSA) commissioned the Institute of Medicine (IOM) to compile best practices in this regard, identify strategies to apply ACA provisions, and explore approaches for integration and coordination between HRSA-funded primary care systems and public health departments.

The IOM published its findings and recommendations in a 2012 report, "Primary Care and Public Health: Exploring Integration to Improve Population Health." The IOM report defined "integration" as the linkage of programs and activities to promote efficiency, achieve gains in population health and improve effectiveness. The IOM report also characterized integration as five specific points on a continuum: isolation, mutual awareness, cooperation, collaboration, partnership and merger.

In addition to the IOM report, other key components of the call to action included ACA incentives and opportunities to support public health/health collaboration and a publication to improve population health through integration, *A Practical Playbook: Public Health and Primary Care*

Together. The playbook is an interactive web-based tool that includes several asthma examples contributed by CDC.

The CDC Office of the Associate Director for Policy (OADP) is coordinating efforts to leverage health system transformation and advance agency-wide public health/healthcare collaboration. OADP prioritized three key areas to achieve this goal. First, high-value prevention and public health policies and interventions will be identified. Second, the understanding and use of credible evidence related to the impact of prevention will be increased among policymakers, public health and health care. Third, collaboration among public health, health care and other sectors will be catalyzed with a special focus on opportunities expanded by ACA.

CDC agreed that asthma would be an ideal model to demonstrate public health/healthcare collaboration. Most notably, asthma accounted for $56 billion in healthcare costs in 2007, 1.8 million emergency department (ED) visits in 2011, and 3,630 deaths in 2013. Moreover, asthma is highly associated with disparities across racial, ethnic and socioeconomic groups.

Multi-component interventions are available to address asthma, including guidelines-based medical management, self-management education, indoor and outdoor trigger reduction interventions, and linkages to social services. A strong evidence base has documented the feasibility and effectiveness of asthma interventions and the ability of asthma efforts to generate a short-term return on investment. CDC is implementing a three-prong approach to advance public health/healthcare collaboration through asthma and maximize the reach, impact, efficiency and sustainability of comprehensive asthma control services.

Part 1 of the three-prong approach is ongoing funding of state Asthma Control Programs that CDC initiated in 1999. The current FOA, "Comprehensive Asthma Control Through Evidence-Based Strategies and Public Health/Healthcare Collaboration," is aligned with CDC's strategic priorities and recommendations in the 2012 IOM report. Due to budget constraints, however, the number of asthma grantees in states and territories that CDC funds decreased from 36 to 23 between the previous and current FOAs.

CDC awarded the FOA in September 2014 and required grantees to provide comprehensive asthma control services by implementing three complementary evidence-based strategies in a stepwise process: guidelines-based medical management, self-management education, and multi-component, multi-trigger home-based interventions. Grantees are providing home- and school-based services as needed or appropriate, including self-management education, linkages to healthcare and other services (e.g., staff training and environmental policies), trigger reduction interventions, linkages to medical care and referrals to social services.

At the public health level, home- and school-based services are critically important to racial/ethnic minority populations with a disproportionate burden of asthma. At the healthcare level, these services have been shown to decrease asthma-related healthcare costs due to a smaller number of ED visits and hospitalizations. Moreover, emerging evidence has demonstrated that trigger reduction interventions can reduce the number and quantity of medications required to control asthma.

Grantees also are required to take steps to link home- and school-based services to health systems. Quality improvement approaches, decision support tools, EHRs, quality measures and team-based care are being used to promote guidelines-based care. Efforts are underway

to facilitate or present a strong case for providing, making linkages and reimbursing self-management education and home-based trigger reduction interventions.

Overall, CDC's vision to achieve public health/healthcare collaboration through the current FOA is based on a goal to increase the percent of persons with well-controlled asthma symptoms and reduce disparities in the national asthma burden. Health systems, a solid infrastructure of state asthma programs, and the provision of necessary services will play a critical role in achieving this goal. Most notably, expanded linkages to health systems will help to sustain access to home-, school- and community-based asthma services.

Part 2 of the three-prong approach is CDC's collaboration with federal partners to identify, recommend and promote a core set of common asthma quality measures. The quality measures will be used to evaluate performance in increasing the percent of persons with well-controlled asthma symptoms and regularly inform payers about the quality of services provided by health plans. The quality measures will facilitate improvements by replacing administrative data with outcome data and plan-based reporting with practice-based scorecards.

The quality measures will require healthcare systems to address other factors that influence health outcomes and also will require public health to identify and focus on the most cost-effective public health interventions. These changes will require public health and healthcare systems to collaborate in achieving their individual missions and goals. CDC will evaluate and recommend quality measures to track and provide incentives for improved clinical management of asthma as a key component of its public health/healthcare collaboration strategy.

CDC and its partners are developing a core set of common asthma quality measures in three phases. First, an inventory of existing measures and reporting systems will be created as a resource for federal partners, states and external groups. Phase 1 has been completed. Second, collaborative efforts will be undertaken with federal partners to recommend a core set of measures by evaluating existing measures in terms of their quality, reliability and capacity to make improvements over time. Phase 2 is in the planning stage. Third, a process will be established to develop, select, ensure stewardship and retain the measures over time. Phase 3 will be completed in 2016.

Part 3 of the three-prong approach is efforts to inform policymakers, Medicaid agencies, other health plans and providers of the existing evidence base. This component is needed to ensure that interventions are implemented and coordinated in the field and resources are available to support comprehensive asthma control services. The National Governors Association and CDC jointly released a policy brief in April 2015, "Health Investments That Pay Off: Strategies for Addressing Asthma in Children."

CDC issued another policy brief on June 1, 2015, "State Population Strategies to Improve Health and Reduce Cost." The document describes CDC's approach to controlling asthma, including a list of priority resources by user (e.g., public health practitioners, state-level decision-makers, state Medicaid directors and healthcare organizations). CDC is providing TA to its asthma grantees to develop state-specific business cases to encourage Medicaid agencies and other funders at the state level to provide or reimburse for asthma self-management education and home visits for persons with uncontrolled asthma.

BSC Discussion

Dr. Herman provided additional details on CDC's ongoing efforts to advance public health/ healthcare collaboration through asthma in response to the BSC's specific questions.

- CDC's team-based care approach to engage entities that can impact the environment of asthma patients: allied health professionals, community health workers, school nurses, coaches, pharmacists, social service agencies and housing authorities.
- CDC's emphasis on primary prevention to determine environmental causes of asthma and its focus on secondary and tertiary prevention to reduce asthma triggers.
- CDC's ongoing efforts (e.g., in-person meetings, monthly webinars and one-on-one quarterly calls) to share information, discuss lessons learned and compare experiences across all 23 state asthma program grantees.
- CDC's strategies to engage state asthma program grantees in the development and vetting of the new asthma quality measures at the outset.
- CDC's consideration of costs associated with more precise subphenotyping of asthma patients (e.g., blood tests and x-rays).
- CDC's collection of state-level asthma data from electronic school records (e.g., number of missed school days and asthma-related visits to school nurses).
- CDC's process to translate findings from the asthma quality measures into actual public health practice in the field, such as performance management training for grantees.
- CDC's challenges in sharing data at the local level (e.g., the reluctance of schools and provider practices to exchange information and difficulties for community health workers to enter home visits into medical records for access by providers).

BSC Guidance

Question 1: Resources for Asthma Quality Measures

- CDC should include a rigorous research platform while developing the asthma quality measures. Asthma is a rapidly evolving field that is driven by molecular technology, particularly the linkage between asthma and targeting of the human microbiome with antibiotics.
- CDC should pilot the asthma quality measures with its grantees to evaluate their performance before national implementation. The evaluation findings should be used as research to build an evidence base for grantees to implement comprehensive asthma control services in the field.
- CDC should extensively factor in the heterogeneity of disease in developing the asthma quality measures. This issue should be a key consideration to capture the full population of asthma patients. Most notably, the quality measures should reflect a reclassification of asthma patients by subphenotype and risk stratification by age to incorporate the large population of adult asthma patients. However, the quality measures should be designed with sufficient flexibility to be modified as the asthma evidence base continues to evolve over time.
- NCEH should showcase asthma, as one of CDC's six priority conditions to advance public health/healthcare collaboration, to make a strong business case for restoring the National Asthma Control Program budget.

Question 3: Data Sharing

- CDC should consider replicating the U.S. Department of Energy (DOE) model of sharing data in which de-identified data are released and researchers or other users are required to apply for access. All applicants must inform DOE of their intent, hypothesis and proposed use of the data. Accepted users are given a password to the database after a

thorough vetting process, but DOE denies access to attorneys or other entities with a personal or monetary interest in the data. DOE has not encountered any issues with confidentiality in the 20 years that its de-identified database has been available. CDC also should review the National Institutes of Health (NIH) model in which grantees are required to develop and implement data sharing plans as a condition of funding.

- CDC should urge its state asthma program grantees to educate their local partners and patient populations to ensure that compliance with data sharing is not perceived as a punitive measure.

Overview of the NCEH/ATSDR EPR Transformation Initiative

RADM Scott Deitchman, MD, MPH
Associate Director for Environmental Health Emergencies
NCEH/ATSDR Office of the Director

Advice Requested from the BSC by NCEH/ATSDR OD:
1. What approaches can be utilized to create synergies in emergency management between NCEH and ATSDR?
2. What are the best strategies to effectively use ATSDR regional offices and staff in EPR?
3. Is a centralized or decentralized EPR program the best model for NCEH and ATSDR?

Dr. Deitchman presented an overview of the new Transformation Initiative that NCEH/ATSDR launched to improve its EPR activities. NCEH/ATSDR undertook this effort to achieve several goals. Current emergency management procedures and structures will be closely examined. The existing mission and vision will be clarified in terms of NCEH/ATSDR's target populations and unique contributions to EPR. Key EPR goals and activities will be identified.

NCEH/ATSDR's specific focus on operations will define the needs and requirements of partners and stakeholders; ensure that its existing structures, roles and responsibilities meet these needs; determine actions to strengthen coordination; assess internal capacity and training needs; and create measures of success to evaluate performance in achieving the goals.

NCEH/ATSDR convened a panel in 2015 to conduct a formal, independent assessment of its EPR portfolio. The panel's key findings in the areas of roles and priorities, accountability and execution, policies and procedures, and internal partnerships are summarized as follows. NCEH/ATSDR's role, particularly during non-emergencies, is not clearly understood. The emergency processes and procedures of NCEH and ATSDR are disconnected.

External stakeholders believe that NCEH/ATSDR is unable to execute and implement concepts in actual practice. The process to define an emergency and coordinate emergencies that do not require EOC activation lacks clarity. A strategic approach has not been implemented for NCEH/ATSDR to develop and maintain internal partnerships for EPR activities.

Based on the findings of the panel's assessment, NCEH/ATSDR agreed to initially prioritize the following areas for improvement. NCEH/ATSDR's role in the CDC Incident Management System will be clarified and its areas of focus will be more clearly defined. Internal responsibilities of various NCEH/ATSDR programs during an emergency response will be specified.

A clear distinction will be made among NCEH/ATSDR's recovery, prevention and mitigation efforts. NCEH/ATSDR's unique coordination role will be separated from the role of other organizations. Comprehensive performance measures will be developed. NCEH/ATSDR noted that these improvements can be achieved in a reasonable amount of time and also can provide a solid foundation to develop more granular strategies.

The first step in the new Transformation Initiative was to design an overarching framework and plan of action to facilitate the transformation of NCEH/ATSDR's emergency preparedness, prevention, mitigation, response and recovery activities. NCEH/ATSDR will launch several efforts to achieve this objective.

NCEH/ATSDR's mission, vision, strategic goals and operating model will be revised. NCEH/ ATSDR's roles and activities will be clarified and aligned with those of other CDC programs, HHS agencies, and external federal and non-federal partners. NCEH/ATSDR will align its supporting operations, communications, human capital and facilities. NCEH/ATSDR will address issues raised in its previous program reviews. NCEH/ATSDR will assure a high level of performance during and between response events.

NCEH/ATSDR expects to generate multiple benefits based on five key outcomes: (1) a more defined, actionable and validated mission and vision; (2) defined performance measures; (3) clearly defined EPR roles and responsibilities; (4) an operating model to align operational activities and strategic goals; and (5) an enhanced approach to engage and collaborate with stakeholders.

NCEH/ATSDR's governance structure to guide the Transformation Initiative includes a Transformation Steering Team, Council of Advisors, Transformation Executive Team, Extended Core Team and Core Team. Roles, responsibilities and expectations of all five groups are clearly defined. NCEH/ATSDR created a work plan with a detailed timeline of activities from the launch of the Transformation Initiative in March 2015 to implementation of the final EPR Transformation Framework in September 2015. NCEH/ATSDR will implement its EPR Transformation Initiative to be consistent with four federal strategic plans.

- Goal 2 of the 2014-2016 NCEH/ATSDR Strategic Plan: prepare for and respond to public health emergencies, including chemical, biological, radiological and nuclear incidents as well as natural disasters and extreme weather events.
- The CDC "24/7" strategic course: save lives, protect persons and save money through prevention.
- Objective 3 of the 2015-2018 National Health Security Strategy: ensure comprehensive health situational awareness to support decision-making before incidents and during response and recovery operations.
- Goal 3 of the HHS Strategic Plan: advance the health, safety and well-being of the American public.

NCEH/ATSDR has completed two of the four steps to implement the Transformation Initiative. In step 1, EPR objectives, roles, priorities and key challenges were reviewed and validated. In step 2, effective processes were identified and decisions were made on areas that need to be improved. In step 3, an outline of solutions that are required to address, mitigate or improve ineffective processes will be created. Solutions will be made to improve the following areas:

organizational structure, standardized processes, staff development procedures, concept of operations, communications and situational awareness mechanisms, preparedness roles and responsibilities, and alignment of human capital, priorities and resources.

In step 4, transformation elements, activities and outcomes will be identified, prioritized and sequenced to promote an "optimal state." Key factors that will be required for success include organizational and operational redesign, succession planning and professional development, response-specific procedures and processes, and strategic communication to stakeholders.

BSC Discussion

Dr. Deitchman provided additional details on NCEH/ATSDR's EPR Transformation Initiative in response to the BSC's specific questions.

- NCEH/ATSDR's ability to conduct disaster research to identify and fill gaps in responses to natural disasters, chemical events or radiological incidents.
- NCEH/ATSDR's efforts to address challenges related to obtaining IRB approval to conduct ethical research during natural disasters.
- NCEH/ATSDR's specific process to ensure rigorous EPR training of leadership and staff in the field.
- NCEH/ATSDR's innovative strategies to overcome barriers to Congressional legislation that prohibits ATSDR from responding to petroleum-related emergencies.

BSC Guidance

Question 1: EPR Similarities and Differences Between NCEH and ATSDR

- NCEH and ATSDR collectively should replicate successes, address weaknesses and fill gaps in the response to the Elk River chemical spill to evaluate its overall organizational function as part of the Transformation Initiative. Based on the Elk River after-action review, for example, NCEH/ATSDR acknowledged that communications among federal, state and local stakeholders must be improved to more effectively respond to and better coordinate future emergencies. NCEH's impressive scenario planning for radiation events also should be reviewed as a model in this regard. These approaches will help to guide the decision-making process on whether a centralized or decentralized EPR program is the most appropriate model for NCEH/ATSDR.

Public Comment Period

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

Overview of the ATSDR Geospatial Research, Analysis and Services Program

Andrew Dent, MA, MBA
Program Director, Geospatial Research, Analysis and Services Program
Agency for Toxic Substances and Disease Registry

Advice Requested from the BSC by ATSDR/DTHHS:

1. What steps can ATSDR take to improve the reach of the Geospatial Research, Analysis and Services Program (GRASP) and strengthen partnerships with state/local health departments, academia, foundations and advocacy groups?
2. What approaches can be implemented to ensure the sustainability of GRASP within and beyond NCEH/ATSDR?
3. What strategies can ATSDR utilize to incorporate innovation in research, practice and communication into GRASP to best demonstrate the importance of geography as a factor in public health?

Mr. Dent presented an overview of GRASP to illustrate the important role of geography in public health. ATSDR established GRASP with a mission to provide leadership and expertise in the application of concepts, methods and tools of geography and geospatial information science to public health research and practice. ATSDR identified five key objectives to fulfill the mission of GRASP.

- Research and analyze geospatial trends and patterns across the wide spectrum of EH, infectious/chronic diseases and injuries
- Extensively collaborate with scientists and researchers
- Enable geospatial capacity and increase the geospatial literacy of agencies, scientists and systems
- Contribute to a vibrant geospatial community
- Embrace, leverage and promote geographic information system (GIS) and geospatial technologies

ATSDR applies technology, ideas and concepts to promote the intersection of place and health in GRASP. For example, geography, geospatial science and statistics, GIS and cartography are included in GRASP to qualitatively characterize space and place. These factors also are used to articulate GRASP quantitative space- and place-based analytic activities, descriptive geostatistics, predictive modeling, and visualization and mapping.

ATSDR addresses various GIS issues based on three GRASP components. For example, the "analysis and research" component was used to develop the 2010 Alameda County, California Park Access Index to determine characteristics of populations in close proximity to local, state and national parks across the country. The "public health emergencies" component was used in the 2010 Haiti cholera outbreak to identify the water distribution network that was within walking distance to community residents. The "GIS technology" component was used to determine the number of visitors who recently accessed the CDC National Center for HIV/AIDS, Viral Hepatitis, STD and TB Prevention Atlas.

CDC centers, institutes and offices outside of ATSDR accounted for 43% of the $2.3 million GRASP budget in FY2014. The current GRASP workforce includes 35 staff with specialized expertise in computer science, geospatial statistics, remote sensing and user experience interface. ATSDR's progress to date includes conducting 292 geospatial projects, focusing on 2,179 sites in the GRASP hazardous sites database, training 133 staff in GIS, and increasing ATSDR's high-technology mapped documents from 2 to 35.

ATSDR created an index of 15 sociodemographic variables that will be used to characterize the social vulnerability of U.S. populations. The index was designed at the census tract level and has been adopted by the public health community, including organizations in New Hampshire,

North Carolina, Tennessee and Texas. The index will allow public health partners to better prepare for and respond to all-hazard events. Validation of the social vulnerability index is underway, particularly its performance after Hurricane Katrina.

ATSDR included the "Intro Map Series" in GRASP. A set of 12 maps was incorporated into multiple datasets to identify geographic boundaries of sensitive populations. This initiative has been successful in facilitating linkages, strong working relationships and thought processes of GIS and mapping between ATSDR and health assessors in the field. ATSDR is using GRASP to establish a baseline, provide follow-up estimates and evaluate progress in achieving EH objective 23 in the Healthy People 2020 school siting goal, "reduce the number of schools located near major roadways in the United States." This effort emphasizes the role of GRASP in integrating geospatial science and technology with health policy.

ATSDR is using GRASP to explore the relationship between environmental conditions and high indoor radon levels. The major purpose of this activity is to raise awareness of radon risks and influence school policies related to radon testing and radon-resistant construction. ATSDR will use GRASP to address indoor radon exposure in five phases.

- Explore the geographic relationship between high radon levels in homes and schools
- Evaluate environmental conditions associated with high radon levels (e.g., permeability, geology and moisture)
- Engage the NCEH Radon Task Force, other CDC partners and EPA in this effort
- Conduct additional pilot projects in schools to test radon awareness materials and increase knowledge of elementary and middle school students and their parents
- Collaborate with CDC and EPA partners to develop a plan for GRASP to increase awareness in schools and eventually affect policy for school siting, construction building and testing

ATSDR has a long history of contributing its GIS expertise to the NCEH EPH Tracking Network. In terms of technology, ATSDR has provided a GIS mapping module for the EPH Tracking Network since 2009. In terms of research, ATSDR is determining whether social vulnerability modifies the relationship between outdoor air quality and ED visits for asthma. In terms of analysis, ATSDR collaborated with the NCEH Built Environment Program to develop national measures for walkability to parks and schools.
ATSDR launched a new environmental burden index (EBI) that currently is in the experimental phase. Environmental data are widely available, but are difficult to use and analyze. Moreover, the quality of environmental data is difficult to understand without extensive research. ATSDR will use the new EBI to aggregate multiple environmental data sources into an easy-to-use index and estimate the quality of U.S. environmental data at the census tract level.

ATSDR used GRASP to support multiple partners in the global polio eradication initiative, including CDC, the Nigerian Ministry of Health, Gates Foundation and WHO. CDC activated the EOC in December 2011 to coordinate support for polio elimination. In this effort, GRASP was used to provide significant geospatial science and technology support, including a web-based polio GIS dashboard in Nigeria, desktop vaccination campaign planning and tracking tools, satellite imagery analysis, and GIS training in the field. Due to the success of these activities, the importance of GIS in ensuring vaccination coverage was acknowledged and requests were made to use GIS for campaign security, routine immunization and the polio effort in Chad.

ATSDR and CDC established the Geography and Geospatial Science Working Group in 2009 with representation from all centers, institutes and offices. The workgroup's membership includes >250 geographers, GIS analysts, GIS technologists and other GIS staff. ATSDR's next steps will be to institutionalize and integrate GIS concepts, measures and reporting into public health surveillance, research and organizational processes.

Place-aware research will be expanded with a stronger focus on activity space, place history, volunteered geospatial information and social media. Process meta-data will be enhanced to build a stronger evidence base of geospatial processes in the public health literature. The organizational structure at ATSDR and CDC will be improved to support and advance geospatial efforts among public health partners.

BSC Guidance

Question 1: The Reach and Partnerships of GRASP

- ATSDR should link GRASP data with NHANES health and exposure data. This approach would provide ATSDR with an opportunity to validate environmental measures. ATSDR should initiate this effort by incorporating its national walkability measures into the NHANES database.
- ATSDR should use GRASP data to assist CDC and its state asthma program grantees in developing new asthma quality measures. GRASP data on school siting and the social vulnerability index on the relationship between outdoor air quality and ED visits for asthma can be used to demonstrate the effectiveness of public health/healthcare collaboration in reducing asthma.

Question 2: Sustainability of GRASP Beyond NCEH/ATSDR

- ATSDR should partner with EPA to build stronger interagency GIS capacity. For example, EPA developed an environmental quality index (EQI) that covers five domains: air, water, land, socioeconomic status and the built environment. The EQI is designed to generate a unified index for every county in the United States that can be used for public health research. EPA also created the EnviroAtlas to provide the public with a set of interactive tools and resources to better understand ecosystem services at the census tract level.

Question 3: GRASP Innovation

- ATSDR should prospectively examine the impact of coastal area topographies (e.g., tidal surges and coastal flooding) on vulnerable populations and healthcare facilities, such as nursing homes. Prospective research with GRASP would allow ATSDR to better predict populations and communities that would be most affected by a future natural disaster.
- ATSDR included 15 sociodemographic variables in its social vulnerability index, but the number of factors should be decreased. ATSDR should review the extensive body of research that is available to identify the most important sociodemographic variables with the highest correlation to social vulnerability.
- ATSDR should incorporate analyses of chemical mixtures and interactions into its new EBI to determine whether a biological infrastructure would be plausible.

Update on the CDC Vessel Sanitation Program

CAPT Jaret Ames, MS, REHS
Chief, Vessel Sanitation Program, NCEH/EEHS
Centers for Disease Control and Prevention

Capt. Ames presented an update on the CDC Vessel Sanitation Program (VSP). The mission of VSP is to help the cruise industry protect U.S. ports by minimizing the risk of gastrointestinal (GI) illnesses aboard cruise ships. VSP's syndromic surveillance and reporting system tracks the introduction, transmission or spread of GI illnesses on cruise ships with ≥13 passengers that sail on a U.S. or foreign itinerary.

VSP is entirely funded by user service fees that cruise ship owners pay for operational inspections and re-inspections. Fees are based on the size of the vessel. The VSP workforce includes seven staff in the Atlanta headquarters and five staff in the Ft. Lauderdale field office. VSP's organizational structure includes four key components.

One, GI surveillance is routinely conducted and outbreak investigations are conducted as needed. Two, consultations to review construction and renovation plans are conducted at the request of the cruise ship industry. Three, training and consultation on global improvements in cruise ship safety and public health practices are offered to cruise ship supervisors during six training seminars per year.

Four, unannounced operational sanitation inspections are conducted twice per year while ships are in U.S. ports. The inspections cover all areas of the cruise ship, including medical centers, potable water systems, food and recreational water areas, housekeeping departments, pest management programs, child activity centers and HVAC systems.

In FY2014, nine VSP inspectors conducted 261 unannounced cruise ship inspections. VSP inspectors provide public health guidance if cruise ships are not complying with standards. Cruise ships that do not receive an inspection score of ≥86 are re-inspected within six weeks. Outcomes of inspections and GI illness outbreaks are publicized on the VSP website. Scheduled construction inspections are routinely conducted as well.

Routine GI illness surveillance involves reports by cruise ships to VSP 24 to 36 hours prior to arrival at a U.S. port. The VSP electronic surveillance system captures the number of GI cases and mnitors illness patterns. Cruise ships are required to immediately provide VSP with special reports when GI illness levels reach 2%-3% of the total number of passengers or crew on board. VSP conducts outbreak investigations if the number of ill passengers or crew members reaches ≥3% of the total cruise ship population or unusual GI illness patterns or characteristics are detected. VSP evaluates GI illnesses aboard ships to determine the cause of the outbreak and make recommendations for control.

VSP is viewed as an international model of cruise ship sanitation and collaborates with multiple global partners to improve cruise ship safety, including ANVISA Brazil, the China Quarantine Inspection Program, Health Canada, New South Wales, the Caribbean Public Health Agency, and the European SHIPSAN Joint Action. VSP helped WHO to train inspectors on ship sanitation inspections in accordance with the International Health Regulation. VSP also

provided assistance in the development and review of the WHO *Handbook for Inspection of Ships and issuance of Ship Sanitation Certificates*.

Update on the CDC Model Aquatic Health Code (MAHC)

CDR Jasen Kunz, MPH
Model Aquatic Health Code Coordinator, NCEH/EEHS
Centers for Disease Control and Prevention

Advice Requested from the BSC by NCEH/EEHS:
1. What guidance can the BSC provide to encourage use of the MAHC by government and industry?
2. What approaches can CDC take to integrate effective multi-center, industry, public health and academic partnerships that were utilized to create the MAHC into other NCEH/ATSDR programs?

Cdr. Kunz described the current status and future directions of the MAHC. The MAHC is a free guidance document that government agencies, private companies, industry and other entities can use to create new or update existing codes for public swimming pools, spray fountains and water parks. However, the MAHC is not a federal law and can only become law if adopted by a state or local agency. The MAHC can be used in its entirety or specific parts can be modified to meet local needs.

Over a 10-year period, ~150 partners and stakeholders from industry, public health and academia applied rigorous science, solid data and best practices to develop the MAHC for implementation in the field. The MAHC is designed as a free and accessible resource that is regularly updated. The scope of the MAHC covers all health concerns at public venues, including illness, injury, drowning, chemical poisoning, and water, air or facility exposures that impact the health of swimmers and facility owners. Public venues covered by the MAHC include manmade, treated and recirculated water venues as well as healthcare-based pools.

The MAHC includes a preface, user guide, glossary of acronyms and chapters for specific issues. The "Design and Construction" chapter provides guidance on secondary disinfection systems to kill chlorine-tolerant organisms and reduce outbreaks. The "Operation and Maintenance" chapter provides guidance on water quality issues and lifeguard standards to reduce drowning. The "Policies and Management" chapter provides guidance on lifeguard training and pool operator training to reduce pool chemical accidents and pool closures.

The MAHC was created because no federal regulatory agency is responsible for aquatic facilities. Moreover, 32% of state and local health departments do not regulate, inspect or license public swimming pools. Existing standards and requirements significantly vary across states, are frequently are outdated and have no scientific basis. Individual jurisdictions allocate a tremendous amount of time and resources to create and update codes.

The public health literature on aquatics was extensively reviewed in developing the MAHC. Drowning is the leading cause of unintentional deaths in children 1-14 years of age and accounts for ~3,500 deaths per year among persons of all ages. Diving accounts for ~450 spinal cord injuries annually. Indoor air quality issues and waterborne outbreaks have

significantly increased over the past 20 years. Injuries associated with pool chemicals accounted for ~5,000 ED visits in 2012. Routine inspections have resulted in ~12% of pool closures and 11% of spa closures.

A 2014 study reported that ~24% of acute GI illness outbreaks in treated recreational water in 2001-2010 could have been prevented with better pool operation and maintenance. However, *Cryptosporidium* spp. is extremely chlorine-tolerant and accounted for ~76% of these outbreaks. For example, chemicals were released in an Indianapolis public pool in June 2012 due to operator and mechanical error. Of ~200 adults and children who were evacuated from the pool, ~71 persons were taken to the ED, several children were hospitalized and other persons were treated at the scene.

CDC has published aquatics safety guidance documents since 1959 and established its Healthy Swimming Program in 2001. CDC and its partners in the public and private sectors served on a steering committee and solicited extensive public comment in developing and revising the 14 MAHC modules from October 2010 to July 2013. The 14 modules were merged and the first edition of the MAHC was released in August 2014.

Adoption of the evidence-based MAHC is expected to result in several long-term public health outcomes, including fewer outbreaks from exposure to contaminated swimming water, fewer drowning incidents, fewer injuries related to pool chemicals and fewer ED visits. The Conference for the Model Aquatic Health Code (CMAHC) was established in 2013 as a non-profit organization to ensure that the MAHC remains up-to-date and evidence-based to support healthy and safe aquatic experiences and promote broad use by pool programs across the country.

The mission of CMAHC is to collect, assess and inform CDC of changes in codes submitted by stakeholders for updating the MAHC. CMAHC also is charged with soliciting, coordinating and prioritizing research needs. CMAHC currently is considering proposals for 150 code changes to improve the MAHC. CMAHC will convene its first biennial conference in October 2015 in Scottsdale, Arizona.

CMAHC will assess the use of the MAHC since its release in August 2014. The implementation of pool codes across states and local jurisdictions will be evaluated by monitoring the inclusion of specific MAHC standards and language in proposed and enacted legislation. The short-term impact of adopting the MAHC will be evaluated by collecting pool inspection data to measure improvements in pool operation and maintenance.
The long-term impact of adopting the MAHC will be evaluated by monitoring decreases in outbreaks, injuries and drowning incidents. CMAHC is aware of ~20 states and large cities that are considering adopting the MAHC at this time. Most notably, New Mexico has publicly announced its plans to introduce a regulatory package for the MAHC in the fall of 2015.

At the federal level, the Centers for Medicare and Medicaid Services (CMS) intends to adopt applicable portions of the MAHC for aquatic therapy offered in 2,600 medical facilities with pools or spas that bill for CMS reimbursement. CMS's reimbursement of 3-3.5 million aquatic therapies each year totals $90-$100 million annually. The MAHC potentially will be included in CMS survey guidance that states will use to evaluate therapy clinics to ensure compliance with Medicare requirements.

BSC Discussion

Capt. Ames and Cmdr. Kunz provided additional details on VSP and the MAHC in response to the BSC's specific questions.

- Responsibility and oversight for inspections of cruise ships that remain within U.S. borders.
- CMAHC's partnerships with the National Conference of State Legislatures and other entities that develop model codes.
- The MAHC definition of "elevated" or "heightened" risk for children's pools and spray fountains due to the higher risk of GI illnesses in these public venues.
- Potential incentives for states and localities to adopt the MAHC (e.g., lower insurance premiums for the venue and reduced liability if an illness, injury or outbreak occurs while the venue is in compliance with the MAHC).

BSC Guidance

Dr. Perry acknowledged the scope and complexity of NCEH/ATSDR's EPH activities that were presented on day 1 of the meeting. She advised NCEH/ATSDR to apply specific components from one initiative to improve another activity. For example, NCEH developed a systematic, rigorous and detailed algorithm to monitor adoption of the MAHC across the United States. ATSDR designed GRASP with solid GIS concepts, methods and tools to research and analyze geospatial trends and patterns in EH, infectious/chronic diseases and injuries.

Dr. Perry raised the possibility of NCEH/ATSDR replicating the MAHC algorithm and key GRASP components to increase the adoption and long-term use of cleaner cookstoves in low- and middle-income countries. Her position was that systems and decision-making for other program components could be leveraged for broader adoption and implementation of cleaner cookstoves globally.

With no further discussion or business brought before the BSC, Dr. Cibulas recessed the meeting at 5:01 p.m. on June 3, 2015.

June 4, 2015 Opening Session: Welcome-BSC Meeting Reconvenes

William Cibulas, PhD, MS, CAPT USPHS
Acting Associate Director for Science, NCEH/ATSDR
BSC Designated Federal Official

Dr. Cibulas opened the floor for introductions and confirmed that the 15 voting members and *ex-officio* members in attendance constituted a quorum for the BSC to conduct its business on June 4, 2015. He reconvened the proceedings at 8:25 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 June 4, 2015 published agenda.

Update on the CDC National Environmental Public Health Tracking Network

Lina Balluz, ScD, MPH
Chief, Environmental Health Tracking Branch, NCEH/EHHE
Centers for Disease Control and Prevention

Advice Requested from the BSC by NCEH/EHHE:
1. What emerging EH priorities should CDC explore to increase the utility of the EPH Tracking Network?

Dr. Balluz presented an update on the CDC National EPH Tracking Network that was established in response to the 2000 Pew Commission recommendation to create a nationwide health tracking network for diseases and exposures. CDC received funding in 2002 to create the EPH Tracking Network as the first national surveillance system to provide environmental and public health data in one source. State and local tracking networks contribute data to the national surveillance system to address specific issues and needs at the local level.

The key components of the EPH Tracking Network are a strong infrastructure, solid expertise and accurate information. Networks of data and individuals are compiled to improve public heath action. CDC established five major goals for the program.

- Build a sustainable EPH Tracking Network at the national level
- Advance EPH science and research
- Disseminate information to guide policy, practice and other actions to improve the nation's health
- Enhance the EPH workforce and infrastructure
- Foster collaboration among health and environmental programs

The EPH Tracking Network currently collects and maintains data in three areas.

Tracking Data Type	Tracking Content Areas
Health Effects Data	Asthma Birth Defects Cancer Carbon monoxide poisoning Childhood lead poisoning Developmental disabilities Heart attacks Reproductive and birth outcomes
Environmental Data	Climate change Community design Homes Outdoor air Water Pesticides

Tracking Data Type	Tracking Content Areas
Population Health Data	Biomonitoring Children's environmental health Health behaviors Population characteristics

CDC implements a step-wise process to add new data to the EPH Tracking Network. State tracking grantees form workgroups and are engaged at the outset to discuss and make decisions on the proposed data and content. CDC makes decisions on the addition of new data from national sources. Rigorous evaluation criteria are applied to test the feasibility of including the proposed data in the EPH Tracking Network. Depending on the type and complexity of the proposed data, the process can be completed in six months to one year.

CDC and its state tracking grantees develop content for the EPH Tracking Network by identifying an EH problem, evaluating the utility of available data, and creating measures and indicators for the public portal. Multiple factors are considered in the extensive data evaluation component: acceptability, accuracy, bias/error, completeness, complexity, confidentiality, cost, consistency, capacity to be generalized, information technology feasibility, linkage capabilities, meta-data, public health importance, public/private use, scope/scale, specificity and timeliness.

The EPH Tracking Network has driven numerous public health actions since its establishment. These actions include informing policymaking, detecting and monitoring trends, generating hypotheses, identifying at-risk populations, improving access to quality data, guiding actions, examining relationships between hazards and diseases, and providing information to the public on diseases and the environment.

CDC currently funds 26 tracking grantees in 25 states and New York City. CDC collaborates with the Association of State and Territorial Health Officials (ASTHO) to conduct a fellowship/ mentorship program. In this effort, non-funded states are paired with state grantees that have well-established tracking systems. CDC and ASTHO have offered 34 tracking fellowships since 2008. CDC's tracking partners include other internal programs, federal agencies and national organizations.

CDC has made several accomplishments since the EPH Tracking Network was launched in 2009. Key data points include 385 EH measures that cover both funded and non-funded tracking states, 1.6 million unique maps, 1 billion rows of data and 245 public health actions reported to date. Moreover, the EH infrastructure has been strengthened in 25 states and New York City. The functionality of tracking has been expanded to include new features. Mentoring, fellowships and other resources have been provided to non-funded states. Strong partnerships have been established with other public health programs in academia. Policy changes have been informed. Public understanding of the impact of the environment on health has been improved.

CDC's next steps will be to address several challenges to improve the EPH Tracking Network in the future (e.g., remaining current and relevant, addressing community concerns and temporal issues, measuring exposures, continuing to identify data gaps, quantifying the value of tracking and sustaining resources).

CDC will expand the three guiding principles of tracking into new focus areas. "Innovative informatics" will focus on rapidly evolving technologies, better functionality to collect data at the sub-county level, and broad use of EHRs. "Collaboration" will focus on extensive engagement of existing and new partners in the development of the 2020 Tracking Strategy. "Data-driven actions" will focus on scientific advancements, improved statistical methods, and wider usability of tracking data with SmartPhone applications.

Preston Burt
Health Communications Specialist
Environmental Health Tracking Branch, NCEH/EHHE
Centers for Disease Control and Prevention

Mr. Burt presented a live demonstration of the EPH Tracking Network to highlight key features of the data query system; provide examples of different types of data that users at all literacy levels can obtain from the public portal; and describe successes of tracking data in driving public health actions. The demonstration focused on the following areas.

- Basic health effects data (e.g., asthma hospitalizations by age in all Florida counties in a map, chart or table format).
- Climate change over time (e.g., future projections of extreme heat days in Texas in a timeline view).
- The new feature to view and compare multiple EH measures on one screen (e.g., annual average ambient air concentrations of $PM_{2.5}$ and the number of persons in poverty in California in 2010-2011).
- The county-based "information by location" tool.
- Success stories of tracking data in driving public health actions at state and local levels:
    - New York City used tracking data to identify seasonal asthma trends; map increases in asthma-related ED visits and hospitalizations in certain boroughs at the beginning of each school year; and widely distribute health alerts and pollen advisories to the public.
    - Maine used tracking data to generate a timeline that showed a seasonal increase in ED visits and hospitalizations due to carbon monoxide poisonings during the winter. Power outages caused by winter storms led local residents to seek alternate indoor heating options. Tracking data were instrumental in Maine's enactment of a law in 2009 that requires carbon monoxide detectors in all new homes built and all existing homes sold.
    - New Mexico used tracking data to provide the public with easily understandable fact sheets, posters, an interactive mapping tool and other resources to reduce adverse health effects from smoke and pollutants during the wildfire season in May-July.

BSC Discussion
Dr. Balluz, Mr. Burt and other EHHE staff provided additional details on the EPH Tracking Network in response to the BSC's specific questions.

- The possibility of CDC decreasing the list of ~17 factors that are evaluated when new data and content are proposed for inclusion in the EPH Tracking Network.
- The ability of tracking users to access background information, methodologies and sources (e.g., CDC's case definition of "developmental disabilities" that are not tracked by all states and CDC's algorithm to make future projections of extreme heat days).

- CDC's efforts to compile tracking data at state and local levels to determine the extent of EH diseases and exposures, inform policies, and drive public health actions at the national level.
- The strong and longstanding collaboration between the EPH Tracking Network and GRASP.
- CDC's rigorous process, protocols and criteria to validate tracking data submitted by state and local grantees, such as hospitalization data that are poorly collected at the local level.
- CDC's systematic process to update tracking data on an annual basis.
- CDC's legal policies and agreements to protect confidentiality and privacy while collecting and releasing state and local tracking data.

BSC Guidance

Question 1: Emerging EH Priorities for the EPH Tracking Network

- CDC should map, align and link tracking content areas to a broader range of health outcomes, such as those that are inventoried for ToxProfiles™ (e.g., renal, metabolic or endocrine disorders).
- CDC should give more attention to the validity, accuracy and quality of hospitalization data that are entered into EHRs, particularly since these data are used to inform public health decisions and actions. CDC should conduct a pilot project with a sample of tracking grantees to improve the collection and integration of EHR data with other platforms. State health information exchanges, EHRs and clinical laboratory data should be key data sources to increase the power of the pilot project.
- CDC's success stories should be limited to those in which public health actions were directly correlated to the EPH Tracking Network. Because several states have passed carbon monoxide detector laws without tracking data, for example, the Maine success story does not demonstrate the potential of the EPH Tracking Network in driving public health action. CDC should place more emphasis on showcasing the successful use of tracking data to generate innovative research.
- CDC should have a much stronger focus on prevention in its ongoing efforts to make the EPH Tracking Network a national program.
- CDC should consider several emerging issues to increase the use of the EPH Tracking Network.
    - Data on stroke and heart failure should be collected in addition to heart attacks due to the tremendous public health burden and cost of these conditions. Modeling should be conducted to predict the increased incidence of heart failure over the next 20 years.
    - Modeling should be performed to estimate costs associated with health effects from future changes in the climate and air pollutant levels.
    - Data should be collected to examine the relationship between environmental home exposures and neurological diseases (e.g., Alzheimer's disease, dementia and Parkinson's disease).
    - Data should be collected on neonicotinoid pesticides because the current literature in this area is extremely scarce.

Dr. Perry concluded the discussion by revisiting the BSC's concerns regarding the future of the EPH Tracking Network. CDC announced that if Congress approves the $11 million reduction proposed in the FY2016 President's budget, tracking funds to grantees would decrease from $35 million to $24 million. She advised the BSC members, as individual citizens, and their EH

peers, colleagues and stakeholders in all states to visit the websites of their Congressional representatives and provide written comments regarding the proposed cut to the tracking budget.

Dr. Perry also encouraged individual citizens to highlight their scientific credentials to inform Congressional representatives of adverse outcomes that likely will occur in their respective states with an inadequate tracking budget. Dr. Breysse emphasized his strong commitment to make the EPH Tracking Network a truly national program in all 50 states.

Advances in Laboratory Methods: Molecular Newborn Screening Tests

Suzanne Cordovado, PhD
Team Lead, Molecular Quality Improvement Program
Newborn Screening and Molecular Biology Branch, NCEH/DLS
Centers for Disease Control and Prevention

Advice Requested from the BSC by NCEH/DLS:
1. What approach can CDC take to translate genomic research on newborns into high-throughput newborn screening programs?
2. What partnerships or strategies can help broaden awareness and understanding about molecular newborn screening among public health professionals?

Dr. Cordovado presented an overview of CDC's laboratory methods and techniques to advance molecular newborn screening technology. The overarching goal of newborn screening is to identify infants born with life-threatening diseases and provide necessary care before illness occurs. Hospitals and birthing facilities collect blood from every infant born in the United States (or a cohort of ~4 million newborns annually). State public health laboratories test dried blood spots (DBS). Infants with a positive test receive follow-up diagnosis and care in clinical settings.

The HHS Secretary recommends that states test newborns for 32 disorders. The disorder must meet the criteria and definition of a "significant disease." The disorder cannot be detectable until after damage occurs. Treatment for the disorder and a mass testing method must be available. The testing method must be rapidly performed within 7 days after birth. The public health benefits must justify the cost of testing.

CDC has the only comprehensive quality assurance program that uses DBS. CDC provides the following services to 560 laboratories: proficiency testing, quality control materials, reference materials for test validation and training, laboratory training and consultation, and development of new test methods. CDC's service area covers all U.S. states and 77 countries. CDC collaborates with the Association for Public Health Laboratories (APHL) and other external partners to address laboratory challenges.

CDC's traditional screening technology included visible and fluorescence enzymatic assays, tandem mass spectrometry, electrophoreses, high-performance liquid chromatography and immunochemical assays. CDC advanced to molecular screening technology in the early 2000s to detect mutations in genes to improve the specificity of biochemical tests for existing disorders and also to detect DNA markers to screen for new disorders. At this time, 44 states use at lest one molecular test for newborn screening.

CDC's key successes in the use of molecular testing are highlighted as follows. To identify infants with cystic fibrosis, a primary immunochemical test was used to measure a non-specific marker. A second-tier test was added to examine a common mutation or a panel of mutations in the *CFTR* gene with more specificity. Because the second-tier test tremendously reduced the rate of false-positive results, the burden of care to the healthcare system in general and cystic fibrosis centers in particular was decreased.

The U.S. Food and Drug Administration approved a mutation-specific drug to treat cystic fibrosis. These early efforts resulted in CDC's establishment of a Cystic Fibrosis Mutation Detection Proficiency Testing Program to validate new molecular tests and methodologies in public health laboratories, provide quality assurance resources, offer ongoing consultation, and collaborate with states to expand the diversity of materials.

To identify infants with severe combined immunodeficiency (SCID), a primary molecular test was used to detect a mutation in one of 25 genes. Infants with SCID have a non-functional immune system and a life expectancy of only 1 year of age. However, this disorder can be cured by a bone marrow transplant in the first few months of life. Early treatment also can reduce medical costs associated with severe infections. Wisconsin used newborn screening funds from CDC to identify the first infant born with SCID.

CDC has improved SCID screening nationwide by funding initial pilot studies in Massachusetts and Wisconsin in 2008 and awarding SCID screening implementation grants to five states in 2011 and 2013: Michigan, Minnesota, Georgia, Oklahoma and Virginia. CDC currently is reviewing applications submitted by other states in response to the 2015 SCID screening implementation FOA.

The CDC laboratory developed a streamlined, simple, efficient and cost-effective high-throughput test to detect a T-cell receptor excision circle (TREC) and determine whether an infant has SCID. CDC created a model performance evaluation survey with benchmarks to assist states in validating and piloting primary molecular testing. States that include SCID screening in their routine newborn screening protocol can join the SCID TREC Proficiency Testing Program.

CDC's extensive TA and training to laboratories include an annual Newborn Screening Molecular Training Workshop with a lecture series and hands-on laboratory experience. To date, >60 public health laboratorians from 30 programs have completed the workshop. The SCID Laboratory Implementation Training Workshop includes laboratory experience with assays and the creation of reference materials. The workshop is offered three to four times a year on an as-needed basis and has educated >30 public health laboratorians from 20 programs.

CDC offers other TA and training in newborn screening in addition to the two workshops: molecular method transfer and technical support, onsite visits for implementation and troubleshooting, laboratory development and design, and online molecular tools and robotics support. CDC and APHL jointly conduct the Molecular Assessment Program (MAP) to provide guidance on molecular testing using DBS because the Clinical Laboratory Improvement Amendments do not include a genetic testing specialty.

MAP is designed as a non-regulatory, comprehensive laboratory site visit to review the full spectrum of a laboratory's molecular testing methods from pre- to post-analytics. During MAP

site visits, laboratories are provided with TA and troubleshooting for their current molecular testing methods and guidance on plans for expansion in the future. CDC and APHL conduct the MAP site visits at no charge to laboratories and will complete 16 laboratory site visits by the end of FY2015. APHL maintains a molecular resources website to provide timely information to laboratories, such as automation methods to screen for newborn disorders, descriptions of molecular assays used in newborn screening, a MAP checklist and an application to request a laboratory site visit.

CDC is at the forefront of the rapidly evolving molecular genetics field. In 1989, the U.S. Human Genome Project was launched. In 2003, 23 laboratories participating in the project completed the first sequencing of the human genome at a cost of ~$3 billion. In 2007, the next generation of human genome sequencing was completed in several weeks at a cost of ~$10,000. The latest DNA sequencers of the human genome can be completed in three days at a cost of ~$1,000 per assay.

The National Human Genome Research Institute collected data to demonstrate that sequencing an entire genome might be easier and less expensive than testing for a number of known mutations. The data showed that the cost per genome was $100 million in 2001 with the Sanger sequencing technology; ~$10 million in 2007 before next-generation sequencing technology was introduced; and ~$5,000 in 2014 to sequence and analyze a genome with the latest DNA sequencers.

The human genome spans 3 billion bases, while the human exome is equivalent to 1% of the genome. The human exome includes DNA segments that contain coding regions of genes. Genes hold the recipe for all proteins in the human body. Exome sequencing is an emerging diagnostic tool. Studies have reported that ~25% of previously undiagnosed patients are given a molecular diagnosis. Exome sequencing is a vast improvement over testing single genes or gene panels, but the major challenge with this technology is an inability to determine whether variants detected in the exome are pathogenic or benign. The medical impact of most variants is still unknown, but efforts are underway by multiple genomic experts to fill this data gap.

NIH awarded $25 million to four clinical research laboratories to test genome/exome sequencing in newborns. The grantees are required to achieve three overarching goals: explore the medical utility of genome/exome sequencing beyond biochemical and molecular tests in current newborn screening; understand diseases identified in the newborn period; and research the ethical, legal and social implications of genomic sequencing of newborns.

Because genome/exome sequencing is not fully developed for public health purposes at this time, CDC currently is focusing on building the capacity of newborn screening laboratories. CDC recently released an FOA in which a screening laboratory will be awarded funds to develop a next-generation sequencing SCID gene panel to identify causative mutations. CDC also will begin to build a laboratory infrastructure to translate genome/exome sequencing research from the four NIH grants into public health practice.

BSC Guidance

Question 1: Translation of Genomic Research on Newborns

- CDC's plan to develop a next-generation sequencing SCID gene panel is appropriate. SCID is associated with a high mortality rate and a tremendous public health cost. Moreover, the incidence of SCID of 1/40,000-100,000 children is sufficient to generate a return on the public health investment. The translation of SCID research for newborn

screening programs also would be extremely informative for clinical follow-up of SCID patients.

Question 2: Increased Awareness/Understanding of Molecular Newborn Screening

- CDC should make efforts to educate other groups beyond public health professionals. The essential functions of molecular newborn screening should be widely communicated and success stories in this field should be clearly articulated.
  - o Healthcare providers have extremely limited knowledge of the role of molecular newborn screening in informing clinical decisions.
  - o Educational interventions should be targeted to parents to increase their knowledge of the impact of molecular newborn screening on improving the quality of life of their children.
  - o CDC should have a strong and ongoing presence at genomics conferences to emphasize the important role of public health in molecular newborn screening and establish new partnerships. To date, research rather than public health has been the major focus area in this field.
- Ethical concerns have been raised regarding molecular newborn screening, such as the personal identification of newborns during exome sequencing and additional research conducted with DBS collected during newborn screening. Moreover, any group is able to use publicly available genomics data for unauthorized purposes. As CDC begins to build a laboratory infrastructure to advance to genome/exome sequencing, rigorous safeguards should be developed to protect the privacy and confidentiality of specific and unique genomics data.

Public Comment Period

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

Updates by the BSC *Ex-Officio* Members

Bonnie Richter, PhD, MPH[1]
Senior Epidemiologist, Office of Health and Safety
U.S. Department of Energy

Dr. Richter reported that the mission of DOE is to ensure the nation's security and prosperity by addressing energy, environmental and nuclear challenges through science and technology solutions. The scope of DOE's activities has evolved over time from research and development of nuclear weapons to environmental cleanup of the nuclear weapons complex and non-proliferation and stewardship of the nuclear stockpile.

DOE was established in 1977 as a predecessor to the Atomic Energy Commission in 1946 and the Energy Research and Development Administration in 1974. Congressional law requires

[1]*Editor's note:* The DOE update is captured in the minutes along with the other three *ex-officio* updates that were presented on June 4, 2015. However, Dr. Richter actually presented the DOE update on June 3, 2015 due to her absence on day 2 of the BSC meeting.

DOE to conduct research and development activities related to the protection and health of DOE workers.

DOE conducts and supports health studies and other research activities to achieve three major goals: (1) identify adverse effects to hazardous materials from DOE operations among DOE workers and community residents near DOE sites; (2) appropriately respond to disease outbreaks and radiation accidents; and (3) address critical research needs for important occupational exposures.

Epidemiologic studies of nuclear workers were initiated in the 1960s. The DOE Office of Environment, Safety and Health was established in 1990, including the Worker and Public Health Activities Program. This initiative was created to study the health consequences of exposures to ionizing radiation and other hazardous materials used in DOE operations to workers and the general public in surrounding communities.

DOE has a long and rich history with its federal partners. Most notably, ATSDR has evaluated environmental exposures and related health effects in communities surrounding DOE sites to determine whether these exposures are harmful to individuals. All of ATSDR's public health assessments at DOE sites are available online.

NCEH has reconstructed radiation doses at DOE sites to determine past releases of radiological materials, doses or amounts of radiation received by persons in close proximity, and possible health effects from radioactive substances to these persons. The National Institute for Occupational Safety and Health (NIOSH) has conducted epidemiologic studies and research on occupational exposures to DOE workers.

In addition to its longstanding partnerships with CDC and ATSDR, DOE also has funded single- and multi-site mortality studies of DOE workers both domestically and internationally. For example, the "Million Worker Study" included a cohort of >200,000 DOE workers and is the largest research effort on low-dose radiation. Mortality studies of DOE workers have focused on exposures from plutonium, polonium, uranium, external ionizing radiation and internal alpha radiation.

Kristina Thayer, PhD
Director, NTP Center for the Evaluation of Risks to Human Reproduction
National Institute of Environmental Health Sciences

Dr. Thayer reported that the National Toxicology Program (NTP) convened an expert panel meeting in May 2015 to identify research needs for assessing the safety of high intake of folic acid. The meeting focused on cancer cognition in conjunction with vitamin B12 deficiency and hypersensitivity, including asthma, allergies, respiratory outcomes, and thyroid- and diabetes-related disorders. NTP released background documents to provide a rationale for focusing on these health outcomes. Key outcomes of the meeting and the background documents will be compiled and developed as an NTP monograph with an expert panel report. In the interim, the background documents and slide sets from the expert panel meeting are available on the NTP website.

NTP will hold its Board of Scientific Counselors meeting on June 16, 2015. The presentations will include NTP's response to the West Virginia chemical spill; tools for systematic reviews (e.g., an online, interactive tool to summarize evidence that links an exposure to a health

outcome and text mining machine learning tools); and updates to the NTP Office of Health Assessment and Translation level of concern categories. NTP currently is developing capacity to warehouse human, animal and *in vitro* data with the systematic review tools.

NTP will conduct a peer review of the pentabromodiphenyl ether mixture draft technical report on June 25, 2015. The draft conclusions provide clear evidence of carcinogenic activity in rats and mice. NTP will convene the "Statistical Approaches to Assessing Health Effects of Environmental Chemical Mixtures in Epidemiology Studies" Workshop on July 13-14, 2015. NTP will conduct a peer review of the carcinogens monograph on cobalt and certain cobalt compounds on July 22, 2015. The public can obtain detailed information on these meetings from the "Calendar and Events" tab on the NTP website.

Wayne Cascio, MD
Director, Environmental Public Health Division
U.S. Environmental Protection Agency

Dr. Cascio reported that EPA, CDC and other federal partners recently held a meeting with Health Canada to initiate efforts in updating *Wildfire Smoke: A Guide for Public Health Officials*. Unlike the air quality index, the guide will provide a simple and easy-to-use method for persons to assess the level of particulates in real-time.

The mission of the EPA Office of Research and Development (ORD) is to protect human health and the environment. ORD's organizational structure includes six research programs.

- Air, Climate and Energy Research Program
- Safe and Sustainable Water Resources Research Program
- Chemical Safety for Sustainability Research Program
- Human Health Risk Assessment Program
- Homeland Security Research Program
- Sustainable and Healthy Communities Research Program

The research programs have been meeting with their external scientific advisory committees and the Office of Management and Budget to develop strategic action plans, research projects and budgets for the FY2016-FY2019 cycle. ORD selects research projects by first engaging in dialogue with national program directors and staff, Congress, EPA clients and stakeholders to identify knowledge gaps. These needs are then communicated to ORD scientists to begin prioritizing, designing and funding appropriate research projects. For example, two of the research programs will conduct projects related to endocrine disruptors, climate-related factors and multi-pollutant research in the upcoming FY2016-FY2019 cycle.

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 organizational structure includes 1,158 staff in 8 offices and research laboratories, 18 Education and Research Centers, and 10 Regional Agricultural Centers across the country. Both of the educational programs are proposed for elimination in the FY2016 President's budget. The NIOSH annual budget of

~$300 million has remained relatively flat over the past few years. Of the entire NIOSH budget, ~33% is allocated to extramural activities.

NIOSH's traditional programs are designed to perform a variety of functions: (1) evaluate health hazards in occupational settings; (2) certify respirators; (3) oversee consequence management in accordance with the Energy Employees Occupational Illness and Compensation Program Act and the World Trade Center Health Program; and (4) conduct health surveillance of coal workers by certifying x-ray facilities and B-readers, approving mine plans, and processing miner examinations.

NIOSH has developed several virtual centers over the past few years that provide a platform for multidisciplinary experts to focus on specific issues, including nanotechnology, motor vehicle safety, workers' compensation studies, direct reading and sensor technology, and productive aging and work.

NIOSH is focusing on several priority issues at this time. The nanomaterial exposure assessment involves field teams that evaluate the handling and characterize the risk of various nanomaterials in the workplace. NIOSH's research in this area resulted in a 2013 publication on the efficiency of collecting nanoparticles for N95 face-piece respirators and filters as well as the release of intelligence bulletins with recommended occupational exposure limits for titanium dioxide and carbon nanotubes/nanofibers.

NIOSH's current hydraulic fracturing activities cover two major areas: (1) an assessment of deaths among oil and gas workers in the field as a result of chemical exposure risks and (2) an evaluation of potential health effects to workers due to occupational risks from high levels of exposure to hydrocarbons. NIOSH has a strong social media presence through its blog, up-to-date Wikipedia page, videos on YouTube, and descriptions of publications, upcoming events and other activities on the NIOSH website.

Open BSC 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.

PROPOSED AGENDA TOPICS	
Presenter	**Topic**
BSC Membership	Discussion and formulation of guidance to address public concerns related to industry funding to CDC.
NCEH/ATSDR OD	Regular status reports on changes to the 2014-2016 NCEH/ATSDR Strategic Plan.
ATSDR/DCHI	Update on the Camp Lejeune SVI assessment (May 2016 meeting).
NCEH/ATSDR OD	More detailed and contextual presentation on NCEH/ATSDR's reorganization of its EPR portfolio as a result of the Transformation Initiative, particularly alignment of NCEH/ATSDR's emergency management processes and operations with those of NIOSH, the Office of Public Health Preparedness and Response, and other parts of CDC.
Dr. Thomas Frieden	Overview from the CDC Director on agency-wide EPH priorities.
NCEH/EHHE	Update on CDC's climate change activities, including scientific and systematic efforts to fill current gaps in toxicological and human exposure data related to neonicotinoid pesticides.
NCEH/ATSDR OD	Status report on the new BSC Fracking Workgroup: the selection of members, timeline to hold the first meeting, and ATSDR's investigation of site-specific impacts of hydraulic fracturing on groundwater or drinking water in communities.
NCEH/ATSDR OD	Overview of websites, repositories or other sources for academic institutions and other groups to easily access NCEH/ATSDR's EH materials, particularly historical resources that have been archived.
BSC Membership	Discussion on potential strategies to encourage non-funded states to apply for tracking and asthma grants, such as a lower level of performance metrics and reporting requirements for states with no history of NCEH/ATSDR funding.

REQUESTED ACTION ITEMS	
Responsibility	**Action Step**
Dr. Edward Murray	Notify the DFO when the joint ATSDR/NIEHS guidance manual on developing a new chemical mixtures ToxProfile™ will be available for the BSC's review and comment.
BSC DFO	Provide the BSC with the link to the current version of the 2014-2016 NCEH/ATSDR Strategic Plan.
Dr. Bonnie Richter	Provide Dr. Herman with information on DOE's stepwise process to release, share and allow access to de-identified data.
Ms. Josephine Malilay	Provide the DFO with the link to the disaster epidemiology paper that EHHE published in November 2014 for distribution to the BSC.
Dr. Wayne Cascio	Provide Mr. Dent with links to the EPA environmental quality index and EnviroAtlas.
Dr. Judith Qualters	Provide the DFO with links to EHHE's recent publications on the EPH Tracking Network for distribution to the BSC: • "Data to Action: Using Environmental Public Health Tracking to Inform Decision Making," *Journal of Public Health Management and Practice*, March/April 2015. **[Distributed during the meeting]** • The special issue on tracking research conducted by CDC's academic partners published in *Environmental Research*.
NCEH/ATSDR OD	Set aside time during the next meeting for the BSC members to conduct a site visit of the NCEH laboratory.

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

- An orientation packet should be distributed to give new BSC members an opportunity to provide the same level of useful, constructive and impactful feedback as existing members. For example, Dr. Breysse highlighted differences between the missions, Congressional mandates and funding streams of NCEH and ATSDR in his OD report, but the new BSC members had no institutional knowledge or background materials to provide informed feedback in this area. Moreover, existing BSC members do not fully understand the distinction between the career track of civilians and U.S. Public Health Service personnel and its impact on NCEH/ATSDR's organizational structure.
- Specific BSC members should be assigned as "lead reviewers" to guide discussions of questions posed by NCEH/ATSDR presenters. This model has been extremely helpful in exploring new perspectives and concepts during NTP Board of Scientific Counselors meetings.
- A set of "meeting best practices" should be formally adopted to strengthen the BSC's advisory role.
    - Implementation of the Strategic Plan should be a standing agenda item. All future NCEH/ATSDR presentations and requests for the BSC's guidance should be directly correlated to and framed in the context of Strategic Plan goals and/or objectives.
    - The BSC and other CDC advisory committees should periodically convene joint meetings at the Tom Harkin Global Communications Center. During the previous meeting, for example, the BSC advised NCEH/ATSDR to place more emphasis on

antimicrobial resistance and environmental practices that contribute to untreatable infections in healthcare settings. The CDC Office of Infectious Diseases (OID) BSC already has established an Antimicrobial Resistance Workgroup to provide guidance on research needs and other gaps in this area. A joint meeting would allow the NCEH/ATSDR and OID BSCs to provide more concrete recommendations on this issue.

- The current BSC membership is not adequately represented in terms of expertise or backgrounds in health disparities and environmental justice issues. Experience and skill sets in these areas should be a major consideration as CDC recruits candidates to fill current vacancies on the BSC.
- Dr. Frieden should attend a future BSC meeting to outline his perspectives on the alignment between CDC-wide and NCEH/ATSDR EPH priorities. The BSC would then be better positioned to provide guidance on agency-wide EPH issues that could benefit other parts of CDC outside of NCEH/ATSDR.
- The BSC commends NCEH/ATSDR on restructuring the meeting format in direct response to its feedback, such as presenting detailed and timely responses to the BSC's action items and guidance, posing specific questions for each presentation, and shortening presentations from 45 to 30 minutes. Despite these improvements, the BSC's advisory role still appears to be passive, limited and at a relatively low level. For example, the BSC is chartered to provide advice to the HHS Secretary and CDC Director in addition to the NCEH/ATSDR Director. However, the BSC's guidance is only captured in the meeting minutes and has no actual impact outside of NCEH/ATSDR. Because the BSC is the external advisory body for the CDC-wide EPH portfolio, NCEH/ATSDR should compile the BSC's guidance in an annual report for distribution at the higher HHS Secretary and CDC Director levels. The 30-minute presentations also should be further shortened to no more than 20 minutes to allow more time for the BSC to discuss and formulate concrete recommendations to the HHS Secretary and CDC Director in addition to the NCEH/ATSDR Director.

Dr. Breysse thanked the BSC members for providing candid observations and perspectives during the open discussion. He confirmed that NCEH/ATSDR would solicit more strategic and focused advice from the BSC in the future. Most notably, Dr. Frieden is interested in the NCEH/ATSDR program that is making the most significant impact on public health at this time. Dr. Breysse planned to obtain concrete guidance from the BSC to respond to Dr. Frieden's question.

Closing Session and Adjournment

Dr. Breysse thanked the BSC members for continuing to contribute their valuable expertise and external input to improve NCEH/ATSDR's portfolio of EPH research and activities. As the new NCEH/ATSDR Director, he confirmed that the BSC's guidance would continue to be thoughtfully considered and translated into actual action steps. The BSC commended NCEH/ATSDR on its ongoing efforts to improve and advance EH for the nation.

The participants applauded Dr. Perry on her outstanding role as the new BSC Chair. The participants also applauded Ms. Sandra Malcom, Ms. Shirley Little and other NCEH/ATSDR OD staff for continuing to provide excellent logistical and administrative support for the BSC meetings.

With no further discussion or business brought before the BSC, Dr. Cibulas adjourned the meeting at 11:57 a.m. on June 4, 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. Hillary Carpenter
Dr. Deborah Cory-Slechta
Dr. Kim Dietrich
Dr. Julia Gohlke
Dr. Ewa King
Dr. Sharon LaFollette
Dr. Kenneth Ramos
Sanjay Ranchod, Esq.
Dr. Matthew Strickland
Dr. Robert Wright

BSC Member Absent
Dr. Phillip Williams

BSC *Ex-Officio* Members Present
Dr. Wayne Cascio
U.S. Environmental Protection Agency

Dr. John Decker
National Institute for Occupational Safety and Health

Dr. Bonnie Richter
U.S. Department of Energy

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

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

NCEH/ATSDR Director
Dr. Patrick Breysse

CDC/NCEH/ATSDR Representatives
Jaret Ames
Lina Balluz
Suzanne Beavers
Leigh Bennett-Conner
Mary Jean Brown
Steven Bullard
Paula Burgess
Preston Burt
Yulia Carroll
Sascha Chaney
Ginger Chew
Pamela Collins
Richard Collins
Suzanne Cordovado
Cheryl Cornwell
Miguel Cruz
Steven Davis
Lindsey de Beer
Rey de Castro
Scott Deitchman
Andrew Dent
Edward Dieser
Stephanie Doan
Christopher Earl
Peter Edwards
Obaid Faroon
Tina Forrester
Richard Gillig
James Gooch
Theresa Grant
Cherie Gray
Olivia Harris
Elizabeth Herman

James Holler
Michele Howard
Joy Hsu
Robin Ikeda
Susan Ingber
Carol Johnson
Laurie Johnson
Maria Jolly
Brian Kaplan
Mateusz Karwowski
Katie Kearns
Donna Knutson
CMDR Jasen Kunz
Caroline Lagoy
Dennis Lenaway
Shirley Little
Hugh Mainzer
Amanda Malasky
Sandra Malcom
Josephine Malilay
Susan McBreairty
Maria Mirabelli
Oleksii Motorykin
Amy Mowbray
Moiz Mumtaz
Edward Murray
Richard Nickle
Jona Ogden
James Pirkle
Judith Qualters
Charlene Reese
Von Roebuck
Helen Rogers
John Sarisky
Christian Scheel
Kanta Sircar
Ram Siwakoti
James Stephens
Heather Strosnider
Jerry Thomas
Subbalakshmi Voleti
Michelle Watters
Robert Whitcomb
Pamela Wigington
Lynn Wilder
Amy Wolkin
Fuyuen Yip

Members of the Public

John Anthony Ho
PwC

Elizabeth Landeen
National Environmental Health Association

Ashley Pandit
PwC

Attachment 2: *Glossary of Acronyms*

ACA	Affordable Care Act
ACMT	American College of Medical Toxicology
AEHAP	Association of Environmental Health Academic Programs
APHL	Association for Public Health Laboratories
ASTHO	Association of State and Territorial Health Officials
BRACE	Building Resilience Against Climate Effects
BSC	Board of Scientific Counselors
CAP	Community Assistance Panel
CDC	Centers for Disease Control and Prevention
CMAHC	Conference for the Model Aquatic Health Code
CMS	Centers for Medicare and Medicaid Services
CPSC	U.S. Consumer Product Safety Commission
DBS	Dried Blood Spots
DCHI	Division of Community Health Investigations
DFO	Designated Federal Official
DLS	Division of Laboratory Sciences
DoD	Department of Defense
DOE	U.S. Department of Energy
DTHHS	Division of Toxicology and Human Health Services
EBI	Environmental Burden Index
ED	Emergendy Department
EEHS	Emergency and Environmental Health Services
EH; EPH	Environmental Health; Environmental Public Health
EHHE	Environmental Hazards and Health Effects
EHRs	Electronic Health Records
EOC	Emergency Operations Center
EPA	U.S. Environmental Protection Agency
EPR	Emergency Preparedness and Response
EQI	Environmental Quality Index
FOA	Funding Opportunity Announcement
GACC	Global Alliance for Clean Cookstoves

GI	Gastrointestinal
GIS	Geographic Information System
GRASP	Geospatial Research, Analysis and Services Program
HAP	Household Air Pollution
HRSA	Health Resources and Services Administration
IOM	Institute of Medicine
IRB	Institutional Review Board
LPG	Liquefied Petroleum Gas
MAHC	Model Aquatic Health Code
MAP	Molecular Assessment Program
NCEH/ATSDR	National Center for Environmental Health/ Agency for Toxic Substances and Disease Registry
NHANES	National Health and Nutrition Examination Survey
NIEHS	National Institute of Environmental Health Sciences
NIH	National Institutes of Health
NIOSH	National Institute for Occupational Safety and Health
NTP	National Toxicology Program
OADP	Office of the Associate Director for Policy
OD	Office of the Director
OID	Office of Infectious Diseases
ORD	Office of Research and Development
PAH	Polycyclic Aromatic Hydrocarbon
PEHSUs	Pediatric Environmental Specialty Units
PFOA	Perfluorooctanoic Acid
PFOS	Perfluorooctane Sulfonate
PM	Particulate Matter
SCID	Severe Combined Immunodeficiency
soilSHOP	Soil Screening, Health, Outreach, Partnership
SVI	Soil Vapor Intrusion
TA	Technical Assistance
TREC	T-Cell Receptor Excision Circle
VSP	Vessel Sanitation Program
WHO	World Health Organization