

MEETING OF THE BOARD OF SCIENTIFIC COUNSELORS, DEPUTY DIRECTOR FOR INFECTIOUS DISEASES

Centers for Disease Control and Prevention
Tom Harkin Global Communications Center
Atlanta, Georgia

December 4–5, 2019

A one-and-a-half day, open public meeting of the Board of Scientific Counselors (BSC), Deputy Director for Infectious Diseases (DDID), was held on December 4–5, 2019, at the Centers for Disease Control and Prevention (CDC) in Atlanta, Georgia. In addition to Board members and CDC staff, the meeting was attended by representatives of several public health partner organizations and other members of the public (appendix).

The agenda included

- A discussion with CDC Director Robert Redfield
- An update from Jay Butler, Deputy Director for Infectious Diseases
- An update on the ongoing Ebola outbreak in the Democratic Republic of the Congo (DRC)
- Focused discussions on workforce initiatives and vector-borne disease activities
- A proposal for a new BSC Vaccine Confidence Work Group and reports from
 - The Food Safety Modernization Act Surveillance Working Group (FSMA SWG)
 - The Infectious Disease Laboratory Working Group (IDLWG)
 - The Acute Flaccid Myelitis (AFM) Task Force
 - The Vector-borne Diseases (VBD) Workgroup of the BSC, OID¹ and the BSC, National Center for Environmental Health/Agency for Toxic Substances and Disease Registry (NCEH/ATSDR)

Over the course of the meeting, the BSC voted to

- Establish a BSC Vaccine Confidence Work Group
- Approve the FSMA SWG Annual Report for submission to the Secretary, Department of Health and Human Services (HHS)
- Accept and endorse the AFM Task Force report
- Use observations and points to consider from the VBD Workgroup as the basis of BSC recommendations to CDC on prevention and control of vector-borne diseases

¹ The VBD Workgroup was established under the former charter of the BSC, OID (Office of Infectious Diseases), which reflects the previous organizational unit. The Office of Infectious Diseases is now known as Deputy Director for Infectious Diseases.

Opening Remarks

BSC, DDID Chair Ruth Lynfield, State Epidemiologist and Medical Director, Minnesota Department of Health, called the meeting to order and was joined in welcoming participants and facilitating introductions by Jay Butler, CDC Deputy Director for Infectious Diseases, and Sarah Wiley, the Designated Federal Official.

Update from the Deputy Director for Infectious Diseases

Dr. Butler, DDID, provided updates from the three infectious disease national centers and the Center for Global Health (CGH).

Leadership Updates

- **DDID**
 - Wendi Kuhnert-Tallman is Senior Advisor for Laboratory Science.
 - Hilary Eiring is Senior Advisor for Policy and Communications.
 - Emily Mosites is leading a new agency-wide scientific workgroup on homelessness and public health.
- **National Center for Emerging and Zoonotic Infectious Diseases (NCEZID)**
 - Alex Hoffmaster is Branch Chief of the Bacterial Special Pathogens Branch, Division of High-Consequence Pathogens and Pathology (DHCPP).
 - Serena Carroll is the acting Associate Director for Laboratory Science.
 - Cheri Gatland-Lightner is Senior Advisor for Informatics, Office of the Director, NCEZID.
- **National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention (NCHHSTP)**. Hazel Dean, former NCHHSTP Deputy Director, is editor-in-chief of *Public Health Reports*, the official journal of the Office of the U.S. Surgeon General and the U.S. Public Health Service.
- **National Center for Immunization and Respiratory Diseases (NCIRD)**
 - David Wentworth is the Director of the CDC-based World Health Organization (WHO) Collaborating Center for Surveillance, Epidemiology, and Control of Influenza.
 - NCIRD is actively recruiting for an Associate Director for Communications.
- **CGH**. Vikas Kapil is the acting Principal Deputy Director of CGH, succeeding Barbara Marston, who has returned to her position as Associate Director for Science and Program, Division of Parasitic Diseases and Malaria.

President's Budget Request

The fiscal year (FY) 2020 President's budget request for CDC is \$6.594 billion. It includes

- \$140 million for the *Ending the HIV Epidemic* initiative
- \$58 million to address infectious disease consequences of the opioid crisis
- \$49.8 million for global health disease surveillance, continuing CDC's work on global health security
- \$10 million for modernizing influenza vaccines

NCEZID Updates

- **The Antimicrobial Resistance (AMR) Challenge.** The AMR Challenge is a yearlong effort to accelerate the fight against antimicrobial resistance across the globe. On September 23, 2019, HHS Secretary Alex Azar, CDC Director Robert Redfield, NCEZID Director Rima Khabbaz, and hundreds of organizational and global leaders gathered to call for continued global action against AMR at a special event of the United Nations General Assembly. Nearly 350 commitments have been made by governments, non-government organizations, and academic and private sector partners.
- **Release of Antibiotic Resistance (AR) Threats in the United States, 2019 in November (AR Threats Report).** Nationwide prevention efforts implemented after the first AR Threats Report was issued in 2013² have reduced deaths from antibiotic-resistant infections by 18 percent, a 30 percent reduction in deaths cause by antibiotic-resistant infections acquired in hospitals. The 2019 report includes
 - Two new threats classified as “Urgent”: drug-resistant *Candida auris* and carbapenem-resistant *Acinetobacter*
 - An updateable Watch List that specifies pathogens to be closely monitored for increasing resistance and spread
 - Estimates of infection and deaths from healthcare-associated infections calculated using electronic health data from hospitals
- **Reducing HIV and hepatitis transmission via organ transplantation.** CDC and HHS are working with the medical community to develop guidance to enhance safety and efficacy monitoring at transplant centers. The guidance will address the standardization of pre- and post-transplant testing for hepatitis C virus and other bloodborne pathogens, including hepatitis B virus and HIV.
- **Quarantine stations are providing life-saving antimalarial medicine:**
 - As of April 2019, intravenous artesunate—the WHO-recommended global standard for treatment of severe malaria—has replaced intravenous quinidine as the first-line treatment for U.S. cases of severe malaria, following discontinuation of production of quinidine for intravenous administration.
 - However, intravenous artesunate is neither approved by the U.S. Food and Drug Administration (FDA) nor commercially available in the United States.
 - To address this need, 10 CDC quarantine stations are maintaining stocks of artesunate for rapid delivery and dispensing it to patients with severe malaria upon request of healthcare providers.
- **Harmful algal blooms (HABs) that produce dangerous toxins.** CDC is working with state and local partners to respond to an uptick in the number of HAB-related emergencies. In 2019, CDC received \$1 million in federal funding to support state-level HAB surveillance, mitigation, and event response, focusing on states that have declared HAB-related emergencies (Oregon, Florida, and Tennessee).
- **Laboratory support for the e-cigarette, or vaping, product use-associated lung injury (EVALI) outbreak.** 2,172 EVALI cases, including 42 deaths, have been reported to CDC, as of November 13. To support the investigation led by the National Center for Injury Prevention and Control (NCIPC), the Infectious Diseases Pathology Branch, DHCPP, is testing patient samples to learn how the lung injuries may have occurred.

² [Antibiotic Resistance Threats in the United States, 2013](#).

- **Advances in poxvirus vaccination.** The Poxvirus and Rabies Branch, DHCPP, has initiated a phase two trial of a monkeypox vaccine among healthcare workers in the DRC using a lyophilized version of a smallpox vaccine. The lyophilized vaccine is the first FDA-approved non-replicating smallpox vaccine and is the only FDA-approved vaccine for prevention of monkeypox.

NCHHSTP Updates

- **Release of the [2018 STD Surveillance Report](#) in October**
 - The new report found that
 - Rates of chlamydia, gonorrhea, and syphilis are increasing. Contributing factors likely include reductions in state and local STD prevention programs, serosorting among persons with HIV, decreased condom use among vulnerable groups, and increased drug use.
 - Congenital syphilis cases have nearly tripled since 2014, and newborn deaths related to congenital syphilis rose 22 percent from 2017 to 2018.
 - CDC is working with other HHS agencies to develop an STD Federal Action Plan to address and reverse the nation's STD epidemic.
- **Viral hepatitis update.** Cases of acute hepatitis A, hepatitis B, and hepatitis C increased in 2017, due in large part to increased injection drug use and low vaccination rates for hepatitis A and B among at-risk adults, particularly persons experiencing homelessness. Outbreaks of hepatitis A between 2016 and 2019 in 30 states involved 28,000 cases and caused 17,000 hospitalizations and 285 deaths. CDC fact sheets on hepatitis A risk for different audiences are posted on the [CDC website](#).
- **Infectious disease consequences of the opioid crisis.** \$5 million was awarded to CDC in FY 2019 to address infectious diseases associated with opioid use.
 - The award was leveraged with funds from NCHHSTP and NCIPC to increase testing for viral hepatitis and improve linkage to care among people who inject drugs in high-impact settings.
 - Funds were also used to provide technical assistance, monitoring, and evaluation support for syringe services programs.
 - Supplemental awards were made to nine jurisdictions: California, Louisiana, Michigan, New York City, Oregon, Rhode Island, South Carolina, West Virginia, and Washington, DC.
- **HHS Ending the HIV Epidemic initiative.** The goal is a 75% reduction in new HIV infections in 5 years and at least a 90% reduction in 10 years.
 - This goal will be achieved by local teams in each community that implement strategies to
 - **Diagnose** all people with HIV as early as possible
 - **Treat** HIV rapidly and effectively to achieve and maintain viral suppression
 - **Protect** people at risk using proven interventions, including pre-exposure prophylaxis (PrEP) and syringe services programs (SSPs)
 - **Respond** quickly to control HIV outbreaks by getting prevention and treatment services to people who need them

- CDC provided \$13.5 million for state and local planning to end HIV, including
 - \$12 million awarded to 32 state and local health departments to develop comprehensive plans tailored to each community
 - \$1.5 million awarded to the National Alliance of State and Territorial AIDS Directors (NASTAD) for national capacity building
- CDC’s 10-year-old flagship HIV prevention campaign, *Act Against AIDS*, has new partners and resources, as well as a new title: [Let’s Stop HIV Together](#).
- New HIV materials and resources include
 - [Ending the HIV Epidemic](#), *CDC Vital Signs*, March 2019
 - [HIV: Journey to Undetectable](#) (video)
 - Information about SSPs and about vulnerable communities³
 - A redesigned CDC [HIV homepage](#) and a new [HIV Nexus website](#) to help clinicians communicate with patients and caregivers about HIV prevention, screening, and treatment

NCIRD Updates

- **New ACIP (Advisory Committee on Immunization Practices) recommendations**, issued at the June 2019 meeting, include
 - *Human papillomavirus (HPV) vaccine*
 - Catch-up vaccination is recommended for persons up to 26 years of age.
 - Catch-up vaccination is not recommended for adults aged 27-45, because the public health benefit of HPV vaccination in this age group is minimal.
 - Shared clinical decision-making about vaccination is recommended for individuals who might be at higher risk.
 - *Pneumococcal vaccines*
 - PPSV23 vaccine is recommended for all adults ≥ 65 years of age.
 - PCV13 vaccine use in children has led to sharp declines in disease among adults and children.
 - ACIP voted to remove the recommendation for routine PCV13 use among adults aged ≥ 65 years.
 - Shared clinical decision-making about vaccination is recommended for adults ≥ 65 years of age potentially at increased risk for exposure to PCV13 serotypes.
 - *Hepatitis A vaccines*
 - All children 2–18 years old who have not previously received hepatitis A vaccine should be vaccinated.

³ Pitasi MA, Delaney KP, Brooks JT, DiNenno EA, Johnson SD, Prejean J. [HIV Testing in 50 Local Jurisdictions Accounting for the Majority of New HIV Diagnoses and Seven States with Disproportionate Occurrence of HIV in Rural Areas, 2016–2017. MMWR Morb Mortal Wkly Rep](#). 2019;68(25):561–567.

- *Serogroup B meningococcal (MenB) vaccines*
 - Routine booster doses of MenB vaccine are recommended for people with certain medical conditions.
 - A booster dose of MenB vaccine is recommended for those at increased risk during an outbreak, if a year or more has passed since the primary series was completed.
- **Executive Order on Modernizing Influenza Vaccines in the United States to Promote National Security and Public Health.** CDC activities include
 - Expanding vaccine effectiveness monitoring and evaluation
 - Enhancing virus characterization and expanding vaccine virus development for use by industry
 - Increasing genomic testing of influenza viruses
 - Removing barriers to vaccination and promoting vaccination coverage
 - Increasing vaccine confidence
- **Update on seasonal influenza**
 - Influenza activity in the Southern Hemisphere was moderate, with co-circulation of H3, H1, and influenza B viruses.
 - The influenza season in Australia was early, and initial reports of a severe season were likely the result of increases in testing.
 - Influenza A(H3N2) viruses were predominant in Australia, but influenza B viruses were predominant in New Zealand.
 - Australia's influenza season is not always a reliable prediction for the U.S. season.
 - Seasonal flu activity in the United States is increasing, with levels of flu-like illness at or above baseline for 3 consecutive weeks.
 - The flu season has begun in the South and parts of the West, while other parts of the country so far see little flu activity.
 - Seven states and Puerto Rico are experiencing high levels of flu-like illness, and seven states are experiencing moderate levels of flu-like illness.
 - Flu activity mostly involves influenza B viruses, followed by H1N1 viruses and H3N2 viruses.
 - 166 million doses of flu vaccine have been distributed.
 - The online [MedFinder tool](#) can help people find antiviral drugs that work best when administered within 48 hours of symptom onset.
- **Maternal vaccination.** In October, CDC issued an [issue of Vital Signs on protecting mothers and babies through vaccination](#). The majority of mothers-to-be in the United States (65%) have not received the two vaccines recommended during pregnancy to reduce the risk of influenza and whooping cough. Among the 75% of women who received an offer to vaccinate or a referral for vaccination, only 66% accepted.
- **Update on measles.** [Data on annual childhood and kindergarten vaccination rates](#) were released in October.
 - Although nationwide vaccination coverage remains high, 32 states have less than 95% coverage with measles vaccine, and pockets of under-vaccination remain.

- The nearly year-long outbreak in Upstate New York and New York City has come to an end, after nearly ending the United States' measles elimination status. The outbreak underscored the need for CDC's *Vaccinate with Confidence* initiative (see page 35).
- **Service to America Medal.** Daniel B. Jernigan, Director, NCIRD Influenza Division, has received the [2019 Samuel J. Heyman Service to America Medal for Science and Environment](#).
- **Upcoming events**
 - ACIP's updated immunization schedules will be published in February.
 - The CDC *Waterborne Disease Burden Report*, including data on norovirus and Legionnaires' disease, will be issued in late winter or early spring.
 - National Infant Immunization Week 2020 will take place from April 25 to May 2.
 - The National Immunization Conference will take place on May 19–21.

CGH Updates

- **Release of the [United States Government Global Health Security Strategy](#) in May.** The new *Strategy* reinforces the [U.S. Government's commitment to the Global Health Security Agenda](#) (GHSA) and to GHSA 2024.
 - The *Strategy* is organized around three goals: strengthened partner country global health security (GHS) capacities, increased international support for GHS, and a homeland prepared for and resilient against GHS threats.
 - New technical priorities include the following: national legislation, policy, and financing; food safety; emergency preparedness; risk communication; and border health security.
 - Partner countries for FY 2020 include the 17 former Phase 1 countries (Bangladesh, Burkina Faso, Cameroon, Cote d'Ivoire, Ethiopia, Guinea, India, Indonesia, Kenya, Liberia, Mali, Pakistan, Senegal, Sierra Leone, Tanzania, Uganda, and Vietnam), plus the Democratic Republic of the Congo and Nigeria.
- **Outbreaks of circulating vaccine-derived polioviruses (cVDPVs).** As of November 14, 93 cases of cVDPVs have been reported in 14 countries. These outbreaks, which occur in communities where immunity levels are low, represent a threat to polio eradication. CDC has scaled up its polio response by deploying 75 additional technical experts to affected countries and to countries at risk. CDC is also assisting the two remaining polio-endemic countries, Afghanistan and Pakistan.
- **Measles outbreak in Samoa.** The Government of Samoa has declared a state of emergency to address a measles outbreak that has caused nearly 4,000 illnesses and 55 deaths. CDC and the U.S. Agency for International Development (USAID) are assisting the Samoan Ministry of Health with the outbreak response, joining colleagues from Hawaii, Australia, New Zealand, French Polynesia, the United Kingdom, Japan, Norway, and Médecins Sans Frontières (MSF). A CDC response team has also deployed to WHO and UNICEF Offices in Fiji.
- **Multiplex testing of samples from the Nigeria HIV impact survey**
 - Through PEPFAR, CDC has supported large, population-based surveys to assess the impact of HIV programs, in terms of HIV prevalence and viral suppression.
 - A large survey underway in Nigeria focuses on the health of children and women of reproductive age. It involves multiplex testing for a range of infections in addition to HIV, including neglected tropical diseases and foodborne and waterborne diseases.

- The results will inform public health programs on immunization and malaria prevention.
- **Ending global tuberculosis: the rationale for TB preventive treatment**
 - Ending the TB epidemic requires a comprehensive epidemic response strategy that includes
 - Finding and treating active TB cases
 - Reducing the reservoir of TB infection through TB preventive treatment (TPT) of persons with latent TB
 - PEPFAR initiated efforts to accelerate TPT in 2017 and is committed to providing TPT to nearly 5 million people living with HIV by the end of 2020. As part of this effort, CDC is helping countries conduct baseline assessments of TB and latent TB, issuing a *TPT Implementation Toolkit and Operational Guide*, raising global awareness about the importance of TPT, providing technical assistance and training, and creating and sustaining public health partnerships.

In conclusion, Dr. Butler reviewed the priorities of the [CDC Strategic Framework](#)—securing global health and domestic preparedness, eliminating diseases, and ending epidemics—and described CDC as a unique agency with a unique mission: working 24/7 to protect the safety, health, and security of Americans.

Discussion

PrEP as a Component of the *Ending the HIV Epidemic* Initiative

CDC continues to reach out to primary care providers to promote the use of PrEP for those at risk of HIV infection. Jonathan Mermin, NCHHSTP Director, noted that physicians are becoming more comfortable with prescribing PrEP, which is both effective (99%) and safe. When PrEP was first available, most prescriptions were for health workers at occupational risk. Today, however, PrEP is more commonly prescribed for people in the community.

Addressing the STD Epidemic

BSC members commented that

- **It is important to integrate the HIV initiative with expanded STD services.** Addressing STDs is a critical component of the *Ending the HIV Epidemic* initiative, because persons infected with STDs are at increased risk of contracting HIV. Dr. Mermin noted that CDC has initiated pilot programs at three sites where patients are screened twice a year for both HIV and STDs. Another approach would be to expand SSP services to include STD services, to reach those at risk of both HIV and STDs.
- **Some jurisdictions lack sufficient field investigators to respond to the increasing number of cases of syphilis and other STDs.** Dr. Mermin said that this issue will likely be addressed in the HHS STD action plan, which is currently under development. Ideally, states and localities should expand STD clinics, both to address treatment needs and to advance STD prevention. In practice, however, the burden of STDs is greater than the resources, and most local jurisdictions must prioritize.

Global Health Security

- Rebecca Martin, CGH Director, stressed that CDC aims to help build infrastructure for outbreak preparedness by strengthening national capacities for laboratory-based disease surveillance and public health management. The ultimate goal is for all countries to establish CDC-like public health institutions.

- Dr. Butler observed that the ongoing discussion around GHS is a good reflection of the renewed recognition that infectious diseases do not recognize borders.

CDC Workforce Task Force Report

Leslie Dauphin, Deputy Director, Office of Laboratory Science and Safety, and Jason Bonander, Deputy Chief Information Officer, Office of the Chief Information Officer, reviewed the accomplishments of the CDC Workforce Task Force.

Challenge and Charge

- Public health is under a state of constant transformation, due to changing demographics, innovations, and automation that impact the workforce and workplace. At the current time, CDC faces risks related to workforce planning, recruitment, and loss of institutional knowledge through the retirement of key personnel.
- The CDC Workforce Task Force was established in January 2019 to develop a strategy and implementation plan for creating the CDC workforce of the future. The Task Force was charged with identifying workforce-related gaps, essential skills for the future, and opportunities to enhance recruitment and retention and to retrain the CDC workforce.

Vision

Between January and April 2019, the Task Force developed a *CDC Future of Work* vision to guide the development of the workforce strategy. The Task Force

- Conducted interviews with staff members, including internal and external subject matter experts (SMEs) and CDC leaders, reviewed workforce data, and identified organizations that might provide insight about transformative workforce practices
- Created a Workforce Analytics Working Group and a Laboratory Workforce Working Group and established five “Tiger Teams” to meet with CDC stakeholders and develop recommendations
- Conducted an environmental scan to identify trends that will impact CDC’s work in the future. The scan included a CDC literature review, case studies and benchmarks, interviews with SMEs, and research on disruptive trends and leading practices.

Strategic Framework

The Task Force developed a strategic framework for the CDC workforce of 2030—with Primary Work Segments, Enabling Functions, and Critical Success Factors—and used feedback from experts in other government agencies, academia, and the private sector to develop the following:

- Four Objectives:
 - Prioritizing workforce functions and designing skills and jobs for planning activities
 - Assessing the current state of workforce competencies and the agency’s abilities to recruit and retain them
 - Developing a workforce plan to access, engage, retain, and equip talent based upon current and future needs
 - Assisting with initial *Future of Work* success factor implementations and answering workforce data questions

- Six Milestones, to be implemented by the Tiger Teams:
 - Defining agency-wide professional, leadership, and data fluency skills
 - Developing tools and recommendations for talent access
 - Developing an employee recruitment and sourcing plan
 - Developing and managing a stakeholder engagement plan
 - Creating initial job profiles for initial future workforce segments (e.g., Data Science/Informatics)
 - Developing an agency-wide development (retooling), engagement, and retention plan

CDC Workforce Plan of the Future

The work products developed by the Tiger Teams will be compiled in a *CDC Future of Work Guide* and a *CDC Workforce Implementation Plan*, which together will form the *CDC Workforce Plan of the Future*.

- The *Guide* will include Essential Professional and Leadership Skills, Essential Data Fluency Skills, Job Profiles for Work Functions of the Future, Tips and Tricks for Assessing Talent, Learning Pathways for Entry-Level Supervisors, and Management Guides for Engaging Your Teams and Retooling.
- The *Implementation Plan* will address activities for Retooling the Workforce; Accessing Talent; Recruiting and Sourcing; and Engagement, Development, and Retention of the Workforce.

Essential Data Fluency Skills

- As part of achieving the first milestone—*Defining agency-wide professional, leadership, and data fluency skills*—the Task Force designated “Data-Savvy Workforce” as a Critical Success Factor and recommended these sequential action steps:
 - Identify priority data and analytics skills desired for a majority of employees, use robust systems to assess current skills, and determine what is needed in the future
 - Upgrade the data science, informatics, and information technology capabilities of CDC’s current workforce to keep pace with the fast-changing fields of data science and analytics
 - Assess alternative mechanisms for accessing specific skill sets in data and analytics to complement skill sets internally
- The Task Force identified and defined agency-wide data fluency skills as Data Acumen; Critical Thinking; Information Sharing; Data Ethics; and Data Security, Privacy, Confidentiality, and Utility. The Task Force developed five levels of proficiency in each skill, from Basic to Expert.

Job Profiles for the CDC Scientists of the Future

- The Tiger Teams built job profiles for each primary workforce segment for inclusion in the *CDC Future of Work Guide*. For the workforce segment on Data Science/Informatics, for example, the *Guide* includes a two-page job profile for three “Associated Essentially Human Functions”: Data Analytics and Modeling, Public Health Integration (Epidemiology), and Data Architecture and Information Science.
- The first page of each job profile lists qualifications, including education, certifications, experience with teamwork, and experience with technologies. The second page lists essential data science/informatics skills, with proficiency levels, and other relevant competencies.

Next Steps

Next steps for implementation of the *CDC Workforce Plan of the Future* and adoption across the agency include

- Providing supervisors with the resources to
 - Equip employees with critical skills and engage their teams
 - Build leadership capabilities to facilitate implementation and transform the CDC Human Resources Office (HRO)
- Providing HRO with new technologies and innovative training and development to enable HRO employees to focus on strategic activities and enhance hiring experiences
- Implementing agency-wide activities to engage, retool, and retain the workforce

Questions for the BSC

- Are members facing workforce-related challenges at your respective institutions due to similar disruptors (e.g., shifts in public health, technology, generational changes)? If so, what are your approaches to address these challenges?
- Please share any ideas for sources/avenues/pathways for recruitment of data scientists.

Discussion

BSC members suggested that

- Communications and community engagement skills are essential to gain community trust, respond to outbreaks, and address vaccine hesitancy.
- CDC might consider
 - Making its workforce more representative of the communities it serves
 - Ensuring that public health workers are trained in fieldwork, which is needed to address zoonotic and vector-borne diseases
 - Developing a CDC job description for a person with legal expertise who can flag legal and ethical issues involved in sharing data sets and think strategically about the development of data-sharing processes and tools
 - Working with partners to address the clinical laboratory workforce shortage
 - Sharing workforce development tools developed by the Task Force with state and local public health partners
- Strategies for improving data science skills at CDC might include
 - Hiring data scientists to work at CDC for 1 or 2 years and continuing the connection after the scientist leaves. The business sector has developed “exit tools” for retaining skills as data scientists move in and out of jobs.
 - Keeping up with data tools and systems to attract young data scientists who wish to work with the most up-to-date technologies
 - Emphasizing the CDC mission when recruiting new employees. Participating in activities that protect the nation’s health may be more important to young scientists than high salaries.

- Encouraging data scientists to develop innovative ways to use Big Data for public health purposes

BSC members also noted that

- Graduates of the Epidemic Intelligence Service and the Council of State and Territorial Epidemiologists (CSTE) Applied Epidemiology Fellowship are an important source of hires at the state and local level.
- State-level approaches to increasing the workforce in whole genome sequencing (WGS) and bioinformatics currently include
 - Hiring graduates of the APHL (Association of Public Health Laboratories)/CDC Bioinformatics Fellowship
 - Partnerships with universities and academic institutes to equip graduate students with expertise in both public health and bioinformatics
 - Encouraging the retraining of existing staff by
 - Helping employees think about advancing their careers over the long term
 - Offering employees training that enhances job satisfaction and encourages retention

Conversation with Robert Redfield, CDC Director

CDC Director Robert Redfield welcomed the BSC members and responded to questions and comments on topics of interest to the BSC members.

Quality of Science Writing

- Comment: Although public health communication from CDC to the public has been generally improved, some journal articles and slide presentations could use enhancement.
- Dr. Redfield requested that BSC members send him examples of poor writing that he can use as teaching tools.
- Dr. Mermin noted that the quality of CDC manuscripts generally benefits from a team approach that helps capture mistakes and provide thoughtful interpretations of data. However, efforts to make the clearance process faster may sometimes allow mistakes to slip through.

Vaping Outbreak

- Comment: CDC, CSTE, and state partners continue to advance the EVALI investigation. This epidemic illustrates the need to be prepared to detect and respond to new and emerging health threats.
- Dr. Redfield recalled that he had suggested activating the EOC when the vaping outbreak first began. Although the cause was not infectious, the outbreak involved severe illness in young people.
- Prior to the outbreak, Dr. Redford spoke with former FDA Director Scott Gottlieb about the increased use of e-cigarettes by young people. More than 6 million children under the age of 18 are using these products.
- More recently, the two issues—vaping that causes lung injury and the increased use of e-cigarettes by teenagers—have sometimes been conflated, although they are separate problems, requiring different solutions. Dr. Redfield suggested that flavored e-cigarettes should be taken off the market,

unless it can be shown that use of e-cigarettes is safe (i.e., does not lead to addiction) and has public health benefit (i.e., prevents addiction to other substances).

Public Health Funding

- Comment: The CDC budget has decreased since 2018 and may decrease further in FY 2020.
- Dr. Redfield noted that
 - The Congressional appropriation to CDC in FY 2019 exceeded the President's Budget Request for FY 2019.
 - The United States is under-invested in public health.
 - The CDC Office of the Director is reviewing the authorizing language for Congressional appropriations to ensure that CDC has flexibility to address new health threats as they arise.
 - CDC is pursuing core capabilities for data, laboratory diagnostics, workforce, emergency response, and global health security and domestic preparedness (see below).

HIV and STDs

- Comment: It is important to target HIV and STDs jointly.
- Dr. Redfield noted that
 - The goal is to end HIV in America by 2030. NCHHSTP has developed an HIV incidence map to target HIV prevention and control efforts. This is not an aspirational goal, but it will require focus.
 - Addressing STDs requires rebuilding our resources, by investing in STD prevention and re-integrating STD care into primary care. This effort will require long-term strategies for support and training.

Infectious Disease Priorities

- Dr. Redfield identified global health, HIV, and data modernization as major priorities for CDC. Other priorities include reducing STDs, improving vaccine confidence, advancing vector control, and addressing antimicrobial resistance. These efforts require collaboration with private sector partners with expertise in family medicine, pediatrics, adolescent medicine, and primary care.
- The data modernization initiative will allow CDC to move forward in such areas as predictive analysis and metagenomic diagnostics.
- Enhancing global emergency preparedness is a core CDC mission. A major aim is to establish 8 to 12 fully equipped CDC offices around the world by 2030. Addressing antimicrobial resistance is also a critical area for public health diplomacy and advocacy.

Future Goals

- Dr. Redfield emphasized that over the long term our current *disease system* should be transformed into a *health system* that
 - Emphasizes prevention
 - Prioritizes conversations between clinicians and patients about vaccines, drug addiction, and behavioral risk factors for infectious diseases

- Re-integrates care for HIV and STDs into primary care, so that the stigma associated with these diseases is reduced
- As a first step, it is important to articulate a vision of a health system guided by incentives for maintaining health instead of reimbursements for treatment of disease.

Dr. Redfield expressed his appreciation and requested feedback and follow-up from BSC members. He concluded by stating that there is no more important societal cause than to invest in public health.

Due to technical difficulties, a question from a BSC member who participated by phone was not communicated to Dr. Redfield. The BSC member later provided his question in an email that was shared with Dr. Redfield's office:

This is a question about national and global health security. Global warming/climate change is at the top of the WHO's list of global threats to health due to the health impacts of extreme weather including typhoons, hurricanes, floods, droughts, heat waves, expansion of vector borne diseases, food insecurity, sea level rise, mass migration, mental health impacts, and more. The recent version of our own US Government multi-agency report, the 4th National Climate Assessment, describes climate change as a major threat to domestic health and our economy through its effects both at home and abroad.

Why is global warming not a global health security priority? Given the overarching threat that climate change presents by virtue of multiple causal pathways that cause a variety of adverse health impacts, shouldn't this be a major, highly visible priority for CDC's domestic and global agenda? When will we have a *Vital Signs* issue on the health impacts of climate change?

During the meeting, Dr. Butler, Deputy Director for Infectious Diseases, responded that

- Vector-borne disease and harmful algal blooms are good examples of the association between climate and health—a cross-cutting issue that affects many aspects of public health.
- It is important that public health studies continue to document how changes in climate impact the distribution and spread of specific infectious diseases.

Food Safety Modernization Act Surveillance Working Group Report

The goal of the FSMA SWG is to provide advice and recommendations regarding the improvement of foodborne illness surveillance to the HHS Secretary (through the Board of Scientific Counselors, DDID, CDC) in the areas of

- Governmental coordination and integration
- Evaluating and improving surveillance systems
- External stakeholder collaboration and communication

Tim Jones, State Epidemiologist, Tennessee Department of Health, and FSMA SWG chair, reported on the FSMA SWG meeting held on December 2–3 and on the draft Annual Report to the HHS Secretary.

December 2–3 FSMA SWG Meeting

WGS Implementation

- In many jurisdictions, WGS implementation has led to the identification of two or three times as many disease clusters, increasing the need for epidemiologic resources and staff.
- Once WGS implementation is complete, all surveillance for enteric diseases will be accomplished with a single, cost-efficient method. Data on serotyping, virulence, and antimicrobial susceptibility testing will be derived from the pathogen's genomic sequence.
- Next steps include finalizing allele codes for *Salmonella* and *Escherichia coli*, updating genotyping databases for resistance and virulence genes, and prevention of reoccurring, emergent, and persistent strains (REPs). Examples of REPs include
 - *E. coli* O157 related to romaine lettuce in the Yuma region
 - Transmission of highly resistant *Shigella* within the MSM community
 - Resistant *Salmonella* Newport associated with beef
 - Extended-spectrum beta-lactamase (ESBL) resistant *Salmonella* Infantis

REP prevention activities involve animal industry surveillance, pre-harvest interventions, and vaccine development.

Population Surveys

- Population surveys are an important source of data about food consumption. Data from these surveys can help outbreak investigators generate hypotheses about sources of food contamination.
- Although past surveys have taken about 5 years to plan, contract, implement, and analyze, CDC is considering whether it would be more effective and cost-effective to conduct these studies on an annual or rolling basis.
- Annual surveys could provide timely data for priority analyses (e.g., of disease burden, exposures, care-seeking behaviors, and food preferences) and provide flexibility to add questions as problems arise.

Strategic Assessment and Program Enhancements

- The CDC Division of Foodborne, Waterborne, and Environmental Diseases (DFWED) has created several cross-divisional entities to coordinate its disease prevention, surveillance, and investigation activities:
 - The Prevention Office, which manages policy development, partnerships, and prevention activities
 - The Office of Program Support, Coordination, and Implementation, which provides administrative support for capacity building, project site visits, and planning and implementation of meetings and conferences (e.g., the [Integrated Foodborne Outbreak Response and Management \[InFORM\] Conferences](#))
 - The Surveillance, Information Management, and Statistics Office, which is responsible for streamlining data systems and networks
- Future DFWED activities will focus on
 - Using WGS to improve surveillance for antimicrobial resistance

- Understanding the impact and sources of REPs
- Addressing the long-term challenge of culture-independent diagnostic tests (CIDTs)
- Integrating waterborne disease activities into foodborne disease platforms
- Translating foodborne disease data into prevention policies and practices

FY 2019 Annual Report

- The FSMA SWG is charged with providing “the [HHS] Secretary, through at least annual meetings of the working group *and an annual public report*, advice and recommendations on an ongoing and regular basis regarding the improvement of foodborne illness surveillance . . .” *Public Law 111-353 Sec. 205 (a) (2).*
- The proposed timeline for the FY 2019 Annual Report includes completion of the report in November; BSC review and comment in December; BSC endorsement at the December BSC meeting (see below); and submission to the HHS Secretary in January 2020.
- The FY 2019 Annual Report includes an introduction, a discussion of key topics, a discussion of resources, a section on Next Steps, and a list of FSMA SWG members. Key topics include the following: CDC Foodborne Illness Surveillance Data Systems and Strategies; Interagency Food Safety Analytics Collaboration (IFSAC) Activities and Analytic Approaches; CDC and FDA Updates on Recent Produce Outbreaks; Challenges and Opportunities of WGS for Illness Detection and Response; Water as a Food Safety Program: “The Water We Eat”; and Updates on CDC Foodborne Disease Surveillance Activities.
- The FY 2019 Annual Report includes these points for consideration:
 - Continue public health infrastructure improvements related to electronic systems, laboratory resources, and epidemiologic capacity
 - Improve data collection and analysis to support investigations, including trace-back and trace-forward investigations
 - Address the challenges and opportunities of WGS
 - Improve national and state capacity for environmental and water-related foodborne disease investigations
 - Focus on collection and analysis of actionable data
 - Increase data-sharing with industry and regulatory partners
 - Enhance public communication about foodborne diseases

Future Topics and Directions

Potential future topics for FSMA SWG include

- Food safety challenges related to imported foods and globalization of the food supply
- Update on REPs
- Update on pre-harvest issues
- Non-enteric foodborne diseases
- Academic and industry partnerships to prevent foodborne disease
- Update on the [Integrated Food Safety Centers of Excellence](#)

Discussion

REPs and Data-Sharing

- Pathogens may persist in the environment (e.g., *E. Coli* O157 associated with lettuce) or persist within a community due to ongoing low-level person-to-person transmission (e.g., STDs).
- Some foodborne pathogens may reappear from time to time in association with a particular food product.
- Rob Tauxe, DFWED Director, noted that
 - When a foodborne strain is traced back multiple times to the same region, investigators try to determine its ecologic roots or “home.”
 - Historically, CDC’s outbreak investigations typically traced contamination events that occurred during food processing or other “downstream” processes. However, REPs usually involve “upstream” or “pre-harvest” issues. To prevent outbreaks caused by REPs, CDC must work with additional partners, such as the Animal and Plant Health Inspection Service, U.S. Department of Agriculture (USDA); the animal production industry; and the producers of animal vaccines.
 - These partners may be unaware of a given problem involving REPs or may be aware but not sure how to respond. An effective response is likely to require a joint effort by CDC and animal production industry partners (e.g., to answer such questions as whether to inoculate a *Salmonella*-infected chicken flock with strain-specific vaccines on a rotating basis).
- Dr. Jones said that CDC and industry partners are trying to resolve issues that prevent them from sharing WGS data on human and animal pathogens.
- John Besser, Deputy Chief, Enteric Diseases Laboratory Branch, DFWED, added that
 - WGS data are revealing the complexity of life and how it changes over time at the molecular level.
 - The public health community must learn how to use and interpret Big Data, especially if WGS data from CDC and industry partners are eventually merged into a single data set.

Future Issues

- BSC members identified these issues for consideration by the FSMA SWG:
 - Staffing challenges at state and local health departments due to greater detection of disease clusters by WGS or CIDTs
 - Maintaining laboratory capacity to conduct reflex cultures when CIDT results are positive
 - Laboratory challenges due to slower turnaround times when WGS-based diagnostics replace serotyping tests
 - The international aspects of food safety
 - Food safety collaborations between the Public Health Agency of Canada (PHAC) and CDC

BSC Action: On the following day, December 5, 2019, the BSC unanimously passed a motion to approve the FY 2019 FSMA SWG Annual Report to the HHS Secretary.

Public Comments

Phone lines were opened for public comments at 4:59 PM on December 4. No comments were made.

Ebola Outbreak in the Democratic Republic of the Congo, 2018–2019

Henry Walke, the Ebola Response Incident Manager, provided an overview of the Ebola virus disease (EVD) outbreak in the DRC, which has caused 3,313 cases of illness, 2,206 deaths, and 162 healthcare worker infections. The outbreak is occurring in a security-compromised zone in an area of heavy cross-border movement. It is one of the largest Ebola outbreaks that has occurred anywhere in the world, second in size only to the 2014–2016 outbreak in West Africa.

Timeline

- The DRC Ministry of Health (MOH) declared an outbreak of Ebola on August 1, 2018.
- In mid-August, CDC staff deployed to the North Kivu province to assist in response efforts.
- The outbreak spread quickly, surpassing 1,000 cases by March 30, 2019.
- By April 2019, more than 100,000 people in affected areas had been vaccinated against Ebola.
- In June 2019, an imported case of Ebola was reported by the Uganda MOH, and in July 2019 a case of Ebola was reported in the city of Goma, the capital of the North Kivu province.
- In August 2019, a year into the outbreak, research findings from the PALM trial⁴ demonstrated that two investigational Ebola treatments are highly effective against Ebola virus (*Zaire ebolavirus*).
- On August 29, 2019, the outbreak surpassed 3,000 cases; by October 4, 2019, there were 1,000 survivors.

Current Status

- Although the epi curve suggests that the outbreak is waning, the risk of resurgence is high, due to movement by infected individuals and to security issues that prevent contact-tracing.
- EVD has been spread by individual travelers, including an infected motorcycle driver whose job was to transport patients to hospitals. A local resurgence also occurred when the body of a person who died from undiagnosed EVD was transported through border health checkpoints.
- The epi curve from the 2014–2016 Ebola outbreak in Guinea exhibited a long tail, with sporadic cases occurring for some months, due in part to disease transmission from survivors to sexual partners. Cases of sexual transmission may be fewer in the DRC, due to vaccination.

CDC's Response Role

- CDC activated its Emergency Operations Center on June 13, 2019 to support the Ebola response.
- CDC staff have provided the DRC MOH with technical assistance in disease tracking, case investigation, contact-tracing, infection prevention and control, ensuring safe burials, community

⁴ Mulangu S, Dodd LE, Davey RT Jr, et al. A Randomized, Controlled Trial of Ebola Virus Disease Therapeutics. *N Engl J Med*. 2019;381(24):2293–2303. doi:10.1056/NEJMoa1910993.

engagement and social mobilization, risk communication and health education, laboratory testing, border health issues, vaccination, data management, and logistics.

- 335 CDC staff have participated in 536 deployments to the DRC and neighboring countries. Due to security concerns, however, most CDC staff are not located near the outbreak area.
- As during the response in West Africa, CDC deployments occur on a short-term, rotating basis. More French-speaking responders are needed.

Vaccination

- Over 255,000 persons have received the rVSV Zaire Ebola virus vaccine (a single-dose, live vaccine). The vaccine has been offered to EVD case contacts and contacts-of-contacts through a ring-vaccination strategy. It has also been offered to frontline healthcare workers.
- In the United States, ACIP is considering recommendations for pre-exposure vaccination of at-risk occupational groups.

Therapeutics

- Preliminary results indicate that treatment with the experimental therapeutics REGN-EB3 and mAb114 increases survival rates by 70–90%.
- The U.S. Government is currently the only source of REGN-EB3 and mAb114, which are made by U.S. companies.
- Use of REGN-EB3 and mAb114 for post-exposure prophylaxis is under consideration. Due to supply issues, the current priority is treatment.

Community Engagement and Social Behavioral Health

CDC partnered with the Red Cross to collect information about community attitudes about outbreak responders, Ebola vaccines, and other aspects of the response. This information is the basis of an FAQ document that includes the 25 most frequently asked questions.

Outbreak Modeling

Infectious disease modeling studies estimate that at least 65% of Ebola cases must be isolated to reduce transmission and end the outbreak.

Outlook

Ongoing efforts to “get to zero” focus on continued vigilance, operational research, and strengthening Congolese response capacities.

Discussion

Response Partnerships

CDC is assisting the DRC MOH, in collaboration with WHO, MSF, and other partners. PHAC has deployed French-speaking epidemiologists and played a major role in strengthening the DRC incident management system.

Domestic Readiness

- The United States is prepared to detect, transport, isolate, and treat domestic cases of Ebola. However, the risk of importation is very low:
 - There are no direct flights between the DRC and the United States.
 - Ebola screening is in place at airports in Goma and affected areas, and contracts are in place to increase airport screening as needed.

Note: BSC members returned to this topic later in the meeting. In regard to monitoring travelers returning to the United States from the DRC, Nancy Messonnier, NCIRD Director, stressed the lack of direct air flights and noted that CDC has a contingency plan that includes vaccination and can be activated if necessary.

Therapeutics

- Patients who receive the new Ebola treatments and persons who are vaccinated within 2 days of symptom onset are more likely to survive. However, getting treatments to the community is difficult, due to security issues, and a shift in survival rates (which are difficult to measure) has not been observed. The proportion of infected people isolated early has generally increased, although it worsens from time to time as new clusters occur.
- Use of REGN-EB3 and mAb114 for post-exposure prophylaxis is not feasible at the current time, due to costs and lack of supplies. The HHS Biomedical Advanced Research and Development Authority (BARDA) is working to increase the manufacture of the new treatments.
- Debra Birnkrant, Director of the Division of Antivirals, FDA Center for Drug Evaluation and Research, reported that FDA is working closely with companies to expedite product review of Ebola treatments and vaccines.

Johnson & Johnson Ebola Vaccine

- A new Ebola vaccine developed by Johnson & Johnson has been approved by WHO for use in the DRC.
- The U.S. Government did not favor using this vaccine, because deployment of a second vaccine could increase community concerns and because this vaccine must be provided in two doses, 56 days apart.
- The rollout of the new vaccine is going well, with about 60–100 people enrolled in a vaccine protocol study. An initial plan to use retinal scans to track enrollees who received the first dose was not successful; the current effort involves taking pictures of vaccinated persons and sending text messages when the second dose is due.

Other Vaccination Issues

- Because motorcycles are often used as ambulances, an effort to vaccinate motorcycle drivers in high-risk areas is underway.

- The possible use of Ebola vaccines as a preventive measure, once the outbreak is over, might not be practical, because of the size of the DRC population.⁵ This question might be addressed later this year, taking into account
 - The need to balance the costs of prevention and of outbreak response
 - The likelihood of Ebola re-emergence from an animal reservoir
 - The duration of the protection the vaccine provides. Thus far, protection has been documented to last for 2 years.

Security Issues

- Coordinated attacks in two places last Wednesday night killed a group of outbreak responders; policemen charged with protecting responders have also been killed. A line has been crossed when responders are targeted and local police are unable to protect them.
- CDC has pulled its contractors from the field, and response activities are no longer taking place in some affected areas.

Research Issues

- A study in Liberia is evaluating the frequency of mild or asymptomatic cases of Ebola.
- Improving access to Ebola isolates for research scientists is an area of active discussion.
 - The Institut National pour la Recherche Biomedicale (INRB) has an agreement with the DRC MOH to collect and analyze Ebola strains.
 - A pre-fabricated molecular diagnostic laboratory is being built in Goma, with support from USAID. CDC is providing technical assistance as requested.
 - More than 100,000 samples have been collected. Potential access to and use of samples are not yet known.

Measles Outbreak in the DRC

- Measles has spread rapidly across the DRC. At the current time, more people in the DRC are dying of measles than Ebola.
- Public health campaigns are underway to address measles through vaccination and provide other health benefits to children. However, community concerns about Ebola are paramount, and misconceptions about Ebola vaccines have affected the acceptance of vaccines against measles.

Vector-Borne Disease Prevention and Control Update

Lyle Petersen, Director, NCEZID Division of Vector-Borne Diseases (DVBD), reported that

- Tickborne diseases have increased significantly, from about 20,000 case counts in 2004 to nearly 60,000 in 2017.
- The incidence of mosquito-borne diseases varied annually between 2004 and 2018, with a large increase in 2016, due to the Zika outbreak.

⁵ The three currently affected DRC provinces include 15 million people; the total population is about 87 million.

- Among arboviral diseases, West Nile neuro-invasive disease has by far the highest incidence each year. The highest number of Eastern equine encephalitis virus (EEEV) cases ever recorded occurred in 2019.
- As described in the 2003 National Academy of Sciences report *Microbial Threats to Health*, drivers of disease emergence that affect VBDs include changes in climate and weather, changing ecosystems, economic development and land use, human demographics and behavior, technology and industry, and international travel and commerce.

Vector-Borne Diseases as a National Priority

- The 2019 [CDC Strategic Framework](#) includes vector-borne diseases as a priority for domestic preparedness.
- An assessment of the impact of climate change on human health issued by the U.S. Global Change Research Program⁶ documents the changing geographical and temporal distributions of disease vectors and vector-borne diseases—including northward range expansion and earlier tick activity—and the emergence of new vector-borne pathogens. The assessment concludes that
 - Climate change is having wide-ranging health impacts.
 - Understanding climate, ecology, and epidemiology is critical for predicting and averting epidemics of infectious diseases.
 - Preparation to prevent, mitigate, and adapt to emerging infectious disease threats related to climate change should include
 - Continued investment in disease surveillance to track disease trends
 - Maintenance of strong national public health capacities to detect, report, and respond when diseases occur in new areas
 - Development of decision-support tools and adaptation strategies
 - An investment in environmental data collection and disease/climate modeling efforts applicable to future climate scenarios

HHS Tick-Borne Disease Working Group

- The aim of the HHS Tick-Borne Disease Working Group (TBDWG) is to “provide expertise and review all efforts within the Department of Health and Human Services related to all tickborne diseases, to help ensure interagency coordination and minimize overlap, and to examine research priorities.” The Work Group includes clinicians, patients, patient advocates, public health professionals, and research scientists.
- The 2018 [TBDWG Report](#) covered Vectors, Surveillance and Prevention; Pathogenesis, Transmission and Treatment; Testing and Diagnosis; Vaccine and Therapeutics; and Other Tick-Borne Diseases and Coinfections; Access to Care and Support to Patients.
- The 2020 TBDWG Report will cover Tick Biology, Ecology, and Control; Pathogenesis and Physiology of Lyme Disease; Clinical Aspects of Lyme Disease; Alpha-gal allergy; Babesiosis and Tick-Borne Viruses; Ehrlichiosis and Anaplasmosis; Rickettsiosis; and Training and Education.

⁶ Beard CB, Eisen RJ, Barker CM, Garofalo JF, Hahn M, Hayden M, Monaghan AJ, Ogden NH, Schramm PJ. 2016: Ch. 5: Vectorborne Diseases. [The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment](#). U.S. Global Change Research Program, Washington, DC, 129–156.

- The first TBDWG report to Congress, in November 2018,
 - Identified substantial gaps in knowledge in pathogenesis, diagnosis, and treatment of tickborne diseases (TBDs) and made recommendations for research
 - Identified challenges in patient access to care and recommended that the processes by which patients are diagnosed and treated be made less burdensome
 - Concluded that the government must lead future research and recommended that
 - NIH create a tickborne disease strategic plan
 - The federal government increase support for research on tickborne diseases
 - Concluded that additional education on TBDs is needed for clinicians and patients
 - Recommended that TBD activities be conducted in a transparent way that facilitates stakeholder involvement and protects the rights of TBD patients

Pending Legislation: The Kay Hagan TICK Act

Senators Susan Collins (R-ME) and Tina Smith (D-MN) are co-sponsoring a bill entitled the Kay Hagan *Ticks: Identify, Control, and Knockout* (TICK) Act, in memory of Senator Kay Hagan (D-NC), who died in October of Powassan virus disease. The bill's provisions include

- Coordinating and developing a national strategy for vector-borne diseases that integrates efforts by HHS, the Department of Defense, USDA, the Environmental Protection Agency, the Department of Interior, the Department of Veterans Affairs, and the Department of Homeland Security
- Re-authorizing the Vector-Borne Disease Regional Centers of Excellence, providing \$10 million per year from FY 2021 to FY 2026
- Enhancing capacity to address vector-borne diseases, authorizing an additional \$20 million per year to support grants to health departments from FY 2021 to FY 2026

Domestic Framework for Vector-Borne Disease Prevention and Control

- The *National Domestic Framework for Vector-Borne Disease Prevention and Control in the United States* was completed in April 2019, was cleared within HHS, and is currently under review by other departments. Components include
 - **Mission:** A nation where vector-borne diseases no longer threaten human health and well-being
 - **Vision:** Protect people from illness, suffering, and death due to vector-borne diseases
 - **Goals:**
 - Understand when, where, and how people are exposed to and get sick or die from vector-borne diseases (*Increase/Improve Understanding*)
 - Develop, evaluate, and improve tools and guidance for the diagnosis and detection of vector-borne diseases (*Detect & Diagnose*)
 - Develop, evaluate, and improve tools and guidance for the prevention and control of vector-borne diseases (*Prevent & Control*)
 - Develop and assess drugs and treatment strategies for vector-borne diseases (*Treat and Mitigate*)

- Disseminate and support the implementation of effective public health and vector control products, tools, and programs to prevent, detect, diagnose, and respond to vector-borne disease threats (*Disseminate Tools, Facilitate Processes, & Build Capacity*)
- The *Framework* includes a call for future agency action plans that will specify activities, metrics, and milestones.

Support for the States to Strengthen VBD Prevention and Control

- CDC provides funding to health departments for VBD prevention and control through the Epidemiology and Laboratory Capacity for Prevention and Control of Emerging Infectious Diseases (ELC) Cooperative Agreement, which
 - Provides resources to 64 state, local, or territory health departments for conducting public health activities
 - Includes a program on vector-borne diseases that supports the 64 jurisdictions in building sustainable, locally relevant programs to identify, prevent, and respond to VBDs
- ELC-supported activities facilitate collaboration among health departments, vector control programs, national public health partners, and the five [Vector-Borne Disease Regional Centers of Excellence](#).
- In FY 2020, CDC will provide combined ELC funding for mosquito-borne and tickborne diseases, including arboviral diseases and Lyme disease.

Vector Week 2020

- CDC will host *Vector Week 2020* in Fort Collins, Colorado, on February 25–28, 2020. Participants will include representatives from ELC jurisdictions, the Vector-Borne Disease Regional Centers of Excellence, public health partner organizations, and other federal agencies.
- Primary objectives will be to
 - Review ongoing CDC-funded activities in VBD prevention and control
 - Create a national vision for addressing emerging VBD threats

Discussion

Surveillance for TBD and TBD Vectors

Dr. Petersen reported that

- CDC focuses on trends in TBD surveillance, rather than on absolute numbers, which are difficult to ascertain, due in large part to under-reporting.
- Ten years ago, CDC estimated an annual incidence of Lyme disease at about 350,000 cases, based on three data sets derived from healthcare records and reports from diagnostic laboratories. CDC is currently updating this estimate.
- Public health capacity to implement prevention and control efforts and assess the impact varies for different VBDs.
 - Reporting on Rocky Mountain spotted fever cases on reservations in Arizona is robust, and proven interventions exist in that setting.

- Reporting on Lyme disease is more problematic as most cases are seen as outpatients, and diseases treated in the outpatient setting are notoriously under-reported. Effective prevention interventions are needed, and assessing their impact is difficult. In one study conducted by CDC, an intervention substantially reduced tick numbers, but not human cases. Thus, entomological outcomes alone are not sufficient to assess human impact.
- Surveillance data for most mosquito-borne diseases are generally sufficient to monitor effectiveness of interventions, particularly in outbreak settings. Data on hospitalizations for West Nile neuro-invasive disease, for example, are sufficiently robust to support evaluations of the impact of interventions to curtail outbreaks.
- CDC is encouraging local jurisdictions to institute or improve long-term environmental surveillance for TBD vectors. CDC has issued [guidelines for surveillance of *Ixodes scapularis* ticks](#) and is developing guidelines for surveillance of *Amblyomma americanum* (lone star) ticks. In the future, CDC plans to update guidance for environmental surveillance of other disease vectors.

Modeling Studies to Support Investment in Vector Control

- CDC has experience in transmission modeling of mosquito-borne diseases such as West Nile disease and dengue fever. Current efforts focus on using modeling to determine the potential impact of VBD interventions.
- Because ecologic factors that influence mosquito-borne transmission vary from place to place, local and regional models are generally more accurate than national ones.
- In regard to the organization of CDC’s modeling activities, Dr. Khabbaz reported that an internal assessment concluded that infectious disease modeling studies have most value when conducted in partnership with subject matter experts within each division. Dr. Messonnier, NCIRD Director, noted that modeling is a tool used in nearly all CDC divisions.
- It was suggested that the BSC consider how CDC and partners might share predictive models and strategic planning models that address VBDs and other infectious disease issues.

Lyme Disease

- CDC’s efforts to improve communication with Lyme advocacy groups include
 - Sending CDC representatives to local meetings to hear patients’ concerns and answer questions
 - Making clear what is known and what is not known about Lyme disease and explaining that CDC focuses on prevention rather than treatment
 - Revising the CDC website to be more patient-oriented
- Concerns about delays in access to care for Lyme disease (especially for patients with chronic symptoms) are addressed in the [Report of the Access to Care Services and Support to Patients Subcommittee to the Tick-Borne Disease Working Group](#).
- CDC is collaborating with the LivLyme group in Colorado, which has created a [TickTracker](#) app that enables users to identify and report ticks and transmit the data to a central database.
- Vaccination may be the best way to prevent Lyme disease. However, it would likely require multiple doses. Although an earlier attempt to reduce Lyme disease through vaccination (using the LYMErix vaccine, in the 1990s) ended when the vaccine was withdrawn from the market, scientists in Europe and the United States are currently developing new vaccines. A variety of Lyme vaccines are on the market for dogs.

- Some tickborne diseases are emerging and poorly understood. The [Alpha-gal allergy](#)—which is associated with tick bites—is an emerging health issue.

Mosquito-Borne Diseases

- **Mosquito control**
 - State and local capacity for vector control appears to have improved since the 2016 Zika outbreak, although data are limited. Sustainability of these capacities after Zika funding has run out is of concern.
 - A 2017 vector control assessment conducted by the National Association of County and City Health Officials found that most jurisdictions lacked key capacities. It would be useful to repeat this assessment to document improvement.
 - CDC provided more specific metrics for success in its new ELC program cooperative agreement, which started this year.
- **Zika virus disease**
 - Vector control efforts likely contributed to the decrease in Zika virus disease in Miami, although some of the decrease may have been due to the natural ebbing of the epidemic. There was no effective vector control in Puerto Rico, partially due to lack of capacity and widespread insecticide resistance.
 - Some of the huge increase in reported cases relative to other mosquito-borne diseases was due to intensive efforts to test pregnant women during the epidemic.
 - The turnaround time for confirmatory serodiagnosis of Zika during the epidemic initially was relatively slow as all of the testing was done at CDC. Over time, a number of state laboratories gained the capacity to test for Zika, increasing capacity and speed. Commercial laboratories were also brought on board. Today, the incidence of Zika has decreased and pressure to increase capacity and decrease turnaround time has lessened.
- **Yellow fever**
 - The yellow fever epidemic in Brazil is on the wane. CDC developed an internal domestic response plan to address concerns that the yellow fever virus might be transmitted in Puerto Rico or the U.S. Virgin Islands.
 - The WHO [Eliminate Yellow Fever Epidemics \(EYE\)](#) initiative includes a partnership with Gavi to vaccinate people at risk for yellow fever. CDC is working with ministries of health to
 - Increase laboratory capacity for yellow fever diagnostics in African and South American countries
 - Increase the number of yellow fever reference laboratories in African countries from one to three

VBD Collaborations with the Public Health Agency of Canada

- PHAC and CDC
 - Have long-standing engagement and collaboration in the area of VBD detection and prevention
 - Hold meetings and pursue joint projects on VBD issues, such as a current project on intrauterine transmission of Lyme disease
 - May develop joint protocols for TBD surveillance, which is an area of mutual concern

Access to VBD Isolates

- CDC is working with partners to improve access to VBD isolates for researchers. Select agent regulations make access to certain isolates (e.g., isolates of EEEV and other tickborne encephalitis viruses) more difficult. It was suggested that CDC might
 - Compile data on laboratory exposures to select agents collected since regulations were strengthened in 2002
 - Quantify laboratory exposures to and disease from pathogens classified as select agents
 - If warranted, develop new, evidence-based recommendations on research use of select agents, including VBD agents

Vector-borne Diseases Workgroup: Final Report and Points to Consider

The Vector-borne Diseases Workgroup (VBD WG) was established jointly by the BSC, OID⁷ and the BSC of the National Center for Environmental Health/Agency for Toxic Substances and Disease Registry, to advance public health efforts to detect, prevent, and respond to VBDS.

VBD WG members includes scientists with expertise in public health, entomology, pesticides, and ecology. At its inception, the VBD WG was co-chaired by James Le Duc, BSC, OID, and Melissa Perry, BSC, NCEH/ATSDR. However, this fall CDC sunsetted the BSC, NCEH/ATSDR. The VBD WG conducted its final work under the auspices of the BSC, DDID.

Tasks

Dr. Le Duc reviewed the five tasks of the VBD WG:

1. Evaluating CDC activities and plans aimed at developing and evaluating VBD prevention and control tools
2. Clarifying CDC/ATSDR's role in monitoring human exposures and adverse health effects subsequent to pesticide applications
3. Assessing CDC efforts aimed at establishing a strong public health workforce in public health entomology
4. Evaluating efforts to improve overall risk communication for VBDS
5. Enhancing collaborations between public health organizations, academia, and industry

Activities

The VBD WG has held five teleconferences:

- On July 6, 2018, the VBD WG confirmed its membership, discussed its timeline, and reviewed tasks and key issues identified by DVBD and NCEH.
- On October 1, 2018, the VBD WG reviewed strategic plans on VBD developed by DVBD and NCEH.

⁷ The VBD WG was established under the former charter of the BSC, OID (Office of Infectious Diseases), which reflects the previous organizational unit. The Office of Infectious Diseases is now known as Deputy Director for Infectious Diseases.

- On November 7, 2018, the VBD WG reviewed progress to date (see below) and discussed workgroup tasks, areas of VBD expertise within DVBD and NCEH, and the pending release of a report from the HHS Tick-Borne Disease Working Group. Ben Beard, Deputy Director, Division of Vector-borne Diseases, NCEZID, is the CDC representative to the HHS workgroup.
- On March 29, 2019, the VBD WG reviewed the draft *National Strategy on Vector-borne Diseases Prevention and Control in the United States*.
- On September 30, 2019, the VBD WG discussed efforts to strengthen the public health workforce in entomology.

Progress

Progress to date includes

- Wider acknowledgement that vector-borne diseases are increasing in the United States and that the United States is not fully prepared to address these risks
- Identification of opportunities for collaboration and improved communications between DVBD and NCEH. Common themes include
 - Training and workforce development. [Current training efforts](#) include the DVBD Vector-Borne Disease Regional Centers of Excellence and the NCEH [training modules](#) on Vector Control for Environmental Health Professionals.
 - Communications issues, such as the need for clear, coordinated messaging, especially during emergencies
 - Collaboration with state and local health departments as principal partners and “customers”
 - Common interests in rodents as reservoirs/vectors of disease and common concerns about importation of exotic mosquito and tick disease vectors
- Identification of unique VBD expertise in NCEH and DVBD, including
 - Toxicology of pesticides and integrated pest control—NCEH
 - Expertise in rodent control, control of dog ectoparasites—NCEH
 - Epidemiology of tickborne diseases—NCEZID

Observations and Points to Consider

The VBD WG provided input to the BSC via six observations and points to consider:

1. **Observation:** Vector-borne diseases (VBDs) pose a very significant and increasing public health concern in the United States.
Consider: CDC should consider continued investments in VBD diagnostic, surveillance, prevention and control activities and expand these efforts as budget allows.
2. **Observation:** Enhanced communications and sharing of strategic plans added significant value to both DVBD and NCEH.
Consider: CDC should consider ways to facilitate continued close dialogue and coordination of programs between DVBD and NCEH.
3. **Observation:** Unique, complementary expertise relevant to VBD is present in both DVBD and NCEH.
Consider: CDC should consider ways to ensure that existing expertise found in both DVBD and NCEH is accessed and utilized when developing plans or responding to emergencies involving VBD.

4. Observation: There is a continuing need for workforce development to address VBD. Good progress is being made through awards to states and local health departments through on-line training, ELC funding and by the Regional Centers of Excellence in Vector-Borne Diseases.

Consider: CDC should maintain a commitment to strengthen state and local health departments through on-line training and ELC funding and consider increasing the number of Regional Centers of Excellence in Vector-Borne Diseases as funding permits.

5. Observation: There is a need for clear, coordinated CDC communications on VBD issues, especially during emergencies.

Consider: CDC should ensure that messages dealing with VBD are developed in coordination with and reviewed by all other relevant partners prior to release to the public.

6. Observation: There is a need to identify a single lead program that holds primary responsibility for VBD within CDC. This is especially important during emergencies to ensure consistent, coordinated messages.

Consider: CDC should consider designating a responsible program lead to coordinate VBD activities and serve as a single spokesperson for the agency, while drawing upon expertise from across the organization.

Discussion

Observation #6

- In regard to identifying a single lead program within CDC with primary responsibility for VBD, BSC members commented that
 - It would be useful to have a designated person coordinate CDC activities and serve as CDC spokesperson during VBD emergencies.
 - It is important for DVBD and NCEH to continue to work together on VBD issues (e.g., in addressing mosquito-borne outbreaks).
- Dr. Beard noted that DVBD generally takes the lead on VBD issues. Although NCEH has relevant expertise, it does not have the same level of investment in prevention and control of vector-borne diseases as DVBD.
- More than 430 DVBD staff members work on VBD issues, including outbreak control; 3 to 5 NCEH staff members work on VBD-related environmental health concerns, such as pest management and the environmental effects of pesticides.
- Dr. Khabbaz, NCEZID Director, agreed that DVBD is recognized as the CDC lead in responding to VBD outbreaks and issues. When the CDC Emergency Operations Center (EOC) was activated to address the Zika epidemic, the EOC
 - Designated a VBD expert from DVBD as the Incident Commander
 - Implemented a process for integrating SMEs from NCEH, the National Center on Birth Defects and Developmental Disabilities, and other centers into the response, as determined by the Incident Commander.
- In view of this discussion, Dr. Le Duc suggested omitting Observation #6.

Observation #3

- It was suggested that the wording in Observation #3 might be revised along these lines:
Consider: CDC should consider ways to ensure that existing expertise found in both DVBD and NCEH is accessed, utilized, and integrated *under the leadership of the appropriate Division* when developing preparedness plans or responding to emergencies involving VBD.

Observations #1 and #4

- It was suggested that the phrases “as budget allows” and “as funding permits” be deleted from Observations #1 and #4.

Other Comments

- It was suggested that CDC should consider working with
 - Schools of public health and professional societies of entomologists to strengthen the public health workforce in entomology
 - Data scientists and modelers to integrate climate change data and ecologic data on vector-borne diseases

BSC Action: The BSC voted to approve the VBD WG observations and points to consider as the basis of official BSC recommendations to CDC.

Report from the Infectious Disease Laboratory Working Group

Michael Loeffelholz, IDLWG co-chair, reported that the October 9 workgroup meeting focused on CIDTs.

Background on CIDTs

- Infectious disease diagnostics have moved significantly and rapidly toward molecular methods with high sensitivity, the ability to detect pathogens previously undetectable by culture, faster time to results, and improved laboratory workflow.
- The conversion from culture-based tests to CIDTs presents challenges, including the lack of cultured isolates for strain characterization and antimicrobial susceptibility testing.
- To sustain essential public health functions that require isolates—e.g., tracking emerging antimicrobial resistance, identifying new diseases, and genotyping microorganisms during outbreak investigations—requires response and planning by CDC.

Presentations at the IDLWG Meeting on October 9, 2019

CIDT Overview

- Dr. Besser, Deputy Chief, Enteric Diseases Laboratory Branch, DFWED, reviewed the impact of CIDTs on public health practice and the need to maintain isolates for public health purposes until direct-from-specimen (metagenomic) characterization of pathogens is achieved.

- Challenges posed by CIDTs include
 - Uncertainties in the interpretation of CIDT test results
 - The clinical significance of some organisms detected by CIDTs may be unclear (e.g. strains of enteropathogenic *E. coli* [EPEC] that have questionable clinical significance).
 - Multiple organisms detected by CIDTs in a single specimen might indicate co-infections.
 - CIDTs do not distinguish between viable and non-viable organisms.
 - Uncertainties in monitoring disease burden and trends
 - The performance and use characteristics of CIDTs are different from those of culture-dependent tests.
 - Pathogens may evolve in ways that prevent detection by CIDTs.
 - A lack of isolates, as CIDTs increasingly replace culture-based tests (see above)
 - Reimbursement issues (e.g., for culture-based reflex testing when CIDTs test positive)
- The benefits of CIDTs include
 - Detection of pathogens for which there was previously no practical test, such as enterotoxigenic *E. coli* (ETEC) and parainfluenza 4 (PIV4)
 - Information about polymicrobial infections detected by CIDT panels
 - Cost-effective, user-friendly applications in developing countries
 - Faster information for local public health action, in terms of
 - Obtaining disease surveillance data
 - Quick evaluation of whether persons can return to work or school after exclusion due to illness
- The CDC strategy for addressing loss of isolates due to CIDT use involves
 - In the near term: Maintain the flow of isolates to public health
 - In the longer term: Develop culture-independent (metagenomic) characterization methods
- To implement the longer-term strategy, CDC will need to modify its data collection and analysis systems to accommodate a metagenomic data stream from clinical laboratories.

CIDTs and Public Health Decision-Making

Dr. Tauxe, DFWED Director, reviewed the impact of CIDTs on public health activities, including

- Defining a case of disease for public health surveillance purposes
- Estimating disease burden and tracking disease trends, which may require adjustments for the increased detection of certain infections by CIDTs
- Improving the monitoring of infections caused by ETEC, norovirus, and *Cyclospora*
- Interpreting complex diagnostic findings (e.g., positive CIDT results for EPEC or enteroaggregative *E. coli* (EAEC), surges in detection of *Vibrio* or *Yersinia*, and detection of co-infections)
- Implementing follow-up of positive CIDT results with reflex cultures to ensure isolate recovery during outbreaks
- Developing protocols for using CIDTs to exclude infected persons from sensitive settings (e.g., daycare centers and food preparation sites) and allow them to return after recovery from infection

2018 Forum on CIDTs: Maintaining Isolate-Based Disease Surveillance

- Collette Fitzgerald, Associate Director for Science, Division of Laboratory Systems, reviewed the discussion about maintaining the flow of isolates for public health purposes at the [2018 Forum on CIDTs](#).
- The Forum participants considered these questions:
 - Which entities should perform reflex culture?
 - Issues include funding, workforce capacity, laboratory capacity, and geographic distance.
 - When clinical laboratories adopt CIDTs, they may no longer perform culture-based tests.
 - Who should pay for reflex culture to meet public health needs?
 - Clinical and reference laboratories are not recognized for their workload and contribution to public health.
 - Reimbursement test codes for “isolate recovery” do not exist.
- The Forum participants stressed that
 - CIDT specimen collection methods must be compatible with culture-based methods.
 - Isolate recovery can be complex and resource-, time-, and labor-intensive.
 - To maintain the flow of isolates, the public health community will need to
 - Improve communication and coordination between clinical and public health laboratories
 - Promote awareness among stakeholders about the impact of CIDTs on disease surveillance
 - Balance the use of novel collection devices that support industry needs (i.e., CIDTs) with the public health need for isolate recovery
 - Evaluate laboratory regulatory and accreditation requirements related to CIDT use
 - Address isolate recovery issues and reimbursement issues for clinical laboratories and public health laboratories

Direct-from-Specimen (Metagenomic) Pathogen Characterization: Continuing Cluster Detection and Disease Surveillance in a Post-Isolate World

- Heather Carleton, Andrew Huang, and Jo Williams of the CDC Bioinformatics and Metagenomics Team reviewed questions about progress toward the use of metagenomic tests as the principal form of infectious disease diagnosis:
 - How will metagenomic data be used to conduct disease surveillance, evaluate trends in the incidence of enteric infections, identify disease clusters, and track antimicrobial resistance?
 - How will metagenomic diagnostics affect the reporting rules for different enteric diseases? Will laboratories be required to forward specimens and/or metagenomic sequences to CDC?
- Steps in the use of metagenomic data to detect outbreaks will include
 - Metagenomic sequencing performed on stool specimens by public health laboratories and/or clinical laboratories, followed by transmission of metagenomic data to CDC and PulseNet
 - Comparison of metagenomic data sets to identify clusters of foodborne illnesses
 - Transmission of metagenomic information to local epidemiologists to support field investigations

- The timeline for the transition to metagenomics for diagnosis of diarrheal illness is likely to be
 - Highly multiplexed amplicon sequencing (2–3 years)
 - Targeted shotgun metagenomics (target enrichment) (3–5 years)
 - Unbiased metagenomics (binning approaches) (5–7 years)
 - Routine use of metagenomics to diagnose diarrheal illness (tentatively in 7–10 years)

IDLWG Feedback

Summary of Issues and Observations

- Public health laboratories will
 - Need to maintain culture-based capacity for strain characterization for the next 5–10 years
 - Need additional resources for this purpose
- Clinical laboratories will need resources to perform reflex cultures when CIDT tests are positive. Insurance companies may not provide reimbursement.
- Most specimens other than stool do not require metagenomic testing, because commercially available diagnostic tests on other specimen types are adequate for the detection and identification of common non-enteric infectious diseases.
- Longitudinal studies are needed to evaluate the characteristics and duration of viral shedding during infections with particular viruses to help make decisions about whether to exclude infected persons from sensitive settings.
- CDC should consider prioritizing development of non-culture-based metagenomic methods for organism characterization over the next 5 years. This will involve
 - Taking a step-wise approach, with a gradual rollout of the new metagenomic capabilities to public health laboratories. Highly multiplexed amplicon sequencing (HMAS) may show the most promise and have the greatest near-term benefit.
 - Exploring other technologies, including shotgun metagenomic approaches, as they become available
 - Building comprehensive, well-curated, and updated bioinformatic databases that contain both genotypic and phenotypic information. These databases will be essential when metagenomics becomes the gold standard for pathogen characterization. Database development should be approached using nationally and internationally accepted common data standards.
- Working with industry and academia is crucial.
 - CDC should utilize vendor-provided syndromic surveillance data to gain a more granular understanding of disease prevalence in regional areas. This might be accomplished in conjunction with the automatic uploading of vendor test data into CDC surveillance systems such as the [National Respiratory and Enteric Virus Surveillance System \(NREVSS\)](#).
 - CDC and public health laboratories should coordinate with industry during test development to ensure that public health needs are met by new diagnostic tests.
 - CDC should work with FDA to develop tools for post-market evaluation of new diagnostic tests and ensure the availability of tests that can detect new, emerging, or variant pathogens.

In conclusion, IDLWG suggests that CDC

- 1. Work with CSTE to**
 - Develop actionable case definitions based on molecular and other advanced technologies
 - Develop a minimal list of stool pathogens with high public health impact for which reflex culture is required when a CIDT is positive
- 2. Work with professional societies** (e.g., APHL, the American Society for Microbiology, the Infectious Diseases Society of America) to encourage clinical laboratories to conduct on-site reflex cultures for a 2-year period while requirements for performing reflex culture are under development at CSTE (see #1 above). After the 2-year transition period, the responsibility for performing reflex cultures should be transferred (with supportive funding) to public health laboratories.
- 3. Consider whether the ELC or the Emerging Infections Program (EIP)** would be appropriate mechanisms for providing state health laboratories with additional support (in terms of FTEs, materials, and training) to maintain capacities for long-term culture and characterization of organisms when the 2-year transition period is over. Public health laboratories—in collaboration with state epidemiologists—might be required to submit a value proposition/return-on-investment document to justify these resources.
- 4. Work with industry and academia** to develop molecular methods for organism characterization, syndromic surveillance, organism “proof of viability,” and detection of variant pathogens as soon as possible. Sample collection methods should be culture-compatible to support reflex culture, which should be performed when considered essential for public health (e.g., to confirm drug susceptibility).

The IDLWG members will reconsider and refine these observations; the group will share an updated version ahead of time and plan to present at the next meeting.

Proposal for a BSC Vaccine Confidence Work Group

Megan C. Lindley, Deputy Associate Director for Science, NCIRD Immunization Services Division, presented a proposal for a new BSC Vaccine Confidence Work Group.

Ms. Lindley reported that

- Vaccination coverage in the United States is generally high.⁸ Most parents have confidence in vaccines and choose to vaccinate their children according to the recommended schedule.
 - Over 94% of kindergarteners have received 2 doses of MMR, state-required doses of DTaP, and varicella vaccine. However, only 51% of adolescents are up to date with HPV vaccine.
 - Childhood influenza vaccination coverage is <80% in all age groups, ranging from 73% in children 6 months–4 years to 52% in 13- to 17-year-olds.
- Some children remain unprotected. In regard to measles, for example, although the national average coverage with ≥1 MMR dose is 90.4%, vaccination coverage in 20 states is below 90%, with some states below 80%.

⁸ See: [Seither R, et al. MMWR Morb Mortal Wkly Rep. 2019;68:905–912](#); and [Walker T, et al. MMWR Morb Mortal Wkly Rep. 2019;68:718–723](#).

Areas of Under-Vaccination Threaten Communities

- When small communities have lower rates of vaccination, it can create a foothold for diseases to spread. CDC has found that
 - Vaccine hesitancy can contribute to localized gaps in vaccination coverage.
 - Individual communities may be hesitant to vaccinate for different reasons.
 - Dissemination of sophisticated misinformation can undermine vaccine confidence in a particular community. For example, the 2018–2019 measles outbreaks in Upstate New York and New York City occurred in close-knit communities targeted with misinformation about vaccines that was tailored to the values and interests of those communities.
- It is important that public health officials and medical providers work together to identify pockets of reduced vaccination rates.

U.S. Measles Elimination Status

- Although measles was officially eliminated from the United States in 2000, the nation's measles elimination status was threatened—for the first time—by the 2018–2019 measles outbreaks.
- Although the United States maintained elimination status, other countries in the Americas have re-established endemic measles transmission since 2016. The Pan American Health Organization (PAHO) Measles and Rubella Elimination Regional Monitoring and Re-verification Commission (MR-RMC) has requested that all countries in the Americas Region provide an annual report to verify that
 - No sustained measles transmission has occurred for a period of 12 months.
 - Surveillance for measles would detect any sustained measles transmission.
 - High coverage with measles-containing vaccine is sustainable.

CDC Vaccinate With Confidence Initiative

- The CDC Vaccinate With Confidence initiative has three key aims:
 - **Protect communities.** Use every available tool to find and protect communities at risk using tailored, targeted approaches.
 - **Empower families.** Ensure parents are confident in the decision to vaccinate by strengthening provider-parent vaccine conversations.
 - **Stop myths.** Work with local partners and trusted messengers to establish new partnerships to contain the spread of misinformation and educate critical stakeholders about vaccines.

Proposal to the BSC

- CDC proposes to establish a BSC, DDID Vaccine Confidence Work Group (VCWG) that provides expert guidance on
 - Improving CDC's existing strategy to strengthen vaccine confidence nationally
 - Supporting development of CDC's report to the PAHO MR-RMC on the U.S. measles elimination status
- VCWG activities will include
 - Reviewing data on vaccination coverage and strategies to address under-vaccination and increase vaccine confidence for all routine childhood vaccines

- Identifying gaps in public health efforts to increase vaccination coverage at the national, state, tribal, and local levels
- VCWG outputs and products will include
 - Meeting minutes that include a participant list, a summary of presentations and findings, and action items
 - An annual VCWG report to the BSC, DDID
- BSC members Tina Tan and Jon Temte have been proposed as VCWG co-chairs. The Designated Federal Official will be Ms. Lindley.
- It is desired that VCWG members have expertise in the following: Pediatric infectious disease, Pediatrics, Family medicine, Nursing, Epidemiology, Health education, Health policy, State/local public health, Vaccine safety, Behavioral health, Psychology, Sociology, Health/risk communication, Public opinion research, and History of science.
- The VCWG will receive administrative and scientific support from NCIRD offices and divisions—including the Office of the Director, the Immunization Services Division, and the Division of Viral Diseases—and the NCEZID Immunization Safety Office.
- The VCWG will meet at least four times per year and report back to the BSC, DDID at least annually. It is anticipated that the VCWG will complete its work within 24 months of its first meeting. In any case, the VCWG will continue to meet and report until its dissolution by the BSC, DDID.

Discussion

- Dr. Tan suggested that the VCWG focus on vaccine hesitancy issues related to all age groups, because vaccine issues primarily related to childhood vaccines may at times apply to adults. For example, an adult traveler infected with measles may spread the disease from one country to another.
- Dr. Messonnier, NCIRD Director, observed that
 - Enhancement of overall confidence in vaccine programs—in all age groups—is the ultimate goal.
 - Issues related to vaccine coverage in adults are broader than vaccine hesitancy, and reasons for under-vaccination differ in adults and children.
 - Receipt of recommended vaccines during pregnancy (e.g., influenza and Tdap) is an early opportunity for women to develop confidence in childhood vaccines. Evidence suggests most mothers have decided how to vaccinate their babies well in advance of the first pediatrician visit where vaccines are offered.
- BSC members commented that
 - A reason for vaccine hesitancy among adults is not believing that vaccines work.
 - Because most decisions about childhood vaccines are made by mothers, it is important to focus on mothers' questions and concerns.
 - It is also important to learn how to push back on misinformation about vaccines. Although direct confrontation is likely to be counterproductive, it may be possible to provide partners with information (including answers to common vaccine questions) that helps them counter vaccine myths and misinformation.

- CDC might also
 - Use social media messaging to teach children, teens, and parents about the benefits of vaccines
 - Work with clinicians to promote the value of vaccines in protecting the community, with special focus on the community of children
- Dr. Messonnier noted that communities differ in how they balance care for the community as a whole with care for their own children. It is necessary to translate vaccine data into messages that take into account a community's values and concerns.
- In regard to the proposed workgroup, BSC members commented that
 - The VWCG can provide feedback on which activities have the most impact in reducing vaccine hesitancy to provide guidance for CDC activities.
 - CDC might consider as members scientists with expertise in behavioral science, psychology, cultural competency, and medical ethics; parents and representatives of community groups; and an ACIP liaison.

BSC Action: The BSC voted to establish a BSC Vaccine Confidence Work Group.

Updates on Acute Flaccid Myelitis and on the AFM Task Force

AFM Update

Janell Routh, Medical Officer, Division of Viral Diseases, NCIRD, provided an overview of ongoing activities to identify the etiology of AFM and prepare for a potential surge in AFM cases in 2020.

Background

- National increases in AFM cases have occurred every 2 years since 2014, when AFM surveillance was initiated following the detection of a cluster of nine cases in Colorado. Most cases have illness onset in September.
- AFM is characterized by the sudden onset of weakness in one or more limbs, with progression of weakness occurring within hours to a few days. Cases occur mostly in children.
- Cranial nerve involvement is seen in about 25% of cases, with difficulty speaking or swallowing, facial droop or ptosis (drooping or falling of the upper eyelid). Lesions are located primarily in the grey matter of the spinal cord, notably in an anterior horn cell (α -motor neuron) distribution, and in the cervical or upper spine.

2019 AFM Epidemiology

- Despite increased awareness about AFM, the numbers of reports and the numbers of confirmed cases in 2019 are consistent with the numbers from other non-peak years (2015 and 2017).
- 93 of 115 case reports have been classified, with additional cases under review or awaiting additional information. Of the 93 classified cases, 32 were confirmed as AFM, 5 as probable, and 56 as non-cases.
- AFM cases are scattered across 15 states, without geographic clustering. Although California and Texas have higher case numbers, the calculated incidence per pediatric population in those states is no greater than in other states.

Evidence for a Viral Etiology for AFM Surges

- Almost 6 years of national AFM surveillance data suggest a consistent low-level baseline rate of AFM cases, across all years.
- The baseline (non-peak) cases have multiple causes, including infectious causes (e.g., enteroviruses, flaviviruses, adenoviruses, and herpesvirus) and non-infectious causes (e.g., neuroinflammatory conditions or spinal vascular disease).
- The peak-year AFM cases might have a single cause (e.g., a specific enterovirus type), or they might have multiple etiologies.
- Evidence for a viral etiology begins with symptoms preceding limb weakness onset in peak-year cases. 97% of the AFM cases confirmed in 2018 were preceded by symptoms consistent with a viral illness before the onset of limb weakness. 81% had upper respiratory symptoms, 79% had fever, about half had neck or back pain, and 21% had a GI illness. The typical sequence involved respiratory symptoms followed by fever and back pain that occurred just before weakness onset.
- Diagnostic testing of cerebrospinal fluid (CSF) specimens from AFM patients has yielded few positive results. Only two CSF specimens collected in 2018 were positive: one for enterovirus D68 (EV-D68) and one for enterovirus A71 (EV-A71). Diagnostic tests of stool and respiratory specimens were positive for a mix of enteroviruses and rhinoviruses; about a quarter of all respiratory specimens were positive for EV-D68, as seen in other peak years.
- Although EV-D68 remains a leading candidate for causing peak-year AFM cases, it is not the only enterovirus that has been associated with AFM. In 2018, an outbreak of EV-A71 in Colorado caused AFM in 10 children.⁹

AFM Cases in Peak Years Differ from AFM Cases in Non-Peak Years

- If a single etiology is causing the biennial AFM peaks, peak-year cases (in 2016 and 2018) should be different from non-peak-year cases (in 2015 and 2017). Comparison studies find that peak-year cases are more likely to have
 - Pleocytosis (an increase in white cell count)
 - Weakness in the upper limbs only
 - More fever and respiratory symptoms prior to the onset of limb weakness
- Peak-year cases are also more likely to test positive for an enterovirus or a rhinovirus (EV/RV) from any type of specimen; *only peak-year cases have tested positive for EV-D68*.
- In contrast, non-peak-year cases are more likely to
 - Have weakness in the lower limbs only
 - Be more severe¹⁰
 - Occur in persons who are older

⁹ Messacar K, Burakoff A, Nix WA, et al. [Notes from the Field: Enterovirus A71 Neurologic Disease in Children — Colorado, 2018](#). MMWR Morb Mortal Wkly Rep. 2018;67:1017–1018.

¹⁰ An AFM case was defined as *severe* if it involved weakness in all four extremities, required mechanical ventilation, and had symptomatic cranial nerve involvement.

- These data suggest that a factor that occurs every 2 years may be causing the AFM peaks. The finding that only peak-year cases have tested positive for EV-D68 strengthens the association between EV-D68 and peak-year cases of AFM.

Differences Among AFM Cases That Occur in Peak Years (2016 and 2018)

- AFM cases reported in 2016 were more severe and had more cranial nerve involvement than cases reported in 2018. AFM cases reported in 2018 were more likely to report fever and respiratory or gastrointestinal symptoms before weakness onset.
- Although the proportion of EV/RV-positive cases was similar in 2016 and 2018,
 - The proportion of cases positive for EV-D68 was significantly higher in 2016.
 - The proportion of cases positive for EV-A71 was higher in 2018, due to the outbreak in Colorado, though not significantly higher.
- However, statistical analyses found that a higher proportion of EV-A71 cases in 2018 did not account for the differences in clinical findings in 2016 and 2018.

AFM Studies with Enterovirus-Binding Antibodies

- CDC collaborated with scientists from the University of California, San Francisco, and Columbia University to test 14 paired CSF and serum samples from confirmed AFM patients with illness onsets in 2018 for enterovirus-binding antibodies, using
 - SeroChip, a microarray of 160,000 unique peptides that span the capsid proteins of all human enteroviruses and the polyproteins of West Nile viruses and tickborne pathogens¹¹
 - VirScan, a phage display involving about 500,000 peptides from vertebrate, mosquito-borne and tickborne viral genomes¹²
- In both studies,^{13,14} enterovirus-specific antibodies in CSF specimens from AFM patients were identified in significantly greater proportions than from non-AFM controls.
- Using the SeroChip, CSF from AFM patients reacted to conserved peptide sequences from all clades of enteroviruses, and specifically to EV-D68.
- Using VirScan, CSF samples from AFM patients identified only one viral family—the *Picornaviridae* family—and binding occurred almost entirely within the genus *Enterovirus*, with two immunodominant *Enterovirus* epitopes, in the capsid protein VP1 and the viral polymerase 3D.

Summary of Findings about AFM Etiologies

- The etiologic drivers of AFM in peak years differ from those in non-peak years, but even in peak years there may be multiple causes of AFM.

¹¹ Tokarz R, Mishra N, Tagliafierro T, et al. A Multiplex Serologic Platform for Diagnosis of Tick-borne Diseases. *Sci Rep.* 2018;8(1):3158. Published 2018 Feb 16. doi:10.1038/s41598-018-21349-2.

¹² Xu GJ, Kula T, Xu Q, et al. *Viral immunology*. Comprehensive Serological Profiling of Human Populations Using a Synthetic Human Virome. *Science.* 2015;348(6239):aaa0698. doi:10.1126/science.aaa0698.

¹³ Mishra N, Ng TFF, Marine RL, et al. Antibodies to Enteroviruses in Cerebrospinal Fluid of Patients with Acute Flaccid Myelitis. *MBio.* 2019;10(4):e01903-19. Published 2019 Aug 13. doi:10.1128/mBio.01903-19.

¹⁴ Schubert RD, Hawes IA, Ramachandran PS, et al. Pan-viral Serology Implicates Enteroviruses in Acute Flaccid Myelitis. *Nat Med.* 2019;25(11):1748–1752. doi:10.1038/s41591-019-0613-1.

- Differences in EV detection support an association between enteroviruses and AFM in peak years, including enterovirus-binding antibodies detected in CSF samples from AFM patients. In peak-year 2018, two main EV types were detected in CSF from AFM patients: EV-D68 and EV-A71.
- These findings underscore the need for broad clinical surveillance and enterovirus surveillance to understand the full spectrum of AFM etiologies.
- The underlying mechanism of AFM disease remains the critical unknown.
 - If EV-D68 is the primary driver in peak years, why does paralysis develop so rarely?
 - Do different case characteristics provide clues about the disease mechanism?
- A better understanding of the pathogenesis of AFM would facilitate the development of treatment and prevention strategies.

Planning for an AFM Surge in 2020: Preparedness and Response

Preparedness

Research activities to prepare for the next biennial surge in AFM cases include

- **Enhancing surveillance for AFM**, by
 - Conducting surveillance at seven pediatric hospitals in the [New Vaccine Surveillance Network \(NVSN\)](#)
 - Implementing pilot studies to improve case finding and decrease reporting time
 - Providing [ELC](#) cooperative agreement funding to health departments for increased AFM surveillance, outreach, and education
- **Characterizing etiologies that cause AFM**, by
 - Subtyping enteroviruses and rhinoviruses associated with AFM, in collaboration with NVSN and the [Emerging Infections Program](#)
 - Analyzing data from an EV-D68 national sero-survey (1999–2018)
 - Completing an EV-D68 viral shedding study
 - Examining enterovirus biology in neuronal and respiratory disease models
- **Understanding AFM pathophysiology**, by
 - Analyzing AFM medical chart abstraction data for 2018
 - Collaborating with NIH on an AFM natural history study
 - Collecting data on the long-term outcomes of confirmed and probable cases of AFM
 - Updating CDC's AFM clinical guidance document for 2020
- **Increasing AFM outreach and communications**, by
 - Conducting market research to improve AFM communication strategies
 - Developing AFM outreach materials for healthcare providers, parents, and the public
 - Continuing AFM parent engagement

Response

Plans for responding to an AFM surge in 2020 involve four response stages:

- **Monitor and Prepare.** CDC will monitor AFM cases through the spring and summer and will work with partners to prepare
 - A Clinical Outreach and Communication Activity (COCA) call
 - Templates for rapid alerts to state and local partners (e.g., via Epi-X and Health Alert notifications)
 - Public health messages
 - A laboratory-testing algorithm for AFM specimens
- **Activate.** If a rise in AFM cases is observed, activation measures will include
 - Establishing an incident command structure for the AFM response
 - Alerting state and local partners and holding a COCA call for healthcare providers
 - Producing sitrep reports to CDC and HHS leadership
- **Respond.** If AFM case counts continue to increase, responders will
 - Track and classify suspect cases of AFM
 - Conduct diagnostic testing
 - Continue medical outreach efforts and provide public health information via website updates
 - Establish an online inquiry inbox for the public and for parents
- **Demobilize and Evaluate.** Once AFM case counts fall back to baseline levels, CDC will
 - Issue an after-action report
 - Analyze and publish 2020 surveillance data

Dr. Routh noted that we currently lack information about AFM prevention and treatment that would allow us to stop or control an AFM outbreak. However, public health action can help ensure that AFM patients are recognized as early as possible and receive appropriate care and medical management.

AFM Task Force Update

Dr. Lynfield—BSC, DDID chair and AFM Task Force co-chair—reviewed the charge and membership of the AFM Task Force, which includes 3 BSC members and 16 AFM clinical and research experts. The Task Force is charged with presenting findings, observations, and outcomes to the BSC and the CDC Deputy Director for Infectious Diseases, for discussion, deliberation, and decision in these areas:

- **AFM etiologies and pathogenesis.** Task Force discussions focus on
 - Evaluating current understanding of AFM and its pathogenic mechanisms
 - Reviewing data and developing hypotheses about possible or likely AFM etiologies and pathogenesis
 - Proposing new studies, study designs, laboratory techniques, assays, and other activities to address specific hypotheses about AFM etiologies and pathogenesis
 - Developing and prioritizing findings and observations to facilitate development of BSC recommendations for areas of further study or investigation

- **Clinical treatment of AFM.** Task Force discussions focus on
 - Building on existing information about clinical practices by seeking information on clinical experience with the treatment of AFM
 - Identifying research gaps in the diagnosis and treatment of AFM
 - Developing potential findings and observations on patient management

Dr. Lynfield expressed her thanks to

- Former BSC member Jill Taylor, who served as the AFM Task Force co-chair during its first year
- BSC member Tina Tan, who has succeeded Dr. Taylor as AFM Task Force co-chair

Task Force Activities

Since the May 2019 BSC, DDID meeting, Task Force activities have included

- Conference calls held in May, June, September, and October 2019 to discuss AFM outcome measures, the updated CSTE case definition for AFM, CDC communications about AFM (including the [July 2019 Vital Signs](#)), laboratory and epidemiology updates, an update on the NIH natural history study, and information from the Transverse Myelitis Association/Siegel Rare Neuroimmune Association
- An in-person meeting in November to
 - Review CDC's research projects and preparedness activities for 2020
 - Prioritize activities for action and research (see below)

Priority Activities for Action and Research

High-priority activities for CDC and partners are listed below under seven categories for action and research. Activities that may be conducted by partners are indicated with an asterisk (*).

- **Communication and education**
 - Strengthen communication and education efforts targeting healthcare providers, parents, and the general public
- **Public health surveillance**
 - Identify cases and investigate temporal and geographic correlations of AFM cases with circulating viruses, using strong, integrated surveillance systems
 - Better characterize the molecular epidemiology of EV-D68 by collecting strains from AFM and non-AFM patients and conducting whole genome sequencing
 - Measure national seroepidemiology of EV-D68
 - Integrate viral surveillance and serology with computational models to analyze and predict EV-D68 epidemiologic dynamics and relationships to AFM epidemiology*
- **Risk factor studies**
 - Identify risk factors through the epidemiologic and natural history studies
 - Identify genetic determinants of risk

- **Diagnostic tool development**
 - Develop immunologic assays (e.g., EV-D68 IgM) in CSF or serum for rapid diagnostics
 - Characterize exposure to infectious agents in sera and CSF using novel diagnostic platforms such as peptide arrays
- **Pathogenesis**
 - Determine viral molecular determinants of neurotropism, cell death, paralytic potential, and unique receptors used by EV-D68 strains*
 - Characterize viral pathogenesis using animal models
 - Identify other humoral factors (e.g., decreased mucosal IgA antibodies) associated with increased risk of AFM
- **Therapeutics and vaccines**
 - Initiate early-stage EV-D68 vaccine development*
 - Screen FDA-approved panels for potential antiviral activity*
 - Develop EV-D68 therapeutic monoclonal antibodies*
- **Treatment and rehabilitation.** High-priority activities:
 - Standardize outcome measures (strength, quality of life, community participation)
 - Evaluate long-term outcomes of AFM patients
 - Long-term follow-up of AFM patients

Questions for the BSC

Feedback was requested in these areas:

- Preparedness
 - Any other considerations for CDC's response plan?
 - Does the BSC endorse the response plan?
- Research agenda
 - Additional suggestions to make the CDC research agenda more robust?
- Priorities
 - Any other high priority areas for consideration?
- Other recommendations?

Discussion

AFM Pathogenesis

- Viruses that access the spinal cord via the respiratory tract might be more likely to cause upper limb weakness. In contrast, CNS infection with poliovirus (spread person-to-person or via food or water) typically affects the lower extremities.
- The rare occurrence of AFM might be the result of antibody enhancement triggered by prior viral exposures.¹⁵
- Questions about viral tropism and about the possible role of antibody enhancement might be addressed using mouse models.

Communication with Families and Clinicians

- Delays in AFM diagnosis affect the care of affected children and make it less likely that CDC will receive clinical specimens needed to answer scientific questions.
- Suggestions for partners who can improve communication with clinicians and parents include
 - The [American Academy of Pediatrics](#)
 - The [Society for Pediatric Urgent Care](#)
 - The [American Association of Nurse Practitioners](#)
 - Diagnostic laboratories, which may receive calls from clinicians asking which specimens to send when AFM is suspected

AFM Surveillance

- Sarah Kidd, NCIRD Division of Viral Diseases, reported that
 - The majority of AFM patients present to pediatricians or emergency departments within 24 hours of the onset of limb weakness. About two-thirds present to emergency departments and one-quarter to primary care providers. Patients are typically seen by pediatric infectious disease doctors after hospital admission.
 - More than half of AFM patients are hospitalized within a day of onset of limb weakness, but some were not hospitalized until 4 or 5 days had passed. This finding underscores the need for better awareness and communication with families and clinicians.
- Dr. Routh reported that retrospective surveillance data from five U.S. sites suggests that surges in AFM cases began in 2014 and subsequently occurred every 2 years. This finding suggests that something changed in 2014.

BSC Action: The BSC accepted and endorsed the AFM Task Force report.

¹⁵ Antibody-dependent enhancement of dengue virus (DENV) infection occurs when pre-existing antibodies from a primary DENV infection bind to an infecting DENV particle during a subsequent infection with a different dengue serotype. The antibodies from the primary infection cannot neutralize the virus. Instead, the antibody–virus complexes bind to circulating monocytes, helping the virus to infect monocytes more efficiently. The outcome is an increase in the overall replication of the virus and a higher risk of severe disease.

Public Comments

Phone lines were opened for public comments at 3:15 PM. No comments were made.

Closing Comments

Dr. Butler thanked the BSC members for their engagement and participation.

The next BSC meeting is scheduled for May 4–5, 2020. The meeting was adjourned at 3:30 PM.

APPENDIX: Meeting Participants

BSC Members

Tammy Beckham <i>(by phone)</i>	Ann Garvey	José Romero
Hilary Babcock	Jesse Goodman	Emily Spivak
Joanne Bartkus	Tim Jones	Bradley Stoner <i>(by phone)</i>
Alex Billioux	Salmaan Keshavjee	Kathy Talkington
Debra Birnkrant	Jim Le Duc	Tina Tan
Barbara Cole <i>(by phone)</i>	Mike Loeffelholz	Jon Temte
Jeff Duchin <i>(by phone)</i>	Ruth Lynfield	Donna Wolk
Dan Dodgen <i>(representing ASPR)</i>	Jeanne Marrazzo	
Emily Erbelding	Howard Njoo <i>(representing PHAC)</i>	
	Lee Riley	

Partners and Other Public Visitors

Meredith Allen (<i>Association of State and Territorial Health Officials</i>)*	Iline Lee (<i>TJ Fac</i>)*
Ellen Carter*	Gabriella Newes-Adeyi (<i>Abt Associates</i>)*
Marla Dalton (<i>National Foundation for Infectious Diseases</i>)*	Monica Schroeder (<i>Council of State and Territorial Epidemiologists</i>)
Janet Hamilton (<i>Council of State and Territorial Epidemiologists</i>)	Rachel Scott (<i>Acute Flaccid Myelitis Association</i>)*
Jay Hemingway (<i>RTI International</i>)*	Gretchen Van Vliet (<i>RTI International</i>)*
Lilly Kan (<i>National Association of County and City Health Officials</i>)	Mary Lee Watts (<i>American Society for Microbiology</i>)
	Rebecca Whitney (<i>SRNA</i>)*

CDC Staff

Alison Albert*	Renee Calanan	Peter Drotman
Noah Aleshire	Marty Cetron	Vivien Dugan
Tiki Barnes	Thomas Clark	Hilary Eiring
Michael Beach	Nakia Clemonns*	David Fitter
Ben Beard*	Amanda Cohn	Cherie Gray*
Jeanne Bertolli	Latrice Cushon	Nicole Gregoricus
Jason Bonander	Les Dauphin	Alexandra Hess
Chris Braden	Kim Distel	Laura Hughes-Baker
Jay Butler	Kathleen Dooling*	Dan Jernigan

CDC Staff (*cont.*)

Adam Johnson*	Susannah McKay*	Janell Routh
Vikas Kapil	Jonathan Mermin	Andrew Ruiz
Rima Khabbaz	Nancy Messonnier	Catherine Sager
Nancy Khalil	Claire Midgley*	Audilis Sanchez*
Sarah Kidd	Emily Mosites	Don Sharp
John Kools*	Atis Muehlenbachs	Sharon Slocumb
Wendi Kuhnert	Kristen Nordlund	Stephanie Smith*
Shibani Kulkarni	Steve Oberste*	Duane Stone
Tatiana Lanzieri*	Mark Pallansch*	Ray Strikas
Alexandra Levitt	Lyle Petersen	Rob Tauxe
Brandi Limbago	Bob Pinner	Khadija Turay
Megan Lindley	Sam Posner	Julie Villanueva
Ruth Link-Gelles*	Amanda Raziano	Henry Walke
Mona Marin*	Susan Redd*	Jen Ware
Rebecca Martin	Robert Redfield	Melinda Wharton
Tonya Martin	Shelby Rhee	Sarah Wiley
Adria Mathis*	Paul Rota	Yingtao Zhou
Sherri McGarry	Sandy Roush	

*These individuals were recorded as having participated by phone. Others not listed may have called in as well.

I hereby certify that to the best of my knowledge, the foregoing minutes of the proceedings of the meeting of the Board of Scientific Counselors, Deputy Director for Infectious Diseases, on December 4–5, 2019, are accurate and complete.

/S/

Ruth Lynfield, M.D.
Chair, BSC, DDID

02/20/20

Date