Career Epidemiology Field Officer Program

Strengthening CDC's Impact in the Field

BIENNIAL REPORT
2016 - 2017

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Background: Commemorating 15 Years on the Front Lines of Public Health

The Centers for Disease Control and Prevention (CDC) created the Career Epidemiology Field Officer (CEFO) program in 2002 to strengthen state, tribal, local, and territorial epidemiology capability for public health preparedness and response. The program was created following the 2001 terrorist attacks in response to an identified need to enhance and expand epidemiology capacity to prepare for, prevent, and respond to public health threats, both natural and manmade.

Public health preparedness begins in the community. Through placement in frontline public health agencies, CEFOs provide communities with a more direct connection to CDC expertise, resources, and technical assistance. As a cadre of expert epidemiologists, CEFOs' key role is to build surveillance and epidemiology capacity for public health preparedness and response. They work in conjunction with their assigned health departments to identify and fill gaps in preparedness capacity, improving their ability to respond to public health threats. CEFOs play a critical role in enhancing disaster epidemiology to raise situational awareness during public health emergencies. Their scope of work varies depending on their assigned jurisdictions' needs and capabilities.

Health departments request CEFOs initially for two-year assignments with the potential for annual renewals contingent upon availability of funds, assignment requirements, and program priorities. CEFOs usually remain in assignments for more than five years.

Funding for CEFO positions is mainly derived from the CDC Public Health Emergency Preparedness (PHEP) cooperative agreement through the direct assistance (DA) mechanism. Health departments allocate PHEP funding through DA requests to support CEFO positions. Some CEFO assignments are co-funded with other CDC programs and support a broader spectrum of activities.

CEFOs gather in Atlanta for the 2017 Annual CEFO Scientific Meeting.

Our Vision

Sustained Epidemiologic Capacity Nationwide for Public Health Preparedness and Response.

Our Mission

To Strengthen State, Tribal, Local, and Territorial Epidemiologic Capability for Public Health Preparedness and Response.

From left, CEFOs Jeff Miller, Celia Quinn, Dan O'Leary, Ma'isah Larkin, Jason Wilken, Erica Thomasson.

CEFO Data Points

CEFOs are mid-level to senior CDC epidemiologists with experience in surveillance, epidemiology, preparedness, research, training, and policy development. Prior to their assignments, CEFOs have completed the CDC Epidemic Intelligence Service (EIS) fellowship or have comparable experience and training. As of December 2017, 24 CEFOs are U.S. Public Health Service (USPHS) Commissioned Corps Officers, and 11 are civil service employees. CEFOs represent an array of disciplines and professional backgrounds. CEFOs are physicians (12), nurses (1), veterinarians (9), and master's- or doctoral- level health scientists (7, 7)—see Table 1. Prior to entering the program, CEFOs acquired expertise in various settings, including academia, state, local, territorial health departments, and federal agencies. The diverse backgrounds and public health skills of CEFOs provide health departments with adept leaders who can work on a broad range of issues essential for community resilience and preparedness.

CEFO Professional Disciplines: 2016 -2017	
Physicians	12
Veterinarians	9
Doctoral-level Epidemiologists	7
Master's-level Epidemiologists	7
Nurse	1

Table 1

CEFOs complete quarterly reports that detail the activities they were involved in during that period of time and the associated preparedness capabilities, and roles for the activities. The number of activities a CEFO works on during any given quarter may vary. Figures 1, 2, and 3 represent the combined capabilities, roles and activities CEFOs reported during 2016-2017.

One of the nation's key preparedness challenges has been determining appropriate state and local public health preparedness priorities. To assist state and local public health departments in their strategic planning, CDC developed 15 capabilities to serve as national public health preparedness standards. Figure 1 shows the principle public health preparedness and response capabilities that CEFO reported in their 2016-2017 quarterly reports. CEFOs focused primarily on supporting and improving their assigned jurisdictions' public health surveillance & epidemiological investigation, community preparedness, and emergency operations coordination capabilities.

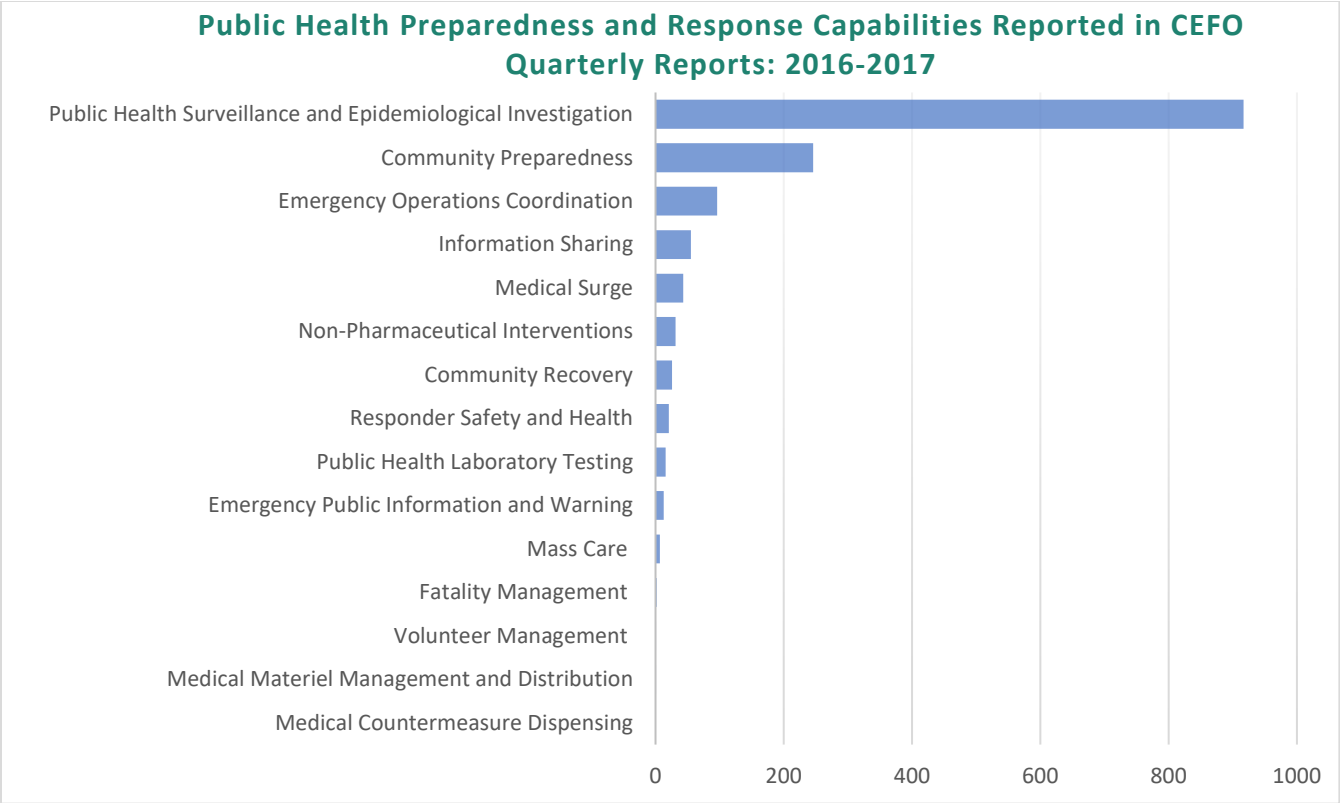


Figure 1

Figure 2 depicts the principle roles CEFOs performed in their reported activities. During 2016-2017, they served primarily as lead, consultant/subject matter expert (SME)/technical advisor and co-lead for their assigned activities. Some CEFOs served in leadership capacities, overseeing state epidemiology divisions and programs, and a number supervised and mentored CDC EIS officers and fellows. This supervision and mentorship help improve and sustain jurisdictional public health workforce capabilities.

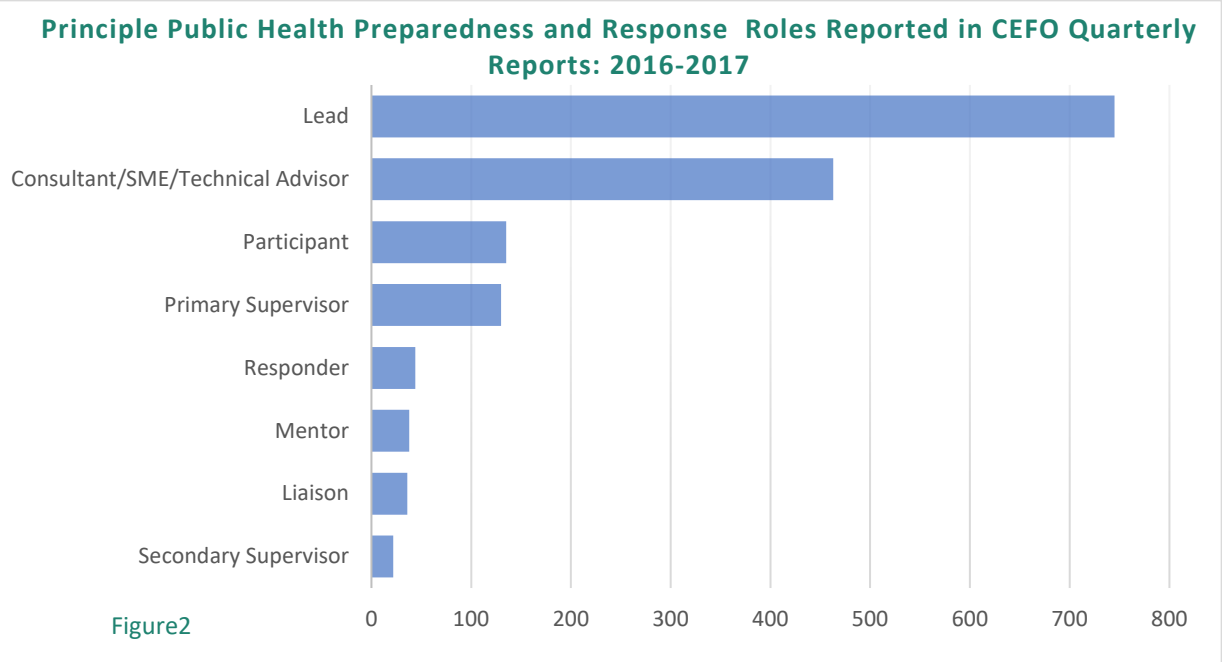
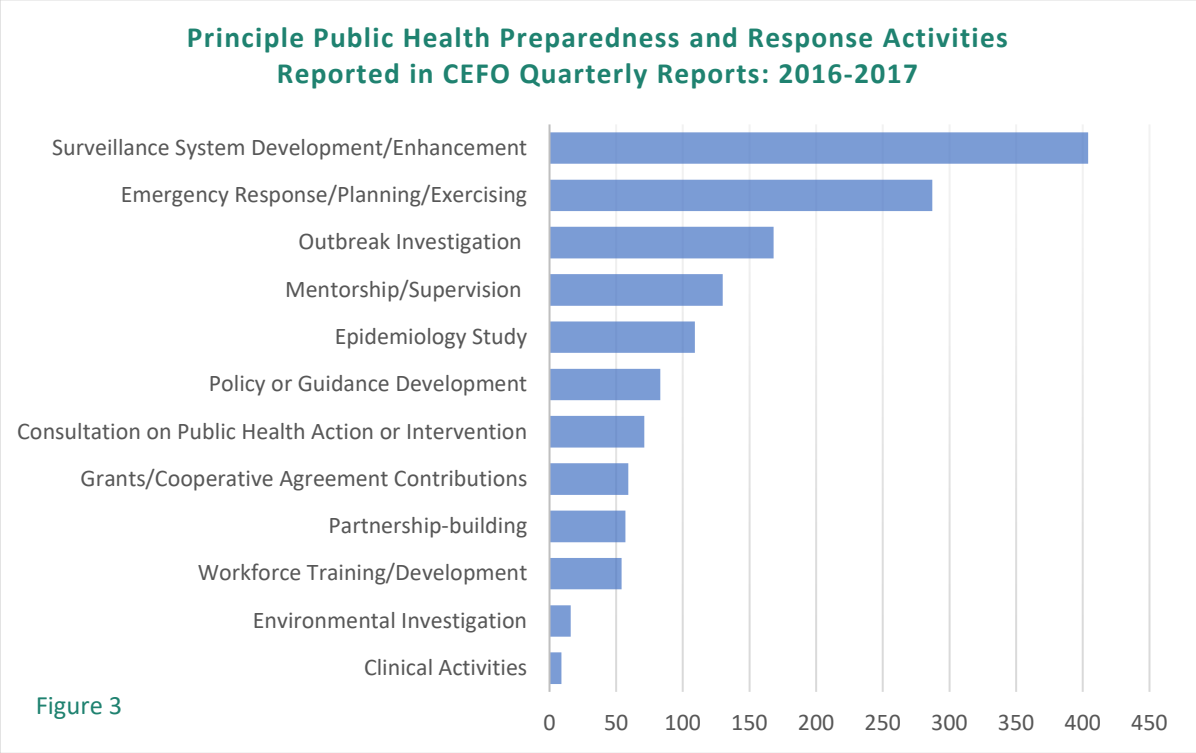


Figure 3 shows the principle activities CEFOs reported they participated in during 2016-2017. Predictably, CEFOs focused primarily on epidemiological activities, including surveillance, outbreak investigations, and epidemiological studies. CEFOs also spent considerable time in emergency responses (including planning and exercising), outbreak investigations, and mentorship.



Accomplishments

Surveillance System Development and Enhancement

CDC's surveillance strategy affirms that public health surveillance and its essential health data is the nation's portal for progress in protecting our health. CDC's overarching goal for federally supported surveillance activities is to get the right information into the right hands at the right time.

CEFOs directly support state and local efforts to enhance and expand existing surveillance systems to improve health monitoring. They provide leadership, subject matter expertise, and technical assistance to strengthen surveillance by evaluating, improving, and developing data collection, information systems, and surveillance-related policies.

Implementing Syndromic Surveillance in Idaho

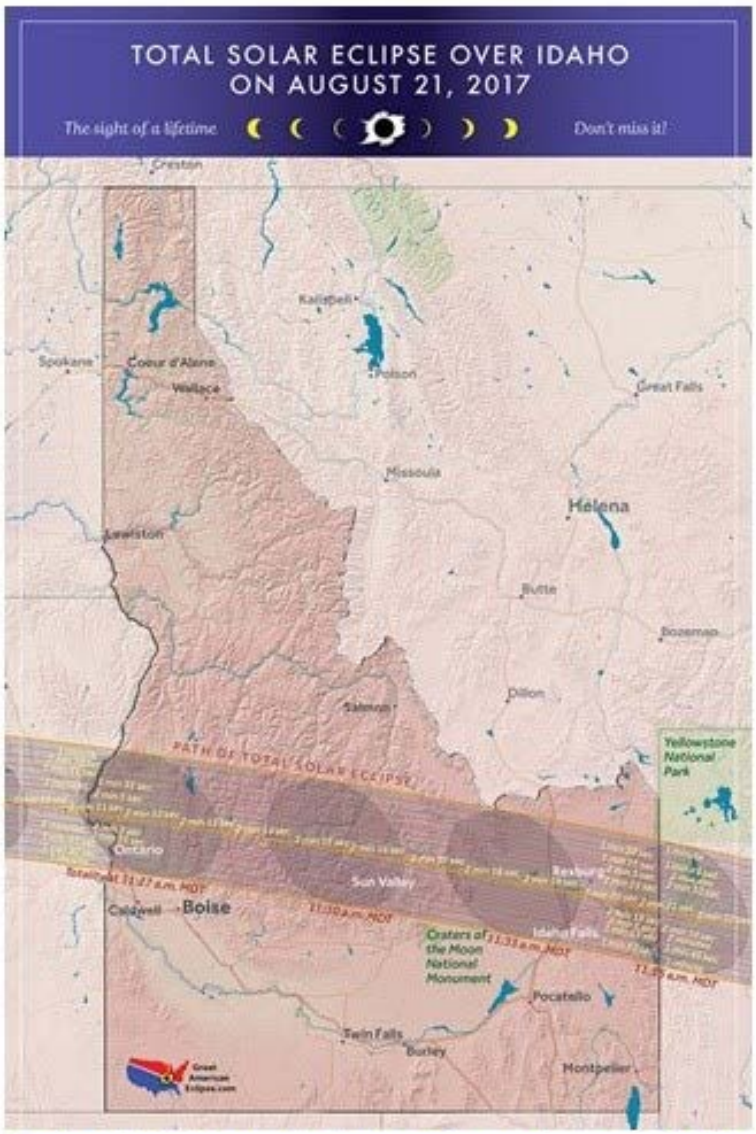
Kris Carter DVM, MPVM, DACVPM, CAPT US Public Health Service
Boise, Idaho

Syndromic surveillance for health trend monitoring and situational awareness is an encouraged component of preparedness capability 13, Public Health Surveillance and Epidemiological Investigation. However, because of competing priorities, not all states, including Idaho, use PHEP funds for this purpose. In 2015, Idaho successfully applied for competitive funding from CDC's National Syndromic Surveillance Program to implement syndromic surveillance with emergency department data using BioSense 2.0, and, in September 2015, was awarded funding for the first year of a four-year project period.

CAPT Carter serves as the syndromic surveillance coordinator for the Idaho Division of Public Health (IDPH), coordinating the activities of the Idaho Syndromic Surveillance team. The team trained hospitals, transitioned to a new BioSense Platform, developed data quality scripts and syndrome definitions, developed and managed syndromic surveillance subgrants with Idaho's seven local public health districts, and trained state and local epidemiologists on syndromic surveillance.

The proportion of eligible Idaho hospitals that registered intent to contribute syndromic surveillance data and submitted emergency department data for syndromic surveillance increased from 2.6 percent in February 2016 to 57.9 percent in February 2018. The percentage of Idaho public health districts receiving data from hospitals in their jurisdiction increased from 14 percent in 2016 to 87 percent in February 2018.

Syndromic surveillance emergency department data were used for the first time in Idaho for a variety of purposes. IDPH now incorporates information from these data into weekly seasonal influenza reports. One public health district now routinely provides suicide-related reports to the local suicide prevention network. Syndromic surveillance during cold weather identified carbon monoxide poisoning in homes and workplaces, stimulating effective public health prevention messaging. The first implementation of syndromic surveillance in Idaho for a planned event took place during the 2017 solar eclipse; syndromic surveillance information was combined with reportable disease data for statewide situation reports. Results indicated that no unusual emergency department activity occurred during the event.



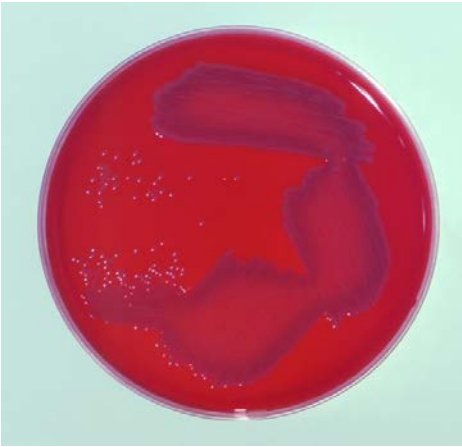
Path of 2017 total solar eclipse through Idaho

Investigating and Describing Elizabethkingia Clusters in Illinois

Livia Navon MS, RD
Chicago, Illinois

Livia Navon, the CEFO for the state of Illinois, led an investigation to better understand the epidemiology of and improve the surveillance for *Elizabethkingia spp*., a multidrug-resistant, Gram-negative bacteria found in the environment that can cause healthcare–associated outbreaks. Little is known about *Elizabethkingia spp.*, including mode of transmission and infection sequelae. It was first identified by Elizabeth King in 1959 as a cause of meningitis outbreaks among hospitalized newborns. *Elizabethkingia anophelis* (EKA) was first identified in 2011 from the midgut of a mosquito. Laboratory methods to detect *Elizabethkingia spp*. continue to evolve with improvements in identifying individual species.

The Illinois Department of Public Health (IDPH) began investigating Elizabethkingia cases in February 2016, after the Wisconsin Department of Health Services notified neighboring states of an ongoing outbreak of EKA among Wisconsin residents. To determine if Illinois had related cases, Navon and IDPH sent memos to Illinois health care providers, infection preventionists, and laboratories, requesting all available isolates of *Elizabethkingia spp*. dating back two years, to January 1, 2014. Healthcare facilities reported 39 patients with positive *Elizabethkingia spp.* cultures from January 2014 to March 2016. Specimens from 11 of these patients were available for testing at CDC. Genomic testing showed that, although one isolate was linked to the Wisconsin outbreak, the rest of the isolates were not linked to the Wisconsin cases and instead, were genetically linked to each other. Unlike the Wisconsin cases where many occurred in the community, Navon and colleagues recognized that all the Illinois cases occurred in healthcare facilities when infections were identified. The Illinois patients lived in at least three different jurisdictions and there was little overlap in the healthcare facilities where they received care.



Isolated *Elizabethkingia spp*. infections are not reportable to IDPH, therefore baseline incidence data were not available. To determine whether the 10 identified cases (from the 11 isolates) represented an increase in EKA infections, the 19 facilities with patients in the cluster were asked to report all patients with *Elizabethkingia spp*. infections from January 1, 2012 to May 16, 2016. Fifteen facilities responded and reported a total of 77 patients, with an average of 17.1 infections per year. The average number of infections per facility was 5.1.

Three outbreaks (2008, 2009, and 2012–2013) of Elizabethkingia meningoseptica had been reported previously in Illinois healthcare facilities. Environmental isolates collected and stored from the 2012–2013 outbreak were sent to CDC for testing to better understand the genetic diversity of *Elizabethkingia spp.* in Illinois. Whole genome sequencing indicated that the 2012–2013 environmental isolates were actually EKA and that their genomes clustered with the 2014–2016 case isolates.

Navon's efforts led to a better understanding of the burden of *Elizabethkingia spp.* and ongoing sporadic EKA infection among critically ill patients in Illinois. One of the biggest lessons learned from this investigation was that EKA, although only identified recently as a human pathogen, has been responsible for more illness among hospitalized patients than previously recognized.

Implementing Enhanced Syndromic Surveillance during the 2017 Solar Eclipse in Kentucky

Doug Thoroughman, PhD, MS, CAPT US Public Health Service
Louisville, Kentucky

Approximately 60 percent of nonfederal emergency department (ED) visits in the U.S. are submitted to the National Syndromic Surveillance Program's BioSense platform, which also hosts the Early Notification of Community-based Epidemics (ESSENCE) syndromic surveillance system. Data from such systems provides near real-time quantitative data to improve situational awareness for public health authorities. Mass gatherings present unique public health challenges and may require enhancements to existing surveillance systems.

On August 21, 2017, a solar eclipse was observed across North America including a total eclipse in 14 states. The point of greatest eclipse was located northwest of Hopkinsville, Kentucky. Eclipse-related events drew an estimated 116,500 visitors to the area.

In preparation for the eclipse, CAPT Doug Thoroughman led a team from the Kentucky Department for Public Health (KDPH) to collaborate with local and regional epidemiologists, emergency medical services (EMS), area hospitals, the Kentucky health information exchange (KHIE), and informatics staff at the Tennessee and Illinois state health departments to implement eclipse-related syndromic surveillance. Gastrointestinal illness, heat-related illness, respiratory illness, drug overdose, and bite or sting syndromes were monitored at five enhanced syndromic surveillance hospitals and at five other hospitals located near Hopkinsville.

First Aid Stations

Eclipse event-related patients (N=36)
- Injuries (n=13)
- Illnesses (n=23)
  - Pain/headache (n=10)
  - Heat-related (n=4)
  - Other (n=9)

Alerts
First aid stations did not alert area epidemiologists of any unusual events

EMS Data

Documented eclipse event-related runs (N=7)
- Injury/illness counts unknown

On-site assists at eclipse-related events (N=4)
- Heat-related (n=4)

Run volume and historical comparisons
All run volumes were similar to or lower as compared to same time period in 2016 and no additional resources were needed to provide care or transport in the area

Enhanced Syndromic Surveillance ED Visit Data

Eclipse event-related visits (N=44)
- Injuries (n=18)
- Illnesses (n=26)
  - Gastrointestinal (n=6)
  - Heat-related (n=6)
  - Respiratory (n=4)
  - Other (n=10)

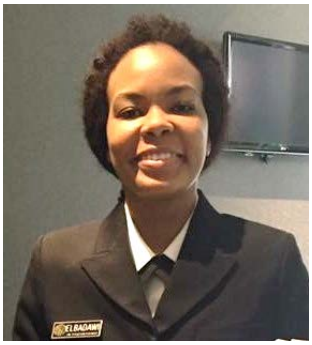
Alerts
- Aug. 17: No. and % of gastrointestinal cases
  - Local epidemiologist investigated
- Aug. 19: No. and % of injuries
  - ESSENCE indicated multiple car accidents
  - No additional EMS resources needed
- Aug. 22: No. and % of respiratory cases
  - Only 1 case was flagged as eclipse event-related
  - No epidemiological links in ESSENCE

Results of enhanced surveillance for illness and injuries associated with the 2017 solar eclipse.

The enhanced syndromic surveillance system that CAPT Thoroughman and the KDPH team implemented in Kentucky improved public health situational awareness during the mass gatherings associated with the 2017 solar eclipse. Forty-four eclipse-related visits were identified, primarily injuries, gastrointestinal illness, and heat-related illness. KDPH staff created dashboards of the counts and category percentages. A key strength of this system was the pre-event training of clinicians and public health professionals, as well as the surveillance data system enhancements that permitted the flagging of ED patient visits. This flagging allowed public health staff to quantify cause-specific, event-related morbidity and facilitated investigation of potential event-related outbreaks in near real-time. The high level of participation of area hospitals and strong collaboration with KHIE likely contributed to the relatively high number of events flagged. An additional strength of the KDPH surveillance system was the inclusion of patient data from first aid station encounters and EMS, which offered more detailed information regarding the type and severity of health issues experienced during the surveillance period. Syndromic surveillance data also provided reassurance that no large event-related increases in injury or illness occurred.

CAPT Thoroughman, the KDPH team, and local health jurisdiction partners and practitioners demonstrated that mass gathering events – especia impacting more than one geographic site – will benefit from greater a planning and standardization of event-related injury and illness rep facilitate successful multijurisdictional mass gathering health surveillan

Enhancing Tick-borne Illness Surveillance Wisconsin



Lina Elbadawi,MD, MS,
LCDR US Public Health Service
Madison, Wisconsin.

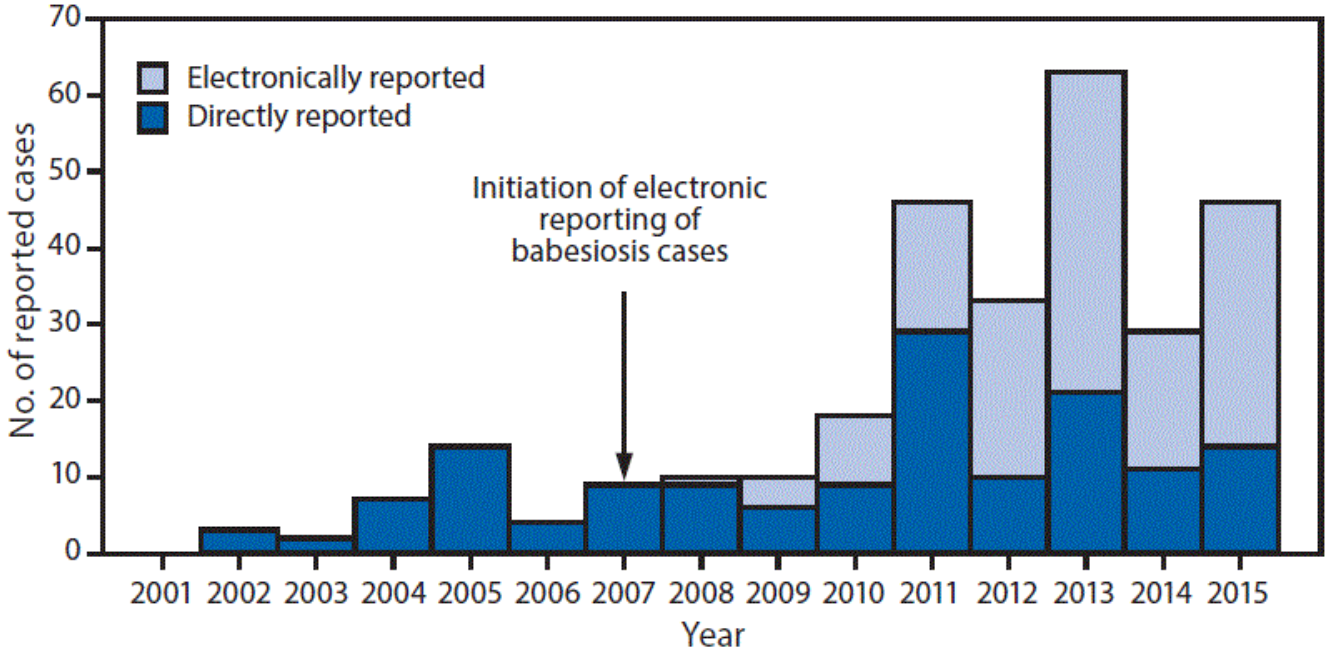
In Wisconsin, *Ixodes scapularis*, commonly called the blacklegged or the deer tick, is the vector for anaplasmosis, babesiosis, ehrlichiosis, Lyme disease, and Powassan virus infection. Over the past decade, changes in case definitions, improvement in surveillance, and expansion of the blacklegged tick population has led to increases in reported incidences for all five infections.

LCDR Lina Elbadawi led the efforts to investigate the reasons for increases in reported tick-borne diseases. These efforts included determining the epidemiological and clinical history of Wisconsin residents with tick-borne infections and examining trends in electronic laboratory reporting and diagnosis by polymerase chain reaction testing (PCR) and serology.

Accurate surveillance is necessary to estimate the increasing burden of diseases and develop appropriate public health interventions for prevention and practice. Both human and tick surveillance data was widely disseminated to clinical providers through publications and state memoranda. Information was disseminated to Wisconsin residents through county fairs and community conferences, including the Wisconsin chapter of the American Camp Association. In addition, LCDR Elbadawi worked with Wisconsin blood banks on increasing screening for tick-borne diseases.

Due to her efforts, information on tick-borne diseases is now routinely disseminated to Wisconsin providers and residents.

Total confirmed Babesiosis case counts (N = 294) initially reported directly and electronically through the Wisconsin Electronic Disease Surveillance System (WEDSS),* Electronic Laboratory Report (ELR) — Wisconsin, 2001–2015



Stein E, Elbadawi LI, Kazmierczak J, Davis JP. Babesiosis Surveillance — Wisconsin, 2001–2015. MMWR Morb Mortal Wkly Rep 2017;66:687–691. DOI: http://dx.doi.org/10.15585/mmwr.mm6626a2.

Epidemiological Studies

CEFOs enhance the ability of state and local jurisdictions to detect and track potential threats to public health, and epidemiological studies lay the groundwork for many of these achievements. Epidemiological studies not only improve the nation's ability to prepare for and respond to public health events, but they support the advancement of public health science overall.

Responding to a Large Outbreak of Multidrug-Resistant Tuberculosis in Minnesota

Rajal Mody, MD, MPH, CAPT US Public Health Service
Saint Paul, Minnesota

Multidrug-resistant tuberculosis (MDR TB) is a major public health threat globally. It is much more difficult to diagnose and treat, and outcomes are worse than for drug-susceptible TB disease. There is also no way to determine if a latent TB infection is caused by an MDR or a drug-susceptible strain, and there is no consensus on how best to treat latent TB infection that may be caused by an MDR strain. Active MDR TB disease cases in Minnesota increased from zero in 2015 to nine in 2016 with an additional nine in 2017. Fourteen of these infections (78 percent) affected people in St. Paul and Ramsey County's large Hmong community, a Southeast Asian ethnic group, including many elders who had attended the same senior day center. Whole genome sequencing revealed that 10 were highly genetically related, thus supporting the assertion that this was an outbreak of active MDR TB transmission rather than reactivation of latent infections. This is one of the largest recent MDR TB outbreaks in the United States. As of May 3, 2018, more than 600 close contacts have been identified who need to be carefully evaluated for evidence of latent or active TB to control this outbreak.

CAPT Mody, through collaboration with national MDR TB experts, led the development of statewide guidance for the medical evaluation of people identified as close contacts of infectious patients and the treatment of those identified as having latent TB that may be MDR. In the Hmong community most affected by this outbreak, the majority of TB clinical evaluation and medical management is provided by local public health. However, as this outbreak was growing rapidly in size, the local public health department lacked sufficient medical staffing of its tuberculosis clinic. CAPT Mody filled this critical gap by obtaining approval to treat patients in the clinic with active MDR TB, overseeing implementation of contact evaluation and clinical management guidance for this outbreak, and overseeing care for many other patients with active and latent tuberculosis unrelated to the outbreak. In addition to direct patient

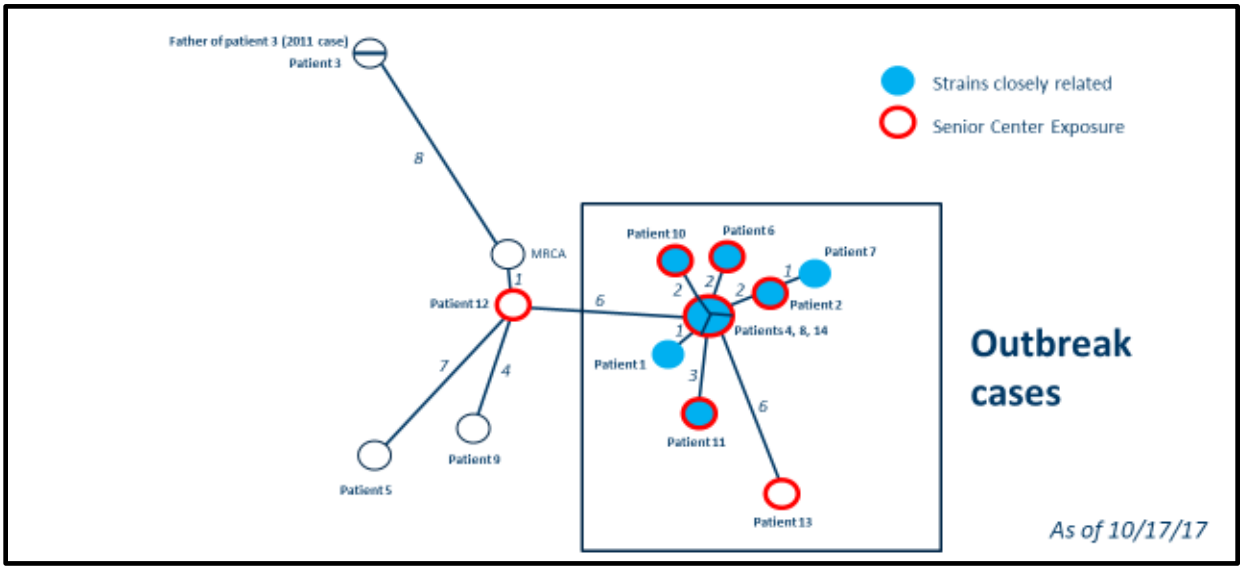
care, CAPT Mody reviewed hundreds of medical records of exposed contacts to identify any immunocompromising medical conditions that would influence clinical management. Even after the clinic was able to restore its medial staffing, CAPT Mody continued to assist the clinic to ensure continued capacity of local public health preparedness, including helping arrange long-term onsite technical assistance by CDC TB clinical experts.

CAPT Mody communicated directly with patients' primary care providers for coordination of care. Building these relationships with primary care providers was essential for ongoing monitoring to facilitate early detection of active disease or adverse medication side effects and drug interactions among outbreak cases and contacts.

CAPT Mody assisted in many other aspects of the outbreak response coordinated through an incident command structure, including developing fact sheets specifically for outreach to Hmong community leaders and adult day center owners and regulators, and development of data management systems. CAPT Mody also worked with local hospitals to address impacts of lengthy and expensive MDR TB hospitalizations.

By filling a critical clinical gap, CAPT Mody championed efforts to prevent and more rapidly detect additional outbreak-related MDR TB cases. None of latently infected outbreak contacts who are receiving medical treatment or active clinical monitoring have developed active MDR TB disease. With treatment of a single MDR TB case estimated to cost $288,000, these activities have likely resulted in a major cost savings to public health and the broader community. CAPT Mody's services in the tuberculosis clinic helped the local health department enhance its preparedness for future health threats. Finally, CAPT Mody helped builds strong ties between public health and primary care providers that have strengthened the community's ability to respond to urgent public health threats.

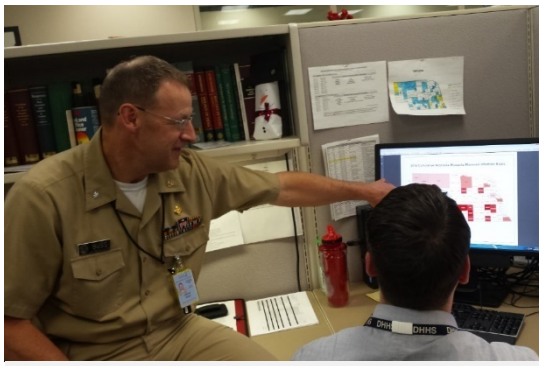
Whole Genome Sequencing of 2016-2017 Hmong MDR TB Cases, Ramsey County Minnesota, 2016-2017 as of Oct. 17, 2017.



Containing an Outbreak of Campylobacteriosis Linked to Contaminated Water in Nebraska

Bryan F. Buss, DVM, MPH, DACVPM, CAPT US Public Health Service
Lincoln, Nebraska

CAPT Bryan F. Buss serves as a CEFO assigned to the Nebraska Department of Health and Human Services (NDHHS). In March 2017, his agency was notified of an apparent cluster of five campylobacteriosis cases in a small Nebraska community. On average, only one Campylobacter case every three years had been reported among residents of this community in the past. Based on this information, the NDHHS Office of Epidemiology, in collaboration with the local health department, initiated an epidemiologic investigation under the leadership of CAPT Buss.

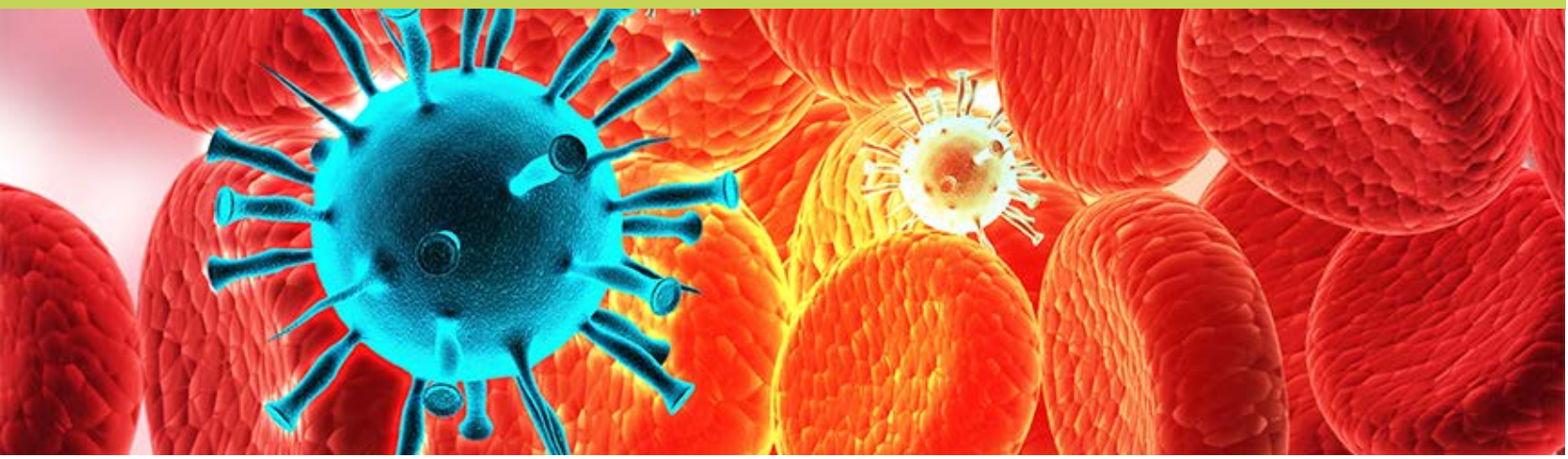


CAPT Buss mentoring a Nebraska Department of Health employee.

The investigation team used a questionnaire for people who lived in the affected community to report their food consumption history, drinking water sources, animal exposures, and whether or not they experienced illness. Of the estimated 600 residents, 94 provided responses. Of these, 39 (41.5 percent) reported developing gastrointestinal illness during the timeframe of interest, including 12 who sought medical care. Six tested positive for campylobacteriosis. Subsequent data analysis indicated a statistically significant association between ill persons and consumption of untreated city tap water. Through further investigation, CAPT Buss and his team identified that a nearby confined animal feeding operation (CAFO) pumped a large volume of livestock waste water through a broken irrigation system which subsequently flooded a ditch in close proximity to two of the town's municipal water wells. Each of these wells had been in operation in the time period immediately prior to the first reported illnesses. Under the direction of NDHHS environmental health officials, the town stopped using these wells immediately.

A map displaying well locations in relation to CAFOs during the campylobacteriosis outbreak in a small Nebraska community.

Based on their investigation findings, CAPT Buss and his team were able to identify *Campylobacter jejuni* as the cause of this outbreak, most likely from municipal water being contaminated by water run-off from an adjacent CAFO. In response, the community decommissioned the two affected wells and opted to replace them with a single, deep, higher capacity groundwater well in an alternate location. Since the time of this investigation, no additional illnesses in this community have been linked to contaminated water.



Outbreak/Environmental Investigations and Emergency Response

CEFOs play a vital emergency response function within their assigned jurisdictions. Emergencies can involve an infectious disease outbreak, a natural disaster, an unusual chemical exposure, or a terrorist attack. Regardless of the scope, duration, or etiologic agent, CEFOs can apply the techniques of applied epidemiology and emergency management to improve public health response and better protect communities.

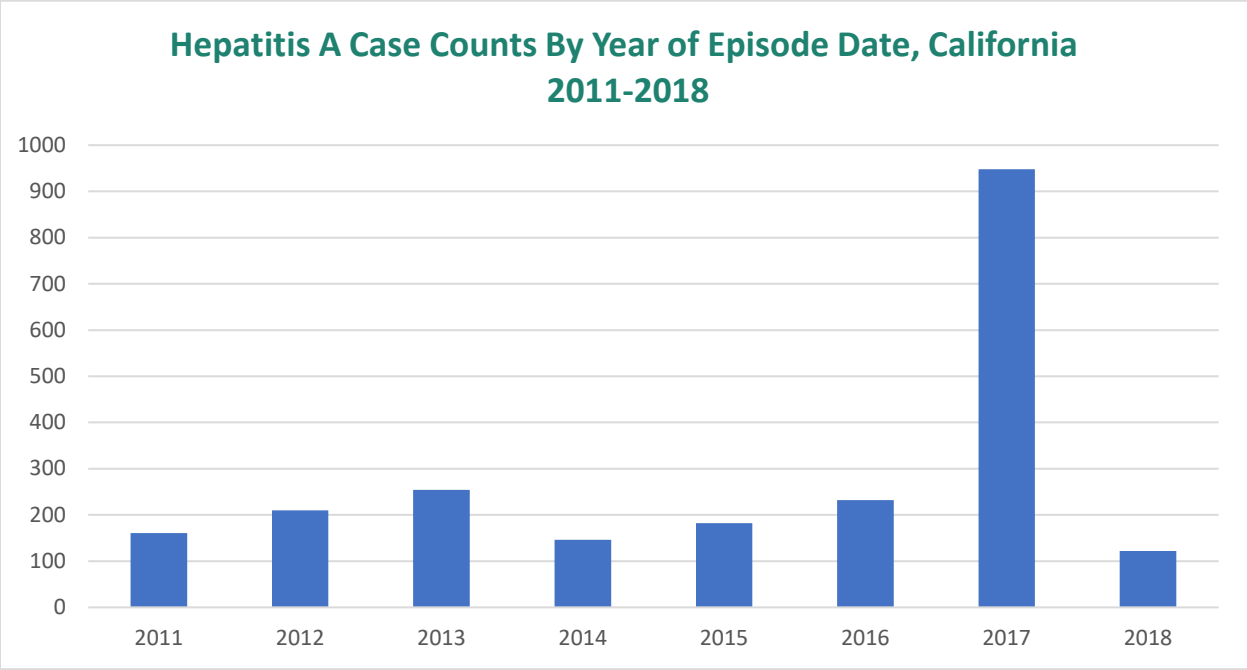
Containing an Outbreak of Hepatitis A among Persons Experiencing Homelessness and Using Illicit Drugs in California

Shua Chai, MD, MPH, CDR US Public Health Service
Richmond, California

In November 2016, California experienced what was, at the time, the largest hepatitis A outbreak in the United States from person-to-person transmission since implementation of the vaccine. The first county affected was San Diego, followed by Santa Cruz, Los Angeles, and Monterey counties. The majority of people who were infected with hepatitis A virus in the outbreak were reported to be people experiencing homelessness or using illicit drugs in settings of limited sanitation. A large response including federal, state, and local partners, along with private industry partners, organized against this outbreak. The California Department of Public Health (CPDH) was the lead agency in California for the state response. As part of the response, CDPH activated its emergency operations center, called the Medical and Health Coordination Center (MHCC).

CDR Shua Chai served as the MHCC's Science Branch Director for the hepatitis A outbreak response, overseeing the coordination of expertise and information between subject matter experts across federal, state, and local government jurisdictions. This response included multiple partners at the state level, the Emergency Preparedness Office, the Immunization Branch, the Environmental and Occupational Health Branch, the Viral and Rickettsial Diseases Laboratory of the state public health laboratory, and other state partners. CDR Chai developed, in coordination with partners, guidelines, policies, educational material, and communication products, especially during periods of vaccine shortage and intense media interest.
As a result, CDPH helped procure, distribute, and monitor use of more than 123,000 hepatitis A vaccine doses (85,000 federally funded, 38,000 state funded) to enable jurisdictions to deliver vaccine to at-risk

populations to stop transmission and prevent future outbreaks. CDR Chai led efforts to prioritize distribution and targeted vaccination of those populations at highest risk for hepatitis A during a period of vaccine shortage, during which the Governor's Declaration of a State of Emergency for the hepatitis A outbreak allowed CDPH to take charge of vaccine procurement, purchase, and distribution. CDR Chai and the Science Branch also provided key subject matter expertise to local health departments to enhance identification and monitoring of cases, environmental sanitation, and prevention of occupational exposure. CDR Chai also helped to streamline internal and external communications so that partners, the media, and the public received accurate information about the outbreak, control measures, and level of risk of hepatitis A infection for different populations. As part of this effort, CDR Chai led regular statewide calls with local health departments to disseminate this epidemiological and laboratory guidance and to coordinate efforts across the state.



Investigating Seoul Virus in Rats and Humans in Minnesota

Stacy Holzbauer, DVM, MPH, DACVPM, CDR US Public Health Service
Saint Paul, Minnesota.

Seoul virus is an Old World hantavirus in the Bunyaviridae family. Its natural reservoir is the Norway rat (*Rattus norvegicus*). Rats infected with Seoul virus are asymptomatic but can transmit the virus to humans through infectious saliva, urine, droppings, or aerosolization from contaminated bedding. In December 2016, the Wisconsin Department of Health Services (WDHS) notified CDC of a patient hospitalized with fever, elevated liver enzymes, decreased white blood cell count, and elevated protein in urine. The patient owned and operated an in-home rattery, or rat-breeding facility, with approximately 100 Norway rats, primarily bred as pets. A family member developed similar symptoms four weeks later. Because both patients were known to have rodent contact, they were tested for hantavirus infections. In January 2017, CDC confirmed recent, acute Seoul virus infection in both patients. An investigation was conducted to identify additional human and rat infections and prevent further transmission. Ultimately, the investigation identified 31 facilities in 11 states with human or rat Seoul virus infections; six facilities also reported exchanging rats with Canadian ratteries. Three Minnesota ratteries received rats from implicated ratteries in Wisconsin and Illinois.

CDR Holzbauer, a CEFO assigned to the Minnesota Department of Health (MDH), led
response to Seoul virus in Minnesota. CDR Holzbauer was quickly able to gather ve
including a mobile anesthetic machine borrowed from the Minnesota Zoo to obtain rat
from the ratteries. She led a team that collected blood specimens from 140 rats and fi
and coordinated shipping to CDC Viral Special Pathogens Lab. She helped create a
notification issued by the MDH and the Minnesota Board of Animal Health (MBAH)
outbreak summary and guidance for Minnesota veterinarians. She helped write a MBAH
that was issued to ratteries that had animals that tested positive and outlined the ste
completed for the quarantine to be lifted.

This was the first recognized outbreak of Seoul virus in U.S. history. Because of
leadership, MDH was the only state health department investigating a large number of
not need to request federal resources and personnel to assist in sample collectio
notification and quarantine order developed by MDH and MBAH was shared with oth
and used as a model document for states to modify for their own use. CDR Holzbauer
response efforts supporting this outbreak at the 2017 National Association of Sta
Veterinarians annual conference as an example of a successful One Health zoonotic dise

Left, CEFO Stacy Holzbauer in personal protective equipment and testing a rat for Seoul Virus.

Researchers display equipment used to obtain specimens from rats for Seoul Virus testing. CEFO Stacy Holzbauer, second cer she

Improving Responder Safety and Tracking in Georgia

Laura Edison, DVM, MPH, LCDR US Public Health Service
Atlanta, Georgia

Response workers who are prepared and trained to respond effectively and safely are essential during a response, and a plan for monitoring their health and safety is critical for their protection. The Deepwater Horizon oil spill and the West Africa Ebola outbreak underscored the importance of responder safety, and there is growing emphasis on this aspect emergency preparedness. Responders, defined as "public health agency staff," may also include first receivers (hospital and medical staff), as well as a wider group of responders, including volunteers. During a major incident, public health staff may be called on to monitor any and all responders. Conducting and participating in monitoring and surveillance activities to rapidly identity potential adverse health effects experienced by public health responders and to identify ways to prevent further adverse effects are essential.

Dr. Edison helped the Georgia Department of Health to develop the Responder Safety, Tracking, and Resilience (R-STaR), which is Georgia's enhancement of CDC's National Institute of Occupational Safety and Health Emergency Responder Health Monitoring and Surveillance™ (ERHMS) framework. R-STaR addresses the three stages of a disaster response workers activities associated with the emergency.

- **Pre-deployment**: Rostering and credentialing employees, assessing vaccination status if applicable, knowledge of which responders are "ready" and available.
- **Deployment**: Where are the responders, what are their deployment duties, what are their hazardous exposures, and how is their health? Are safety plan updates needed to protect other responders?
- **Post-deployment**: How is their health now? What were the lessons learned?

Under the leadership of Dr. Edison, R-STaR was actively set up to:

- Roster and credential responders prior to an event
    - Record credentials, capabilities, trainings, immunizations, etc.
- Identify exposures and symptoms early in the course of a response
- Prevent or mitigate adverse physical and psychological outcomes
    - Take corrective action and evaluate protective measures
    - Identify responders for medical referral or long-term health surveillance
- Communicate rapidly with all responders
- Track resources and responders
- Meet preparedness capability requirements

Hurricane Matthew had an anticipated major impact on coastal Georgia. As the health department activated its EOC and response teams, it became clear that many public health staff would be deployed to work on the response.

The hurricane hit Georgia on October 7, 2016. Thanks to the foresight of Dr. Edison and the team involved with developing R-STaR, the new tool was successfully used to monitor the health and safety of responders deployed for storm response. R-STaR was activated the day the storm hit. During the response, 128 responders were registered and reported in 11 health districts, and more than 30 counties, in fields ranging from nursing, environmental health, epidemiology, and immunizations. R-STaR was easy to use, well received by responders, and provided valuable information on responder health during and after deployment. A published evaluation of the R-STaR activation highlighted the benefits of using a user-friendly web-based monitoring system. The report also presented recommendations to improve hurricane responder training and disaster preparedness planning to more effectively monitor and protect responder health and safety. A more robust R-STaR tool with improved content and functionality is in development.

Plans, Guidance, and Policy Development

When policy makers need timely, accurate, and effective strategies to address public health concerns, they often rely on CEFOs for guidance. CEFOs provide critical subject matter expertise in areas that jurisdictions may not otherwise have adequate staff or resources to handle.

Medical Surge Planning: Prioritizing Interfacility Movement during Disasters in New York City

Timothy Styles, MD, MPH, CDR US Public Health Service
New York City, New York

New York City (NYC) is a common target for terrorism events – three events, two bombing incidents and one vehicular ramming, occurred during 2016 and 2017 alone. Although the city has 19 trauma centers spread across the city, with a population of more than 8.5 million residents, any large-scale event could quickly overwhelm the healthcare system - especially limited specialty services such as burn and pediatric trauma capacity. NYC Department of Health and Mental Hygiene (DOHMH) has prioritized working with health systems, hospitals, city, state and federal partners to build medical surge capacity and address specialty surge.

DOHMH has worked closely with city health care coalitions to develop response functions, including plans to prioritize patients for transport and mobilizing critical resources and beds after disasters. In 2017, CAPT Styles developed two, one-page patient information and prioritization forms (one for beds and one for transportation) that could be quickly completed by hospitals and communicated to a prioritization team to ensure rapid transport of patients as higher level or specialty services become available. DOHMH supported one borough coalition to exercise the use of the forms and assess the use and adequacy to convey patient rapid transport needs after a disaster. Additionally, this coalition exercise tested patient tracking using a state system that monitors the movement of patients during mass casualty or mass evacuation events. Prior plans and exercises required a seven-page patient information form to prioritize patients based on needs. These forms were cumbersome and burdensome in coordination of rapid secondary transport. Prior exercises also showed an inability to keep track of patient interfacility movement after initial transport.

Exercising medical surge secondary transport prioritization and patient tracking provided critical information that improved medical surge planning in NYC. Through this exercise, 16 facilities were able to

activate incident command structures to surge resources to receive more than 80 patients each, as well as rapidly request transport for patients they would not be able to adequately treat given their staffing and resources. All 16 facilities reported the ability to rapidly complete and transfer patient information, request immediate secondary transport, and perform a virtual "handshake" to accept transfers. Testing of patient transfer prioritization forms showed a vast improvement from a 2016 exercise's findings. Ease of form completion and transmission facilitated rapid movement of patients to definitive care after a notional disaster. Further use of the patient tracking system allowed facilities to test and identify gaps in their ability to use current electronic tracking equipment and programs, something not typically used outside of a disaster.

Using a One Health Approach to Increase the Public Health Capacity of Arizona's Tribes

Heather Venkat, DVM, MPH
Phoenix, Arizona

The 22 sovereign American Indian communities in Arizona represent a wealth of cultural diversity. Arizona has the second largest American Indian population in the entire United States, and tribal reservation land covers over one quarter of the state. Dr. Heather Venkat, the CEFO for Arizona, works tirelessly to ensure that public health preparedness needs are sensitive to the unique needs of tribal populations.

Multiple zoonoses occur on tribal lands including Rocky Mountain spotted fever (RMSF), *Onchocerca lupi*, hantavirus, plague, and rabies. Hantavirus is a severe condition that can be fatal if not treated quickly thus early identification and treatment can improve patients' chances of survival. Exposure to hantavirus can be prevented by eliminating contact between humans and infected rodents and their droppings wherever possible. RMSF infections are tick-borne; they can be fatal or cause serious disability.

Dr. Venkat provided consultation and support for a tribal medical center's hantavirus laboratory protocol with the goal of wider use throughout all of the tribe's clinics, including other partner states. She provided hantavirus-focused training to approximately 75 clinicians at three tribal medical centers. She created and updated other zoonotic and infectious disease education and testing and treatment algorithms and protocols used by tribal partners.

Venkat, left, collaborating with the Indian Health Service and tribal members to perform Rocky Mountain spotted fever field surveillance and education for local tribal members.

The Navaho Nation, Tohono O'odham Nation, San Carlos Apache Tribe, and White Mountain Apache Tribe are just a few examples of American Indian communities Dr. Venkat actively works with. She led the production and dissemination of culturally appropriate educational materials, and helped update the Arizona Department of Health Services (ADHS) Tribal Handbook. Using CDC technical assistance and consultation, she and her team developed and delivered community education to improve knowledge about varied zoonotic risks, address gaps, and reduce environmental hazards using integrated public health solutions. She helped organize and conduct

education and outreach annual campaigns for several tribal reservations to examine tick surveillance on dogs, assess areas around homes for tick and mosquito-breeding sites, and to apply tick treatments near homes and on dogs.

She also supported rabies vaccination and zoonotic disease education efforts for some tribes in collaboration with the Indian Health Services Office of Environmental Health Services. Dr. Venkat has led and supported public health training during ADHS-sponsored events, such as the RMSF Vector Statewide Tribal Meeting and Vector Conference. Dr. Venkat led a community assessment for public health emergency response (CASPER) training for tribes which was the first time many of them were trained in this rapid needs assessment methodology. Six of the tribes have adopted Arizona's Medical Electronic Disease Surveillance Intelligence System (MEDSIS), received training, and are able to better manage their own cases and more easily share information with the county that jurisdiction resides in as well as with the Arizona Department of Health Services. These collaborations with American Indian tribes have strengthened Arizona's overall capacity to respond to zoonotic and other diseases, and other public health threats.

Venkat provides canine rabies vaccinations and education to American Indian tribal members during a public health campaign.

Preparing for Pediatric Medical Surge in New York City

Celia Quinn, MD, MPH, CDR US Public Health Service
New York City, New York

Addressing surges in demand for medical care (preparedness capability 10) and caring for the needs of at-risk populations, including children, are priorities of the PHEP program. New York City (NYC) has 62 acute care hospitals that participate in the 911 system including 16 level 1 trauma centers, three of which are pediatric level 1 trauma centers. Twenty-eight hospitals care for pediatric patients and have, with the assistance of the NYC Pediatric Disaster Coalition, developed pediatric-specific components of their overall disaster plans. The NYC Department of Health and Mental Hygiene and partners conducted an exercise on May 25, 2017 to test the ability of the New York City (NYC) Healthcare System to respond to a surge of pediatric trauma patients. Such exercises help public health emergency preparedness and response planners test and improve their plans and capabilities to address the unique needs of children during disasters.

As a CDC Career Epidemiology Field Officer assigned to NYC, CDR Quinn worked with the experts in the NYC Pediatric Disaster Coalition and the Fire Department of New York (FDNY) to plan and conduct this exercise. They designed the exercise to reflect an estimated number of injured children who would need to be transported to hospitals and the types of injuries they might experience if a highly coordinated and widespread terrorist attack occurred. Twenty-eight hospitals participated in the exercise to test plans related to pediatric surge. They assessed the resources they would need to meet the surge demands, including nursing and specialty staff availability, pediatric medications and equipment, communications and incident command processes, and decision-making regarding transfers to specialty hospitals.

CDR Quinn, a pediatrician and a parent of two young New Yorkers, and her colleagues validated that NYC hospitals could rapidly increase pediatric critical care capacity. Hospitals more than doubled their number of beds in pediatric intensive care units and added 1,105 pediatric inpatient beds so children could stay in the hospital for an extended period of time. They opened 203 operating rooms that could treat children who needed surgery. They also identified gaps in order to further improve medical surge capability. This was the largest exercise NYC has conducted that focused primarily on caring for injured children.

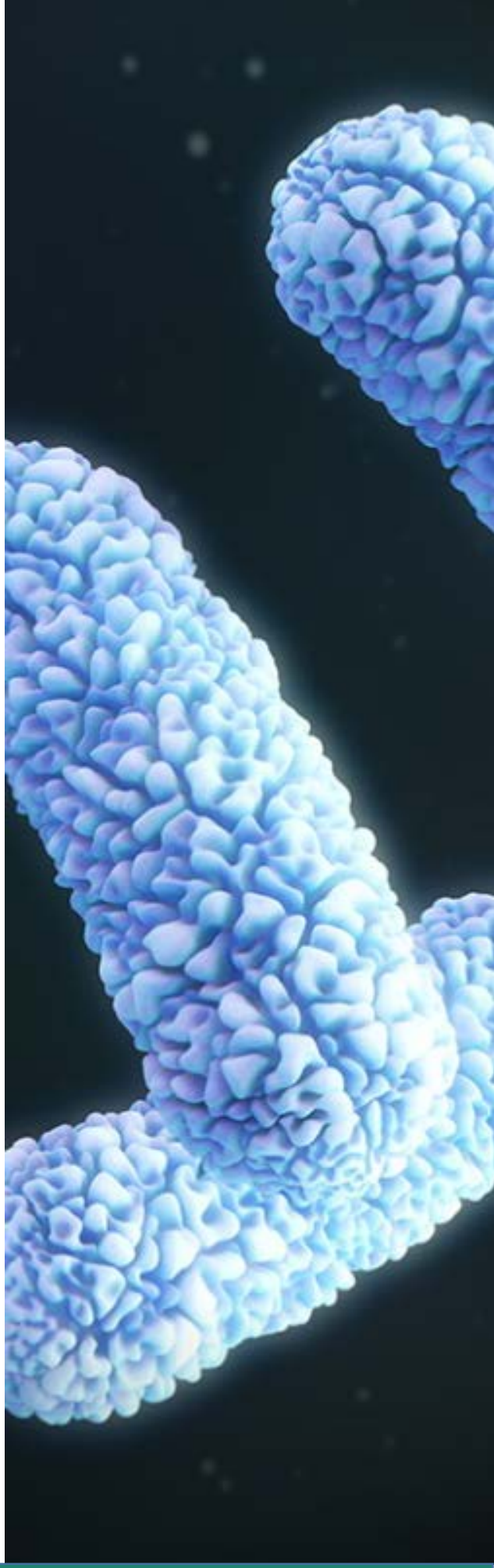
Building Capacity to Conduct Risk Assessments and Prevent Outpatient Infections in Pennsylvania

Jeffrey R. Miller, MD, MPH,
CDR US Public Health Service
Harrisburg, Pennsylvania

The detection, prevention, and containment of healthcare-associated (HAI) infections, superbugs, and other emerging pathogens are critical public health preparedness activities. These activities prevent costly infections, save patient lives, keep healthcare providers and responders safe, and minimize the impact on our vital health infrastructure.

In 2016, CDR Jeffrey Miller helped develop and implement a strategic HAI plan for the Pennsylvania Department of Health. He provided leadership of high-profile emergency responses (e.g., Ebola), and spearheaded innovative efforts to build robust and enduring state public health capacity. He has informed workforce development activities, improved efficiency in Pennsylvania healthcare-associated infection response programs, and led efforts to improve infection control capacity, outbreak response, infection prevention, and antibiotic stewardship at the Pennsylvania Department of Health and across the state.

Through implementation of the strategic plan and assisted by CDR Miller's leadership, the Pennsylvania Department of Health secured approximately $1 million of additional funding annually for the HAI program and increased staffing from 0.4 to 11 full-time employees. Over the last two years, the team completed a total of 116 onsite infection control assessments in dialysis centers and acute, long-term and outpatient care facilities. Notable team responses benefitting from CDR Miller's input include the first U.S. outbreak of emergent mcr-1 antibiotic resistant infections, description of the first four of seven azole-resistant Aspergillus infections in the U.S., and containment of carbapenemase-resistant *Enterobacteriaceae* outbreaks in healthcare facilities. CDR Miller and the HAI team also took quick and decisive action limiting further spread of a large multi-state *Burkholderia cepacia* bloodstream infection outbreak affecting 59 long-term care facilities and causing 163 illnesses and seven deaths.



Education, Training, and Workforce Development Activities

CEFOs serve as educators and mentors to the next generation of public health professionals. Their varied knowledge and experience helps ensure the continued excellence of our nation's public health system.

Responding to an Influenza A (H7N2) Outbreak in New York City

Scott Harper, MD, MSc, MPH, DTMH, CAPT US Public Health Service
New York City, New York

The threat of animal influenza viruses entering the human population leading to an influenza pandemic is a significant public health concern. From November 2016 through February 2017, the first reported outbreak of influenza A (H7N2) occurring in hundreds of cats was investigated in New York City (NYC) animal shelters. Only one case of animal to human transmission was noted during the acute phase of the outbreak.

Since the outbreak was detected several weeks after the first cat with confirmed influenza A (H7N2) entered the shelter system, it was possible that other human infections had occurred before the outbreak's identification, and that mild or subclinical infections were overlooked after the outbreak was identified. The NYC Health Department, in conjunction with CDC's Influenza Division, used a newly developed series of serological assays to conduct a serosurvey among shelter staff to determine whether additional human infections had occurred before outbreak identification and to assess occupational exposure risk. CAPT Harper served as served as the senior subject matter advisor for the EISOs who were on the front lines acquiring and analyzing the data, as well as CDC liaison to the influenza division.

The team identified an additional human case of influenza A (H7N2), bringing the total to two confirmed human infections in shelter staff during this outbreak. Using serological assays newly developed by CDC's Influenza Division, antibody responses against influenza A (H7N2) virus were detected in the serum of one of 121 shelter staff workers. Five other staff workers exhibited low positive titers to influenza A (H7N2) virus, indicating possible infection; however, investigators could not rule out cross-reactive antibody responses to seasonal influenza viruses. The remaining 115 persons were seronegative. The seropositive staff worker reported multiple direct exposures to cats without using personal protective equipment and

had experienced mild illness with subjective fever, runny nose, and sore throat. Without the serosurvey, this additional human case would have gone undetected. The findings provided further evidence that transmission of influenza A (H7N2) from cats to humans could occur, but, importantly, the risk to humans currently remains low. The NYC Health Department's EIS Officer, supervised by CAPT Scott Harper, presented data from the serosurvey at the 2018 EIS Conference and won CDC's prestigious Donald C. Mackel Award, recognizing the best collaborative work between epidemiology and laboratory scientists.

Building Epidemiological Capacity in the Long-Term Care Setting to Manage Outbreaks

Ma'isah Larkin, MBA, MPH, CPH, PMP
Trenton, New Jersey

During the 2016-2017 influenza season, New Jersey experienced high levels of widespread flu activity throughout the state. The elderly are one of the populations most susceptible to the illness. Many long-term care facilities (LTCF) within the state were affected by influenza outbreaks, requiring assistance from local health departments. In many instances, the local health departments are burdened by numerous outbreaks in their jurisdictions. This highlighted a need for training long-term care personnel to identify, manage, and prevent outbreaks

As the state CEFO, Ma'isah Larkin has led numerous outbreak investigations in varying settings. In 2017, to address the burden of flu outbreaks in long-term care facilities and other intuitional settings, she worked to develop a training workshop for LTCF personnel to improve their ability to detect outbreaks, initiate investigations, and work to control and prevent future outbreaks. The training workshop consisted of a half day training to teach basic epidemiological principals and the steps to conduct respiratory/gastro-intestinal/scabies outbreak investigation, as well as the appropriate steps to take in reporting any outbreaks. A hands-on segment was included in the investigation component which allowed attendees to learn the appropriate methods for conducting case surveillance and completing line lists. Nearly 200 people were trained during five sessions held throughout New Jersey.

As a result of Larkin's efforts, many LTCFs are better equipped to prevent and respond to the various types of outbreaks that may occur in their facilities. Many local health departments provided feedback on the workshop in how it improved reporting of outbreaks from LTCFs. Additionally, it streamlined the process of following up on outbreaks. There was noted improvement in outbreak reporting and response process from LTCFs during the 2017-2018 flu season. Because the training was highly effective, it led the New Jersey Department of Health to adopt the workshop as an annual training event for attendees.

Building the Epidemiology Workforce and Surveillance Capacity in Kentucky

Kimberly Porter, PhD, MSPH
Louisville, Kentucky

Kentucky requires reporting of multiple healthcare-associated infections (HAI), which necessitates electronic laboratory reporting through Kentucky's health information exchange. Many facilities are not yet connected to the system, and instead fax copies of laboratory reports and accompanying case investigations to the health department. Hundreds of HAI reports come in monthly and require significant staff time to enter into an Epi Info database. Staff trained in epidemiology have historically spent the majority of their time doing data entry. New epidemiologists on the team often had limited experience and needed guidance on how to improve their skills to help address this situation.

`Dr. Kimberly Porter helped orient new epidemiologists on the HAI team to the subject matter and led the development of their work plans. Dr. Porter worked with them to help understand the data they were entering and the database itself, with an emphasis on improving the efficiency of data entry to allow them more time to focus on data management and analyses. Before Dr. Porter transferred from Kentucky to Alaska, she worked with other staff at the health department to develop a strategy for moving away from paper-based reporting toward electronic reporting.

The epidemiology side of the HAI team improved its efficiency, which is critical for the sustainability of HAI surveillance in Kentucky. The epidemiologists' ability to improve data quality through routine, automated cleaning, to detect outbreaks, and to analyze trends over time and geographically was also strengthened. There has been an increase in automating the identification of reportable HAIs from the laboratory data using Logical Observation Identifiers Names and Codes and Systematized Nomenclature of Medicine codes. Quality HAI surveillance data will help inform prevention activities in Kentucky, which will reduce transmission of HAIs and increase the safety of healthcare organizations statewide.

Program Development and Evaluation

CEFOs build, enhance, and foster program development by maintaining partnerships between public health and healthcare providers, conducting exercises, expanding mass care and medical surge capabilities, and improving health communications and information sharing across jurisdictions. They work with health departments, hospitals, doctors, clinics, long-term care facilities, and other providers to ensure the programs that are developed are comprehensive and maintain integrity across public health settings, and that effectively meet their stated goals.

Developing a Strategy for Vaccinating the Highest Risk Groups during a Hepatitis A Outbreak in Michigan

Jevon McFadden, MD, MPH, CDR US Public Health Service
Lansing, Michigan

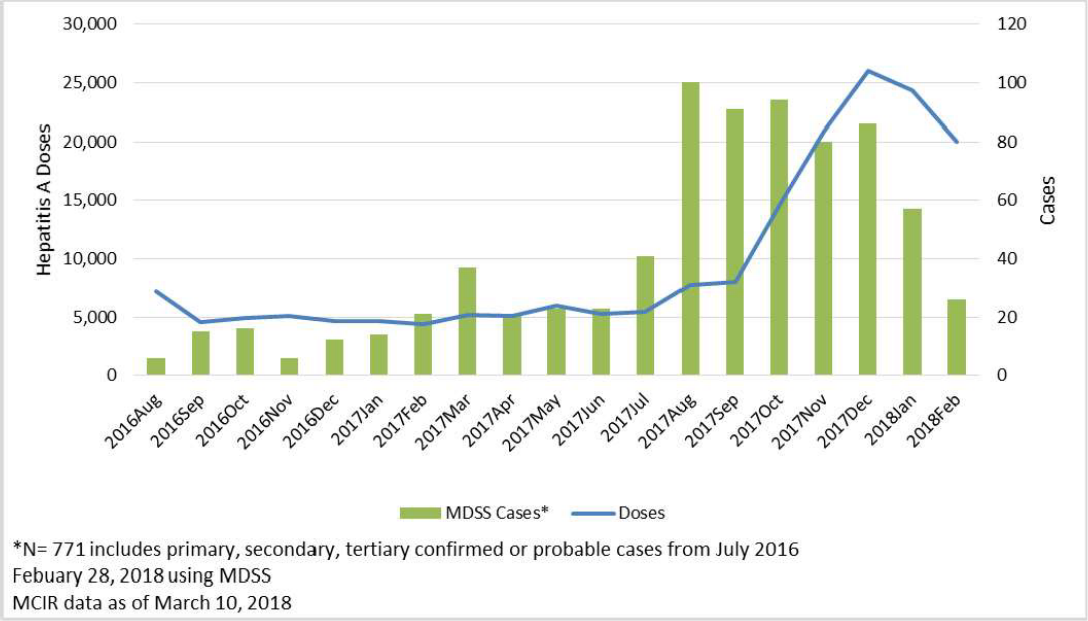
In August 2016, southeast Michigan began to experience a low-level increase in reported cases of hepatitis A. Few of the cases appeared linked in any way to food establishments or foreign travel, which had consistently been the two most commonly reported risk factors among hepatitis A cases in Michigan prior to 2016. Risk factors commonly reported by these new cases included drug abuse, homelessness, and recent incarceration. In late August 2017, there was a dramatic surge (see graphic below) in reported cases with similar risk profiles accompanied by geographic spread to a number of neighboring counties outside the southeast Michigan area, as well as the emergence of men who have sex with men as an additional risk factor seen among nearly 20 percent of newly reported cases.

In September and October 2017, MDHHS leadership worked to procure funding from the state legislature to increase capacity at local health departments specifically for responding to the hepatitis A outbreak. MDHHS activated its emergency coordination center to better coordinate state and local response activities.

In late October 2017, the Michigan state epidemiologist requested that CEFO CDR Jevon McFadden assist the outbreak leadership team to help guide all MDHHS hepatitis A outbreak response activities. His role involved guiding all outbreak-related data interpretation activities to inform outbreak response activities by MDHHS and local health departments. A critical component of this strategy involved providing better data to local health departments on the locations and characteristics of high-risk persons so that they could effectively target vaccination efforts to the areas of highest need. Through numerous detailed presentations to MDHHS leadership, on calls involving affected local health departments statewide, and on individual calls with the most heavily impacted jurisdictions, CDR McFadden effectively communicated the importance of the targeted vaccination approach and provided guidance on strategies for overcoming challenges to reaching the highest risk populations.

Through this targeted vaccination strategy, more than 150,000 doses of adult hepatitis vaccine were administered from October 2017 to May 2018. The proportion of vaccine that was administered to highest risk geographic areas increased nearly threefold during this time. Michigan has seen a consistent decline in reported cases each month since December 2017. Due to the long incubation period of hepatitis A, it is premature to say whether or not this trend will continue down to baseline levels, and it is also unclear the degree to which the targeted vaccination strategy impacted this persistent decline in cases. However, it is clear that the strategy that CDR McFadden helped initiate and continues to support has been effective at delivering significantly more vaccine to the highest risk groups. Michigan is now experiencing the longest sustained decline in cases since the start of the outbreak in August 2016.

HAV cases vs. HAV doses administered to adults by month, August 2016 - February 2018



Building Disaster Epidemiology Capacity in West Virginia

Erica Thomasson, PhD, MPH
Charleston, West Virginia

The West Virginia Department of Health and Human Resources (WVDHHR) Bureau for Public Health (BPH) is the state agency charged with overseeing health responses to disasters that occur within West Virginia. Between 1954 and 2016, there were 66 disaster declarations – over half of these declarations have occurred since 2000. Following the 2014 Elk River chemical spill that contaminated the water supply of approximately 300,000 residents, West Virginia requested an assessment of disaster epidemiology capacity at the BPH from CDC. CDC recommended planning for various disasters and building disaster epidemiology capacity within the BPH by having both state and local public health staff skilled in disaster epidemiology tools.

CDC's National Center for Environmental Health, in collaboration with the National Institute for Occupational Safety and Health, and the Agency for Toxic Substances and Disease Registry, helps prepare agencies to respond to disasters and minimize the effects of disasters on communities by providing a disaster epidemiology workshop at no cost to state and local public health.

The purpose of this workshop is to provide disaster epidemiology training to a diverse audience with varied epidemiological experience and to enhance knowledge, awareness, and capacity of three existing federal tools for disaster situations: the Community Assessment for Public Health Emergency Response (CASPER), the Emergency Responder Health Monitoring System (ERHMS), and the Assessment of Chemical Exposures (ACE). CASPER is an epidemiologic technique for public health practitioners and emergency management officials designed to provide household-based information about a community's needs quickly and at a low cost; ERHMS provides a health monitoring and surveillance framework for emergency responders which includes specific recommendations and tools for all phases of a response; and ACE provides resources to help gather epidemiologic information after acute toxic substance releases. The workshop described how these tools can be used in each disaster phase to produce actionable information.

To build disaster epidemiology capacity in West Virginia, Erica Thomasson, a CEFO assigned to the BPH's Office of Environmental Health Services, requested and led the coordination of this training in West Virginia. The workshop was held at West Virginia University (WVU) School of Public Health in Morgantown during March 28–30, 2017 and was attended by over 80 staff from state and local health departments and WVU students. The workshop provided attendees with the knowledge, skills, and abilities to be a part of West Virginia's trained cadre of volunteers that contribute to building and sustaining West Virginia's preparedness and response capacity.

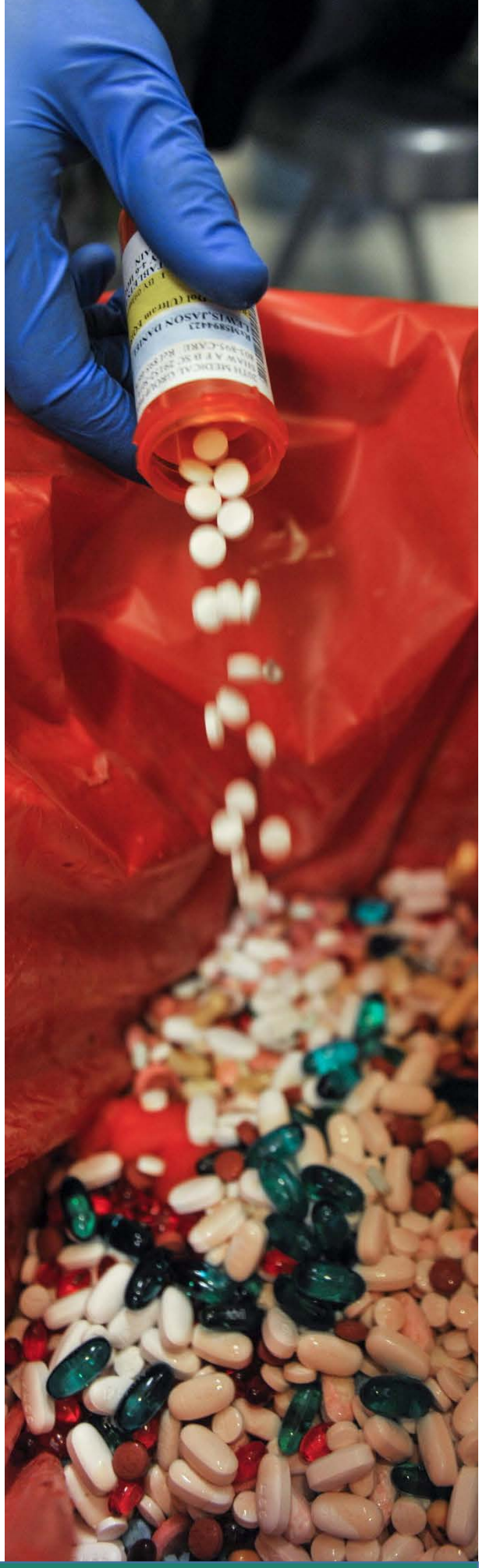
Measuring Antibiotic Consumption Rates in Long-Term Care Facilities in South Dakota

Nato Tarkhashvili, MD
Pierre, South Dakota

Long-term care facilities are often considered a reservoir of multidrug-resistant organisms due to high consumption rates of antibiotics. According to CDC, each year 4.1 million Americans are admitted to or reside in nursing homes. Up to 70% of nursing home residents received antibiotics during each year, and 75% of antibiotics are incorrectly prescribed. Dr. Tarkhashvili, a CEFO in South Dakota, led an investigation to address this issue.

Dr. Tarkhashvili prepared a protocol and study instrument for long-term care facilities to report consumption rates electronically. Together with colleagues, Dr. Tarkhashvili successfully recruited 18 facilities to participate starting in January 2017. Participating facilities received monthly reports noting their consumption rate, rates in other (de-identified) facilities in the state, and statewide consumption rates. This allowed participating facilities to compare their rates to others in the group and with the state overall. Additionally, findings were discussed during monthly conference calls that also provided opportunities for the group to learn about antimicrobial stewardship to reduce unneeded prescribing.

In addition to antibiotic consumption rates, this project measured *Clostridium difficile* rates in each facility and attempted to correlate rates with antibiotic consumption. The Healthcare Associated Infections (HAI) segment of Epidemiology and Laboratory Capacity (ELC) grant required coordinated approach on prevention and control of HAI in the state. The funding has helped South Dakota to measure and evaluate successes accomplished in HAI arena, specifically in measuring and reducing antibiotic consumption and associated infections among long-term care facility residents.



CEFO Innovations

Responding to a jurisdiction's public health needs in an effective and timely manner necessitates the ability to innovate. CEFOs consistently exhibit high aptitude in innovate in useful ways. From the distribution of limited medical surge equipment throughout a state to better serve the population to identifying a new way to use systems already in place to respond to emergencies more efficiently, CEFOs continually work to improve public health using whatever resources are available.

Developing and Implementing a New Approach to Infectious Disease Emergency Response in Alabama

Melissa Morrison, MPH, CDR US Public Health Service
Robertsdale, Alabama

The Alabama Department of Public Health (ADPH) activated its incident management system (IMS) for an infectious disease response for the first time in 2015. While previous infectious disease responses had stressed capacity, the Ebola Virus Disease response was the first that involved multiple departmental units and exceeded resources to that scale. It became clear that the traditional IMS structure was not as effective for infectious disease responses as for natural disaster responses and that improvements in scalability were needed.

CDR Melissa Morrison drew from her experiences as program manager for the ADPH Ebola Virus Disease response to identify strengths and weaknesses in the ADPH IMS structure. She applied the model of the CDC IMS structure to include a Scientific Response Section in the ADPH IMS structure for infectious disease responses. She also adapted the San Francisco Bay Area Advanced Practice Center Infectious Disease Response Plan Toolkit to ADPH, using Highly Pathogenic Avian Influenza as the first planning scenario.

The resulting ADPH Infectious Disease Emergency Response (IDER) Activation and Notification protocol was in place in January 2016 and was first used to initiate the activation of the ADPH IMS to respond to Zika. The new IDER IMS organizational structure was successfully customized to the scientific requirements of the Zika response, implemented, and scaled up and down according to the needs of the response. CDR Morrison's use of the IDER protocols and IMS structure have been officially approved by the ADPH Center for Emergency Preparedness to be implemented for future infectious disease responses.

Preventing Toxic Chlorine Gas Exposures at Aquatic Venues in California

Jason Wilken, PhD, MPH
LCDR US Public Health Service
Richmond, California

In June 2015, the California Department of Public Health (CDPH) was informed by staff from the Hazardous Materials Division of Contra Costa County of a chemical release at a municipal swimming pool that sickened 34 swimmers, mostly children. An investigation by Contra Costa County identified equipment failure and human error as contributing factors for excess pool chemicals being expelled at high concentrations, generating toxic chlorine gas.

LCDR Jason Wilken responded by reviewing records held by the California Department of Pesticide Regulation; he identified eight other incidents involving toxic chlorine gas exposures at aquatic venues from 2008 through 2015. A total of 155 people were sickened, 121 were transported to an emergency department or were evaluated by their primary medical provider, and five required hospital admission. A review of incident reports identified equipment failure and human error as contributing causes. LCDR Wilken assembled a multidisciplinary team representing epidemiology, clinical practice, hazardous materials, environmental health, and swimming pool inspectors and engineers to develop recommendations to prevent future toxic chlorine gas releases at aquatic venues.

In 2016-2017, LCDR Wilken and his colleagues presented their findings and recommendations at multiple venues, including the National Environmental Health Association, the Council for the Model Aquatic Health Code (CMAHC) and the Council of State and Territorial Epidemiologists annual conferences. They were also published in CDC's Morbidity and Mortality Weekly Reports. LCDR Wilken was invited by the CMAHC to propose updates to the language of CDC's Model Aquatic Health Code, CDC's collection of best practices and regulatory language for aquatic venue and safety. These recommended changes were the first to address prevention of toxic chlorine gas releases, and they were adopted as best practices in 16 sections of the 2018 revision of the Model Aquatic Health Code.

Deploying a Geographic Information System to Protect Food Safety during a Water Emergency in Mississippi

Nykiconia Preacely, DrPH, MPH, CPH
Jackson, Mississippi

Emergency conditions affecting the water supply to food service establishments may comprise food safety and pose a threat of foodborne illness. Jackson, Mississippi issued an emergency declaration to shut off water service to address three massive breaks to a 48-inch water service line. They anticipated that a multitude of services, including food service operations, would be disrupted during the 24-72 hour water outage. Although the State of Mississippi Rapid Response Team (SMMRT) owned several licenses of ArcGIS Online (GIS), this geospatial data management and analysis software had never been utilized in a SMRRT field deployment.

SMRRT activated the incident command structure to review and approve emergency operations plans for food establishments that intended to remain operational during the planned water outage. To help SMRRT better direct their resources to protect food safety during the outage, Dr. Nykiconia Preacely utilized technical expertise in GIS to facilitate management of the food emergency response. She identified 600 Mississippi State Department of Health (MSDH) regulated food facilities in the affected area through GIS analysis. Team members were assigned to provide advance notice to these facilities to either suspend operations during the water outage or to operate using limited services pre-approved by MSDH as outlined in the incident's Emergency Operations Plan.

As a result of Dr. Preacely' s leadership, GIS was deployed to provide SMRRT with timely information to precisely guide field operations for issuance of special operating permits to food facilities that decided to remain open. In addition to spatial data, the "collector" application for ArcGIS allowed SMRRT to collect assessments, monitor EOP submissions, and add photo data while in the field. Lessons learned from the response indicated the usefulness of GIS as a robust resource that facilitated an efficient response to a food emergency.

Identifying a Tick Species and Disease Agent for the First Time in Pennsylvania

Enzo R. Campagnolo, DVM, MPH, FADD
Harrisburg, Pennsylvania

Lyme disease and other tick-borne diseases cause a significant medical, psychological, social, and financial burdens on residents of and visitors to Pennsylvania. As a veterinary CEFO assigned to the Pennsylvania Department of Health, Dr. Enzo Campagnolo has demonstrated leadership in his groundbreaking work to identify and respond to tick-borne diseases. Interactions among various tick species may present new disease vector opportunities. From both an epidemiological and public health perspective, the possibility of any tick becoming a vector species for an emerging zoonotic disease should never be overlooked. Identification of a new tick species in the area is important knowledge when evaluating emerging zoonotic diseases. Borrelia species and Powassan virus are among the current and emerging tick-borne infectious disease agents in Pennsylvania. Understanding the current epidemiology of tick-borne illnesses within the state is important to inform disease surveillance, prevention, and control activities.

Dr. Campagnolo conducted statewide tick surveillance, recovering ticks from hunter-harvested white-tailed deer in Pennsylvania, and analyzed the results of these collections. He identified a tick (*Dermacentor albipictus*) previously not found in Pennsylvania, and confirmed the presence of *Ixodes scapularis*, the principal vector of Lyme disease. He discovered a unique tick-borne Borrelia species of public health concern, *Borrelia miyamotoi*, which can cause symptoms similar to Lyme disease. He was also the first to document the presence of Powassan virus in the *I. scapularis* (deer tick) population in the state.

Dr. Campagnolo's identification of the *D. albipictus* tick for the first time in Pennsylvania highlights the need for public health practitioners to monitor this tick as a possible new disease vector. Confirmation of *I. scapularis*, the principal vector of Lyme disease, as the most prominent tick recovered supports the need for continued surveillance for Lyme disease and also highlights the importance of Lyme disease control and prevention activities in the state. Although Lyme disease is currently reportable, human *B. miyamotoi* infections are not; his findings support the need for increased public health and clinical awareness of this disease. Lastly, Dr. Campagnolo's identification for the first time of Powassan virus in *I. scapularis* ticks in Pennsylvania supports the need for more compre
increased public health and clinical awareness o
rapidly disseminated these important findings thr
information is also important for clinicians in neig
Pennsylvania.

Investigating Injection-Site Infections Linked to a Pain Management Clinic in Florida

Ann Schmitz, DVM, MA. LCDR US Public Health Service
Miami, Florida

Pain management specialists frequently offer corticosteroid injections to treat chronic pain. Epidural steroid injections (ESI), in particular, have been controversial with respect to effectiveness and safety. In terms of outbreaks of hospital associated infections (HAI) associated with these procedures, contamination at the point of manufacture, unsafe compounding pharmacy practices, and unsafe injection practices have been points of concern. The Florida Department of Health's (DOH) Acute Investigations Team has partnered with the HAI Prevention Program and Bureau of Public Health Laboratory staff to evaluate new tools and assays to more effectively investigate these outbreaks. In August 2017 the Florida Department of Health (DOH) was notified of a cluster of patients with paraspinal abscess development consistent with nontuberculous mycobacterial (NTM) infections following ESI at the same pain management clinic.

LCDR Ann Schmitz serves as a regional epidemiologist and laboratory liaison covering South Florida for DOH's Acute Investigations Team and acts as a technical consultant for outbreaks of healthcare associated infections. LCDR Schmitz coordinated the activities of the involved local health departments, DOH syndromic surveillance program, DOH HAI Prevention Program, Bureau of Public Health Laboratories (BPHL), and CDC to successfully identify the etiologic agent and scope of the outbreak and provide recommendations for corrective action to prevent further transmission at this clinic.

This investigation was remarkable for the introduction of two new capacity-building tools and assays. This was the first outbreak in Florida where BPHL successfully performed whole genome sequencing of *Mycobacterium abscessus* isolates with analysis from CDC's Metagenomics and Molecular Biology Team to find all sequences were identical and suggestive of a common source of exposure. This outbreak investigation also marked the first time CDC's Infection Prevention and Control Assessment Tool for Outpatient Settings was used in a joint site visit by local epidemiology staff and HAI program staff. LCDR Schmitz' introduction of the use of this assessment tool with the combined perspective of infection control and epidemiology were critical to the identification of several practices at the clinic that may have contributed to the outbreak and resulted in recommendations for corrective action. Local epidemiology staff are now trained to use this tool in the event a joint team is not feasible. DOH is moving towards routinely incorporating these tools to investigate HAI/NTM outbreaks in Florida.

Building Medical Surge Capacity in Wyoming

Daniel O'Leary, DVM, DACVPM, CAPT US Public Health Service
Cheyenne, Wyoming

Large, sparsely populated areas face unique challenges responding to public health emergencies due to limited resources and long distances. Addressing these requires creativity, awareness of opportunities, and deep collaboration with response partners. In February 2015, the Wyoming Department of Health (WDH) worked to obtain, at no cost, a Federal Medical Station (FMS) from the Department of Health and Human Services (HHS). An FMS is a deployable medical equipment and supply cache designed to provide low-acuity care for up to 250 patients for 72 hours without resupply. Intended uses include medical surge and mass care when existing resources are overwhelmed. An FMS requires significant transportation and storage capabilities, as well as capable personnel.

CAPT Dan O'Leary, the CEFO assigned to the WDH, led multi-agency efforts to develop and implement plans to ensure the capability and capacity to use the FMS during public health emergencies. They turned the 250-bed FMS into 50-bed Wyoming Medical Stations (WMS). He developed inventories, led reconfiguration teams, and procured and stocked all needed equipment and supplies to meet HHS 50-bed specifications. Working with multiple Wyoming partners, he led the development of a statewide WMS concept of operations and planning guide. Partners included the Wyoming Office of Homeland Security, its departments of education and revenue, various county emergency management and public health nursing offices, county attorneys, the American Red Cross, Army and Air Force National Guard units, and a private transportation firm.

He initiated and led efforts to identify, vet, and catalogue medical sheltering sites in every Wyoming county. He coordinated two-day WMS trainings taught with CDC's FMS strike team and HHS Region 8 emergency coordinators. Trainees included local public health, local emergency management, and state Red Cross officials. He recruited a nine-person volunteer WMS strike team, wrote team operating procedures, conducted two multi-day WMS deployment trainings, and worked to test and improve the WMS deployment plans. The strike team deployed the WMS to Idaho for that state's full-scale, multi-state exercise, "Wasatch Wobble," during spring of 2017. CAPT O'Leary worked with the Wyoming National Guard to create a mission ready package of Guard medical staff to operate the WMS. He led a three-day joint training that included WMS deployment across the state by Wyoming's strike team; classroom training of 50 National Guard medical professionals and Wyoming Red Cross regional managers; setup of a joint general population/medical shelter; and a full day caring for 28 'patients' played by local teenage volunteers.

Wyoming's WMS deployment to Idaho during a multi-state exercise during spring of 2017 demonstrated ability to meet demands for mass care and medical surge during multi-state public health emergencies. CAPT O'Leary's efforts have helped prepare Wyoming and its neighboring jurisdictions to care for displaced, low acuity patients.

2016 Zika Response

CDC's Emergency Operations Center (EOC) was activated January 22, 2016, to respond to the Zika virus outbreak. Zika virus is transmitted primarily through the bite of infected mosquitoes, but can also be transmitted through sexual intercourse and from mother-to-fetus. While Zika virus infection is generally asymptomatic in adults, congenital Zika virus infection can lead to severe birth defects. The 2016 Zika virus outbreak in the western hemisphere primarily impacted populations in Central America, South America, and the Caribbean, but was of great concern in the United States because of humanitarian reasons, the risk of imported infections, and the introduction of Zika virus into mosquito populations in the continental United States. CEFOs from across the United States and territories responded to protect the nation from the growing threat Zika posed.

Protecting America's Outposts: The CDC Zika Territorial Health Unit

Walter Randolph Daley, DVM, MPH, Captain US Public Health Service
Chief, Field Services Branch

As the Zika outbreak in the Americas spread to multiple countries during late 2015, CDC began to prepare for spread into the United States. This eventually occurred in December 2015 with the confirmation of local Zika virus transmission in Puerto Rico (PR). Shortly after, in January 2016, local Zika virus transmission was detected in the U.S. Virgin Islands (USVI) and American Samoa (AS). With the presence of the CDC Dengue Branch in San Juan and Dana Thomas, the CEFO assigned to PR, a pre-existing CDC structure existed to support the health department there with the response. In early February, Jay Roth (CEFO – TN) deployed to USVI and Thane Hancock (CEFO – USAPI) deployed to AS to lead CDC response teams. Other CEFOs later deployed to both locations.

Initially, CDC teams in AS and USVI were led by experienced CEFOs, and there was regular communication with the CDC incident manager (IM). However, by June 2016, the attention of CDC response leadership had become focused on Puerto Rico, where the number of Zika cases was in the thousands, and the mainland U.S., where local transmission was eminent. Concurrently, case counts began increasing drastically in USVI while AS continued to have limited ability to test biologic samples for surveillance purposes. The IM identified the need for a unit to coordinate USVI and AS field teams and the interaction of multiple CDC Zika taskforces with these jurisdictions.

In August 2016, CEFO program director Randolph Daley established the Territorial Health Unit (THU) within the State Coordination Taskforce (SCTF) to improve coordination of CDC efforts in USVI and the US-affiliated Pacific Islands (USAPI). Within the first two weeks, the THU began to direct USVI and AS field

teams, coordinate with multiple taskforce representatives to provide a unified approach, and develop a standard weekly report and briefing for the IM team. The CEFO for the USAPI was designated as the Pacific Zika Coordinator, reporting directly to the THU lead and supervising field teams assigned to USAPI jurisdictions. The THU continued to operate effectively throughout the response.

Accomplishments of the THU include:

- Instituted Zika testing of all pregnant women in AS in accordance with CDC guidelines
- Enhanced Zika virus surveillance activity in AS, allowing the determination of the end of local Zika transmission and the early identification of a subsequent dengue outbreak
- After identifying local Zika virus transmission in Kosrae, Federated States of Micronesia (FSM), coordinated deployment of a CDC team, and rapid delivery of mosquito larvicide for use prior to a large influx of travelers in December 2016
- Coordinated rapid deployment of a team to Chuuk, FSM, to enhance Zika surveillance and assess potential cases
- Supported improvement of vector control plans in USVI and FSM
- Improved Zika case reporting from USVI, particularly entry of information into ArboNet
- Facilitated activities to prevent sexual transmission of Zika virus in USVI

By ensuring sufficient coordination of CDC field activities in the territories and freely associated states, the THU was able to support other elements of the CDC Zika virus response to maximize results. This critical role guaranteed that the needs of these isolated populations were not obscured by the intense focus on PR and the mainland U.S.

Protecting Virginia during the Zika Outbreak in the Americas

Katie Kurkjian, DVM, MPH
Virginia Department of Health

In recent years, large-scale infectious disease outbreaks, like the Ebola outbreak in West Africa, have tested public health's capacity for preparedness and response. When Zika virus emerged and spread throughout the Americas in 2016–2017, the Virginia Department of Health (VDH) needed to quickly establish and maintain surveillance for Zika virus infection.

In response, Dr. Katie Kurkjian served as a Zika subject matter expert for epidemiologic activities. From January 2016 to May 2017, she led a team responsible for coordinating human surveillance for Zika infections across the Commonwealth. She developed, revised, and reviewed guidelines, procedures, and tools needed for surveillance and case investigation, supported data collection and analysis activities, and ensured that public health colleagues and partners had access to timely, accurate summaries on epidemiologic activities. As the team lead, she also oversaw a pilot project to capture Zika virus testing requests from healthcare providers using a secure, web-based system (REDCap). Dr. Kurkjian also assisted with the U.S. Zika Pregnancy Registry efforts by drafting VDH's initial procedures and serving on CDC's data use work group. She assisted with planning activities for conducting a community survey if local mosquito transmission was identified, information sharing activities including drafting or reviewing website materials for the public and clinicians, and applying for funding opportunities that involved epidemiologic activities.

As a result of Dr. Kurkjian's work, VDH communicable disease staff had access to up-to-date surveillance resources and information to support their work. VDH also had a trained, capable surveillance team dedicated to the Zika response, thereby providing some relief to communicable disease staff at the local, regional, and state levels, permitting non-Zika surveillance and investigation activities to continue with minimal disruption.

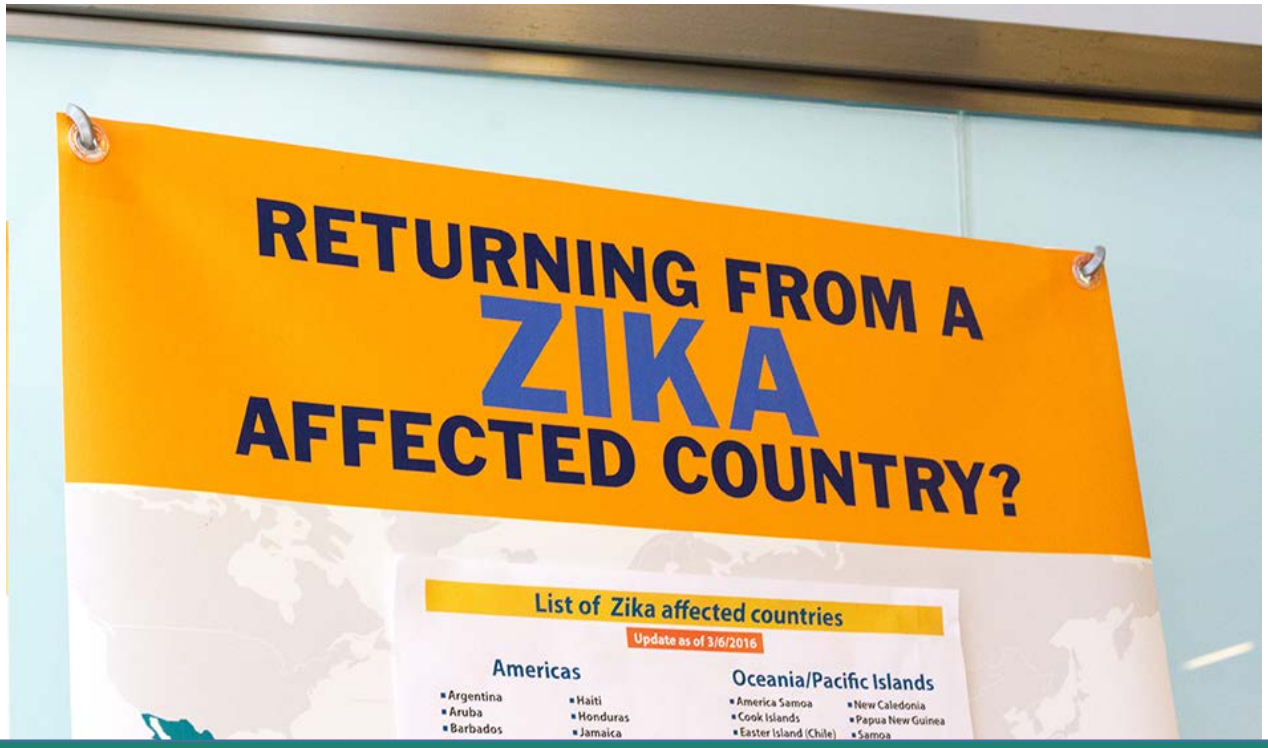
Coordinating Zika Testing in New York City

Neil Vora, MD, CDR US Public Health Service
New York City, New York

During 2016, there were more than 5,000 symptomatic Zika cases reported in the continental United States, 20 percent of which were in New York – mostly in New York City. New York City's Department of Health and Mental Hygiene (DOHMH) was one of the first agencies in the country to offer Zika virus testing for patients. During 2016, over 20,000 Zika specimens were tested at DOHMH. However, during February of 2016, DOHMH received numerous specimens for Zika testing that were incorrectly collected, that lacked appropriate labeling (which posed patient safety issues), and that originated from patients with no risk factors for Zika (e.g. the patients had not traveled to Zika-affected areas of the world and therefore did not need to be tested). To address these concerns, CDR Neil Vora, the CEFO for New York City, was tasked with creating a call center to coordinate Zika testing for New Yorkers.

CDR Vora assembled a team of more than 20 staff to open a novel call center for Zika testing, which managed incoming calls from providers testing patients for Zika throughout New York City. CDR Vora built upon his experience overseeing a call center for Ebola active monitoring in 2015. In the Zika testing call center, CDR Vora oversaw the development and implementation of 37 operational protocols (with 51 additional supporting documents) to ensure that his staff handled requests for Zika testing in a consistent fashion that prioritized the latest science, health equity (making sure all New Yorkers had access to Zika testing, if testing was indicated), and customer service (trying to minimize the burden on providers).

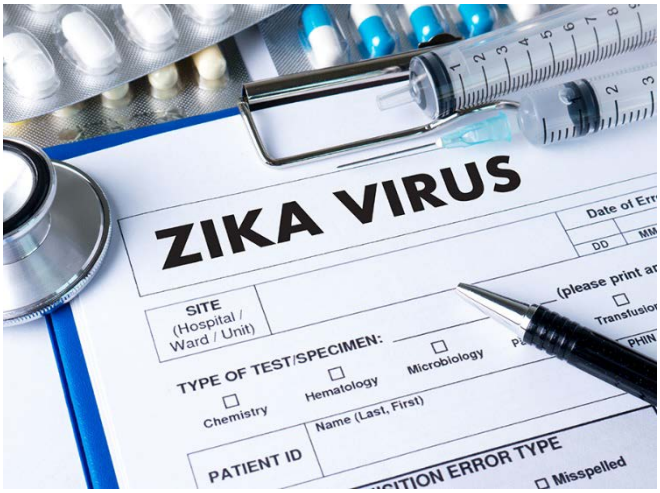
CDR Vora also deployed staff to public hospitals in New York City to raise awareness about Zika and to facilitate Zika testing at obstetrics and gynecology clinics thought to be serving at-risk populations. Over a period of nearly a year, over 8,000 patients had Zika testing coordinated through the DOHMH Zika testing call center.



Ensuring Zika Testing for the Most At-Risk in New York City

Catherine Dentinger, FNP, MPH, Captain USPHS
New York City, New York

The emergence of Zika virus in the America's led to a surge in requests for laboratory testing for pregnant women who had recently returned from areas experiencing local Zika virus transmission. This surge rapidly affected New York City as many pregnant women and their partners who were concerned about their infection status sought testing, information, and reassurance. The demand for laboratory testing led to triage and a Zika-focused call center, but before that was implemented, many personnel worked to address the issue. One facet that concerned New York City's Department of Health and Mental Hygiene was whether test requests appropriately reflected Zika exposure risks.



CAPT Catherine Dentinger worked with partners in the health department to address surge issues including assisting its reference laboratory with the novel testing protocols and the most up-to-date guidance and recommendations; the rapidly accelerating surge in demand for such testing and the lack of any commercial testing facilities available to help meet surge demands; and ensuring testing was prioritized for pregnant women who had a higher likelihood of exposure. She provided expert consultations and education for numerous providers, routed calls to a wide array of experts including pediatric specialists who could help diagnose Zika-related anomalies, and ensured the flow of specimens and information between labs and providers.

Working with health department partners, she also helped evaluate testing requests to assess if they validly reflected patients who had greater risks of exposures to Zika virus, as opposed to those who had little or no actual risk. Initial assessments revealed lower-than-expected rates of testing among women residing in areas with high numbers of travelers to Zika-affected areas. In response, CAPT Dentinger and her colleagues increased outreach to women who had higher risk for Zika exposure and their providers through Spanish media interviews and distribution of multilingual materials in areas with large immigrant populations.

CAPT Dentinger's timely and energetic efforts ensured that the health department could successfully manage the flow of information and testing requests during a time of critical need. Her efforts helped providers and laboratorians better serve pregnant patients who had concerns about their pregnancy outcomes. Furthermore, her efforts helped ensure that the limited Zika testing capacity available during the initial phase of the response was conserved and appropriately targeted for patients with a higher risk of infection. The health department's outreach boosted test requests from census tracts in New York City where immigrants from areas with active Zika transmission resided. Rates of Zika testing among women 15–44 years of age in these census tracts increased from 29 per 100,000 before the effort to 40 per 100,000. This outcome demonstrates how CAPT Dentinger's efforts helped ensure appropriate resource allocation during a time of relative shortage — a critical public health goal.

Confirming the Link between Zika Virus Infection and Guillain Barre Syndrome in Puerto Rico

Dana Thomas, MD, MPH,
CAPT US Public Health Service
San Juan, Puerto Rico

In 2015, areas recently affected by Zika virus, such as Brazil, Columbia and French Polynesia, reported concurrent increases in the numbers of reported cases of Guillain Barre Syndrome (GBS), a rare neurological disorder caused by the immune system's attack of its own peripheral nerves. Rapid-onset muscle weakness can lead to paralysis and often requires mechanical ventilation. GBS can be fatal and takes months or years to recover. In addition to mechanical ventilation, treatment usually consists of one or more doses of intravenous immunoglobulins which costs around $10,000 for each. In January 2016, a person presented to a hospital in San Juan with numbness and progressive weakness, preceded by two days of rash. GBS was subsequently diagnosed and laboratory analysis provided serologic evidence of recent Zika virus infection.

Serving as the Chief of Staff for the Zika Response in Puerto Rico, CAPT Dana Thomas selected Dr. Emilio Dirlikov, CDC Epidemic Intelligence Service Officer assigned to the Puerto Rico Department of Health, as the Principal Investigator for an emergency public health surveillance system for GBS and other neurological conditions. CAPT Thomas ensured the PHEP objectives for monitoring epidemiologic trends, providing arbovirus testing, and supporting health care professionals across the island were met and reported to CDC.

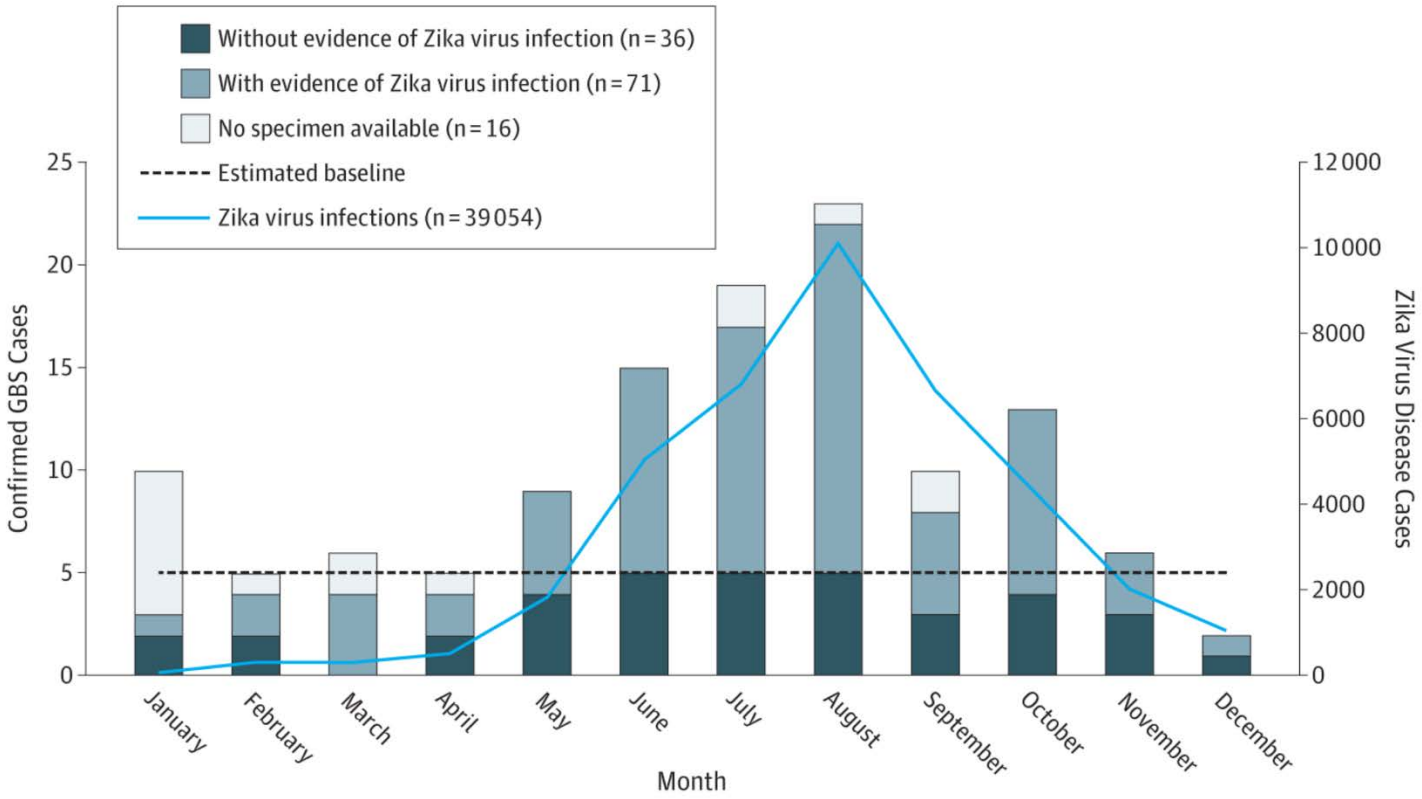
Emergency public health surveillance in Puerto Rico resulted in timely monitoring of cases of GBS throughout the local Zika virus outbreak and led to several key public health and scientific accomplishments:

- A case-control investigation found acute Zika infection, confirmed by RT-PCR positive results, as a risk factor for GBS.
- Findings from a postmortem investigation suggest that pathophysiology was antibody mediated without neurotropism.

- Investigations characterized clinical features of Zika virus-associated GBS, finding higher morbidity during the acute phase and more frequent cranial neuropathy during acute neuropathy and six months afterward.
- Surveillance data and research results were shared broadly through publication of six peer-reviewed publications, one Spanish-language magazine article, domestic and international presentations (e.g. GBS CIDP Foundation International Biannual and regional conference, NJDOH, Association of Mexican Clinicians and Microbiologists, EIS, TEPHINET, IDWEEK, ASTMH).
- Experience was shared at Pan American Health Organization (PAHO) and World Health Organization (WHO) headquarters and was included in a WHO toolkit.

Investigations are ongoing to better understand the association between Zika virus infection and GBS and other neurological conditions. The efforts within the GBS team epitomize the balance of managing an emergency response (e.g. ensuring healthcare professionals and the vulnerable populations they serve have the resources needed for the best possible outcomes) while creating new scientific knowledge to benefit the population at the epicenter of the next Zika epidemic. Under the leadership of CAPT Thomas, this groundbreaking study was published in JAMA Neurology, thus enhancing the public health breadth of knowledge of Zika virus.

Confirmed Guillain-Barré Syndrome Cases With and Without Evidence of Zika Virus Infection and Zika Virus Disease Cases by Month of Symptom Onset, Puerto Rico, 2016GBS indicates Guillain-Barré syndrome



JAMA Neurol. 2018;75(9):1089-1097. doi:10.1001/jamaneurol.2018.1058

Implementing Zika Virus Surveillance and Epidemiology in Tennessee

Julie Shaffner, MS, MPH
Nashville, Tennessee

In early 2016, as Zika spread throughout Central and South America, the Tennessee Department of Health rapidly established disease surveillance for the virus. The goals for this work were to 1) identify and report cases among travelers and their sexual partners, 2) link pregnant cases to appropriate clinical care, and 3) improve the ability to detect and respond to any locally transmitted cases.

Incident command was established with Julie Shaffner serving as the chief of the operations section. In this role, she was responsible for developing and implementing a surveillance system for Zika. She developed guidelines, protocols, and tools needed for surveillance and case investigation, created data collection instruments, conducted analyses, and ensured that public health colleagues, partners, and the public received accurate and updated information about the virus and its spread. She utilized Epi Info's visual dashboard to create tools to check for data quality issues, ensuring that cases were accurately and thoroughly reported. Additionally, she assisted with planning activities for conducting a community-based response when cases were identified within a time frame that suggested local transmission. As Zika became well-established in the western hemisphere, the response transitioned from an emergency to part of normal operations. During this time, Shaffner assisted with hiring and training permanent staff to handle vector-borne disease epidemiology and surveillance.

These activities led to the identification, investigation, and reporting of 71 confirmed and probable cases (from 1,057 investigations) of Zika amongst Tennessee residents in 2016 and 2017. There were 44 local community responses in 2016, increasing community awareness and understanding of mosquito-borne disease prevention.

Responding to Zika in the Pacific

W. Thane Hancock, MD, MPH, LCDR US Public Health Service
U.S.-Affiliated Pacific Islands

In early 2016, Zika transmission was confirmed in American Samoa. This was the first confirmed transmission of Zika virus in the U.S.-affiliated Pacific Islands (USAPI) since 2007. Due to the urgent concerns over the impact of Zika on pregnant women and their fetuses, American Samoa requested help from CDC in responding to the emerging outbreak. By mid-2016, Zika transmission was confirmed on two other US-affiliated Pacific Islands, the Republic of the Marshall Islands, and Kosrae State of the Federated States of Micronesia. At the end of 2016, Chuuk State reported a cluster of illnesses that local health officials suspected were due to Zika or dengue. CDC support was requested by all these island jurisdictions. CDC deployed four different teams across USAPI to meet this response need. Coordinating this response across three different countries, with different languages, cultures, government structures, and social taboos was especially difficult. The CDC teams required guidance from someone with arboviral outbreak response experience, an understanding of the local contexts of each of the impacted islands, connections with the island's public health staff, and the ability to create a strategic plan to enable the islands to meet CDC guidelines and confirm the end of transmission.

LCDR Thane Hancock was asked to fill this supervisory role for CDC's Zika response in the U.S. Pacific. He was uniquely qualified for this assignment due to his current position as a CEFO for USAPI and his past experience of working in the Pacific on multiple arboviral outbreaks, including the world's first identified Zika outbreak in 2007. He immediately collaborated with deployed CDC staff and the local health departments to craft a plan on how to appropriately support Zika response activities and empower the island's jurisdictions to meet CDC guidelines on screening and monitoring pregnant women. He also assisted in developing recommendations on how the islands could confirm the end of transmission and when they could stop the routine screening of all pregnant women for Zika.

LCDR Hancock and public health officials accessing mosquito habitat during the 2016 Zika response.

The supervision, plans, and recommendations developed by LCDR Hancock allowed for a more easily coordinated and efficient CDC support to the local health departments. This enabled the development of sustainable surveillance systems and the eventual demobilization of CDC support teams from the Pacific while key monitoring and surveillance activities were maintained. He created plans that took into account the local resources and applied them in innovative ways so island jurisdictions could meet the CDC guidelines for screening and monitoring pregnant women on their island. Finally, his recommendations on determining the end of transmission led to the establishment of a timeline to discontinue the routine testing of pregnant women in American Samoa and were utilized by other affected island jurisdictions to determine the end of transmission. This enabled all the USAPI countries to eventually be removed from the World Health Organization list of countries with ongoing Zika transmission.

Evaluating Zika Virus Outreach in Targeted Communities in Chicago

Karrie-Ann E. Toews, MPH
Chicago, Illinois

It is important to ensure that limited public health resources are appropriately distributed to those most in need. Karrie-Ann Toews, the CEFO in Chicago, analyzed spatial distribution of Zika virus test requests in 2016 by residential location, and compared this to the distribution of Chicago residents native to areas with ongoing Zika virus transmission to assess testing demand in this group. Census data showed that immigrants from countries with ongoing Zika transmission were concentrated on the West and Northwest sides of Chicago, while residents tested clustered around the central and near-North sides of Chicago, areas that are more affluent. Community areas with high concentrations of immigrants from Zika affected areas were under-represented in Zika testing data.

After this analysis, Toews worked to ensure that CDPH expanded public and provider outreach on Zika risk, prevention, and testing in the West and Northwest communities. Under her leadership, a list of 20 targeted community areas was developed, and a public-facing Zika awareness and prevention campaign was launched on billboards, bus routes and train lines serving these areas. In addition, 250 provider offices providing OB/GYN, pediatric, or family practice care in targeted community areas participated in a point-of-care media campaign, with posters and take away brochures on Zika prevention, family planning, and testing to encourage discussions between patients and providers on Zika screening for exposure and to enhance testing in potentially at-risk populations.

Tests for residents of these community areas represented 47 percent of all Zika tests requested from January 1, 2016 through July 30, 2017. The proportion of tests for residents of these areas from July 31, 2017 to November 30, 2017 increased significantly to 56 percent. For the 20 community areas that received additional outreach engagement, the proportion of total Zika test requests for residents of these areas significantly increased since the launch of the 2017 campaign. Efforts to increase Zika testing in higher risk populations in Chicago allowed CDPH to efficiently link higher-risk residents in underserved areas to appropriate care.

Ensuring Zika Virus Testing of Pregnant Unaccompanied Children from Central America and Mexico in Maricopa County, Arizona

Rebecca Sunenshine, MD
CAPT US Public Health Service
Phoenix, Arizona

Zika virus infection during pregnancy can cause severe birth defects. Historically high numbers of unaccompanied children, including adolescents who are or become pregnant, migrate through areas with Zika virus transmission in Central America and Mexico to the U.S. border. Once apprehended, unaccompanied children are referred to Administration for Children and Families Office of Refugee Resettlement (ORR) custody. Federal law requires this agency to shelter and provide medical services to unaccompanied children until reunification with sponsors while awaiting immigration proceedings. However, this can be challenging due to changes in location and resulting changes in governing jurisdictions throughout this process. Pregnant unaccompanied children migrating from or through Zika affected areas represent a vulnerable population for which no formal system was in place to ensure appropriate Zika virus testing, counseling, and access to indicated healthcare.

CAPT Sunenshine, the CEFO assigned to the Maricopa County Department of Public Health (MCDPH), worked closely with her MCDPH colleagues, the ORR, associated medical providers, the Arizona Department of Health Services, and with contracted shelter facilities to develop and implement a system to ensure these individuals were tested for Zika virus and that their test results were communicated to them and their obstetric care providers, along with appropriate counseling. From February 23 to November 27, 2016, MCDPH tracked and investigated 81 pregnant unaccompanied children from Mexico and Central America. They collected information on demographics, facility, gestational age, and Zika testing status and results. 57 (70%) were tested. When a patient was reunified before test results were available, CAPT Sunenshine and MCDPH worked with state and federal partners to ensure results were communicated to the receiving health department, new provider, and patient. One individual had confirmed Zika virus infection, one had an equivocal IgM result, five had results consistent with an unspecified flavivirus infection, and 50 tested negative for Zika virus by IgM antibody and/or polymerase chain reaction.

Among 24 untested unaccompanied children, 13 were reunified with an out-of-state sponsor prior to specimen collection, two did not meet testing requirements, and one delivered before testing.

Another eight awaited specimen collection at the time of this report submission. All seven (12.3%) with non-negative results were reported to the state health department for inclusion in the CDC Zika pregnancy registry.

Under Dr. Sunenshine's leadership, MCDPH collaborated with federal entities and state and local public health to develop a robust surveillance system ensuring this at-risk population was not overlooked and that they received appropriate care.

Developing a Zika Pregnancy Registry in North Carolina

Jennifer MacFarquhar, MPH, RN, CIC
Raleigh, North Carolina

The emerging threat of Zika virus disease highlighted opportunities for improved communication, disease surveillance, and response in North Carolina. To help, Jennifer MacFarquhar, a CEFO for the state, served on the Zika incident management team in the operations section for the duration of the response. She provided oversight and direction to the epidemiology team, clinicians, and blood collection centers. She also established the North Carolina Zika Pregnancy Registry, part of the national CDC registry. This registry required active follow-up of pregnant women with positive or indeterminate Zika virus laboratory results and their infants for the first year of the child's life. Establishing this registry required building new partnerships with other branches (Women's and Children's Health and Birth Defects Monitoring Program), coordinating new communication pathways, and assuring linkage to care. MacFarquhar provided oversight of the North Carolina Zika Pregnancy Registry. Additionally, she provided technical input for grant-writers which resulted in funding to support additional full-time employees for vector-borne surveillance, entomologists, and a Zika Pregnancy Registry coordinator.

Because of MacFarquhar's work, North Carolina established and currently maintains a pregnancy registry for women and infants affected by Zika. It established new partnerships with health department divisions and healthcare providers, thereby assuring linkage to care for a vulnerable population. Additionally, North Carolina is conducting ongoing vector surveillance across the state.

Leading an Integrated Epidemiological Approach to Zika in Philadelphia

Ami Patel, PhD, MPH
Philadelphia Dept. of Public Health

The emergence of Zika virus in the Western Hemisphere prompted the need for local and state health departments throughout the country to prepare for and respond to local transmission of the infection and severe cases of infection. A coordinated response integrating infectious disease, maternal and child health, and mosquito epidemiology was essential to prepare the City of Philadelphia for Zika virus prevention and control. Dr. Patel served as Epidemiology Lead for the Department and was engaged in all facets of Zika virus epidemiology at the local level.

Dr. Patel established an Incident Command Structure for the Department in February 2016 and convened the larger planning team on an approximately monthly basis to discuss Zika Virus activities, updates, planning, and gaps. She served as the Epidemiology Operations Lead. As part of this role, Dr. Patel rapidly integrated Zika virus surveillance into PDPH's existing electronic disease surveillance system, established protocols with over 10 clinical laboratories for the appropriate collection and submission of clinical specimens for testing at public health laboratories, wrote three health advisories, and secured federal funding to increase capacity for mosquito, human, and long term birth defect surveillance. She oversaw epidemiologists on her team who produced surveillance reports and provided technical guidance on epidemiological analyses. In addition, she was co-principal investigator for a Zika CASPER (rapid needs assessment) to assess the impact of PDPH's community outreach campaign.

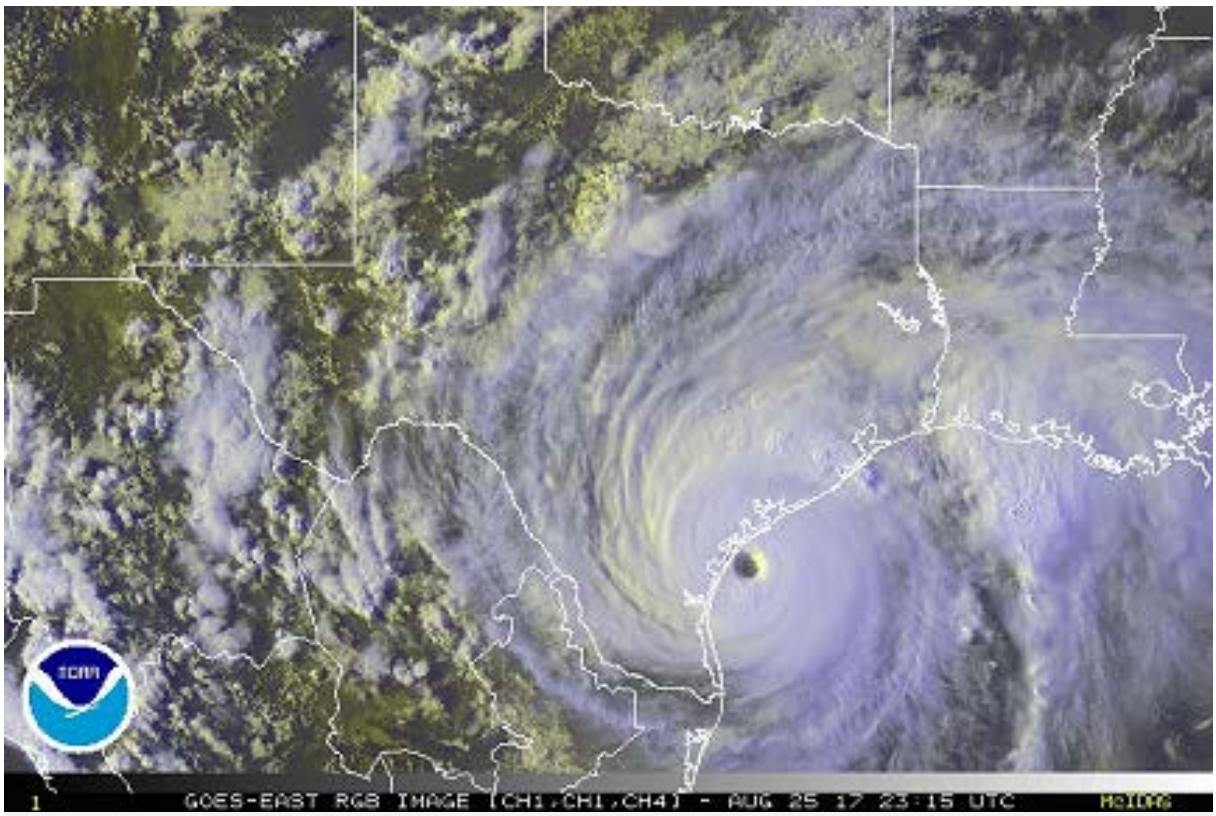
The use of epidemiological tools such as electronic disease surveillance systems, surveillance reports, and mapping has been essential in providing leadership with data to make decisions for public health action. This has been exemplified by linking human surveillance with mosquito control efforts, utilizing epidemiological case investigations to guide clinical decision making, and performing surveys to evaluate prevention efforts such as educational posters and prevention kits. Lastly, Dr. Patel sought to ensure the sustained role of epidemiology as a component of PDPH's Zika response by writing three grant applications to request resources for personnel and supplies dedicated to Zika virus surveillance and epidemiology.

Through successful grant applications, Dr. Patel established six FTEs dedicated to Zika virus surveillance and prevention and control. Through the health alert network, Dr. Patel disseminated updated clinical and prevention guidance to greater than 3,000 healthcare professionals throughout the city of Philadelphia. Her work to establish a birth defects registry focused on Zika-associated defects is providing a foundation for establishment of a comprehensive registry for the city. This is the first registry of its kind in the state of Pennsylvania. Use of epidemiology tools (surveillance, mapping, study design) has been essential to provide PDPH with data needed for decision making. For instance, human and mosquito surveillance has driven vector control efforts including source reduction. Epidemiological analysis of census and testing data has facilitated targeted prevention messaging. An analysis of hospital discharge data provided a surrogate estimate of baseline birth defects to which Zika-specific surveillance data can be compared. Results of the CASPER are being used to improve communication messages for next season in an effort to reduce morbidity. The data collected through each of these activities is essential to make the case for dedicated resource allocation and in time may help to justify use of public health resources to ultimately impact disease morbidity.

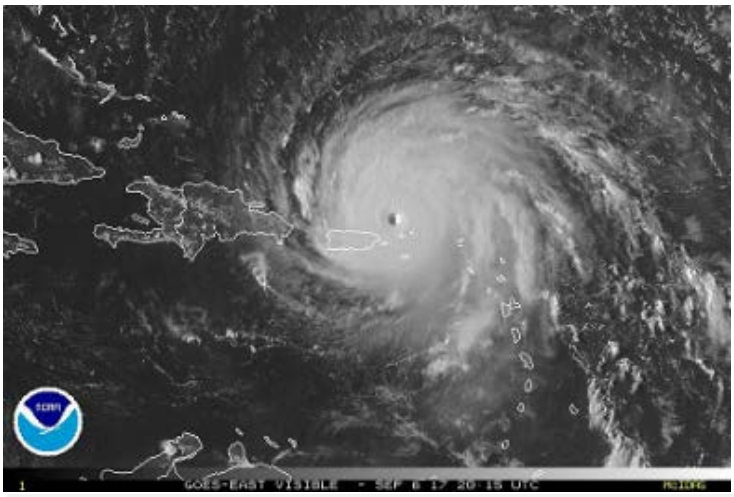
Dr. Patel served as a leader in the Philadelphia Department of Public Health who recognizes the importance of epidemiology and the need to utilize such tools for the prevention and control of emerging infectious diseases. She went beyond her normal duties to cross program areas and lead an integrated epidemiological approach to Zika virus. Through her leadership, she successfully implemented a robust program to examine Zika virus's local epidemiology.

Hurricane Response

Hurricanes Harvey, Irma, and Maria in Texas, Florida, Puerto Rico, and the United States Virgin Islands (USVI) caused severe flooding and high winds, resulting in damage to houses, critical facilities, schools, and essential public health infrastructure. CEFOs responded to some of the hardest hit areas in many ways. Their activities included establishing disease and injury surveillance systems and identification of facilities in dire need of resources.



Hurricane Harvey https://www.ospo.noaa.gov/Organization/History/imagery/Harvey/index.html



Hurricane Irma
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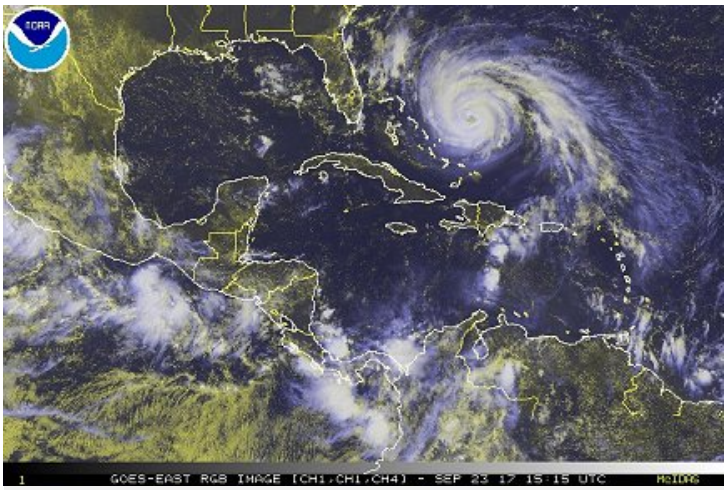


Hurricane Maria
https://www.ospo.noaa.gov/Organization/History/imagery/Maria/index.html

Responding to Hurricanes Irma and Maria in the U.S. Virgin Islands

Joseph (Jay) Roth Jr., MPH, CAPT US Public Health Service
U.S. Virgin Islands

During September 2017, the U.S. Virgin Islands (USVI) were struck by two Category 5 hurricanes within a two-week period which severely damaged the territory's infrastructure. Hurricanes Irma and Maria caused widespread damage to homes and businesses, leaving many residents without electricity and potable household water for months. Of the three hospitals in USVI, only two remained marginally operable, and public health operations were limited because the majority of facilities and staff members were affected by the storms and because of damage to health department buildings.

The response to a disaster of this magnitude required the application of nearly every preparedness capability, and CAPT Jay Roth provided ESF-8 and Emergency Operations Center (EOC) leadership and support throughout the months-long response period. Initially, mass care and evacuation of hundreds of patients were the primary priorities, though distribution of needed medical supplies, food, and water were concurrently coordinated. Teams quickly established general and special needs shelters for residents on each island. CAPT Roth was pre-positioned to support all of these response activities.

CAPT Roth's efforts were essential in establishing disaster surveillance activities, which included shelter surveillance, active disease surveillance, and community assessments to characterize the disaster impact and identify community needs. Two Community Assessments for Public Health Emergency Response (CASPERs) were conducted during the response phase, followed by a CASPER to gauge recovery progress and guide recovery efforts. The information gleaned from these assessments enabled territorial leadership and EOC partners to wage a data driven response and manage recovery efforts, keeping public health needs in the forefront of recovery planning.

Ensuring Disease Surveillance Capacity and Vaccine Distribution for Children after Hurricane Maria in Puerto Rico

Timothy Styles, MD, MPH, CDR US Public Health Service
New York City, New York

On September 20, 2017, Hurricane Maria made landfall in Puerto Rico as a strong Category 4 hurricane, causing unprecedented damage to structures, roads, and critical infrastructure including electricity, water, and healthcare. Ongoing power outages and lack of access to clean water and healthcare left the residents vulnerable to infectious disease outbreaks as well as exacerbations of chronic diseases. Additionally, the loss of infrastructure disrupted typical disease surveillance mechanisms. This created a gap in health-related situational awareness. The loss of cold chain threatened supplies of vaccines needed to prevent a variety of diseases.

In an attempt to fill the surveillance gap, CDC coordinated a disaster deployment response team in late October to establish a novel syndrome-based and laboratory disease surveillance system. Selected to lead a team of eight between October 30 and November 9, 2017, CAPT Timothy Styles, a NYC CEFO, partnered with the Department of Veterans affairs to quickly establish a disease surveillance system that provided timely and accurate surveillance data on veterans as a sentinel for the larger population of Puerto Rico. While acting in an additional deployment role as Public Health Branch Lead, CAPT Styles was able to identify gaps and target facilities for generator support to ensure cold chain and improve vaccine distribution to at-risk pediatric populations.

CDR Styles meeting with medical staff of the Veterans Hospital in Ponce, discussing surveillance for acute infections, exacerbations of chronic diseases and mental health conditions associated with the devastation of Hurricane Maria.

With the hard work of his surveillance team, CAPT Styles helped record over 13,000 unique patient encounters with patients representing 77 of 78 municipalities. Coded into syndromes or diagnoses as appropriate, these encounters provided near real-time situational awareness for key infectious disease syndromes and exacerbations of chronic disease. This information helped public health officials identify potential outbreaks of pre-existing conditions and hurricane-related exacerbations of said conditions, including behavioral and environmental health concerns. Additionally, collaborating with the Puerto Rico Department of Health, the vaccine prevention team was able to coordinate facility inspections, assess power needs, and work to double vaccine distribution capacity for children on the island prior to demobilization. This included approving more than 25 additional Vaccine for Children sites.

Opioid Crisis

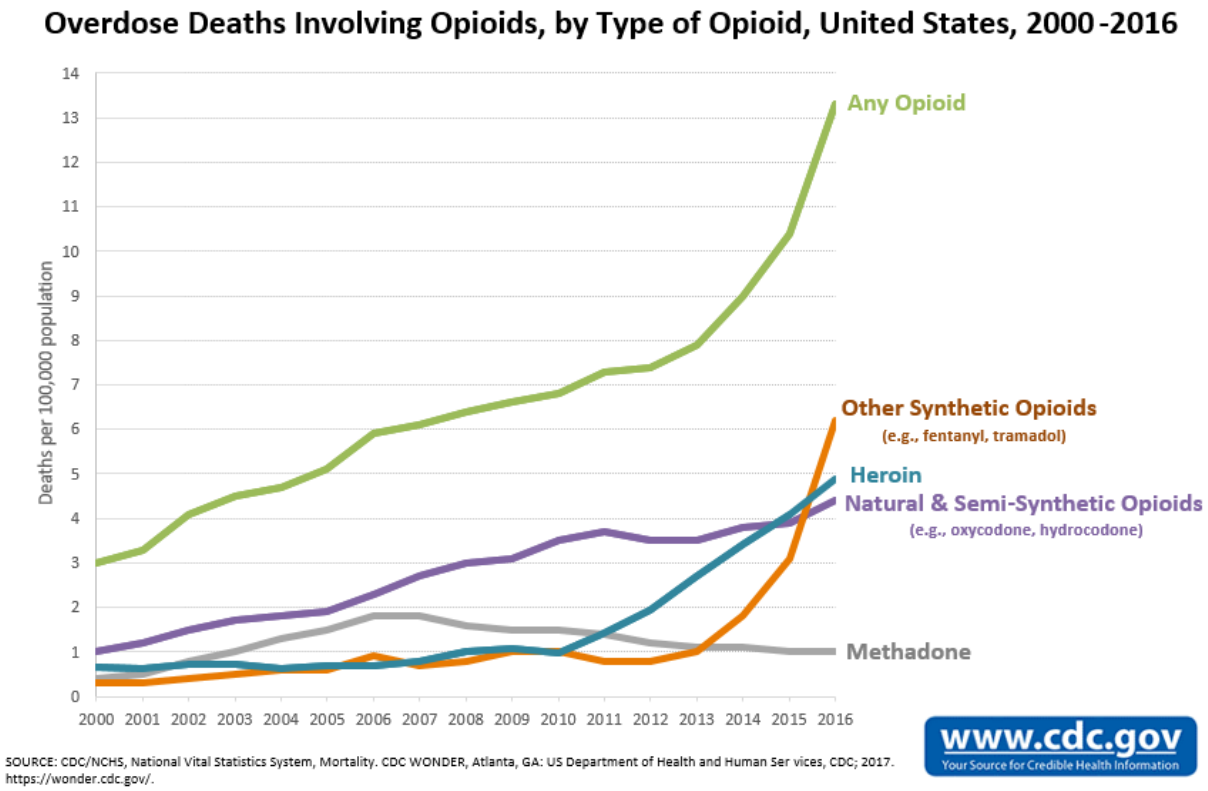
"One of the most pressing public health challenges our country faces today is our epidemic of opioid addiction and overdose. Each day, 116 Americans die of opioid overdoses, while almost 12 million of our fellow citizens each year misuse opioids"

-Alex M. Azar II, Secretary of HHS
Friday, April 13, 2018

The opioid overdose epidemic continues to worsen in the United States. In 2016, 63,632 drug overdose deaths occurred, a 21.4 percent increase from 2015. Nearly two-thirds (66.4 percent) of drug overdose deaths in 2016 involved prescription opioids, illicit opioids, or both – an increase of 27.7 percent from 2015. Heroin and synthetic opioids (e.g., fentanyl) are driving increases in opioid-involved deaths.

(Vivolo-Kantor AM, Seth P, Gladden RM, et al. Vital Signs: Trends in Emergency Department Visits for Suspected Opioid Overdoses — United States, July 2016–September 2017. MMWR Morb Mortal Wkly Rep 2018;67:279–285. DOI: http://dx.doi.org/10.15585/mmwr.mm6709e1.)

CEFOs respond to immediate threats on the front lines of public health and are part of our nation's early warning system for public health emergencies. They were poised to identify and sound the alarm about the opioid crisis long before it became part of our nation's collective conscience. They continue to work throughout states and territories to identify effective methods to combat all aspects of this epidemic.



Coordinating Efforts to Respond to the Opioid Crisis in Maryland

Jessie Goodell, MPH
Baltimore, Maryland

The rapidly rising number of deaths from heroin, fentanyl, prescription painkillers, and other opioids led Maryland governor Larry Hogan to declare a state of emergency in March 2017. The governor announced new funding to address the crisis and appointed a senior emergency management advisor to lead the state's coordinated effort to combat the crisis. Several staff from the Maryland Department of Health (MDH) Office of Preparedness and Response joined this effort to respond to Maryland's opioid crisis, including CEFO Jessica Goodell.

Since January 2017, Goodell served as the chief planner for the Opioid Operational Command Center (OOCC) – a coordination body established by executive order that brings together multi-disciplinary partners to identify challenges, establish system-wide priorities, and develop opportunities for collaboration to reduce the harmful impacts of opioid addiction on Maryland communities. Goodell supported a small senior advisory group in developing the overarching structure of the OOCC utilizing the National Incident Management System and corresponding mission, core functions, operational tempo, and reporting mechanisms. In her primary role as chief planner, she oversaw efforts to provide high-level coordination and policy guidance, preparation, and distribution of incident information, including development of plans and protocols and data analysis and dissemination. As a result, the OOCC supported cross-agency coordination and collaboration to share knowledge, strengthen communication, and foster relationship building.

To address the need for real-time, accurate data to plan for and prevent overdoses, Goodell worked with colleagues at MDH to establish an intra-departmental drug-related data workgroup to strengthen data governance and infrastructure, enhancing the state's response to the opioid crisis. The MDH drug-related data workgroup is comprised of data stewards, policy experts, analysts, and other staff from across behavioral health and public health services, including the Vital Statistics Administration, Office of the Chief Medical Examiner, the Prescription Drug Monitoring Program, the Office of Preparedness and Response, the Environmental Health Bureau, Maryland Violent Death Reporting System, and the Office of Information Technology. Through this coordination, the MDH workgroup could more quickly collect, analyze, and share fatal and non-fatal drug-related data and monitor trends in overdose-related morbidity and mortality. This work group has strengthened relationships across the department and increased awareness of programs and initiatives that may be interrelated. Due to Goodell's efforts, Maryland has been successful in coordinating partners to identify and report on existing efforts, to develop enhanced surveillance systems of opioid-related morbidity and mortality, and to define success within the mission and scope of each partner agency.

Ensuring a Coordinated Response Framework to the Opioid Crisis in Tennessee

Rendi Murphree, PhD, CAPT US Public Health Service
Nashville, Tennessee

Curbing the epidemic of substance abuse disorder is a top priority for the Tennessee Department of Health (TDH). Despite remarkable gains in reducing the number of morphine milligram equivalents dispensed annually, demand for opioids and resulting morbidity and mortality continues to rise. In 2017, TDH recognized the need for greater direction and coordination of opioid-related initiatives and requested assistance from the Tennessee Emergency Preparedness Program. Dr. Rendi Murphree was named incident manager for the opioid epidemic response that involved more than 10 divisions, offices, and programs throughout TDH. Though no formal state of emergency was declared in Tennessee, Dr. Murphree began integrating components of the national incident management system in TDH response activities in July 2017.

Dr. Murphree led a virtual activation of emergency operations by integrating components of the current best practices in emergency management: national incident management system (NIMS), incident command structure (ICS) and 4DX-Four Disciplines of Execution (1). This improved cohesion and coordination of response activities such as:

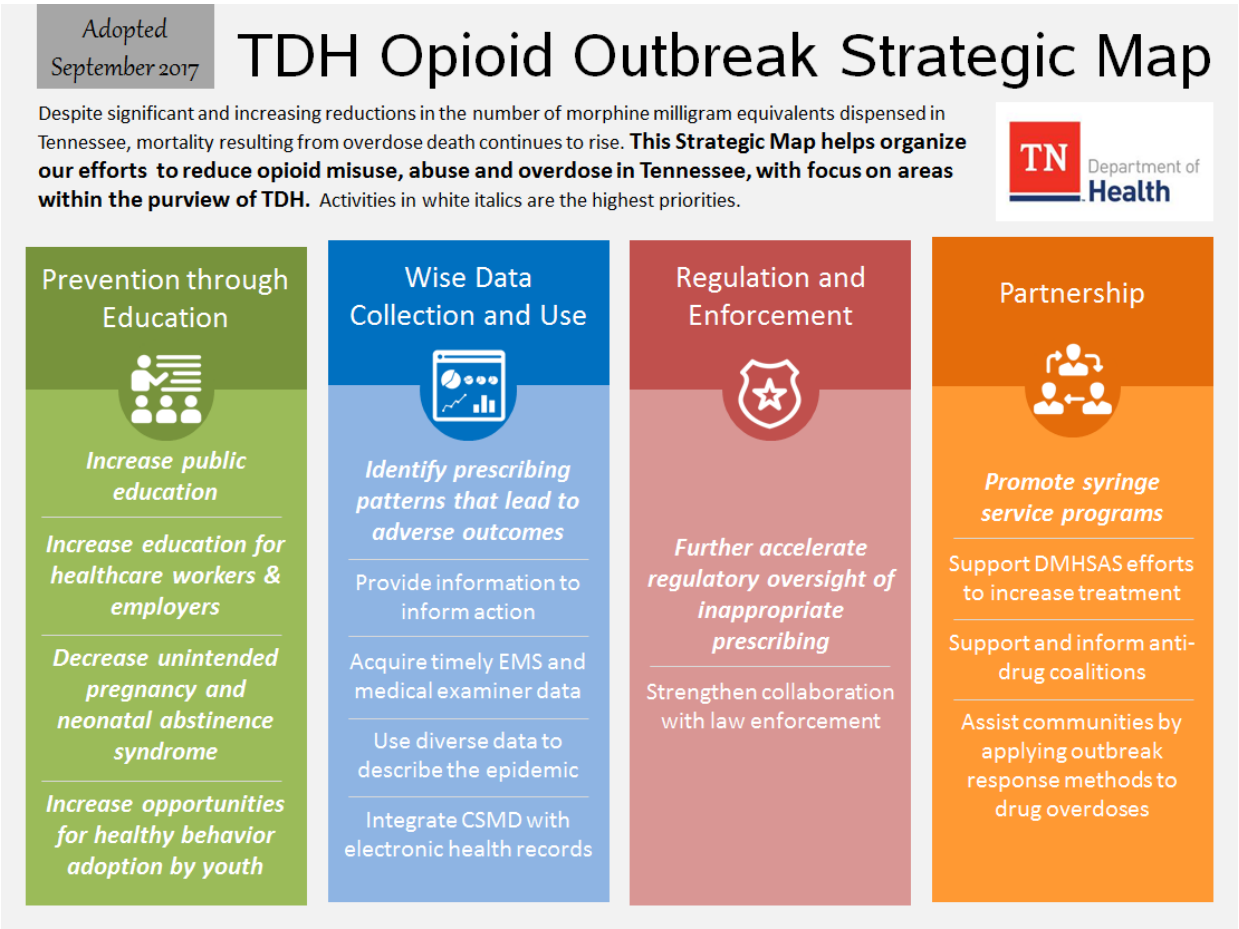
- Compiling a situational report for January 2016–July 2017 to document previous accomplishments and create a common operating picture.
- Revising the TDH strategic map for 2017–2018 using a participatory and iterative process and by focusing on what TDH can do well.
- Coaching responders through the 4DX process of documenting specific goals, activities, and measures that support priority initiatives in the revised strategic map. Briefly, the 4DX principles are: focus on what is most important, act on lead (process) measures, keep a scorecard, and create a cadence of accountability.
- Implementing an ICS-like structure and operational tempo including regular situational reports and action plans.

- Meeting frequently with each of the divisions, offices, and programs throughout TDH to identify complementary activities and connect staff to improve service delivery and communication and reduce departmental duplication.
- Regularly communicating with rural regional and metropolitan health department staff to keep them informed, identify needs, and provide technical assistance.

[1] McChesney, Chris, et al. The 4 Disciplines of Execution: Achieving Your Wildly Important Goals. Free Press, 2016.

Fighting the epidemic of substance abuse disorder and opioid misuse will likely require decades of prevention and treatment. Though it is too early to gage the impact of a more coordinated response and virtual activation of emergency operations in Tennessee, important lessons have been learned, including:

- Lacking a formal emergency declaration, a virtual activation may be useful in ramping up response activities and improving coordination.
- Responders may need a refresher training on the concepts of ICS and unified command.
- A strategic plan is not a finish line—it is the starting line for a lengthy response.
- A coordinated response needs coaches, a playbook, a rhythm, and a scoreboard.
- Ongoing communication, collaboration, and evaluation is key to keeping everyone engaged and tracking toward goal achievement.
- Work to avoid response fatigue by celebrating small wins.
- Do not let the great be the enemy of good. The thirst for perfect data should not prevent implementation of science-based mitigation strategies. There is time to evaluate and adjust as new information becomes available.



Investigating Infectious Disease Complications of the Opioid Crisis in North Carolina

Aaron Fleischauer, PhD, MSPH, CAPT US Public Health Service
Raleigh, North Carolina

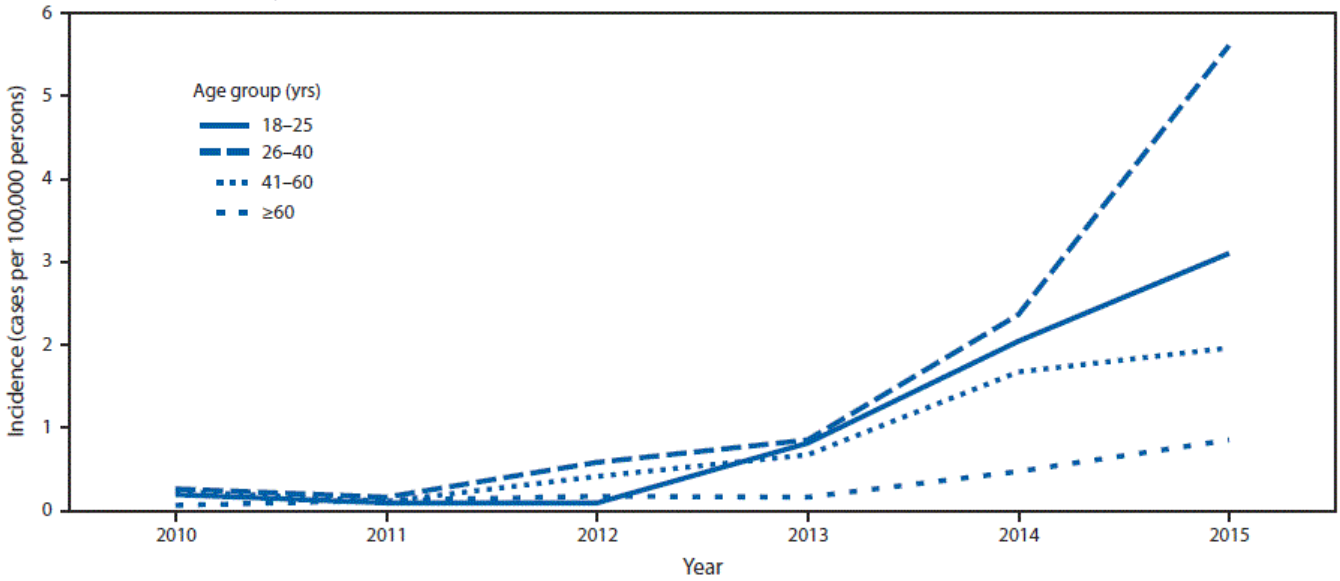
Opioid dependence and overdose has increased to epidemic levels in the United States. The 2014 National Survey on Drug Use and Health estimated that 4.3 million people were nonmedical users of prescription pain relievers. These users are 40 times more likely than the general population to use heroin or other injection drugs. Furthermore, CDC estimated a near quadrupling of heroin-related overdose deaths during 2002–2014. Though overdose contributes most to drug-associated mortality, infectious disease complications of intravenous drug use constitute a major cause of morbidity leading to hospitalization. In addition to infections from hepatitis C virus (HCV) and human immunodeficiency virus (HIV), injection drug users are at increased risk of acquiring invasive bacterial infections, including endocarditis.

In response, in 2016, Dr. Fleischauer conducted a county-level vulnerability assessment to determine which localities in North Carolina were at greater risk for an HIV/HCV outbreak (similar to Scott County, IN). Dr. Fleischauer identified far western and several other rural North Carolina counties as having an increased rate of new HCV infections coupled with dramatic increases in injection drug use. As a result, in 2017, the North Carolina Division of Public Health increased resources for screening and linkage to care to these counties. In addition, a partnership with the University of North Carolina at Chapel Hill (UNC-CH) and RTI International led to successful funding on a multi-million dollar National Institutes of Health grant to provide critical testing and screening capacity and comprehensive syringe service programs to this region.

Dr. Fleischauer also completed one of the first population-based analyses of injection drug use-associated endocarditis. In 2017, Dr. Fleischauer analyzed hospital discharge data and calculated a 13-fold increase in new endocarditis infections among predominantly young, white people from rural counties (and a corresponding 22-fold increase in total hospital costs). The work was published in an MMWR and received media attention. This seminal work led to the creation of a statewide healthcare taskforce on endocarditis management. Dr. Fleischauer is currently collaborating with UNC-CH and Duke University on a follow-up study that will assess reoccurrence rates.

For the past two years, Dr. Fleischauer has worked to enumerate and describe the infectious disease complications of the opioid crisis. His work has led to programmatic investments on the local level including increased screening capacities, greater reach of syringe service programs and the hiring of bridge counselors who are tasked with linking newly diagnosed patients to care. His work on endocarditis received national attention and led to the development of a statewide task force that is currently rethinking medical assisted treatment options for this vulnerable population.

Incidence* of hospital discharge diagnoses of drug dependence–associated endocarditis,† by age group — North Carolina, 2010–2015



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CEFOs 2016 – 2017

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Melissa Morrison, MPH, CDR, USPHS, Alabama Department of Health

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Livia Navon, MS, RD, Illinois Department of Health

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Kim Porter, PhD, MSPH, Alaska Department of Health and Social Sciences

Nykiconia Preacely. DrPH, MPH, CPH, Mississippi State Department of Health

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Ann Schmitz, DVM, AM, LCDR, USPHS, Florida Department of Health

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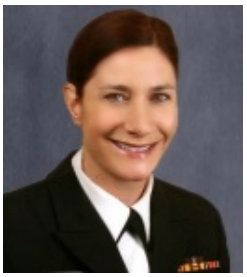
Timothy Styles, MD, MPH, CDR, USPHS, NYC Department of Health and Mental Hygiene



Rebecca Sunenshine, MD, FIDSA, CAPT USPHS, Maricopa County Public Health

Dana Thomas, MD, MPH, CAPT USPHS, New Jersey Department of Health

Nato Tarkhashvili, MD South Dakota Department of Public Health

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Doug Thoroughman, PhD, MS, CAPT USPHS, Kentucky Department for Public Health

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Jason Wilken, PhD, MPH, LCDR USPHS, California Department of Health

Appendix

Field Services Branch Publications: September 28, 2016 – September 25, 2017 (37 peer-reviewed and three others)

Peer-reviewed publications

Victor Caceres, Temporary Epidemiology Field Officer Team Lead

Caceres, VM, Cardoso, P, Sidibe, S, Lambert, S, Lopez, A, Pedalino, B, & Herrera GDJ. Daily reporting for suspect Ebola using short messaging service (SMS) in Guinea Bissau. Public Health. 2016 Sept;138:69-73.

Enzo Campagnolo, Career Epidemiology Field Officer, Pennsylvania

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Kris Carter, Career Epidemiology Field Officer, Idaho

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Rosenthal M, Johnson CJ, Scoppa S, **Carter K**. Two suspected worksite or occupational cancer clusters investigated using the Cancer Data Registry and multiple primary standardized incidence ratios in SEER*Stat—Idaho, 2013–2014. J Registry Manag. 2016 Fall; 43(3):128–133.

Rosenthal M, Taylor M, Anderson KS, **Carter KK**. Gastroenteritis associated with rafting the Middle Fork of the Salmon River – Idaho, 2013. J Environ Health. 2017 July/August; 80(1):14-21

W. Randolph Daley, Field Services Branch Chief

Katrin S. Kohl, Rossanne Philen, Ray R. Arthur, **Mary Dott**, **Rachel Nonkin Avchen**, Kate M. Shaw, **Maleeka J. Glover**, and **W. Randolph Daley**. United States notifications of travelers from Ebola-Affected Countries. Health Security; Volume 15, Number 3, 2017

Aaron Fleischauer, Career Epidemiology Field Officer, North Carolina

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Stacy Holzbauer, Career Epidemiology Field Officer, Minnesota

Minnesota Department of Health (including **Holzbauer SM**). Annual Summary of Communicable Diseases Reported to the Minnesota Department of Health, 2016. 2017 August.

Jasmine Jacobs-Wingo, Temporary Epidemiology Field Assignee, New York City
Neil Vora, Career Epidemiology Field Officer, New York City

Jacobs-Wingo J, Ezeoke I, Saffa A, Tate A, Lee D, Johnson K, Whittemore K, Illescas A, Collins A, Rand M, Rakeman JL, Varma JK, **Vora NM**. Using a call center to coordinate Zika virus testing-New York City, 2016. J Emerg Manag. 2016 Nov/Dec;14(6):391-395. https://www.ncbi.nlm.nih.gov/pubmed/28101877

Livia Navon, CEFO, Illinois

Jagai JS, Grossman E, **Navon L**, Sambanis A, Dorevitch S. Hospitalizations for heat-stress illness varies between rural and urban areas: An analysis of Illinois data, 1987–2014. Environmental Health. 2017:16:38.

Nykiconia Preacely, Career Epidemiology Field Officer, Mississippi

Staneva M, Dobbs T, Pearson M, **Preacely N**, Johnson R, Byers P. The Mississippi Opioid Epidemic: Data Brief. Mississippi State Department of Health. Mississippi. May 11, 2017.

Staneva M, Pearson M, Dobbs T, **Preacely N**, Byers P. Prescriptions for Opioid Analgesics in Mississippi: Numbers, Rates and Trend Analysis, 2011-2014. Mississippi State Department of Health. Mississippi. May 22, 2017.

Celia Quinn, Career Epidemiology Field Officer, New York City

Varma JK, Prezant DJ, Wilson R, **Quinn C**, Asaeda G, Cagliuso NV, Rakeman JL, Raphael M. Preparing the health system to respond to Ebola Virus Disease in New York City, 2014. Disaster Med Public Health Prep. 2017 Jun; 11(3): 370-374.

Joseph Roth, Career Epidemiology Field Officer, U. S. Virgin Islands

Coutts SP, King JD, Pa'au M, Fuimaono S, **Roth J**, Rose M, Lammie PJ, Lau CL, and Graves PM. Prevalence and risk factors associated with lymphatic filariasis in American Samoa after mass drug administration. Tropical Medicine and Health (2017) 45:22. DOI 10.1186/s41182-017-0063-8.

Rebecca Sunenshine, Career Epidemiology Field Officer, Maricopa County, Arizona

Jones JM, Koski L, Khan M, Brady S, **Sunenshine R**, Komatsu KK. Coccidioidomycosis: An underreported cause of death—Arizona, 2008–2013. Med Mycol. 2017 Jun 8. doi: 10.1093/mmy/myx041

Dana Thomas, Career Epidemiology Field Officer, Puerto Rico

Dirlikov E, Kniss K, Major C, **Thomas DL** et al. Predicted cases of Guillan-Barre syndrome and healthcare resource needs during ongoing Zika virus transmission - Puerto Rico, 2016. Emerg Infect Dis 2017 Jan; 23(1):134–136.

Karrie-Ann Toews, CEFO, Chicago

Francois Watkins LK, **Toews KE**, Harris AM, Davidson S, Ayers-Millsap S, Lucas CE, Hubbard BC, Kozak-Muiznieks NA, Khan E, Kutty P. Lessons learned from an outbreak of Legionnaire's Disease on a hematology-oncology unit. Infect Control Hosp Epidemiol. 2016 Dec; 6 1-8.

Neil Vora, CEFO, New York City

Corrado RE, Lee D, Lucero DE, Varma JK, **Vora NM**. Burden of adult community-acquired, healthcare-associated, hospital-acquired, and ventilator-associated pneumonia — New York City, 2010–2014. *Chest*. 2017 Apr. Pub Med PMID: 28455128.
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Whittemore K, Tate A, Illescas A, Saffa A, Collins A, Varma JK, **Vora NM**. Zika Virus knowledge among pregnant women who were in areas with active transmission. Emerg Infect Dis. 2017 Jan; 23(1):164-166.
https://www.ncbi.nlm.nih.gov/pubmed/27855041

Jason Wilken, Career Epidemiology Field Officer, California
Barreau T, Conway D, Haught K, Jackson R, Kreutzer R, Lockman A, Minnick S, Roisman R, Rozell D, Smorodinsky S, Tafoya D, **Wilken JA** (corresponding author). Household physical health, mental health, and financial impacts from the drought in two California Counties, 2015. Am J Public Health. 2017. 107(5):783–790.

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MMWR contributions

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