

Centers for Disease Control and Prevention's Temporary Epidemiology Field Assignee program: Supporting state and local preparedness in the wake of Ebola

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Abstract

Objectives: The Centers for Disease Control and Prevention launched the Temporary Epidemiology Field Assignee (TEFA) Program to help state and local jurisdictions respond to the risk of Ebola virus importation during the 2014–2016 Ebola Outbreak in West Africa. We describe steps taken to launch the 2-year program, its outcomes and lessons learned.

Methods: State and local health departments submitted proposals for a TEFA to strengthen local capacity in four key public health preparedness areas: 1) epidemiology and surveillance, 2) health systems preparedness, 3) health communications, and 4) incident management. TEFA's and jurisdictions were selected through a competitive process. Descriptions of TEFA activities in their quarterly reports were reviewed to select illustrative examples for each preparedness area.

Results: Eleven TEFA's began in the fall of 2015, assigned to 7 states, 2 cities, 1 county and the District of Columbia. TEFA's strengthened epidemiologic capacity, investigating routine and major outbreaks in addition to implementing event-based and syndromic surveillance systems. They supported improvements in health communications, strengthened healthcare coalitions, and enhanced collaboration between local epidemiology and emergency preparedness units. Several TEFA's deployed to United States territories for the 2016 Zika Outbreak response.

Conclusion: TEFA's made important contributions to their jurisdictions' preparedness. We believe the TEFA model can be a significant component of a national strategy for surging state and local capacity in future high-consequence events.

Keywords

Ebola, Zika, preparedness, response, capacity building, surveillance, epidemiology, state and local readiness

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Background

The 2014–2016 Ebola Outbreak in West Africa, primarily affecting Liberia, Sierra Leone, and Guinea, resulted in an estimated 28,639 cases and 11,316 deaths.¹ On 30 September 2014, the Centers for Disease Control and Prevention (CDC) confirmed the first case of Ebola ever diagnosed in the United States, which occurred in Dallas in a traveler from Liberia (Figure 1).² This was followed in October 2014 by two cases among healthcare workers who treated the initial patient in Dallas and a travel-associated

case in New York City.^{2,3} These four US cases resulted in the rapid escalation of domestic preparedness and response activities. In October 2014, CDC issued guidance for

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monitoring persons with potential Ebola virus exposure daily for 21 days after returning from Ebola-affected countries and caring for patients with Ebola in the United States.^{4,5} CDC also worked with health departments to designate hospitals capable of evaluating, diagnosing, and treating persons suspected of having Ebola.⁶ These and other Ebola response activities created a short-term need for additional epidemiologists (surge capacity) at state and local health departments to support emergency preparedness and response programs. In response to this need, CDC created the Temporary Epidemiology Field Assignee (TEFA) program, based in the Office of Public Health Preparedness and Response (now Center for Preparedness and Response), Division of State and Local Readiness.

The TEFA program was modeled after CDC's Career Epidemiology Field Officer (CEFO) Program, which assigns experienced, highly trained epidemiologists to state, territorial, and local health departments to strengthen public health emergency response capacity.⁷ As funding for the TEFA program was temporary, CDC designed it as a 2-year, term-limited initiative. The administrators of the program and TEFA assignees describe the steps taken to launch the program, its outcomes, and lessons learned.

Methods

TEFA program funding, hiring, and assignments

In December 2014, the US Congress passed emergency funding to support the US Ebola response.⁸ In early 2015, CDC awarded money to state and local health departments through a grant (the Public Health Emergency Preparedness (PHEP) Supplemental Funding for Ebola Preparedness and Response Activities).⁹ The grant included funds to create a temporary, 2-year initiative, the TEFA Program, with an estimated cost of US\$3.5 million. CDC solicited letters of intent from PHEP recipients at state and local health departments interested in being host sites, requesting a work plan proposal for a TEFA to strengthen local capacity in four key public health preparedness areas outlined in the grant: (1) epidemiology and surveillance (including active monitoring of potential cases of Ebola virus disease), (2) health systems preparedness, (3) health communications, and (4) incident management.⁹ CDC's criteria for selecting recipients for TEFA assignees included a clearly expressed need for Ebola preparedness and response activities and a well-defined work plan. A total of 14 jurisdictions submitted proposals meeting this criteria. Because of limited funding, the agency selected only 11 jurisdictions to host TEFAs, one assignee at each site. These included seven states—Georgia, Maryland, Nebraska, New Jersey, Ohio, Pennsylvania, Tennessee; two cities—Chicago, New York City; one county—Los Angeles County; and the District of Columbia.

During March–September 2015, CDC recruited TEFA candidates and hired them into term-limited federal positions. Once selected, CDC matched TEFA assignees

considering results of jurisdictional-level interviews and geographical preferences. Eight of the 11 TEFAs were masters-level graduates of CDC's Public Health Prevention Service (PHPS) Fellowship.^{10,11} Of the other three, two had doctoral-level training (one being a graduate of CDC's Epidemic Intelligence Service)¹² and one had masters-level training. During October 2015–October 2016, the first year of the program, there were a few transitions: TEFAs in Los Angeles County and the District of Columbia left for other positions, the Pennsylvania TEFA was reassigned, soon after starting, to Los Angeles County (and not replaced in Pennsylvania), and a new TEFA (a graduate of CDC's Epidemic Intelligence Service) was hired for the District of Columbia. All TEFAs had prior experience in local and/or state health departments. Many had worked in infectious diseases and/or surveillance, and half had previously deployed to the field during the CDC Ebola response.

In October 2015, TEFAs reported to units within state and local health departments at their sites. Units included public health preparedness and response, hospital preparedness, acute disease epidemiology, and outbreak response teams (Table 1). Upon arrival, the TEFA and their health department supervisors finalized work plans, establishing priority activities in the four key preparedness areas for the coming year. Within the first few months of the TEFAs' arrival, Ebola virus transmission in West Africa subsided, and Zika virus emerged in the Western Hemisphere.^{13,14} As a result, TEFAs made an early transition from Ebola-related response, recovery, and preparedness to Zika-related response activities, while continuing to respond to everyday public health events (e.g. foodborne outbreaks and suspect measles cases). TEFAs documented their work in quarterly reports submitted to their CDC supervisor, presentations at national conferences, and publication in scientific journals.^{15–17}

Data collection

Each TEFA's quarterly report described their activities in the four outcome areas defined in the program grant: epidemiology and surveillance, health communications, health systems preparedness, and incident management systems (IMSS). For this article, descriptions of TEFA activities were obtained from an analytic process which involved review of all TEFA quarterly reports by the authors to identify activities that fell under each outcome area, an iterative process to confirm and clarify activities, and selection of the most unique or illustrative examples for each outcome.

Outcomes

Epidemiology and surveillance. TEFAs worked to strengthen epidemiology and surveillance by supporting state and local efforts in planning for and responding to major (e.g. Ebola and Zika) and routine (e.g. influenza and measles) outbreak investigations; these included both event-based

Table 1. Organizational units within state and local health departments where each Temporary Epidemiology Field Assignee (TEFA) was placed and duration of TEFA assignment.

Jurisdiction of assignment	Organizational unit	No. months TEFA assigned
Chicago	Hospital Preparedness Program	17
District of Columbia	Center for Policy, Planning and Evaluation & Health Emergency Preparedness and Response Administration	24
Georgia	Acute Disease Epidemiology Section (ADES)	24
Los Angeles County	Acute Communicable Disease Control	22
Maryland	Office of Preparedness and Response, Planning Team	24
Nebraska	Division of Public Health Epidemiology and Informatics Unit	23
New Jersey	Division of Epidemiology, Environmental and Occupational Health/Communicable Disease Services/Infectious and Zoonotic Diseases Program	15
New York City	Office of Emergency Preparedness and Response, Bureau of Healthcare System Readiness	24
Ohio	Outbreak Response and Bioterrorism Investigation Team (ORBIT)	18
Tennessee	Communicable and Environmental Diseases and Emergency Preparedness Division	21

and syndromic surveillance (Table 2). Host sites were still conducting active monitoring for Ebola when the TEFA's arrived. The presence of TEFA's allowed health department staff to refocus on their routine operations that had been set aside during the Ebola crisis. TEFA's assumed Ebola-related duties such as monitoring individuals and their domestic travel, managing call center data, assuring data quality, and reporting monthly jurisdictional data.

During the Zika response, TEFA's provided leadership in epidemiologic and laboratory surveillance. At their host sites, they supported the investigation of suspect cases, the creation of pregnancy and birth registries, and the design of protocols for confirming testing eligibility and submitting diagnostic tests to state laboratories. In New York City, a TEFA helped to model the Zika Testing Call Center after the Ebola Active Monitoring Call Center.¹⁵ Lessons learned from the Ebola call center enabled the expedited acquisition of call center staff and implementation of electronic algorithms for decisions regarding the testing of suspected Zika cases.

TEFA's developed methods to collect, visualize, and share information about monitoring of individuals exposed to high-consequence infectious diseases and to provide situational awareness during public health emergencies. A TEFA-led collaboration between the Nebraska Department of Health and Human Services and the University of Nebraska Medical Center developed an automated monitoring system for healthcare providers exposed to high-consequence infectious pathogens using the REDCap cloud-based software platform.¹⁸ This software collects symptom information from exposed healthcare providers, sends text message reminders to these providers to enter new symptoms, and alerts management when providers report symptoms indicative of monitored diseases. Another project in Tennessee involved the development of data collection and visualization tools using REDCap and iDashboards to monitor individuals exposed to avian influenza. These tools provided near real-time analytics to state and local epidemiology and

emergency preparedness staff for timely decision-making and can be easily adapted for use with other diseases.¹⁹

In the District of Columbia, the TEFA led a collaboration with nearby jurisdictions, federal agencies, and healthcare facilities to implement human and animal surveillance during the 2017 Presidential Inauguration to detect event-related disease outbreaks and injuries. A multi-pronged approach was implemented using syndromic surveillance and field-based patient tracking to monitor patients visiting medical aid stations at both inaugural venues and emergency departments, and animals brought to veterinary facilities.

Health communications. TEFA's supported improvements in health communications by adapting newer technologies and/or improving the reliability and reach of existing systems to transmit urgent public health incident information to clinicians, laboratorians, and public health practitioners. For example, two TEFA's were instrumental in improving the messaging of jurisdictional health alert networks patterned after the national health alert network run by CDC. Health alert networks provide a secure communication system for rapid distribution of information (e.g. outbreak updates and treatment recommendations) via email, phone, fax, pager, and text messaging. In Nebraska, the TEFA led the conversion of a fax-based health alert system to an email and text message-based system. All 98 hospitals in the state were contacted, and a focal person at each was identified who was asked to automate the forwarding of health alert network emails and keep the listing current for their facility—resulting in a timelier, decentralized, and less resource-intensive system. In Los Angeles County, the TEFA and project staff conducted a comprehensive evaluation of health alert network benefits and challenges. This effort explored methods of increasing participation (e.g. various modes of delivery and automatic enrollment at the time of licensure renewal) and led to recommendations for improving health alert network messaging both in format and content.

Table 2. Examples of Temporary Epidemiology Field Assignee (TEFA) program major activities to strengthen preparedness and response capabilities of state and local jurisdictions, October 2015–October 2017.

Outcomes	Jurisdiction	Example TEFA activities ^a
Epidemiology and surveillance		
Monitoring of persons exposed to Ebola	MD, NJ, NYC, OH, TN	Coordinated personnel for Ebola Call Center (NYC) Led active monitoring of returning travelers (MD, NJ, NYC, OH, TN)
Zika surveillance and epidemiology	CHI, MD, NYC, NE, NJ, TN	Developed laboratory testing criteria and coordinated approval of test requests (CHI, NYC, NJ, TN) Investigated Zika cases, ensured data quality, and reported results (MD, NJ, TN) Established pregnancy and birth registries for persons potentially exposed to Zika (NE, NJ)
Data visualization	LAC, TN	Created dashboards to inform response planning for avian influenza outbreak (TN) Supported data maintenance for Zika dashboard updates (LAC)
Outbreak investigations	CHI, LAC, NE, TN	Investigated <i>Campylobacter</i> outbreak linked to contaminated water in a small rural municipality (NE) Investigated invasive group A strep outbreak (CHI) Investigated <i>Salmonella</i> outbreak in a neonatal intensive care unit (LAC)
Syndromic surveillance	DC, MD	Coordinated syndromic surveillance and patient tracking during Presidential Inauguration (DC, MD) Integrated non-fatal overdose, emergency department visit data into opioid response (MD)
Health communications		
Jurisdictional health alert network	LAC, NE, NJ	Evaluated the effectiveness of the county health alert network system and developed recommendations (LAC) Facilitated health alert network system switch from fax to email-based system (NE) Wrote health network alerts for vectorborne diseases and established testing/reporting guidelines (NJ)
Public and provider education	CHI, GA, NJ, TN	Developed pamphlets about well-water safety after wildfires (TN) Developed a community-wide Zika campaign, targeting high-risk neighborhoods (CHI) Developed web-based country search tool (Travel Clinical Assistant) to disseminate outbreak information and infection control precautions to providers (GA)
Health systems preparedness		
Response plan development	CHI, MD, GA, NE, NJ, NYC	Contributed to the development of jurisdictional Ebola Response Plan (CHI, GA, MD, NYC, NJ) Developed State Heroin and Opioid Overdose Alert and Response Plan (MD) Assisted in revising State's Zika, Dengue and Chikungunya Response Plan (NE)
Drills and exercises	CHI, NJ, NYC	Facilitated tabletop exercise for Ebola patient transport to Regional Treatment Center (CHI, NJ, NYC) Organized personal protective equipment training and Ebola transport drills for frontline hospitals and EMS providers (CHI)
Incident management		
Support Zika national response	CHI, LAC, MD, NYC, OH, TN	Deployed to American Samoa and US Virgin Islands (developing pregnancy registries), Puerto Rico (promoting health risk communications at ports of entry), and supporting CDC Emergency Operations Center in Atlanta

MD: Maryland; NJ: New Jersey; NYC: New York City; OH: Ohio; TN: Tennessee; CHI: Chicago; NE: Nebraska; LAC: Los Angeles County; DC: District of Columbia; GA: Georgia.

^aExamples are not exhaustive, so some jurisdictions in subcategories may not be represented.

In Georgia, the TEFA led the design and implementation of the Travel Clinical Assistant (TCA), a free web-based tool that allows clinicians to search for current infectious disease outbreaks in 231 countries.^{20,21} The tool lists incubation periods, clinical symptoms, transmission modes, and infection control recommendations. The TCA uses multiple data sources including CDC travel health notices and is continually updated. The

TCA has been promoted statewide at professional conferences and meetings and was added as a web tool to the intranet sites of two major hospital systems in Georgia.

Health systems preparedness. TEFA helped strengthen health systems preparedness for high-consequence pathogens by enhancing healthcare coalitions (e.g. recruiting new partners

and conducting training on emergency plans) and collaborating in the development of response plans for all-hazards scenarios, including natural disasters and emergencies involving bioterrorism, chemical, nuclear, and/or radiological events. Response plans outline the responsibilities of federal, state, and local partners in events that require active monitoring, laboratory diagnosis, follow-up of contacts, patient isolation, transportation of persons under investigation, and/or collaboration with multiple stakeholders. TEFAs also coordinated with partner organizations to develop training programs (e.g. infection control) and led or participated in state and local emergency response exercises, which were essential for strengthening the plans, getting partner buy-in, and preparing emergency response staff. In Chicago, the TEFA chaired an advisory group which developed the health department planning document which provided strategic and operational guidance for the City of Chicago and its public, private, and nonprofit healthcare system partners to prepare for and respond to an Ebola incident.

IMs. TEFAs filled IMS leadership roles in their jurisdictions' Emergency Operations Centers (EOCs), coordinating public health response efforts to disease outbreaks, natural disasters, and the opioid epidemic. The TEFA in Tennessee served as Operations Section Chief for a measles outbreak in Shelby County, coordinating teams responsible for case and contact identification and management, data collection and analysis, laboratory services, and public education. In Maryland, the governor declared a state of emergency in March 2017 to address the opioid crisis, implementing a formal IMS structure, known as the Opioid Operational Command Center (OCCC). The Maryland TEFA served terms as interim Deputy Incident Commander (March–April 2017) and Planning Section Chief (May 2017–September 2017). The TEFA supported a small senior advisory group in developing the overarching structure of the OCCC using the National IMS and corresponding mission, core functions, operational tempo, and reporting mechanisms. Her primary responsibilities as Chief Planner were providing policy guidance to decision-makers, coordination of statewide opioid-related efforts across state and local agencies, development of plans and protocols, in addition to data analysis and dissemination. Six TEFAs deployed outside their assigned jurisdictions for 30–60 days to support CDC's Zika response activities: one to the CDC EOC in Atlanta and five to CDC field teams in American Samoa, Puerto Rico, and US Virgin Islands.

Lessons learned

TEFAs' previous federal and state experience and combined epidemiology and management skills enabled them to build bridges between local epidemiology and emergency preparedness units, and data collectors and decision-makers. Not only did the TEFAs build bridges within their host sites, they also served as a valuable link between CDC and local and state jurisdictions. For example, as the Zika outbreak progressed,

laboratory testing guidance and recommendations from CDC changed rapidly. TEFAs were able to assist their host and deployment sites in interpreting and implementing the guidance and also in providing specific feedback to CDC regarding challenges in operationalizing recommendations. The working relationship between emergency preparedness and epidemiology units varied by jurisdiction, especially where these units existed in different departments or agencies. TEFAs played key liaison roles and strengthened collaborations. Their web-based data visualization and information technology initiatives improved decision-making by making surveillance data readily available in a usable format to response leaders. TEFAs increased local surge capacity during the Ebola and Zika outbreaks by assuming response and recovery duties, mitigating these high-consequence events and allowing health department staff to transition to routine activities.

TEFAs enhanced state-to-state dissemination of best practices by informally sharing with each other commonly experienced gaps and strategies in their health departments' plans for infectious disease response and monitoring of exposed healthcare providers. They supported post-response after-action reporting to identify strengths and weaknesses (e.g. need for strengthening risk communication, personal protective equipment protocols, and quarantine/isolation procedures), several of which were noted as national gaps in the government report "June 2016 US Department of Health and Human Services Ebola Response Improvement Plan: Based on Lessons Learned from the 2014-2016 Ebola Epidemic."²² TEFAs were able to leverage their deployment experience and their access to CDC resources to serve in their various roles.

There were limitations for the TEFA program; in particular, the timely identification and hiring of a cadre of highly skilled staff for temporary positions. Eight months passed from program inception to launch. Most TEFAs were graduates of the PHPS, a fellowship that has been discontinued at CDC. This 3-year fellowship provided skillsets ideally suited to the TEFA work—it trained masters-level professionals in both epidemiology and management through two 6-month rotations at CDC headquarters and a 24-month assignment in a state or local jurisdiction. These individuals were early in their career, flexible and willing to accept a temporary position and, in many cases, to relocate. The absence of the PHPS will make future TEFA-like efforts more challenging, though current CDC training programs such as the Public Health Associate Program, Preparedness Field Assignee Program, Preventive Medicine Residency, and EIS could provide exceptional candidates for future TEFA-like initiatives. CDC could also explore placing mid-level permanent staff in the field for 12-month rotations or creating a sustainable mobile field assignee program, whose size and term-limits could fluctuate in the event of a high-profile emergency. Contracting mechanisms could expedite outside agency hires. The ability to quickly identify and hire qualified staff and create the right incentives for them to commit to temporary assignments will promote the success of similar programs in the future.

The science of public health preparedness is relatively new; evaluating the long-term impact or cost-effectiveness of a program, where the endpoint is a mitigated or prevented event, is challenging.²³ In the absence of an independent, formal evaluation, we believe it is important to document the history and lessons learned from this time-limited program to respond to the unprecedented outbreak of Ebola in West Africa (2014–2016) and Zika emergence in the Western Hemisphere (2016). Many state and local public health departments have limited surge capacity due to chronic staff shortages caused by an aging (retiring) workforce, budgetary constraints, and administrative barriers to filling positions.²⁴ We believe the TEFA model can be a significant component of a national strategy for surging state and local capacity in future high-consequence events.

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Authors' statement

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