Infectious Diseases

Harris County Public Health, Disease Control and Clinical Prevention

Houston, Texas

Assignment Description

The Epidemiology Program, which is housed in the Disease Control and Medical Epidemiology (DCME) Section of the Disease Control and Clinical Prevention Division, is responsible for routine disease surveillance, outbreak control and prevention, and response to public health emergencies. The CSTE Fellow will fully participate in Epidemiology Program activities. He/she will gain hands-on experience in infectious disease surveillance and data analysis. The Fellow will participate in, and likely have the opportunity to lead disease and outbreak investigations involving medical record review, patient interviews, questionnaire design, control measure implementation, data collection and analysis, and report writing. As an important part of the Epidemiology Program team, the Fellow will also participate in preparedness and response activities as time permits, and depending upon the level of the public health response required. Since HCPH is a large, urban health department, public health response may be organized under Incident Command Structure (ICS) and require interdivisional involvement.

The Fellow will interact with other programs in DCME, including the Tuberculosis Elimination, Refugee Health Screening, and HIV Prevention Programs. Because HCPH has adopted One Health and Health Equity approaches in public health practice, the Fellow will also have the opportunity to interact with other HCPH divisions and offices according to his/her interests and availability. These include Environmental Public Health; Veterinary Public Health; Mosquito and Vector Control (MVC); Operations and Finance; Nutrition and Chronic Disease Prevention; Policy and Planning; the Office of Communications, Education and Engagement (OCEE); and the Office of Public Health Preparedness and Response (OPHPR). In addition, the Fellow will have opportunities to participate in various agency wide meetings, including Public Health Matters, the One Health Tag Up, and the Chronic Disease Tag Up.

HCPH's setting as the 3rd most populous county in the nation, provides important context for the depth and breadth of experience an incoming Fellow will gain, by being part of a team that provides epidemiology services to such a large, complex, and diverse urban population. Harris County has the 8th busiest international airport in the United States, which is ranked 3rd for non-stop domestic and international service (http://www.flightstats.com/go/Airport/airportDetails.do?airportCode=iah). The Houston area has many international travelers, one of the world's busiest ports, and the worlds largest medical center. The Epidemiology Program provides epidemiology services, including surveillance of notifiable conditions, to this population.

In recent years, the HCPH Epidemiology Program has been involved in investigations of human rabies, Japanese Encephalitis, a large outbreak of hepatitis B associated with long term care facilities, the largest national outbreak of West Nile virus (WNV) reported to date, measles, pertussis, and many

interesting foodborne illness clusters identified by PulseNet. The Program has also accumulated intensive experience in response to the emergence of Ebola and Zika Virus (ZIKV). Finally, the Program sucessfully responded to Hurricane Harvey this year, including conducting public health surveillance in a 10,000 cot mega-shelter in Harris County. Because of the diverse population and large area we serve, Epidemiologists in our program gain rich experience investigating various types of rare and exotic diseases and responding to publich health emergencies.

Day-to-Day Activities

The Fellow will apply principles of Epidemiology to day-to-day disease surveillance and control activities, and respond to public health emergencies within the jurisdiction of HCPH. Of particular importance are the surveillance, control, and prevention of notifiable infectious conditions, including diseases related to potential bioterrorism agents, outbreak situations, and other public health emergencies or natural disasters. In the context of learning general disease surveillance, the Fellow will focus on Hepatitis C (HC), which has been identified as a priority in HCPH's Epidemiology Program.

With guidance from mentors and the Surveillance Supervisor, the Fellow's day-to-day activities may include:

- Investigating reports of notifiable conditions in Harris County residents as assigned. This process involves review of medical records, interpretation of laboratory reports, patient interviews, implementation of control measures, and completion of surveillance forms (with other steps as necessary based on the situation or condition).
- Providing information and Epidemiology consultations related to public health issues via telephone, mailings, and presentations to individuals, schools, child care centers, nursing homes, hospitals, health care providers, and other agencies in order to identify notifiable conditions, outbreaks, and public health emergencies and prevent the spread of disease
- Analysis of epidemiologic data to describe disease burden and characteristics in the county and produce reports
- Exploration of opportunities to improve disease surveillance
- Exploration of opportunities to develop interventions or mechanisms to connect patients to services
- Conduct of investigations and provision of interventions for epidemic or unusual community health related episodes or outbreaks, including those related to potential bioterrorism agents and other public health issues, thus contributing to the development of the public health preparedness capacity of the Program

Potential Projects

Surveillance Infectious Disease Epidemiology - General Disease Surveillance Rotation Activity

In the first months of the fellowship (length to be determined in consultation with the Fellow and considering Epidemiology Program priorities), the Fellow will conduct Epidemiology investigations for various notifiable infectious diseases in order to gain broad experience in Epidemiology surveillance and be prepared for the future profession. A full spectrum of both common and rare notifiable conditions has been seen in HCPH's jurisdiction, including salmonellosis, shigella, campylobacteriosis, enterohemorrhagic E. coli, cryptoporiosis, cyclosporiasis, Vibrio, invasive streptococcal infection, multi-drug resistant infections, hepatitis, meningitis, chickenpox, mumps, invasive Haemophilus influenzae, Lyme disease, typhus fever, Chagas disease, legionellosis, influenza-associated pediatric portality, Chikungunya virus, WNV, malaria, ZIKV, dengue, and brucellosis, among others.

The aforementioned surveillance activities involve: 1) Review of medical records, interpretation of laboratory reports, patient interviews, implementation of control measures, and completion of surveillance forms (with other steps as necessary based on the situation or condition). 2) Provision of information and Epidemiology consultations related to public health issues via telephone consultation, mailings, and presentations to individuals, schools, child care centers, nursing homes, hospitals, health care providers, and other agencies in order to identify notifiable conditions, outbreaks, and public health emergencies and prevent the spread of disease.

After this rotation, the Fellow will have a comprehensive understanding of infectious disease surveillance and its workflow in the field, and have proficiency in our new electronic disease surveillance tool, Maven.

This rotation will be followed by surveillance activities in specific areas to allow the fellow to obtain in-depth understanding of certain conditions of public health significance.

Surveillance Activity ZIKV Investigation

The Epidemiology Program received its first travel-related ZIKV case at the end of 2015. HCPH immediately formed a Zika Readiness Team to address public health concerns and appropriate measures in case of confirmation of the infection in Harris County. Since then, the Program has investigated a substantial number of ZIKV reports and identified disease cases and infections. Given the public health significance of ZIKV, the holistic efforts to combat the infection, the complexity of ZIKV surveillance, and the One Health and Health Equity approach taken in the response, ZIKV surveillance is an excellent representation of infectious disease surveillance, providing beneficial experience to the Fellow.

The Fellow will conduct investigations of reported cases of ZIKV. He/she will interview and educate patients, conduct provider outreach and education, and interpret laboratory results. This process includes monitoring changes in state and CDC recommendations to convey new guidelines to providers. The Fellow will also have access to a few years' worth of data from completed investigations to compile and analyze trends in ZIKV testing over time. Harris County's climate, urbanization, income inequality, and mosquito vectors place it at high risk for local ZKV transmission. In preparation for a response to possible local transmission, the Fellow will have opportunities to collaborate with a diverse set of public health professionals at HCPH, including people in MVC, Environmental Health, OPHPR, and OCEE.

ZIKV is challenging because it is transmitted by arthropod vector, and sexually, and because of its heightened risk in our most vulnerable populations. At the end of this project, the Fellow will have gained experience in disease investigation, education of patients and providers, public health preparedness, and complex data analysis.

Surveillance Evaluation **Evaluation of Hepatitis C (HC) Surveilance in HCPH**

The Fellow will conduct a comprehensive evaluation of HC surveillance in HCPH's jurisdiction utilizing "Updated Guidelines for Evaluating Public Health Surveillance Systems" from the Centers for Disease Control and Prevention (CDC).

Our program has conducted previous evaluations of the arbovirus and salmonellosis components of our surveillance system utilizing this guidance, one of which was sucessfully performed by a CSTE Applied Epidemiology Fellow. Expanding this evaluation methodology to HC will allow the Fellow to understand the current state of specific components of surveillance systems and their mechanisms. Selected surveillance system attributes to be evaluated include data quality, flexibility, simplicity, and representativeness. Post evaluation recommendations and possible implementation will contribute to improvement of surveillance at HCPH in the future.

Major Project **HC - Epidemiology Surveilllance and Improvement**

The CDC estimates that there are 2.7 million individuals in the U.S. living with chronic HC, and approximately 17,000 new HC infections occur each year (https://www.cdc.gov/hepatitis/hcv/cfaq.htm). The estimated prevalence rate of HC antibodies in Texas in 2010 is 2,060 per 100,000 (https://hepvu.org/state/texas/), which may translate to at least 45,320 estimated number of persons living with HC in Harris County. Looking at HIV as a potential comparison, the Harris County HIV case rate in 2016 was 63% higher than the state rate, meaning that it is very possible that our HC burden may be significantly higher (file:///C:/Users/ahaynie/Downloads/HIVSurveillanceReport.pdf). Of infected individuals with HC,

only acute HC illness is currently reportable. Understanding the burden of HC is the most important first step to control the epidemic, but this it is not an easy task. Data on HC infections, particularly for geographic units smaller than the state level, are scarce. A lack of the baseline data contributes to the challenges of HC surveillance. Another challenge is the lack of robust HC detection method in surveillance. Given the enormous volume of HC laboratory results generated and that only acute HC is reportable, many local health departments do not routinely investigate laboratory-identified reports of HC infection without accompanying evidence of acute symptoms or liver function tests. This results in under identification and underreporting of cases. Since the majority of chronic HC infections are not identified, affected individuals are not connected to services. While highly effective treatment options are available, opportunities for cure may be missed due to this gap in surveillance.

From January 1 to July 28th this year, the Epidemiology Program has received more than 16,000 Electronic Laboratory Records (ELRs) for HC, including duplicates, group testing that is reported separately, follow up testing, and out of jurisdiction reports. Among them, we have identified only a handful of acute HC cases. A more sensitive and effective surveillance algorithm is needed for identification of acute and chronic HC infections in order to describe the disease burden and characteristics of the infected, develop interventions, and connect patients to services.

In this project, the Fellow will aim to 1) understand current HC surveillance in the Epidemiology Program, 2) identify opportunities to improve HC surveillance, 3) develop a new protocol to detect acute HC infections utilizing liver function tests, other data in NEDSS, and other sources of information, and 4) develop a database of acute and chronic HC infections in Harris County.

Major Project **Understanding the Burden of HC in Harris County, TX**

The burden of HC in HCPH's jurisdiction is not well understood. The Fellow will participate in activities designed to increase understanding of this burden in the local community. The Fellow will analyze HC surveillance data collected by HCPH's Epidemiology Program for over 10 years to describe the disease's infection rate and geographic distribution, demographic characteristics of infected individuals, selected clinical characteristics, disease trends over time, and risk factors for infection. The fellow will also develop an HC monitoring report template that will enable the Epidemiology Program to continue future monitoring, ultimately leading to development and evaluation of targeted prevention strategies, earlier initiation of treatment, and decreases in negative outcomes and healthcare costs related to HC.

Major Project **Linkage to Care for Patients Infected with HC**

The Fellow will explore services available for those infected with HC in the local community and develop a linkage to care protocol for these individuals. The fellow may work closely with Houston Methodist Hospital, which has several HC treatment locations throughout Harris County, in developing this protocol. The Fellow will also explore resources available through the American Liver Foundation, Health Resources and Services Administration, Partnership for Prescription Assistance,

Department of Veterans Affairs, pharmaceutical providers, and other agencies to compile a resource guide to assist affected individuals.

The linkage to care protocol will be developed, implemented, and maintained in collaboration with HCPH's HIV Prevention Program and Ryan White Grant Administration Section, which provide preventive services and coordination of care for individuals infected with, or at high risk for, HIV. Their expertise will be intrumental in this process given the similarity in risk factors for HIV and HCV and their extensive experience in related areas.

Major Project Understanding the Burden of the Opioid Epidemic (OE) in Harris County, TX

The burden of the U.S.'s OE within Harris County and the HCPH jurisdiction is not well understood. The Fellow will work with HCPH's chronic disease epidemiologist and Nutrition and Chronic Disease Prevention Division to participate in activities designed to increase understanding of this burden in the local community. The Fellow will analyze available overdose-related data such as syndromic surveillance data collected by jurisdictional hospitals and mortality data collected by Texas DSHS Vital Statistics Unit, to describe the geographic burden and distribution, demographic characteristics of affected individuals (if possible), selected clinical characteristics, trends over time, and risk factors for dependence or overdose, and overdose-related fatalities, as well as any reports received related to overdoses. The fellow will also conduct research related to the availability of preventive and treatment-related resources within Harris County and HCPH jurisdiction for individuals affected by opioid dependence, including but not limited to needle substitution programs, methadone and other prescription opioid replacement treatments, and other substance abuse related programs. Additionally, the fellow will attempt to gain access to and utilize information available through Texas's prescription monitoring program to characterize and identify trends over time in controlled substance prescribing by Harris County (or HCPH jurisdiction) providers, including information related to reason for prescription, specialty of prescriber, expected duration of use for prescribed opioids, and other potentially useful information. The fellow will also develop an OE monitoring report template that will enable the Epidemiology Program to continue future monitoring, ultimately leading to development and evaluation of targeted prevention strategies, and decreases in negative outcomes and healthcare costs related to the OE. This would complement the fellow's surveillance work in identifying local resources available for individuals affected by opioid dependence.

Preparedness Role

Harris County is no stranger to emergencies and HCPH has long experienced responding to these situations. The Epidemiology Program plays an integral part in the HCPH response to public health emergencies and natural disasters.

In September 2005, as ICS was set up to respond to the large numbers of evacuees arriving in Harris County following Hurricane Katrina, HCPH led the Medical Branch Operation at the Astrodome/Reliant Complex. The Epidemiology Program had primary responsibility to implement a

comprehensive epidemiological surveillance in all shelter areas. HCPH applied a health assessment in the clinic triage areas for all evacuees seeking care in shelter clinics. Further investigations were conducted for all evacuees suspected of having infectious diseases. Routine, preexisting surveillance systems were maintained and allowed for follow up of hospitalized evacuees. Additionally, epidemiologists rounded in all shelter areas every 12 hours to identify any infection control related issues that arose.

One example of an infection control issue was the identification of large ice chests with drinks accessible to all evacuees placed at various places in the shelters. Immediately, risk of fecal-oral transmission of infectious pathogens was identified and the practice was corrected. Volunteers were placed at all ice chests to distribute drinks as needed. In collaboration with the University Of Texas School Of Public Health, a daily cot-to-cot survey was implemented to assess the general health status of evacuees in the shelter areas. This effort was instrumental in quick identification of a Norovirus outbreak in the main shelter area at the Astrodome. HCPH also tracked immunizations given in the shelters, laboratory tests ordered, medical complaints, and pharmaceutical usage. In addition to these disease control efforts, environmental shelter assessments were conducted and appropriate health education messages for evacuees and response personnel were provided.

Epidemiology Program staff stayed at “shelters of last resort” (for residents with significant medical conditions who were unable to evacuate) during Hurricane Ike and participated in the post-hurricane response. Epidemiology-related activities implemented as part of the post-hurricane response included shelter assessments and other active surveillance activities.

The HCPH Epidemiology Program responded to the 2014-15 Ebola Outbreak by conducting passenger monitoring to more than 100 individuals arriving from West African countries including some passengers categorized under “some risk” that required direct active monitoring. The CDC/CSTE Applied Epidemiology Fellow assigned to our agency at that time took an active role during that response. As of 2016 our program is actively responding to the ongoing ZIKV emergency. To date we have investigated more than 1,500 reports of suspected ZIKV in residents of Harris County.

After Hurricane Harvey in Fall of 2017, the Epidemiology Program played a critical role in public health surveillance and response. Active surveillance was conducted in the NRG mega-shelter to rapidly detect communicable and high-consequence illness and to prevent disease transmission. An online survey tool and novel epidemiology consulting method were developed to aid in this surveillance. Surveillance included daily review of onsite medical, mental health, pharmacy, and vaccination activities, as well as nightly cot-to-cot resident health surveys. Symptoms of infectious disease, exacerbation of chronic disease, and mental health issues among evacuees were closely monitored. Rapid epidemiology consultations were performed for shelter residents displaying symptoms consistent with communicable illness or other signs of distress during nightly cot surveys. Onsite rapid assay tests and public health laboratory testing were used to confirm disease diagnoses. When indicated, disease control measures were implemented and residents referred for further evaluation. Analyses were performed to describe the surveillance results.

Epidemiology Program staff also participate in emergency response drills for suspected biological terrorist attacks and prophylaxis distribution, known as Point of Dispensing (POD) exercises.

The Fellow may be assigned to participate in any of the above activities should a public health emergency occur. In addition, the Fellow may participate in Community Assessment for Public Health Emergency Response (CASPER) activities conducted regularly by HCPH to assess community emergency preparedness or in response to public health emergencies.

In times of emergency response, the Fellow will have responsibilities including shelter disease surveillance and/or additional disease surveillance specific to the nature of the emergency. After Hurricane Harvey, for instance, the entire Epidemiology Program participated in both shelter and community disease surveillance activities related to the hurricane and subsequent flooding. This provided unique experience to staff in disaster preparedness and response.

Additional Activities

Depending on the interests of the Fellow and as time permits, the Fellow may analyze data related to healthcare associated infections including multidrug-resistant *Acinetobacter* Infections and Carbapenem-resistant Enterobacteriaceae infections using the surveillance data collected by the Program.

In addition, the Fellow will attend agency wide and other meetings, including a regional bimonthly meeting of epidemiologists in Texas Health Region 6/5 South.

Mentors

Primary	Leann Liu MD, MS Deputy Epidemiology Program Director
Secondary	Deborah Bujnowski PhD, MPH, RD Chronic Disease Epidemiologist