ID: 60461265
Wastewater Surveillance, Infectious Diseases - Host Site Description
New York City Department of Health and Mental Hygiene

Assignment Location: Long Island City, US-NY
New York City Department of Health and Mental Hygiene
Antimicrobial Resistance Unit, Bureau of Communicable Diseases, Division of Disease Control

Primary Mentor: Karen Alroy, DVM, MPH
One Health Team Lead, Antimicrobial Resistance Unit (ARU)
New York City Department of Health and Mental Hygiene (NYC Health Department)

Secondary Mentor: William Greendyke, MD
Infection Prevention Team Lead, Antimicrobial Resistance Unit (ARU)
New York City Department of Health and Mental Hygiene (NYC Health Department)

Work Environment
Hybrid

Assignment Description

The CSTE fellow will be fully integrated into BCD at the NYC Health Department and assigned to the ARU. They will have their own analytic, surveillance, and educational projects to work on daily. The fellow's main assignment will be working on projects related to antimicrobial resistance surveillance in wastewater. In addition, the fellow will be invited to join and potentially lead the Wastewater Surveillance Working Group, a collaboration between BCD and the NYC Public Health Laboratory. The fellow will participate in foundational discussions and will need to consider what epidemiologic questions can and should be asked to help shape wastewater surveillance, particularly as it pertains to antimicrobial resistant pathogens. It is anticipated that many of the fellow's projects would arise out of discussions with this working group.

Fellow's Anticipated Day-to-Day Activities:
- Attend weekly BCD outbreak meetings to discuss current acute issues for all diseases that BCD tracks.
- Attend weekly ARU team meetings to discuss data, surveillance, infection control, antimicrobial stewardship and wastewater updates pertaining to the team.
- Attend monthly in-person ARU team meetings.
- Attend routine Wastewater Surveillance Working Group Meetings.
- Attend quarterly meetings with the NYC Public Health Laboratory staff to discuss shared projects.
- Liaise with ARU leadership regarding the current status of wastewater surveillance.
- Assist with routine investigations within ARU (e.g., review regional health information exchange data from individuals with a newly reported carbapenem-resistant organism).
- Support ARU surveillance through rotations with the Surveillance and Data Team, creating and running SAS code, meeting with the Surveillance and Data Team and the BCD Data Unit, and contributing to the recent CRO expansion for electronic laboratory reporting.
- Conduct special studies, including considerations of study design, human-subjects review determination (as needed), project implementation, data collection, and analysis.
- Prepare presentations and manuscripts for meetings and conferences, agency publications, and peer-reviewed journals.

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Describe Statistical and Data Analysis Support, Such as Databases, Software, and Surveillance Systems Available to the Fellow

The agency has licenses for analytic software such as SAS and SPSS, as well as databases such as SQL and Microsoft Access. The fellow will have the opportunity to attend software training, such as SAS courses, through the SAS institute, as well as R trainings held at other locations and within the agency. BCD uses Maven to track and manage communicable disease data, and the agency uses the Electronic Clinical Laboratory Reporting System (ECLRS) to receive electronic lab reports for all reportable diseases in NYC, including reports from the NYC Public Health Laboratory via StarLIMS. BCD has a Data Unit, which offers statistical analytic support, epidemiologic methods support, review of abstracts and papers, and programming assistance. The agency also has a Bureau of Epidemiology Services, which can provide additional technical support as needed, including expertise in survey design, mapping and spatial analyses using geographic information systems (GIS), qualitative data collection, social epidemiology among others subject areas.

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Projects

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Surveillance Activity Title: Updating and strengthening carbapenem-resistant organism surveillance.

Surveillance Activity Description:
The NYC Health Department has conducted surveillance of carbapenem-resistant Enterobacterales (CRE) via electronic laboratory reporting since 2018. Recent changes in reporting requirements as well as advancements with whole genome sequencing, have prompted the ARU Surveillance and Data Team to update and revise their routine surveillance practices. With growing concern about gram negative carbapenem-resistance beyond the Enterobacterales taxonomic order, with organisms such as CRPA and CRAB, the NYC Board of Health modified the city's health code to expand reporting to include all carbapenem-resistant organisms (CRO). In addition, the current CSTE position statement recommends surveillance efforts focus on carbapenemase-producing organisms (CPO), a subset of CRO that are more likely to have resistance genes on plasmids, which can be easily transmitted between bacteria and enable rapid spread among people. Since testing for carbapenemase genes or phenotypic carbapenemase production is not widely available in all diagnostic laboratories, the ARU Surveillance and Data Team and the NYC Public Health Laboratory coordinate to have isolates forwarded to secondary labs where these carbapenemase tests can be conducted in order to determine if isolates meet the CSTE case definition. Meanwhile, in addition to these reporting changes, capacity for whole genome sequencing at the city and state public health laboratories has increased, and there is a growing potential to incorporate sequencing data into routine surveillance. The ARU Surveillance and Data team is actively working to update and strengthen the way in which these resistant bacteria are counted in our surveillance database, how sequencing data are stored and analyzed, and how surveillance data are reported to CDC.

Surveillance Activity Objectives:
The CSTE fellow will be involved in all stages of the planning and implementation of these surveillance updates, including revising the surveillance database to capture isolates that undergo carbapenemase testing and identify ones meeting the CSTE case definition, analyzing and summarizing surveillance data including sequencing data, presenting of findings to internal and external stakeholders, and preparation of surveillance reports. The fellow will also be encouraged to present analyses of surveillance data to internal and external stakeholders through oral presentations and written manuscripts including contributing to the preparation of a public facing surveillance report for ARU.

Surveillance Activity Impact:
The CSTE fellow will have a public health impact by preparing and helping to summarize data for the inaugural public facing surveillance report on antimicrobial resistance in NYC.

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Sharing these data for a public audience will improve the Health Department's transparency for key stakeholders such as NYC hospitals and medical providers, long-term care facilities, congregate and other residential facilities, as well the NYC general population at large. These data will help in improving communication with stakeholders and planning for future public health interventions.

Surveillance System Evaluation Title: Evaluation of Candida auris surveillance and planning for the analysis of C. auris wastewater surveillance pilot data.

Surveillance System Evaluation Description:
Candida auris is an emerging fungal pathogen that can easily spread among people and surfaces in acute and long-term care facilities. Candida auris can cause infections or it can colonize an individual, namely, living and growing on the skin, in the ears, or elsewhere on a person's body without causing symptoms. The severity of illness caused by C. auris ranges from skin infections to life threatening bloodstream infections. While most healthy people are not at risk of getting C. auris, people with underlying health conditions or with medical devices such as breathing tubes, feeding tubes, catheters in a vein, or urinary catheters are most susceptible to infection. C. auris has been shown to be highly transmissible in health care settings such as acute care hospitals and long-term care facilities.

Candida auris was first detected in the U.S. in 2013 and became a nationally notifiable disease in 2018. New York was one of the initial hot spots of this emerging fungus, and NYC, in particular, remains a location with a relatively high burden of disease. Our knowledge of C. auris epidemiology is primarily based on clinical and screening testing that occurs at hospitals and long-term care facilities. Much less is known about carriage of this fungus in community and outpatient settings. The Wadsworth Center, the New York State Public Health Laboratory, has begun a pilot project in C. auris wastewater surveillance, representing a novel data source that can be used to describe C. auris epidemiology. This surveillance evaluation would be the first population-level comprehensive epidemiologic description C. auris data in NYC from electronic laboratory reports and the initial comparison of these data with Wadsworth Center's C. auris wastewater surveillance pilot data.

Surveillance System Objectives:
The fellow would conduct a descriptive analysis of C. auris epidemiology in NYC from the existing electronic laboratory-based surveillance system, and conduct an evaluation of this system using methods described in the Morbidity and Mortality Weekly Report articles Klaucke et al. "Guidelines for evaluating surveillance systems" from 1988, and the German et al. article, "Updated guidelines for evaluating public health surveillance systems: recommendations from the Guidelines Working Group" from 2001, as well as from other peer-reviewed literature. The fellow would plan for and conduct a comparison of the C. auris electronic-laboratory based surveillance system with wastewater surveillance pilot data with a potential focus on the geographic resolution of laboratory versus wastewater data and an examination of endemic versus non-endemic regions for C. auris.

Surveillance System Impact:
The fellow will help to lead the inaugural evaluation of C. auris surveillance in NYC comparing laboratory versus wastewater data sources. This work will not only inform local and state public health authorities on the benefits and challenges associated with wastewater surveillance for this pathogen, but this work could improve our understanding of the burden and distribution of C. auris in NYC communities ultimately helping to guide future data collection and control measures to further prevent its spread.

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Major Project Title: Strategic planning for antimicrobial resistance wastewater surveillance at the NYC Health Department.

Major Project Description:
Public health capacity in wastewater surveillance has grown considerably since 2020. Following the COVID-19 pandemic, an influx of federal funding helped to establish NYC Health Department Public Health Laboratory wastewater surveillance, and prompted our epidemiologists to consider how routine wastewater testing can inform public health surveillance and action. In 2023, the U.S. National Academies of Science, Engineering, and Medicine published a report "Wastewater-based Disease Surveillance for Public Health Action" that describes this growing field. This report provides examples of epidemiologic questions that can be answered through wastewater surveillance, the unique challenges jurisdictions encounter when using this testing modality, and examples of how wastewater surveillance data can inform public health action. Most recently, a NYC Health Department Wastewater Surveillance Working Group used this report to create a framework tool to use when onboarding new pathogens for wastewater surveillance. In addition to this report and the growing body of literature on wastewater surveillance in public health, the CDC has a National Wastewater Surveillance System (NWSS) online dashboard for public health practitioners nationwide to view how other U.S. jurisdictions are incorporating wastewater surveillance into their work for different diseases. While the CDC NWSS program has highlighted antimicrobial resistance as a future potential target, it is not yet clear to the NYC Health Department ARU, if and how wastewater surveillance would complement our existing surveillance of antimicrobial resistant organisms and resistance genes.

Major Project Objectives:
The CSTE fellow will conduct a literature search, including a review of the resources described above, conduct key informant interviews, help to populate the NYC Health Department wastewater surveillance framework, and create a strategy planning document. We anticipate that this literature review and strategic planning will help guide the ARU to better understand how wastewater testing can improve how we monitor antimicrobial resistance in NYC and how we strive towards controlling its spread. In addition, this strategy document will help to identify next steps including pilot activities and opportunities for collaboration to advance antimicrobial resistance wastewater surveillance.

Major Project Impact:
This strategic planning process will help orient our team to the current antimicrobial resistance wastewater surveillance landscape. There are a number of factors somewhat unique to antimicrobial resistance wastewater surveillance, such as the diversity of resistant bacterial pathogens, detection of organisms versus resistance genes, known versus novel resistance genes, varied prevalence depending on the organism, colonization versus infection, and the detection of non-human contributions to wastewater (such as from animals or environmental sources), just to name a few. By considering these and other factors, this project will help clarify opportunities and challenges to onboard antimicrobial resistance wastewater surveillance. We imagine that other public health jurisdictions are struggling with similar questions regarding antimicrobial resistance wastewater surveillance and envision sharing findings from this project with other public health practitioners through a conference abstract, presentation, or even a published manuscript.

Additional Project #1 Title: Assessing wastewater surveillance pilot programs for flu and RSV in NYC.
Project #1 Type: Major Project

Project #1 Description:
In August 2020, the NYC Departments of Environmental Protection (DEP) and the NYC Health Department began weekly testing and analysis of wastewater samples from the 14 sewersheds in NYC using real-time qPCR to measure SARS-CoV-2 viral levels. Since then, the NYC Health Department has tracked SARS-CoV-2 viral trends in wastewater over time and explored the relationship between these trends and other COVID-19 clinical surveillance indicators including counts of cases, emergency department visits, and deaths.

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As testing practices and reporting requirements have changed, wastewater surveillance for SARS-CoV-2 has become an additional metric for COVID-19 and another tool in the COVID-19 disease surveillance toolbox. In the spring of 2024, the NYC Health Department will begin analyzing wastewater samples for influenza (flu) and RSV. Both flu and RSV are reportable to the NYC Health Department by laboratories, and syndromic surveillance is used to monitor care-seeking in emergency departments for respiratory and specifically influenza-like illnesses. Similar to the COVID-19 surveillance program, the NYC Health Department would like to enhance its flu and RSV clinical surveillance systems by incorporating flu and RSV wastewater surveillance.

Project #1 Objectives and Expected Deliverables:
The CSTE fellow will help evaluate the wastewater surveillance pilot programs for flu and RSV. Activities will include assessing the relationship between flu and RSV viral levels in wastewater and clinical surveillance indicators, including counts of reported cases, emergency department visits, and deaths. Additionally, the fellow will develop and maintain a flu and RSV wastewater surveillance dashboard showing trends in viral levels over time citywide and by sewershed. The fellow may also develop additional analyses to evaluate flu and RSV wastewater trends as needed. This evaluation will help determine the utility of these wastewater surveillance programs and whether they should be incorporated into the NYC Health Department flu and RSV surveillance systems.

Project #1 Impact:
These pilot programs will allow the NYC Health Department to assess the utility of wastewater surveillance for flu and RSV and support interpretation of wastewater data as a surveillance indicator for flu and RSV in NYC. The timing of wastewater surveillance trends relative to clinical surveillance trends may be helpful in determining the beginning of the respiratory season, which has implications for the healthcare community. If successful, these programs will also provide additional models for launching wastewater surveillance programs for other diseases and could provide an additional surveillance metric to inform disease surveillance. As these wastewater programs are further developed, they can also be a guide for other health departments who may have different reporting requirements or less capacity to ascertain clinical surveillance indicators due to resource constraints. The development of these programs may potentially be shared with other public health practitioners through a conference abstract, presentation, or a published manuscript.

Additional Project #2 Title: Evaluating antibiotic prescription data in New York City: Comparing publicly available data through Medicare Part D with prescription and claims data purchased from IQVIA.
Project #2 Type: Surveillance System Evaluation

Project #2 Description:
Antimicrobial stewardship and judicious antibiotic prescribing are essential to help reduce the emergence of antimicrobial resistance. One component of CDC's Core Elements for Antibiotic Stewardship is measuring antibiotic prescription data to identify inappropriate antibiotic prescribing practices. Health Departments can either use publicly available data or can purchase data to help measure antibiotic prescribing. NYC Health Department's ARU purchased two datasets from a healthcare data company, IQVIA Government Solutions Inc. (IQVIA), that describe data from medical providers (practicing within NYC) and pharmacies (located within or outside of NYC) that provide services to patients seen by NYC-based providers. One dataset was focused on Medical Claims and the other was a Longitudinal Prescription dataset, both covering the years of 2019-2022. Using these data, we plan to classify medical providers according to their volume of antibiotic prescriptions. Medicare Part D provides data publicly available online that can similarly be used to guide antibiotic stewardship interventions. By comparing analyses from these two sources for NYC-based providers, the CSTE fellow will be able to showcase the potential value and possible limitations of using public datasets as a tool for guiding antimicrobial stewardship interventions.

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Project #2 Objectives and Expected Deliverables:
The CSTE fellow will perform an analysis to better understand concordance between the IQVIA outpatient prescription dataset that ARU purchased and the Medicare Part D dataset that is publicly available. While analysis of the purchased IQVIA dataset is underway by other personnel in the ARU, the CSTE fellow will have the opportunity to download and explore comparable data from the Medicare Part D data set. The CSTE fellow will obtain Medicare Part D data and analyze characteristics of antibiotic prescribers as well as antibiotic prescription data within NYC. The fellow will then compare the two data sets to evaluate overall concordance. Given the costs associated purchasing IQVIA data sets, many public health jurisdictions would be interested to see what possibilities that may exist to either supplement or forego an IQVIA purchase with publicly available data. These analyses could potentially be shared with other public health practitioners through a conference abstract, presentation, or a published manuscript.

Project #2 Impact:
While a number of public health entities have purchased IQVIA data for their jurisdictions, the time and cost needed to purchase these data are substantial. Understanding the concordance of IQVIA data and publicly available Medicare Part D data can help health departments across the nation potentially save money and time, and at a minimum have a better understanding of the benefits and limitations of making an investment such as a purchase of prescription data.

Please Describe the Fellow's Anticipated Role in Preparedness and Response Efforts – Include Activities and Time Allocation (Required Competency of Fellowship)

The NYC Health Department has responded to numerous citywide and national emergencies, including the initial outbreak of West Nile virus in 1999, the response to the 9/11 terrorist attacks and anthrax investigation in 2001, the outbreak of Ebola in West Africa in 2014, the outbreak of measles in NYC in 2019, the COVID-19 pandemic in 2020, the Mpox response in 2022, and most recently responding to an increase in varicella in NYC. All employees are assigned to an Emergency Preparedness Committee for purposes of planning for and responding to emergencies. The fellow will be assigned to the Surveillance and Epidemiology Branch and will be expected to participate in the NYC Health Department's responses during emergencies, and in all drills and meetings required by the unit. Prior fellows have had the opportunity to participate in point-of-distribution (POD) clinics to disseminate hepatitis A vaccine to patrons of restaurants, participate in POD clinics to test animal shelter staff for influenza after identification of a novel strain in cats, support investigations of measles cases to ensure rapid identification of contacts at high risk for developing illness, perform COVID-19 cluster investigations, assist with COVID-19 vaccine breakthrough and reinfection studies, as well as Mpox and varicella response activities.

Please Describe the Fellow's Anticipated Role in Cluster and Outbreak Investigations – Include Activities and Time Allocation (Required Competency of Fellowship)

Different units within BCD routinely identify and respond to clusters and outbreaks in NYC. The fellow will be invited to participate in any outbreak investigation within BCD or elsewhere within the agency. Recent outbreak investigations that the ARU and Infection Prevention Team have been involved with include a multi-state outbreak of extensively drug-resistant Pseudomonas linked to artificial tears as well as two viral hepatitis outbreaks including one at an outpatient healthcare facility and another linked to a residential congregate setting. For the multi-state outbreak linked to artificial tears, members of the ARU Surveillance and Data Team and Infection Prevention Team worked in tandem to identify new cases, conduct patient interviews, coordinate with external stakeholders such as CDC and other state and local health departments, and two ARU team members were included as investigators in a manuscript describing the outbreak which was recently accepted for publication in the Journal of Clinical Infectious Diseases. For the viral hepatitis clusters, the BCD EISO was deployed to the field to participate in facility site visits and helped to support an on-site rapid response team offering post-exposure prophylaxis at the residential congregate setting.

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Please Describe the Fellow's Anticipated Role in the COVID-19 Response – Include Activities and Time Allocation

New York City had one of the highest burdens of COVID-19 infections in the United States and continues to experience community transmission. At the NYC Health Department, the Respiratory Diseases Unit within BCD is primarily responsible for conducting COVID-19 surveillance. The specific duties the fellow will perform will depend on the needs of the agency and disease transmission dynamics in NYC once they begin the fellowship, but responsibilities would include but not be limited to: maintaining routine data tasks for management of COVID-19 surveillance data, as well as supporting data analyses and reporting to inform decision-making for COVID-19 surveillance, outbreak, and response activities. There may be additional projects the fellow may work on incorporating analysis of COVID-19 data. COVID-19 response activities and priorities continue to change given the dynamic nature of this pandemic.

Please Describe Opportunities for Fellows to Work in Health Equity as well as Incorporating Diversity, Equity, and Inclusion into their Work

Health equity is one of the NYC Health Department's top priorities. In 2021, the NYC Board of Health declared racism a public health crisis, and for years, the NYC Health Department has taken many steps to address health equity in NYC. The fellow will have the opportunity to be involved in all aspects of the NYC Health Department's health equity work, including but not limited to: participating in agency- and division-wide health equity trainings, forums, summits, presentations, and various working groups like the Data for Equity Workgroup. The Division of Disease Control also hosts a health equity journal club to discuss the articles that provide an equity lens to public health work. The NYC Health Department develops resources to help staff integrate equity principles into their everyday work, including a guide for public health communication and an equity framework for publications. Moreover, all data analyses the fellow conducts, per agency health equity standards, will look for the presence of disparities in various health outcomes by race/ethnicity, neighborhood-level poverty, county of residence, age, and sex. In addition, the NYC Health Department has started offering a training series on data equity, which reviews core issues facing the equitable and ethical use of data. BCD has been heavily involved in health equity initiatives, including an orientation for all new staff on the Race to Justice Program (the NYC Health Department's plan to incorporate health equity in all its work), hosting dismantling racism discussions, and updating questionnaires to collect race/ethnicity and gender identity/sexual orientation data more appropriately across all BCD-investigated diseases. The fellow will also be encouraged to participate in health education activities across NYC, which include healthy swimming outreach at NYC pools, health fairs, or rabies education in schools. Lastly, we have several workforce equity-related workgroups in BCD, including the Committee for Hiring, Retention and Promotion, that work to improve diversity through our recruitment efforts and also address issues in the office to create a more inclusive environment.