Using Molecular HIV Surveillance in Public Health Practice:

A Step-by-Step Guide

Molecular HIV Surveillance (MHS) is the collection of HIV genetic data to support local and state health departments in monitoring trends in HIV transmission and antiretroviral (ARV) drug resistance. Health departments use MHS to identify and investigate clusters of HIV infections in order to develop and evaluate HIV prevention strategies, guide public health action, and enhance understanding of the burden of HIV within an area or population.

Within local and state health departments, surveillance staff examine how closely related different viruses are based on similarities between DNA sequence patterns. When combined with information on a person’s demographics, geographic location, and risk characteristics, this analysis can help describe likely transmission patterns between persons. This data is then anonymized and sent to the CDC for further analysis, where the de-identified data is aggregated and can be searched for genetic matches. Once the CDC has identified a cluster, a collection of five or more genetically linked cases diagnosed within a one-year period, the information is reported back to the health department that has jurisdiction over the majority of the related cases of the virus.

Analysis of these transmission networks can help guide HIV prevention efforts and optimize the allocation of resources by identifying persons at highest risk of being infected with HIV. Identifying active HIV transmission is key in HIV prevention and care efforts. It is important to identify growing clusters in order to interrupt transmission.

While there are clear public health benefits, the emergence of molecular surveillance has raised alarm within communities nationwide, particularly in those living in states with HIV criminality laws in place. HIV advocates have voiced concerns around potential breaches of privacy, discrimination, and the potential for MHS data to be used in criminal investigations. It is important to note that while MHS is used to identify transmission networks or clusters, this data cannot be used to accurately determine transmission directionality. Additionally, federal and state data privacy laws strictly limit the ability of health departments to release health data.

Local and state health departments have a key role to play in working with community partners to address concerns around MHS. Meaningful engagement with communities that are most at risk will help to assuage concerns and improve understanding between community and government. This guide
serves as a resource for health departments seeking to implement MHS and effectively communicate the usage of MHS data to community members and partners.

The following was informed by presentations and materials from three UCHAPS member organizations: New York City Department of Health and Mental Hygiene, Houston Health Department, and Maryland Department of Health.

**HOW NYC DEPARTMENT OF HEALTH AND MENTAL HYGIENE USES MHS FOR PREVENTION**

**STEP 1: Ensure that state law enables MHS data collection and analysis.**

- In 2005, New York State (NYS) mandated electronic reporting of viral load, CD4 values and genotypes.
- In 2010, NYS mandated proactive linkage to care for newly diagnosed persons and baseline lab tests that include genotype.
- Nucleotide sequence from genotypes ordered by NYC physicians is reported to surveillance. Nearly 58% of new cases are genotyped within 3 months of diagnosis.

**STEP 2: Implement point-of-diagnosis genotyping.**

- NYC recognized that the MHS process was too long to be of use for partner notification and linkage to care. They realized they could shorten the process using point-of-diagnosis genotyping.
- Now all HIV positive samples get sequenced at the clinic immediately upon diagnosis.
- NYC partnered with University of California San Diego for data analysis. UCSD analyzes sequences to determine the cluster of the newly diagnosed case.
- NYC’S Department of Health and Mental Hygiene (DOHMH) epidemiologist gives data on viremic (not virally suppressed) and out-of-care (OOC) cluster members to field service units (FSU).
- FSU offers testing to undiagnosed named partners, offers return to care to OOC cases, and adherence support to viremic in-care cases.

**STEP 3: Expand partner services to genetic partners.**

- All new diagnosed cases are offered an interview with partner notification and voluntary testing. However, named partners do not represent the patient’s entire network and only 59% of named partners end up having the same genotype as the patient.
• Expanding partner services to include genetic partners, in addition to named partners, can slow incidence rates.

STEP 4: Focus on HIV+ in Sexual Health Clinics.

• In 2016, through the Phylo Project, the NYC Public Health Laboratory built capacity to perform point-of-diagnosis genotyping at sexual health clinics (SHCs), which diagnose 250 cases per year.
• SHC cases are genotyped and clustered. OOC and viremic cluster members with 1-degree separation from index patient sent to FSU. FSU verifies care status.
• OOC cases are re-engaged in care. Reasons for OOC are addressed through referrals (housing, health insurance, substance use counseling, etc.).

STEP 5: Identify challenges to the process.

• Challenges to the above interventions included getting individuals to agree to be interviewed, to name partners, and to accept adherence support.

STEP 6: Triage cases or clusters by considering the following questions.

• What is the cluster’s growth trend?
• How many individuals in the cluster are viremic?
• How many acute infections are in the cluster?
• What are the risk factors and demographics of the cluster?
• What variables predict growth of this cluster?

STEP 7: Plan next stage of intervention.

• The next stage of the Phylo Project will focus on Hispanic and Latino men who have sex with men (MSM).

HOW MHS INFORMATION TRAVELS FROM THE HOUSTON HEALTH DEPARTMENT TO THE MEMBERS OF THE HOUSTON COMMUNITY

STEP 1: Clusters are prioritized based on CDC data.

• CDC sent lines of most concerning cases to 15 Health Departments in the United States, including the Houston Health Department (HHD).
• 16 clusters were identified in Texas, 9 of which are in Houston.
• HHD began to prioritize cluster members in order to organize care efforts.

STEP 2: Create an inventory of resources and cost estimates to carry out activities proposed.

• HHD and Texas Department of State Health Services coordinated efforts through bi-weekly calls.
STEP 3: Determine how molecular data will be used.

- Funding Opportunity Announcements (FOA) were released for analysis of data to identify which clusters will receive intervention.
- HHD attended consultation hosted by Third Coast Center for AIDS Research on use of molecular data and how it’s used.

STEP 4: Seek community input.

- HHD sought community input and support regarding the MHS grant application and the proposed MHS activities.

STEP 5: Pursue a funding opportunity.

- HHD received 17-1711, a three-year demonstration project beginning in 2017 that uses data to monitor health outcomes, identify active HIV transmission networks and implement HIV interventions, with a primary focus on clusters with Hispanic/Latino MSM.
- HIV sequence data must be reported for at least 20% of HIV diagnoses between 2013-2015.

STEP 7: Hold meetings with local stakeholders and partners.

- Local researchers from the University of Texas School of Public Health were gathered to discuss network analysis and genetic modeling techniques and answer questions.
- An invitation letter from the director of HHD was sent to the mayor of Houston to discuss Houston’s HIV epidemic and how local government representatives will take part in addressing the crisis.
- Key Meeting points:
  a. Discuss data that the grant opportunity harnesses.
  b. Outline what activities HHD plans to propose in response.
  c. Seek input and ideas from the organization.
  d. Request organizations support for application.

STEP 8: Create strategies to expand partnerships within and between health departments and community-based organizations.

- HHD partnered with agencies across Houston, including those with non-health missions, to improve messaging to Hispanic/Latino communities and collaborated with local researchers on
analysis techniques, visualization of data, and developing questions for enhanced partner services interviews.

**STEP 9: Identify clusters and risk networks.**
- MHS data and CDC tools were used to identify molecular clusters that include Hispanic/Latino MSM.
- Partner services data were used to access underlying transmission clusters and HIV risk networks.

**STEP 10: Identify social-structural factors for the target population.**
- HHD identified the factors which can negatively influence the likelihood of accessing prevention care services for Hispanic/Latino MSM such as fear of criminalization and the Immigration and Customs Enforcement (ICE).

**STEP 11: Develop an implementation and evaluation plan.**
- The strategy developed in Houston is known as PODER: Promotion of Data to Engage Latino MSM in the HIV Response.
- Key points in strategy:
  a. Link cluster data to STD surveillance and partner services data.
  b. Modernize and augment DIS interviews.
  c. Conduct linkage and re-linkage using service linkage workers.
  d. Utilize mobile unit to target venues for HIV testing.

**STEP 12: Create a community engagement plan.**
- In order to effectively implement the steps outlined in the PODER strategy, HHD worked to engage stakeholders through hosting meetings and gathering local community-based organizations and faith communities to increase community awareness of surveillance data, prevention services, PrEP, and mobile unit availability.

**STEP 13: Modernize Diagnostic Interview Schedule (DIS) and retrain staff**
- The interview protocol was updated to shift focus on PrEP and treatment as a prevention effort first and identify partners second.
- A standard operating procedure for cluster investigations was created for health department staff.
- Cultural competency trainings were provided for DIS, PrEP coordinators, and service linkage staff.

**STEP 14: Conduct linkage and utilize mobile units.**
- Mobile units for HIV testing were used to widen services and accessibility to
better reach the target population of Hispanic/Latino MSM and link them to care and services.

**STEP 15: Identify challenges.**

- Challenges for HHD included:
  - Lack of awareness among HIV workforce on surveillance in general
  - Lack of target audience knowledge of molecular surveillance
  - Political and social context for target population
  - Limited resources within partner services

**STEP 2: Discuss how molecular HIV surveillance is used to identify active HIV transmission and implement HIV interventions.**

- 17-1711, a three-year demonstration project from 2017-2020, provided funding to expand and enhance cluster activities and increase impact on HIV-related activities. Through this grant, MDPH was able to support in-depth analyses and assessments of cluster related factors and prevention services for Hispanic/Latino MSM in the state of Maryland.

**STEP 3: Prevention and Health Promotion Administration establishes a mission, vision and partnerships.**

- **Mission**: To protect, promote, and improve health and well-being of all Marylanders and their families through provision of public health leadership and through community-based public health efforts.
- **Vision**: A future in which all Marylanders and their families enjoy optimal health and well-being.
- Develop partnerships with local health departments, providers, community-based organizations, public and private sector agencies.
STEP 4: Create a cluster response team and establish protocol for cases, contacts and communities.

- MDPH’s cluster response included epidemiologists from HIV surveillance and STI programs as well as health services administrators from HIV Prevention Services.
- Cases are linked to care, undergo partner services interviews, and moved towards viral suppression.
- Contacts are screened for HIV, transmission patterns are identified, and are either linked to care or prescribed PrEP depending on status.
- Communities identify needed resources.

STEP 5: Arrange meetings to establish regional cooperation and identify action items.

- In order to coordinate local health departments, state health departments, and the CDC, weekly meetings were established to review cluster data. Lab results were shared with neighboring regions of Washington DC and Virginia.
- Sharing agreements were established with CDC for joint notification of clusters in the DMV region and to exchange complete case, laboratory, and partner data on cross-jurisdiction clusters.
- These partnerships were particularly important in order to maximize the limited funding resources available for MHS.

STEP 6: Enhance data management and analysis.

- MDPH tested multiple data software programs for optimal storage and analysis.
- A cluster network diagram was created to identify different transmission routes (MSM, MSM/IDU, IDU, HET) in specific areas.

For more information or to request technical assistance, please contact UCHAPS at 202-945-2060 or via email at info@uchaps.org.