PACHA Full Council meeting:
HIV Cluster Detection and Response
November 15, 2021
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What is Cluster Detection and Response?
Cluster detection and response offers a framework to guide tailored implementation of proven HIV prevention strategies where transmission is occurring most rapidly.
Why is Responding to Clusters Important?

Standard Treatment & Prevention Services

Tailored Interventions & Specialized Care

Cluster Detection and Response
HIV Is Transmitted Through Networks

Transmission is not uniform

Identify networks in which HIV is spreading quickly

Help people get into care and prevent HIV
Networks Include People With and Without HIV

- Diagnosed
- Undiagnosed
- At risk
Response Activities Should be Tailored to Networks Experiencing Rapid Transmission

- Cluster detection and response goes beyond identifying subpopulations with high numbers of diagnoses
  - Even within priority populations, transmission is not uniform
  - Groups experiencing rapid transmission change over time and show substantial geographic variation
- Identifying networks not reached by existing services presents an opportunity to improve health equity

Oster AM et al. Viruses 2021
How Are Clusters Detected?
Cluster and outbreak detection

Providers and community

Surveillance: Molecular data

Surveillance: HIV diagnoses

Partner services

Molecular analysis

Time-space analysis
Molecular Cluster Detection
Identifying Rapid HIV Transmission

HIV brings extra challenges

- Delayed diagnosis
- Population mobility
- High-burden areas

Traditional epidemiology

Dailey AF et al. MMWR Wkly 2017
Molecular Outbreak Detection Is Longstanding

Averts 250,000 illnesses from Salmonella annually

> 75% of TB outbreaks first identified using molecular data
Mindra G et al. Pub Health Rep 2017
HIV Molecular Data Usually Come from Drug Resistance Testing

- Standard part of clinical care in many developed nations
- Public health agencies can conduct secondary data analysis

http://www.aidsinfo.nih.gov/ContentFiles/AdultandAdolescentGL.pdf
How is molecular data collected by the National HIV Surveillance System?

1. **Persons with HIV**
   - Provider orders HIV drug resistance (genotypic) testing

2. **Laboratory performs genotypic testing**
   - Specimen sent to laboratory
   - Resistance report sent to provider
   - Specimen prepared
   - Genetic sequence generated and compared with reference
   - Mutations identified and resistance interpreted

3. **HIV sequence reported electronically to health department**
   - State and local HDs
   - Specimen sent to laboratory
   - HIV prevention interventions
   - Cluster detection

4. **Mandated by state and local reporting laws**
   - Covered by consent to medical care
Clusters and Outbreaks Affect Many Different Populations

- Outbreaks among people who inject drugs have been highly visible in recent years.

- Sexual transmission is the mode of HIV transmission for >75% of people in molecular clusters of rapid transmission.

- Using diverse methods to identify clusters is important to improve services for all populations experiencing rapid transmission.

Oster AM et al. Viruses 2021
HIV Transmission Rate in the United States

4 transmissions per 100 people living with HIV per year

Holtgrave DR et al. Open AIDS J 2012
HIV Transmission Rate in First 60 Priority Molecular Clusters

44 transmissions per year per 100 persons living with HIV

France AM et al. CROI 2018
HIV Transmission Rate in Some Clusters Is Even Higher

134 transmissions per year per 100 persons living with HIV

McClung RP et al. CROI 2021
Molecular Analysis Detects Clusters That Would Otherwise Be Missed

- None of the first 60 molecular clusters recognized through epidemiologic methods alone
- Rapid transmission can be hard to detect without sequence data
- Since December 2015, molecular analysis has identified nearly 300 clusters of rapid transmission
Core Strategies for Cluster Detection and Response
### Core Cluster Detection and Response Strategies

#### Fundamental Building Blocks

- Internal partnerships
- External partnerships and community engagement
- High-quality, timely data
- Data integration
- Flexible funding

- Investigate and Intervene in Networks
  - Understand networks
  - Support linkage to and retention in critical services

- Identify and Address Gaps in Programs and Services
  - Identify and swiftly address gaps revealed
  - Use cluster information to guide future activities
Community Engagement is Essential
Involving Communities Is Essential and Can Help to Address Stigma

- Involving local community members and organizations in planning, implementing, and evaluating response activities can strengthen the delivered interventions
  - Can help design messaging and materials to avoid further stigmatizing affected communities and deliver services effectively
Fundamental Building Blocks: Example of Community Partnerships

Molecular Cluster in Texas

- Providers, community members, and HD staff established an alliance
- The alliance’s efforts led to:
  - A quadrupling of HIV testing
  - Accelerated linkage to care
  - Activities to reduce stigma

Pack et al. Natl HIV Prev Conf 2019
HIV Criminalization

- CDC provides guidance to states on reviewing and revising criminalization laws and ensuring strong data protections
- January 2021: CDC leadership published commentary in *Lancet HIV* encouraging states to align their HIV criminalization laws with the science and/or revise the application of these laws for the sake of people with HIV and for the public’s health

U.S. HIV Public Health Data Are Strictly Protected

No known instances of molecular data from surveillance being used in a court case
# Core Cluster Detection and Response Strategies

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Massachusetts Outbreak Response

• Qualitative interviews conducted with people who inject drugs, providers, and other stakeholders
• Identified challenges in accessibility of HIV treatment and syringe services programs
• Led to rapidly service expansion in the response with later expansion statewide

Cranston et al. MMWR 2019; Alpren et al. AJPH 2020
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Minneapolis Outbreak Response

- Moved from clinic-based PrEP model to a street-based PrEP model
- Integrated HIV prevention and care services into culturally competent clinics focused on tribal communities

Response Outcomes

- Reduced diagnoses or transmission, or a lack of new linked cases
- Improved HIV testing and diagnosis
- Improved viral suppression, or improved linkage to and retention in HIV care
- Improved PrEP uptake or SSP utilization
- Improved prevention and care for other conditions, such as hepatitis A vaccination, hepatitis C treatment, improved opioid use disorder treatment, prevention of endocarditis

Diagnose all people with HIV as early as possible.

Treat people with HIV rapidly and effectively to reach sustained viral suppression.

Prevent new HIV transmissions by using proven interventions, including pre-exposure prophylaxis (PrEP) and syringe services programs (SSPs).

Respond quickly to potential HIV outbreaks to get needed prevention and treatment services to people who need them.

Ending the HIV Epidemic: Response Guides Other Strategies

www.HIV.gov
A Variety of Resources Can Be Used to Support Response

- Integrated HIV Surveillance and Prevention Programs for Health Departments
  - Supports core activities cluster detection and response, including developing cluster and outbreak detection and response plans

- Ending the HIV Epidemic Initiative
  - Provides funding to further develop fundamental building blocks, investigate and intervene in networks, and identify and address gaps in programs and services

- CDC directly funded health departments and CBOs can receive capacity-building assistance for cluster detection and response planning and response-related activities
Cluster and Outbreak Response Can Help Bring the Nation Closer to Ending the HIV Epidemic

- Cluster and outbreak detection allow us to identify when HIV is spreading quickly.
- A cluster or outbreak is a failure of our care and prevention services that needs to be addressed to improve access to services and stop transmission.
- Cluster and outbreak response involves curating care and prevention services to be more accessible to the people who need them most.
For more information, contact CDC
1-800-CDC-INFO (232-4636)

www.cdc.gov/hivcluster

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.