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Multipronged Approach to Controlling a Tuberculosis Outbreak Among Persons Experiencing Homelessness

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Abstract

In May 2009, the Marion County Public Health Department in Indiana declared a tuberculosis (TB) outbreak among persons experiencing homelessness in Marion County, began active case finding to detect additional cases, and formed a TB outbreak response team to plan and coordinate outbreak activities. Outbreak-associated cases had 1 of 2 outbreak genotypes and either reported experiencing homelessness themselves or had an epidemiologic link to a shelter or a person experiencing homelessness. The last of 53 outbreak-associated cases was detected in 2019 after more than 2 years without a case. The Marion County Public Health Department continues to address TB-related issues and implement prevention measures at homeless shelters and among persons experiencing homelessness in 2019. This example, in addition to other published guidance, can be used by jurisdictions to plan and implement their own TB outbreak prevention and response activities among persons experiencing homelessness.

Keywords

homelessness; outbreak; partnership; tuberculosis

Background

Tuberculosis disproportionately affects persons experiencing homelessness, with approximately 5% of TB cases reported among persons experiencing homelessness in the year prior to diagnosis. In contrast, approximately 1% of persons in the United States report experiencing homelessness in a given year.¹

On March 1, 2009, the Marion County Public Health Department (MCPHD) in Indiana diagnosed tuberculosis (TB) in a person experiencing homelessness. At the time of diagnosis, the patient resided at a local shelter. After careful case reviews using TB genotyping and epidemiologic investigation methods, the MCPHD identified 8 additional cases with the same genotype that occurred among current or former shelter residents during January 2008 to June 2009. In May 2009, the MCPHD declared a TB outbreak among persons experiencing homelessness in Marion County. During the enhanced outbreak mitigation phase, a second outbreak genotype was identified among persons experiencing homelessness in Marion County.

Outbreaks of TB among persons experiencing homelessness present multiple challenges for prevention and control.^{2–4} Persons experiencing homelessness often have medical and social risk factors that can accelerate the disease course, make treatment challenging, and limit their access to health care services.^{2,5–7} They may move frequently and use pseudonyms, making it challenging for public health workers to locate them for diagnostic evaluations and provide months of directly observed TB treatment, the standard of care in the United States. Since TB disease can be prevented through treating persons with latent TB infection (LTBI),^{8,9} asymptomatic infection with *Mycobacterium tuberculosis*, coordinated efforts among the many agencies serving persons experiencing homelessness give public health the best chance to locate at-risk people promptly, prevent and cure TB disease, and stop outbreaks.¹⁰ To address this growing outbreak and the many inherent challenges, the

MCPHD implemented a multipronged approach involving a diverse array of teams and strategies (Table).

Methods

Genotyping and case definitions

Since 2009, the Centers for Disease Control and Prevention has offered genotyping of at least 1 isolate for every culture-confirmed TB case in the United States using 2 standard methods: spacer oligonucleotide typing (spoligotyping) and 24-locus mycobacterial interspersed repetitive units variable-number tandem repeat (MIRU-VNTR).¹¹ Outbreak-associated cases were reported in Marion County, had 1 of 2 outbreak genotypes as defined by spoligotyping and MIRU-VNTR (or a single locus variant of an outbreak genotype), and either reported experiencing homelessness or had a direct link to a shelter or a person experiencing homelessness.

TB outbreak response team

The MCPHD established the tuberculosis outbreak response team in October of 2009, 7 months after the first outbreak-associated case was detected. Participants included the county TB program coordinator, TB medical director, epidemiologists, lab coordinator, nurse case manager, county jail nurse, community health workers, directors of the 3 homeless shelters that were identified as sites of transmission, social workers, a nonprofit homeless outreach organization, and the Indiana State TB Control Program. During the twice monthly meetings, the team discussed the status of each TB case and identified solutions to overcome the challenges of outbreak control.

Cluster-buster meetings

Because patients were often unable to name close contacts due to frequent use of pseudonyms, district health offices relied on identifying common gathering places to find and evaluate contacts. The MCPHD began holding twice monthly meetings for public health nurses and community health workers from the 4 district offices to discuss locations frequented by affected patients. Using shared information, public health nurses prepared specific questions to ask their patients. As a result, several new sites of possible transmission were identified and visited for targeted testing.

Targeted testing events

To expedite testing for TB infection among persons experiencing homelessness, the MCPHD conducted 2 large targeted testing events in the summer of 2009, using interferon-gamma release assays, which require only 1 visit for testing and interpretation compared with 2 visits with the TB skin test. One-step testing is particularly useful when there is increased concern for loss-to-follow up among patients. Among 507 persons tested at 1 homeless shelter, 89 (18%) tested positive for TB infection, compared with a TB infection rate of 2.8% nationally among US-born persons.¹² The MCPHD began participating in annual homeless shelter health fairs and offered free interferon-gamma release assay and HIV testing with incentives provided for obtaining test results, clinical evaluations, and treatment when indicated. The MCPHD also provided weekly interferon-gamma release

assay testing at shelters, offering incentives, such as additional nights at a shelter, for completing testing.

Letters of understanding

To overcome the challenge of identifying contacts to infectious patients, the MCPHD worked with legal advisors and community agencies to develop letters of understanding. The letters of understanding allowed the MCPHD to share names of missing or lost contacts with agencies that agreed to adhere to confidentiality laws, including 3 prominent homeless shelters, a nonprofit agency serving the homeless, and other social service programs, community health centers, and hospitals. The MCPHD was contacted if any listed persons presented to any of the collaborating agencies.

Infection control in homeless shelters

The MCPHD worked with shelter staff to implement infection control measures, which included implementing tracking sheets to detect persons who were coughing. In addition, the MCPHD staff posted TB education materials, provided masks to shelter residents, installed UV lighting and high efficiency particulate air filters, and created an isolation room to house symptomatic patients until TB disease had been excluded. The MCPHD began twice weekly testing for LTBI; residents who tested negative were given a card for 6 months of shelter admittance. Those with positive tests were referred for chest radiography, clinical evaluation, and treatment for LTBI or TB disease. To maximize adherence with LTBI treatment, health care providers used short-course LTBI treatment regimens whenever possible. Patients with TB disease were provided a hotel room for the duration of their treatment.

Results

During 2008–2019, 53 outbreak-associated cases were diagnosed; 37 were associated with the first outbreak genotype and 16 with the second identified outbreak genotype. All cases were in persons experiencing homelessness or with a direct link to a shelter or a person experiencing homelessness; 42 cases were in persons who reported homelessness in the year prior to diagnosis and had stayed at 1 of 2 local shelters, 10 were in persons who spent time with others who experienced homelessness while contagious, and 1 person ate meals from the primary affected shelter. Among outbreak-associated patients, 51 (96%) were born in the United States, 49 (92%) were males, 34 (64%) black, 17 white (32%), and 2 (4%) Hispanic. The height of the outbreak was in 2009 with 12 cases; the number of cases fluctuated until 2012 and then declined steadily until 2016 (see Supplemental Digital Content Figure, available at <http://links.lww.com/JPHMP/A677>). The last outbreak-associated case during the study time frame was reported on October 17, 2019. This was the first outbreak-associated case in 3 years and was in a person who reported experiencing homelessness in 2007 and leaving Indiana soon after. Screening continues for those requesting admission to homeless shelters; testing is also offered twice weekly at the primary shelter and additional cases may be identified in the future. Strong infection control policies and procedures at shelters help prevent future cases of TB disease by quickly detecting clients with LTBI and offering LTBI treatment. Tuberculosis outbreak response team meetings no longer occur

regularly, but members represent a strong and functional collaborative group of partners that can quickly scale up the response should another outbreak occur.

Discussion and Conclusion

In this article, we detail how a county health department in an urban area effectively controlled an extensive TB outbreak among persons experiencing homelessness by building and maintaining relationships with patients, partners, and the community, and implementing regular screening and testing for TB, standard infection control measures, and treatment strategies that worked for patients. While all activities may not be necessary in the absence of an outbreak, many are part of a comprehensive approach to infection control and TB prevention in a high-risk setting. These long-term activities include regular TB testing for shelter residents, coordination meetings of all service providers for persons experiencing homelessness, and infection control practices at shelters. Shorter-course regimens for TB infection, such as 3 months of once weekly rifapentine plus isoniazid, may also be a useful tool for clinicians and public health departments to implement when treating infected persons who are experiencing homelessness.¹³ This regimen has been shown to be as effective as 9 months of daily isoniazid with better treatment completion and less adverse effects.⁹ Other jurisdictions can use this successful example to inform their TB outbreak prevention and response activities in addition to following published guidance.¹⁴

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Implications for Policy & Practice

- Congregate settings increase the risk of a TB outbreak; persons experiencing homelessness are more at risk for TB than the general US-born population and are disproportionately involved in TB outbreaks.
- TB outbreaks associated with homeless shelters have been associated with poor infection control practices and lack of coordinated approaches.
- Preventing and stopping outbreaks among persons experiencing homelessness require a comprehensive and coordinated approach among many stakeholders and service providers.
- Effective interventions focus on screening, early case finding, effective treatment, and thorough contact investigations.

Table.

Interventions implemented as part of a tuberculosis outbreak response, Marion County, Indiana, 2008–2016.

Intervention	Date Initiated	Date Ended	Responsible Party	Challenges
Annual health fairs with free TB testing	July 2009	Ongoing	MCPHD	Multi-agency coordination
TB Outbreak Response Team Meetings	Oct 2009	Oct 2017	MCPHD	Multi-agency coordination
Incentives for testing and treatment completion	Sept 2009	Ongoing with modifications	MCPHD	Lack of funding for sustained cash incentives, created unrealistic long-term expectation
Cough logs	Feb 2010	Modified by shelters	Shelter staff	Education needed
Masks for shelter residents	Feb 2010	Modified by shelters	Shelter staff	Education needed
Letters of Understanding	Feb 2010	Ongoing as needed	MCPHD	Legal document
Green card for shelter admission – requires negative TB test within 6 months	April 2010	Ongoing	MCPHD and shelter staff	Creates barrier to some clients staying at shelter
Cluster Buster Meetings	June 2010	Tapered off with declining case count	MCPHD	Schedule coordination
Twice weekly TB testing at shelters	Sept 2010	Ongoing	MCPHD and shelter staff	Set up of testing services and coordination
HEPA filters and UV lighting at shelter with maintenance	Sept 2010	Ongoing	MCPHD and shelter leadership	Obtaining funding installation and long-term maintenance
Isolation rooms for shelter residents with suspected TB disease	Ongoing	Ongoing	Shelter leadership	Limited space in shelters for an appropriate isolation room
Offer social services to assist with housing, food, transportation, substance abuse, and mental health complications	Ongoing	Ongoing as needed	MCPHD	Coordination between multiple agencies

Abbreviations: HEPA, high efficiency particular air; MCPHD, Marion County Public Health Department; TB, tuberculosis.