MANAGEMENT OF TB IN THE HOMELESS: CDC’S EXPERIENCE WITH OUTBREAKS

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Background

- 1% of the U.S. population experiences homelessness in a given year

- Well-established association between TB and the homeless
CDC Experience: TB Outbreaks and Homelessness

- 72% of domestic TB outbreaks investigated by CDC in 2002–2010 involved homelessness
  - In one outbreak, all 31 cases in a 2-year period were linked to a single homeless shelter

- Factors promoting TB transmission among persons experiencing homelessness
  - Vulnerable persons in crowded congregate settings
  - Name-based contact investigations of limited utility
  - Timely diagnosis and treatment completion challenging

  - SatScan-based, 3 overlapping 3-year periods, clusters (n ≥ 2), where clusters indicate recent transmission
  - 11.2% of homeless persons with TB in clusters
  - Homeless persons with TB more likely in clusters: OR = 2.4 (Adjusted OR = 1.4)
  - Substance users with TB more likely in clusters: OR = 2.3 (Adjusted OR = .4)

ACET Recommendations to Prevent and Control TB among the Homeless

- Advisory Council on the Elimination of Tuberculosis (ACET) published recommendations in 1992 addressing TB in homeless populations:
  - TB case finding and treatment completion
  - LTBI screening and treatment if HIV infection or other medical condition that increases TB risk
  - Examine (and potentially retreat) inadequately treated recent TB disease and infection
  - Contact investigation, including screenings at shelters

EPIDEMIOLOGY OF TB IN PERSONS EXPERIENCING HOMELESSNESS
Surveillance* Definition of Homelessness

- Homeless variable added in 1993
- At any time during the 12 months before the TB diagnostic evaluation
- One of the following
  - No fixed, regular, and adequate nighttime residence
  - Primary nighttime residence was
    - Publicly or privately operated shelter
    - Institution that provides temporary residence
    - Building not designated for, or ordinarily used as, regular sleeping accommodation for human beings
  - Alternating between multiple residences

* Definition of homelessness in the Report of Verified Case of TB (RVCT)
TB Cases Reported as Homeless in the 12 Months Prior to Diagnosis, Age ≥15, United States, 1993-2011*

*Updated as of June 25, 2012
Note: Homeless within past 12 months of TB diagnosis
TB Incidence

- **U.S. TB incidence rate**
  - 2007 (Jan 1 – Dec 30, 2007) 4.4 per 100,000
  - 2008 (Jan 1 – Dec 30, 2008) 4.2 per 100,000
  - 2009 (Jan 1 – Dec 30, 2009) 3.8 per 100,000

- **TB incidence rate in the homeless**
  - 2007 (Oct 1, 2006–Sept 30, 2007) 46 per 100,000
  - 2008 (Oct 1, 2007–Sept 30, 2008) 45 per 100,000
  - 2009 (Oct 1, 2008–Sept 30, 2009) 40 per 100,000
  - Over 3 years 44 per 100,000

Source: National TB Surveillance System, CDC

- 1994–1997: 41% HIV-infected among those tested
- 1998–2001: 29% HIV-infected among those tested
- 2002–2005: 26% HIV-infected among those tested
- 2006–2009: 25% HIV-infected among those tested

*Excluding CA, RI, VT
## Substance Use among Homeless Persons with TB — United States, 1994–2009

<table>
<thead>
<tr>
<th>Substance used in past year</th>
<th>Homeless N=15,919</th>
<th>Non-Homeless N=242,084</th>
<th>Prevalence Odds Ratio (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>(%)</td>
<td>n</td>
</tr>
<tr>
<td>Excess alcohol</td>
<td>8,444</td>
<td>(53)</td>
<td>27,543</td>
</tr>
<tr>
<td>Non-injection drug</td>
<td>4,941</td>
<td>(35)</td>
<td>13,067</td>
</tr>
<tr>
<td>Injection drug</td>
<td>2,038</td>
<td>(14)</td>
<td>4,358</td>
</tr>
<tr>
<td>Any of the above substances</td>
<td>10,308</td>
<td>(65)</td>
<td>34,470</td>
</tr>
</tbody>
</table>

Source: National TB Surveillance System, CDC
### Incarceration by Housing Status in Persons with TB — United States, 1994–2009

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Homeless N=15,919</th>
<th>Non-Homeless N=242,084</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>n</td>
</tr>
<tr>
<td>Correctional institution at time of diagnosis</td>
<td>1,430 (9)</td>
<td>7,655 (3)</td>
</tr>
<tr>
<td>Type of correctional institution</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Local Jail</td>
<td>1,146 (80)</td>
<td>3,721 (49)</td>
</tr>
<tr>
<td>State prison</td>
<td>142 (10)</td>
<td>2,481 (32)</td>
</tr>
<tr>
<td>Federal prison</td>
<td>41 (3)</td>
<td>537 (7)</td>
</tr>
</tbody>
</table>

Note: p values <0.01 for all comparisons listed

Source: National TB Surveillance System, CDC

Source: National TB Surveillance System, CDC
# TB Treatment Outcomes* by Housing Status — United States, 1994–2007

<table>
<thead>
<tr>
<th>Outcome</th>
<th>Homeless N=14,005</th>
<th></th>
<th>Non-Homeless N=209,593</th>
<th></th>
<th>Prevalence Odds Ratio (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>(%)</td>
<td>n</td>
<td>(%)</td>
<td></td>
</tr>
<tr>
<td>Completed</td>
<td>11,087</td>
<td>(79)</td>
<td>178,202</td>
<td>(85)</td>
<td>0.5 (0.47–0.53)</td>
</tr>
<tr>
<td>Died during treatment</td>
<td>1,246</td>
<td>(8.8)</td>
<td>17,951</td>
<td>(8.5)</td>
<td>1.0 (0.98–1.1)</td>
</tr>
<tr>
<td>Moved</td>
<td>568</td>
<td>(4)</td>
<td>6,384</td>
<td>(3)</td>
<td>1.4 (1.2–1.5)</td>
</tr>
<tr>
<td>Lost</td>
<td>933</td>
<td>(7)</td>
<td>4,570</td>
<td>(2)</td>
<td>3.2 (3.0–3.4)</td>
</tr>
<tr>
<td>Refused</td>
<td>100</td>
<td>(0.7)</td>
<td>476</td>
<td>(0.7)</td>
<td>1.1 (0.9–1.3)</td>
</tr>
</tbody>
</table>

*Outcome defined only for those who initiated therapy (excluding dead at diagnosis).
CDC EXPERIENCE DURING OUTBREAK INVESTIGATIONS
TB Outbreaks

- U.S. TB outbreaks typically involve U.S.-born persons with multiple social risk factors for TB*
  - Overwhelming even to well-resourced programs

- TB partners can ask CDC for assistance with outbreaks exceeding local surge capacity

- Cutbacks expected to exacerbate difficulties detecting and responding to outbreaks

Examples of Recent Investigations

- Drug-resistant outbreak at urban shelter
- Outbreaks associated with shelter & jail
- Outbreak at an assisted living facility for adults with mental illness
  - Resident population frequented homeless shelters
- Outbreak among homeless in a suburban community of <100,000 total persons
- Outbreaks among homeless involving multiple homeless service centers
  - Thousands of persons exposed at a service center to an infectious case during each outbreak
Common Themes

- U.S.-born, men, & substance use common
- Prolonged infectious periods due to diagnostic delays
- Challenging to identify & locate contacts for evaluation
  - Transient population, aliases common
  - Substance use, mental illness as barriers to care
  - Mistrust of authorities, reluctance to access care
- Timely diagnosis & treatment of LTBI difficult
- Drug use-sites & jails were frequent transmission sites
Findings Suggesting Transmission in Shelters

- Patient utilized services (e.g., overnight or daytime) at a shelter during infectious period or was exposed to another contagious patient who utilized services
  - Might involve patients without an overnight stay

- Multiple cases with matching genotype patterns among persons with shared history of shelter use

- In one outbreak, patient played cards with clients at shelter, but did not utilize shelter services
  - Might involve patients who never used shelter services
CDC Experience with On-site Case Finding

- On-site case finding utilized as a supplement to traditional name-based contact investigations

- Examples from two investigations in 2009

<table>
<thead>
<tr>
<th>Setting</th>
<th>Average nightly census (persons)</th>
<th>Population’s housing status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban emergency overnight shelter</td>
<td>400–600</td>
<td>Homeless</td>
</tr>
<tr>
<td>Assisted living facility for adults with mental illness</td>
<td>80</td>
<td>Intermittent housed at facility but frequently stayed in homeless shelters</td>
</tr>
</tbody>
</table>
CDC Experience with On-site Case Finding

- Offered all staff and clients onsite services for TB evaluation, including TB symptom screening, chest radiography, clinician assessment, & TB skin test or blood test
  - Referrals for inpatient care (respiratory isolation) at discretion of onsite clinician based on symptoms, medical history (e.g., HIV)

- Results of on-site case finding

<table>
<thead>
<tr>
<th>Number</th>
<th>Shelter</th>
<th>Facility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participants</td>
<td>311</td>
<td>74</td>
</tr>
<tr>
<td>Diagnosed with latent TB infection</td>
<td>117 (38%)</td>
<td>66 (89%)</td>
</tr>
<tr>
<td>Diagnosed with active TB disease</td>
<td>5 (2%)</td>
<td>0</td>
</tr>
</tbody>
</table>
CDC Experience with On-site Case Finding

- **Required buy-in of shelter staff**
  - Impact on delivery of shelter services
  - Security concerns

- **Atypical work hours**
  - Some shelters have daytime lockout, so on-site activities in early morning or late evening
  - Overtime, special approvals for work hours

- **Incentives, education, & visible shelter staff participation to encourage participation of shelter clients**

- **Protection of health department staff**
  - Infection controls, environmental safety (e.g., extreme temps)
CDC Experience with On-site Case Finding

- When possible, identified exposed cohort to target for active case-finding
  - Bed maps, dates of stay, shelter staff
  - Can require complex data management with close cooperation of shelter

- Maintain confidentiality

- Opportunity to evaluate for multiple health conditions in population with barriers to health care
  - Assess for multiple conditions (e.g., diabetes)
  - Offer vaccinations (e.g., during flu season)
  - In one outbreak where HIV prevalence was high and a syphilis outbreak had occurred, testing for HIV and syphilis were offered
CDC Experience with On-site Case Finding

- Has worked best when all services offered onsite
  - Symptom screening
  - Test for TB infection
  - Chest radiography with “wet reads”
  - Sputum collection
  - Clinician available onsite
  - Hospitals aware of activities

- IGRA versus TST
  - Advantages of IGRA: second visit not required for result, test for multiple conditions using single venous puncture
  - Disadvantages: of IGRA: costs, laboratory capacity, need for phlebotomists, influence of environmental conditions (e.g., extreme cold temperatures in one outbreak)
Other Examples of Interventions

- **Housing first programs:** an immediate and primary focus on helping individuals and families quickly access and sustain permanent housing.

- **Housing first programs have demonstrated**
  - Improved HIV treatment adherence
  - Improved overall health outcomes
  - Cost savings
  - Improved patient experience

- **Supportive housing during TB treatment**
  - Provides curative treatment to patient, removes infectious case from congregate setting → interrupts TB transmission
  - Reduces the effect of unstable housing as a barrier to adherence
Other Examples of Interventions

- Administrative infection controls in congregate settings
  - Mandatory skin testing for clients
  - TB screening upon intake
  - Cough monitoring by staff

- Case management to address multiple comorbid conditions
  - Mental illness, substance abuse, chronic disease (e.g., cancer, diabetes)

- Bringing treatment to the patient (i.e., directly observed therapy for TB or LTBI at a shelter or homeless service center)
Other Examples of Interventions

- Providing incentives (e.g., public transportation tokens) to complete evaluation & treatment
- Testing for multiple conditions that affect population
  - HIV infection
  - Sexually transmitted infections
  - Diabetes
- Using blood test for TB infection rather than skin test
  - Test for multiple conditions
  - Single clinical encounter
  - Perhaps less stigmatizing (test result not visible)
WHAT WILL PREVENT A FUTURE OUTBREAK?
Setting up Administrative Controls at Shelter

- Mandatory TB screening at all shelters within the community
  - Within days of access to services
  - Using referral system with TB program, health department, or health clinic serving homeless persons
- Other administrative controls
  - Separating patients with symptoms until evaluation is complete
  - Cough monitor (requires training)
  - Attendance logs & bed maps
  - Symptom screening upon intake (requires training)
  - Establishing timely referral procedures
  - Routine screening for TB for clients & staff
Engaging Other Homeless Agencies

- **Health Care for the Homeless (HCH) Grantees**
  - There are currently >180 clinics or community health centers that provide health care for this population
  - Many have mobile and street clinic components
  - HCH grantees have established rapport and trust with this population
  - HCH providers conduct TB screening activities to provide clearance to enter programs

- **Shelter directors**
  - Often know about social networks by the relative increase in interaction with their clients
LTBI Treatment

- Persons experiencing homelessness have increased TB risk and should be screened as part of targeted testing programs.
- Contacts in an outbreak are at even higher risk.
- LTBI completion rates are low in this population. Improve with TB education and use of incentives.
- Some protection has been shown in those that even begin (but may not complete) LTBI treatment.

Sources: Anger H, Proops D, Harris T, et al. Active Case Finding and Prevention of Tuberculosis Among a Cohort of Contacts Exposed to Infectious Tuberculosis Cases in New York City Clinical Infectious Diseases 2012;54(9):1287–95
Conclusions

- TB disproportionately affects homeless persons
  - 10-fold higher TB incidence rate
- Decline of TB occurring among homeless persons mirrors decline in the United States
- Foreign-born comprise 20% of homeless TB patients
  - Predominantly Hispanic
  - Their characteristics more similar to U.S.-born homeless than to other foreign-born with TB
Conclusions

- Persons who are homeless have a high prevalence of conditions that increase TB risk
  - Both for TB infection and TB disease
  - Vulnerable populations in congregate settings → potential for explosive transmission of TB
  - Population often lacks ready access to medical care

- Homeless persons with TB have a higher prevalence of HIV infection, previous TB, and more advanced disease

- Genotyping shows that homeless persons with TB are more likely to be in clusters and those clusters are more likely to grow
Conclusions

- Although homelessness is associated with 6% of TB cases, homelessness is a common feature of outbreaks where CDC is asked to provide assistance.

- Interventions to interrupt transmission among homeless populations often require alternative methods:
  - Often resource-intensive, difficult to sustain.
What is being done at the national level?

- **Multiple agencies & non-governmental organizations addressing homelessness & needs of the homeless**
  - Includes agencies outside of CDC & HHS

- **Effective TB control strategies should integrate interventions that address other health problems**
  - Will require collaboration across agencies & organizations
  - CDC’s Division of TB Elimination is exploring CDC’s role
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