

STUDENT VERSION

*Cases in Population-Oriented  
Prevention  
(C-POP)*

**Outbreak of Tuberculosis  
in a Homeless Men's Shelter**

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Abstract:

Tuberculosis presents a significant public health challenge. In this teaching case, medical students are given information about four cases of active tuberculosis that occurred over a short period of time in residents of a homeless men's shelter. The students then walk through the steps that a local health department takes to identify and screen those individuals at risk for transmission of tuberculosis during an outbreak. During this process, they learn skills in epidemiology (such as defining "epidemic" and distinguishing uses for incidence and prevalence) as well as in population-based prevention of tuberculosis. Finally students discuss health policy as it relates to the control and prevention of tuberculosis.

**Recommended Reading:**

- Chapter in an epidemiology text that addresses measuring disease occurrence
- Small PM, Fujiwara PI. Medical Progress: Management of Tuberculosis in the United States. *N Engl J Med.* 2001;345 (3); 189-200

**Objectives: At the end of the case, the student will be able to:**

- Apply the agent/host/environment model in understanding disease causation;
- Define epidemic;
- Identify common factors in incident cases;
- Identify risk factors for tuberculosis, including TB/HIV connection;
- Evaluate methods for population-based prevention, including contact investigations/other interventions (legal);
- Develop skills in outreach follow-up in a hard-to-reach group; and
- Formulate public health policies regarding tuberculosis.



## Section B: Investigation of an Outbreak

In Section A, you were asked whether this was an epidemic. In order to determine if this occurrence was markedly different from baseline, you need to know what the incidence of active TB is in your county. Characteristics of the four patients described in Section A are presented below.

**Table 1: Characteristics Of The Four Men Diagnosed With Active Tuberculosis.**

| <u>Case</u> | <u>TST*</u> | <u>Chest X-Ray</u>                     | <u>HIV status</u> | <u>Alcohol Use</u> | <u>Substance Abuse</u> |
|-------------|-------------|--|-------------------|--------------------|------------------------|
| 1           | 0x0         | Left upper lobe infiltrate             | Positive          | Past Hx**          | Past Hx                |
| 2           | 0x0         | Right middle lobe opacity              | Positive          | Yes                | Yes                    |
| 3           | 0x0         | Left lower lobe opacity                | Positive          | Yes                | Yes                    |
| 4           | 15x22       | Severe bilateral disease with cavities | Negative          | Past Hx            | Past Hx                |

\*TST= Tuberculin skin test

\*\*Hx= History

### Questions:

- 1. “Incidence” and “prevalence” are measures of disease occurrence. Which would you use to measure active TB? Which would you use to measure latent tuberculosis infection (LTBI)? Why?**
- 2. What common factors are evident here?**
- 3. Three of the cases had negative tuberculin skin tests (TSTs). What are some of the limitations of using TSTs?**



- 8. Because active tuberculosis is recognized, contact investigations are initiated immediately.**
- A. Why?**
- B. Who is the target population (Oxford Street Inn v. all homeless shelters v. community at large)?**
- C. What method of screening would you recommend (TST, clinical assessment and/or chest x-ray)?**

Staff at the County Health Department (CHD) and Oxford Street Inn were able to compile a master list of individuals who were at risk for tuberculosis infection based on dates of possible exposure (January to September 1997). There were 312 individuals determined to be at risk, including staff at the shelter. The list of individuals at risk consisted almost exclusively of other homeless men who stayed at the shelters during this time period.

**Questions:**

- 9. What factors need to be taken into account when considering contact investigations in this target population?**
- 10. What strategies would you recommend to locate the persons identified as being at risk?**

The staff at both the Oxford Inn and at the CHD worked diligently to identify and locate these individuals. Based on knowledge of the individuals, men were classified by the ease at which they could be located and assessed for intervention. Results of the staff's efforts are shown below.

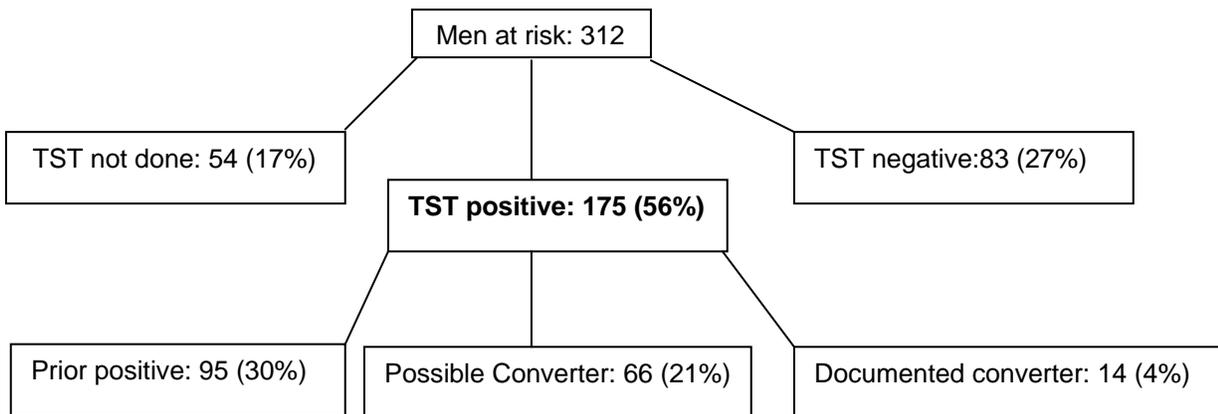
Table 2: Classification of Homeless Men Based On Accessibility:  
**Oxford Inn Outbreak, Syracuse NY, 1997**

| Patient Category | Accessibility  | Number (Percentage) of Individuals |
|------------------|----------------|------------------------------------|
| A                | Medium to high | 87 (28%)                           |
| B                | Low            | 78 (25%)                           |
| C                | Very Low       | 147 (47%)                          |
| Total (A+B+C)    |                | 312 (100%)                         |

**SCREENING:**

All individuals who were determined to be at risk for tuberculosis were offered screening including an initial TST, three month follow-up TST for those with an initial negative TST, chest x-ray, and clinical assessment. Not all men were found, nor did all comply with recommendations. Results of the screening effort are shown below.

**Figure 1. Results of Screening TST Results: The Oxford Street Inn Outbreak, Syracuse NY, 1997**



Notes:

1. Prior (+) TST: Men who had documentation of a positive TST prior to January 1997.
2. Possible Converter: Men who were found to have a positive TST at the time of screening but whose prior TST status was unknown.
3. Documented converter: Men who had documentation of a negative TST in the recent past but who were shown to be TST positive during this screening.

Through the above screening efforts, one additional case of active pulmonary TB was identified by the end of September 1997. Unfortunately, of the first five cases, four individuals did not voluntarily comply with recommendations for isolation and treatment. Court orders were issued in all four of these situations to enforce compliance. Please refer to the line listing of the five patients below.

**Table 3: Line Listing for First Five Men Diagnosed with Active Tuberculosis in Homeless Shelters in Syracuse, 1997.**

| <u>Case</u> | <u>Age</u> | <u>Date of Diagnosis</u> | <u>Shelter</u> | <u>HIV status</u> | <u>Alcohol Use</u> | <u>Substance Use</u> | <u>Court Order</u> |
|-------------|------------|--------------------------|----------------|-------------------|--------------------|----------------------|--------------------|
| 1           | 28         | 7/97                     | Oxford/RM      | Positive          | Past Hx            | Past Hx              | Yes                |
| 2           | 43         | 7/97                     | Oxford/RM      | Positive          | Yes                | Yes                  | No                 |
| 3           | 36         | 8/97                     | Oxford         | Positive          | Yes                | Yes                  | Yes                |
| 4           | 47         | 8/97                     | Oxford         | Negative          | Past Hx            | Past Hx              | Yes                |
| 5           | 38         | 9/97                     | Oxford         | Negative          | Yes                | Unknown              | Yes                |

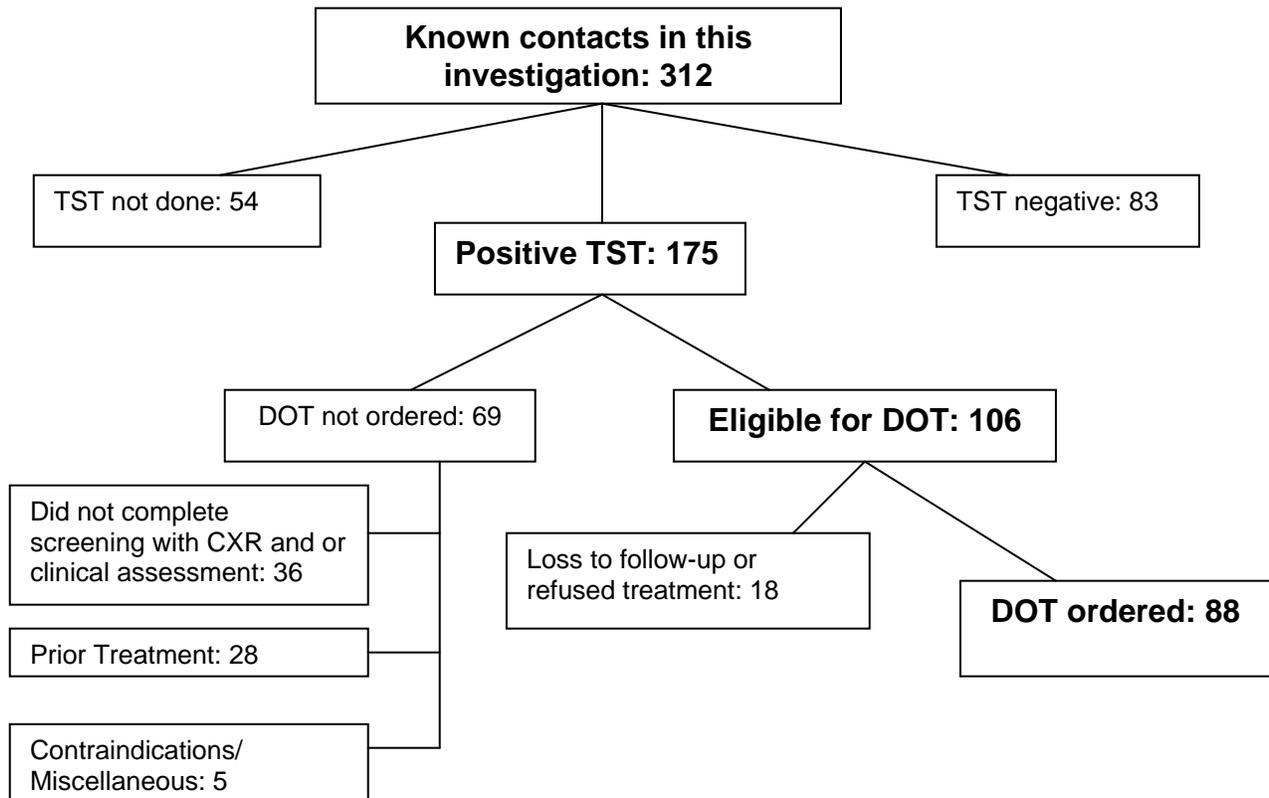
**Question:**

- Please discuss issues of individual autonomy versus community protection. When would you resort to obtaining a court order? Are there any other diseases for which you would recommend similar legal action?**

**Section C: Directly Observed Therapy and Case Management**

Directly observed therapy with case management is recommended by the Centers for Disease Control and Prevention for all people who have active tuberculosis as well as for certain individuals with latent tuberculosis infection. People who are infected with tuberculosis and who are at greater risk of progressing to active tuberculosis (such as children) may be evaluated for need for directly observed therapy for latent tuberculosis infection (DOT). Additionally, individuals who are at high risk for non-compliance with self-administered medication should be assessed for directly observed therapy. Because of the accessibility issues and concerns of non-compliance in the population of individuals at risk in this outbreak, DOT was recommended for all shelter residents diagnosed with latent tuberculosis infection. The disposition of the men identified as being at risk during the contact investigation is shown below.

Figure 2. Disposition of 312 Homeless Men: The Oxford Street Inn Outbreak, 1997



1. Why was DOT important in this situation?
2. What were significant barriers in administering DOT?
3. How would you manage those individuals who refused DOT?

## Section D: Aftermath of the outbreak...

Unfortunately, even though DOT was ordered for almost ninety men, very few individuals actually completed therapy for the same reasons that were explored earlier in the case. Over the following year, five more homeless men were diagnosed with active tuberculosis for a total of ten cases of active TB in homeless men in approximately one year. DNA fingerprinting demonstrated that seven of the cases were caused by an identical strain of *Mycobacterium tuberculosis*. An isolate from an eighth case was closely related and felt to be a variant of the same strain. Isolates from two other cases were not considered to be related. Four of these ten patients had had a prior positive TST and had initiated therapy in the past but none was known to have completed a full course of therapy.

### **Question:**

**What public health policies would you recommend to address the above-described situation?**

### Final Outcome Of The Outbreak To Date:

According to the New York State Department of Health, since 1997, there have been 109 cases of active tuberculosis reported in Onondaga County to date. Of these, 23 cases with positive cultures were evaluated for a linkage with the Oxford Street Inn. DNA fingerprinting has demonstrated that 20 of these cases were associated with the initial outbreak in the Oxford Street Inn. In addition, the New York State Department of Health reports that the same strain of *Mycobacterium tuberculosis* has been found in at least 26 homeless individuals in Maryland and the District of Columbia.