

HEALING HANDS



San Francisco TB Clinic Medical Director, Dr. Chris Keh reads a Tuberculin Skin Test (TST).

Tuberculosis: A Persistent Threat to Public Health

Although the overall number of new tuberculosis (TB) cases reported in the United States continues to decline, challenges remain that impede progress toward the national public health goal of TB elimination. Initiatives to increase TB awareness, testing, and treatment of latent infection and TB disease will be critical to future TB elimination efforts, especially among groups that are disproportionately affected, such as people experiencing homelessness, foreign-born populations, and racial/ethnic minorities (Centers for Disease Control and Prevention [CDC], 2013a).

Homeless persons are at high risk for TB, perhaps because they have factors that favor TB transmission, such as crowded living situations, excessive alcohol use, immune-deregulating substance abuse, HIV infection, malnutrition, and high rates

of incarceration. The absence of restful sleep and safety are additional risk factors that impair immune function and increase the risk of infection. TB outbreaks among homeless people are attributed to lack of health insurance and delay in seeking treatment, and associated with recurrent infection (Feske, Teeter, Musser, & Graviss, 2013).

In 2012, among individuals age 15 and over with TB and known housing status, 5.6 percent reported being homeless within the past year (CDC, 2013a). This proportion of TB

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cases occurring among homeless persons has remained stable at approximately 6 percent since 1994 (Bamrah, Woodruff, Powell, Ghosh, Kammerer, & Haddad, 2013). The high TB rates in the homeless population is reflective of the TB rates found in the US before industrialization, suggesting that TB control efforts have failed to address the TB epidemic among those who are most impoverished, and that the TB organism may have found its US niche (Feske et al., 2013).

The rate of TB incidence (i.e., the number of new cases) associated with homelessness is about ten times the rate in the general population. Based on 2006 - 2010 data, the annual TB incidence rate among homeless persons ranged from 36 to 47 cases per 100,000 persons, in contrast to the incidence rate of 3.6 among the general population (Bamrah et al., 2013).

A Potentially Deadly Infection

Once known as *consumption*, TB is a contagious disease caused by the bacterium *Mycobacterium tuberculosis*. Primarily an airborne disease, TB bacteria are spread from person to person when an infectious person coughs, sneezes, speaks, laughs, or sings. These germs can stay in the air for several hours. When people nearby inhale these germs, they may become infected. TB disease can be fatal if not treated properly (CDC, 2012b; Curry International Tuberculosis Center [CITC], 2013).

Two TB-related Conditions

Most people who have TB infection never develop TB disease because the bacteria may remain latent, or inactive, throughout their lifetime. Those with latent TB infection (LTBI) do not feel sick or have TB symptoms and cannot spread the bacteria to others. The bacteria may multiply or become active in some individuals—especially those with weak immune systems—leading to TB disease. People who have TB disease can spread germs to those they are in close contact with, such as family, roommates, or coworkers (CDC, 2011; CITC, 2013). Homeless shelters are among the most likely places for TB transmission since they are conducive to crowding and house populations that are at increased risk of advanced TB disease (Bamrah et al., 2013; San Francisco Department of Public Health TB Control Division, 2005). Table 1 summarizes many of the distinctions between latent and active TB-related conditions.

Detecting TB Infection

Screening for TB upon admitting individuals to homeless shelters facilitates TB detection and treatment and reduces the risk of transmission in shelters. “CDC generally recommends that high-risk settings test clients and staff members every 12 months,” says **Sapna Bamrah Morris, MD**, medical officer for the CDC’s outbreak investigations team in Atlanta. “If there is transmission within your population, we recommend more frequent testing. In a shelter setting that has experienced active TB cases, screening should be repeated eight to 10 weeks after the last active case.”

Two kinds of tests are used to detect TB bacteria in the body, the tuberculin skin test—known as TST or PPD—and TB blood tests. The TST is performed by injecting a small amount of liquid—purified protein derivative (PPD)—into the skin of the forearm. The person must return within 48 to 72 hours to have the test read, or the TST must be repeated. A trained health care worker looks for a reaction on the arm—typically, a raised, hard area or swelling called an induration—and if present, measures its size using a ruler. A positive reaction to the PPD indicates that the person probably has TB infection, although the test cannot distinguish between a latent infection and active disease. Reliable TST administration and reading requires standardization of procedures, training, supervision, and practice (CDC, 2011; CDC, 2012b; CDC, 2012d; CDC, 2013b).

Around for more than a century, the TST has well-known drawbacks. It requires two clinic visits, one to

Table 1: Latent TB Infection versus TB Disease

A Person with Latent TB Infection . . .	A Person with TB Disease . . .
Does not feel sick and has no symptoms	Usually feels sick and has symptoms that may include: *Unexplained weight loss *Loss of appetite *Sweating at night *Fever *Constant fatigue or weakness *Chills *Coughing for three weeks or longer *Coughing up blood or sputum *Chest pain
Cannot spread TB bacteria to others	Are considered infectious and may spread TB bacteria to others
Usually has a skin test or blood test result indicating TB infection	Usually has a skin test or blood test result indicating TB infection
Has a normal chest x-ray and a negative sputum test	May have an abnormal chest x-ray, or positive sputum smear or culture

Source: CDC, 2012c

administer the test and another to read it. Interpretation of the skin reaction is somewhat subjective and false-positive results can occur, especially in the case of prior BCG (bacille Calmette-Guerin) vaccination (Hunger, 2012). “For these reasons, it’s important to remember that the TST isn’t the best diagnostic test and it’s only one piece of evidence,” says Morris.

TB blood tests

Also called interferon-gamma release assays or IGRAs, TB blood tests use a blood sample to measure how the immune system reacts to the TB bacteria. Two IGRAs are available in the US: QuantiFERON-TB Gold In-Tube test (QFT) and the T-Spot. These blood diagnostics are more convenient, have greater specificity, and fewer false positives. IGRAs are the preferred method of TB testing for those who have received the BCG vaccination and for those who have a difficult time returning to have a TST read (CDC, 2013b; Hunger, 2012). BCG is not widely used in the US, but it is often given to infants and small children in countries where TB is common (CDC, 2009).

“The TB blood test has advantages, depending on the community,” says Morris. “It’s especially helpful when you have a number of foreign-born clients. Clinicians need to be aware that there is a certain way to draw the blood and treat the sample, and there are issues around the laboratory running the test properly. The onus is on the HCH project to make sure that there are no known problems with the lab by checking with their health department’s TB control person.”

Understanding test results

If either the TST reaction or TB blood test is positive, the person may need additional tests to see if the infection is latent or active TB disease. These tests typically include a chest x-ray and may include an examination of sputum for TB bacteria. (Sputum is phlegm coughed up from deep inside the lungs.) Although TB bacteria usually attack the lungs, they can attack any part of the body—such as brain, spine, and kidney—so the clinician may check the patient’s urine, take tissue samples, or run other tests (CDC, 2012e). “It’s important to remember that because of the possibility of false negatives with either the TST or IGRA, neither test rules out the presence of active TB. Diagnosing TB requires looking at multiple factors and using clinical judgment,” Morris says.

Treating LTBI: Easier Than Ever

Identifying and treating LTBI may have the greatest impact on reducing the excess burden of TB in the homeless population, preventing future cases and achieving cost savings for health jurisdictions (Bamrah et al., 2013). Studies estimate that between 18 percent and 51 percent of the homeless population has LTBI (Tankimovich, 2013).

In the US, about 5 percent to 10 percent of those with LTBI progress to active disease, if not treated. Treating LTBI is

Characteristics of TB Patients Who Reported Experiencing Homelessness, 1994 – 2010

- » In 2011, the majority of homeless persons with TB were US-born; 20% were foreign-born
- » Among US-born homeless persons, the majority was non-Hispanic black (52%) or non-Hispanic white (34%)
- » Among foreign-born homeless persons, the majority diagnosed with TB was of Hispanic ethnicity (67%)
- » Most homeless TB patients were males between the ages of 25–64
- » Prevalence of HIV co-infection was higher compared to non-homeless persons
- » Incarceration increased the risk for not completing treatment
- » Persons who are homeless have a greater likelihood of not completing treatment due to having moved, refusing treatment, or being lost to follow-up
- » The odds of being in a county-based genotype cluster were 2.5 times higher, suggesting local transmission

Sources: Sources: Bamrah et al., 2013; CDC, 2012a

easier because there are fewer bacteria in the person’s body. The clinician initiates LTBI treatment after excluding the possibility of TB disease, using one of four approved regimens. The medications used are isoniazid (INH), rifampin (RIF), and rifapentine (RPT) (CDC, 2012f; CDC, 2013c).

A new regimen that reduces treatment time may increase LTBI treatment success and ensure better completion rates among homeless individuals (Bamrah et al., 2013). The 12-dose regimen of INH and RPT simplifies and shortens treatment from 270 daily doses over nine months, to 12 once-weekly doses over three months. The 12-dose regimen should be administered under DOT (directly observed therapy), which is where a health care worker meets with the TB patient to watch them take each dose of anti-TB medication (CDC, 2013c). Research indicates that hard-to-reach, high-risk populations, such as immigrants and people experiencing homelessness, are more likely to seek out TB detection and treatment—and finish TB treatment—when they are better educated about the disease (Tankimovich, 2013).

Treating TB Disease

Because TB is a major problem among homeless individuals, the Advisory Council for the Elimination of Tuberculosis (ACET) developed recommendations to help prevent and control TB in this population (CDC, 1992). The box below outlines ACET’s priorities for TB prevention and control activities based on their

clinical and public health importance and their cost-effectiveness.

On average, each person with TB disease transmits it to another 10 to 15 people before recovering or dying (Hunger, 2012). People with TB disease can be cured if they obtain medical evaluation and appropriate medication (CITC, 2013). TB differs from other diseases because by law, the onus of completion of therapy is on the health care provider and local health department, not the patient (Chicago Department of Public Health [CDPH], 2013a).

TB disease treatment lasts for six to 12 months and requires several medications. The first-line anti-TB agents forming the core treatment regimens are INH, RIF, EMB (ethambutol), and PZA (pyrazinamide). It is essential for persons with TB disease to finish the medicines, taking them exactly as prescribed (CDC, 2012f). The global standard of care for treating TB disease, DOT helps the patient complete treatment in the least amount of time, which is critical during the first two months when drug resistance can develop. Clinicians should stress that the DOT requirement applies to all TB patients so that the person does not perceive that they are being singled out (CDPH, 2013a).

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Drug resistance and TB drug shortages

In the US, the first reports of drug resistance to TB medication appeared in the mid-1970s. Resistance occurs when the bacteria develop the ability to withstand antibiotic attack and then multiply. Partial or inconsistent treatment for a given individual is the usual cause of drug resistance. Multidrug-resistant TB (MDR TB) is a form of the disease that is resistant to two or more of the primary drugs used for TB treatment. Drug-resistant TB is difficult and costly to treat, extending treatment time over many months or years. Even with the long course of treatment, the cure rate for MDR TB is about 50 percent—compared to over 90 percent for non-resistant TB strains (American Lung Association [ALA], 2013). In December 2012, the FDA approved a new drug, bedaquiline, as part of combination therapy to treat adults with MDR TB when other therapeutic options are unavailable (US FDA, 2012).

Reducing the Excess Burden of Disease

In 2012, individual state rates of TB varied widely, from 0.4 in West Virginia to 9.0 in Alaska. Four states—California, Texas, New York, and Florida—accounted for half (49.9 percent) of all TB cases, although they have less than one-third of the US population (CDC, 2013a). TB among persons with a history of homelessness accounted for many of these cases. Recent outbreaks demonstrate the vulnerability of homeless persons and highlight the need for aggressive, sustained TB control efforts (CDC, 2012g). Here, we talk to our colleagues about how they are addressing the high TB case rate among homeless persons.

California

Due to its high proportion of foreign-born residents and marginally housed persons, San Francisco has the highest TB rates of any US metro area (Kawamura, 2010), and cases have been increasing since 2010 (Higashi, 2013). The largest proportion of cases—70 percent—is among the Asian population; 80 percent of all cases were among foreign-born individuals (Grinsdale, n.d.).

“San Francisco has an annual screening requirement for shelter clients,” says **Julie Higashi, MD, PhD**, TB control director with the San Francisco Department of Public Health (SFDPH) TB Control Program. “The city created a database to track TB testing results, which supports our screening program by giving us the ability to track over 95 percent of individuals tested. We moved to using the QFT, and we’ve found it to be cost-effective.”

As a result of shelter screening, the numbers show that there has not been transmission in San Francisco’s shelters for several

Priorities for TB Services in Homeless Populations

- » Detection, evaluation, and reporting of homeless persons who have current symptoms of active TB and completion of an appropriate course of treatment by those diagnosed with active TB.
- » Screening and preventive therapy for homeless persons who have—or are suspected of having—TB infection.
- » Examination and appropriate treatment of persons with recent TB that has been inadequately treated.
- » Screening and appropriate treatment of persons exposed to an infectious case of TB. Because contacts are difficult to define in a shelter population, it is usually necessary to screen all shelter residents when an infectious case is identified.
- » Screening and preventive therapy for homeless persons with known medical conditions that increase the risk of TB (e.g., diabetes mellitus).

Source: CDC, 1992

years. Higashi says, “We do have a cluster of cases linked to an SRO [single room occupancy], suggesting that mandatory shelter screening is successful in finding cases before they spread.”

TB is a public safety issue and fighting the disease is a shared responsibility. “In the mid-2000s,” says Higashi, “we brought together representatives from the health department, Breathe California, CDC, Curry International Tuberculosis Center, shelters, and other homeless providers. A big TB exposure in shelters galvanized the community to execute a preventive strategy going forward.” The health department credits the significant community involvement in screening and prevention among high-risk populations for San Francisco’s substantial gains in TB control over the past ten years (Kawamura, 2008).

“Shelter staff worry about privacy concerns, or that health department policies infringe on homeless individuals’ rights and present hurdles to getting services,” says Higashi. “Coalition building is critical to implementing uniform screening policies. HCH clinicians can educate shelter providers by giving them easy-to-read materials. Shelters have huge staff, typically with a lot of turnover. They need simple guidelines to make it work.”

Florida

In 2012, Florida experienced a large, uncontained TB outbreak resulting in 13 deaths and 99 illnesses, mostly among Jacksonville’s homeless population. Duval County experienced a 16 percent increase in TB cases, and a CDC report estimated that approximately 3,000 persons might have been exposed to the contagious patients in Jacksonville (Campbell & McCorquodale, 2012).

“We have a unique residential program addressing TB in central Florida,” says **Pia Valvassori, PhD, ARNP**, with Orlando’s Health Care Center for the Homeless. “There are eight hospital beds for TB patients, who are treated for three to six months to be sure that they’re no longer contagious. We work with discharge planners so that the hospital discharges the person to a facility, not to the street. Our TB clinic is part of the health department; the HCH project provides primary care treatment and case management services.” Valvassori advises clinicians to use TB blood tests to get results quickly. “We use the IGRA exclusively,” she says, “doing PPDs on everyone in the shelter was a nightmare.”

Valvassori recommends hosting in-service training for large shelters so that staff members know when to refer guests for testing or treatment. “Work to dispel myths, and be sure that staff understand the difference between latent infection and active disease [see Table 1]. Encourage cough etiquette practices among staff and guests, and train in-take staff to ask screening questions.”

Illinois

Despite a record low number of new TB cases during 2012, Illinois ranks sixth in the nation for the highest number of TB

TB Evaluation

Ask the patient the following questions, and if the answer to any is yes, he or she should see a physician.

- » Do you have a cough that has lasted for at least three weeks?
- » Do you now have drenching sweats during the night? (e.g., wanted to change clothing or sheets at night because they were very wet?)
- » Have you lost more than 10 lbs. in the past two months?
- » Have you now or ever coughed up blood? (e.g., seen red blood in phlegm or mucus from the mouth?)
- » Have you ever been treated or told you should be treated for TB?
- » Have you presently or have you ever been in close contact with person(s) known to have TB or who are on treatment for active TB? (e.g., a family member, a shelter roommate, a close friend, anybody living in the same house or sleeping in the same room?)

*Source: Adapted from Lutheran Family Health Centers/
Mount Sinai School of Medicine Community Medicine Program*

cases. Following the national trend, the majority (69 percent) of Illinois’ TB cases were among individuals who were born in countries where TB is common, such as Mexico, India, and the Philippines. Given that TB is a global problem, the increase in cases worldwide means more cases in the US (Illinois Department of Public Health, 2013).

As of September 2011, 28 persons associated with a homeless shelter in Kane County received a diagnosis of TB disease. According to the CDC, outbreaks among persons experiencing homelessness are difficult to control, in part because of the challenges in finding and locating contacts and providing treatment for LTBI. Eighty percent of the patients in this outbreak spent time at sites other than the shelter during their infectious periods, suggesting that transmission was not limited to the shelter setting and outbreaks among homeless populations pose a risk to entire communities (CDC, 2012g).

Metropolitan Chicago is a relatively high incidence area for TB (CDPH, 2013b). Chicago’s Heartland Health Outreach (HHO) manages nine housing units specifically set aside for homeless persons with active TB disease who are discharged from hospital with nowhere to recuperate. “To be eligible for an apartment and DOT, individuals must be healthy enough to care for themselves and not be infectious,” explains **Mary Tornabene, APN, CNP**.

“Testing for TB in the shelter provides opportunities to educate clients about health—such as making healthy food choices—and it’s when we give annual flu shots,” Tornabene says. She goes to the shelter to read clients’ TST results. “Although we offer prophylactic treatment to those with latent TB, treatment isn’t mandated.”



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This photograph captures a sneeze in progress, revealing a plume of salivary droplets as they are expelled in a large cone-shaped array, thereby dramatically illustrating the reason to cover one's mouth when coughing or sneezing in order to protect others from germ exposure.

Indiana

While Indiana's TB rates are relatively low compared to the rest of the US (ALA, n.d.), during 2012 there were 102 new TB cases—a 2 percent increase from 2011. Over one-third of the state's 92 counties reported TB cases, with the three most populous counties—Marion, Lake, and Allen—accounting for over half (58.8 percent) of all new cases. Indiana's high-risk populations for TB infection include children, persons with HIV comorbidity, those who are foreign-born, and individuals experiencing chronic homelessness (Indiana Tuberculosis Control Program, 2013).

"Our first active case spread to many more than we would have thought," says **Heidi Bryer, LPN**. "We still have active cases showing up in our shelters—especially among male clients—so we have mandatory testing every six months. We run a blood test instead of administering the PPD." The Marion County Health Department covers the cost of testing. Bryer is a street outreach nurse with the Eskenazi Medical Group, a clinic co-located in Horizon House, a day center serving homeless persons in Indianapolis.

New York

In 2012, New York City's TB rate dropped to a record low of 8 cases per 100,000 people, which is double the national rate of 3.2 cases per 100,000 people. In addition, there was a slight increase in cases of MDR TB (United Press International, 2013).

"Lutheran Family Health Centers issued guidelines for IGRA testing in its Community Medicine Program," says **Ansell Horn, PhD**, a nurse practitioner with Lutheran's Community Medicine

Program (CMP) in New York City. "The TST costs \$0.45 while the QFT costs \$42.50. The new policy is to use the QFT only for certain high-risk groups, such as immunocompromised persons. In addition to cost, clinic time is an issue since QFT testing requires drawing three low-volume tubes of blood that are slow to fill. If the PPD result is ambiguous or if a PPD-positive client elects prophylactic treatment, we may run a blood test to confirm the diagnosis given the significant number of false positives with the PPD."

"With our population, we worry about adverse side effects associated with treating TB infection," adds **Blanca Sckell, MD**, CMP's medical director. Side effects of TB drugs are uncommon, but can be serious when they do occur. "TB treatment can be highly toxic to the liver, which can lead to drug-induced hepatitis, so clinicians must be careful about who we treat. Before starting treatment, we ask about hepatitis symptoms and run baseline liver function tests." Given the liver's central role in drug metabolism and detoxification, it is vulnerable to injury.

Connected by the Air We Breathe

Since 2009, federal funding to support local TB programs has been reduced, decreasing budgets, resources, and staffing. As a result, program capacity to perform unique public health functions has significantly decreased. The consequences are that TB programs' ability to ensure timely, effective TB diagnosis and treatment is compromised leading to untracked and untreated contacts and unchecked TB transmission (National Tuberculosis Controllers Association [NTCA], 2013).

At the same time, many TB programs are experiencing an increase in cases as well as an increase in the proportion of complex cases, which requires more staff time, services, and resources. Factors associated with the increased complexity of cases include more TB patients having comorbidities (e.g., HIV or diabetes), drug resistance, mental or substance abuse disorders, and many being homeless, migrant, undocumented, or lacking English language proficiency (NTCA, 2013).

As public health resources shrink, the ability to treat LTBI decreases and the focus shifts to keeping active cases out of the public sphere and using DOT to improve treatment adherence and completion. In this new environment, it is even more important for HCH clinicians to treat LTBI. Addressing TB among people experiencing homelessness represents both one of our greatest challenges and opportunities in achieving TB elimination.

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Healing Hands is published quarterly by the National Health Care for the Homeless Council | www.nhchc.org

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This publication was made possible by grant number U30CS09746 from the Health Resources & Services Administration, Bureau of Primary Health Care. Its contents are solely the responsibility of the authors & do not necessarily represent the official views of the Health Resources & Services Administration.

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