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World Tuberculosis (TB) Day

The Connecticut Department of Public Health (DPH) and public health officials across the nation recognize March 24th as World TB (Tuberculosis) Day. On this day in 1882, Dr. Robert Koch gave a historic lecture on "The Etiology of Tuberculosis" to the scientific community announcing that he had discovered the cause of tuberculosis, the TB bacillus. At that time, TB was the cause of death in 1 out of 7 people. Tuberculosis continues to be a major cause of morbidity and mortality. One third of the world's population is currently infected with TB (defined as latent tuberculosis infection), with an estimated 10% of these developing active disease in their lifetime.

The DPH TB Control Program is commemorating World TB Day through a number of awareness raising events statewide in conjunction with local health departments. The TB Control Program works with healthcare providers and local health departments by monitoring for new cases, assuring completion of treatment, investigating and treating recently exposed contacts, and promoting screening for infection in a variety of settings with the goal of preventing the spread of TB. For more information, visit the DPH TB Control Program website at www.ct.gov/dph/TB.

Tuberculosis Mortality in Connecticut, 2007–2009

In the United States, approximately 550 persons die from tuberculosis (TB) annually (*1*). The Centers for Disease Control and Prevention recommends review of TB-related deaths to determine if they were preventable and to develop and implement death-reduction policies (*2*); however, no standardized review method exists. The Connecticut Department of Public Health (DPH) TB Control Program reviewed deaths among TB cases reported during 2007–2009 to: 1) assess TB-relatedness of deaths, and 2) evaluate missed prevention opportunities.

Health department and medical records of decedents were reviewed. To determine TB-relatedness of deaths and missed prevention opportunities, a tool based on TB severity and complications, national care standards, and in some instances, expert opinion was used. Deaths were classified as definitely TB-related, possibly TB-related, unlikely TB-related, and definitely not TB-related. Those classified as definitely or possibly were considered TB-related deaths. For selected surveillance variables, chi-square and a two-sample independent *t* test were used to identify risk factors for death by comparing decedents to survivors.

During the period under review, 300* cases of TB were reported; 20 (7%) died. Of decedents, 14 (70%) died during TB treatment, 5 (25%) were diagnosed after death, and 1 (5%) died before starting TB treatment; 9 (45%) were immunocompromised. Classification for the deaths was as follows: 5 (25%) definitely TB-related, 12 (60%) possibly TB-related, 2 (10%) definitely not TB-related, and 1 (5%) unlikely TB-related. Of the 17 TB -related deaths, 16 (94%) had ≥1 missed prevention opportunity. Missed opportunities included inappropriate TB drug regimen (n = 5), and provider delay in initiating (n = 5) or completing (n = 5) diagnostic evaluation.

In comparison to persons with TB who survived, those who died were more likely to have used alcohol (risk ratio [RR]: 4.4; 95% confidence interval [CI]: 1.8–11.0), and had combined pulmonary and extrapulmonary (EP) TB (RR: 3.3; 95% CI: 1.2–9.1) (Table 1, page 10). They were also more likely to be older (mean age decedents = 65.5 years; mean age survivors = 41.3 years; CI: 15.2–33.2).

*One person was excluded from this total for the purposes of this report because death occurred several months after leaving the state.

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Table 1. Demographic and clinical comparison of tuberculosis decedents and survivors, Connecticut, 2007–2009

	Decedents n = 20	Survivors n = 280		
	No. (%)	No. (%)	RR	CI
Male sex	11 (55)	152 (54)	1.0	0.4–2.4
Foreign born	11 (55)	213 (76)	0.4	0.2–1.0
Previous TB	1 (5)	11 (4)	1.3	0.2–8.7
Smear (+)	9 (50)*	91 (49)†	1.0	0.4–2.5
HIV (+)	1 (11)*	13 (6)†	1.8	0.2–13.4
Combined TB§	**4 (20)**	**17 (6)**	**3.3**	**1.2–9.1**
Homeless	2 (10)	8 (3)	3.2	0.9–12.0
Alcohol	**5 (25)**	**16 (6)**	**4.4**	**1.8–11.0**

*Incomplete denominator data for decedents.
†Incomplete denominator data for survivors.
§Combined TB = combined pulmonary and EP TB.

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Editorial Note

In Connecticut, a systematic review of deaths in reported TB cases indicated that the majority of deaths were TB-related, and that missed prevention opportunities were common. These overall results are similar to those found in a pilot study of a TB death assessment tool developed in California (*3*).

This review shows that certain risk factors are associated with TB-related deaths in Connecticut including alcohol use, combined pulmonary and EP TB, and older age. When managing TB patients who have risk factors associated with TB-related death, providers and case managers should ensure timely starting of standardized treatment regimens and close monitoring of patients' response to treatment. The TB Control Program plans to use the results of this review to develop interventions to raise awareness of missed opportunities in the prevention of TB deaths and to provide instruction on current TB diagnostic and treatment modalities.

This review has at least three limitations. First, a control group was lacking for the primary outcomes; in-depth medical chart review was only performed for decedents and not for survivors. Second, the small cohort size limited the power to detect statistically significant differences. Third, missed prevention opportunities do not necessarily indicate preventable deaths.

This report serves as a reminder that TB occurs in Connecticut, and persons continue to die from this disease. With increased awareness and educational efforts, future TB deaths might be prevented.

References

1. Centers for Disease Control and Prevention. Reported Tuberculosis in the United States, 2009. http://www.cdc.gov/tb/statistics/reports/2009/default.htm. Accessed 29 January, 2011.
2. Centers for Disease Control and Prevention. Essential components of a TB prevention and control program. *MMWR* 1995; 44 (No. RR-11):1–18.
3. Centers for Disease Control and Prevention. TB Death Assessment Tool in California: Development and Pilot Test. *TB Notes* 2008; 4:9–13.

Suboptimal Tuberculosis Prevention Among Non-native Persons in Connecticut, 2005–2008

To better understand factors influencing tuberculosis (TB) screening among non-native persons, the Connecticut TB Control Program studied barriers for access to healthcare for persons after entry into the United States. Predictors for latent TB infection (LTBI) testing were also identified. Non-native persons with confirmed or suspected TB disease were interviewed and classified by their entry status: documented persons included permanent residents (immigrants and refugees) and visitors (persons admitted temporarily), and undocumented persons were persons entering illegally.

During 2005–2008, 162 non-native persons originating from 60 different countries were interviewed due to suspected TB; 59% were male, 51% were <35 years of age, and 37% were Hispanic. Of 142 persons with known entry status, 43% were permanent residents, 34% were visitors, and 23% were undocumented. The TB rate was highest among persons from Asia (26 cases per 100,000 population) and Africa (21 cases per 100,000 population). (Population denominators by region of origin for each year were obtained from the 2005-2008 American Coummunity Survey data to calculate average annual TB case rates (*1*)). Among interviewed persons, 56% had health insurance and

61% had an established provider; however, 22% had not sought medical care routinely.

Overall, 105 (65%) of non-native persons reported not having received LTBI testing after U.S. entry and before being reported as a TB patient. Only 57% (55/96) with established providers, 68% (41/60) who entered as permanent residents, and 56% (5/9) with human immunodeficiency virus (HIV) infection reported not having been tested for LTBI. The remaining 35% (57/162) reported receiving post-arrival LTBI testing; median time from arrival until testing was 2 years. Only 46% (12/26) completed therapy for LTBI.

Overall, Hispanics were more likely than non-Hispanics to have had post-arrival LTBI testing (44% versus 26%, *p*=.02) (Table 1). When stratified by immigration status, Hispanic permanent residents and visitors were more likely than respective non-Hispanics to have undergone LTBI testing. Additionally, Hispanic permanent residents (63%) and Hispanic visitors (83%) were more likely than undocumented Hispanics (23%) to have undergone testing.

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Editorial Note

Despite having the highest TB rates, persons from Asia and Africa were less likely than persons from the Americas to have had LTBI testing. Additionally, undocumented persons were less likely than documented persons to have had LTBI evaluation. Although having a provider was a significant predictor for LTBI testing, <50% of persons with an established provider reported having been tested. These findings underscore the need to reinforce TB testing guidelines among providers who treat non-native persons at high risk (*2*).

Reduction of healthcare barriers among non-native persons is critical for enhancing TB control and will require an increased awareness and trust in systems for identification and treatment of this population. For example, in Delaware, public health officials collaborated with businesses to develop a no-name TB tracking system that protects the identity and immigration status of workers (*3*). During the 2 years after implementation of this system, completion rates for LTBI treatment increased from

Table 1. Multivariable analysis of selected factors associated with having prior latent tuberculosis infection testing in non-native persons after entering the United States

Characteristics	Prior LTBI testing no. (%)	Unadjusted OR (95% CI)	*p* value	Adjusted OR (95% CI)	*p* value
Region of origin					
Africa	2/13 (15)	0.21 (0.04, 1.00)	.05	0.12 (0.02, 0.63)	.01
Europe	6/17 (36)	0.62 (0.21, 1.85)	.39	0.34 (0.09, 1.26)	.11
Asia	13/55 (24)	0.35 (0.16, 0.76)	.008	0.17 (0.07, 0.45)	.0004
Americas	36/77 (47)	Reference		Reference	
Had established provider					
Yes	43/98 (44)	2.74 (1.34, 5.60)	.005	3.61 (1.50, 8.72)	.004
No	14/63 (22)	Reference		Reference	
Entry status					
Undocumented persons	7/33 (21)	0.41 (0.16, 1.04)	.06	0.20 (0.07, 0.59)	.004
Documented persons	43/109 (39)	Reference		Reference	

OR = odds ratio; CI = confidence interval

48% to 64%. Such a system might be useful in certain Connecticut industries in which non-native persons at risk for TB often work.

Perceived barriers to completion of LTBI treatment also need to be addressed. In this analysis, the majority of persons with a prior positive tuberculin skin test (TST) did not complete LTBI treatment. Reasons provided were often based on misconceptions such as, the belief among patients and providers that positive TST results were due to prior bacille Calmette-Guerin (BCG) vaccination despite studies indicating that the protective effect of BCG over time is minimal and guidelines recommending that BCG vaccination history should not be considered when interpreting a TST. Measures to overcome this barrier include expanding use of improved diagnostic tests (e.g., interferon gamma release assays), which are not affected by BCG vaccination.

Recall bias of self-reported LTBI testing, and possible miscommunication as a result of language barriers during interviews are potential limitations to these data. In addition, the reasons that non-native persons did not undergo post-arrival testing for LTBI were not determined.

Improving access to medical care for non-native persons is important for the elimination of TB in this population.

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2. Centers for Disease Control and Prevention. CDC immigration requirements: technical instructions for tuberculosis screening and treatment, using cultures and directly observed therapy, October 1, 2009. http://www.cdc.gov/immigrantrefugeehealth/pdf/tuberculosis-ti-2009.pdf. Accessed February 2, 2011.
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Table. Summary of tuberculosis cases reported in Connecticut*, 2010

Classification	n= 85 No. (%)
Age (years)	
<5	3 (4)
5-14	3 (4)
15-24	13 (15)
25-44	30 (35)
45-64	17 (20)
>65	19 (22)
Race/Ethnicity	
Asian	33 (39)
Hispanic	20 (24)
White	18 (21)
Black	14 (16)
Gender	
Male	44 (52)
Female	41 (48)
Birth Origin	
U.S. and Territories	19 (22)
Other Nations (26 different Nations)	66 (78)
Pulmonary cases	63 (74)
HIV positive	6 (7)
Multi-drug resistant (resistance to at least isoniazid and rifampin)	5 (6)
Birth Nations with more than 5 Cases	
India	9
Philippines	6
Guatemala	5
Haiti	5
Vietnam	5
Towns with ≥5 cases	**Rate****
Hartford	10 (8.1)
Stamford	9 (7.4)
Bridgeport	8 (5.8)
Danbury	7 (8.8)
New Britain	5 (7.1)

* Cases were reported from 38 towns.
** Rate per 100,000 population.

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