SHORT COMMUNICATION

Effectiveness of reporting on latent tuberculous infection in Massachusetts, 2006–2008

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Massachusetts is one of five states that mandate the reporting of latent tuberculous infection (LTBI). We assessed 2006–2008 Massachusetts surveillance data for LTBI to describe the system and examine the characteristics of persons with LTBI. Over 3 years, 15 301 LTBI cases were reported (4742–5398/year). Among those with known country of birth ($n = 11\,655$), 9983 (85.7%) were foreign-born. Substantial under-ascertainment and/or under-reporting appear likely; mandatory reporting does not appear sufficient for LTBI detection. Enhanced targeted testing, active LTBI surveillance, or laboratory-based surveillance may be needed to eliminate tuberculosis disease in the United States.

In 2010, 11 182 cases of tuberculosis disease (TB) were reported to the Centers for Disease Control and Prevention (CDC).¹ Almost 80% of active TB cases in the United States develop from latent tuberculous infection (LTBI) reactivation;² finding and treating persons with LTBI is therefore critical for TB control.^{3,4} Surveillance is a way of monitoring the effectiveness of this process. To our knowledge, only Massachusetts and four other US states (Missouri, New Hampshire, New Mexico, and Texas) mandate the reporting of new LTBI cases.

LTBI was made a reportable condition in Massachusetts in 2003. Clinicians are advised to perform LTBI testing as per CDC guidelines, including testing TB contacts and foreign-born individuals in the country for <5 years, among others.⁵ LTBI case reports are submitted to the Massachusetts Department of Public Health; the system is passive and reliant on clinician compliance. The form documents tuberculin skin test (TST) results based on clinicians' interpretation of guidelines,⁴ or interferon-gamma release assay (IGRA) results and demographic information. Clinicians can record risk factors including age, contact with a TB case, and medical conditions associated with progression to active disease; human immunodeficiency virus (HIV) infection status is not requested. Persons with active TB disease are excluded.

The objectives of the present study were to evaluate LTBI surveillance in Massachusetts, and to describe the characteristics of reported cases.

STUDY POPULATION, DESIGN AND METHODS

LTBI reporting forms are submitted by mail or fax and compiled in an electronic database. Data from 2006–

2008 were analyzed using SAS version 9.1 (Statistical Analysis Software Institute, Cary, NC, USA). An LTBI case was defined as a person with a positive TST or IGRA.⁴ We calculated the reported state-wide LTBI prevalence using projected population data from the 2000 census.⁶ We performed descriptive analyses and comparisons using χ^2 tests.

The study was considered exempt from ethics approval requirements by the Boston University Institutional Review Board.

RESULTS

Over 3 years, 15 301 LTBI cases were reported (4742–5398 per year); of these, 188 (1.2%) were diagnosed using IGRAs. The average prevalence of reported LTBI was 80/100 000 population/year. The median age was 35.0 years (range <1–104); 739 reported cases (4.9%) were children aged <15 years and 856 (5.7%) were adults aged ≥ 65 years (Table).

Among reported cases with known country of birth ($n = 11\,655$), 9983 (85.7%) were foreign-born. The largest proportions were born in Asia (35.5%), the Caribbean Islands (15.6%), and Africa (14.8%). Among 5860 foreign-born persons with documented time of stay in the United States, 3097 (52.8%) had been in the country <5 years.

A greater proportion of US-born than foreign-born persons were reported as having close contact with an active TB case (1.6% vs. 1.1%, $P = 0.1$). Foreign-born persons in the United States <5 years (compared with ≥ 5 years) were younger (median age 31 vs. 38 years, $P < 0.0001$) and were less likely to have reported contact with an active TB case (0.8% vs. 1.6%, $P = 0.004$).

DISCUSSION

Identification and treatment of persons with a high risk of reactivating LTBI is a basic principle of TB control in the United States.⁴ Despite state-mandated reporting of LTBI in Massachusetts, current testing and reporting patterns suggest a prevalence more than 50 times lower than in the US overall and 40 times lower than in the Northeast, based on National Health and Nutrition Examination Survey (NHANES) data.^{2,7} The relatively low reported prevalence in Massachusetts likely indicates that 1) not enough testing is being performed, and thus results are not available for reporting, and/or 2) there is underreporting of positive tests.

Our findings suggest that testing in Massachusetts

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KEY WORDS

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TABLE Comparison between foreign-born and US-born persons with reported latent tuberculous infection, Massachusetts, United States 2006–2008

Variable	Total (<i>n</i> = 15 301)* <i>n</i> / <i>N</i> (%)	US-born (<i>n</i> = 1672) <i>n</i> / <i>N</i> (%)	Foreign-born		
			Total† (<i>n</i> = 9983) <i>n</i> / <i>N</i> (%)	In the United States <5 years (<i>n</i> = 3097) <i>n</i> / <i>N</i> (%)	In the United States ≥ 5 years (<i>n</i> = 2763) <i>n</i> / <i>N</i> (%)
Male sex	7245/14 987 (48.3)	894/1645 (54.4)‡	4617/9864 (46.8)	1406/3065 (45.9)	1281/2744 (46.7)
Age, years median (range)	35.0 (<1–104)	33 (1–100)‡	35 (<1–104)	31 (<1–97)§	38 (7–93)
Age group, years					
<15	739/15 005 (4.9)	112/1644 (6.8)‡	436/9912 (4.4)	214/3069 (7.0)§	34/2763 (1.2)
15 – 24	2704/15 005 (18.0)	406/1644 (24.7)‡	1687/9912 (17.0)	670/3069 (21.8)§	328/2763 (11.9)
25 – 44	7188/15 005 (47.9)	610/1644 (37.1)‡	4896/9912 (49.4)	1471/3069 (47.9)§	1463/2763 (53.0)
45 – 64	3518/15 005 (23.5)	382/1644 (23.2)‡	2395/9912 (24.2)	608/3069 (19.8)§	786/2763 (28.5)
≥65	856/15 005 (5.7)	134/1644 (8.2)‡	498/9912 (5.0)	106/3069 (3.5)§	152/2763 (5.5)
Risk factors¶					
Children aged <4 years	119/15 301 (0.8)	21/1672 (1.3)‡	71/9983 (0.7)	41/3097 (1.3)§	0/2763 (0.0)
Tuberculosis contact	144/15 301 (0.9)	26/1672 (1.6)	109/9983 (1.1)	25/3097 (0.8)§	45/2763 (1.6)
Diabetic	71/15 301 (0.5)	24/1672 (1.4)‡	31/9983 (0.3)	2/3097 (0.1)§	13/2763 (0.5)

*The total column is greater than the sum of the US-born and foreign-born columns, as for some persons data were missing on country of birth.

†The total foreign-born column is greater than the sum of in the United States <5 years and in the United States ≥5 years because the duration of time in the United States was unknown for some persons.

‡Statistically significant difference between total US-born and total foreign-born ($P < 0.05$).

§Statistically significant difference between foreign-born in the United States < 5 years vs. ≥5 years ($P < 0.05$).

¶Persons could have more than one documented risk factor.

is more frequently conducted among (or reported for) foreign-born adults – but not primarily as part of contact investigations. Testing and reporting in foreign-born persons in the United States <5 years was essentially equivalent to that of foreign-born persons in the United States for ≥5 years.

Reporting of risk factor information was optional, and data suggest that it was incomplete. Country of birth was reported for 76% of cases. Diabetes was a reported risk factor for 0.5% of LTBI cases; however, the national prevalence of diagnosed diabetes in 2007 was 5.9%.⁸ Enhancing the reporting requirement to collect more complete data on reporting sources and factors known to increase the risk of developing active disease may prove beneficial for LTBI surveillance.

Our findings were limited by the nature of the passive surveillance system and the likelihood that some detected LTBI cases were not reported. Comparison of Massachusetts reporting rates with NHANES data is limited by differences in study populations (i.e., testing in Massachusetts is theoretically targeted at higher risk groups, while it is performed among all NHANES participants); however, the comparison still provides some basis for assessing the effectiveness of the Massachusetts surveillance system. Assessing LTBI prevalence is complicated by the fact that some cases may be undocumented immigrants who are not included in population estimates. Finally, we were unable to confirm that clinicians accurately interpreted the CDC TST size cut-offs, and some false-positive TST results may have resulted from inaccurate TST reading, other mycobacterial infections or previous bacille Calmette-Guérin vaccination in foreign-born persons.

Our findings suggest that screening is likely underperformed. The American Thoracic Society/CDC/Infectious Diseases Society of America guidelines recommend targeted testing for persons with either an increased risk of having LTBI or an increased risk of progression from LTBI to TB, including recently infected persons and those with clinical conditions (e.g., HIV infection) or social characteristics (e.g., homelessness) that increase the risk.⁴ Markov modeling has demonstrated the cost-effectiveness of screening

foreign-born persons, close contacts of TB cases, and HIV-infected persons.⁹ The gaps detected in Massachusetts may inform the educational efforts of state TB programs for clinicians by emphasizing the importance of testing at-risk persons and reporting results.

Efforts that go beyond mandatory reporting, such as active surveillance or broader use of IGRA testing and automatic reporting of positive results, could improve the sensitivity of LTBI surveillance. As shorter, better-tolerated LTBI treatment regimens become more widely used,¹⁰ targeted testing and treatment for LTBI may become even more effective as a means to eliminate TB in the United States. Surveillance for LTBI would then become an increasingly important tool for monitoring this intervention.

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Le Massachusetts est l'un des cinq états qui exige la déclaration de l'infection tuberculeuse latente (LTBI). Nous avons évalué les données de surveillance de la LTBI au Massachusetts de 2006 à 2008 afin de décrire le système et d'étudier les caractéristiques des patients. En trois ans, 15 301 cas ont été rapportés (4742 à 5398 par an). Parmi les 11 655 patients dont le pays d'origine était connu, 9983 (85,7%)

étaient nés à l'étranger. Il est probable que ce système de déclaration et de surveillance est déficient, car la déclaration obligatoire ne paraît pas suffire à la détection de la LTBI. L'élimination de la tuberculose aux Etats-Unis pourrait nécessiter de mettre l'accent sur le dépistage ciblé, la surveillance active de la LTBI ou une surveillance basée sur les examens de laboratoire.

Massachusetts es uno de los cinco estados en los cuales la notificación de la infección tuberculosa latente (LTBI) es obligatoria. En el presente estudio se evaluaron los datos de la vigilancia de esta afección entre el 2006 y el 2008, con el objeto de describir el sistema de vigilancia y examinar las características de las personas con diagnóstico de LTBI en Massachusetts. Durante el período de 3 años del estudio se notificaron 15 301 casos (de 474 a 5398 por año). De los casos en los cuales se conocía el país de origen

($n = 11\,655$), 9983 personas habían nacido en el extranjero (85,7%). Es muy probable que exista una considerable deficiencia en la verificación y la notificación; la declaración obligatoria no parece una medida suficiente para detectar la LTBI. Se precisa una intensificación de las pruebas diagnósticas dirigidas, una vigilancia activa o una vigilancia de laboratorio de esta afección, con el propósito de eliminar la enfermedad tuberculosa en los Estados Unidos de América.