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Tuberculosis in Jails and Prisons: United States, 2002–2013

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Abstract

Objectives—To describe cases and estimate the annual incidence of tuberculosis in correctional facilities.

Methods—We analyzed 2002 to 2013 National Tuberculosis Surveillance System case reports to characterize individuals who were employed or incarcerated in correctional facilities at time they were diagnosed with tuberculosis. Incidence was estimated with Bureau of Justice Statistics denominators.

Results—Among 299 correctional employees with tuberculosis, 171 (57%) were US-born and 82 (27%) were female. Among 5579 persons incarcerated at the time of their tuberculosis diagnosis, 2520 (45%) were US-born and 495 (9%) were female. Median estimated annual tuberculosis incidence rates were 29 cases per 100 000 local jail inmates, 8 per 100 000 state prisoners, and 25 per 100 000 federal prisoners. The foreign-born proportion of incarcerated men 18 to 64 years old increased steadily from 33% in 2002 to 56% in 2013. Between 2009 and 2013, tuberculosis screenings were reported as leading to 10% of diagnoses among correctional employees, 47% among female inmates, and 42% among male inmates.

Conclusions—Systematic screening and treatment of tuberculosis infection and disease among correctional employees and incarcerated individuals remain essential to tuberculosis prevention and control.

Mycobacterium tuberculosis transmission among correctional staff and inmates,[1–4] with additional transmission to the community (including family and friends,[5,6] children,[6,7] and patients and staff of outside health care facilities[8]), has been well documented. However, quantifying the magnitude of the tuberculosis (TB) problem in jails and prisons is complicated by varying case-finding procedures across different settings, frequent inmate

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The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

CONTRIBUTORS

L. A. Lambert, L. R. Armstrong, A. M. France, and M. B. Haddad originated and designed this analysis. L. A. Lambert and M. B. Haddad prepared the first draft of the article. All of the authors helped interpret the results and provided critical revisions to the article.

HUMAN PARTICIPANT PROTECTION

No protocol approval was needed for this examination of existing surveillance data.

transfers, unpredictable lengths of stay, high rates of recidivism, and challenges of maintaining continuity of care after release.[9,10]

Jails are facilities operated at the city or county level. Local jails typically confine individuals awaiting a court hearing, serving a sentence of less than 1 year, or anticipating transfer to prison. Prisons are longer-term facilities operated under the legal authority of state departments of corrections or the Federal Bureau of Prisons. Prisons typically hold individuals with sentences of more than 1 year. Whereas a local jail detention might range from hours to months, state imprisonment averages approximately 3 years and federal imprisonment approximately 5 years.[11,12]

US Immigration and Customs Enforcement (ICE), under the US Department of Homeland Security, has at least 30 000 people in custody at any given time while they are undergoing administrative immigration proceedings.[13] Sixty-seven percent of ICE detainees are housed in local or state facilities under agreements with the operators of those facilities, and an additional 3% are in Federal Bureau of Prisons facilities. The remainder are in facilities owned (13%) or contracted (17%) by ICE. Individuals in ICE custody are detained for an average of 27 days.[13]

In a previous study, we estimated median annual TB incidence rates of 54 cases per 100 000 local jail inmates, 17 per 100 000 state prisoners, and 30 per 100 000 federal prisoners during 1993 to 2003.[14] The epidemiology of TB in the United States as a whole has shifted since that period such that the majority (66%) of new TB cases now occur among people born in other countries,[15,16] leading to a greater emphasis on detecting and treating preexisting latent TB infections in foreign-born residents of the United States.[17,18] If the epidemiology of TB in US jails and prisons has similarly shifted to involve more foreign-born individuals, the choice of TB prevention and control strategies in correctional facilities might also need to be modified.[10,19]

In this national update to our previous study, we estimated annual TB incidence among inmates of local jails and state and federal prisons between 2002 and 2013. We describe characteristics of people who were incarcerated at the time their TB diagnostic evaluations began. We also describe TB cases that occurred during the same 12-year period among correctional employees.

METHODS

Our primary data source was the National Tuberculosis Surveillance System, through which the District of Columbia and the 50 US states report verified TB cases to the Centers for Disease Control and Prevention.[15,20] We identified all individuals reported as employed in a correctional facility within the 12 months before their TB diagnosis and all people reported as incarcerated at the time their TB diagnostic evaluation began. In the National Tuberculosis Surveillance System, individuals are categorized as incarcerated only if they are considered a detainee or inmate when the TB diagnostic evaluation begins. Data on length of incarceration are unavailable; people are not reclassified if they become incarcerated during TB treatment. In the case of incarcerated individuals, but not employees,

the type of correctional facility is also reported. These types of facilities include local jails, state prisons, federal prisons, and a category labeled “other,” a classification that includes ICE detention facilities and other facilities.[20]

New surveillance variables were added in 2009, including whether the TB patient also has diabetes and the primary reason for the initial medical evaluation that led to the TB diagnosis. Choices for reason evaluated are mutually exclusive. The TB disease symptoms classification means that the person sought medical attention because of TB symptoms (i.e., symptoms were not found through a contact investigation or a routine screening). Routine TB screening means that the person had a positive test result for TB infection as part of nonoccupational screening focused on specific groups at higher risk for TB (i.e., targeted testing), which could include an intake assessment for residents of correctional facilities. Other reasons for the diagnosis (e.g., including an incidental finding from a chest radiograph or the results of a laboratory test ordered without suspicion of TB disease) are also options.[20]

Estimated Tuberculosis Incidence by Type of Facility

To estimate annual TB incidence among incarcerated individuals by type of correctional facility (i.e., local jail or state or federal prison), we used a methodology similar to that used to calculate TB incidence in the Centers for Disease Control and Prevention’s annual TB report[15] after applying a steady-state assumption (i.e., stable daily average number of inmates). As with our previous report,[14] we used data from the US Bureau of Justice Statistics for denominators in our incidence estimates. The bureau’s Annual Survey of Jails provided midyear numbers of individuals in local jails.[21] Annual data collected from state departments of corrections and the Federal Bureau of Prisons provided year-end numbers of people in state and federal prisons.[22] However, these data sources do not provide information on country of origin; therefore, we were not able to distinguish between US-and foreign-born inmates in our incidence estimates.

Case Characteristics and Analysis

More than 90% of the incarcerated individuals included in our analysis were male, which is consistent with the preponderance of men aged 18 to 64 years in the incarcerated population in the United States.[21,22] Therefore, here we focus on men in this age group and provide only a brief description of results among incarcerated women, juvenile men, and older men with TB. In our analyses, we examined clinical characteristics of TB patients (e.g., previous TB diagnosis, disease site, and drug resistance). Demographic characteristics assessed included country of origin, self-reported race/ethnicity, and available social risk factors (i.e., homelessness and substance use during the 12 months before TB diagnosis). Complete data were available for more than 90% for all examined variables with the exception of substance use among foreign-born individuals and HIV co-infection.

Because the epidemiology of TB differs markedly between US- and foreign-born individuals,[15,16,18,23] we stratified these 2 groups when comparing characteristics between incarcerated and nonincarcerated men aged 18 to 64 years during 2002 to 2013. Using logistic regression to estimate adjusted effects of age group, race/ethnicity, HIV infection,

homelessness, and substance use, we modeled the odds of being incarcerated at the time of TB diagnosis. Prevalence odds ratios and 99% confidence intervals were calculated to compare differences in magnitudes of associations.

We noted marked differences by type of correctional facility in estimated TB incidence, foreign-born proportions, and reasons for TB evaluation. Therefore, we further partitioned the men in these types of facilities as 3 distinct populations to allow additional descriptions. We used SAS version 9.3 (SAS Institute Inc, Cary, NC) in conducting all of our analyses.

RESULTS

During 2002 through 2013, 35 US states reported 299 TB cases among people employed in correctional facilities, and every state other than Vermont and Wyoming reported at least 1 TB case in a correctional facility inmate (n = 5579 cases).

Correctional Employees With Tuberculosis

The median age of correctional employees with TB was 44 years (range = 20–82); 171 (57%) of these 299 employees were US-born, and 82 (27%) were women. Eleven (4%) were either dead at TB diagnosis or died during treatment; their median age was 50 years (range = 33–71) at time of death.

Eighty-one (96%) of the 84 correctional employees with TB during 2009 through 2013 had information reported about the circumstances leading to the TB diagnosis: 40 (49%) self-presented for medical attention because of TB disease symptoms, 25 (31%) were reported as having TB diagnosed incidentally, 9 (11%) were identified through a TB screening or other occupational testing, and 7 (9%) were identified through contact investigations after a known TB exposure.

Incidence by Location and Type of Facility

Four large states (California, Texas, Florida, and New York) reported the majority (57%) of the 5579 TB cases among correctional facilities (n = 3190). In Arizona and Georgia, more than 200 cases each occurred in detention or correctional facilities. Nearly half of the cases reported (n = 2577) were among foreign-born individuals; the most frequent countries of origin were Mexico (n = 1489), Honduras (n = 289), Guatemala (n = 180), and El Salvador (n = 130). Approximately half (n = 2674, or 48%) of all cases nationally occurred in local jails, 1234 (22%) occurred in state prisons, and 594 (11%) occurred in federal prisons. Another 915 (16%) were classified as occurring in the “other facility” category, which would include ICE detention facilities.[20] Data on facility type were missing or unknown for the remaining 162 cases (3%).

The estimated annual TB incidence during 2002 to 2013 was lower for state prisoners (3–10 cases per 100 000 inmates; median = 8) than for federal prisoners (18–36 cases per 100 000; median = 25) and local jail inmates (24–37 cases per 100 000; median = 29; Table 1). Meanwhile, the overall national TB incidence decreased from 5.2 cases per 100 000 population in 2002 to 3.0 per 100 000 in 2013.[15]

Female Inmates With Tuberculosis

Of the 5579 individuals incarcerated at the time of TB diagnosis during 2009 through 2013, 495 (9%) were female. Among these female inmates, 369 (75%) were US-born, 9 (2%) were younger than 18 years, and 8 (2%) were older than 64 years. The 2 most common types of correctional facilities were local jails (n = 268, or 54%) and state prisons (n = 103, or 21%). Among the 154 (31%) female inmates with information about the circumstances leading to their TB diagnosis, the most common means of diagnosis was a routine TB screening (47% of diagnoses were the result of targeted testing).

Juvenile and Older Men With Tuberculosis

Of the 5084 male inmates with TB, 40 (< 1%) were younger than 18 years and 84 (2%) were older than 64 years. After exclusion of an additional 26 men with TB whose age or country of birth was unknown, data for 4934 inmates remained for subsequent analysis.

Demographic Trends Among Incarcerated Adult Men

Among the 4934 men aged 18 to 64 years with TB diagnosed during incarceration, the proportion who were foreign-born was 33% in 2002 and then steadily increased, surpassing the US-born proportion in 2008 and reaching 56% in 2013 (Figure 1). Foreign-born incarcerated men with TB tended to be younger (median = 33 years) than US-born incarcerated men with the disease (median = 41 years).

Among the 4934 men, 2087 (42%) were foreign-born Hispanics, 1373 (28%) were US-born non-Hispanic Blacks, 594 (12%) were US-born non-Hispanic Whites, and 459 (9%) were US-born Hispanics. Among the 2414 foreign-born men, 2073 (86%) had a reported US arrival date; 1083 (52%) of these men had arrived within a year of their diagnosis.

Culture confirmation of *M. tuberculosis* was available for 79% of the inmates with TB diagnoses; also, in 97% of these cases, drug susceptibility results were available for isoniazid and rifampin. Approximately 1% of the men demonstrated resistance to isoniazid and rifampin (i.e., they exhibited multidrug-resistant TB).

Among the male inmates during 2009 through 2013 for whom diabetes status and evaluation reason were reported, 4% had diabetes (lower than the overall national prevalence of 15% among TB patients[15]), and 42% of TB diagnoses were reported as being the result of routine TB screening procedures (i.e., targeted testing). Adjusted analyses showed that previous TB and substance use were associated with incarceration at the time of TB diagnosis (Table 2).

Differences by Facility Type Among Incarcerated Men

During 2002 through 2013, 2357 (48%) of the 4934 male inmates aged 18 to 64 years with TB diagnosed during incarceration were housed in local jails. A total of 359 (27%) of the 1335 US-born men and 151 (15%) of the 1022 foreign-born men with TB diagnosed while in a local jail had been homeless during the preceding year. Among the 877 foreign-born jail inmates with a reported date of arrival in the United States, 320 (36%) had entered the country within a year before their diagnosis.

Of the 4934 male inmates with TB, 1079 (22%) were in state prisons. The majority of these inmates (86%) were US-born. Fewer than 7% of state prisoners with TB had experienced homelessness in the past year.

A smaller number of inmates (n = 554, or 11%) were housed in federal prisons. The majority (76%) were foreign-born. Among the 363 foreign-born federal prisoners with a reported US arrival date, 206 (57%) had arrived within a year before their diagnosis.

DISCUSSION

Although TB incidence nationally[15] and in jails and prisons[14] declined steadily between 1993 and 2013, incarcerated populations continue to experience TB at a substantially higher incidence than in the general population. Local jails remain the facilities with both the largest number and highest incidence of TB cases. Although federal facilities still report the fewest TB cases, the estimated incidence in those facilities was similar to that in local jails owing to their relatively smaller populations. State prisons have sustained a steady decline in TB incidence, now approaching that of the overall US population; however, they still contribute a substantial number of TB cases among incarcerated individuals in the United States.

The preponderance of TB patients in state prisons, where TB incidence was lowest, are US-born. Although length of incarceration was not a surveillance variable, the 7% prevalence of recent homelessness among state prisoners might indicate that their incarcerations are more longstanding at the time of their TB diagnosis. A longer history of incarceration might be associated with previous access to TB control efforts such as treatment of latent TB infection.[10,17,24]

The higher TB incidence in local jails and federal prisons appears to correspond to higher proportions of foreign-born individuals receiving TB diagnoses during incarceration, often within months of their arrival in the United States. Recent arrival in the United States is well established as a risk factor for TB disease.[18,23] Our findings also demonstrate successful TB case detection procedures for recently arrived foreign-born inmates in local jails and federal prisons, which would signal progress since the early 1990s, when reports described transmission resulting from TB cases that were not recognized during intake.[5,24–26]

Limitations

Our analysis is subject to certain limitations. For example, TB associated with recent arrival was likely underascertained among foreign-born individuals because the United States includes TB cases in national surveillance counts only if a person with a verified TB diagnosis has been or plans to remain in the United States for at least 90 days.[20] Because the National Tuberculosis Surveillance System currently defines incarceration status only on the basis of when the TB diagnostic evaluation began,[20] we have underestimated the proportion of TB cases associated with incarceration. Conversely, successful active case finding during routine intake procedures might help detect TB cases sooner than they would have been detected in the general community.

Because we used numbers from the US Bureau of Justice Statistics[21,22] as the denominators for our annual incidence estimates, we had to assume that the bureau's data on midyear numbers of individuals in local jails and year-end numbers of individuals in state and federal prisons were valid approximations of the total number of person-years represented by each of those 3 populations for the calendar year in question. However, owing to rapid inmate turnover, the cumulative number of people who undergo TB screenings upon intake into a correctional facility each year is far higher than the average daily number of inmates would imply. Finally, surveillance data for certain variables were missing, particularly in the case of foreign-born incarcerated men (e.g., data on substance use and HIV status).

Conclusions

In addition to detecting and treating active TB disease at intake, correctional facilities offer a venue for identifying individuals with TB infection and offering them treatment, if indicated, to prevent later progression to active TB.[24] Although the standard 9-month isoniazid and 4-month rifampin regimens for treating latent TB infection are still options,[17] the shorter course regimen recommended in 2011 (i.e., isoniazid and rifapentine administered once weekly for 12 weeks via directly observed therapy)[27] can be a particularly favorable option to implement on a larger scale in correctional facilities. This 12-dose isoniazid–rifapentine regimen, which quadrupled treatment completion in an urban jail after its introduction in 2012,[28] is now the standard of care for the Federal Bureau of Prisons[29] and is less hepatotoxic and more cost-effective than 9 months of daily isoniazid for latent TB infection.[30,31]

After baseline testing for infection with *M. tuberculosis*, employees of correctional facilities that house substantial numbers of inmates with TB risk factors (e.g., HIV, foreign country of birth) should receive TB screening at least annually.[10] When institutional TB prevention and care procedures are ineffective, *M. tuberculosis* transmission to correctional employees is an occupational health concern.[10] A 1990s TB outbreak in a jail in Tennessee included 5 correctional officers.[2] In 2004 in Florida, 5 TB cases were identified among correctional staff (1 secretary and 4 officers).[3] In 2009 in Texas, a missed TB diagnosis led to 3 TB cases among staff guarding a local jail inmate while he was hospitalized.[8] Although correctional employees and health care providers serving incarcerated populations are at increased risk of TB exposure,[1–3,8] our analysis suggests that TB case ascertainment among correctional employees was rarely attributable to employment-related TB testing or contact investigation activities.

Given the typical rapid inmate turnover within jails and frequent transfers among prisons,[10,32] *M. tuberculosis* transmission beyond jails and prisons into the surrounding community and even more distant areas can occur when prompt and effective TB screening procedures, followed by effective treatment of both TB disease and infection, are lacking.[5–8,24,32] During the 1990s, one county in New York diagnosed 40 TB cases among current or former inmates, 1 case in a correctional officer, and 8 cases among individuals exposed in the community.[5] In more recent TB outbreaks that have spread from the state prison system to communities in Arkansas[4] and Tennessee,[6] inmates either had been

released before treatment of latent TB infection could be completed[4] or were known to have been recently infected but did not receive treatment.[6]

Public Health Implications

Prevention and cure of TB among incarcerated individuals require more focused attention in the United States, especially because the epidemiology of TB in jails and prisons is shifting to involve more people recently arriving from countries with a higher prevalence of TB, which lends itself to a greater emphasis within correctional facilities, as in the general community, on detecting and treating preexisting TB infection.[17,18] Systematic screening and treatment of both TB disease and TB infection among inmates and correctional employees can benefit those individuals as well as the broader community.

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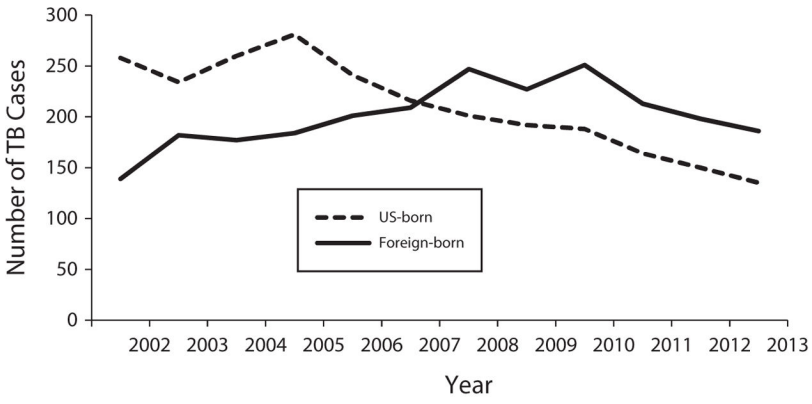

FIGURE 1.

Men Aged 18–64 Years Who Were Incarcerated at the Time of Their Tuberculosis Diagnosis, by Birth Origin: United States, 2002–2013

TABLE 1

Estimated Annual Tuberculosis (TB) Incidence Among Male and Female Inmates of Any Age at the Time of Diagnosis: United States, 2002–2013

Year	Local Jails			State Prisons			Federal Prisons			Overall National TB Incidence per 100 000[c]
	No. of TB Cases	No. of Inmates[a]	Estimated TB Incidence per 100 000 Inmates	No. of TB Cases	No. of Inmates[b]	Estimated TB Incidence per 100 000 Inmates	No. of TB Cases	No. of Inmates[b]	Estimated TB Incidence per 100 000 Inmates	
2002	242	665 475	36	122	1 276 616	10	41	163 528	25	5.2
2003	255	691 301	37	83	1 295 542	6	63	173 059	36	5.1
2004	243	713 990	34	130	1 316 772	10	58	180 328	32	5.0
2005	277	747 529	37	134	1 338 292	10	35	187 618	19	4.8
2006	249	765 819	33	109	1 375 628	8	42	193 046	22	4.6
2007	216	780 174	28	103	1 397 217	7	64	199 618	32	4.4
2008	215	785 533	27	107	1 407 002	8	51	201 280	25	4.2
2009	219	767 434	29	99	1 407 369	7	42	208 118	20	3.8
2010	203	748 728	27	116	1 404 032	8	48	209 771	23	3.6
2011	198	735 601	27	107	1 382 606	8	40	216 362	18	3.4
2012	178	744 524	24	77	1 352 582	6	59	217 815	27	3.2
2013	179	731 208	24	47	1 358 875	3	51	215 866	24	3.0
Annual median			29			8			25	4.4

[a] Numbers were derived from Minton and Zeng.[21]

[b] Numbers were derived from Carson.[22]

[c] Data were derived from the Centers for Disease Control and Prevention.[15]

TABLE 2

Characteristics of Men Aged 18–64 Years, by Birth Origin and Incarceration Status at the Time of Tuberculosis Diagnosis: United States, 2002–2013

Characteristic	US-Born (n = 27 873)				Foreign-Born (n = 40 140)			
	Incarcerated (n = 2 520), No. (%)	Not Incarcerated (n = 25 353), No. (%)	Unadjusted OR for Incarceration (99% CI)	Adjusted[a] OR for Incarceration (99% CI)	Incarcerated (n = 2 414), No. (%)	Not Incarcerated (n = 37 726), No. (%)	Unadjusted OR for Incarceration (99% CI)	Adjusted[a] OR for Incarceration (99% CI)
Age group, y								
18–29	537 (21)	3 108 (12)	5.6 (4.2, 7.6)	4.6 (3.3, 6.4)	897 (37)	10 512 (28)	7.9 (4.9, 12.8)	3.9 (2.3, 6.8)
30–39	598 (24)	3 616 (14)	5.4 (4.0, 7.2)	4.6 (3.3, 6.3)	796 (33)	9 325 (25)	7.9 (4.9, 12.8)	4.6 (2.7, 7.8)
40–49	807 (32)	7 408 (29)	3.5 (2.6, 4.7)	3.1 (2.3, 4.3)	506 (21)	8 115 (22)	5.8 (3.6, 9.4)	3.6 (2.1, 6.3)
50–59	488 (19)	8 297 (33)	1.9 (1.4, 2.6)	1.7 (1.2, 2.4)	185 (8)	6 982 (19)	2.5 (1.5, 4.1)	1.8 (1.0, 3.2)
60–64	90 (4)	2 924 (12)	1 (Ref)	1 (Ref)	30 (1)	2 792 (7)	1 (Ref)	1 (Ref)
Race/ethnicity								
Non-Hispanic White	594 (24)	8 541 (34)	1 (Ref)	1 (Ref)	52 (2)	1 634 (4)		
Non-Hispanic Black	1 373 (55)	12 153 (48)	1.6 (1.4, 1.9)	1.4 (1.2, 1.6)	101 (4)	5 463 (14)		
Non-Hispanic Asian	16 (<1)	392 (2)	0.6 (0.3, 1.1)	0.4 (0.2, 1.0)	161 (7)	14 228 (38)		
Hispanic	459 (18)	3 218 (13)	2.1 (1.7, 2.4)	1.5 (1.3, 1.8)	2 087 (86)	15 980 (42)	8.9 (7.6, 10.4)[b]	7.6 (6.2, 9.2)[b]
Other, multiple, or missing[c]	78 (3)	1 049 (4)	1.1 (0.8, 1.5)	0.8 (0.6, 1.2)	13 (<1)	421 (1)		
Previous TB diagnosis	138 (5)	1 301 (5)	1.1 (0.8, 1.4)	1.3 (1.0, 1.6)	156 (6)	1 732 (5)	1.4 (1.2, 1.8)	1.8 (1.4, 2.4)
Anatomic site of disease								
Pulmonary only	1 988 (79)	19 669 (78)	1.0 (0.9, 1.2)		2 201 (91)	25 919 (69)	6.1 (4.7, 7.8)	
Extrapulmonary only	333 (13)	3 379 (13)	1 (Ref)		110 (5)	7 852 (21)	1 (Ref)	
Both sites	197 (8)	2 292 (9)	0.9 (0.7, 1.0)		103 (4)	3 940 (10)	1.9 (1.3, 2.7)	
Pulmonary TB								
Positive acid-fast bacilli sputum smear	917 (42)	12 336 (56)	0.5 (0.5, 0.6)		836 (36)	15 553 (52)	0.5 (0.4, 0.6)	
Cavitary disease[d]	545 (25)	8 102 (37)	0.6 (0.5, 0.7)		505 (22)	9 122 (31)	0.6 (0.6, 0.7)	
HIV status known[e]	2 075 (82)	20 530 (81)			1 714 (71)	26 159 (69)		
Positive test result	407 (20)	3 973 (20)	1.0 (0.9, 1.2)	0.7 (0.6, 0.9)	138 (8)	3 006 (11)	0.7 (0.5, 0.9)	0.5 (0.4, 0.7)

Characteristic	US-Born (n = 27 873)				Foreign-Born (n = 40 140)			
	Incarcerated (n = 2 520), No. (%)	Not Incarcerated (n = 25 353), No. (%)	Unadjusted OR for Incarceration (99% CI)	Adjusted[a] OR for Incarceration (99% CI)	Incarcerated (n = 2 414), No. (%)	Not Incarcerated (n = 37 726), No. (%)	Unadjusted OR for Incarceration (99% CI)	Adjusted[a] OR for Incarceration (99% CI)
Negative test result	1 668 (80)	16 557 (81)	1 (Ref)[e]	1 (Ref)[a]	1 576 (92)	23 153 (89)	1 (Ref)[e]	1 (Ref)[a]
Dead at diagnosis of TB	38 (2)	621 (2)	0.6 (0.4, 0.9)		3 (<1)	336 (<1)	0.1 (0.03, 0.6)	
Homelessness status								
Homeless[f]	458 (18)	4 586 (18)	1.0 (0.9, 1.2)	1.0 (0.9, 1.2)	235 (10)	1 574 (4)	2.8 (2.3, 3.3)	1.6 (1.2, 2.1)
Status missing/unknown	44 (2)	209 (<1)			235 (10)	253 (<1)		
Alcohol use status								
Excess alcohol use[f]	824 (33)	9 014 (36)	0.9 (0.8, 1.0)	0.7 (0.6, 0.8)	570 (24)	4 607 (12)	2.6 (2.3, 3.0)	0.9 (0.7, 1.1)
Missing/unknown	102 (4)	533 (2)			299 (12)	599 (2)		
Drug use status								
Non-IDU[f]	847 (34)	5 293 (21)	2.0 (1.8, 2.2)	1.7 (1.4, 1.9)	524 (22)	1558 (4)	7.5 (6.5, 8.7)	3.8 (3.1, 4.7)
Non-IDU status missing/unknown	111 (4)	673 (3)			307 (13)	682 (2)		
IDU[f]	254 (10)	1 339 (5)	2.1 (1.7, 2.5)	1.7 (1.4, 2.2)	142 (6)	301 (<1)	8.8 (6.7, 11.6)	2.8 (1.9, 4.1)
IDU status missing/unknown	122 (5)	631 (2)			304 (13)	606 (2)		

Note. CI = confidence interval; IDU = injection drug use; OR = odds ratio. As a result of rounding, percentages might not sum to 100%.

[a]The adjusted models were based on the 24 219 (86.9%) US-born and 30 211 (75.3%) foreign-born men with known age, self-reported race/ethnicity, previous TB status, HIV test result, homelessness status, and substance use status (i.e., complete reporting of those variables for the individual TB case record, permitting inclusion of HIV test refusal, HIV test not offered, indeterminate HIV result, or HIV test done but with an unknown result). Except for the association between incarceration and HIV test not offered (vs the referent of having a negative test result), which had an adjusted odds ratio of 2.5 (99% CI = 1.9, 3.1) among foreign-born men, none of these other HIV classifications were associated with incarceration in either the unadjusted or the adjusted models and are therefore not shown in this table.

[b]The referent group for foreign-born Hispanic men was all foreign-born non-Hispanic men.

[c]The small numbers of men in the American Indian/Alaska Native, Native Hawaiian/Pacific Islander, multiple race, and other/unknown race categories are grouped together.

[d]Cavitary disease status was based on chest radiograph result.

[e]HIV status known was based on having positive or negative HIV test results reported. Percentages for positive and negative HIV test results were based on the total number of men with known HIV status. California reported only positive HIV test results for 2002–2004, no HIV results for 2005–2008, and partial results for 2009–2010; during 2011–2013, HIV status was reported for 92% of California's TB cases. Vermont reported HIV test results for 2002–2006 only. Only the 22 605 (81.1%) US-born men and 27 873 (69.4%) foreign-born men with a positive or negative HIV test result were considered in the unadjusted models (i.e., excluding HIV test refusal, HIV test not offered, indeterminate HIV result, HIV test done but with an unknown result, or missing results for the HIV variable).

[f] Risk factor status was based on the 12-month period before TB diagnosis. The referent group for odds ratios excludes men whose risk factor status was missing/unknown.