

## 2018 Annual Report Slide Set

Slide 1. Tuberculosis in the United States—National Tuberculosis Surveillance System, Highlights from 2018. This slide set was prepared by the Division of Tuberculosis Elimination, National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention (NCHHSTP), Centers for Disease Control and Prevention (CDC), U.S. Department of Health and Human Services (HHS). It provides recent trends and highlights of data collected through the National Tuberculosis Surveillance System (NTSS) for 2018. Since 1953, through the cooperation of state and local health departments, CDC has collected information on newly reported cases of tuberculosis (TB) disease in the United States. The data presented here were collected by the revised TB case report introduced in 2009. Each individual TB case report (Report of Verified Case of Tuberculosis, or RVCT) is submitted electronically to CDC. The data for this slide set are based on TB case reports for 1993–2018 received by CDC as of June 6, 2019. All case counts and rates for years 1993–2017 have been updated and data from 2018 have been added.

Slide 2. During 2018, the United States reported the lowest number of TB cases (9,025) and lowest incidence rate (2.8 cases per 100,000 persons) on record. With the exception of 2015, in which there were increases, the U.S. TB case count and incidence rate have declined every year since 1992.

Slide 3. The annual incidence rate decrease (–1.3%) from 2017 to 2018 and percent decrease in case count (–0.7%, not shown) is the smallest year-to-year decrease since 1993, excluding increases in 2015.

Slide 4. The National Vital Statistics System reported 515 TB-related deaths (0.2 deaths per 100,000 persons) for 2017, the most recent year for which data are available. This represents a 2.5% decrease in deaths and a 3.1% decrease in the mortality rate from 2016, although 2017 deaths remain higher than the historical low of 470 deaths (0.1 deaths per 100,000 persons) reported in 2015.

Slide 5. Among U.S. states, the majority of TB cases continue to be reported from California (23.2%), Texas (12.5%), New York (8.3%), and Florida (6.5%).

Slide 6. When considering incidence rates by reporting area, Alaska (8.5 cases per 100,000 persons) has the highest TB rate, followed by Hawaii (8.4), New York City (6.7), California (5.3), the District of Columbia (5.1), and Texas (3.9).

Slide 7. Among the U.S. territories, incidence rates ranged from 0 (U.S. Virgin Islands, not shown) to 90.4 (Commonwealth of the Northern Marianas Islands). For the 3 freely associated states, reported incidence rates were 54.0 for the Federated States of Micronesia, 65.5 for the Republic of the Marshall Islands, and 94.4 for the Republic of Palau.

Slide 8. Demographic characteristics of TB patients remain similar to previous years, with the majority of reported TB cases occurring among non-U.S.–born persons (6,335 cases; 70.2%); however, the incidence rate among non-U.S.–born persons continues to decrease, with the 2018 rate (14.3 cases per 100,000 non-U.S.–born persons) representing the lowest rate on record. TB cases among U.S.-born persons remained virtually level from 2017 to 2018 at 2,666 cases (29.5%) and 1.0 cases per 100,000 U.S.-born persons.

Slide 9. The most common countries of birth among non-U.S.–born TB patients remained similar to previous years, with Mexico (18.9%) the most frequently reported country of birth, followed by the Philippines (12.3%), India (9.9%), Vietnam (8.0%), and China (6.0%).

Slide 10. The countries of birth with the highest U.S. incidence rates are the Republic of the Marshall Islands (160.4 cases per 100,000 Marshallese), followed by the Republic of the Congo (156.8 cases per 100,000 Congolese), Somalia (100.4 cases per 100,000 Somalians), and Bhutan (90.8 cases per 100,000 Bhutanese). U.S.

population estimates by country of birth were used for the denominator and were obtained from the U.S. Census Bureau, American Community Survey (ACS) Public Use Microdata Sample data, 2013–2017, 5-year file.

Slide 11. Almost 15% of cases among non-U.S.–born persons are diagnosed within 1 year of arrival in the United States. TB patients born in countries with particularly high percentages of cases diagnosed among persons who arrived in the United States <1 year before diagnosis include the Republic of the Congo (40%), the Dominican Republic (35.7%), Afghanistan (34.1%), and Honduras (34.0%).

Slide 12. In 2018, non-Hispanic Asians continue to represent the largest proportion of TB patients (3,190 cases; 35.3%), followed by Hispanics (2,617 cases; 29.0%), non-Hispanic blacks (1,799 cases; 19.9%), and non-Hispanic whites (1,074; 11.9%).

Slide 13. When expressed as incidence rates, non-Hispanic Native Hawaiians/other Pacific Islanders had the highest incidence rate (20.0 cases per 100,000 Native Hawaiians/other Pacific Islanders), followed by non-Hispanic Asians (17.0 cases per 100,000 Asians). Non-Hispanic blacks (4.4 cases per 100,000 blacks), Hispanics (4.4 cases per 100,000 Hispanics), and non-Hispanic American Indians/Alaska Natives (4.3 cases per 100,000 American Indians/Alaska Natives) were essentially similar in rate, with multiple race (0.8 cases per 100,000 persons) and non-Hispanic whites (0.5 cases per 100,000 whites) having the lowest incidence rates. Downward trends continued among non-Hispanic Asians and non-Hispanic blacks. However, incidence rates remained essentially unchanged from 2017 among all other racial/ethnic groups.

Slide 14. The distribution of TB patients by race/ethnicity continued to differ markedly by origin of birth. Among U.S.-born TB patients, the largest racial/ethnic group was non-Hispanic blacks (35.7%), followed by non-Hispanic whites (30.3%), Hispanics (22.1%), and non-Hispanic Asians (5.1%). Approximately half of TB cases reported among non-U.S.–born persons occurred among non-Hispanic Asians (48.1%), followed by Hispanics (31.9%), non-Hispanic blacks (13.4%), and non-Hispanic whites (4.2%).

Slide 15. Distribution of TB patients by age group remains similar to past years, with a plurality of cases occurring among persons aged 25–44 years (2,728 cases; 30.2%), followed closely by persons aged 45–64 years (2,694 cases; 29.9%) and persons aged ≥65 years (2,354 cases; 26.1%). In contrast, only 1,246 cases (13.8%) occurred among children and young adults aged <25 years.

Slide 16. Incidence rates by age group did not follow the proportionate distribution, however. The oldest age group (≥65 years) had the highest incidence rate overall (4.5 cases per 100,000 persons), and the incidence rate generally decreased with decreasing age. However, the youngest group (0–4 years) had an incidence rate approximately twice that of the second youngest group (5–14 years). This observation might be attributable to cohorts with increased risk for TB exposure and infection, compared with the present, moving through time into older age groups. Of note, among non-Hispanic Native Hawaiians/other Pacific Islanders, the incidence rate for persons aged ≥65 years is lower than the next 2 younger age groups (24.1 cases per 100,000 persons aged 45–64 years and 21.7 cases per 100,000 persons aged 25–44 years).

Slide 17. Men continued to represent the majority (61.2%) of TB patients overall, although the male:female ratio is close to 1 among children aged ≤14 years. This might indicate that the factors that cause men to be disproportionately represented among TB patients might become more influential in adulthood. The overrepresentation of men also was somewhat greater among U.S.-born persons (64.5% male), compared with non-U.S.–born persons (59.9% male).

Slide 18. Overall, the number of TB cases in all pediatric age groups has decreased from 1993 through 2018. The most notable drop has been among the toddler/preschool group (age 1–4 years).

Slide 19. In contrast to overall U.S. TB cases, where over two-thirds of cases are among non-U.S.–born persons, only 82 cases (22.0%) of pediatric cases are among non-U.S.–born children, and the fraction has been fairly stable (21–30%) since 1993.

Slide 20. Since 2010, the ability to identify the origin of birth for parents/guardians of pediatric cases of TB has been available for all jurisdictions. For this timeframe, the majority of U.S.-born pediatric TB (175 cases; 60.3%) has been among patients where at least one parent/guardian was non-U.S.–born.

Slide 21. The majority of U.S. TB cases continued to be verified through positive culture (7,062 cases; 78.2%), with other laboratory-confirmation methods (i.e., nucleic acid amplification or smear microscopy) only representing a limited proportion of verified cases (314 cases; 3.5%). In the absence of laboratory confirmation, 1,252 cases (13.9%) were confirmed by meeting the clinical criteria for a verified TB case; this percentage continued to decrease as proportionately more cases were verified through laboratory techniques.

Slide 22. A vast majority of U.S. TB cases had pulmonary involvement (79.6%). Among the 20.4% of US TB cases with only extrapulmonary involvement, TB of the lymphatic system remained most common (36.9%), followed by TB of the pleura (16.9) and TB of bones and joints (9.6%). TB meningitis, a particularly serious form of the disease, continued to decrease, with only 3.8% of extrapulmonary cases involving the meninges. “Other” includes all other extrapulmonary sites of disease, e.g., ocular, hepatic.

Slide 23. During 2018, 81.5% of all reported TB cases were started on HRZE, and an additional 11.9% of cases were started on a different 4-drug regimen.

Slide 24. During 2016, the most recent year with treatment completion data available, 64.0% of cases were treated exclusively by using DOT, whereas an additional 30.3% of patients received a combination of DOT and self-administered treatment.

Slide 25. The vast majority (89.2%) of patients in 2016 who were eligible, completed treatment within 1 year of diagnosis. An additional 6.4% of these patients completed treatment >1 year after diagnosis.

Slide 26. In 2018, 605 isoniazid-resistant TB cases were reported in the United States, a 3% decrease from 625 cases during 2017. However, as a percentage of all TB cases, the proportion that were resistant to isoniazid has remained relatively steady at approximately 9%. The trend in the proportion of U.S.-born TB cases with isoniazid resistance remained relatively constant at 5.6% as did the trend for non-U.S.–born cases at 10.9%.

Slide 27. Small case counts for multidrug-resistant (MDR) TB cases reported in the United States cause variability in numbers and percentage year to year. In 2018, a previous notable increase in MDR TB cases (from 97 cases during 2016 to 128 cases during 2017) was reversed, with 98 MDR TB cases being reported for 2018. The percentage of all MDR cases occurring among persons with no previous history of TB disease (i.e., primary MDR TB) has remained steady for the past several years at approximately 1%.

Slide 28. Coinfection with HIV is a major risk factor for progression of latent TB infection to TB disease. Starting in this edition of the report, we are limiting HIV coinfection trend data to 2011–2018 because HIV status data before 2011 had <90% completeness and data were most likely not missing at random, which can result in overestimation of HIV coinfection. Among 2018 cases that were alive at diagnosis, HIV status was known for 87.9%, and 5.1% of persons with known HIV status were coinfecting with HIV. Among TB cases diagnosed in persons 25–44 years of age, 92.4% had known HIV status, and 8.3% of these persons were HIV positive.

Slide 29. Among reported risk factors for TB, diabetes mellitus (19.8%) was most commonly reported, followed by having been a close contact of a person with infectious TB (7.7%) or having an immunocompromising condition other than HIV (7.3%). Having been a contact of a person with infectious TB was proportionately more

common among U.S.-born persons (15.9%), compared with non-U.S.-born persons (4.2%). Diabetes mellitus, however, was proportionately more common among non-U.S.-born persons (22.0%), compared with U.S.-born persons (14.6%).

Slide 30. During 2018, 3.6% of TB cases among persons aged  $\geq 15$  were diagnosed among residents of correctional facilities.

Slide 31. Correctional facilities include federal prisons (11.9% of TB cases diagnosed among residents of correctional facilities during 2018), state prisons (17.4%), local jails (25.8%), juvenile facilities (2.3%), and other facilities (40.6%).

Slide 32. Overall, only 1.7% of 2018 TB cases aged  $\geq 15$  years were diagnosed among long-term-care facility residents. Nationally, 4.3% of all TB cases were diagnosed among persons aged  $\geq 15$  years experiencing homelessness.

Slide 33. Substance misuse is also a TB risk factor. Overall, 1.3% of all 2018 TB patients aged  $\geq 15$  years reported injection-drug use (IDU) during the year preceding diagnosis. Reported use of non-injection drugs among patients aged  $\geq 15$  years was higher (6.8%) than IDU, as was excessive use of alcohol (9.3%).

Slide 34. During 2018, 21.8% of all 2018 TB patients aged  $\geq 15$  years reported being unemployed; an additional 33.7% of TB patients were not seeking employment or were retired.

Slide 35. Successful therapy completion for TB patients is a major performance indicator for TB programs. Among patients during 2016 who were alive at diagnosis, 87.2% had completed TB treatment successfully. However, 6.7% of all patients died before completing TB treatment; 1.3% were lost to follow-up before completing treatment; and 4.5% did not complete treatment for other or unknown reasons. Of note, only 29 patients (0.3%) had to permanently stop TB treatment because of an adverse treatment event.

Slide 36. Among TB cases diagnosed during 2016, a total of 833 (9.0%) patients died, with 315 (37.8%) of those deaths attributed to TB disease or TB treatment. Of the 833 deaths, 206 (24.7%) were dead at the time of TB diagnosis; 33.5% of those deaths were attributed to TB. The remaining 627 (75.3%) deaths occurred after diagnosis; 39.2% of these deaths were attributed to TB.

Slide 37. Time required for a patient's positive sputum culture to convert to negative is a key indicator of treatment effectiveness. Among 5,115 cases during 2016 with positive sputum cultures, 4,215 (82.4%) had documented sputum culture conversion to negative. Among the 809 (15.8%) cases for which sputum culture conversion was undocumented, the most common reason was that the patient had died (30.3%) before sputum culture conversion; however, a substantial proportion of these cases (36.8%) did not have a known reason reported for not having documented sputum culture conversion.

Slide 38. This slide shows the increase in genotyping surveillance coverage from 2004 to 2018. In 2004 the proportion of culture confirmed TB cases with at least one genotyped isolate was 52.6%; in 2018 it was 96.3%. The national goal for genotyping surveillance coverage is 94.0%.

Slide 39. This slide shows the schematic for sequential assignment of unique spoligotypes and initial 12-locus MIRU-VNTR combination or 24-locus MIRU-VNTR combination.

Slide 40. This slide shows the number of county-based TB genotype clusters by the size of the clusters; a genotype cluster is defined as two or more cases with matching spoligotype and 24-locus MIRU-VNTR (GENType) within a county during the specified three-year time period. In the 2016–2018 three-year time period, there were 893 two-case clusters, 224 three-case clusters, 90 four-case clusters, 42 five-case clusters, 33 six-case

clusters, 21 seven-case clusters, 5 eight-case clusters, 12 nine-case clusters, and 29 case clusters that were greater or equal to 10 in size.

Slide 41. Clusters are classified into alert levels on the basis of a log-likelihood ratio (LLR) calculation; clusters with an LLR of  $5 < \text{LLR} < 10$  are classified as a medium alert level, and clusters with an  $\text{LLR} \geq 10$  are classified as a high alert level. Clustered cases were often part of medium- (22.6%) or high-level alerts (18.6%). At the cluster level, 392 (29.1%) of 1,349 clusters identified nationally were either medium- or high-level alerts.

Slide 42. Nationally, CDC attributed 1,712 (12.6%) of 13,601 genotyped cases reported during 2017–2018 to recent transmission.

Slide 43. CDC has provided national estimates of recent transmission and extensive recent transmission throughout a 2-year period since the publication of *Reported Tuberculosis in the United States, 2016*. The number of cases attributed to recent transmission has declined. By comparison, estimates were 1,894 cases during 2015–2016 and 1,712 during 2017–2018.

Slide 44. A greater proportion of genotyped cases were attributed to recent transmission among U.S.-born persons (25.1%) than among non-U.S.-born persons (7.6%). Greater proportions of cases attributed to recent transmission and extensive recent transmission were identified among certain racial groups and among persons with social and behavioral risk factors, compared with national averages.

Slide 45. For more information, please contact Division of Tuberculosis Elimination at <http://www.cdc.gov/tb/>.