

# Tuberculosis in the United States

1993–2017

## National Tuberculosis Surveillance System

**Slide 1 (Title slide). Tuberculosis in the United States—National Tuberculosis Surveillance System, Highlights from 2017.** 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 trends for the recent past and highlights data collected through the National Tuberculosis Surveillance System for 2017. 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 1993–2017 received by CDC as of June 1, 2018. All case counts and rates for years 1993–2016 have been updated and data from 2017 has been added.

**Slide 2. Reported Tuberculosis (TB) Cases and Rates, United States, 1993–2017.** The modern era of TB surveillance began in 1993. Case counts decreased each year from 1993 to 2014, and again in 2016 and 2017. However, in 2015, a slight increase occurred in the total number of TB cases reported in the United States. From 1993 until 2000, TB case counts decreased at an average annual percent change (APC) of -6.24%, and the incidence rate during this period also declined at a similar pace (APC = -7.30%). The rate of decline in case counts slowed during 2000–2007 (APC = -2.83%) with a similar deceleration in the rate of decline of the incidence rate during this period (APC = -3.70%). Declines in case counts accelerated again during 2007–2012 (APC = -5.88%) with a corresponding decrease in the incidence rate during this period (APC = -6.70%). However, since 2012 the rate of decline has slowed considerably with an APC of -1.50% for the case count and an APC of -2.20% for the incidence rate during this period. In 2017, a total of 9,105 cases (incidence rate = 2.8 cases per 100,000 persons) were reported from the 50 states and the District of Columbia (DC). While this represents the lowest case count and incidence rate on record for the United States, the recent slowing of progress toward TB elimination is of concern.

**Slide 3. TB Case Rates, United States, 2017.** Thirty-nine reporting areas reported a rate  $\leq 2.8$  cases/100,000 population, the 2017 national average. Eleven states, the District of Columbia (DC) and New York City (NYC) reported a rate  $> 2.8$  cases/100,000 population; these accounted for 59% of the national total in 2017.

**Slide 4. TB Case Rates by Age Group, United States, 1993–2017.** During 2017, case rates in all age groups declined by  $> 50\%$  from their 1993 values: persons aged  $\geq 65$  years, from 17.7 cases/100,000 population in 1993 to 4.5 in 2017; persons aged 45–64 years, from 12.5 to 3.3; persons aged 25–44 years, from 11.6 to 3.2; persons aged 15–24 years, from 5.0 to 2.0; persons aged 5 to 14 years, from 1.7 to 0.5; and persons aged  $\leq 4$  years, from 5.2 to 1.1.

**Slide 5. Reported TB Cases by Age Group, United States, 2017.** Three percent of TB cases were among children aged 0–4 years; 2% were among those aged 5–14 years; 9% were among persons aged 15–24 years; 30% were among adults aged 25–44 years; 30% were among adults aged 45–64 years; and 25% were among adults aged  $\geq 65$  years.

**Slide 6. TB Case Rates by Age Group and Sex, United States, 2017.** Case rates tended to increase with age, ranging from  $< 1$  case/100,000 children aged 5–14 years to a high of 6.6 cases/100,000 men aged  $\geq 65$  years. As

age increased, the case rate among men increased faster than women; the rates among men aged  $\geq 45$  years were approximately twice those among women of the same age.

**Slide 7. TB Case Rates by Race/Ethnicity, United States, 1993–2017.** The rates among most race/ethnicity groups indicate a declining trend in TB since 1993. Asians consistently had the highest yearly TB rates, but their rates declined from 29.3 cases/100,000 population in 2003 to 17.7 in 2017, a 39.7% decrease. Rates also declined among the following racial/ethnic groups: non-Hispanic blacks/African Americans, from 11.7 in 2003 to 4.7 in 2017 (–60.0%); Hispanics, from 10.2 to 4.4 (–57.5%); non-Hispanic whites, from 1.4 to 0.5 (–61.9%); American Indians and Alaska Natives, from 8.3 to 3.9 (–53.0%). Among Native Hawaiian/Other Pacific Islanders the rate increased, from 15.7 to 19.1 (+21.6%). Because of the low TB case counts and population estimates for Native Hawaiians/Other Pacific Islanders in the United States, case rates for this group might appear high. (Percentage change are based on unrounded data.)

Certain key factors likely contribute to the disproportionate burden of TB among minority groups. For persons who were born in countries where TB is common, TB disease can result from infection acquired in their country of origin. Unequal distribution of TB risk factors (e.g., human immunodeficiency virus [HIV] infection) also might contribute to increased exposure to TB or to an increased risk for experiencing TB after becoming infected with *Mycobacterium tuberculosis*.

**Slide 8. TB Case Rates by Age Group and Race/Ethnicity, United States, 2017.** After early childhood (ages 0–4 years), risk typically increased with age across all racial/ethnic groups, except among Native Hawaiians/Other Pacific Islanders, which did not indicate a trend. Rates were consistently higher among minority racial/ethnic groups than among non-Hispanic whites. Rates were the highest among Asians and Native Hawaiians/Other Pacific Islanders.

**Slide 9. Reported TB Cases by Race/Ethnicity, United States, 2017.** During 2017, approximately 88% of all reported TB cases occurred among racial/ethnic minorities: Asians, 36%; Hispanics, 28%; non-Hispanic blacks/African Americans, 21%; American Indians/Alaska Natives, 1%; and Native Hawaiians/Other Pacific Islanders, 1%. In contrast, 12% of cases occurred among non-Hispanic whites. Persons reporting two or more races, not including persons of Hispanic or Latino ethnicity, accounted for 1% of all cases. Unknown or missing data on race accounted for <0.5% of all cases.

**Slide 10. TB Cases and Rates among U.S.-Born versus Non-U.S.-Born Persons, United States 1993–2017.** The graph illustrates the increase in the percentage of cases occurring among non-U.S.-born persons during the study period, from 29% in 1993 to 70% in 2017. Overall, the number of cases among non-U.S.-born remained stable before 2009, with approximately 7,400–8,000 cases/year. During 2009, the number decreased to 6,996, and that trend continued through 2013, with the number of cases among non-U.S.-born persons decreasing to 6,222. In 2014 and 2015 the number of cases among non-U.S.-born persons increased to a high of 6,406 in 2015. However, in 2016, the number of cases decreased to 6,356 cases, yet increased again in 2017 to 6,384. Among U.S.-born persons the number of cases decreased from >17,000 in 1993 to 2,705 in 2017. The incidence rate for U.S.-born persons decreased from 7.4 in 1993 to 1.0 in 2017, but the incidence rate among non-U.S.-born persons is considerably higher, although it has also decreased from 34.0 in 1993 to 14.7 in 2017.

**Slide 11. Reported TB Cases, by Origin and Race/Ethnicity, United States, 2017.** Among U.S.-born persons with TB in 2017, 37% were non-Hispanic black/African American; 30% were non-Hispanic white, 22% were Hispanic/Latino; 5% were Asian; 3% were American Indian/Alaska Native; and 2% were Native Hawaiian/Other Pacific Islander. Persons reporting two or more races totaled 1% of cases among U.S.-born persons. Among non-U.S.-born persons with TB, 49% were Asian; 31% were Hispanic/Latino; 14% were non-Hispanic black/African American; 4% were non-Hispanic white; 1% were Native Hawaiian/Pacific Islander; and 1% were persons

reporting two or more races, not including persons of Hispanic/Latino origin. Cases among American Indians/Alaska Natives constituted 0.03% of the cases among non-U.S.–born persons and are not included on the charts.

**Slide 12. Percentage of Non-U.S.–Born Persons among TB Cases, United States, 2007 and 2017.** The number of states with <25% of their TB cases occurring among non-U.S.–born persons decreased from 7 states in 2007 to 3 states in 2017. The number of states with ≥25%–49% of cases among non-U.S.–born persons decreased from 14 states in 2007 to 10 states in 2017. However, the number of states that had ≥50% of their cases among non-U.S.–born persons increased from 29 states, DC, and NYC in 2007 to 37 states, DC, and NYC in 2017.

**Slide 13. Countries of Birth Among Non-U.S.–Born Persons Reported with TB, United States, 2017.** The top seven countries are displayed in the chart; those countries have remained relatively constant since 1986, when information regarding country of birth was first reported by all areas submitting reports to CDC. During 2017, the top seven countries accounted for 61% of all cases among non-U.S.–born persons, with Mexico accounting for 19%; the Philippines, 13%; India, 9%; Vietnam, 8%; China, 6%; Guatemala, 3%; and Haiti, 3%. Persons from 139 other countries each accounted for ≤2.5% of the total, but altogether, accounted for 39% of non-U.S.–born persons reported with TB.

**Slide 14. Percentage of Non-U.S.–Born Persons with TB, by Time of Residence in U.S. Before Diagnosis, 2017.** The chart indicates the distribution for the top three countries of birth (Mexico, the Philippines, and India). Among persons born in Mexico, 12.0% had been in the United States for <1 year; 8.1%, 1–4 years; 8.6%, 5–9 years; 21.0%, 10–19 years; and 36.9% for ≥20 years. Among persons born in the Philippines, 10.8% had been in the United States for <1 year; 12.5%, 1–4 years; 11.1%, 5–9 years; 21.1%, 10–19 years; and 33.5%, ≥20 years. Among persons born in India, 16.7% had been in the United States for <1 year; 24.8%, 1–4 years; 12.5%, 5–9 years; 18.3%, 10–19 years; and 18.0%, ≥20 years. Values for unknown length of residence in the United States for these top three countries ranged from 9.7 to 13.4% for 2017. For all other non-U.S.–born persons, 18.8% had been in the United States for <1 year; 18.9%, 1–4 years; 13.2%, 5–9 years; 16.4%, 10–19 years; 24.3%, ≥20 years; and 8.4%, unknown length of residence. Overall, 16.3% had been in the United States for <1 year; 16.6%, 1–4 years; 12.0%, 5–9 years; 18.1%, 10–19 years; 27.2%, ≥20 years; and 9.8%, unknown length of residence.

**Slide 15. Primary Anti-TB Drug Resistance, United States, 1993–2017.** The graph starts in 1993, the year in which the individual TB case reports submitted to the national surveillance system began collecting information regarding initial susceptibility test results for patients with culture-positive TB. Data were available for >87.1% of culture-positive cases for each year. Primary resistance was calculated by using data from persons with no reported prior TB episode. Resistance to at least isoniazid was 8.2% in 1993; however, by 2017, this had increased to 8.8%. Resistance to at least isoniazid and rifampin, known as multidrug-resistant TB (MDR TB), was 2.5% in 1993. The percent of primary MDR TB has remained approximately stable since it decreased to 1.0% in 1998. However, in 2017, the percent of primary MDR TB increased to 1.6%.

**Slide 16. Primary MDR TB, United States, 1993–2017.** This graph focuses on trends in primary multidrug-resistant TB (MDR TB), which is based on initial isolates from persons with no prior history of TB. The number of primary MDR-TB cases, represented by the bars, decreased steadily from 407 in 1993 to 115 in 2001, with a slight increase to 132 in 2002. Since then, the total number of primary MDR-TB cases has fluctuated from 70 to 103 cases, with 97 cases reported for 2017. Primary MDR TB, indicated by the trend line, decreased from 2.5% in 1993 to approximately 1.0% in 1998, and had changed little until 2017 when it increased to 1.6%.

**Slide 17. Primary Isoniazid Resistance among U.S.-Born versus Non-U.S.–Born Persons, United States, 1993–2017.** On the basis of initial isolates from persons with no prior history of TB, the percentage of isoniazid resistance has remained higher among non-U.S.–born persons than among U.S.-born persons for all years

measured. Among non-U.S.-born persons, the percentage declined from 12.1% in 1993 to 10.1% in 2017. In U.S.-born persons, the percentage decreased from 6.7% in 1993 to 4.2% in 2007. From 2008 to 2016 the percentage of cases ranged from 5.2% in 2008 to a high of 7.5% in 2014. During 2017, the percentage of primary isoniazid resistance among U.S.-born cases was 5.4%.

**Slide 18. Primary MDR TB in U.S.-born versus Non-U.S.-born Persons, United States, 1993–2017.** This graph highlights primary MDR TB in U.S.-born versus non-U.S.-born persons. The percentage with primary MDR TB has declined among both groups since 1993, although the decline in the U.S.-born has been greater. The proportion of primary MDR-TB cases in the United States that are attributed to non-U.S.-born persons increased from approximately 25% in 1993 to 85% in 2017 (not shown on slide). Among the U.S.-born, the percentage with primary MDR TB has been less than 1% since 1997 and was 0.9% in 2017. The percentage among non-U.S.-born persons has fluctuated year by year, although it has remained between 1.2 and 1.8% since 1995. In 2017, the percentage of primary MDR TB among non-U.S.-born persons was 1.8%.

**Slide 19. XDR TB Case Count, Defined on Initial DST, United States, 1993–2017.** Extensively drug-resistant TB (XDR TB) at first drug susceptibility test (DST) is defined as resistance to isoniazid and rifampin, plus resistance to any fluoroquinolone and at least one of three injectable second-line anti-TB drugs. Two cases of XDR TB were reported in 2017, and the most reported in a single year was 10 in 1993. No cases were reported in 2003 and 2009, and no apparent trend exists in the number of cases over time.

**Slide 20. Reporting of HIV Test Results in Persons with TB by Age Group, United States, 1993–2017.** This slide shows the completeness of reporting of HIV test results in persons with TB by age group from 1993 through 2017. The percentage of TB patients for whom test results were reported increased from 30% among all ages in 1993 to 89% in 2017. Among adults 25–44 years of age, the percentage increased from 45% in 1993 to 93% in 2017. California began reporting HIV test results to CDC in 2011; this accounts for the substantial percentage increase for that year.

**Slide 21. Estimated HIV Coinfection in Persons Reported with TB, United States, 1993–2017.** This slide provides minimum estimates of HIV coinfection among persons reported with TB from 1993 through 2017. Since the addition of the request for HIV status to the individual TB case report in 1993, incomplete reporting has provided a challenge to calculating reliable estimates, although reporting improved substantially beginning in 2011. Results from the cross-matching of TB and AIDS registries have been used to supplement reported HIV test results. For all ages, the estimated percentage of HIV coinfection in persons who reported HIV testing (positive, negative, or indeterminate test results) with TB decreased from 48% to 6% overall from 1993–2017, and from 63% to 9% among persons 25 to 44 years of age during this period.

**Slide 22. TB Cases by Residence in Correctional Facilities, Ages ≥15, United States, 1993–2017.** This graph highlights the number of cases among persons who were residents of any type of correctional facility at the time of TB diagnosis. Cases must have occurred in persons 15 years of age or older. The number of cases among persons residing in a correctional facility has decreased from a high of 1,117 cases in 1994 to 268 cases in 2017. Between the years 2000 and 2010, the number of cases residing in a correctional facility ranged between the mid to high-400s and high-500s; 2011 was the first year to drop below this range to 423 cases. Of total cases, the percentage of cases among persons residing in a correctional facility has ranged from 5.0% in 1994 to 3.1% in 2017. The 1990s saw a decreasing trend in percentage until 2002. Since 2002, there was an increasing trend in percentage until 2015 when the percentage dropped below 4.0% again. In 2017, the percentage of total cases was 3.1%.

**Slide 23. TB Cases by Homeless Status, Ages ≥15, United States, 1993–2017.** This graph highlights the status of cases that occurred among persons experiencing homelessness within twelve months before TB diagnosis during

1993–2017. Cases shown occurred in persons 15 years of age or older. The number of cases among persons experiencing homelessness has decreased from a high of 1,379 cases in 1994 to 397 in 2017. This category has seen an overall decrease in cases since 1994, with the exception of the slight increases observed in years 2003, 2006, and 2010. Of total cases, the percentages of cases occurring in persons experiencing homelessness have declined overall from 5.2% in 1993 to 4.6% in 2017.

**Slide 24. Mode of Treatment Administration in Persons Reported with TB, United States, 1993–2015.** In 1993, the reporting areas began providing information about mode of treatment administration on the individual TB case report form. Treatment administered as only directly observed therapy (DOT) increased from 21.7% in 1993 to 65.1% in 2015, the latest year with available data. The proportion of patients who received at least some portion of their treatment as DOT (based on combining the percentage of patients who received only DOT and the percentage for whom some portion was self-administered) was 93.6% in 2015.

**Slide 25. Completion of TB Therapy, United States, 1993–2015.** The reporting areas began providing information on completion of therapy in 1993 through the individual TB case report form. The calculations exclude persons with initial isolate rifampin resistant, or patient with bone and joint disease, meningial disease or disease of the central nervous system, or pediatric patient (age <15) with miliary disease or positive blood culture or a positive nucleic acid amplification test on a blood specimen, and those who moved out of the country within one year of initiating treatment. Overall completion of therapy had remained at approximately 92–93% from 1998 through 2008, but increased to 95–97% from 2009 to 2015. In 2015, the latest year with available data, completion of therapy was 96%. Completion in 1 year or less increased from 63% in 1993 to 90% in 2015. The current DHHS Healthy People 2020 objective is completion of therapy in 1 year or less in 93% of patients. CDC is working with state and local health departments to determine and evaluate reasons for apparently delayed completion of therapy, which may vary by jurisdiction.

**Slide 26. Definition for Tuberculosis Genotyping in the United States.** 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 27. National Tuberculosis Genotyping Surveillance Coverage by Year, United States, 2004–2017.** This slide shows the increase in genotyping surveillance coverage from 2004 to 2017. In 2004 the proportion of culture confirmed TB cases with at least one genotyped isolate was 52.6%; in 2017 it was 96.3%. The national goal for genotyping surveillance coverage is 94.0%.

**Slide 28. Number of County-based Tuberculosis Genotype Clusters by Cluster Size, United States, 2015–2017.** 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 2015–2017 three year time period, there were 928 two-case clusters, 229 three-case clusters, 110 four-case clusters, 46 five-case clusters, 22 six-case clusters, 17 seven-case clusters, 11 eight-case clusters, 10 nine-case clusters, and 36 case clusters that were greater or equal to 10 in size.

**Slide 29. Tuberculosis Genotype Clusters by TB GIMS Alert Levels, United States, 2015–2017.** This slide shows a chart with percentages of genotype clusters by alert level. Alert level is determined by the log likelihood ratio statistic (LLR) for a given cluster, identifying higher than expected geospatial concentrations for a TB genotype cluster in a specific county, compared to the national distribution of that genotype; TB GIMS generates alert level notifications based on this statistic: “No alert” is indicated if LLR is between  $0 < LLR < 5$ , “medium” is for LLR of  $5 < LLR < 10$  and “high” alert is for clusters with  $LLR \geq 10$ . In the 2015–2017 three year time period, high alerts made up 5% of the total, medium alerts were 24%, and no alert were 71%.

**Slide 30. (Final slide).** For more information, please contact Division of Tuberculosis Elimination at <http://www.cdc.gov/tb/>.