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World TB Day — March 24, 2017

World TB Day is recognized each year on March 24, which commemorates the date in 1882 when Dr. Robert Koch announced his discovery of *Mycobacterium tuberculosis*, the bacillus that causes tuberculosis (TB). World TB Day provides an opportunity to raise awareness about TB and the measures needed to tackle this devastating disease. In 2017, for the second year, CDC will join the global Stop TB Partnership in adopting the World TB Day theme "Unite to End TB."

In 2016, a total of 9,287 new TB cases occurred in the United States (incidence of 2.9 cases per 100,000 persons) (*1*), a decrease from the 2015 case count and incidence. This 2016 provisional case count represents the lowest number of TB cases recorded since reporting began in 1953. However, data suggest that current strategies will not be sufficient to reach the goal of U.S. TB elimination during this century (*2*).

CDC is committed to eliminating TB in the United States. This will require expanded initiatives, both in the United States and globally. These initiatives must maintain and strengthen existing strategies for diagnosing and treating persons with TB disease and also increase testing and treatment of persons with latent TB infection as outlined in CDC recommendations and the 2016 recommendation from the U.S. Preventive Services Task Force (USPSTF) (*3,4*). Additional information about World TB Day and CDC's TB elimination activities is available on CDC's TB website (https://www.cdc.gov/tb/worldtbday).

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Tuberculosis — United States, 2016

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In 2016, a total of 9,287 new tuberculosis (TB) cases were reported in the United States; this provisional* count represents the lowest number of U.S. TB cases on record and a 2.7% decrease from 2015 (*1*). The 2016 TB incidence of 2.9 cases per 100,000 persons represents a slight decrease compared with 2015 (-3.4%) (Figure). However, epidemiologic modeling demonstrates that if similar slow rates of decline continue, the goal of U.S. TB elimination will not be reached during this century (*2*). Although current programs to identify and treat active TB disease must be maintained and strengthened, increased measures to identify and treat latent TB infection (LTBI) among populations at high risk are also needed to accelerate progress toward TB elimination.

*This report is limited to National Tuberculosis Surveillance System data as of February 17, 2017. Updated data will be available in CDC's annual TB surveillance report later this year.

INSIDE

Continuing Education examination available at https://www.cdc.gov/mmwr/cme/conted_info.html#weekly.

U.S. Department of Health and Human Services
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Health departments in the 50 states and District of Columbia (DC) electronically report to CDC[†] verified cases of TB that meet the CDC and Council of State and Territorial Epidemiologists case definition for TB. Reports include demographic and clinical information, as well as medical and social risk factors for TB disease. Persons reported with TB are classified as U.S.-born or foreign-born persons based on established criteria[§]; race/ethnicity is self-reported. U.S. Census Bureau midyear population estimates provide the denominators used to calculate TB incidence overall (3). The Current Population Survey (https://www.census.gov/programs-surveys/cps.html) provides the population denominators used to calculate TB incidence according to national origin and racial/ethnic group.

State-specific TB incidence in 2016 ranged from 0.2 cases per 100,000 persons in Wyoming to 8.3 in Hawaii (median state incidence = 1.9). Twelve states (Alaska, Arkansas, California, Florida, Georgia, Hawaii, Maryland, Minnesota, New Jersey, New York, North Dakota, and Texas) and DC reported incidence higher than the national incidence (Table 1). As in previous years, four states (California, Florida, New York, and Texas) reported >500 cases each in 2016, accounting for 50.9% of reported cases nationwide.

[†] https://www.cdc.gov/tb/programs/rvct/instructionmanual.pdf.

[§] U.S.-born persons are defined as persons who were born in the United States or a U.S. island area or born abroad to a U.S. citizen parent or parents. All others, including those who have become U.S. citizens through naturalization, are considered to be foreign-born persons.

Among 9,287 TB cases reported in 2016, U.S.-born persons accounted for 2,935 (31.6%) cases, and 6,307 (67.9%) cases occurred among foreign-born persons; 45 (0.5%) cases occurred among persons whose national origin was not known (Table 2). TB incidence among U.S.-born persons (1.1 cases per 100,000) decreased 8.4% from 2015 (Figure). Incidence among foreign-born persons (14.6 cases per 100,000) decreased 3.2% from 2015, but was approximately 14 times the incidence among U.S.-born persons.

Among U.S.-born persons, TB incidence remained stable among non-Hispanic whites (0.5 cases per 100,000) and Asians (2.1), but decreased from 2015 in all other racial/ethnic groups including Hispanics (1.6 [-11.4%]), non-Hispanic blacks (3.0 [-6.8%]), American Indian/Alaska Natives (5.0 [-28.8%]), and Native Hawaiian/Pacific Islanders (9.2 [-27.3%]) (Table 2). TB incidence has decreased or remained stable since 2013 in all U.S.-born racial/ethnic groups except American Indian/Alaska Natives and Native Hawaiian/Pacific Islanders, which experienced increases during this period before decreasing in 2016.

Among foreign-born persons, the highest TB incidence in 2016 was among Asians (26.9 cases per 100,000), followed by non-Hispanic blacks (22.3) and Hispanics (10.0), and most foreign-born racial/ethnic groups have experienced gradual decreases between 2013 and 2016. The top five countries of origin for foreign-born persons reported with TB disease in the United States were Mexico (1,194 cases, 18.9% of all foreign-born cases), the Philippines (795, 12.6%), India (593,

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TABLE 1. Tuberculosis (TB) case counts and incidence with annual percent changes, by U.S. Census division and state/district — United States and the District of Columbia, 2015 and 2016

Census division/state	Case count* 2015	Case count* 2016	Case count* % Change	Incidence 2015	Incidence 2016	Incidence % Change†
Division 1: New England						
Connecticut	70	52	-25.7	2.0	1.5	-25.5
Maine	18	23	27.8	1.4	1.7	27.6
Massachusetts	192	190	-1.0	2.8	2.8	-1.4
New Hampshire	13	15	15.4	1.0	1.1	15.0
Rhode Island	30	12	-60.0	2.8	1.1	-60.0
Vermont	7	5	-28.6	1.1	0.8	-28.4
Total	**330**	**297**	**-10.0**	**2.2**	**2.0**	**-10.2**
Division 2: Middle Atlantic						
New Jersey	326	294	-9.8	3.6	3.3	-9.9
New York	763	768	0.7	3.9	3.9	0.7
Pennsylvania	200	174	-13.0	1.6	1.4	-12.9
Total	**1289**	**1236**	**-4.1**	**3.1**	**3.0**	**-4.1**
Division 3: East North Central						
Illinois	343	342	-0.3	2.7	2.7	0.0
Indiana	116	109	-6.0	1.8	1.6	-6.3
Michigan	131	133	1.5	1.3	1.3	1.4
Ohio	143	141	-1.4	1.2	1.2	-1.5
Wisconsin	69	40	-42.0	1.2	0.7	-42.1
Total	**802**	**765**	**-4.6**	**1.7**	**1.6**	**-4.6**
Division 4: West North Central						
Iowa	38	48	26.3	1.2	1.5	25.8
Kansas	36	39	8.3	1.2	1.3	8.3
Minnesota	150	168	12.0	2.7	3.0	11.2
Missouri	92	101	9.8	1.5	1.7	9.5
Nebraska	33	28	-15.2	1.7	1.5	-15.7
North Dakota	9	22	144.4	1.2	2.9	144.1
South Dakota	17	12	-29.4	2.0	1.4	-30.0
Total	**375**	**418**	**11.5**	**1.8**	**2.0**	**11.0**
Division 5: South Atlantic						
Delaware	22	16	-27.3	2.3	1.7	-27.9
District of Columbia	33	25	-24.2	4.9	3.7	-25.4
Florida	602	639	6.1	3.0	3.1	4.3
Georgia	320	302	-5.6	3.1	2.9	-6.6
Maryland	176	220	25.0	2.9	3.7	24.6
North Carolina	199	220	10.6	2.0	2.2	9.3
South Carolina	104	103	-1.0	2.1	2.1	-2.3
Virginia	212	205	-3.3	2.5	2.4	-3.8
West Virginia	10	14	40.0	0.5	0.8	40.8
Total	**1678**	**1744**	**3.9**	**2.7**	**2.7**	**2.7**
Division 6: East South Central						
Alabama	119	112	-5.9	2.5	2.3	-6.1
Kentucky	67	91	35.8	1.5	2.1	35.4
Mississippi	74	61	-17.6	2.5	2.0	-17.5
Tennessee	131	103	-21.4	2.0	1.5	-22.0
Total	**391**	**367**	**-6.1**	**2.1**	**1.9**	**-6.5**
Division 7: West South Central						
Arkansas	90	91	1.1	3.0	3.0	0.8
Louisiana	119	127	6.7	2.5	2.7	6.4
Oklahoma	67	78	16.4	1.7	2.0	15.9
Texas	1333	1250	-6.2	4.9	4.5	-7.7
Total	**1609**	**1546**	**-3.9**	**4.1**	**3.9**	**-5.1**
Division 8: Mountain						
Arizona	198	188	-5.1	2.9	2.7	-6.6
Colorado	73	64	-12.3	1.3	1.2	-13.8
Idaho	11	18	63.6	0.7	1.1	60.7
Montana	9	4	-55.6	0.9	0.4	-56.0
Nevada	85	56	-34.1	2.9	1.9	-35.4
New Mexico	47	39	-17.0	2.3	1.9	-17.0
Utah	37	20	-45.9	1.2	0.7	-47.0
Wyoming	4	1	-75.0	0.7	0.2	-75.0
Total	**464**	**390**	**-15.9**	**2.0**	**1.6**	**-17.2**
Division 9: Pacific						
Alaska	68	57	-16.2	9.2	7.7	-16.6
California	2130	2073	-2.7	5.5	5.3	-3.3
Hawaii	127	119	-6.3	8.9	8.3	-6.5
Oregon	76	70	-7.9	1.9	1.7	-9.4
Washington	207	205	-1.0	2.9	2.8	-2.7
Total	**2608**	**2524**	**-3.2**	**5.0**	**4.8**	**-4.1**
United States	**9546**	**9287**	**-2.7**	**3.0**	**2.9**	**-3.4**

* Case counts based on data from the National Tuberculosis Surveillance System as of February 17, 2017. U.S. Census Bureau midyear population estimates provide the denominators used to calculate TB incidence.

† Percentage change in incidence is calculated on the basis of unrounded incidence for 2015 and 2016.

9.4%), Vietnam (496, 7.9%), and China (383, 6.1%). Cases in persons born in these countries accounted for 54.9% of all cases among foreign-born persons.

HIV status was known for 86.7% of TB cases reported in 2016; among these patients, 5.8% had documented HIV co-infection. Living in congregate settings such as shelters, long-term care facilities, and correctional facilities is a known risk factor for TB exposure (*4*), and complete data on these risk factors were available for >93% of cases. Among these, 4.6% of patients reported having experienced homelessness in the year preceding diagnosis. In addition, 1.8% were reported as residing in a long-term care facility, and 3.5% were reported as being confined in a correctional facility at the time of diagnosis.

The most recent year for which complete drug-susceptibility data are available is 2015; the data include test results for 98.7% of culture-confirmed TB cases. In 2015, 88 cases of multidrug-resistant TB¶ occurred; multidrug-resistant TB accounted for 0.4% and 1.2% of culture-confirmed TB cases among U.S.-born and foreign-born persons, respectively. Among the 88 multidrug-resistant TB cases, 72 (81.8%) occurred in persons

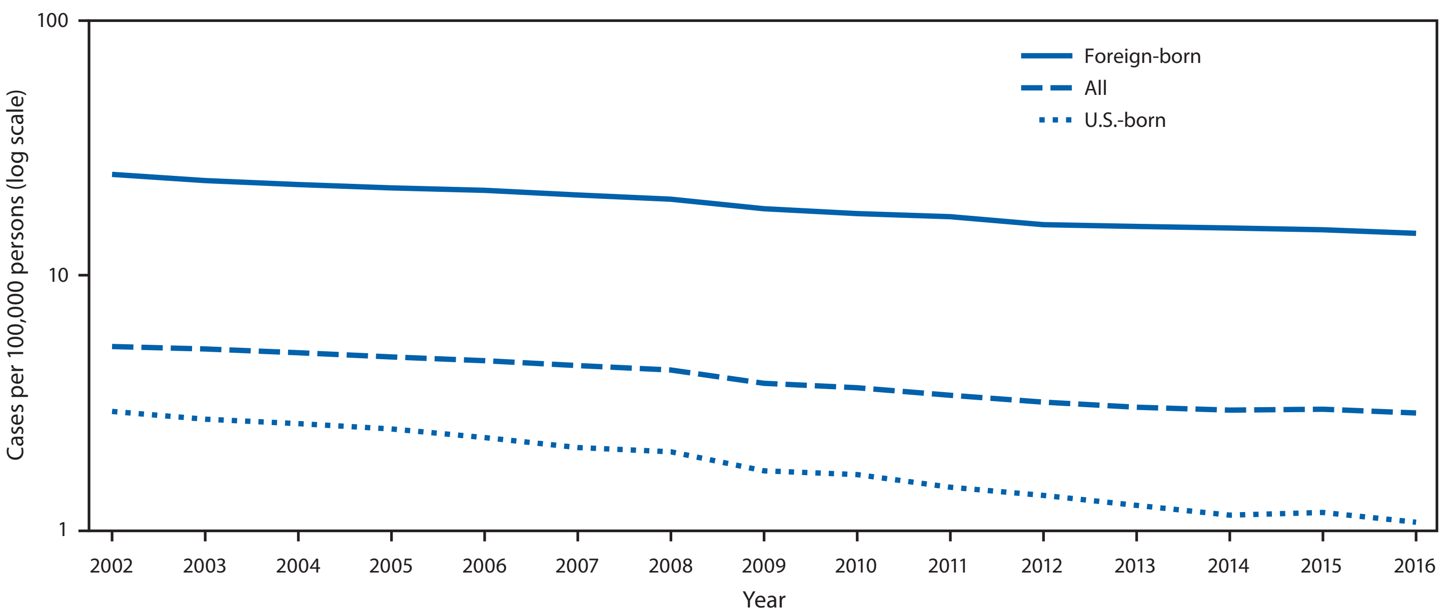
¶ Multidrug-resistant tuberculosis (TB) is defined by the World Health Organization as a case of TB in a person with a *Mycobacterium tuberculosis* isolate resistant to at least isoniazid and rifampin.

TABLE 2. Tuberculosis (TB) case counts and incidence,* by national origin and race/ ethnicity — United States, 2013–2016†

U.S. population group	Case count (incidence)			
	2013	**2014**	**2015**	**2016**
U.S.-born§				
Hispanic	650 (1.8)	651 (1.8)	657 (1.8)	599 (1.6)
White, non-Hispanic	1,092 (0.6)	970 (0.5)	987 (0.5)	911 (0.5)
Black, non-Hispanic	1,251 (3.6)	1,186 (3.4)	1,139 (3.3)	1,062 (3.0)
Asian	151 (2.4)	137 (2.1)	136 (2.1)	145 (2.1)
American Indian/Alaska Native	122 (5.6)	114 (5.1)	144 (7.0)	108 (5.0)
Native Hawaiian/Pacific Islander	45 (6.3)	83 (12.4)	88 (12.7)	67 (9.2)
Multiple or unknown race/ ethnicity	44 (—¶)	37 (—¶)	35 (—¶)	43 (—¶)
Total U.S.-born	**3,355 (1.2)**	**3,178 (1.2)**	**3,186 (1.2)**	**2,935 (1.1)**
Foreign-born				
Hispanic	2,033 (11.1)	2,093 (11.2)	2,033 (10.4)	1,979 (10.0)
White, non-Hispanic	323 (4.2)	279 (3.6)	252 (3.3)	293 (3.9)
Black, non-Hispanic	835 (24.5)	828 (23.6)	852 (23.0)	898 (22.3)
Asian	2,850 (29.0)	2,920 (29.3)	3,089 (29.0)	3,023 (26.9)
American Indian/Alaska Native	2 (3.0)	—**	1 (1.9)	2 (5.8)
Native Hawaiian/Pacific Islander	17 (6.7)	8 (3.6)	14 (4.3)	12 (3.3)
Multiple or unknown race/ ethnicity	125 (—¶)	92 (—¶)	111 (—¶)	100 (—¶)
Total foreign-born	**6,185 (15.6)**	**6,220 (15.4)**	**6,352 (15.1)**	**6,307 (14.6)**
Unknown national origin	**9 (—¶)**	**5 (—¶)**	**8 (—¶)**	**45 (—¶)**
Total	**9,549 (3.0)**	**9,403 (3.0)**	**9,546 (3.0)**	**9,287 (2.9)**

* Incidence calculated per 100,000 persons.
† Case counts based on data from the National Tuberculosis Surveillance System as of February 17, 2017. The Current Population Survey (https://www.census.gov/programs-surveys/cps.html) provides the population denominators used to calculate TB incidence according to national origin and racial/ ethnic group.
§ U.S.-born persons were born in the United States or a U.S. island area or born abroad to a U.S. citizen parent or parents. All others, including naturalized U.S. citizens, are considered to be foreign-born persons.
¶ Incidence was not calculated for these categories.
** No cases for foreign-born American Indian/Alaska Native population occurred in 2014.

FIGURE. Tuberculosis (TB) incidence overall and among U.S.-born and foreign-born persons* — United States, 2002–2016



* U.S.-born persons are those persons who were born in the United States or a U.S. island area or were born abroad to a U.S. citizen parent or parents. All others, including naturalized U.S. citizens, are considered foreign-born persons.

Summary

What is already known about this topic?

An annual decline in the number of cases and incidence of tuberculosis (TB) in the United States was found beginning in 1993 and continuing until 2015, when the case count increased and the incidence remained the same as the previous year.

What is added by this report?

Provisional data for 2016 indicate a decreased TB case count and incidence compared with 2015.

What are the implications for public health practice?

Current strategies are effective in controlling TB, but not sufficient to promote progress toward the goal of eliminating TB in the United States. Current TB control priorities remain important to prevent a resurgence of TB, but expanded measures and new strategies are needed to achieve TB elimination. Targeted testing and treatment of latent TB infection in populations at high risk for TB are key strategies for lowering incidence and moving toward elimination.

with no reported prior history of TB disease. In 2015, one case of extensively drug-resistant TB** was reported.

Discussion

Provisional data for 2016 demonstrate a slight decline in both TB case count and incidence in the United States compared with 2015. However, previously published epidemiologic modeling suggests that maintaining similar rates of decline in the future will not be sufficient to achieve TB elimination in the United States during this century (*2*). Current TB control priorities, including early identification of TB cases, prompt institution of appropriate treatment, and identification of exposed contacts remain critical to preventing a resurgence of TB; to achieve TB elimination, expanded measures and new strategies are needed. Epidemiologic models demonstrate that identifying and treating persons with LTBI (a condition that occurs when a person is infected with *Mycobacterium tuberculosis* without signs and symptoms, or radiographic or bacteriologic evidence of TB disease) is critical to accomplishing the goal of TB elimination (*2*). This strategy is consistent with CDC recommendations as well as 2016 recommendations from the U.S. Preventive Services Task Force (USPSTF) to screen for LTBI with tests such as the tuberculin skin test or interferon-gamma release assay in populations that are at increased risk for TB (*4*,*5*). The USPSTF characterizes populations at increased risk as those persons who were born in, or formerly resided in, countries with increased TB prevalence as defined by the World Health Organization (WHO) (*6*); and persons who currently live in, or have lived in high-risk congregate settings such as homeless shelters, correctional facilities, and long-term care facilities.

In 2016, four of the top five countries of origin for foreign-born persons reported with TB disease were considered high TB burden countries by WHO (China, India, Philippines, Vietnam), and accounted for 36% of incident TB cases among foreign-born persons in the United States (*6*). Because approximately 90% of TB cases in foreign-born persons in the United States are attributable to reactivation of LTBI, targeted testing for and treatment of LTBI among foreign-born persons from countries with high TB prevalence could be an effective strategy to decrease TB incidence (*7*). The current recommendation from the USPSTF to test persons at increased risk regardless of length of time in the United States is in keeping with evidence that reactivation of LTBI remains a substantial concern, even in foreign-born persons who have lived in the United States for many years (*8*,*9*).

Workers in high-risk congregate settings are also at increased risk for TB and should be included as part of a targeted testing and treatment approach (*4*). Other persons at risk for TB infection or for progression from LTBI to TB disease who should also be included in this strategy include close contacts of infectious TB patients, persons with immunosuppression, persons with other medical conditions (e.g., diabetes mellitus, chronic renal failure, or silicosis) associated with progression from LTBI to TB disease, and persons with fibrotic changes on a chest radiograph suggestive of inactive TB disease (*4*).

The findings in this report are subject to at least two limitations. First, this analysis is limited to reported provisional case counts and incidence rates for 2016. Second, incidence rates are calculated based on estimated population denominators for 2016.

Although TB case counts and incidence are decreasing in the United States, progress is insufficient to achieve in this century the goal of TB elimination. Measures to diagnose and treat active TB disease must continue, and new strategies aimed at accelerating progress toward TB elimination in the United States, such as targeted testing for and treatment of LTBI, should also be employed. Expanded partnerships with health care providers outside of the public health sector will be important in effectively implementing such a strategy.

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** Extensively drug-resistant TB is defined by the World Health Organization as a case of TB in a person with a *Mycobacterium tuberculosis* isolate with resistance to at least isoniazid and rifampin among first-line anti-TB drugs, resistance to any fluoroquinolone (e.g., ciprofloxacin or ofloxacin), and resistance to at least one of three second-line injectable drugs (i.e., amikacin, capreomycin, or kanamycin).

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Tuberculosis Among Foreign-Born Persons Diagnosed ≥10 Years After Arrival in the United States, 2010–2015

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The majority of tuberculosis (TB) cases in the United States are attributable to reactivation of latent TB infection (LTBI) (*1*). LTBI refers to the condition when a person is infected with *Mycobacterium tuberculosis* without signs and symptoms, or radiographic or bacteriologic evidence of TB disease. CDC and the U.S. Preventive Services Task Force (USPSTF) recommend screening populations at increased risk for LTBI, including persons who have lived in congregate settings at high risk and persons who were born in, or are former residents of countries with TB incidence ≥20 cases per 100,000 population (*2*–*4*). In 2015, foreign-born persons constituted 66.2% of U.S. TB cases (*5*). During the past 30 years, screening of persons from countries with high TB rates has focused on overseas screening for immigrants and refugees, and domestic screening for persons who have newly arrived in the United States (*6*,*7*). However, since 2007, an increasing number and proportion of foreign-born patients receiving a diagnosis of TB first arrived in the United States ≥10 years before the development and diagnosis of TB disease. To better understand how this group of patients differs from persons who developed TB disease and received a diagnosis <10 years after U.S. arrival, CDC analyzed data for all reported TB cases in the United States since 1993 in the National TB Surveillance System (NTSS). After adjusting for age and other characteristics, foreign-born persons who arrived in the United States ≥10 years before diagnosis were more likely to be residents of a long-term care facility or to have immunocompromising conditions other than human immunodeficiency virus (HIV) infection. These findings support using the existing CDC and USPSTF recommendations for TB screening of persons born in countries with high TB rates regardless of time since arrival in the United States (*2*,*3*).

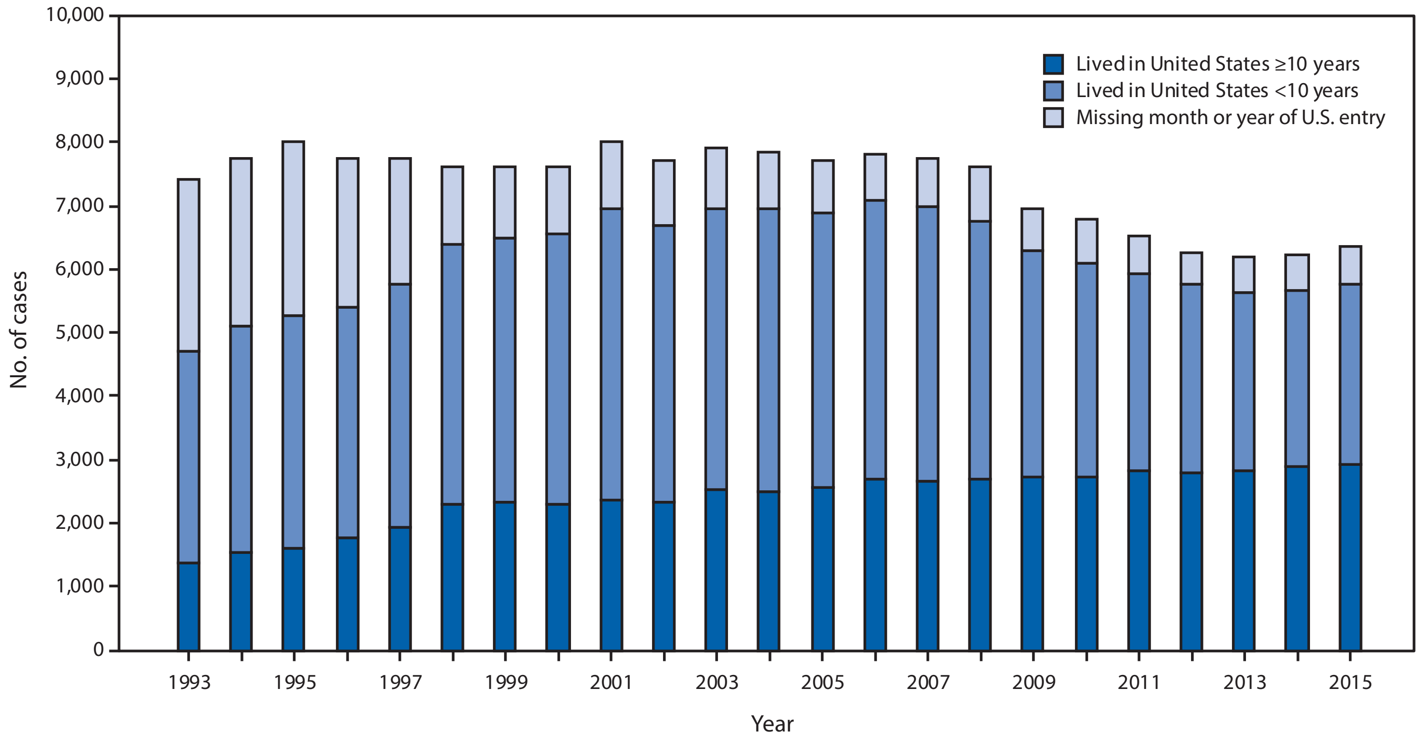
In the NTSS, persons are categorized as foreign-born if they were born outside of the United States, U.S. insular* areas, and the freely associated states† (except persons born abroad to a U.S. citizen parent). The number of years in the United States is defined as the interval from first entry into the United States to the date the TB patient was first reported to a health department. Persons were classified as having arrived in the United States <10 years or ≥10 years before diagnosis. Persons missing month or year of U.S. entry were excluded from the analysis when comparing the two groups. Persons <10 years of age were also excluded from the comparison analysis because they could not have lived in the United States for ≥10 years. Adjusted odds ratios were calculated using a logistic regression model and backward elimination of variables with statistically insignificant effects (p>0.05) in the model to assess the association between receiving a diagnosis of TB disease ≥10 years after U.S. entry compared with <10 years after U.S. entry and a demographic characteristic or TB risk factor. Age at diagnosis was modeled categorically and divided into 10-year groups.

During 1993–2015, the number and proportion of TB cases among foreign-born persons who were missing month or year of U.S. entry declined from 2,689 (36.3%) to 587 (9.2%), and the number and proportion of TB cases among foreign-born persons who arrived in the United States ≥10 years before diagnosis increased from 1,360 (18.4%) in 1993 to 2,922 (46.0%) in 2015 (Figure). During 2010–2015, 38,345 new cases of TB were reported among foreign-born persons, 34,866 (90.9%) of whom had complete U.S. entry date information. During 2010–2015, among all foreign-born persons with TB disease, the median interval from arrival in the United States to developing TB was 9 years, (interquartile range [IQR] = 2–21 years); the median age at arrival was 29 years (IQR = 21–43 years), and the median age at TB diagnosis was 45 years (IQR = 30–62 years). Among foreign-born persons with TB diagnosed after residing ≥10 years in the United States, the median time spent in the United States before developing TB was 21 years (IQR = 14–31 years) compared with 2 years (IQR = 0–5 years) among persons who resided in the United States <10 years. The median age at arrival for both TB patients who had been in the United States ≥10 years and <10 years before diagnosis was 29 years (IQR = 20–42 years, IQR = 22–44 years, respectively). The median age at TB diagnosis was 56 years (IQR = 43–69 years) for persons with TB diagnosed after ≥10 years in the United States, compared with 33 years (IQR = 25–48 years) for persons with TB diagnosed <10 years in the United States. The top three countries of origin for persons with TB diagnosed ≥10 years after U.S. arrival were Mexico (26.8%), the Philippines (14.0%), and Vietnam (9.2%), whereas the top three countries of origin among persons with diagnoses <10 years after U.S. arrival were Mexico (14.3%), India (10.6%), and the Philippines (10.3%). After

* The U.S. insular areas are American Samoa, Guam, Puerto Rico, U.S. Virgin Islands, and Commonwealth of the Northern Mariana Islands.

† The freely associated states are the sovereign nations that have signed compacts of free association with the United States (Federated States of Micronesia, Republic of the Marshall Islands, and Republic of Palau).

FIGURE. Number of tuberculosis cases diagnosed among foreign-born persons <10 years and ≥10 years after arrival in the United States, 1993–2015



adjusting for other factors in the multivariable model, ≥10-year residents were significantly more likely to be aged ≥40 years and to report being of Hispanic ethnicity (Table). Similarly, ≥10-year residents were independently associated with residing in a long-term care facility at diagnosis, reporting excess alcohol use during the year preceding diagnosis, and having a history of a non-HIV–related immunocompromising condition, including diabetes mellitus, end-stage renal disease, tumor necrosis factor-alpha antagonist therapy, or having received an organ transplant (Table). However, ≥10-year residents had lower odds of being a resident of a correctional facility at the time of diagnosis (Table).

Discussion

In recent years, more U.S. TB diagnoses among foreign-born persons occurred ≥10 years after arrival in the United States than among foreign-born persons in the United States <10 years. In 2013, for the first time, the number of TB cases diagnosed among foreign-born persons after ≥10 years in the United States was higher than the number diagnosed among persons in the United States for <10 years. Historically, TB prevention measures for foreign-born persons have focused on screening persons before or shortly after arrival in the United States and on finding and treating active TB disease (*6*). Although the joint effects of overseas and domestic TB prevention strategies are substantial, their independent effects on the trends of U.S. TB cases are unknown. Whereas TB case rates among foreign-born persons are highest among those who have newly arrived in the United States (*8*), rates of TB diagnosed among foreign-born persons ≥10 years after arrival remain substantially higher than those among U.S.-born persons. Most TB in the United States is thought to be a consequence of infection acquired years in the past, and recent estimates are that 92.5% of TB among foreign-born persons is caused by reactivation of LTBI (*1*). Therefore, most TB among foreign-born persons, even those who arrived ≥10 years ago, is probably attributable to infections acquired before U.S. arrival. These data support the recommendations by CDC and USPSTF to screen and treat persons with LTBI who were born in, or are former residents of, countries with increased TB prevalence regardless of time since arrival in the United States or age (*2*,*3*).

The findings in this report are subject to at least two limitations. First, NTSS does not routinely collect data regarding overseas travel by foreign-born patients since initial U.S. arrival; therefore, an unknown number of ≥10-year residents might have become infected with TB during more recent travel outside the United States. Second, data for month or year of first entry into the United States were missing for 9.1% of TB cases among foreign-born persons during 2010–2015. The majority of persons who reported year of U.S. entry without month information

TABLE. Characteristics and adjusted odds ratios of foreign-born patients receiving a tuberculosis (TB) diagnosis ≥10 years versus <10 years after arrival in the United States, 2010–2015*

Characteristic	No. (%) TB cases: Diagnosed <10 years after U.S. arrival (n = 17,492)	No. (%) TB cases: Diagnosed ≥10 years after U.S. arrival (n = 16,989)	Adjusted odds ratio (95% CI)[†]
Sex			
Male	9,826 (56.2)	10,390 (61.2)	1.1 (1.0–1.2)
Female	7,663 (43.8)	6,595 (38.8)	Referent
Race/ethnicity[§]			
Black	3,445 (19.7)	1,342 (7.9)	0.5 (0.4–0.6)
Asian	7,757 (44.4)	7,920 (46.6)	0.8 (0.7–0.9)
Hispanic	5,124 (29.3)	6,455 (38.0)	1.3 (1.2–1.5)
White	685 (3.9)	934 (5.5)	Referent
Other	481 (2.0)	338 (2.7)	0.7 (0.5–0.8)
Age group (yrs)[¶]			
10–19	1,271 (7.3)	140 (0.8)	0.2 (0.2–0.3)
20–29	5,652 (32.3)	886 (5.2)	0.3 (0.3–0.3)
30–39	4,211 (24.1)	2,245 (13.2)	Referent
40–49	2,309 (13.2)	3,114 (18.3)	2.4 (2.2–2.6)
50–59	1,606 (9.2)	3,433 (20.2)	3.6 (3.3–3.9)
60–69	1,244 (7.1)	2,940 (17.3)	3.9 (3.6–4.3)
70–79	874 (5.0)	2,392 (14.1)	4.5 (4.0–4.9)
≥80	325 (1.9)	1,839 (10.8)	9.1 (8.0–10.5)
Resident of correctional facility at time of diagnosis	910 (5.2)	309 (1.8)	0.4 (0.4–0.5)
Resident of long-term care facility at time of diagnosis	91 (0.5)	297 (1.8)	1.6 (1.3–2.2)
Excess alcohol use within the previous year**	848 (4.9)	1,361 (8.1)	1.5 (1.3–1.6)
Diabetes mellitus	1,455 (8.3)	3,794 (22.3)	1.3 (1.2–1.4)
HIV status at time of diagnosis			
Positive	929 (5.3)	685 (4.0)	0.9 (0.8–1.1)
Unknown[††]	2,089 (11.9)	3,064 (18.0)	1.1 (1.0–1.2)
Immunosuppression (not HIV/AIDS)[§§]	325 (1.9)	880 (5.2)	1.6 (1.4–1.9)
End-stage renal disease	160 (0.9)	535 (3.2)	1.3 (1.1–1.6)
TNF-α antagonist therapy	47 (0.3)	131 (0.8)	2.2 (1.5–3.2)
Previous organ transplantation	18 (0.1)	121 (0.7)	2.5 (1.5–4.2)

Abbreviations: AIDS = acquired immunodeficiency syndrome; CI = confidence interval; HIV = human immunodeficiency virus; TNF-α = tumor necrosis factor alpha.
* Multivariable model: other characteristics investigated but not significant (p>0.05) in the univariate analysis included having extrapulmonary site of disease only, previous history of TB, being homeless within previous year, reporting injecting drug use within previous year, and reporting noninjecting drug use within previous year.
† Odds ratios are for the association between each exposure variable and whether the patient had resided in the United States for ≥10 years or <10 years. Each odds ratio was adjusted for all of the other exposure variables displayed in the table using multivariable logistic regression.
§ Black, Asian, white and "other" are non-Hispanic. The "other" racial/ethnic category includes non-Hispanic Native Hawaiian and Other Pacific Islander, non-Hispanic American Indian/Alaskan Native, those of unknown race, and those reporting multiple races.
¶ Persons aged 0–9 years were excluded, because they could not have lived in the United States for ≥10 years.
** For variable definitions, refer to the following: CDC. CDC Tuberculosis Surveillance Data Training Report of Verified Case of Tuberculosis (RVCT) Self-Study Modules Participant Manual. Atlanta, GA: U.S. Department of Health and Human Services, CDC; 2009. https://www.cdc.gov/tb/programs/rvct/default.htm.
†† Laboratory HIV test was either refused or not offered or result was indeterminate or unknown or HIV status was unknown or missing.
§§ These data do not include HIV-infected patients, but patients who reported immunosuppression caused by either a medical condition or medication, or immunosuppressive therapy.

(and were therefore excluded from the comparison analysis) were among those in whom TB was diagnosed ≥10 years after U.S. arrival; if these persons had been included in this analysis, the number of TB cases diagnosed among foreign-born persons ≥10 years after U.S. arrival would have been even higher.

Historically, TB prevention activities in the United States have been implemented primarily by the public health sector (*9*). If CDC and USPSTF recommendations are implemented (*2*,*3*), prevention activities, including screening for TB infection through the use of the tuberculin skin test or interferon-gamma release assays, might need to be expanded beyond the public health sector to include private providers and community health centers to better reach populations that have lived in the United States for ≥10 years. The findings of this analysis that the diagnosis of TB in foreign-born persons ≥10 years after U.S. arrival is independently associated with being a resident of a long-term care facility and having non-HIV–related immunocompromising conditions (including, but not limited to, diabetes mellitus or end-stage renal disease) underscore the importance of LTBI screening and treatment to prevent TB disease in these populations. Continued initiatives for overseas and domestic screening as well as expanding partnerships with both private and public health care providers will be important in promoting testing and treatment for LTBI.

Summary

What is already known about this topic?

Tuberculosis (TB) screening in the United States of persons from high TB–prevalence countries has historically focused on newly arrived persons. U.S. TB cases typically occur among persons who were infected years before experiencing disease. Persons with latent TB infection have a 5%–10% lifetime risk for developing TB disease in the United States.

What is added by this report?

Beginning in 2013, the number of TB diagnoses among foreign-born persons ≥10 years after U.S. arrival (2,823) has exceeded those among persons <10 years after U.S. arrival (2,814). In 2015, among 5,763 TB cases diagnosed in foreign-born persons in the United States for whom the date of U.S. entry was known, 2,922 (51%) were diagnosed in persons ≥10 years after U.S. arrival. Foreign-born persons who received a TB diagnosis ≥10 years after U.S. arrival had greater odds of being aged ≥40 years, residing in a long-term care facility at diagnosis, and having non-HIV–related immunocompromising conditions.

What are the implications for public health practice?

Promoting testing for TB infection as part of routine primary care among groups at high risk is crucial for advancing TB prevention and elimination initiatives in the United States. Emphasis should be focused on persons who have lived in countries with high TB prevalence, including persons who have resided in the United States for ≥10 years.

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Establishing a Timeline to Discontinue Routine Testing of Asymptomatic Pregnant Women for Zika Virus Infection — American Samoa, 2016–2017

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The first patients with laboratory-confirmed cases of Zika virus disease in American Samoa had symptom onset in January 2016 (*1*). In response, the American Samoa Department of Health (ASDoH) implemented mosquito control measures (*1*), strategies to protect pregnant women (*1*), syndromic surveillance based on electronic health record (EHR) reports (*1*), Zika virus testing of persons with one or more signs or symptoms of Zika virus disease (fever, rash, arthralgia, or conjunctivitis) (*1*–*3*), and routine testing of all asymptomatic pregnant women in accordance with CDC guidance (*2*,*3*)· All collected blood and urine specimens were shipped to the Hawaii Department of Health Laboratory for Zika virus testing and to CDC for confirmatory testing. Early in the response, collection and testing of specimens from pregnant women was prioritized over the collection from symptomatic nonpregnant patients because of limited testing and shipping capacity. The weekly numbers of suspected Zika virus disease cases declined from an average of six per week in January–February 2016 to one per week in May 2016. By August, the EHR-based syndromic surveillance (*1*) indicated a return to pre-outbreak levels. The last Zika virus disease case detected by real-time, reverse transcription–polymerase chain reaction (rRT-PCR) occurred in a patient who had symptom onset on June 19, 2016. In August 2016, ASDoH requested CDC support in assessing whether local transmission had been reduced or interrupted and in proposing a timeline for discontinuation of routine testing of asymptomatic pregnant women. An end date (October 15, 2016) was determined for active mosquito-borne transmission of Zika virus and a timeline was developed for discontinuation of routine screening of asymptomatic pregnant women in American Samoa (conception after December 10, 2016, with permissive testing for asymptomatic women who conceive through April 15, 2017).

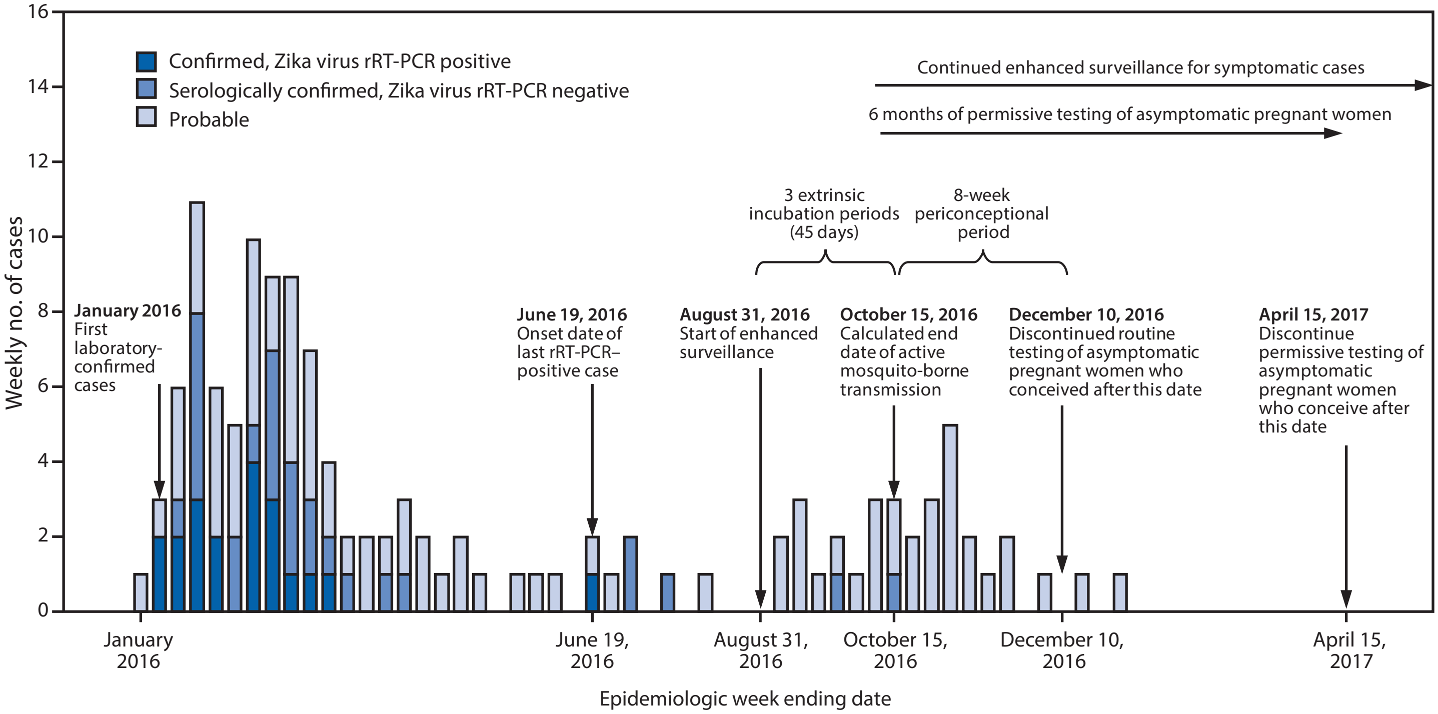
To assess whether local transmission was occurring, CDC recommended an enhanced surveillance strategy that included free clinic-based testing and reporting of all patients with an acute illness compatible with Zika virus disease at the majority of health care clinics. This enhanced surveillance was fully implemented in American Samoa by August 31, 2016. Evidence of ongoing local transmission was assessed primarily by results of rRT-PCR testing. Because of the serologic cross-reactivity between Zika virus and other flaviviruses (e.g., dengue virus) circulating in American Samoa, and the possible long duration of anti-Zika immunoglobulin M (IgM) antibody positivity, serology was considered a less specific method for detection of Zika virus and therefore a less reliable indicator of ongoing Zika virus transmission.

During August 31, 2016–October 15, 2016 (a period of 45 days, representing three 15-day extrinsic incubation periods* for Zika virus) (*4*), 32 patients were identified with symptoms of suspected Zika virus disease (one or more of the following: fever, rash, arthralgia, or conjunctivitis). Thirty (94%) of the patients were tested by rRT-PCR (median interval from symptom onset = 1 day; range = 0–30 days); two specimens did not contain sufficient quantity for testing. All 30 specimens tested negative. Among 277 asymptomatic pregnant women tested, 86 (31%) tested anti-Zika IgM-positive or equivocal; all 86 specimens subsequently tested negative by rRT-PCR. Although routine testing of asymptomatic pregnant women was not a component of enhanced surveillance for symptomatic disease, the negative rRT-PCR results were considered supportive evidence for the absence of ongoing local Zika virus transmission. Because no rRT-PCR-positive cases among pregnant or nonpregnant persons were identified within 45 days after the start of enhanced surveillance, an end date of potential active mosquito-borne transmission was calculated to be October 15, 2016 (Figure).

To account for women who might have been exposed during the periconceptional period (8 weeks before conception), routine testing of asymptomatic pregnant women who conceived within 8 weeks after the calculated transmission end date (on or before December 10, 2016) was recommended (*5*). Given the possibility of Zika virus persistence in semen for 6 months (*5*), testing of asymptomatic pregnant women who conceive through April 15, 2017, can be considered as a conservative

* An extrinsic incubation period is the interval from acquisition of an infectious agent by a vector (e.g., mosquito) until the vector can transmit the agent to another susceptible vertebrate host.

FIGURE. Timeline of laboratory-confirmed and probable Zika virus disease cases* with start of enhanced surveillance, calculated end date of mosquito-borne transmission, and testing recommendations — American Samoa, 2016–2017



Abbreviation: rRT-PCR = real-time, reverse transcription–polymerase chain reaction.

* Includes reported confirmed and probable Zika virus disease cases per Council of State and Territorial Epidemiologists definitions (https://wwwn.cdc.gov/nndss/conditions/zika-virus-disease-non-congenital/case-definition/2016/06/). Laboratory criteria for confirmed Zika virus disease, noncongenital: detection of Zika virus (ZIKV) by culture, viral antigen or viral RNA in serum, cerebrospinal fluid (CSF), tissue, or other specimen (e.g. amniotic fluid, urine, semen, or saliva); or positive ZIKV IgM antibody test of serum or CSF with positive ZIKV neutralizing antibody titers and negative neutralizing antibody titers against dengue or other flaviviruses endemic to the region where exposure occurred. Laboratory criteria for probable Zika virus disease, noncongenital: positive ZIKV IgM antibody test of serum or CSF with positive neutralizing antibody titers against ZIKV and dengue or other flaviviruses endemic to the region where exposure occurred; or negative dengue virus IgM antibody test and no neutralizing antibody testing performed.

approach at the discretion of the patient and her provider (i.e., "permissive testing").

On the basis of the information collected, testing for Zika virus infection in accordance with CDC guidance is currently recommended in American Samoa for the following groups: 1) all persons with signs and symptoms consistent with Zika virus disease; 2) asymptomatic pregnant women with an estimated date of conception (or last menstrual period) on or before December 10, 2016; 3) pregnant women with prenatal findings suggesting congenital Zika virus syndrome (*6*); 4) neonates born to mothers with laboratory evidence of Zika virus infection during pregnancy or who have abnormalities consistent with congenital Zika virus syndrome (*6*); and 5) asymptomatic pregnant women who lived in, traveled to, or had sex without a condom with a person who lived in or traveled to an area with active Zika virus transmission outside of American Samoa.

Discussion

Because many Zika virus infections are asymptomatic (*7*), enhanced clinic-based surveillance will not detect all cases of Zika virus infection; in addition, there is always a risk of reintroduction of Zika virus to American Samoa, although a potential reintroduction is expected to be detected by continued enhanced surveillance at clinics. The calculation of an end date for local Zika virus transmission in American Samoa relied solely on rRT-PCR as evidence of recent Zika infection. Serologic testing was considered less reliable in identifying recent transmission because of the long duration of IgM positivity (12 weeks or longer) and potential for cross-reactivity with other flaviviruses.

The increased likelihood of false positive test results that occurs as disease prevalence declines (*8*) can have negative psychosocial repercussions on pregnant women and significantly burden the health care system with only limited benefit. Establishing a timeline for discontinuing screening

Summary

What is already known about this topic?

CDC recommends Zika virus testing of asymptomatic pregnant women who live in areas with active Zika virus transmission as part of routine obstetric care during the first and second trimesters. Currently, there are no CDC recommendations to guide the discontinuation of testing for asymptomatic pregnant women following the end of Zika virus transmission in a jurisdiction.

What is added by this report?

Information on Zika virus transmission from the existing enhanced surveillance in American Samoa and current CDC guidance were used to develop criteria for calculating an end date (October 15, 2016) for active mosquito-borne transmission of Zika virus and to propose a timeline for discontinuation of routine screening of asymptomatic pregnant women in American Samoa (conception after December 10, 2016, with permissive testing for asymptomatic pregnant women who conceive through April 15, 2017).

What are the implications for public health practice?

The rationale described in this report might be adapted by similar jurisdictions with small populations and a potential for interruption of Zika virus transmission to help guide decisions about when to discontinue routine screening of asymptomatic pregnant women for Zika virus infection following the end of active mosquito-borne transmission.

of asymptomatic pregnant women allows ASDoH to allocate resources appropriately toward early interventions for children and families affected by Zika virus. The surveillance processes outlined and the timeline established for American Samoa might have implications for jurisdictions where small populations and similar population immunity following widespread Zika virus exposure can facilitate interruption of transmission.

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Self-Reported Work-Related Injury or Illness — Washington, 2011–2014

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Work-related injuries and illnesses account for an estimated $250 billion annually in medical expenses and indirect costs, such as lost earnings and benefits, and reduced productivity at home; these costs are 12% more than the cost of all cancers and 30% more than costs for diabetes (*1*). Traditional state-wide surveillance systems often rely on employer-reported data to describe work-related injury and illness, which underestimate the magnitude. Studies estimate that the Bureau of Labor Statistics' Survey of Occupational Injuries and Illnesses (BLS SOII) undercount 20%–70% of cases compared with workers' compensation, which has also been shown to underestimate cases (*2*,*3*). These surveillance systems also lack information on potential individual-level risk factors, such as health status and risk behaviors. Data were analyzed from the Washington State Behavioral Risk Factor Surveillance System (WA BRFSS) to demonstrate an opportunity to enhance current occupational health surveillance systems. During 2011–2014, 6.4% of Washington workers reported work-related injuries or illnesses during the previous year. Work-related injuries or illnesses were significantly associated with industry and occupation, male gender, lower socioeconomic status, chronic health conditions, and substance use. Because BRFSS does not rely on employer report and contains information on workers not available in traditional occupational health surveillance systems, it is a useful tool for identifying and examining work-related injury and illness.

BRFSS is a CDC-sponsored, statewide telephone survey conducted annually to collect information on health outcomes and behaviors. The sample includes adults aged ≥18 years in a private residence or college housing. Since 1995, the WA BRFSS has added questions* to collect information on industry and occupation. Trained coders assign industry and occupation codes to verbatim responses through automated and manual coding processes. During 2011–2014, WA BRFSS also collected work-related injury or illness information on working adults with a state-added question.† The response rates in Washington during this period ranged from 31% to 44%.

Among the 51,335 respondents to the 2011–2014 WA BRFSS, 25,493 (50.0%) were eligible to answer the work-related injury or illness question, including those currently employed for wages (20,028, 78.5%), self-employed (4,059, 15.9%), and out of work for <1 year (1,406, 5.5%). Among all eligible respondents, 24,650 (96.7%) participated in the optional work-related injury or illness module.

Associations between work-related injury or illness and select demographics, health conditions,§ and risk behaviors¶ were examined. Results were weighted to the adult population in Washington. Statistical significance was determined using Rao-Scott chi-square tests, at $\alpha=0.05$.

During 2011–2014, an estimated 6.4% (190,076 annually) of employed Washington residents reported having a work-related injury or illness during the previous year (Table 1). The percentage of workers with work-related injuries or illnesses varied significantly by respondent's reported industry and occupation, with the highest prevalences reported among workers in the Transportation and Warehousing (9.2%), and Construction industries (8.9%), and the Installation, Repair, and Maintenance (11.1%), Service (9.7%), and Transportation and Material Moving (9.6%) occupations (Table 1). The percentage of workers reporting work-related injury or illness was lowest among females (5.7%), married persons (5.4%), persons with ≥4 years of college (4.1%); and persons with an annual household income ≥$75,000 (4.4%) (Table 2).

* "What is your job title?" and "What kind of work do you do?"

† Work-related injury or illness defined as a "yes" response to "In the past 12 months, have you been injured while performing your job, or has a doctor or other medical professional told you that you have a work-related illness?"

§ Coronary heart disease defined as a "yes" response to "Has a doctor, nurse, or other health professional ever told you that you had angina or coronary heart disease?"; Diabetes defined as a "yes" response to "Has a doctor, nurse, or other health professional ever told you that you have diabetes?"; Depression defined as a "yes" response to "Has a doctor, nurse, or other health professional ever told you that you have a depressive disorder, including depression, major depression, dysthymia, or minor depression?"; Arthritis defined as a "yes" response to "Has a doctor, nurse, or other health professional ever told you that you have some form of arthritis, rheumatoid arthritis, gout, lupus, or fibromyalgia?"; Blindness or serious difficulty seeing defined as a "yes" response to "Are you blind, or do you have serious difficulty seeing, even when wearing glasses?"; Asthma defined as a "yes" response to "Has a doctor, nurse, or other health professional ever told you that you had asthma?", and a "yes" response to "Do you still have asthma?"

¶ Average hours of sleep in 24-hour period defined as the response to "On average, how many hours of sleep do you get in a 24-hour period?"; Use of pain killer to get high defined as a response >0 to "During the past 30 days, on how many days did you use a pain killer to get high, like Vicodin, OxyContin (sometimes called Oxy or OC) or Percocet (sometimes called Percs)?"; Marijuana usage defined as a response >0 to "During the past 30 days, on how many days did you use marijuana or hashish (grass, hash, or pot)?"; Smoker defined as a "yes" response to "Have you smoked at least 100 cigarettes in your entire life?", and an "every day" or "some days" response to "Do you now smoke cigarettes every day, some days, or not at all?"; Binge drinking defined as a response >0 to "During the past 30 days, how many days per week or per month did you have at least one drink of any alcoholic beverage such as beer, wine, a malt beverage or liquor?", and a response >0 to "Considering all types of alcoholic beverages, how many times during the past 30 days did you have [5 or more drinks for men/4 or more drinks for women] on an occasion?"

TABLE 1. Self-reported work-related injury or illness among employed adults, by year and employment characteristics — WA BRFSS, Washington, 2011–2014

Characteristic	No. in sample	Weighted percent with work- injury/illness	(95% CI)	p value
Total	**24,650**	**6.4**	**(5.9–6.8)**	—
Year				
2011	6,884	6.0	(5.1–6.9)	0.568
2012	7,643	6.4	(5.2–7.2)	—
2013	5,367	6.9	(6.0–7.8)	—
2014	4,756	6.2	(5.2–7.2)	—
Employment status				
Employed for wages	19,345	6.5	(6.1–7.0)	0.013
Self employed	3,975	4.7	(3.6–5.7)	—
Out of work for <1 yr	1,330	7.5	(5.4–9.5)	—
Industry*				
Agriculture, forestry, fishing, hunting, and mining	968	7.8	(5.3–10.4)	<0.001
Construction	1,361	8.9	(6.8–11.0)	—
Manufacturing	2,255	7.2	(5.7–8.6)	—
Wholesale and retail trade	2,236	6.2	(4.8–7.6)	—
Transportation and warehousing	915	9.2	(6.7–11.7)	—
Utilities	269	7.1	(3.3–10.9)	—
Information, finance and insurance, real estate services, and management	1,945	3.0	(1.7–3.8)	—
Professional, scientific, and technical services	2,217	2.9	(1.8–3.9)	—
Administrative support and waste management services	659	7.7	(4.5–10.8)	—
Educational services	2,776	5.4	(4.2–6.6)	—
Health care and social assistance	3,699	6.3	(5.2–7.4)	—
Arts, entertainment, and recreation	496	6.8	(3.7–10.0)	—
Accommodation and food services	718	7.6	(4.9–10.3)	—
Other services	1,112	6.1	(4.0–8.2)	—
Public administration	1,744	7.4	(5.8–9.0)	—
Occupation†				
Management, business and financial	4,759	3.7	(2.9–4.5)	<0.001
Professional and related	7,375	4.5	(3.8–5.2)	—
Service	2,968	9.7	(8.1–11.2)	—
Sales and related	1,704	3.9	(2.6–5.1)	—
Office and administrative support	2,396	5.1	(3.8–6.4)	—
Farming, fishing, and forestry	369	7.8	(4.2–11.4)	—
Construction and extraction	849	9.4	(6.8–11.9)	—
Installation, repair, and maintenance	577	11.1	(8.1–14.2)	—
Production	965	7.9	(6.0–9.9)	—
Transportation and material moving	1,070	9.6	(7.2–12.0)	—

Abbreviations: CI = confidence interval; WA BRFSS = Washington State Behavioral Risk Factor Surveillance System.
* North American Industrial Classification System, Industry Sectors.
† Standard Occupational Classifications.

The percentage of respondents reporting work-related injuries or illnesses was higher among persons with chronic health conditions, such as heart disease, depression, arthritis, blindness or difficulty seeing, and asthma, than among workers not reporting these conditions (Table 3). Reporting of these health conditions was not significantly higher among workers within high-risk industries and occupations (≥7 work-related injuries or illnesses reported per 100 workers) compared with workers in lower-risk (<7 per 100 workers) industries and occupations (data not shown).

The percentage of work-related injury or illness was significantly higher among workers who reported sleeping ≤6 hours per night on average (9.4%) compared with workers who slept an average of >6 hours per night (5.0%) (Table 3). The percentage of workers who reported work-related injury or illness was significantly higher among respondents who reported use of pain killers to get high (15.9%) or marijuana (8.9%), being a current smoker (10.0%), and binge drinking (7.4%), compared with workers who did not report these behaviors (Table 3).

Discussion

This is the first study to demonstrate the utility of the BRFSS as an occupational health surveillance system by examining associations of work-related injuries or illnesses with selected worker demographics, health conditions, and behaviors. The associations reported here are corroborated elsewhere in the literature (*4–7*), further supporting the use of BRFSS as a potential surveillance tool. For example, the industries with the highest percentages of work-related injury or illness identified in this report are consistent with high-risk industries

TABLE 2. Self-reported work-related injury or illness among employed adults, by demographic characteristics — WA BRFSS, Washington, 2011–2014

Characteristic	No. in sample	Weighted percent with work- injury/ illness	(95% CI)	p value
Total	**24,650**	**6.4**	**(5.9–6.8)**	**—**
Sex				
Male	11,715	6.9	(6.3–7.6)	0.005
Female	12,935	5.7	(5.1–6.3)	—
Age group (yrs)				
18–24	1,286	6.2	(4.6–7.7)	0.045
25–34	2,906	7.0	(5.8–8.1)	—
35–44	4,474	5.7	(4.8–6.6)	—
45–54	6,356	6.7	(5.9–7.5)	—
55–64	6,958	6.7	(5.9–7.6)	—
≥65	2,408	3.7	(2.6–4.8)	—
Race/Ethnicity*				
White	20,401	6.3	(5.8–6.7)	0.111
Black or African American	405	8.8	(5.6–12.0)	—
Asian	545	4.6	(2.4–6.8)	—
Native Hawaiian/Other Pacific Islanders	408	5.4	(2.5–8.3)	—
American Indian/Alaskan Native	181	9.5	(2.6–12.8)	—
Other	247	9.3	(3.4–15.6)	—
Multiracial	490	9.6	(5.7–13.5)	—
Hispanic	1,684	6.5	(5.0–8.0)	—
Marital status				
Married	14,877	5.4	(4.9–5.8)	<0.001
Divorced	3,481	9.6	(8.0–11.2)	—
Widowed	1,355	8.7	(6.1–11.3)	—
Separated	3,741	6.4	(5.3–7.5)	—
Never married	1,052	7.4	(5.4–9.5)	—
Children				
Yes	15,819	6.5	(5.9–7.1)	0.480
No	8,759	6.2	(5.5–6.8)	—
Education				
< High school diploma	1,067	8.1	(5.9–10.3)	<0.001
High school graduate	4,706	7.2	(6.2–8.2)	—
College 1–3 yrs	7,192	7.5	(6.7–8.3)	—
College ≥4 yrs	11,648	4.1	(3.6–4.5)	—
Income (dollars)				
<20,000	1,745	7.2	(5.5–8.9)	<0.001
20,000–<25,000	1,403	7.3	(5.4–9.2)	—
25,000–<35,000	1,994	8.5	(6.7–10.4)	—
35,000–<50,000	3,140	8.5	(7.0–9.9)	—
50,000–<75,000	4,399	6.7	(5.7–7.7)	—
≥75,000	9,829	4.4	(3.8–5.0)	—
Veteran status (ever)				
Yes	2,717	9.2	(7.7–10.7)	<0.001
No	21,913	6.0	(5.6–6.5)	—
Sexual orientation				
Heterosexual	22,976	6.4	(5.9–6.8)	0.719
Homosexual, bisexual, or other	894	6.0	(4.0–8.8)	—

Abbreviations: CI = confidence interval; WA BRFSS = Washington State Behavioral Risk Factor Surveillance System.
* Race/ethnicity was coded into mutually exclusive categories.

TABLE 3. Self-reported work-related injury or illness among employed adults, by selected health and behavior characteristics — WA BRFSS, Washington, 2011–2014

Characteristic	No. in sample	Weighted percent with work- injury/ illness	(95% CI)	p value
Total	**24,105**	**6.3**	**(5.9–6.8)**	**—**
Body mass index (BMI)				
Underweight and normal (BMI<25.0)	8,344	5.8	(5.0–6.5)	0.045
Overweight (25.0≤BMI<30.0)	8,611	6.5	(5.8–7.3)	—
Obese (BMI ≥30.0)	6,370	7.3	(6.4–8.1)	—
Coronary heart disease (ever)				
Yes	512	9.5	(5.9–13.2)	0.038
No	24,048	6.3	(5.9–6.8)	—
Diabetes (ever)				
Yes	1,937	7.6	(5.8–9.4)	0.125
No	22,684	6.3	(5.8–6.7)	—
Depression (ever)				
Yes	4,710	10.1	(8.8–11.4)	<0.001
No	19,843	5.5	(5.0–5.9)	—
Arthritis (ever)				
Yes	5,554	10.4	(9.1–11.6)	<0.001
No	18,959	5.5	(5.1–6.0)	—
Blind or serious difficulty seeing				
Yes	2,649	10.6	(8.8–12.4)	<0.001
No	21,757	5.9	(5.4–6.3)	—
Asthma (current)				
Yes	2,098	8.2	(6.7–9.8)	0.007
No	22,364	6.2	(5.7–6.7)	—
Average hours of sleep in 24-hour period (2013–2014 only)				
≤6	3,090	9.4	(8.0–10.9)	<0.001
>6	6,975	5.0	(4.4–5.7)	—
Use pain killer to get high (any use in past 30 days)				
Yes	135	15.9	(6.5–25.2)	0.002
No	21,131	6.2	(5.8–6.7)	—
Marijuana use (any use in past 30 days)				
Yes	1,428	8.9	(6.9–10.8)	0.002
No	19,758	6.1	(5.6–6.6)	—
Smoker (current)				
Yes	3,168	10.0	(8.6–11.4)	<0.001
No	21,191	5.6	(5.2–6.1)	—
Binge drinking (male: ≥5drinks; female: ≥4 drinks, on any occasion)				
Yes	4,169	7.4	(6.3–8.4)	0.023
No	19,852	6.1	(5.6–6.6)	—

Abbreviations: CI = confidence interval; WA BRFSS = Washington State Behavioral Risk Factor Surveillance System.

reported from other data sources, including Transportation and Warehousing; Construction; and Agriculture, Forestry, Fishing, Hunting, and Mining (*4*). Work injury and illness disparities by gender, education, and income described here replicate a body of evidence demonstrating higher unintentional injury risk among males and the relation of lower income and education attainment with overall poor health status (*5*). The WA BRFSS data presented in this analysis also reproduced important associations between several chronic conditions, such as

Summary

What is already known about this topic?

Work-related injuries and illnesses are frequent and have lasting negative economic and social consequences. Comprehensive surveillance is critical for identifying and evaluating effective control strategies and populations at risk.

What is added by this report?

Data from the Washington State Behavioral Risk Factor Surveillance System (WA BRFSS) were used to gather information on work-related injury or illness. During 2011–2014, 6.4% of Washington workers reported work-related injuries or illnesses during the previous year. Work-related injuries or illnesses were significantly associated with industry and occupation, male gender, lower socioeconomic status, chronic health conditions, and substance use.

What are the implications for public health practice?

Because BRFSS does not rely on employer report and contains information on workers not available in traditional occupational health surveillance systems, it is a useful tool for identifying and examining work-related injury and illness. BRFSS provides opportunities to enhance ability to track injury and illness trends, identify and describe disparities among workers by industry and occupation of employment, and generate hypotheses for control measures. Future research should consider further assessment of health status as a potential contributor to occupational injury risk.

obesity, heart disease, depression, arthritis, asthma, and poor eyesight and work-related injury and illness that have been documented by other studies (*6*,*7*).

Higher percentages of work-injury and illness among persons reporting an average of ≤6 hours of sleep per night, binge drinking, and recent use of painkillers to get high and marijuana compared with persons not reporting those conditions have also been identified as risk factors for work-related injury or illness in other studies (*7*,*8*). Marijuana and pain killer usage was measured by reported behavior in the previous month only, whereas work-related injury and illness was measured over an entire year. This suggests that substance use might also be an outcome of work-related injuries and illnesses rather than solely a risk factor, because opioids are frequently prescribed to treat injured workers (*9*).

The findings in this report are subject to at least five limitations. First, BRFSS findings are limited because of the survey's cross-sectional design. This prevents identification of causal factors for work-related injury or illness and the ability to determine whether reported health conditions existed before, or resulted from a work-related injury or illness. Second, because responses are self-reported, the findings are also subject to recall and social desirability biases, which could result in differential recall of more severe or recent events. Third, the survey question used to collect reports of work-related injury or illness here prevents characterization by severity or distinguishing conditions. Fourth, workers' or physicians' definitions of a work-related injury or illness might differ from legally reportable definitions, so results are not directly comparable to state-level employer-reported data, such as the BLS SOII. Finally, BRFSS does not collect information on other factors known to cause work-related injuries and illnesses such as physical, chemical, biological or ergonomic hazards.

This report demonstrates the utility of the WA BRFSS as a statewide occupational health surveillance system, which unlike other current surveillance systems, collects work-related injury or illness data. The WA BRFSS identifies cases by worker-report, and therefore is not subject to the same underreporting biases present in systems that rely on physician or employer reports of injury and illness. The WA BRFSS also collects demographic, health status and behavior information on workers that is not available in other sources of occupational injury and illness data, allowing for more complete characterization of persons with recent work-related injuries and illnesses. The WA BRFSS could serve as a model for other states to include similar questions to collect work-related injury and illness data to enhance their occupational surveillance capabilities, and allow for opportunities to aggregate state data for evaluation of this outcome on a larger scale. Further research might help to determine if there is segregation of workers by their demographic, health, and behavior characteristics into high-risk industries and occupations, or if these characteristics are causally related to injury and illness. Assessment of health status and behaviors as potential contributors to occupational injury risk might inform future prevention activities, but does not mitigate the employer's responsibility in providing a workplace free from hazards.

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Notes from the Field

Obstetric Tetanus in an Unvaccinated Woman After a Home Birth Delivery — Kentucky, 2016

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On July 11, 2016, state and local health departments in Kentucky were notified of a case of obstetric tetanus in an unvaccinated woman. Obstetric tetanus, which occurs during pregnancy or within 6 weeks of the end of pregnancy, follows contamination of wounds with *Clostridium tetani* spores during pregnancy, or the use of contaminated tools or practices during nonsterile deliveries or abortions. CDC did not identify any cases of obstetric tetanus in the United States during 1972–2008 (*1*,*2*). State and local health departments in Kentucky investigated this case to identify risk factors and provide recommendations.

The patient, a woman aged 30 years, is a member of an Amish community. In late June, she delivered a child at home, assisted by an unlicensed community childbirth assistant. She had never received a vaccination for tetanus. Delivery was complicated by breech presentation, but no birth trauma, unsterile conditions, or other complications were reported. Nine days postpartum, the patient experienced facial numbness and neck pain, which progressed over 24 hours to stiff neck and jaw and difficulty swallowing and breathing. She was admitted to the hospital where a clinical diagnosis of tetanus was made, and 6,000 international units of tetanus immunoglobulin were administered intramuscularly. Endotracheal intubation and mechanical ventilation were required. Her hospital course was complicated by seizures and a need for prolonged respiratory support. After approximately a month, the patient was stable and discharged home.

The infant was monitored at home during the mother's hospitalization. Tetanus immunoglobulin was recommended; however, the family declined treatment. A local advanced practice nurse performed weekly follow-up visits and noted no problems in the infant.

The close relationship between the local health department, health care providers, and the approximately 400-member Amish community facilitated contact with community leaders for an opportunity to discuss implementing Advisory Committee on Immunization Practices (ACIP) recommendations for tetanus immunization through a vaccination campaign. Door-to-door home visits in areas with vaccine-supportive community leaders were made by local health department staff members and the advanced practice nurse to explain the benefits of vaccination and provide vaccine. At the time of the campaign, there was one pregnant woman and one woman who was immediately postpartum in the community; both declined vaccination. Forty-seven (12%) persons were vaccinated, including 32 children aged ≤18 years. An age-appropriate diphtheria, tetanus, and pertussis vaccine (DTaP or Tdap) was administered to 30 (64%) of the 47 vaccine recipients. Because many community members reported having had pertussis disease and were opposed to receiving pertussis vaccine, 17 (36%) persons received age-appropriate tetanus and diphtheria toxoids without pertussis vaccine (DT or Td). Although none of the persons receiving vaccine had been previously vaccinated against any disease to date, none have agreed to complete the series because of little perceived ongoing vaccination need. Additional outreach initiatives are planned.

To prevent tetanus, ACIP recommends a 5-dose series of diphtheria and tetanus toxoids and acellular pertussis vaccine (DTaP) for children at ages 2, 4, 6, 15–18 months, and 4–6 years, followed by 1 dose of tetanus and diphtheria toxoids and acellular pertussis vaccine (Tdap) for adolescents aged 11–12 years. Previously vaccinated adults are recommended to receive routine booster doses of a tetanus-containing vaccine every 10 years, and unvaccinated adults should complete a 3-dose primary series (*3*,*4*). Pregnant women with unknown or incomplete tetanus vaccination histories should receive a series of 3 doses of tetanus and reduced diphtheria toxoids (Td) to protect against obstetric and neonatal tetanus (*5*). ACIP also recommends a dose of Tdap to all previously vaccinated pregnant women at 27 to 36 weeks' gestation during each pregnancy, regardless of time of previous vaccination, to provide protection from pertussis to infants.

This case highlights the importance of tetanus vaccination for all persons as recommended by ACIP (*5*,*6*). Although Amish communities generally do not have religious objections to vaccination (*7*), preventive health care has not historically been accessed by this Amish community. Trust between the Amish community, local health department, and a familiar health care provider, as well as working within community members' homes, and providing culturally appropriate education and recommendations through community leaders, facilitated vaccination of some persons. Ongoing outreach by health departments is beneficial to vulnerable, nonimmunized or underimmunized populations.

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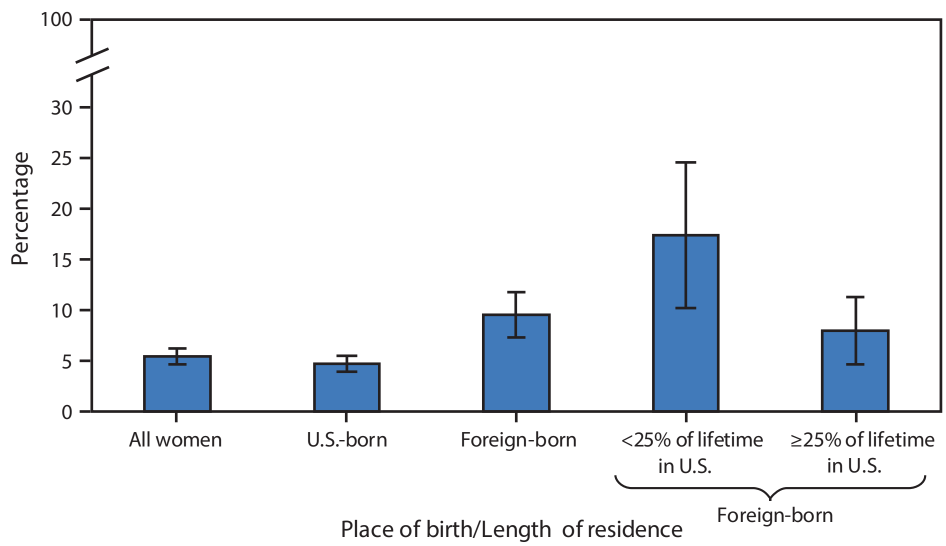
QuickStats

FROM THE NATIONAL CENTER FOR HEALTH STATISTICS

Percentage* of U.S. Women Aged 50–74 Years Who Never Had a Mammogram,† by Place of Birth and Length of Residence in the United States§ — National Health Interview Survey, 2013 and 2015¶



* With 95% confidence intervals indicated by error bars.

† A mammogram is a radiograph of the breast that might be used to check for breast cancer in women who have no signs or display no symptoms of the disease. The U.S. Preventive Services Task Force recommends screening for breast cancer with mammography every 2 years for women aged 50–74 years.

§ Country of birth, number of years residing in the United States, and current age were used to determine nativity and percentage of time in the United States.

¶ Estimates are based on household interviews of a sample of the civilian, noninstitutionalized U.S. population and are derived from the National Health Interview Survey.

In 2013 and 2015 combined, 5.4% of U.S. women aged 50–74 years had never received a mammogram in their lifetime. Foreign-born women were twice as likely as U.S.-born women to have never received a mammogram (9.5% versus 4.7%). Foreign-born women who lived in the United States for <25% of their lifetime were more than twice as likely to have never received a mammogram compared with those who resided in the U.S. for ≥25% of their lifetime (17.3% versus 7.9%).

Source: National Health Interview Survey, 2013 and 2015 combined. https://www.cdc.gov/nchs/nhis.htm.

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