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World TB Day — March 24, 2020

World TB Day is observed each year on March 24, providing an opportunity to increase awareness about tuberculosis (TB) and the actions needed to find, treat, and prevent this devastating disease.

In 2019, a provisional total of 8,920 TB cases were reported in the United States (incidence = 2.7 cases per 100,000 persons) (*1*), a 1.1% decrease from the 9,021 cases reported during 2018 and the lowest number of U.S. cases recorded since reporting began in 1953. Increased diagnosis and treatment of latent TB infection remains essential for eliminating TB in the United States.

An analysis of global TB surveillance data found that in 2018, an estimated 10 million persons with incident TB and 1.5 million TB-related deaths occurred worldwide, representing 2% and 5% declines from 2017. Among the estimated 10 million persons with TB, 70% were reported to WHO in 2018, a 9.4% increase from 2017 (*2*). Approximately 862,000 reported TB cases occurred among persons living with human immunodeficiency virus (HIV) infection. In 2018, 1.8 million persons with HIV began TB preventive treatment (TPT), a 88% increase in treatment initiation from 2017. Less progress in TPT implementation was reported among children aged <5 years than among persons living with HIV infection. TPT has been demonstrated to decrease morbidity and mortality among persons with HIV infection. Full implementation of effective strategies, including TPT, is crucial for reaching global targets.

CDC is working with partners to diagnose, treat, and prevent TB in the United States and globally. Additional information is available at https://www.cdc.gov/tb/worldtbday/ and https://www.cdc.gov/globalhivtb/who-we-are/events/world-tb-day/worldtbday.html.

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Global Epidemiology of Tuberculosis and Progress Toward Meeting Global Targets — Worldwide, 2018

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Worldwide, tuberculosis (TB) is the leading cause of death from a single infectious disease agent (*1*), including among persons living with human immunodeficiency virus (HIV) infection (*2*). A World Health Organization (WHO) initiative, The End Tuberculosis Strategy, set ambitious targets for 2020–2035, including 20% reduction in TB incidence and 35% reduction in the absolute number of TB deaths by 2020 and 90% reduction in TB incidence and 95% reduction in TB deaths by 2035, compared with 2015 (*3*). This report evaluated global progress toward these targets based on data reported by

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WHO (*1*). Annual TB data routinely reported to WHO by 194 member states were used to estimate TB incidence and mortality overall and among persons with HIV infection, TB-preventive treatment (TPT) initiation, and drug-resistant TB for 2018 (*1*). In 2018, an estimated 10 million persons had incident TB, and 1.5 million TB-related deaths occurred, representing 2% and 5% declines from 2017, respectively. The number of persons with both incident and prevalent TB remained highest in the WHO South-East Asia and African regions. Decreases in the European region were on track to meet 2020 targets. Globally, among persons living with HIV, 862,000 incident TB cases occurred, and 1.8 million persons initiated TPT. Rifampicin-resistant or multidrug-resistant TB occurred among 3.4% of persons with new TB and 18% among persons who were previously treated for TB (overall, among 4.8% of persons with TB). The modest decreases in the number of persons with TB and the number of TB-related deaths were consistent with recent trends, and new and substantial progress was observed in increased TPT initiation among persons living with HIV. However, to meet the global targets for 2035, more intensive efforts are needed by public health partners to decrease TB incidence and deaths and increase the number of persons receiving TB curative and preventive treatment. Innovative approaches to case finding, scale-up of TB preventive treatment, use of newer TB treatment regimens, and prevention and control of HIV will contribute to decreasing TB.

TPT (the most common global regimen consists of daily isoniazid for ≥6 months) has been demonstrated to prevent TB disease among persons who might be infected with TB and are at risk for TB disease (*4*). Current WHO recommendations advise providing a course of TPT to all persons living with HIV and to all household contacts of persons with bacteriologically confirmed pulmonary TB disease (*5*).

TB data are reported to WHO annually by 194 member states and are reviewed and validated in collaboration with reporting entities (*1*,*6*). For each country, 2018 disease incidence (per 100,000 HIV-negative persons and per 100 persons living with HIV) was estimated from 1) TB prevalence surveys; 2) notifications from country surveillance systems adjusted by a standard factor to account for underreporting, overdiagnosis, and underdiagnosis; 3) national inventory studies that measure the level of underreporting of detected persons with TB combined with capture-recapture modeling; and 4) national notification data supplemented with expert opinion about case-detection gaps. Among HIV-negative persons, TB mortality rate estimates were based on all-cause mortality data from civil registration and vital statistics, mortality surveys, or the product of TB incidence and case fatality rate (CFR) (*1*). Among persons living with HIV, TB mortality rates were derived from the product of incidence and CFR. Data on persons receiving TPT represent numbers directly reported to WHO.

In 2018, an estimated 10 million persons had incident TB (132 per 100,000 population), a 2% decline from 2017 (Figure 1). Incidence has declined by an average of 1.6% per

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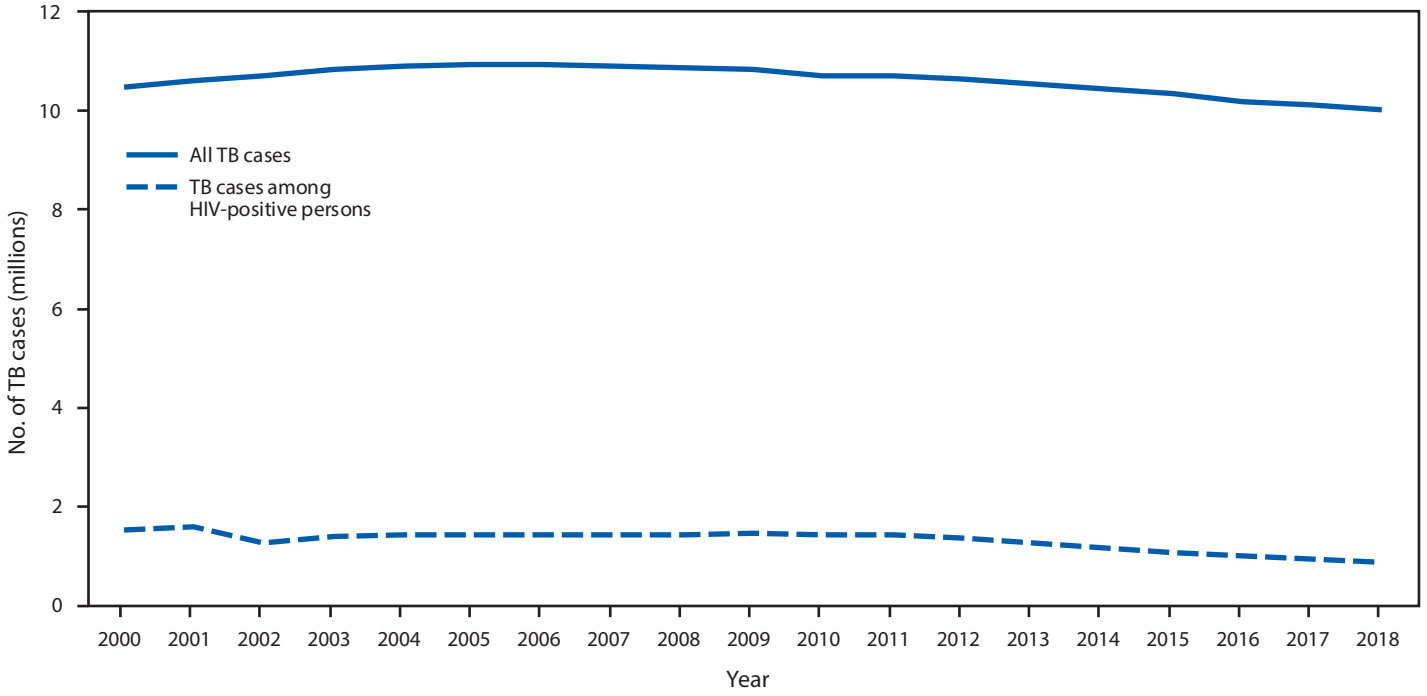
FIGURE 1. Trends in estimated incident tuberculosis (TB) among all persons and among persons living with human immunodeficiency virus (HIV-positive persons) — worldwide, 2000–2018



Source: Adapted with permission from World Health Organization. Global tuberculosis report 2019. Geneva, Switzerland: World Health Organization; 2019.

year since 2000. In 2018, 7.0 million persons globally were notified of their TB-positive results, representing 70% of the estimated number of persons with incident TB, an increase from the 6.4 million persons (64%) notified in 2017. In 2018, 69% of all persons with incident TB received anti-TB treatment, compared with 64% in 2017. The estimated number of TB-related deaths declined 5%, from 1.57 million in 2017 to 1.49 million in 2018 (CFR = 15%) (Figure 2). An estimated 862,000 persons living with HIV had incident TB in 2018, accounting for 8.6% of all persons with TB. Within this group, the estimated annual TB incidences were 6% in 2000, 2.5% in 2017, and 2.3% in 2018. In 2018, an estimated 251,000 TB deaths among persons living with HIV occurred (CFR = 29%). Overall, an estimated 484,000 persons had incident rifampicin-resistant or multidrug–resistant TB in 2018, representing 4.8% of all persons with TB, 3.4% of persons with a new TB diagnosis, and 18% of persons previously treated for TB. An estimated 214,000 persons died of either rifampicin-resistant or multidrug–resistant TB (CFR = 44%) in 2018. Among persons with rifampicin-resistant TB, 78% were estimated to have multidrug–resistant TB.

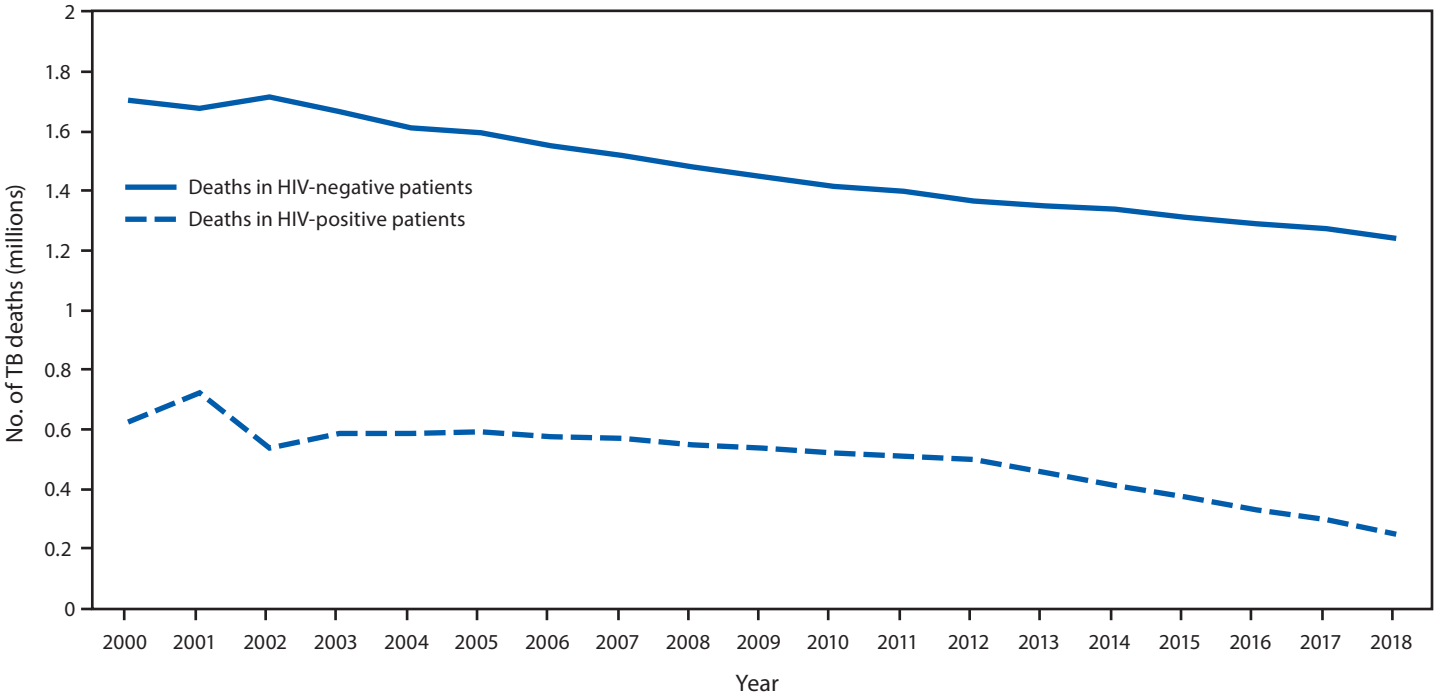
The WHO region of South-East Asia accounted for the highest percentage of TB cases (44% of all persons with TB) in 2018 (TB incidence = 220 per 100,000 population) (Table). TB incidence also was high in the African region (231 per 100,000 population) and, in 2018, this region accounted for 71% of all persons living with HIV with TB worldwide, similar to 2017. In the European region, TB incidence declined 15% since 2015 to 28 per 100,000 population. However, the proportion of persons with rifampicin-resistant or multidrug–resistant TB in this region (30%) remained substantially higher than that in all other regions (range = 3.1%–5.4%), and overall incidence of rifampicin-resistant or multidrug–resistant TB is similar to the Africa and South-East Asia regions.

In 2018, 65 countries reported data on TPT use among eligible persons living with HIV and 109 countries among children aged <5 years. Among these countries, 1.8 million persons living with HIV received TPT in 2018 (an 88% increase from 960,000 in 2017). Less progress was observed among eligible children aged <5 years: 350,000 children received TPT in 2018, a 20% increase compared with 292,000 in 2017.

Discussion

WHO's initiative, The End TB Strategy (*3*), has ambitious targets for 2020–2035, and the 2018 United Nations High Level Meeting on TB (UNHLM-TB) declaration established targets for 2022 that included providing TB treatment for 40 million persons infected with TB and providing TPT to 30 million persons, including 6 million persons living with HIV (*7*). Although some progress was made in 2018 toward meeting global targets, the overall number of persons with TB and TB-associated deaths decreased only slightly from 2017.

FIGURE 2. Trends in the estimated number of tuberculosis (TB)-related deaths among persons living with human immunodeficiency virus (HIV-positive persons) and HIV-negative persons — worldwide, 2000–2018



Source: Adapted with permission from World Health Organization. Global tuberculosis report 2019. Geneva, Switzerland: World Health Organization; 2019.

TABLE. Estimated number of incident tuberculosis (TB) cases, TB incidence, and number of TB-associated deaths among all persons and persons living with human immunodeficiency virus (HIV-positive persons) and number of TB patients with rifampicin-resistant TB, by World Health Organization (WHO) region — Worldwide, 2018

WHO region	No. of persons with TB (x 1,000)	Incidence*	No. of deaths (x 1,000) (%)	No. of TB cases among HIV-positive persons (x 1,000)	No. of TB deaths among HIV-positive persons (x 1,000) (%)	No. rifampicin-resistant TB cases (x 1,000)	Incidence of rifampicin-resistant TB†	% of TB cases rifampicin-resistant†
Global (all regions)	**10,000**	**132**	**1,493 (15)**	**862**	**251 (29)**	**484**	**9.3**	**4.8**
African	2,450	231	609 (25)	615	211 (34)	77	7.3	3.1
Americas	289	29	23 (8)	29	5.9 (20)	11	1.0	3.8
Eastern Mediterranean	810	115	79 (10)	7	2.2 (32)	38	5.5	4.7
Europe	259	28	27 (10)	30	4.4 (15)	77	8.3	29.7
South-East Asia	4,370	220	658 (15)	140	21 (15)	182	9.2	4.1
Western Pacific	1,840	96	97 (5)	41	6.5 (16)	99	5.2	5.4

Source: Adapted with permission from World Health Organization. Global tuberculosis report 2019. Geneva, Switzerland: World Health Organization; 2019.
* Cases per 100,000 persons.
† Includes multidrug-resistant TB.

Notable highlights in progress include an increased proportion of persons notified of TB-positive results, increased TPT among persons living with HIV, and decreased TB incidence in the European region.

The African region continues to have the highest HIV prevalence; thus, a large proportion of the TB cases in this region were associated with HIV. Similarly, the TB CFR among persons living with HIV continues to be high, and consequently, overall TB CFR was highest in this region. Whereas the European region is on track to meet 2020 targets, the overall proportion of persons with rifampicin-resistant or multidrug–resistant TB remains a substantial challenge. Recent progress in the development of new treatment regimens for TB and updated WHO guidelines suggest that all persons with rifampicin-resistant or multidrug–resistant TB could benefit from effective all-oral treatment regimens (*8*).

A key UNHLM-TB target is to initiate 30 million persons on TPT by 2022. Although the overall number of TPT initiations remains well below the target, including among household members of persons with TB, the number of persons living with HIV who initiated TPT nearly doubled from 2017 to 2018 and appears on track to meet the target of 6 million

Summary

What is already known about this topic?

Targets for reducing tuberculosis (TB) have been set in a World Health Organization (WHO) initiative, The End TB Strategy. Achieving these targets will require substantial annual reductions in the incidence of TB and the number of TB deaths.

What is added by this report?

In 2018, an estimated 10 million incident TB cases and 1.5 million TB deaths occurred, reductions of 2% and 5%, respectively, from 2017. TB epidemiology varied by WHO region.

What are the implications for public health practice?

Innovative approaches to case finding, scale-up of TB preventive treatment, use of newer TB treatment regimens, and prevention and control of HIV will contribute to decreasing TB incidence.

by 2022 (*1*). Substantial improvements in TPT initiation in other populations, including children aged <5 years who are household contacts of persons with TB, are necessary to reach the UNHLM-TB targets. Although daily isoniazid has been the primary TPT regimen globally, an alternative regimen of a 12-dose, once-weekly combination of isoniazid and rifapentine has been demonstrated to have similar efficacy with lower toxicity (*4*) and is anticipated to be increasingly used as a TPT regimen.

The findings in this report are subject to at least two limitations. First underlying data quality, particularly for surveillance, might affect the accuracy of estimates. Second, the differing methodologies used to generate country-level estimates might affect the comparability of estimates among regions and countries.

Global targets to end TB represent ambitious goals; however, achieving them will result in the prevention of disease and death among millions of persons. Although progress continues to be made, at the current pace of progress it remains unlikely that 2035 targets will be met. The scale-up of TB disease surveillance, initiation of TPT among eligible persons, and effective treatment need to continue to improve. Much more intensive efforts to find, cure, and prevent all cases of TB are necessary to meet global targets and end the public health burden of TB.

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Tuberculosis — United States, 2019

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Since 1989, the United States has pursued a goal of eliminating tuberculosis (TB) through a strategy of rapidly identifying and treating cases and evaluating exposed contacts to limit secondary cases resulting from recent TB transmission (*1*). This strategy has been highly effective in reducing U.S. TB incidence (*2*), but the pace of decline has significantly slowed in recent years (2.2% average annual decline during 2012–2017 compared with 6.7% during 2007–2012) (*3*). For this report, provisional 2019 data reported to CDC's National Tuberculosis Surveillance System were analyzed to determine TB incidence overall and for selected subpopulations and these results were compared with those from previous years. During 2019, a total of 8,920 new cases were provisionally reported in the United States, representing a 1.1% decrease from 2018.* TB incidence decreased to 2.7 cases per 100,000 persons, a 1.6% decrease from 2018. Non–U.S.-born persons had a TB rate 15.5 times greater than the rate among U.S.-born persons. The U.S. TB case count and rate are the lowest ever reported, but the pace of decline remains slow. In recent years, approximately 80% of U.S. TB cases have been attributed to reactivation of latent TB infection (LTBI) acquired years in the past, often outside the United States (*2*). An expanded TB elimination strategy for this new decade should leverage existing health care resources, including primary care providers, to identify and treat persons with LTBI, without diverting public health resources from the continued need to limit TB transmission within the United States. Partnerships with health care providers, including private providers, are essential for this strategy's success.

Health departments in the 50 U.S. states and the District of Columbia (DC) report all TB cases that meet the Council of State and Territorial Epidemiologists' surveillance case definition† to CDC. Reports include patient demographics, clinical features, and medical and social risk factors. Self-reported race/ethnicity data are collected and reported following federal standards; Hispanics/Latinos can be of any race, and all other reported race categories are non-Hispanic/Latino. The U.S. Census Bureau defines a U.S.-born person as one born in the United States or a U.S. territory or born abroad to a U.S. citizen parent. Rates (cases per 100,000 persons) were calculated for the United States and administrative divisions (i.e., the 50 states, DC, and census divisions) using midyear U.S. Census Bureau population estimates.§ Rates by national origin and race/ethnicity were calculated using midyear Current Population Survey estimates.¶ Average annual percentage changes (APC) in incidence were calculated for 2007–2012 and 2012–2019; these years were selected based on previous research demonstrating a statistically significant change in incidence trends during 2007 and 2012 (*3*). Data regarding drug-resistant TB cases are reported for 2018, the most recent year for which complete drug-resistance data are available.

U.S. TB incidence decreased an average of 2.1% per year during 2012–2019, a slower rate of decline than the average 6.4% per year during 2007–2012. The overall U.S. TB rate for 2019 was 2.7 cases per 100,000 persons, while state-specific 2019 TB rates ranged from 0.2 (Wyoming) to 8.1 (Alaska) (Table 1). Nine states (Alaska, California, Georgia, Hawaii, Maryland, New Jersey, New York, Texas, and Washington) and DC reported TB rates higher than the national rate. Four states (California, Florida, New York, and Texas) continued to account for approximately half of all reported TB cases.

Among 8,920 TB cases reported during 2019, a total of 6,322 (70.9%) occurred among non–U.S.-born persons (Table 2). From 2018 to 2019, the rate among U.S.-born persons declined 4.2% (to 0.9 cases per 100,000 persons), while the rate among non–U.S.-born persons declined 1.5% (to 14.1) (Table 2) (Figure).

Among non–U.S.-born persons residing in the United States, TB rates during 2019 were highest among Asians (25.7 per 100,000), followed by Native Hawaiians/Pacific Islanders (25.1), blacks/African Americans (19.5), Hispanics/Latinos (10.2), and American Indians/Alaska Natives (5.3) and were lowest among whites (3.1) (Table 2). Rates decreased from 2018 to 2019 for all non–U.S.-born groups except American Indians/Alaska Natives and Native Hawaiians/Pacific Islanders. The top five countries of birth among non–U.S.-born persons with incident TB in 2019 were Mexico (1,165 cases; 18.4% of non–U.S.-born cases), the Philippines (790; 12.5%), India (573; 9.1%), Vietnam (503; 8.0%), and China (387; 6.1%).

Among U.S.-born persons, 2019 rates were highest for Native Hawaiians/Pacific Islanders (3.5), followed by American Indians/Alaska Natives (3.4), blacks/African Americans (2.5), Hispanics/Latinos (1.6), and Asians (1.6) and were lowest

* This report is limited to National Tuberculosis Surveillance System case reports verified as of March 3, 2020. Updated data will be available in CDC's annual TB surveillance report later this year.

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

§ https://www.census.gov/data/tables/time-series/demo/popest/2010s-national-total.html.

¶ https://www.census.gov/programs-surveys/cps/data/data-tools.html.

TABLE 1. Tuberculosis (TB) case counts and rates with annual percentage changes, by U.S. Census division and state or district — United States, 2018 and 2019

Census division/ State	No. of reported TB cases*			TB rate†		
	2018	2019	% change	2018	2019	% change§
Division 1: New England						
Connecticut	51	67	31.4	1.4	1.9	31.6
Maine	14	19	35.7	1.0	1.4	35.2
Massachusetts	200	179	–10.5	2.9	2.6	–10.6
New Hampshire	12	6	–50.0	0.9	0.4	–50.2
Rhode Island	20	14	–30.0	1.9	1.3	–30.1
Vermont	5	3	–40.0	0.8	0.5	–40.0
Subtotal	**302**	**288**	**–4.6**	**2.0**	**1.9**	**–4.7**
Division 2: Middle Atlantic						
New Jersey	291	311	6.9	3.3	3.5	6.9
New York	744	754	1.3	3.8	3.9	1.7
Pennsylvania	213	198	–7.0	1.7	1.5	–7.1
Subtotal	**1,248**	**1,263**	**1.2**	**3.0**	**3.1**	**1.4**
Division 3: East North Central						
Illinois	319	327	2.5	2.5	2.6	2.9
Indiana	116	108	–6.9	1.7	1.6	–7.4
Michigan	108	132	22.2	1.1	1.3	22.2
Ohio	178	150	–15.7	1.5	1.3	–15.8
Wisconsin	49	51	4.1	0.8	0.9	3.8
Subtotal	**770**	**768**	**–0.3**	**1.6**	**1.6**	**–0.3**
Division 4: West North Central						
Iowa	49	52	6.1	1.6	1.6	5.9
Kansas	28	38	35.7	1.0	1.3	35.6
Minnesota	172	147	–14.5	3.1	2.6	–15.0
Missouri	80	70	–12.5	1.3	1.1	–12.7
Nebraska	27	17	–37.0	1.4	0.9	–37.3
North Dakota	13	18	38.5	1.7	2.4	37.7
South Dakota	12	16	33.3	1.4	1.8	32.4
Subtotal	**381**	**358**	**–6.0**	**1.8**	**1.7**	**–6.4**
Division 5: South Atlantic						
Delaware	22	19	–13.6	2.3	2.0	–14.4
District of Columbia	36	24	–33.3	5.1	3.4	–33.7
Florida	591	558	–5.6	2.8	2.6	–6.6
Georgia	271	301	11.1	2.6	2.8	10.0
Maryland	210	212	1.0	3.5	3.5	0.8
North Carolina	196	185	–5.6	1.9	1.8	–6.6
South Carolina	86	80	–7.0	1.7	1.6	–8.1
Virginia	205	190	–7.3	2.4	2.2	–7.7
West Virginia	6	10	66.7	0.3	0.6	67.8
Subtotal	**1,623**	**1,579**	**–2.7**	**2.5**	**2.4**	**–3.5**
Division 6: East South Central						
Alabama	91	87	–4.4	1.9	1.8	–4.7
Kentucky	65	66	1.5	1.5	1.5	1.4
Mississippi	81	58	–28.4	2.7	1.9	–28.3
Tennessee	139	128	–7.9	2.1	1.9	–8.7
Subtotal	**376**	**339**	**–9.8**	**2.0**	**1.8**	**–10.2**
Division 7: West South Central						
Arkansas	76	63	–17.1	2.5	2.1	–17.3
Louisiana	105	89	–15.2	2.3	1.9	–15.0
Oklahoma	74	72	–2.7	1.9	1.8	–3.1
Texas	1,124	1,153	2.6	3.9	4.0	1.3
Subtotal	**1,379**	**1,377**	**–0.1**	**3.4**	**3.4**	**–1.1**
Division 8: Mountain						
Arizona	178	184	3.4	2.5	2.5	1.7
Colorado	64	66	3.1	1.1	1.1	1.9
Idaho	15	7	–53.3	0.9	0.4	–54.3
Montana	5	2	–60.0	0.5	0.2	–60.3
Nevada	69	52	–24.6	2.3	1.7	–25.9
New Mexico	41	40	–2.4	2.0	1.9	–2.6
Utah	18	27	50.0	0.6	0.8	47.5
Wyoming	1	1	0.0	0.2	0.2	–0.2
Subtotal	**391**	**379**	**–3.1**	**1.6**	**1.5**	**–4.4**
Division 9: Pacific						
Alaska	63	59	–6.3	8.6	8.1	–5.9
California	2,097	2,118	1.0	5.3	5.4	0.9
Hawaii	120	99	–17.5	8.4	7.0	–17.2
Oregon	81	70	–13.6	1.9	1.7	–14.3
Washington	190	223	17.4	2.5	2.9	16.0
Subtotal	**2,551**	**2,569**	**0.7**	**4.8**	**4.8**	**0.4**
Total	**9,021**	**8,920**	**–1.1**	**2.8**	**2.7**	**–1.6**

* Based on data from the National Tuberculosis Surveillance System as of March 3, 2020.
† Cases per 100,000 persons. Calculated using midyear population estimates from the U.S. Census Bureau.
§ Calculated using unrounded figures.

among whites (0.4). TB incidence decreased from 2018 to 2019 for all U.S.-born groups except Hispanics.

Human immunodeficiency virus (HIV) status was known for 87.3% of reported 2019 TB cases; 4.9% of those patients were coinfected with HIV, including 7.8% of persons aged 25–44 years. Initial drug-susceptibility testing results for at least isoniazid and rifampin were reported for 94.9% of culture-confirmed cases during 2018, the most recent year for which complete data are available.** Among the 6,746 cases during 2018 with available drug-susceptibility test data, 102 (1.5%) were multidrug-resistant††; 88 (86.3%) of these cases were among non–U.S.-born persons; 83 (81.4%) reported no previous TB episode. One case of extensively drug-resistant TB§§ was reported during 2018; this case occurred in a non–U.S.-born person with a reported previous episode of TB disease.

Discussion

Since adoption of the U.S. TB elimination strategy in 1989 (*1*), TB incidence has decreased by approximately two thirds (*2*), demonstrating the effectiveness of efforts during the last three decades to prevent TB transmission in the United States.

** Because initial drug-susceptibility test results for isoniazid and rifampin were only available for 86.4% of culture-confirmed cases during 2019, more complete data from 2018 are presented. Culture-confirmed cases are defined as cases that were culture-positive on a specimen collected ≤2 weeks after starting TB treatment.

†† A case of TB caused by a strain of *Mycobacterium tuberculosis* that is resistant to at least isoniazid and rifampin.
§§ A case of TB caused by a strain of *Mycobacterium tuberculosis* that is resistant to isoniazid, rifampin, any fluoroquinolone, and at least one injectable second-line drug (i.e., amikacin, kanamycin, or capreomycin).

TABLE 2. Tuberculosis (TB) case counts and rates, by national origin and race/ethnicity — United States, 2016–2019

U.S. population group	No. of cases* (rate†)			
	2016	2017	2018	2019
U.S.-born§ persons				
Hispanic/Latino	593 (1.6)	582 (1.5)	589 (1.5)	628 (1.6)
White	904 (0.5)	790 (0.4)	807 (0.4)	756 (0.4)
Black/African American	1,057 (3.0)	999 (2.8)	950 (2.7)	905 (2.5)
Asian	144 (2.1)	134 (1.9)	137 (1.9)	120 (1.6)
American Indian/ Alaska Native	110 (5.1)	91 (3.8)	102 (4.0)	79 (3.4)
Native Hawaiian/ Pacific Islander	30 (4.1)	45 (6.5)	42 (5.6)	23 (3.5)
Multiple or unknown race/ ethnicity	22 (—¶)	28 (—¶)	31 (—¶)	42 (—¶)
Subtotal	**2,860 (1.0)**	**2,669 (1.0)**	**2,658 (1.0)**	**2,553 (0.9)**
Non–U.S.-born persons				
Hispanic/Latino	1,976 (10.0)	1,959 (9.9)	2,039 (10.3)	2,065 (10.2)
White	281 (3.7)	266 (3.4)	261 (3.2)	250 (3.1)
Black/African American	911 (22.7)	899 (22.2)	846 (20.3)	825 (19.5)
Asian	3,055 (27.2)	3,128 (27.3)	3,069 (26.0)	3,000 (25.7)
American Indian/ Alaska Native	1 (2.9)	2 (2.9)	2 (3.5)	3 (5.3)
Native Hawaiian/ Pacific Islander	46 (12.7)	67 (22.7)	72 (24.4)	81 (25.1)
Multiple or unknown race/ ethnicity	64 (—¶)	52 (—¶)	70 (—¶)	98 (—¶)
Subtotal	**6,334 (14.7)**	**6,373 (14.7)**	**6,359 (14.3)**	**6,322 (14.1)**
Unknown national origin	5 (—¶)	7 (—¶)	4 (—¶)	45 (—¶)
Total	**9,199 (2.8)**	**9,049 (2.8)**	**9,021 (2.8)**	**8,920 (2.7)**

* Based on data from the National Tuberculosis Surveillance System as of March 3, 2020.

† Cases per 100,000 persons. Rates according to national origin and race/ethnicity were calculated using midyear population estimates from the Current Population Survey. Total rate was calculated using midyear population estimates from the U.S. Census Bureau.

§ U.S.-born persons were those born in the United States or U.S. territories (American Samoa, Northern Mariana Islands, Guam, Puerto Rico, or U.S. Virgin Islands) or born elsewhere to a U.S. citizen. Non–U.S.-born persons were born outside the United States and U.S. territories, and include those born in the sovereign freely associated states (Federated States of Micronesia, Marshall Islands, or Palau) unless one or both parents were U.S. citizens.

¶ Rates could not be calculated for these categories because population estimates are not available.

However, the pace of progress has slowed since 2012 (*3*). This slowing is primarily related to the declining proportion of TB cases caused by recent transmission within the United States, against which the U.S. TB elimination strategy has been most effective (*4*). Currently, approximately 80% of TB cases result from reactivation of LTBI acquired years in the past, often outside the United States (*2*).

This shift in U.S. TB epidemiology from being driven primarily by recent transmission within the United States to reactivation of LTBI acquired in the past (often outside the United States) requires an expanded strategy that increases emphasis on detecting and treating LTBI. However, this expanded focus on LTBI cannot compromise existing efforts to prevent TB transmission if the United States is to avoid another TB resurgence, as occurred in the late 1980s and early 1990s (*5*). The U.S. Preventive Services Task Force and CDC recommend routine LTBI screening for populations at increased risk, including persons who have lived in countries with increased TB prevalence and persons who have resided in high-risk congregate settings (e.g., homeless shelters or correctional facilities) (*6*). The efficacy and cost-effectiveness of LTBI screening and treatment, when implemented in populations at risk, compare favorably with other widely accepted preventive care interventions, including mammography to screen for breast cancer (*7*) and use of statins to prevent cardiovascular disease (*8*). LTBI screening (and treatment as indicated) should therefore be considered a routine and integral part of primary care for patients at elevated risk for LTBI.

The findings in this report are subject to at least four limitations. First, this analysis is based on provisional case counts for 2019; however, in previous years, final case counts and rates have not differed greatly from the provisional figures. Second, rates were calculated using estimated population denominators; as a result, rates might change slightly as population estimates are refined in the future. Third, incidence trends for some demographic groups with few patients, e.g., non–U.S.-born American Indian/Alaska Natives, should be interpreted cautiously because of the increased volatility in these rates. Finally, complete drug susceptibility test data are not available for 2019 because susceptibility testing might take several weeks to complete because of the slow-growing nature of *Mycobacterium tuberculosis*.

Concerns regarding the potential adverse effects of LTBI treatment have been an important barrier to LTBI screening and treatment in the past (*9*). To address these concerns,

Summary

What is already known about this topic?

Tuberculosis (TB) incidence in the United States has steadily declined since 1993, but the pace of decline has slowed in recent years.

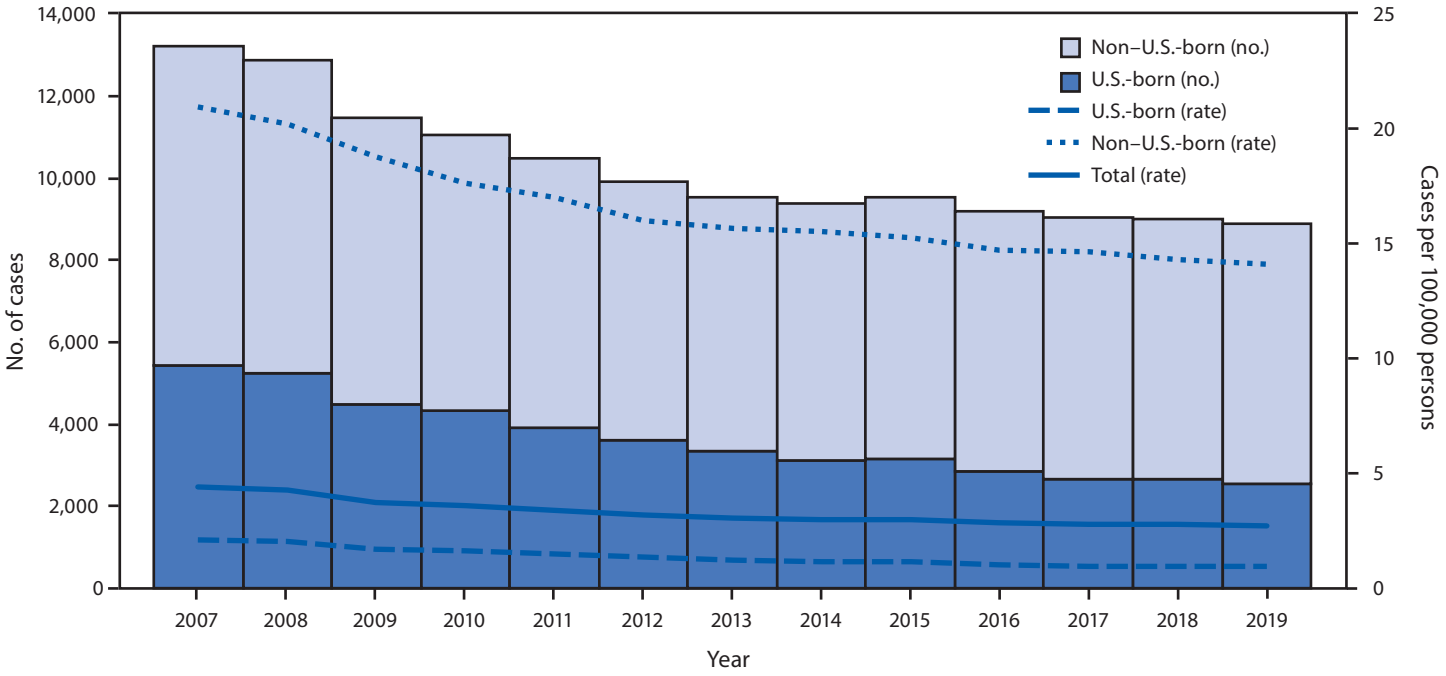
What is added by this report?

The U.S. TB rate during 2019 declined to 2.7 cases per 100,000 persons, the lowest level on record. However, the annual pace of decline (-1.6% from 2018) remains slow, particularly among TB cases that are attributed to reactivation of latent TB infection (LTBI).

What are the implications for public health practice?

To eliminate TB, the United States needs to expand testing and treatment for LTBI while continuing to prevent TB transmission. Partnerships with health care providers, including private providers, are essential for this strategy's success.

FIGURE. Tuberculosis (TB) case counts and rates, by national origin*,† — United States, 2007–2019



* Number of cases with unknown national origin not shown (range = 2–60 per year; median = 7). Total rate includes cases with unknown national origin.
† Rates for non–U.S.-born and U.S.-born persons were calculated using Current Population Survey estimates. Total rate was calculated using U.S. Census Bureau population estimates.

CDC and the National Tuberculosis Controllers Association have released new guidelines that recommend short-course, rifamycin-based regimens, which have less toxicity and better completion rates than does isoniazid monotherapy (*10*). CDC will continue to support and encourage public health partners and primary care providers to increase adoption of LTBI testing and treatment guidelines to accelerate progress toward TB elimination.

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Drug and Opioid-Involved Overdose Deaths — United States, 2017–2018

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Of the 70,237 drug overdose deaths in the United States in 2017, approximately two thirds (47,600) involved an opioid (*1*). In recent years, increases in opioid-involved overdose deaths have been driven primarily by deaths involving synthetic opioids other than methadone (hereafter referred to as synthetic opioids) (*1*). CDC analyzed changes in age-adjusted death rates from 2017 to 2018 involving all opioids and opioid subcategories* by demographic characteristics, county urbanization levels, U.S. Census region, and state. During 2018, a total of 67,367 drug overdose deaths occurred in the United States, a 4.1% decline from 2017; 46,802 (69.5%) involved an opioid (*2*). From 2017 to 2018, deaths involving all opioids, prescription opioids, and heroin decreased 2%, 13.5%, and 4.1%, respectively. However, deaths involving synthetic opioids increased 10%, likely driven by illicitly manufactured fentanyl (IMF), including fentanyl analogs (*1*,*3*). Efforts related to all opioids, particularly deaths involving synthetic opioids, should be strengthened to sustain and accelerate declines in opioid-involved deaths. Comprehensive surveillance and prevention measures are critical to reducing opioid-involved deaths, including continued surveillance of evolving drug use and overdose, polysubstance use, and the changing illicit drug market; naloxone distribution and outreach to groups at risk for IMF exposure; linkage to evidence-based treatment for persons with substance use disorders; and continued partnerships with public safety.

Drug overdose deaths were identified in National Vital Statistics System multiple cause-of-death mortality files† using the *International Classification of Diseases, Tenth Revision* (ICD-10) underlying cause-of-death codes X40–X44 (unintentional), X60–X64 (suicide), X85 (homicide), or Y10–Y14 (undetermined intent). Among deaths with drug overdose as the underlying cause, the opioid subcategory was determined by the following ICD-10 multiple cause-of-death codes: all opioids (T40.0, T40.1, T40.2, T40.3, T40.4, or T40.6)§; prescription opioids (T40.2 or T40.3); heroin (T40.1); and synthetic opioids other than methadone (T40.4). Some deaths involved more than one opioid subcategory and were included in the rates for each; subcategories are not mutually exclusive.¶

Changes from 2017 to 2018 in age-adjusted overdose death rates** were examined for all opioids, prescription opioids, heroin, and synthetic opioids. Death rates were stratified by age, sex, race/ethnicity, urbanization level,†† U.S. Census region,§§ and state. State-level analyses included 38 states and the District of Columbia (DC) with adequate drug specificity¶¶ for 2017 and 2018.*** The drug or drugs involved in the drug overdose death were not specified on 12% of drug overdose death certificates in 2017 and on 8% of those from 2018. The percentage of 2018 death certificates with at least one drug specified ranged from 54.1% to 100% among states. Changes in death rates from 2017 to 2018 were compared using z-tests

* Natural opioids include morphine and codeine. Semisynthetic opioids include oxycodone, hydrocodone, hydromorphone, and oxymorphone. Prescription opioids include methadone, natural, and semisynthetic opioids. Synthetic opioids include methadone, tramadol, and fentanyl (prescription and illicitly manufactured). Heroin is an illicit opioid made from morphine.

† https://www.cdc.gov/nchs/nvss/deaths.htm.

§ Drug overdose deaths, as defined, that have opium (T40.0), heroin (T40.1), natural and semisynthetic opioids (T40.2), methadone (T40.3), synthetic opioids other than methadone (T40.4) or other and unspecified narcotics (T40.6) as a contributing cause.

¶ For example, a death involving both heroin and a synthetic opioid other than methadone would be included in both the "heroin" and "synthetic opioid other than methadone" death rates.

** Age-adjusted death rates were calculated using the 2000 U.S. Census standard population age distribution https://www.cdc.gov/nchs/data/nvsr/nvsr61/nvsr61_04.pdf.

†† Categories were determined by the 2013 National Center for Health Statistics Urban-Rural Classification Scheme for Counties. *Large central metro:* counties in metropolitan statistical areas (MSAs) of ≥1 million population that 1) contain the entire population of largest principal city of the MSA; or 2) have their entire population contained in the largest principal city of the MSA; or 3) contain at least 250,000 inhabitants of any principal city of the MSA. *Large fringe metro:* counties in MSAs of ≥1 million population that did not qualify as large central metro counties. *Medium metro:* counties in MSAs of populations of 250,000–999,999. *Small metro:* counties in MSAs of populations less than 250,000. *Micropolitan (nonmetropolitan):* counties in micropolitan statistical areas. *Noncore (nonmetropolitan):* nonmetropolitan counties that did not qualify as micropolitan. https://www.cdc.gov/nchs/data_access/urban_rural.htm.

§§ *Northeast*: Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont. *Midwest*: Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin. *South*: Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia. *West*: Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming.

¶¶ Adequate drug specificity requires that at least one specific drug is named on the death certificate.

*** State-level analyses comparing death rates from 2017 to 2018 included 38 states and D.C. that met the following criteria: 1) >80% of drug overdose death certificates named at least one specific drug in 2017 and 2018; 2) change from 2017 to 2018 in the percentage of death certificates reporting at least one specific drug was <10 percentage points; and 3) ≥20 deaths occurred during 2017 and 2018 in at least two opioid subcategories examined. States whose reporting of any specific drug or drugs involved in an overdose changed by ≥10 percentage points from 2017 to 2018 were excluded because drug-specific overdose numbers and rates might have changed substantially from 2017 to 2018 as a result of changes in reporting.

when deaths were ≥100 and nonoverlapping confidence intervals based on a gamma distribution when <100.††† Changes presented in the text represent statistically significant findings, unless otherwise specified.

During 2018, drug overdoses resulted in 67,367 deaths in the United States, a 4.1% decrease from 2017. Among these drug overdose deaths, 46,802 (69.5%) involved an opioid. From 2017 to 2018, opioid-involved death rates decreased 2.0%, from 14.9 per 100,000 population to 14.6 (Table 1); decreases occurred among females; persons aged 15–34 years and 45–54 years; non-Hispanic whites; and in small metro, micropolitan, and noncore areas; and in the Midwest and South regions. Rates during 2017–2018 increased among persons aged ≥65 years, non-Hispanic blacks, and Hispanics, and in the Northeast and the West regions. Rates decreased in 11 states and DC and increased in three states, with the largest relative (percentage) decrease in Iowa (–30.4%) and the largest absolute decrease (difference in rates) in Ohio (–9.6); the largest relative and absolute increase occurred in Missouri (18.8%, 3.1). The highest opioid-involved death rate in 2018 was in West Virginia (42.4 per 100,000).

Prescription opioid-involved death rates decreased by 13.5% from 2017 to 2018. Rates decreased in males and females, persons aged 15–64 years, non-Hispanic whites, Hispanics, non-Hispanic American Indian/Alaska Natives, and across all urbanization levels. Prescription opioid–involved death rates remained stable in the Northeast and decreased in the Midwest, South, and the West. Seventeen states experienced declines in prescription opioid–involved death rates, with no states experiencing significant increases. The largest relative decrease occurred in Ohio (–40.5%), whereas the largest absolute decrease occurred in West Virginia (–4.1), which also had the highest prescription opioid-involved death rate in 2018 (13.1 per 100,000).

Heroin-involved death rates decreased 4.1% from 2017 to 2018; reductions occurred among males and females, persons aged 15–34 years, non-Hispanic whites, and in large central metro and large fringe metro areas (Table 2). Rates decreased in the Midwest and increased in the West. Rates decreased in seven states and DC and increased in three states from 2017 to 2018. The largest relative decrease occurred in Kentucky (50.0%), and the largest absolute decrease occurred in DC (–7.1); the largest relative and absolute increase was in Tennessee (18.8%, 0.9). The highest heroin-involved death rate in 2018 was in Vermont (12.5 per 100,000).

Death rates involving synthetic opioids increased from 9.0 per 100,000 population in 2017 to 9.9 in 2018 and accounted for 67.0% of opioid-involved deaths in 2018. These rates increased from 2017 to 2018 among males and females, persons aged ≥25 years, non-Hispanic whites, non-Hispanic blacks, Hispanics, non-Hispanic Asian/Pacific Islanders, and in large central metro, large fringe metro, medium metro, and small metro counties. Synthetic opioid–involved death rates increased in the Northeast, South and West and remained stable in the Midwest. Rates increased in 10 states and decreased in two states. The largest relative increase occurred in Arizona (92.5%), and the largest absolute increase occurred in Maryland and Missouri (4.4 per 100,000 in both states); the largest relative and absolute decrease was in Ohio (–20.7%, –6.7). The highest synthetic opioid–involved death rate in 2018 occurred in West Virginia (34.0 per 100,000).

Discussion

During 1999–2018, opioids were involved in 446,032 deaths in the United States.§§§ From 2017 to 2018, relative decreases occurred in death rates involving all drug overdoses (–4.1%), all opioids (–2.0%), prescription opioids (–13.5%), and heroin (–4.1%); a relative increase occurred in the rate of overdose deaths involving synthetic opioids (10.0%). Decreases in all opioid-involved death rates were largely driven by those involving prescription opioids. The number of filled opioid prescriptions peaked in 2012 and decreased thereafter (*4*). Efforts to reduce high-dose opioid prescribing¶¶¶ (*4*) have increased and have contributed to decreases in prescription opioid–involved deaths. Factors that might be contributing to the decrease in heroin-involved deaths include fewer persons initiating heroin use (*5*), shifts from a heroin-based market to a fentanyl-based market (*6*), increased treatment provision for persons using heroin, and expansion of naloxone access (*5*,*7*). Increases in synthetic opioid–involved deaths are likely driven by proliferation of IMF or fentanyl analogs in the illicit drug supply (*3*,*5*,*6*). According to the Drug Enforcement Administration, fentanyl was the most identified synthetic opioid found during drug seizures in the first half of 2017 (*6*); in addition, fentanyl reports in all regions increased during 2014–2018.**** This is consistent with current findings indicating recent increases

††† Z-tests were used if the number of deaths was ≥100; a p-value of <0.05 was considered to be statistically significant. Nonoverlapping confidence intervals based on the gamma method were used if the number of deaths was <100 in 2017 or 2018. This method of comparing confidence intervals is a conservative method for estimating statistical significance; caution should be observed when interpreting a nonsignificant difference when the lower and upper limits being compared overlap only slightly. https://www.cdc.gov/nchs/data/nvsr/nvsr68/nvsr68_09-508.pdf.

§§§ https://wonder.cdc.gov.

¶¶¶ High-dose prescribing rates include prescriptions with daily dosage of ≥90 morphine milligram equivalents.

**** https://www.nflis.deadiversion.usdoj.gov/DesktopModules/ReportDownloads/Reports/NFLISDrug2018MY.pdf.

TABLE 1. Annual number and age-adjusted rate of drug overdose deaths* involving all opioids† and prescription opioids,§,¶ by sex, age, race/ethnicity, urbanization level,†† U.S. Census region,§§ and selected states¶¶ — National Vital Statistics System, United States, 2017 and 2018**

	All opioids				Prescription opioids			
	2017	2018	Rate change from 2017 to 2018***		2017	2018	Rate change from 2017 to 2018***	
Decedent characteristic	No. (rate)	No. (rate)	Absolute change	Relative change	No. (rate)	No. (rate)	Absolute change	Relative change
All	**47,600 (14.9)**	**46,802 (14.6)**	**−0.3†††**	**−2.0†††**	**17,029 (5.2)**	**14,975 (4.5)**	**−0.7†††**	**−13.5†††**
Sex								
Male	32,337 (20.4)	32,078 (20.1)	−0.3	−1.5	9,873 (6.1)	8,723 (5.3)	−0.8†††	−13.1†††
Female	15,263 (9.4)	14,724 (9.0)	−0.4†††	−4.3†††	7,156 (4.2)	6,252 (3.7)	−0.5†††	−11.9†††
Age group (yrs)								
0–14	79 (0.1)	65 (0.1)	0.0	0.0	50 (0.1)	36 (0.1)	0.0	0.0
15–24	4,094 (9.5)	3,618 (8.4)	−1.1†††	−11.6†††	1,050 (2.4)	790 (1.8)	−0.6†††	−25.0†††
25–34	13,181 (29.1)	12,839 (28.1)	−1.0†††	−3.4†††	3,408 (7.5)	2,862 (6.3)	−1.2†††	−16.0†††
35–44	11,149 (27.3)	11,414 (27.7)	0.4	1.5	3,714 (9.1)	3,350 (8.1)	−1.0†††	−11.0†††
45–54	10,207 (24.1)	9,565 (23.0)	−1.1†††	−4.6†††	4,238 (10.0)	3,490 (8.4)	−1.6†††	−16.0†††
55–64	7,153 (17.0)	7,278 (17.2)	0.2	1.2	3,509 (8.4)	3,291 (7.8)	−0.6†††	−7.1†††
≥65	1,724 (3.4)	2,012 (3.8)	0.4†††	11.8†††	1,055 (2.1)	1,152 (2.2)	0.1	4.8
Sex and age group (yrs)								
Male 15–24	2,885 (13.0)	2,527 (11.5)	−1.5†††	−11.5†††	728 (3.3)	548 (2.5)	−0.8†††	−24.2†††
Male 25–44	17,352 (40.0)	17,240 (39.4)	−0.6	−1.5	4,516 (10.4)	3,895 (8.9)	−1.5†††	−14.4†††
Male 45–64	11,061 (26.9)	10,986 (26.8)	−0.1	−0.4	4,089 (9.9)	3,637 (8.9)	−1.0†††	−10.1†††
Female 15–24	1,209 (5.7)	1,091 (5.2)	−0.5†††	−8.8†††	322 (1.5)	242 (1.2)	−0.3†††	−20.0†††
Female 25–44	6,978 (16.3)	7,013 (16.2)	−0.1	−0.6	2,606 (6.1)	2,317 (5.4)	−0.7†††	−11.5†††
Female 45–64	6,299 (14.6)	5,857 (13.6)	−1.0†††	−6.8†††	3,658 (8.5)	3,144 (7.3)	−1.2†††	−14.1†††
Race/Ethnicity**								
White, non-Hispanic	37,113 (19.4)	35,363 (18.6)	−0.8†††	−4.1†††	13,900 (6.9)	12,085 (6.0)	−0.9†††	−13.0†††
Black, non-Hispanic	5,513 (12.9)	6,088 (14.0)	1.1†††	8.5†††	1,508 (3.5)	1,444 (3.3)	−0.2	−5.7
Hispanic	3,932 (6.8)	4,370 (7.5)	0.7†††	10.3†††	1,211 (2.2)	1,122 (2.0)	−0.2†††	−9.1†††
American Indian/Alaska Native, non-Hispanic	408 (15.7)	373 (14.2)	−1.5	−9.6	187 (7.2)	125 (4.7)	−2.5†††	−34.7†††
Asian/Pacific Islander, non-Hispanic	348 (1.6)	345 (1.5)	−0.1	−6.3	130 (0.6)	115 (0.5)	−0.1	−16.7
County urbanization level††								
Large central metro	14,518 (13.9)	14,767 (14.1)	0.2	1.4	4,945 (4.7)	4,394 (4.1)	−0.6†††	−12.8†††
Large fringe metro	13,594 (17.2)	13,476 (17.0)	−0.2	−1.2	4,273 (5.2)	3,791 (4.6)	−0.6†††	−11.5†††
Medium metro	10,561 (16.2)	10,328 (15.8)	−0.4	−2.5	3,951 (5.9)	3,539 (5.2)	−0.7†††	−11.9†††
Small metro	3,560 (12.9)	3,379 (12.2)	−0.7†††	−5.4†††	1,479 (5.2)	1,278 (4.5)	−0.7†††	−13.5†††
Micropolitan (nonmetro)	3,462 (13.9)	3,162 (12.7)	−1.2†††	−8.6†††	1,440 (5.6)	1,240 (4.7)	−0.9†††	−16.1†††
Noncore (nonmetro)	1,905 (11.2)	1,690 (10.1)	−1.1†††	−9.8†††	941 (5.3)	733 (4.1)	−1.2†††	−22.6†††
U.S. Census region of residence§§								
Northeast	11,784 (21.3)	12,467 (22.8)	1.5†††	7.0†††	3,047 (5.3)	2,991 (5.3)	0.0	0.0
Midwest	12,483 (19.1)	11,268 (17.2)	−1.9†††	−9.9†††	3,702 (5.5)	2,965 (4.4)	−1.1†††	−20.0†††
South	16,999 (14.1)	16,413 (13.5)	−0.6†††	−4.3†††	6,929 (5.6)	5,936 (4.7)	−0.9†††	−16.1†††
West	6,334 (8.0)	6,654 (8.3)	0.3†††	3.8†††	3,351 (4.1)	3,083 (3.8)	−0.3†††	−7.3†††
States with very good to excellent reporting (n = 29)¶¶								
Alaska	102 (13.9)	68 (8.8)	−5.1	−36.7	51 (7.0)	38 (4.9)	−2.1	−30.0
Arizona	928 (13.5)	1,106 (15.9)	2.4†††	17.8†††	414 (5.9)	362 (5.0)	−0.9†††	−15.3†††
Connecticut	955 (27.7)	948 (27.5)	−0.2	−0.7	273 (7.7)	231 (6.4)	−1.3	−16.9
District of Columbia	244 (34.7)	191 (26.7)	−8.0†††	−23.1†††	58 (8.4)	41 (5.7)	−2.7	−32.1
Georgia	1,014 (9.7)	866 (8.3)	−1.4†††	−14.4†††	568 (5.4)	440 (4.1)	−1.3†††	−24.1†††
Illinois	2,202 (17.2)	2,169 (17.0)	−0.2	−1.2	623 (4.8)	539 (4.2)	−0.6†††	−12.5†††
Iowa	206 (6.9)	143 (4.8)	−2.1†††	−30.4†††	104 (3.4)	64 (2.1)	−1.3†††	−38.2†††
Maine	360 (29.9)	282 (23.4)	−6.5†††	−21.7†††	100 (7.6)	69 (5.1)	−2.5	−32.9
Maryland	1,985 (32.2)	2,087 (33.7)	1.5	4.7	711 (11.5)	576 (9.2)	−2.3†††	−20.0†††
Massachusetts	1,913 (28.2)	1,991 (29.3)	1.1	3.9	321 (4.6)	331 (4.7)	0.1	2.2
Missouri	952 (16.5)	1,132 (19.6)	3.1†††	18.8†††	253 (4.1)	265 (4.4)	0.3	7.3
Nevada	412 (13.3)	372 (11.5)	−1.8	−13.5	276 (8.7)	235 (7.2)	−1.5†††	−17.2†††
New Hampshire	424 (34.0)	412 (33.1)	−0.9	−2.6	62 (4.8)	43 (3.1)	−1.7	−35.4
New Mexico	332 (16.7)	338 (16.7)	0.0	0.0	171 (8.5)	176 (8.2)	−0.3	−3.5
New York	3,224 (16.1)	2,991 (15.1)	−1.0†††	−6.2†††	1,044 (5.1)	998 (4.9)	−0.2	−3.9
North Carolina	1,953 (19.8)	1,783 (17.9)	−1.9†††	−9.6†††	659 (6.5)	489 (4.7)	−1.8†††	−27.7†††

See table footnotes on next page.

TABLE 1. (*Continued*) Annual number and age-adjusted rate of drug overdose deaths* involving all opioids† and prescription opioids,§,¶ by sex, age, race/ethnicity, urbanization level,†† U.S. Census region,§§ and selected states¶¶ — National Vital Statistics System, United States, 2017 and 2018**

	All opioids				Prescription opioids			
	2017	2018	Rate change from 2017 to 2018***		2017	2018	Rate change from 2017 to 2018***	
Decedent characteristic	No. (rate)	No. (rate)	Absolute change	Relative change	No. (rate)	No. (rate)	Absolute change	Relative change
Ohio	4,293 (39.2)	3,237 (29.6)	−9.6†††	−24.5†††	947 (8.4)	571 (5.0)	−3.4†††	−40.5†††
Oklahoma	388 (10.2)	308 (7.8)	−2.4†††	−23.5†††	251 (6.7	172 (4.3)	−2.4†††	−35.8†††
Oregon	344 (8.1)	339 (8.0)	−0.1	−1.2	154 (3.5)	151 (3.4)	−0.1	−2.9
Rhode Island	277 (26.9)	267 (25.9)	−1.0	−3.7	99 (8.8)	85 (7.7)	−1.1	−12.5
South Carolina	749 (15.5)	835 (17.1)	1.6	10.3	345 (7.1)	375 (7.4)	0.3	4.2
Tennessee	1,269 (19.3)	1,307 (19.9)	0.6	3.1	644 (9.6)	550 (8.2)	−1.4†††	−14.6†††
Utah	456 (15.5)	437 (14.8)	−0.7	−4.5	315 (10.8)	306 (10.5)	−0.3	−2.8
Vermont	114 (20.0)	127 (22.8)	2.8	14.0	40 (6.3)	27 (4.4)	−1.9	−30.2
Virginia	1,241 (14.8)	1,193 (14.3)	−0.5	−3.4	404 (4.7)	326 (3.8)	−0.9†††	−19.1†††
Washington	742 (9.6)	737 (9.4)	−0.2	−2.1	343 (4.3)	301 (3.8)	−0.5	−11.6
West Virginia	833 (49.6)	702 (42.4)	−7.2†††	−14.5†††	304 (17.2)	234 (13.1)	−4.1†††	−23.8†††
Wisconsin	926 (16.9)	846 (15.3)	−1.6†††	−9.5†††	362 (6.4)	301 (5.3)	−1.1†††	−17.2†††
Wyoming	47 (8.7)	40 (6.8)	−1.9	−21.8	31 (6.0)	28 (4.6)	−1.4	−23.3
States with good reporting (n = 10)¶¶								
California	2,199 (5.3)	2,410 (5.8)	0.5†††	9.4†††	1,169 (2.8)	1,084 (2.6)	−0.2	−7.1
Colorado	578 (10.0)	564 (9.5)	−0.5	−5.0	300 (5.1)	268 (4.4)	−0.7	−13.7
Florida	3,245 (16.3)	3,189 (15.8)	−0.5	−3.1	1,272 (6.0)	1,282 (6.0)	0.0	0.0
Hawaii	53 (3.4)	59 (4.1)	0.7	20.6	40 (2.5)	33 (2.3)	−0.2	−8.0
Indiana	1,176 (18.8)	1,104 (17.5)	−1.3	−6.9	425 (6.6)	370 (5.6)	−1.0†††	−15.2†††
Kentucky	1,160 (27.9)	989 (23.4)	−4.5†††	−16.1†††	433 (10.2)	315 (7.2)	−3.0†††	−29.4†††
Michigan	2,033 (21.2)	2,011 (20.8)	−0.4	−1.9	633 (6.5)	556 (5.6)	−0.9†††	−13.8†††
Minnesota	422 (7.8)	343 (6.3)	−1.5†††	−19.2†††	195 (3.6)	136 (2.5)	−1.1†††	−30.6†††
Mississippi	185 (6.4)	173 (6.1)	−0.3	−4.7	96 (3.2)	92 (3.1)	−0.1	−3.1
Texas	1,458 (5.1)	1,402 (4.8)	−0.3	−5.9	646 (2.3)	547 (1.9)	−0.4	−17.4

* Deaths were classified using *the International Classification of Diseases, Tenth Revision* (ICD–10). Drug overdose deaths were identified using underlying cause-of-death codes X40–X44, X60–X64, X85, and Y10–Y14. Rates are age-adjusted using the direct method and the 2000 U.S. standard population, except for age-specific crude rates. All rates are per 100,000 population.

† Drug overdose deaths, as defined, that have opium (T40.0), heroin (T40.1), natural and semisynthetic opioids (T40.2), methadone (T40.3), synthetic opioids other than methadone (T40.4) or other and unspecified narcotics (T40.6) as a contributing cause.

§ Drug overdose deaths, as defined, that have natural and semisynthetic opioids (T40.2) or methadone (T40.3) as a contributing cause.

¶ Categories of deaths are not exclusive as deaths might involve more than one drug category. Summing of categories will result in more than the total number of deaths in a year.

** Data for Hispanic origin should be interpreted with caution; studies comparing Hispanic origin on death certificates and on Census surveys have shown inconsistent reporting on Hispanic ethnicity. Potential race misclassification might lead to underestimates for certain categories, primarily American Indian/Alaska Native non-Hispanic and Asian/Pacific Islander non-Hispanic decedents. https://www.cdc.gov/nchs/data/series/sr_02/sr02_172.pdf.

†† By the 2013 National Center for Health Statistics Urban-Rural Classification Scheme for Counties. https://www.cdc.gov/nchs/data_access/urban_rural.htm.

§§ *Northeast*: Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont. *Midwest*: Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin. *South*: Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia. *West*: Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming.

¶¶ Analyses were limited to states meeting the following criteria. States with very good to excellent reporting had ≥90% of drug overdose deaths mention at least one specific drug in 2017, with the change in drug overdose deaths mentioning of at least one specific drug differing by <10 percentage points from 2017 to 2018. States with good reporting had 80% to <90% of drug overdose deaths mention at least one specific drug in 2017, with the change in the percentage of drug overdose deaths mentioning at least one specific drug differing by <10 percentage points from 2017 to 2018. States included also were required to have stable rate estimates (i.e., based on ≥20 deaths in at least two of the following drug categories: opioids, prescription opioids, synthetic opioids other than methadone, and heroin).

*** Absolute rate change is the difference between 2017 and 2018 rates. Relative rate change is the absolute rate change divided by the 2017 rate, multiplied by 100. Nonoverlapping confidence intervals based on the gamma method were used if the number of deaths was <100 in 2017 or 2018, and z-tests were used if the number of deaths was ≥100 in both 2017 and 2018.

††† Statistically significant (p-value <0.05).

in synthetic opioid–involved death rates in all regions except the Midwest.

The findings in this report are subject to at least five limitations. First, postmortem toxicology testing varies by jurisdiction; improvements in testing might account for some reported increases. Second, the percentage of 2017 and 2018 death certificates with at least one drug specified varied among states and over time, limiting opioid subcategory rate comparisons. Third, because heroin is metabolized to morphine (*8*), some heroin deaths might have been misclassified

TABLE 2. Annual number and age-adjusted rate of drug overdose deaths* involving heroin† and synthetic opioids other than methadone,§,¶ by sex, age, race/ethnicity, urbanization level,†† U.S. Census region,§§ and selected states¶¶ — National Vital Statistics System, United States, 2017 and 2018**

	Heroin				Synthetic opioids other than methadone			
	2017	2018	Rate change from 2017 to 2018***		2017	2018	Rate change from 2017 to 2018***	
Decedent characteristic	No. (rate)	No. (rate)	Absolute change	Relative change	No. (rate)	No. (rate)	Absolute change	Relative change
All	**15,482 (4.9)**	**14,996 (4.7)**	**−0.2†††**	**−4.1†††**	**28,466 (9.0)**	**31,335 (9.9)**	**0.9†††**	**10.0†††**
Sex								
Male	11,596 (7.3)	11,291 (7.1)	−0.2†††	−2.7†††	20,524 (13.0)	22,528 (14.2)	1.2†††	9.2†††
Female	3,886 (2.5)	3,705 (2.3)	−0.2†††	−8.0†††	7,942 (5.0)	8,807 (5.5)	0.5†††	10.0†††
Age group (yrs)								
0–14	—§§§	—§§§	—§§§	—§§§	33 (0.1)	29 (0.1)	0.0	0.0
15–24	1,454 (3.4)	1,160 (2.7)	−0.7†††	−20.6†††	2,655 (6.1)	2,640 (6.1)	0.0	0.0
25–34	4,890 (10.8)	4,642 (10.2)	−0.6†††	−5.6†††	8,825 (19.5)	9,568 (20.9)	1.4†††	7.2†††
35–44	3,713 (9.1)	3,740 (9.1)	0.0	0.0	7,084 (17.3)	8,070 (19.6)	2.3†††	13.3†††
45–54	3,043 (7.2)	2,922 (7.0)	−0.2	−2.8	5,762 (13.6)	6,132 (14.7)	1.1†††	8.1†††
55–64	2,005 (4.8)	2,077 (4.9)	0.1	2.1	3,481 (8.3)	4,018 (9.5)	1.2†††	14.5†††
≥65	368 (0.7)	445 (0.8)	0.1	14.3	620 (1.2)	871 (1.7)	0.5†††	41.7†††
Sex and age group (yrs)								
Male 15–24	1,031 (4.7)	821 (3.7)	−1.0†††	−21.3†††	1,877 (8.5)	1,841 (8.4)	−0.1	−1.2
Male 25–44	6,428 (14.8)	6,305 (14.4)	−0.4	−2.7	11,693 (27.0)	12,810 (29.2)	2.2†††	8.1†††
Male 45–64	3,830 (9.3)	3,778 (9.2)	−0.1	−1.1	6,524 (15.8)	7,195 (17.6)	1.8†††	11.4†††
Female 15–24	423 (2.0)	339 (1.6)	−0.4†††	−20.0†††	778 (3.7)	799 (3.8)	0.1	2.7
Female 25–44	2,175 (5.1)	2,077 (4.8)	−0.3	−5.9	4,216 (9.8)	4,828 (11.2)	1.4†††	14.3†††
Female 45–64	1,218 (2.8)	1,221 (2.8)	0.0	0.0	2,719 (6.3)	2,955 (6.9)	0.6†††	9.5†††
Race/Ethnicity**								
White, non-Hispanic	11,293 (6.1)	10,756 (5.8)	−0.3†††	−4.9†††	21,956 (11.9)	23,214 (12.6)	0.7†††	5.9†††
Black, non-Hispanic	2,140 (4.9)	2,145 (4.9)	0.0	0.0	3,832 (9.0)	4,780 (11.0)	2.0†††	22.2†††
Hispanic	1,669 (2.9)	1,768 (3.1)	0.2	6.9	2,152 (3.7)	2,766 (4.7)	1.0†††	27.0†††
American Indian/Alaska Native, non-Hispanic	136 (5.2)	133 (5.1)	−0.1	−1.9	171 (6.5)	191 (7.3)	0.8	12.3
Asian/Pacific Islander, non-Hispanic	119 (0.5)	85 (0.4)	−0.1	−20.0	189 (0.8)	214 (1.0)	0.2†††	25.0†††
County urbanization level††								
Large central metro	5,820 (5.6)	5,467 (5.2)	−0.4†††	−7.1†††	8,511 (8.2)	9,804 (9.4)	1.2†††	14.6†††
Large fringe metro	4,526 (5.8)	4,321 (5.5)	−0.3†††	−5.2†††	8,991 (11.6)	9,871 (12.7)	1.1†††	9.5†††
Medium metro	2,973 (4.6)	3,091 (4.8)	0.2	4.3	6,254 (9.8)	6,750 (10.5)	0.7†††	7.1†††
Small metro	972 (3.6)	949 (3.5)	−0.1	−2.8	1,878 (7.0)	2,050 (7.6)	0.6†††	8.6†††
Micropolitan (nonmetro)	801 (3.3)	780 (3.3)	0.0	0.0	1,860 (7.7)	1,925 (8.0)	0.3	3.9
Noncore (nonmetro)	390 (2.4)	388 (2.4)	0.0	0.0	972 (6.0)	935 (5.8)	−0.2	−3.3
U.S. Census region of residence§§								
Northeast	4,310 (7.8)	4,363 (8.0)	0.2	2.6	8,861 (16.2)	10,351 (19.1)	2.9†††	17.9†††
Midwest	4,228 (6.5)	3,575 (5.5)	−1.0†††	−15.4†††	8,234 (12.8)	8,348 (12.9)	0.1	0.8
South	4,776 (4.0)	4,718 (3.9)	−0.1	−2.5	9,906 (8.3)	10,443 (8.6)	0.3†††	3.6†††
West	2,168 (2.8)	2,340 (3.0)	0.2†††	7.1†††	1,465 (1.9)	2,193 (2.8)	0.9†††	47.4†††
States with very good to excellent reporting (n = 29)¶¶								
Alaska	36 (4.9)	29 (3.8)	−1.1	−22.4	37 (4.9)	18 –§§§	–§§§	–§§§
Arizona	334 (5.0)	352 (5.2)	0.2	4.0	267 (4.0)	522 (7.7)	3.7†††	92.5†††
Connecticut	425 (12.4)	338 (9.9)	−2.5†††	−20.2†††	686 (20.3)	767 (22.5)	2.2	10.8
District of Columbia	127 (18)	79 (10.9)	−7.1†††	−39.4†††	182 (25.7)	162 (22.6)	−3.1	−12.1
Georgia	263 (2.6)	299 (2.9)	0.3	11.5	419 (4.1)	349 (3.4)	−0.7†††	−17.1†††
Illinois	1,187 (9.2)	1,050 (8.3)	−0.9†††	−9.8†††	1,251 (9.8)	1,568 (12.4)	2.6†††	26.5†††
Iowa	61 (2.1)	37 (1.3)	−0.8	−38.1	92 (3.2)	80 (2.8)	−0.4	−12.5
Maine	76 (6.2)	71 (6.0)	−0.2	−3.2	278 (23.5)	229 (19.8)	−3.7	−15.7
Maryland	522 (8.6)	356 (5.9)	−2.7†††	−31.4†††	1,542 (25.2)	1,825 (29.6)	4.4†††	17.5†††
Massachusetts	466 (7.0)	475 (7.0)	0.0	0.0	1,649 (24.5)	1,806 (26.8)	2.3†††	9.4†††
Missouri	299 (5.3)	351 (6.1)	0.8	15.1	618 (10.9)	868 (15.3)	4.4†††	40.4†††
Nevada	94 (3.1)	108 (3.5)	0.4	12.9	66 (2.2)	85 (2.8)	0.6	27.3
New Hampshire	28 (2.4)	12 —§§§	—§§§	—§§§	374 (30.4)	386 (31.3)	0.9	3.0
New Mexico	144 (7.4)	130 (6.6)	−0.8	−10.8	75 (3.7)	105 (5.4)	1.7	45.9
New York	1,356 (6.8)	1,243 (6.3)	−0.5	−7.4	2,238 (11.3)	2,195 (11.2)	−0.1	−0.9
North Carolina	537 (5.6)	619 (6.3)	0.7	12.5	1,285 (13.2)	1,272 (13.0)	−0.2	−1.5

See table footnotes on next page.

TABLE 2. (*Continued*) Annual number and age-adjusted rate of drug overdose deaths* involving heroin† and synthetic opioids other than methadone,§,¶ by sex, age, race/ethnicity, urbanization level,†† U.S. Census region,§§ and selected states¶¶ — National Vital Statistics System, United States, 2017 and 2018**

	Heroin				Synthetic opioids other than methadone			
	2017	2018	Rate change from 2017 to 2018***		2017	2018	Rate change from 2017 to 2018***	
Decedent characteristic	No. (rate)	No. (rate)	Absolute change	Relative change	No. (rate)	No. (rate)	Absolute change	Relative change
Ohio	1,000 (9.2)	721 (6.6)	−2.6†††	−28.3†††	3,523 (32.4)	2,783 (25.7)	−6.7†††	−20.7†††
Oklahoma	61 (1.6)	84 (2.2)	0.6	37.5	102 (2.6)	79 (2.0)	−0.6	−23.1
Oregon	124 (3.0)	154 (3.7)	0.7	23.3	85 (2.1)	97 (2.4)	0.3	14.3
Rhode Island	14—§§§	24 (2.2)	—§§§	—§§§	201 (20.1)	213 (21.0)	0.9	4.5
South Carolina	153 (3.2)	183 (3.8)	0.6	18.8	404 (8.5)	510 (10.8)	2.3†††	27.1†††
Tennessee	311 (4.8)	369 (5.7)	0.9†††	18.8†††	590 (9.3)	827 (12.8)	3.5†††	37.6†††
Utah	147 (4.8)	156 (5.1)	0.3	6.3	92 (3.1)	83 (2.9)	−0.2	−6.5
Vermont	41 (7.3)	68 (12.5)	5.2	71.2	77 (13.8)	106 (19.3)	5.5	39.9
Virginia	556 (6.7)	532 (6.4)	−0.3	−4.5	829 (10.0)	852 (10.3)	0.3	3.0
Washington	306 (4.0)	328 (4.2)	0.2	5.0	143 (1.9)	221 (2.9)	1.0†††	52.6†††
West Virginia	244 (14.9)	195 (12.3)	−2.6	−17.4	618 (37.4)	551 (34.0)	−3.4	−9.1
Wisconsin	414 (7.8)	327 (6.0)	−1.8†††	−23.1†††	466 (8.6)	506 (9.4)	0.8	9.3
Wyoming	—§§§	—§§§	—§§§	—§§§	—§§§	—§§§	—§§§	—§§§
States with good reporting (n = 10)¶¶								
California	715 (1.7)	778 (1.9)	0.2†††	11.8†††	536 (1.3)	865 (2.2)	0.9†††	69.2†††
Colorado	224 (3.9)	233 (3.9)	0.0	0.0	112 (2.0)	134 (2.2)	0.2	10.0
Florida	707 (3.6)	689 (3.5)	−0.1	−2.8	2,126 (11.0)	2,091 (10.7)	−0.3	−2.7
Hawaii	10 —§§§	—§§§	—§§§	—§§§	—§§§	—§§§	—§§§	—§§§
Indiana	327 (5.3)	311 (5.0)	−0.3	−5.7	649 (10.5)	713 (11.5)	1.0	9.5
Kentucky	269 (6.6)	140 (3.3)	−3.3†††	−50.0†††	780 (19.1)	744 (17.9)	−1.2	−6.3
Michigan	783 (8.2)	633 (6.5)	−1.7†††	−20.7†††	1,368 (14.4)	1,531 (16.0)	1.6†††	11.1†††
Minnesota	111 (2.0)	93 (1.7)	−0.3	−15.0	184 (3.5)	202 (3.7)	0.2	5.7
Mississippi	34 (1.3)	39 (1.4)	0.1	7.7	81 (2.9)	72 (2.6)	−0.3	−10.3
Texas	569 (2.0)	668 (2.3)	0.3†††	15.0†††	348 (1.2)	358 (1.2)	0.0	0.0

* Deaths were classified using *the International Classification of Diseases, Tenth Revision* (ICD–10). Drug overdose deaths were identified using underlying cause-of-death codes X40–X44, X60–X64, X85, and Y10–Y14. Rates are age-adjusted using the direct method and the 2000 U.S. standard population, except for age-specific crude rates. All rates were per 100,000 population.

† Drug overdose deaths, as defined, that have heroin (T40.1) as a contributing cause.

§ Drug overdose deaths, as defined, that have semisynthetic opioids other than methadone (T40.4) as a contributing cause.

¶ Categories of deaths are not exclusive as deaths might involve more than one drug category. Summing of categories will result in more than the total number of deaths in a year.

** Data on Hispanic origin should be interpreted with caution; studies comparing Hispanic origin on death certificates and on Census surveys have shown inconsistent reporting on Hispanic ethnicity. Potential race misclassification might lead to underestimates for certain categories, primarily American Indian/Alaska Native non-Hispanic and Asian/Pacific Islander non-Hispanic decedents. https://www.cdc.gov/nchs/data/series/sr_02/sr02_172.pdf.

†† By the 2013 National Center for Health Statistics Urban-Rural Classification Scheme for Counties. https://www.cdc.gov/nchs/data_access/urban_rural.htm.

§§ *Northeast*: Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont. *Midwest*: Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin. *South*: Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia. *West*: Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming.

¶¶ Analyses were limited to states meeting the following criteria. States with very good to excellent reporting had ≥90% of drug overdose deaths mention at least one specific drug in 2017, with the change in drug overdose deaths mentioning of at least one specific drug differing by <10 percentage points from 2017 to 2018. States with good reporting had 80% to <90% of drug overdose deaths mention at least one specific drug in 2017, with the change in the percentage of drug overdose deaths mentioning at least one specific drug differing by <10 percentage points from 2017 to 2018. States included also were required to have stable rate estimates (i.e., based on ≥20 deaths in at least two of the following drug categories: opioids, prescription opioids, synthetic opioids other than methadone, and heroin).

*** Absolute rate change is the difference between 2017 and 2018 rates. Relative rate change is the absolute rate change divided by the 2017 rate, multiplied by 100. Nonoverlapping confidence intervals based on the gamma method were used if the number of deaths was <100 in 2017 or 2018, and z-tests were used if the number of deaths was ≥100 in both 2017 and 2018.

††† Statistically significant (p-value <0.05).

§§§ Cells with nine or fewer deaths are not reported. Rates based on <20 deaths are not considered stable rate estimates and are not reported.

Summary

What is already known about this topic?

In 2017, 68% of the 70,237 U.S. drug overdose deaths involved an opioid. During 2016–2017, deaths involving all opioids and synthetic opioids increased; deaths involving prescription opioids and heroin remained stable.

What is added by this report?

Opioids were involved in approximately 70% (46,802) of drug overdose deaths during 2018, representing decreases from 2017 in overdose death rates involving all opioids (2% decline), prescription opioids (14%), and heroin (4%); rates involving synthetic opioids increased 10%.

What are the implications for public health practice?

Surveillance of overdose and polysubstance use trends and the illicit drug supply to track emerging threats, enhancing linkage to treatment, and a multisectoral response are critical to sustaining and accelerating declines in opioid-involved deaths.

as morphine deaths, resulting in an underreporting of heroin deaths. Fourth, potential race misclassification might have led to underestimates for certain categories, particularly American Indian/Alaska Natives and Asian/Pacific Islanders.[††††] Finally, adequate drug specificity data were available from only 38 states and DC, which might limit generalizability of state-based analyses.

From 2017 to 2018, small decreases occurred in all overdose deaths and in deaths involving all opioids, prescription opioids, and heroin; however, deaths involving synthetic opioids continued to increase in 2018 and accounted for two thirds of opioid-involved deaths. Findings also highlight increases in deaths among non-Hispanic blacks and Hispanics, indicating the need for culturally tailored interventions that address social determinants of health and structural-level factors. In addition, changing substance use patterns, including the resurgence of methamphetamine use, particularly among persons using opioids (*9*) and the mixing of opioids with methamphetamine and cocaine in the illicit drug supply (*6*), have continued to make the drug overdose landscape more complicated and surveillance and prevention efforts more challenging. To sustain decreases and prevent continued increases, continued urgent action is needed. Overdose Data to Action[§§§§] is a 3-year cooperative agreement through which CDC funds health departments in 47 states, DC, two territories, and 16 cities and counties for surveillance and prevention efforts. These measures include obtaining more timely data on all drug overdoses, improving toxicology to better identify polysubstance-involved deaths, enhancing linkage to treatment for persons with opioid use disorder and risk for opioid overdose, improving prescription drug monitoring programs, implementing health systems interventions, partnering with public safety, and implementing other innovative surveillance and prevention activities. Because of the reductions observed in deaths involving prescription opioids, continued efforts to encourage safe prescribing practices, such as following the CDC Guideline for Prescribing Opioids for Chronic Pain (*10*) might be enhanced by increased use of nonopioid and nonpharmacologic treatments for pain. Additional public health efforts to reduce opioid-involved overdose deaths include expanding the distribution of naloxone, addressing polysubstance use, and increasing the provision of medication-assisted treatment. Enhanced and coordinated multisectoral surveillance of the illicit drug supply[¶¶¶¶] to track emerging threats, including the type and amount of specific drugs, could also help prevent overdoses. A comprehensive, multisectoral surveillance, prevention, and response approach remains critical for sustaining and expanding preliminary successes in reducing opioid-involved overdose deaths and specifically curtailing synthetic opioid–involved deaths and other emerging threats.

[††††] Data for Hispanic origin should be interpreted with caution; studies comparing Hispanic origin on death certificates and on Census surveys have shown inconsistent reporting on Hispanic ethnicity. Potential race misclassification might lead to underestimates for certain categories, primarily American Indian/Alaska Native non-Hispanic and Asian/Pacific Islander non-Hispanic decedents. https://www.cdc.gov/nchs/data/series/sr_02/sr02_172.pdf.

[§§§§] https://www.cdc.gov/drugoverdose/od2a/index.html.

[¶¶¶¶] https://www.nflis.deadiversion.usdoj.gov/DesktopModules/ReportDownloads/Reports/NFLIS-Drug-AR2018.pdf.

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Variation in Adult Outpatient Opioid Prescription Dispensing by Age and Sex — United States, 2008–2018

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In 2017, prescription opioids were involved in 36% of opioid-involved overdose deaths in the United States (*1*). Prescription opioids can be obtained by prescription or through diversion (the channeling of regulated drugs from legal to illegal sources) (*2*). Among new heroin users, 66%–83% reported that their opioid use began with the misuse of a prescription opioid (*3*). "Misuse" is generally defined as drugs taken for a purpose other than that directed by the prescribing physician, in greater amounts, more often, or for a longer duration than prescribed (*2*). Exposure to prescription opioids can be lessened by ensuring recommended prescribing, thereby potentially reducing the risk for misuse, opioid use disorder, and overdose (*4*). Sex and age groups with high exposure to prescription opioids are not well defined. Using a retail pharmaceutical database from IQVIA,* nationwide trends in opioid prescription fill rates for adult outpatients by age and sex were examined during 2008–2018. Opioid prescription fill rates were disproportionately higher among men and women aged ≥65 years and women of all ages. For reasons not well understood, these disparities persisted over 11 years even as the opioid fill rate declined for each age group and sex. Interventions to improve prescribing practices by following evidence-based guidelines that include weighing the benefits and risks for using prescription opioids for each patient and adopting a multimodal approach to pain management could improve patient safety while ameliorating pain. These efforts might need to consider the unique needs of women and older adults, who have the highest opioid prescription fill rates.

The IQVIA administrative database Total Patient Tracker was used to identify patients aged ≥20 years who had at least one opioid prescription filled in a given year during January 1, 2008–December 31, 2018. A second IQVIA database (SMART—Patient Insights) was used to determine the total number of opioid prescriptions filled each year. These databases recorded information from approximately 50,400 retail pharmacies, representing 92% of all U.S. retail prescriptions. Data were weighted to provide nationwide estimates. Prescriptions written by veterinarians or oncologists were excluded to avoid including prescriptions for animals or for human patients undergoing active cancer treatment, as were records for which age or sex was unknown (approximately 2.0% each). Data were not available from mail order prescription services, or from prescriptions provided directly by prescribers or at methadone maintenance treatment clinics. Cough or cold formulations containing opioids and buprenorphine products commonly used to treat opioid use disorder were also excluded. Because only existing, deidentified data were used, CDC determined the study to be exempt from human subject regulations and institutional review board review.

To compute the age-standardized annual percentage of the U.S. adult population aged ≥20 years with a filled opioid prescription, the number of all unique persons who had an opioid prescription filled in a given year was divided by the estimated U.S. census population during that year for each respective age group. Pearson's chi-squared test of categorical data was used to test for differences in annual percentage distributions among age groups and sex using SAS (version 9.4; SAS Institute). Temporal trends during 2008–2018 were assessed by fitting log-linear regression models and comparing trends among groups by pairwise comparison parallel or coincidence testing using Joinpoint regression software (version 4.5.0.1; National Cancer Institute). All hypothesis testing was two-tailed, using $p<0.05$ to indicate statistical significance.

In 2018, an opioid prescription was filled by 19.2% of the adult U.S. population, with an average of 3.6 prescriptions per patient (Table). Among adults aged ≥65 years, 25.0% had at least one opioid prescription filled in 2018, including 23.5% of men and 26.1% of women. Compared with patients aged 20–24 years, those aged ≥65 years were approximately 2.6 times as likely to have had an opioid prescription filled in 2018 (25.0% versus 11.2%; odds ratio [OR] = 2.64; 95% confidence interval [CI] = 2.63–2.65; $p<0.001$).

From 2008 to 2018, the percentage of adults who had an opioid prescription filled declined 31% overall, from 27.8% to 19.2%, an average of 3.5% per year (95% CI = −4.9% to −2.1%; $p<0.001$). This decline was significant for each age group and sex (Figure 1) (Table). The magnitude of decline varied fourfold by age group, ranging from 1.7% each year among patients aged 55–64 and ≥65 years (95% CI = −2.3% to −1.0%; $p<0.001$) to 6.7% among patients aged 20–24 years (95% CI = −7.5% to −5.9%; $p<0.001$) (Table).

For each age group, a statistically higher percentage of women than men filled at least one opioid prescription over the 11-year study period (Figure 2). In 2018, women had

*https://www.iqvia.com/locations/united-states/solutions/commercial-operations/essential-information/prescription-information.

TABLE. Trends in the annual percentage*of adults aged ≥20 years who had an opioid prescription filled, by age group and sex — United States, 2008–2018

Sex/Age group (yrs)	Patients with at least one opioid prescription filled						% Change from 2008 to 2018	AAPC (95% CI) from 2008 to 2018§
	2008			2018				
	No. (%)*	OR (95% CI)	Opioid prescription per patient†	No. (%)*	OR (95% CI)	Opioid prescription per patient†		
Men and women								
Total¶	**60,954,146 (27.8)**	**N/A**	**3.6**	**47,504,970 (19.2)**	**N/A**	**3.6**	**−31**	**−3.5 (−4.9 to −2.1)**
20–24	4,755,234 (22.5)	Referent	2.0	2,468,395 (11.2)	Referent	1.7	−50	−6.7 (−7.5 to −5.9)
25–34	11,000,783 (27.4)	1.30 (1.29 to 1.31)**	2.7	6,786,718 (14.8)	1.37 (1.36 to 1.38)**	2.5	−46	−5.9 (−7.3 to −4.5)
35–44	11,466,903 (27.2)	1.29 (1.28 to 1.30)**	3.4	7,417,100 (17.9)	1.73 (1.72 to 1.74)**	3.4	−34	−3.9 (−5.3 to −2.6)
45–54	12,989,778 (29.2)	1.42 (1.41 to 1.43)**	4.2	8,547,366 (20.4)	2.04 (2.03 to 2.05)**	4.0	−30	−3.3 (−4.2 to −2.4)
55–64	9,843,599 (28.8)	1.39 (1.38 to 1.40)**	4.1	10,184,432 (23.9)	2.49 (2.48 to 2.50)**	4.5	−17	−1.7 (−2.3 to −1.0)
≥65	11,463,550 (29.6)	1.45 (1.44 to 1.46)**	3.8	13,177,942 (25.0)	2.64 (2.63 to 2.65)**	3.8	−16	−1.7 (−2.3 to −1.0)
Men								
Total¶	**25,415,537 (23.8)**	**Referent**	**3.4**	**19,819,894 (16.5)**	**Referent**	**3.7**	**−31**	**−3.5 (−6.6 to −0.4)**
20–24	1,828,929 (16.9)	Referent	1.9	925,544 (8.2)	Referent	1.7	−51	−6.5 (−8.0 to −5.0)
25–34	4,341,681 (21.5)	Referent	2.6	2,491,609 (10.6)	Referent	2.9	−51	−6.7 (−8.6 to −4.7)
35–44	4,884,731 (23.3)	Referent	3.3	3,010,659 (14.5)	Referent	3.5	−38	−4.4 (−6.2 to −2.7)
45–54	5,749,176 (26.3)	Referent	4.1	3,677,678 (17.8)	Referent	4.0	−32	−3.6 (−4.7 to −2.6)
55–64	4,376,831 (26.6)	Referent	4.0	4,612,416 (22.4)	Referent	4.5	−16	−1.5 (−2.2 to −0.8)
≥65	4,434,694 (26.7)	Referent	3.4	5,531,474 (23.5)	Referent	3.6	−12	−1.2 (−2.3 to −0.0)
Women								
Total¶	**35,538,609 (31.5)**	**1.45 (1.44 to 1.46)††**	**3.7**	**27,685,077 (21.9)**	**1.45 (1.44 to 1.46)††**	**3.6**	**−30**	**−3.2 (−4.5 to −2.0)**
20–24	2,926,305 (28.3)	1.95 (1.94 to 1.96)††	2.0	1,542,851 (14.3)	1.88 (1.87 to 1.89)††	1.6	−49	−7.0 (−7.5 to −6.4)
25–34	6,659,102 (33.0)	1.79 (1.78 to 1.80)††	2.7	4,295,109 (19.0)	1.97 (1.96 to 1.98)††	2.4	−42	−5.3 (−6.6 to −4.0)
35–44	6,582,172 (31.1)	1.49 (1.48 to 1.50)††	3.5	4,406,440 (21.3)	1.58 (1.57 to 1.59)††	3.2	−32	−3.6 (−4.8 to −2.4)
45–54	7,240,602 (32.0)	1.32 (1.31 to 1.33)††	4.3	4,869,688 (23.0)	1.38 (1.37 to 1.39)††	4.0	−28	−3.0 (−3.8 to −2.3)
55–64	5,466,768 (30.9)	1.24 (1.23 to 1.25)††	4.2	5,572,016 (25.3)	1.17 (1.16 to 1.18)††	4.5	−18	−1.8 (−2.4 to −1.2)
≥65	7,028,856 (31.7)	1.27 (1.26 to 1.28)††	4.1	7,646,467 (26.1)	1.23 (1.22 to 1.24)††	4.0	−18	−1.8 (−3.2 to −0.5)

Abbreviations: AAPC = average annual percentage change; CI = confidence interval; N/A = not applicable; OR = odds ratio.

* Percentages are age-adjusted to the 2000 U.S. census population.

† Calculated by totaling the number of opioid prescriptions and dividing by the total number of patients who received at least one opioid prescription in a study year.

§ Indicates that AAPC was significantly different from zero at the alpha = 0.05 level.

¶ The numbers by age groups do not sum to the total number of all adults aged ≥20 years in each study year because the total number was calculated for patients aged ≥20 years from Total Patient Tracker to avoid potential double-counting of persons who progress in age; these patient numbers are weighted estimates.

** Indicates Pearson's chi-squared test was significant (p<0.001) compared with those aged 20–24 years who had an opioid prescription filled or not.

†† Indicates Pearson's chi-squared test was significant (p<0.001) compared with their male counterpart in the same age group who had an opioid prescription filled or not.

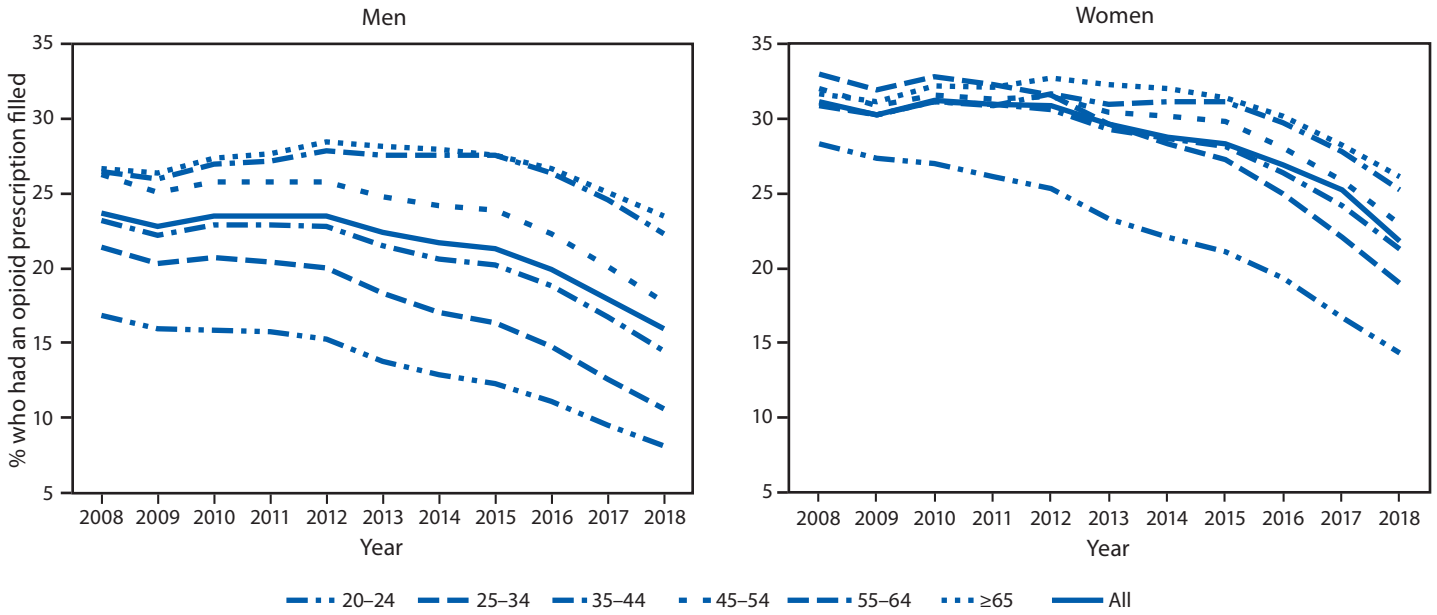
approximately 1.5 times the odds of filling an opioid prescription overall than did men (21.9% versus 16.5%; OR = 1.45; 95% CI = 1.44–1.46; p<0.001) (Table). Within each age group, the odds among women were significantly higher than were those among men. This difference was largest among persons aged 25–34 years, among whom women had nearly twice the odds of filling an opioid prescription than did men (19.0% versus 10.6%; OR = 1.97; 95% CI = 1.96–1.98; p<0.001).

Discussion

The annual percentage of U.S. adults who had an opioid prescription filled decreased by 31% during 2008–2018. This decline might be attributed to implementation of several opioid prescribing guidelines, enhanced prescription drug monitoring programs, and other quality improvement initiatives (*5*). Percentages of persons with at least one opioid prescription filled were the highest among adults aged ≥65 years. These persons might have higher frequency, longer duration, or greater intensity of chronic pain, which might contribute to higher prescription fill rates (*6*). Some researchers have described a stable trend from 2007 to 2016 among commercially insured and Medicare Advantage beneficiaries in opioid prescription fill rates (*7*), whereas the findings in this study indicated a decline. Although the reasons for this discrepancy are not clear, the patient population of the current study is different from that of the study of Medicare Advantage beneficiaries and includes all classes of payers.

Higher opioid prescription fill rates among older adults is particularly worrisome because they are more likely to have an adverse event, even death, from taking an opioid medication (*8*). Older adults might also be less aware of the number of doses taken, have problems with balance or gait, experience a drug interaction with another medication used to treat a chronic condition, or have reduced opioid excretion resulting from age-related changes in liver and renal function (*8*). The percentage decline of opioid prescriptions filled by patients

FIGURE 1. Comparison of trends*,† in the annual percentage of adults aged ≥20 years who had an opioid prescription filled, by age group and sex — United States, 2008–2018



* Indicates that average annual percentage change during 2008–2018 was significantly different from zero at the alpha = 0.05 level by using Joinpoint regression analysis.
† Indicates that two trends in terms of average annual percentage change compared between men and women of the same age group were parallel and identical, using parallelism or coincidence test that examines whether two regression mean functions (slope of the change in trend) are similar or identical in direction at p<0.05.

aged ≥65 years was the smallest of any age group, only 16% over 11 years.

Compared with men, women in all age groups had higher odds of having an opioid prescription filled. This might be partly explained by physical differences in how women process pain (*9*), higher likelihood of having a diagnosis of a mental health disorder, greater use of health care, or higher prevalence of certain chronic health conditions for which opioids are commonly prescribed (e.g., arthritis and fibromyalgia) compared with that of men (*10*). In addition, younger women might receive opioids during their childbearing years for painful reproductive disorders (e.g., dysmenorrhea or endometriosis) (*10*). However, the extent to which these conditions are driving these differences is unknown.

The findings in this report are subject to at least five limitations. First, only those prescriptions filled by retail pharmacies were considered; data were not available from other sources. Second, analyzing dosage, duration, or type of formulation was beyond the scope of this study. Third, information was not available on prescriptions that were written but not filled, whether any or all of the prescription was taken by the patient, and whether the prescription was new versus a refill. Fourth, this report did not assess drug diversion, which could result in prescription opioids being obtained through illicit sources (*2*). Finally, the efficacy of the prescription relative to the medical condition and severity could not be determined.

Those age groups among both sexes with the highest prescription fill rates warrant special attention to understand whether and how prescribing might be reduced. Optimal prescribing for these groups might differ from that of other groups because best practices for treating pain vary by medical condition and pharmacokinetics, and the prevalence of medical conditions varies by age group and sex (*4*). Additional research could help better identify patient needs and effective multimodal approaches to pain management, particularly among women and persons aged ≥65 years, the groups with higher opioid prescription fill rates. This in turn could help to establish the extent to which the observed differences in fill rates are relevant and lead to optimal prescribing for all subpopulations.

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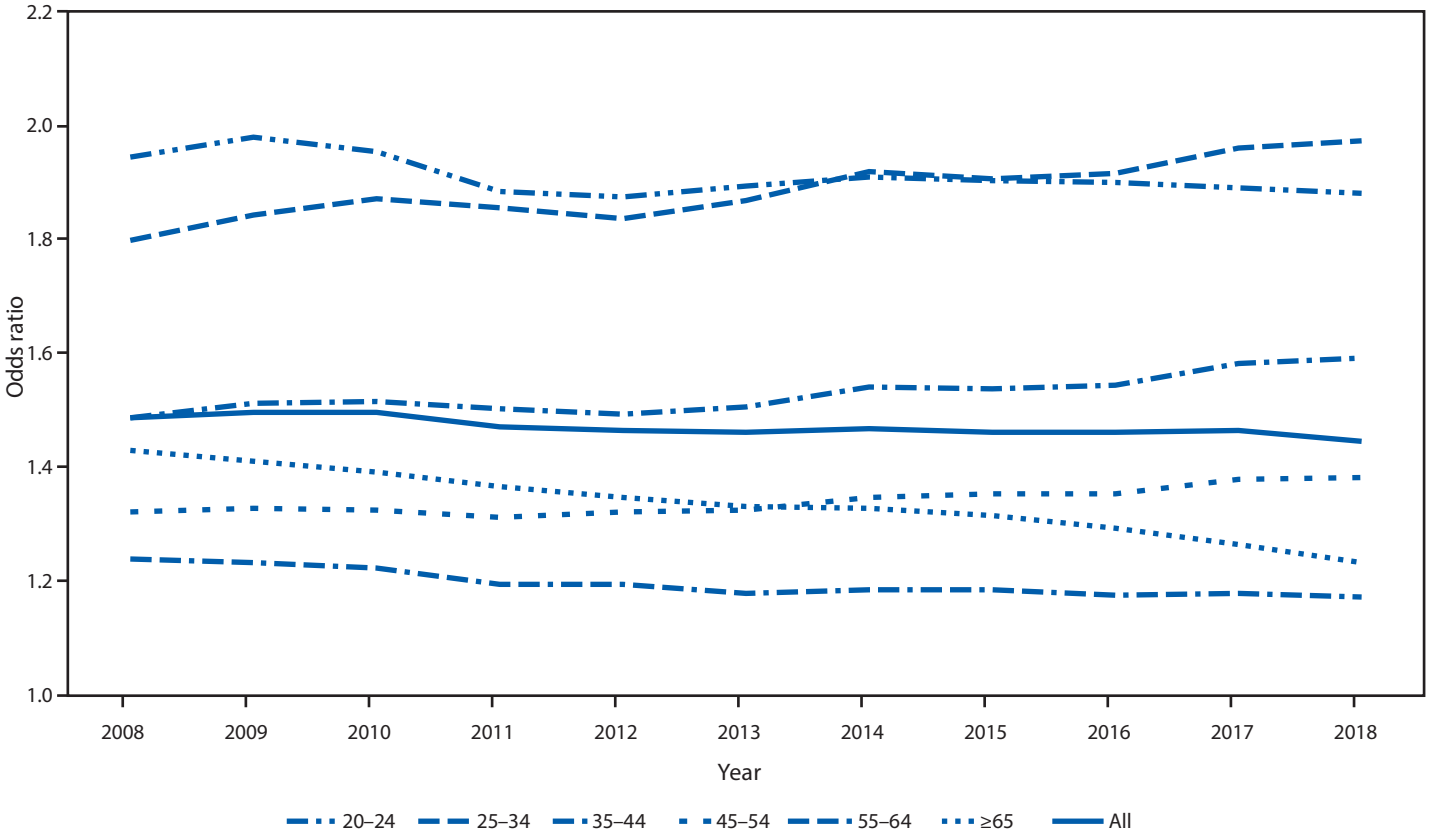
FIGURE 2. Trends* in odds of women having an opioid prescription filled compared with men, by age group among adults aged ≥20 years — United States, 2008–2018



* Indicates Pearson's chi-squared test was significant (p<0.001) for differences in annual percentage distributions among each age group and sex each year during 2008–2018.

Summary

What is already know about this topic?

One third of U.S. opioid overdose deaths in 2017 involved prescription opioids despite reductions in opioid dispensing since 2012. Sex and age groups with high exposure to prescription opioids are not well defined.

What is added by this report?

One in five adults had an opioid prescription filled in 2018, with higher fill rates among women than men across age groups. Although fill rates declined in each age group among both sexes during 2008–2018 (31% overall), disparities persisted. Rates among adults aged ≥65 years were highest and declined least.

What are the implications for public health practice?

Efforts to improve opioid prescribing need to consider the unique needs of women and older adults while using multimodal approaches to pain management.

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Delayed Identification of Infants Who Are Deaf or Hard of Hearing — Minnesota, 2012–2016

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Few studies have examined factors associated with the timing of identification of hearing loss within a cohort of infants identified as deaf or hard of hearing (DHH) and what factors are associated with delayed identification. Minnesota Early Hearing Detection and Intervention (EHDI) personnel studied deidentified data from 729 infants with confirmed congenital hearing loss (i.e., hearing loss identification after not passing newborn hearing screening) born in Minnesota during 2012–2016. Differences in likelihood of delayed identification of congenital hearing loss (defined as not passing newborn hearing screening and age >3 months at the time of identification as DHH) based on multiple variables were analyzed. Overall, 222 (30.4%) infants identified as DHH had delayed identification. Multivariate regression showed that infants identified as DHH were significantly more likely to have delayed identification if they had 1) low birthweight, 2) public insurance, 3) a residence outside the metropolitan area, 4) a mother with a lower level of education, 5) a mother aged <25 years, or 6) a mother who was Hmong. Despite achievements of EHDI programs, disparities exist in timely identification of hearing loss. Using this information to develop public health initiatives that target certain populations could improve timely identification, reduce the risk for language delay, and enhance outcomes in children who are DHH.

The institution of EHDI programs has substantially reduced the average age of identification of infants who are DHH (*1*). Despite this, many infants do not meet the Joint Committee on Infant Hearing benchmark of identification of hearing loss by age 3 months (*2*). Although national EHDI data consistently show excellent screening rates, in 2016 only 75.9% of infants who did not pass screening had documentation of definitive diagnostic testing by age 3 months to identify whether a permanent hearing loss exists. Among those found to have a permanent hearing loss, only 67.3% were enrolled in Early Intervention services by the benchmark of age 6 months (*3*). Earlier enrollment in Early Intervention services among infants identified as DHH can improve language outcomes (*4*,*5*); however, a delay in identification of hearing loss might lead to delayed referral to Early Intervention and subsequently increase the risk for language delay in these children.

To determine characteristics associated with delayed diagnosis of hearing loss among Minnesota infants identified as DHH, data were collected by the Minnesota Department of Health (MDH) EHDI information system (EHDI-IS), which contains demographic, screening, diagnostic, and intervention data on children who have been identified as DHH. Data in EHDI-IS are obtained primarily from birth care providers and facilities, audiologists, public health nurses, and birth certificates via the Minnesota Office of Vital Records. The study population included 729 infants born in Minnesota during 2012–2016 who did not pass newborn hearing screening and were identified as DHH. Independent variables included location of residence and birth facility; maternal race/ethnicity, country of origin, age, and education level at the time of birth; primary language used in the home; birthweight; and infant's health insurance status. If multiple maternal race categories were indicated on the birth certificate, the bridged race category derived by the Minnesota Office of Vital Records using the National Center for Health Statistics bridging methodology was used (*6*). Because Minnesota is home to some of the largest Somali and Hmong populations in the United States, Somali and Hmong were included as distinct populations. The outcome variable was delayed identification of hearing loss, defined as not passing newborn hearing screening and identification of hearing loss by 3 months of age. This study qualified as a public health program evaluation and therefore was considered exempt from Institutional Review Board review.

Prevalence ratios for delayed identification of hearing loss (age >3 months at identification compared with ≤3 months) were estimated for each independent variable using a modified Poisson regression model (*7*). Multicollinearity was assessed by testing for correlation coefficients >0.80 and variance inflation factors >2.5. Birth hospital location was highly correlated with residence location and therefore was not included in the multivariate model. Adjusted prevalence ratios were also estimated using a modified Poisson regression model (*7*). The final model used 686 records with complete data for all included variables. Statistical analyses were conducted in SAS software (version 9.4; SAS Institute).

Among 729 infants, 222 (30.4%) had delayed identification of hearing loss (Table). Bivariate analyses showed increased likelihood of delayed identification associated with residence location, birthweight, home language, maternal race/ethnicity, maternal country of origin, maternal age, maternal education level, and health insurance status.

TABLE. Characteristics associated with delayed identification of hearing loss (age >3 months) among infants identified as deaf or hard of hearing after not passing newborn hearing screening — Minnesota, 2012–2016

Characteristic (no. with available information*)	No.	No. (%) with delayed diagnosis	Prevalence ratio (PR) of delayed diagnosis	
			Unadjusted PR (95% CI)	Adjusted† PR (95% CI)
Total	**729**	**222 (30)**	—	—
Residence location at birth (698)				
Metropolitan area§	411	112 (27)	Referent	Referent
Nonmetropolitan area	287	98 (34)	1.3 (1.0–1.6)¶	1.4 (1.0–1.8)¶
Birth hospital location (699)				
Metropolitan area§	463	130 (28)	Referent	—
Nonmetropolitan area	236	80 (34)	1.2 (1.0–1.5)	—
Birthweight (698)				
Normal (≥2,500g)	585	153 (26)	Referent	Referent
Moderately low (1,500g–2,499g)	85	34 (40)	1.5 (1.1–2.1)¶	1.4 (1.0–1.9)¶
Very low (<1,500g)	28	23 (82)	3.1 (2.5–3.9)¶	2.6 (2.0–3.3)¶
Primary language used in the home (723)				
English	609	181 (30)	Referent	Referent
Non–English	93	39 (42)	1.4 (1.1–1.9)§	1.1 (0.8–1.7)
American Sign Language	21	<5**	—**	0.2 (0.03–1.4)
Maternal race/Ethnicity (695)				
White	468	122 (26)	Referent	Referent
Hmong	69	32 (46)	1.8 (1.3–2.4)¶	1.6 (1.1–2.5)¶
Hispanic or Latina (of any race)	49	13 (27)	1.0 (0.6–1.7)	0.7 (0.4–1.2)
Black or African American (excluding Somali)	43	21 (49)	1.9 (1.3–2.6)¶	1.5 (1.0–2.3)
Asian (excluding Hmong)	34	10 (29)	1.1 (0.7–1.9)	1.2 (0.6–2.1)
Somali	21	5 (24)	0.9 (0.4–2.0)	0.7 (0.3–1.6)
American Indian	11	<5**	—**	1.1 (0.5–2.6)
Mother born in the United States (698)				
Yes	550	156 (28)	Referent	Referent
No	148	54 (36)	1.3 (1.0–1.7)¶	1.1 (0.7–1.6)
Maternal age at birth (705)				
<25 years	131	62 (47)	1.9 (1.5–2.4)¶	1.4 (1.1–1.8)¶
25–34 years	446	112 (25)	Referent	Referent
>34 years	128	40 (31)	1.2 (0.9–1.7)	1.3 (1.0–1.8)
Maternal education level at birth (691)				
College graduate or higher	246	40 (16)	Referent	Referent
Some college	233	83 (36)	2.2 (1.6–3.1)¶	1.6 (1.2–2.3)¶
High school graduate or less	212	85 (40)	2.5 (1.8–3.4)¶	1.7 (1.2–2.5)¶
Public health insurance (infant) (729)				
No	252	45 (18)	Referent	Referent
Yes	308	125 (41)	2.3 (1.7–3.0)¶	1.6 (1.1–2.2)¶
Unknown	169	52 (31)	1.7 (1.2–2.4)¶	1.4 (1.0–2.0)

Abbreviation: CI = confidence interval.

* For all variables except public health insurance, status was unknown if missing. Records with missing data in any of these variables were excluded from the multivariate analysis. Public health insurance status had a higher percentage unknown (23% versus 1%–5% for other variables) and thus a separate category of "unknown" was created to allow records with unknown public health insurance status to be included in the multivariate model.

† The multivariate model was adjusted for residence location at birth, maternal race/ethnicity, mother born in the United States, maternal age, maternal education level, and public health insurance status.

§ Includes the seven counties (Anoka, Carver, Dakota, Hennepin, Ramsey, Scott, and Washington) of the Twin Cities region.

¶ Statistically significant (p<0.05).

** Number suppressed to protect data privacy.

After adjusting for other variables, the characteristic most strongly associated with delayed identification of hearing loss was birth weight, specifically very low birthweight (VLBW, <1,500g) or moderately low birth weight (MLBW, 1,500–2,499g). Overall, 82% of infants born with VLBW and identified as DHH received the diagnosis at age >3 months. Infants born with VLBW were more than twice as likely to have delayed identification, and infants born with MLBW also were significantly more likely to have delayed identification compared with infants born with normal birth weight (VLBW adjusted prevalence ratio [APR] = 2.6; 95% CI = 2.0–3.3); MLBW APR = 1.4; 1.0–1.8) (Table).

Maternal age and education also were significantly associated with delayed identification of hearing loss. Only 16% of infants born to a mother with a college degree were identified late, compared with 36% of infants born to a mother with

some college and 40% born to a mother with a high school diploma or less. Infants born to mothers who did not have a college degree were more likely to be identified late (high school or less APR = 1.7; 1.2–2.5; some college APR = 1.6; 1.2–2.3). Approximately one half of infants born to a mother aged <25 years had delayed identification, and they were more likely to be identified late compared with infants whose mother was aged 25–34 years (APR = 1.4; 1.1–1.8) (Table). For the maternal race/ethnicity groups considered, infants whose mothers were Hmong were 60% more likely to have delayed identification compared with infants whose mothers were white (APR = 1.6; 1.1–2.5). Nearly one half of infants whose mothers were black had delayed identification. Although not significant at the p<0.05 level, the APR for this group was among the largest (APR = 1.5; 1.0–2.3). Infants whose residence was outside of the Twin Cities metropolitan area (APR = 1.4; 1.0–1.9) or who had public health insurance (APR = 1.6; 1.1–2.2) also were more likely to have delayed identification.

Summary

What is already known about this topic?

The Joint Committee on Infant Hearing guidelines for Early Hearing Detection and Intervention recommends that all infants who have not passed newborn hearing screening should have diagnostic audiologic testing to identify hearing loss by age 3 months.

What is added by this report?

Significant delays in diagnosis of hearing loss among Minnesota infants identified as deaf or hard of hearing (DHH) were associated with low birth weight, lower maternal education, maternal age <25 years, maternal Hmong ethnicity, residence outside the metropolitan area, and public health insurance use.

What are the implications for public health practice?

Using this information to develop public health initiatives that target certain populations could improve timely identification, reduce the risk for language delay, and enhance outcomes in children who are DHH.

Discussion

Socioeconomic factors are well documented determinants of health, and several socioeconomic indicators in this study were associated with delayed identification of infants who are born DHH. More work is needed to understand the barriers to audiologic follow-up for persons with lower socioeconomic status. Partnering with birth and primary care providers to improve messaging about the need for follow-up after newborn hearing screening and improvements in scheduling follow-up appointments for further testing at the time the infant does not pass the screening have both been identified as promising practices that might have a positive effect (*8*).

In this study, VLBW infants were at highest risk for delayed identification. These infants are at increased risk for multiple complications in the neonatal period, many of which are included in the Joint Committee on Infant Hearing's list of risk factors for permanent congenital, delayed-onset, or progressive hearing loss in childhood (*2*). VLBW infants also might be medically fragile in the Neonatal Intensive Care Unit with acute issues that preclude conducting a diagnostic hearing test in a timely fashion. In addition, delayed identification was more likely for infants born to mothers of Hmong ethnicity. This finding has not been previously reported in the literature. In fact, a review of the literature revealed a paucity of hearing-related studies involving Hmong subjects (*9*). The reasons behind this association are unclear and further studies in this patient population are needed. Similar to previous findings (*10*), infants in this study living outside of the metropolitan area were more likely to have delayed identification compared with infants who live within the metropolitan area. Health care resources, particularly access to pediatric audiology services, might be limited in some nonmetropolitan regions. The development of tele-audiology programs to improve access has been well described and has been piloted in Minnesota with some success.* However, more work is needed to expand upon and further refine these programs.

The findings in this report are subject to at least five limitations. First, data provided by the Office of Vital Records are obtained via self-report and are subject to reporting bias. Second, residence, language and insurance data are obtained from audiologists and public health nurses, and the potential for reporting error exists. Third, other factors not part of this data set, such as comorbidities, might have affected the result. Fourth, some of the comparison groups have small numbers making it difficult to detect associations. Finally, because the outcome was studied as a dichotomous variable it was not possible to report relative delays associated with certain demographic factors.

Disparities in timely identification of hearing loss exist among infants who are DHH in Minnesota. Delayed identification might lead to delay in initiation of Early Intervention services which has been shown to result in poorer language outcomes in children identified as DHH. The information obtained from this study might help justify development of public health initiatives to target certain populations, including strengthening partnerships with local public health teams making home visits to MLBW and VLBW infants after hospital discharge. Another potential key partnership is with Special Supplemental Nutrition Programs for Women, Infants, and Children that have contact with low-income families, many

* https://doi.org/10.1016/j.otc.2011.08.006.

of whom have public insurance. These teams are in a position to encourage or even facilitate scheduling of follow-up appointments for diagnostic hearing testing. Finally, creating information and resources for families in formats that are easily accessible but not dependent upon literacy or education levels (e.g., podcasts or online videos) is another public health initiative with the potential to improve outcomes.

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Evaluation of the Effectiveness of Surveillance and Containment Measures for the First 100 Patients with COVID-19 in Singapore — January 2–February 29, 2020

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Coronavirus disease 2019 (COVID-19) was first reported in Wuhan, China, in December 2019, and has since spread globally, resulting in >95,000 confirmed COVID-19 cases worldwide by March 5, 2020 (*1*). Singapore adopted a multipronged surveillance strategy that included applying the case definition at medical consults, tracing contacts of patients with laboratory-confirmed COVID-19, enhancing surveillance among different patient groups (all patients with pneumonia, hospitalized patients in intensive care units [ICUs] with possible infectious diseases, primary care patients with influenza-like illness, and deaths from possible infectious etiologies), and allowing clinician discretion (i.e., option to order a test based on clinical suspicion, even if the case definition was not met) to identify COVID-19 patients. Containment measures, including patient isolation and quarantine, active monitoring of contacts, border controls, and community education and precautions, were performed to minimize disease spread. As of March 5, 2020, a total of 117 COVID-19 cases had been identified in Singapore. This report analyzes the first 100 COVID-19 patients in Singapore to determine the effectiveness of the surveillance and containment measures. COVID-19 patients were classified by the primary means by which they were detected. Application of the case definition and contact tracing identified 73 patients, 16 were detected by enhanced surveillance, and 11 were identified by laboratory testing based on providers' clinical discretion. Effectiveness of these measures was assessed by calculating the 7-day moving average of the interval from symptom onset to isolation in hospital or quarantine, which indicated significant decreasing trends for both local and imported COVID-19 cases. Rapid identification and isolation of cases, quarantine of close contacts, and active monitoring of other contacts have been effective in suppressing expansion of the outbreak and have implications for other countries experiencing outbreaks.

On January 2, 2020, days after the first report of the disease from China, the ministry of health (MOH) in Singapore, a small island city-state in Southeast Asia with a population of approximately 5.7 million, developed a local case definition (Supplementary Table, https://stacks.cdc.gov/view/cdc/85735) and advised all medical practitioners to be vigilant for suspected COVID-19 patients (*2*). A confirmed case was defined as a positive test for SARS-CoV-2, the virus that causes COVID-19, by reverse transcription–polymerase chain reaction (RT-PCR) (*3*), or a positive viral microneutralization antibody test using a SARS-CoV-2 virus isolate (BetaCoV/Singapore/2/2020; GISAID accession 76 number EPI_ISL_407987) and conducted using previously published protocols (*4*). At hospitals, patients with suspected COVID-19 received chest radiographs and RT-PCR testing on at least two nasopharyngeal swabs collected 24 hours apart (*5*). Physicians are mandated to report all suspected and confirmed COVID-19 patients through a centralized disease notification system.

The case definition was updated five times following the outbreak's start to adapt to the evolving global situation (Supplementary Table, https://stacks.cdc.gov/view/cdc/85735). The MOH carried out contact tracing around confirmed cases to identify persons who might have been infected. Contacts with fever (temperature ≥100.4°F [≥38°C]) or respiratory symptoms were transferred directly to a hospital for further evaluation and testing. Close contacts were defined as having close (within 6.6 ft [2 m]) and prolonged (generally ≥30 minutes) contact with the COVID-19 patient. Contacts at lower risk were persons who had some interactions with the COVID-19 patient for shorter periods of time. Asymptomatic close contacts were placed under compulsory quarantine for 14 days, and contacts at lower risk were placed under active monitoring. All contacts were assessed by telephone for fever or respiratory symptoms by public health officials during the quarantine or monitoring period, thrice daily for close contacts and once daily for contacts at lower risk. Contacts who became symptomatic were transferred to a hospital. Surveillance was enhanced in late January 2020 by testing the following groups for COVID-19: 1) all hospitalized patients with pneumonia (later expanded to include patients with pneumonia evaluated in primary care settings); 2) ICU patients with possible infectious causes as determined by the physician; 3) patients with influenza-like illness at sentinel government and private primary care clinics included in the routine influenza surveillance network; and 4) deaths from possible infectious causes. In addition, medical practitioners could choose to test patients if there was clinical (e.g., prolonged respiratory illness with unknown cause) or epidemiologic (e.g., association with known clusters) suspicion.

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The effectiveness of Singapore's surveillance and containment efforts was assessed from the outbreak's start until February 29 by calculating the 7-day moving average of the interval from symptom onset to isolation in hospital or quarantine. This measure provides an indication of the time spent within the community when a person with COVID-19 is potentially infectious. Differences in the percentages of cases detected through the different surveillance components were tested using the chi-squared or Fisher's exact test. All analyses were conducted using R statistical software (version 3.5.1; The R Foundation).

Among the first 100 confirmed COVID-19 cases in Singapore, the average patient age was 42.5 years (median = 41 years; interquartile range [IQR] = 34–54 years) (Table). The majority (72%) of patients were aged 30–59 years, and 60% of patients were male. RT-PCR confirmed 99% of cases, and one case was confirmed by viral microneutralization testing. Twenty-four cases were imported, and the rest resulted from local transmission. Fifteen patients were ever in the ICU; no deaths have been reported to date. Contact tracing contributed to the primary detection of approximately half (53%) of COVID-19 patients. Another 20 (20%) patients were identified at general practitioner clinics or hospitals because they met the case definition; 16 were identified through enhanced surveillance (15 from pneumonia surveillance and one from the ICU), and another 11 through medical providers' clinical discretion. No patients were identified through surveillance for influenza-like illness. A significant difference was found in the percentage of cases detected by the various surveillance methods, depending on whether the cases were linked to another COVID-19 patient or by travel to China, compared with cases that could not be linked to another case (p<0.001). Among linked cases, the largest proportion (62.7%) was detected through contact tracing, whereas among unlinked cases, the largest proportion of cases (58.8%) was detected through enhanced surveillance (Table). The earliest symptom onset date reported by a COVID-19 patient was January 14 (Figure 1). The epidemic curve peaked on January 30, when nine patients were identified, before declining to two to five patients per day on February 11 and continuing forward. International importations accounted for a majority of cases at the outbreak's start before more local cases were detected. The mean interval from symptom onset to hospital isolation or quarantine was 5.6 days (median = 5 days; IQR = 2–8 days). The 7-day moving average of the interval from symptom onset to isolation declined significantly across the study period for both imported and local cases, from 9.0 and 18.0 days to 0.9 and 3.1 days, respectively (p<0.001) (Figure 2). Among the 53 patients first identified through contact tracing, 13 (24.5%) were contacted on or before the date of symptom onset.

Discussion

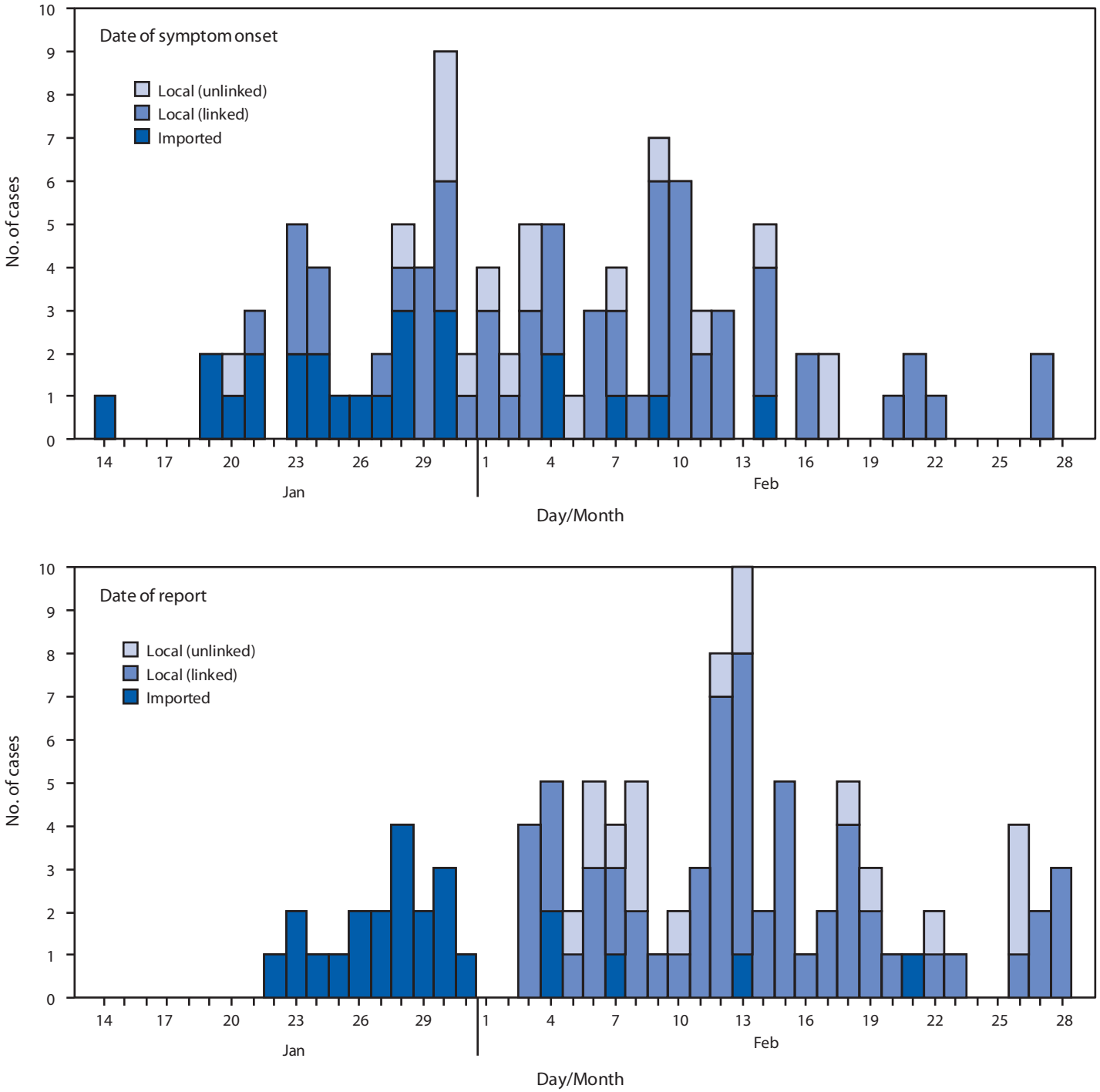
In this assessment of the measures that Singapore, a small city-state, put in place to identify COVID-19 patients and contain disease spread in the early outbreak phase, approximately one quarter of cases were detected through enhanced surveillance among hospitalized patients with pneumonia and ICU patients (16 cases [16%]) and through providers' clinical discretion (11 [11%]). A recent study considered Singapore to

TABLE. Characteristics of coronavirus disease 2019 (COVID-19) cases, by linkage to other known cases (N = 100) — Singapore, January–February 2020

Characteristic	No. (%) of COVID-19 cases			P-value
	Total	Linked*	Unlinked†	
Age group (yrs)				
<30	**17 (17.0)**	17 (20.5)	0 (—)	0.12
30–39	**28 (28.0)**	23 (27.7)	5 (29.4)	
40–49	**20 (20.0)**	16 (19.3)	4 (23.5)	
50–59	**24 (24.0)**	20 (24.1)	4 (23.5)	
≥60	**11 (11.0)**	7 (8.4)	4 (23.5)	
Sex				
Male	**60 (60.0)**	46 (55.4)	14 (82.4)	0.06
Female	**40 (40.0)**	37 (44.6)	3 (17.6)	
Ethnic group				
Chinese	**87 (87.0)**	74 (89.2)	13 (76.5)	0.21
Indian	**6 (6.0)**	4 (4.8)	2 (11.8)	
Malay	**2 (2.0)**	1 (1.2)	1 (5.9)	
Other	**5 (5.0)**	4 (4.8)	1 (5.9)	
Primary detection method				
Contact tracing	**53 (53.0)**	52 (62.7)	1 (5.9)	<0.001
Case definition at medical consult	**20 (20.0)**	16 (19.3)	4 (23.5)	
Enhanced surveillance	**16 (16.0)**	6 (7.2)	10 (58.8)	
Provider clinical discretion	**11 (11.0)**	9 (10.8)	2 (11.8)	

* Patients who were epidemiologically linked to other COVID-19 patients or had recent travel to China.
† Patients whose source of infection could not be determined.

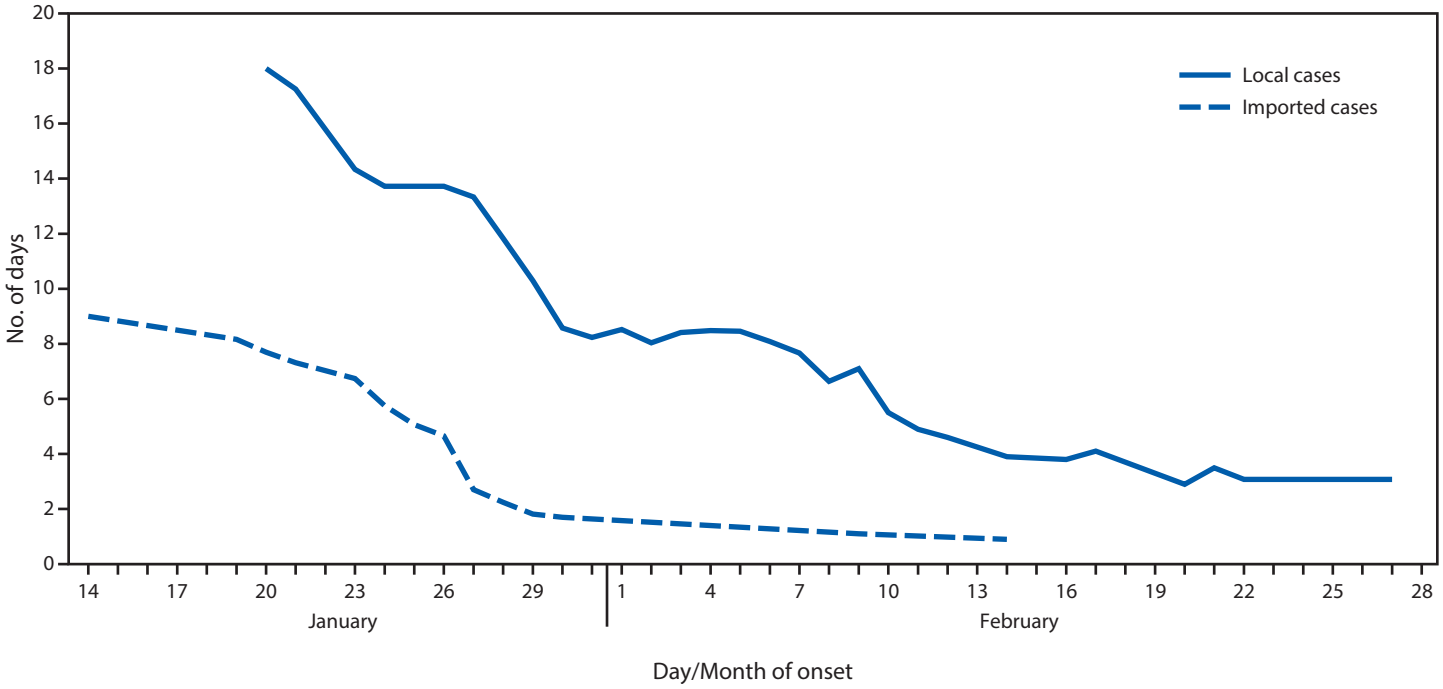
FIGURE 1. Date of symptom onset and date of report for cases of coronavirus disease 2019 (COVID-19) (N = 100), based on importation and linkage*,† status — Singapore, January 14–February 28, 2020



* Linked patients defined as those who were found to be epidemiologically linked to other COVID-19 patients or who had recent travel to China.
† Unlinked patients defined as those whose source of infection could not be determined.

have the highest surveillance capacity for COVID-19 among all countries (*6*). The study estimated that if other countries had similar detection capacities as Singapore, the global number of imported cases detected would be 2.8 times higher than the observed current number. The surveillance methods in Singapore complemented one another to identify infected persons, with the overlapping components constituting safety nets; none of the methods alone would have detected all

FIGURE 2. Interval from symptom onset to isolation or hospitalization (7-day moving average), of coronavirus disease 2019 (COVID-19) cases (N = 100), by importation status — Singapore, January 14–February 28, 2020



patients. The case definition was important for clinicians to use as a foundation, and active case finding around COVID-19 patients through contact tracing was useful in detecting new patients early for isolation.

The enhanced surveillance measures of SARS-CoV-2 testing of all patients with pneumonia, surveillance of ICU patients with severe illness and deaths potentially attributable to COVID-19, and clinical discretion in requesting testing were all important in detecting initially unlinked patients for further investigation. Adoption of multiple surveillance mechanisms can ensure broad coverage because each missed case can lead to chains of transmission that might be difficult to contain subsequently.

Singapore has implemented aggressive measures to contain local transmission of COVID-19. After an initial increase in locally transmitted cases, the number of newly identified cases decreased after approximately 1 month, determined by symptom onset dates. This decrease is likely a result of the early implementation of surveillance and detection measures while the numbers of patients were still small and individual-level containment was possible; a larger number of cases would have driven community transmission. The decline in the 7-day moving average of interval from onset to isolation in hospital and quarantine was also indicative of efforts to contain disease spread across time.

Singapore has also implemented other measures to reduce the spread of COVID-19. To prevent imported cases from seeding local transmission, border control measures included temperature screening initially for travelers on flights from Wuhan before expanding to include all travelers entering Singapore at air, sea, and land checkpoints (*7*). Short-term visitors with travel in the past 14 days to selected countries or regions (initially mainland China and later expanded to South Korea, northern Italy, and Iran) were denied entry; Singapore residents returning from these areas were placed under a mandatory 14-day self-quarantine. To reduce community spread, public education messages were focused on personal hygiene and seeking early medical care and self-isolation when having respiratory symptoms. As of March 5, 2020, schools have not closed because there was no widespread community transmission in Singapore and few cases among children; precautionary measures such as reducing mixing across classes or schools have been implemented to limit possible disease transmission.

The findings in this report are subject to at least three limitations. First, the 7-day moving average interval from symptom onset to isolation could fluctuate for recent dates as additional patients are detected and might be insufficient as a single measure to evaluate the effectiveness of containment. Further indicators to assess effectiveness of containment measures should be investigated. Nevertheless, the downward trend was significant from the outbreak's start until early February. Second, the case detection methods were primarily focused on symptomatic patients. Further studies are needed to assess the number of asymptomatic patients in the community and their

Summary

What is already known about this topic?

First detected in China in late 2019, coronavirus disease 2019 (COVID-19) transmission has spread globally.

What is added by this report?

Singapore implemented a multipronged surveillance and containment strategy that contributed to enhanced case ascertainment and slowing of the outbreak. Based on review of the first 100 cases, the mean interval from symptom onset to isolation was 5.6 days and declined after approximately 1 month.

What are the implications for public health practice?

A multipronged surveillance strategy could lead to enhanced case detection and reduced transmission of highly infectious diseases such as COVID-19.

potential to transmit disease and whether additional measures targeting asymptomatic patients would have resulted in further case reductions. Finally, generalizability of results is limited because of the small sample size and lack of cases in settings such as long-term nursing facilities and health care settings.

Singapore implemented strong surveillance and containment measures, which appear to have slowed the growth of the outbreak. These measures might be useful for detection and containment of COVID-19 in other countries that are experiencing the start of local COVID-19 outbreaks. Singapore is a small island city-state, and nations with other characteristics might need to adapt and augment Singapore's approaches to achieve the same level of effectiveness.

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Initial Investigation of Transmission of COVID-19 Among Crew Members During Quarantine of a Cruise Ship — Yokohama, Japan, February 2020

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On March 17, 2020, this report was posted as an MMWR *Early Release on the* MMWR *website (https://www.cdc.gov/mmwr).*

An outbreak of coronavirus disease 2019 (COVID-19) among passengers and crew on a cruise ship led to quarantine of approximately 3,700 passengers and crew that began on February 3, 2020, and lasted for nearly 4 weeks at the Port of Yokohama, Japan (*1*). By February 9, 20 cases had occurred among the ship's crew members. By the end of quarantine, approximately 700 cases of COVID-19 had been laboratory-confirmed among passengers and crew. This report describes findings from the initial phase of the cruise ship investigation into COVID-19 cases among crew members during February 4–12, 2020.

On February 1, a laboratory-confirmed case of COVID-19 was identified in a passenger who had developed symptoms on January 23 and disembarked on January 25, before the ship arrived in Yokohama. Another passenger with a laboratory-confirmed case of COVID-19 had developed symptoms on January 22 and was on the ship when it arrived in Yokohama on February 3. All symptomatic passengers were tested upon arrival in Yokohama, and those with positive results were disembarked February 4 and 5. The index patient for this outbreak could not be determined. On February 5, passengers remaining on the ship were requested to observe 14-day quarantine in their cabins. Approximately two thirds of the persons on board were passengers staying in cabins located on decks 5–12. The remainder (N = 1,068) were crew members, >80% of whose cabins were on decks 2–4. Crew members remained on board the ship at all times and had not disembarked during port calls. After quarantine began, crew members continued to perform their regular duties, delivered meals to passengers, and remained in their cabins when they were not working; symptomatic crew members were required to remain in their cabins.

Because the first detected cases occurred among passengers who became symptomatic on January 22 and 23, COVID-19 was likely transmitted first from passengers to crew members and subsequently spread among the crew, especially among food service workers. The first case detected in a crew member occurred in a food service worker who developed fever on February 2. A real-time polymerase chain reaction test performed by the Yokohama quarantine office laboratory was positive for SARS-CoV-2, the etiologic agent of COVID-19, and the crew member was permitted to disembark in Yokohama on February 4. By February 9, a total of 20 cases* among crew members had been laboratory-confirmed, including three in those who reported close contact with other crew members with laboratory-confirmed COVID-19 before implementation of quarantine. Seven ill crew members had symptom onset within 3 days of the start of quarantine, indicating that some SARS-CoV-2 transmission likely occurred before the implementation of quarantine.

The crew dining area was identified as the primary area of congregation for the crew; passengers did not have access to this part of the ship. The earliest laboratory-confirmed COVID-19 cases in crew members occurred in food service workers; 15 of the 20 confirmed cases in crew members occurred among food service workers who prepared food for other crew members, and 16 of the 20 cases occurred among persons with cabins on deck 3, the deck on which the food service workers lived (Table). Until February 6, no mechanism for systematic testing was implemented; only crew members who visited the medical clinic with symptoms were tested, and information on the total number of tests administered is not available.

The cruise ship company administered a questionnaire to all crew members on February 3, at which time three crew members reported subjective fever. A second survey of crew members was conducted on February 9, at which time fever was reported by 31 crew members, 20 (65%) of whom were food service workers.

Interviews were conducted with nine crew members with confirmed COVID-19 on February 12, just before their disembarkation; three of these patients reported close contact with other crew members with confirmed COVID-19 before their symptoms began. These interviews indicated that infection had apparently spread among persons whose cabins were on the same deck (deck 3) and who worked in the same occupational group (food service), probably through contact or droplet spread, which is consistent with current understanding of COVID-19 transmission (*2*). Eight of 20 crew members with confirmed COVID-19 had cabin mates; investigators later learned that following disembarkation, as of March 4, five of the eight cabin mates had also developed COVID-19.

This investigation underscores the need for swift epidemiologic investigation as soon as a COVID-19 case is detected in

*Testing for COVID-19 was conducted for crew members who sought medical attention.

TABLE. Coronavirus disease 2019 (COVID-19) cases and fever status among crew members aboard a cruise ship (N = 1,068) — Yokohama, Japan, February 2020

Characteristic	No. of crew members	No. (%) febrile at the time of survey		No. (%) confirmed cases[†,§]
		Feb 3	Feb 9*	
Type of work				
Food service	245	0 (—)	20 (8)	15 (6)
Housekeeping	176	0 (—)	0 (—)	1 (1)[¶]
Galley	135	0 (—)	3 (2)	0 (—)
Beverage service	61	0 (—)	2 (3)	2 (3)
Deck	57	1 (2)	2 (4)	0 (—)
Steward	53	0 (—)	1 (2)	1 (2)
Guest service	40	1 (3)	1 (3)	0 (—)
Gift shop	28	1 (4)	0 (—)	0 (—)
Production cast	27	0 (—)	1 (4)	0 (—)
Arts	5	0 (—)	1 (20)	0 (—)
Others	241	0 (—)	0 (—)	1 (—)
Total	**1,068**	**3 (0.3)**	**31 (3)**	**20 (2)**
Crew member cabin deck				
2	171	0 (—)	2 (1)	2 (1)
3	582	1 (0.2)	26 (4)	16 (3)
4	148	1 (1)	1 (1)	1 (1)
5	84	0 (—)	1 (1)	1 (1)
6	33	0 (—)	1 (3)	0 (—)
7	30	1 (3)	0 (—)	0 (—)
Others	18	0 (—)	0 (—)	0 (—)
N/A	2	0 (—)	0 (—)	0 (—)
Total	**1,068**	**3 (0.3)**	**31 (3)**	**20 (2)**

Abbreviation: N/A = not available.

* The survey conducted on February 9 did not include a crew member who had disembarked.

† Food service worker crew members were more likely to be infected than were housekeeping or galley crew members (Bonferroni multiple comparison test: $p<0.005$).

§ Testing for COVID-19 was conducted for crew members who sought medical attention.

¶ Although this crew member did not report fever, other symptoms and close contact with another patient with confirmed COVID-19 were reported, which led to testing for COVID-19.

an area or group where a large number of persons gather in a closed or crowded setting (e.g., a cruise ship, music club, health care setting, sports arena, or gymnasium). These settings have been previously associated with infections spread by contact or droplet, such as influenza (*3*). Close contacts of persons with confirmed COVID-19 should self-quarantine and monitor their symptoms; persons who develop COVID-19 symptoms while on board a ship should be isolated to limit transmission to other passengers and crew.†

† https://www.cdc.gov/quarantine/maritime/recommendations-for-ships.html.

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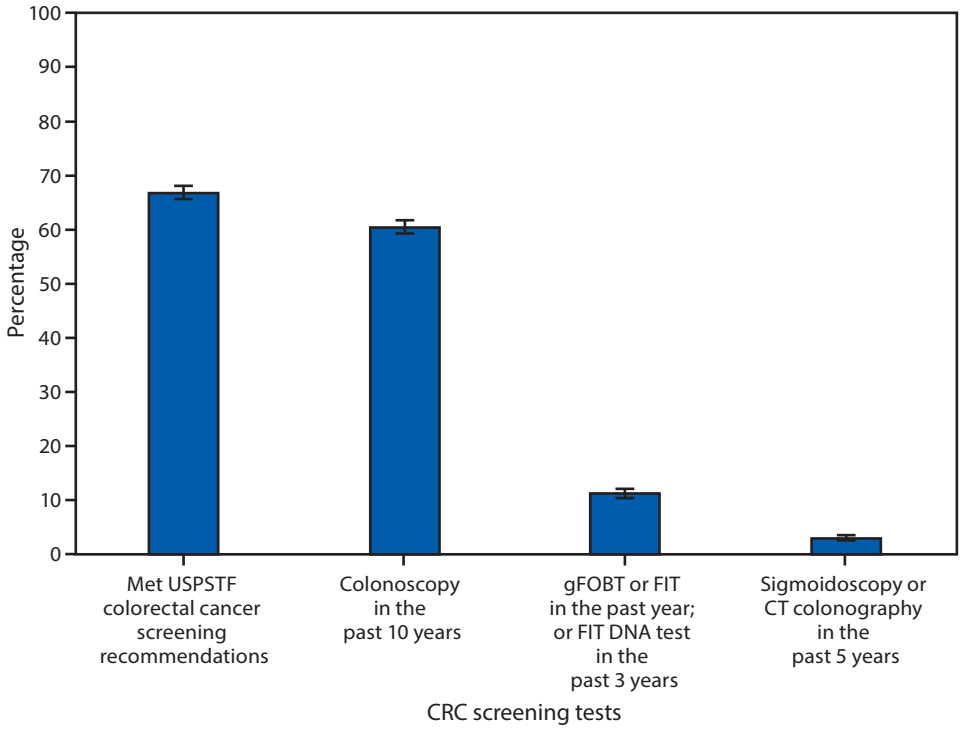
QuickStats

FROM THE NATIONAL CENTER FOR HEALTH STATISTICS

Percentage of Adults Aged 50–75 Years Who Met Colorectal Cancer (CRC) Screening Recommendations*,† — National Health Interview Survey, United States, 2018§



Abbreviations: CT = computed tomography; FIT = fecal immunochemical test; gFOBT = guaiac-based fecal occult blood test; USPTF = U.S. Preventive Services Task Force.

* USPSTF screening recommendations for colorectal cancer (CRC) for adults of average risk include alternative tests and specified time intervals beginning at age 50 years and continuing until age 75 years: colonoscopy every 10 years; flexible sigmoidoscopy or computed tomography (CT) colonography every 5 years, or flexible sigmoidoscopy every 10 years plus fecal immunochemical test (FIT) every year; FIT DNA test every 3 years; guaiac-based fecal occult blood test (gFOBT) or FIT test annually.

† Sample adults aged ≥40 years were asked in separate questions if they ever had a named recommended colorectal test and if so when was the most recent test. Colorectal tests included colonoscopy, sigmoidoscopy, CT colonography or virtual colonoscopy, gFOBT, FIT, and FIT DNA (Cologuard) test. Respondents could answer yes to more than one test; the tests were not mutually exclusive.

§ 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. Estimates are presented with 95% confidence intervals indicated by error bars. Persons with a personal history of colorectal cancer were excluded from these analyses.

In 2018, 67.0% of U.S. adults aged 50–75 years met the U.S. Preventive Services Task Force recommendations for colorectal cancer screening; 60.6% had a colonoscopy in the past 10 years. An estimated 11.3% had either a gFOBT or FIT within the past 1 year, or had a FIT DNA test in the past 3 years. Fewer adults, 3.1%, had a sigmoidoscopy or CT colonography in the past 5 years.

Source: National Health Interview Survey, 2018. https://www.cdc.gov/nchs/nhis.htm.

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