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Arthritis Awareness Month — May 2019

Arthritis Awareness Month, led by the Arthritis Foundation (https://www.arthritis.org), is observed each May to bring attention to arthritis and its impact. Arthritis affects an estimated 54.4 million U.S. adults, or approximately one in four (*1*); and of these adults with arthritis, approximately 27% have severe joint pain (*2*). Arthritis also is linked to higher rates of physical inactivity (*1*).

A report in this issue of *MMWR* found that arthritis is more common among American Indian/Alaska Natives than among any other racial/ethnic group and is most prevalent in Appalachia and the Lower Mississippi Valley regions (*3*). Likewise, the report found that, in all states, severe joint pain and physical inactivity were common among adults with arthritis, but especially among those in southeastern states, and were most common among adults who were disabled or unable to work (*3*). Adults with arthritis and severe joint pain also were more likely to be physically inactive than those with no or mild to moderate joint pain (*3*) even though physical activity eases arthritis pain over time (*1*).* CDC supports evidence-based lifestyle management programs proven to help adults with arthritis to be physically active and improve their quality of life.†

* https://www.cdc.gov/arthritis/basics/physical-activity-overview.html.
† https://www.cdc.gov/arthritis/interventions/physical-activity.html.

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State-Specific Severe Joint Pain and Physical Inactivity Among Adults with Arthritis — United States, 2017

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An estimated 54.4 million (approximately one in four) U.S. adults have doctor-diagnosed arthritis (arthritis) (*1*). Severe joint pain and physical inactivity are common among adults with arthritis and are linked to adverse mental and physical health effects and limitations (*2*,*3*). CDC analyzed 2017 Behavioral Risk Factor Surveillance System (BRFSS) data to estimate current state-specific prevalence of arthritis and, among adults with arthritis, the prevalences of severe joint pain and physical inactivity. In 2017, the median age-standardized state prevalence of arthritis among adults aged ≥18 years was 22.8% (range = 15.7% [District of Columbia] to 34.6%

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[West Virginia]) and was generally highest in Appalachia and Lower Mississippi Valley regions.* Among adults with arthritis, age-standardized, state-specific prevalences of both severe joint pain (median = 30.3%; range = 20.8% [Colorado] to 45.2% [Mississippi]) and physical inactivity (median = 33.7%; range = 23.2% [Colorado] to 44.4% [Kentucky]) were highest in southeastern states. Physical inactivity prevalence among those with severe joint pain (47.0%) was higher than that among those with moderate (31.8%) or no/mild joint pain (22.6%). Self-management strategies such as maintaining a healthy weight or being physically active can reduce arthritis pain and prevent or delay arthritis-related disability. Evidence-based physical activity and self-management education programs are available that can improve quality of life among adults with arthritis.

BRFSS is an ongoing state-based, landline and cellular telephone survey of noninstitutionalized adults in the United States aged ≥18 years that is conducted by state and territorial health departments in 50 U.S. states, the District of Columbia (DC), and U.S. territories.† The combined (telephone and cellular) median response rate in 2017 among states was 45.9% (range = 30.6%–64.1%); 435,331 adults reported information about arthritis status and age, and among them, 144,099 reported having arthritis.§ Having arthritis was defined as a response of "yes" to the question "Have you ever been told by a doctor or other health care professional that you have arthritis, rheumatoid arthritis, gout, lupus, or fibromyalgia?" No/mild, moderate, and severe joint pain were defined by responses of 0–3, 4–6, and 7–10, respectively, to the question "Please think about the past 30 days, keeping in mind all of your joint pain or aching and whether or not you have taken medication. On a scale of 0 to 10 where 0 is no pain or aching and 10 is pain or aching as bad as it can be, during the past 30 days, how bad was your joint pain on average?" Physical inactivity was defined as a response of "no" to the question "During the past month, other than your regular job, did you participate in any physical activities or exercises such as running, calisthenics, golf, gardening, or walking for exercise?"

All analyses, which accounted for BRFSS's complex sampling design, were conducted using SAS (version 9.4; SAS Institute) and SUDAAN (version 11.0; RTI International). Sampling weights, using iterative proportional fitting (raking), were applied to make estimates representative of each state.¶ Age-standardized,** state-specific prevalences of arthritis among

* *Appalachia region:* all of West Virginia; parts of Alabama, Georgia, Kentucky, Maryland, New York, North Carolina, Ohio, Pennsylvania, South Carolina, and Virginia (https://www.arc.gov/appalachian_region/MapofAppalachia.asp). *Lower Mississippi Valley region:* Arkansas, Kentucky, Louisiana, Mississippi, Missouri, and Tennessee (https://www.mvd.usace.army.mil/Media/Publications/Our-Mississippi/About/Lower-Mississippi/).

† https://www.cdc.gov/brfss/about/index.htm.

§ https://www.cdc.gov/brfss/annual_data/2017/pdf/2017-response-rates-table-508.pdf.

¶ http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.684.5837&rep=rep1&type=pdf.

** Estimates were age-standardized to the 2000 projected U.S. population aged ≥18 years using three age groups: 18–44, 45–64, and ≥65 years. https://www.cdc.gov/nchs/data/statnt/statnt20.pdf.

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adults aged ≥18 years, and of severe joint pain and physical inactivity among adults with arthritis, were calculated by selected characteristics. Differences across subgroups were tested using t-tests, and orthogonal linear contrasts were conducted for tests of trends to detect linear patterns in ordinal variables (*4*); all differences and trends reported in the text are significant ($\alpha = 0.05$).

In 2017, age-specific arthritis prevalence was higher with increasing age, ranging from 8.1% among those aged 18–44 years to 50.4% among those aged ≥65 years (Table 1). Age-standardized arthritis prevalence was significantly higher among women (25.4%) than among men (19.1%); non-Hispanic American Indian/Alaska Natives (29.7%) than among other racial/ethnic groups (range = 12.8%–25.5%); and those unable to work/disabled (51.3%), compared with retired (34.3%), unemployed (26.0%), or employed/self-employed (17.7%). Arthritis prevalence was higher with increasing body mass index, ranging from 17.9% among those with healthy weight or underweight to 30.4% among those with obesity. Arthritis prevalence was lower among Hispanics and non-Hispanic Asians than among other racial/ethnic groups, was inversely related to education and federal poverty level, and was higher among those living in more rural areas compared with urban dwellers.

Among adults with arthritis, no/mild, moderate, and severe joint pain was reported by 36.2% (95% confidence interval [CI] = 35.7%–36.8%), 33.0% (CI = 32.4%–33.5%), and 30.8% (CI = 30.3%–31.4%) of respondents, respectively (unadjusted prevalences). Age-specific percentages for severe joint pain declined with increasing age, ranging from 33.0% among those aged 18–44 years to 25.1% among those aged ≥65 years. Age-standardized severe joint pain prevalence was ≥40% among the following groups: those unable to work/disabled (66.9%); those with less than a high school diploma (54.1%); those living at ≤125% federal poverty level (51.6%); non-Hispanic blacks (50.9%); retired persons (45.8%); Hispanics (42.0%); non-Hispanic American Indians/Alaska Natives (42.0%); and lesbian/gay/bisexual/queer/questioning (40.7%; reported by 27 states). Severe joint pain prevalence was similar across urban/rural geographic areas, ranging from 32.7%–35.7% in all areas, except for a lower prevalence (28.6%) in large fringe metro areas (Table 1).

Among adults with arthritis, age-specific physical inactivity prevalence was higher with increasing age (ranging from 31.0% among those aged 18–44 years to 37.0% among those aged ≥65 years). Age-standardized physical inactivity prevalence was ≥40% among the following groups: those unable to work/disabled (51.2%); those with less than a high school diploma (46.4%); those living at ≤125% federal poverty level (42.6%); and non-Hispanic blacks (40.4%). Physical inactivity prevalence increased with increasing rurality and with increasing joint pain levels (ranging from 22.6% among those with no/mild joint pain to 47.0% among those with severe joint pain).

Median age-standardized state prevalence of arthritis among adults aged ≥18 years was 22.8% (range = 15.7% [DC] to 34.6% [West Virginia]) (Table 2) and was highest in Appalachia and Lower Mississippi Valley regions. Among 144,099 adults with arthritis, median age-standardized state prevalences of severe joint pain and physical inactivity were 30.3% (range = 20.8% [Colorado] to 45.2% [Mississippi]) and 33.7% (range = 23.2% [Colorado] to 44.4% [Kentucky]), respectively. Age-standardized severe joint pain (Figure) and physical inactivity prevalences were highest in southeastern states.

Discussion

The 2017 age-standardized prevalence of arthritis was highest in Appalachia and the Lower Mississippi Valley; prevalences of severe joint pain and physical inactivity among adults with arthritis were highest in southeastern states. Estimates for all three outcomes in 2017 were similar to those in 2015 (*5*). Except for age, urban-rural status, and sexual orientation, sociodemographic patterns for prevalences of severe joint pain and physical inactivity were similar and offer potential targets for interventions designed to reduce arthritis pain.

Joint pain is often managed with medications, which are associated with various adverse effects. The 2016 National Pain Strategy advises that pain-management strategies be multifaceted and individualized and include nonpharmacologic strategies,[††] and the American College of Rheumatology recommends regular physical activity as a nonpharmacologic pain reliever for arthritis.[§§] Although persons with arthritis report that pain, or fear of causing or worsening it, is a substantial barrier to exercising (*6*), physical activity is an inexpensive intervention that can reduce pain, prevent or delay disability and limitations, and improve mental health, physical functioning, and quality of life with few adverse effects (*7*,*8*).[¶¶] Physical Activity Guidelines for Americans recommends that adults, including those with arthritis, engage in the equivalent of at least 150 minutes of moderate-intensity aerobic physical activity per week for substantial health benefits.[***] Adults who are unable to meet the aerobic guideline because of their condition (e.g., those with severe joint pain) should engage in regular physical activity according to their abilities and avoid

[††] https://iprcc.nih.gov/sites/default/files/HHSNational_Pain_Strategy_508C.pdf.
[§§] http://mqic.org/pdf/2012_ACR_OA_Guidelines_FINAL.PDF.
[¶¶] https://health.gov/paguidelines/second-edition/report/pdf/pag_advisory_committee_report.pdf.
[***] https://health.gov/paguidelines/second-edition/pdf/Physical_Activity_Guidelines_2nd_edition.pdf.

TABLE 1. Age-specific and age-standardized* prevalence of arthritis† among U.S. adults aged ≥18 years, and among those with arthritis, prevalences of severe joint pain,§ and physical inactivity,¶ by selected characteristics — Behavioral Risk Factor Surveillance System, United States, 2017

Characteristic	Sample size (adults aged ≥18 yrs)	Unweighted no. with arthritis**	Arthritis, % (95% CI)	Severe joint pain,†† % (95% CI)	Physical inactivity,†† % (95% CI)
Age group (yrs)					
18–44	122,340	11,615	8.1 (7.8–8.3)	33.0 (31.3–34.7)	31.0 (29.4–32.7)
45–64	159,379	54,383	31.8 (31.3–32.3)	35.6 (34.7–36.5)	35.9 (35.0–36.8)
≥65	153,612	78,101	50.4 (49.8–51.0)	25.1 (24.3–25.9)	37.0 (36.1–37.8)
Sex					
Men	192,681	52,827	19.1 (18.8–19.4)	27.3 (25.9–28.7)	30.4 (29.1–31.7)
Women	242,460	91,221	25.4 (25.0–25.7)	36.0 (34.7–37.3)	35.6 (34.3–36.9)
Race/Hispanic ethnicity§§					
White	331,585	116,255	24.1 (23.8–24.3)	27.4 (26.4–28.4)	31.8 (30.8–32.8)
Black	34,952	11,594	24.1 (23.3–24.9)	50.9 (48.0–53.9)	40.4 (37.3–43.5)
Hispanic	32,064	5,800	16.9 (16.2–17.7)	42.0 (38.7–45.4)	36.0 (32.8–39.3)
Asian	9,165	1,161	12.8 (11.2–14.5)	27.7 (16.9–41.8)¶¶	36.1 (25.0–48.9)
American Indian/Alaska Native	8,206	2,805	29.7 (27.2–32.4)	42.0 (35.3–49.0)	33.2 (27.7–39.1)
Other/Multiple race	11,952	3,930	25.5 (24.1–27.0)	37.4 (33.4–41.7)	33.3 (29.1–37.7)
Highest level of education					
Less than high school graduate	31,177	12,595	25.7 (24.9–26.6)	54.1 (51.0–57.2)	46.4 (43.1–49.6)
High school graduate or equivalent	118,840	43,212	23.4 (23.0–23.8)	35.5 (33.9–37.1)	38.7 (37.0–40.3)
Technical school/Some college	120,950	42,634	24.4 (23.9–24.8)	30.2 (28.5–31.9)	31.6 (30.1–33.2)
College degree or higher	163,230	45,317	17.5 (17.1–17.8)	15.1 (14.0–16.3)	20.0 (18.7–21.4)
Employment status					
Employed/Self-employed	217,384	44,544	17.7 (17.4–18.1)	20.6 (19.5–21.8)	29.2 (28.0–30.4)
Unemployed	18,884	5,864	26.0 (24.9–27.2)	39.9 (36.6–43.3)	33.4 (30.4–36.7)
Retired	129,618	64,620	34.3 (28.4–40.7)	45.8 (35.0–57.1)	31.1 (24.2–39.1)
Unable to work/Disabled	31,689	20,443	51.3 (49.8–52.7)	66.9 (64.9–68.9)	51.2 (48.8–53.5)
Other	34,662	7,965	21.1 (20.2–22.0)	30.6 (27.3–34.2)	29.4 (26.0–32.9)
Federal poverty level***					
≤125% FPL	59,064	23,120	28.6 (28.0–29.3)	51.6 (49.6–53.6)	42.6 (40.6–44.7)
>125% to ≤200% FPL	55,134	22,702	24.7 (24.0–25.5)	33.0 (30.5–35.5)	36.7 (33.9–39.5)
>200% to ≤400% FPL	89,104	32,172	22.4 (21.9–23.0)	24.9 (22.6–27.3)	31.1 (28.8–33.4)
>400% FPL	117,078	30,457	18.4 (17.9–18.8)	13.9 (12.0–16.1)	20.7 (18.8–22.6)

See table footnotes on the next page.

physical inactivity. Even small amounts of physical activity can improve physical functioning in adults with joint conditions (*9*). Most adults with arthritis pain can safely begin walking, swimming, or cycling to increase physical activity.

Arthritis-appropriate, evidence-based, self-management programs and low-impact, group aerobic, or multicomponent physical activity programs are designed to safely increase physical activity in persons with arthritis.†††,§§§ These programs are available nationwide and are especially important for those populations that might have limited access to health care, medications, and surgical interventions (e.g., those in rural areas, those with lower income, and racial/ethnic minorities). Physical activity programs including low-impact aquatic exercises (e.g., Arthritis Foundation Aquatic Program) and strength training (e.g., Fit and Strong!) can help increase strength and endurance. Participating in self-management education programs, such as the Chronic Disease Self-Management Program, although not physical activity–focused, is also beneficial for arthritis management and results in increased physical activity. Benefits of the Chronic Disease Self-Management Program include increased frequency of aerobic and stretching/strengthening exercise, improved self-efficacy for arthritis pain management, and improved mood (*10*). Adults with arthritis can also engage in routine physical activity through group aerobic exercise classes (e.g., Walk with Ease, EnhanceFitness, Arthritis Foundation Exercise Program, and Active Living Every Day).

The findings in this report are subject to at least three limitations. First, BRFSS data are self-reported and susceptible to recall, social desirability, and related biases. Second, low response rates for individual states might bias findings. Finally, institutional populations are excluded from sampling, meaning prevalences of studied outcomes are likely underestimated. Strengths include a measurement of joint pain and large sample size that allows analysis of detailed characteristics and subgroups.

††† https://www.cdc.gov/arthritis/interventions/physical-activity.html.
§§§ https://www.cdc.gov/arthritis/interventions/self_manage.htm.

TABLE 1. (*Continued*) Age-specific and age-standardized* prevalence of arthritis† among U.S. adults aged ≥18 years, and among those with arthritis, prevalences of severe joint pain,§ and physical inactivity,¶ by selected characteristics — Behavioral Risk Factor Surveillance System, United States, 2017

Characteristic	Sample size (adults aged ≥18 yrs)	Unweighted no. with arthritis**	Arthritis, % (95% CI)	Severe joint pain,†† % (95% CI)	Physical inactivity,†† % (95% CI)
Sexual orientation†††					
Straight	185,994	63,300	22.1 (21.8–22.5)	31.7 (30.1–33.3)	33.4 (32.0–34.9)
Lesbian/Gay/Bisexual/Queer/ Questioning	9,346	2,646	22.5 (21.1–24.0)	40.7 (36.3–45.4)	33.2 (29.2–37.5)
Urban-rural status§§§					
Large metro center	68,712	18,857	19.5 (19.0–20.0)	34.2 (31.5–37.0)	30.7 (28.2–33.3)
Large fringe metro	83,056	26,913	22.2 (21.7–22.6)	28.6 (26.7–30.6)	31.6 (29.7–33.6)
Medium metro	90,803	29,572	23.1 (22.7–23.5)	33.0 (31.3–34.7)	34.0 (32.3–35.8)
Small metro	60,652	20,685	24.0 (23.5–24.6)	32.7 (30.8–34.7)	35.0 (33.0–37.1)
Micropolitan	65,752	23,315	26.3 (25.6–26.9)	33.3 (30.9–35.7)	37.0 (34.7–39.4)
Rural (noncore)	66,356	24,757	27.7 (26.9–28.5)	35.7 (33.2–38.3)	38.7 (36.2–41.2)
Body mass index (kg/m^2)					
Underweight/Healthy weight (<25)	131,890	34,818	17.9 (17.5–18.2)	29.1 (27.2–31.0)	28.6 (27.0–30.3)
Overweight (25 to <30)	145,099	46,441	20.4 (20.0–20.8)	28.6 (26.7–30.5)	27.8 (26.2–29.5)
Obese (≥30)	125,421	53,342	30.4 (29.9–30.9)	37.2 (35.7–38.7)	39.3 (37.7–40.8)

Abbreviations: CI = confidence interval; FPL = federal poverty level.

* Except for age groups, estimates were age-standardized to the 2000 projected U.S. population aged ≥18 years using three groups (18–44, 45–64, and ≥65 years): https://www.cdc.gov/nchs/data/statnt/statnt20.pdf.

† Respondents were classified as having arthritis if they responded "yes" to the question "Have you ever been told by a doctor or other health care professional that you have arthritis, rheumatoid arthritis, gout, lupus, or fibromyalgia?" Overall, 144,099 respondents reported arthritis.

§ Severe joint pain was defined as a response of 7–10 to "Please think about the past 30 days, keeping in mind all of your joint pain or aching and whether or not you have taken medication. On a scale of 0 to 10 where 0 is no pain or aching and 10 is pain or aching as bad as it can be, during the past 30 days, how bad was your joint pain on average?" Overall, 141,744 (98.4%) respondents with arthritis had severe joint pain data available.

¶ Physical inactivity was defined as reporting "no" to the question "During the past month, other than your regular job, did you participate in any physical activities or exercises such as running, calisthenics, golf, gardening, or walking for exercise?" Overall, 135,160 (93.8%) respondents with arthritis had physical inactivity data available.

** Categories might not sum to sample total because of missing responses for some variables.

†† Among adults aged ≥18 years with arthritis.

§§ Persons who identified as Hispanic might be of any race. Persons who identified with a racial group were all non-Hispanic.

¶¶ Estimate is potentially unreliable because the relative standard error was between 20% and 30%.

*** Federal poverty level is the ratio of total family income to federal poverty level per family size. Overall, 35,648 respondents had missing data.

††† Sexual orientation was not asked in every state. The 27 states that asked sexual orientation were California, Connecticut, Delaware, Florida, Georgia, Hawaii, Illinois, Indiana, Iowa, Louisiana, Massachusetts, Minnesota, Mississippi, Montana, Nevada, New York, North Carolina, Ohio, Oklahoma, Pennsylvania, Rhode Island, South Carolina, Texas, Vermont, Virginia, Washington, and Wisconsin. A total of 1,049 respondents refused to answer.

§§§ Urban-rural status was categorized using the National Center for Health Statistics 2013 Urban-Rural Classification Scheme for Counties: https://www.cdc.gov/nchs/data/series/sr_02/sr02_166.pdf.

Effective, inexpensive physical activity and self-management education programs are available nationwide and can help adults with arthritis be safely and confidently physically active. This report provides the most current state-specific and demographic data for arthritis, severe joint pain, and physical inactivity. These data can extend collaborations among CDC, state health departments, and community organizations to increase access to and use of arthritis-appropriate, evidence-based interventions to help participants reduce joint pain and improve physical function and quality of life.¶¶¶

¶¶¶ https://www.cdc.gov/arthritis/partners/index.htm.

Summary

What is already known about this topic?

Approximately one in four U.S. adults has arthritis. Severe joint pain and physical inactivity are common among adults with arthritis and are linked to poor mental and physical health outcomes.

What is added by this report?

In 2017, marked state-specific variations in prevalences of arthritis, severe joint pain, and physical inactivity were observed. Physical inactivity was more prevalent among persons with severe joint pain than among those with less pain.

What are the implications for public health practice?

State-specific data support efforts to promote participation in arthritis-appropriate, evidence-based self-management education and physical activity programs, which can reduce pain, increase physical activity and function, and improve mood and quality of life.

TABLE 2. State-specific crude and age-standardized* prevalence of arthritis† among U.S. adults aged ≥18 years and among those with arthritis, prevalences of severe joint pain,§ and physical inactivity¶ — Behavioral Risk Factor Surveillance System, United States, 2017

State	Arthritis				Severe joint pain**				Physical inactivity**			
	No.		Prevalence, % (95% CI)		No.		Prevalence, % (95% CI)		No.		Prevalence, % (95% CI)	
	Unweighted	Weighted (x 1,000)	Crude	Age-standardized	Unweighted	Weighted (x 1,000)	Crude	Age-standardized	Unweighted	Weighted (x 1,000)	Crude	Age-standardized
Alabama	2,778	1,241	33.3 (31.9–34.8)	30.4 (29.0–31.8)	1,050	477	38.9 (36.5–41.4)	41.1 (37.0–45.3)	1,158	519	44.6 (42.1–47.2)	42.3 (38.1–46.6)
Alaska	943	124	22.5 (20.4–24.8)	22.8 (20.8–25.0)	193	28	22.6 (18.2–27.7)	23.8 (17.1–32.1)	267	34	29.0 (24.2–34.3)	29.1 (21.8–37.8)
Arizona	4,925	1,285	24.3 (23.5–25.1)	22.0 (21.3–22.8)	1,248	384	30.3 (28.6–32.1)	31.7 (28.6–35.0)	1,472	405	34.5 (32.7–36.3)	29.3 (26.4–32.4)
Arkansas	2,298	700	30.9 (28.8–33.0)	28.4 (26.3–30.5)	734	260	37.6 (33.9–41.5)	42.4 (35.8–49.3)	920	265	40.6 (36.9–44.3)	36.8 (30.8–43.2)
California	2,095	5,873	19.5 (18.4–20.6)	18.3 (17.4–19.3)	547	1,682	28.9 (26.1–31.8)	29.7 (24.6–35.3)	461	1,432	26.6 (23.8–29.5)	26.3 (21.8–31.3)
Colorado	2,796	920	21.4 (20.5–22.3)	20.3 (19.5–21.1)	500	188	20.8 (19.0–22.8)	20.8 (17.8–24.3)	578	200	24.5 (22.4–26.7)	23.2 (19.7–27.2)
Connecticut	3,269	639	23.1 (22.1–24.1)	20.1 (19.3–21.0)	707	161	25.6 (23.5–27.9)	28.5 (24.0–33.5)	899	185	31.9 (29.7–34.2)	30.5 (25.7–35.7)
Delaware	1,247	189	25.3 (23.6–27.1)	22.3 (20.7–24.0)	381	62	33.6 (30.0–37.5)	34.6 (28.2–41.6)	443	67	38.5 (34.7–42.5)	37.5 (30.6–45.0)
District of Columbia	900	80	14.3 (13.2–15.5)	15.7 (14.7–16.9)	298	29	37.1 (33.1–41.3)	40.4 (32.1–49.4)	262	24	30.8 (27.1–34.8)	29.9 (23.1–37.7)
Florida	7,271	4,112	24.8 (23.6–26.0)	20.5 (19.5–21.5)	2,540	1,496	37.3 (34.7–40.0)	42.0 (36.9–47.3)	2,670	1,506	39.4 (36.7–42.1)	34.4 (29.8–39.3)
Georgia	1,826	1,734	22.3 (21.1–23.5)	21.0 (19.9–22.1)	606	562	32.9 (30.2–35.9)	29.2 (25.0–33.9)	743	697	43.7 (40.6–46.9)	39.9 (34.8–45.2)
Hawaii	1,942	232	21.0 (19.8–22.3)	19.0 (17.9–20.1)	411	51	22.2 (19.5–25.2)	27.3 (22.5–32.7)	463	66	30.1 (26.8–33.6)	33.4 (27.8–39.6)
Idaho	1,540	304	24.2 (22.7–25.7)	22.2 (20.8–23.6)	338	70	23.1 (20.4–26.1)	26.1 (21.2–31.7)	455	92	32.6 (29.3–36.0)	30.9 (25.4–37.1)
Illinois	1,726	2,405	24.5 (23.1–25.9)	22.4 (21.2–23.7)	388	633	26.4 (23.5–29.5)	28.4 (22.5–35.1)	495	688	30.5 (27.7–33.4)	24.9 (20.5–29.9)
Indiana	5,118	1,428	28.4 (27.5–29.3)	26.1 (25.3–27.0)	1,383	417	29.6 (28.0–31.3)	30.3 (27.5–33.3)	1,853	517	39.5 (37.7–41.4)	36.9 (33.8–40.2)
Iowa	2,309	588	24.6 (23.6–25.7)	22.0 (21.0–22.9)	434	123	21.1 (19.1–23.3)	22.4 (18.7–26.6)	698	179	32.7 (30.5–35.1)	28.4 (24.6–32.4)
Kansas	6,540	519	24.1 (23.4–24.7)	22.2 (21.6–22.8)	1,506	129	25.3 (23.9–26.7)	26.6 (24.3–29.0)	2,205	177	37.0 (35.4–38.5)	34.6 (32.0–37.4)
Kentucky	3,350	1,095	32.3 (30.7–33.8)	29.4 (28.0–30.9)	1,222	413	38.3 (35.5–41.2)	39.2 (35.0–43.5)	1,433	474	46.4 (43.5–49.3)	44.4 (40.0–48.8)
Louisiana	1,588	962	27.2 (25.7–28.8)	25.5 (24.1–26.9)	566	363	38.3 (35.2–41.5)	39.0 (34.3–44.0)	596	369	42.8 (39.5–46.1)	41.7 (36.8–46.9)
Maine	3,619	333	31.1 (29.8–32.5)	26.5 (25.2–27.9)	730	71	21.6 (19.6–23.7)	22.2 (18.6–26.2)	1,046	96	30.8 (28.6–33.1)	26.4 (22.8–30.4)
Maryland	4,907	1,146	24.9 (23.9–26.0)	22.8 (21.9–23.8)	1,140	304	26.8 (24.7–29.0)	31.8 (27.5–36.4)	1,520	367	35.2 (33.0–37.5)	33.5 (29.0–38.3)
Massachusetts	2,126	1,262	23.7 (22.2–25.4)	21.3 (20.0–22.8)	498	327	26.6 (23.3–30.1)	25.9 (20.9–31.7)	611	377	32.1 (28.5–35.9)	27.9 (22.3–34.2)
Michigan	3,953	2,338	30.5 (29.4–31.5)	27.1 (26.2–28.1)	1,079	749	32.4 (30.4–34.4)	34.8 (31.4–38.4)	1,217	781	35.2 (33.2–37.2)	36.2 (32.7–39.8)
Minnesota	4,269	833	19.8 (19.1–20.5)	17.8 (17.2–18.5)	811	165	20.2 (18.6–21.9)	22.1 (19.3–25.2)	1,319	253	32.7 (30.9–34.6)	31.2 (28.0–34.6)
Mississippi	1,915	657	29.3 (27.6–31.0)	27.2 (25.6–28.8)	709	272	42.0 (38.8–45.3)	45.2 (39.7–50.7)	725	256	43.1 (39.8–46.4)	41.6 (35.9–47.6)
Missouri	2,752	1,296	27.8 (26.5–29.1)	24.9 (23.8–26.1)	782	373	29.4 (27.0–31.9)	30.8 (26.6–35.4)	1,051	472	37.7 (35.1–40.3)	35.4 (30.9–40.1)
Montana	1,930	207	25.5 (24.0–26.9)	22.6 (21.3–24.0)	450	51	24.8 (22.1–27.8)	27.2 (22.8–32.1)	640	68	34.0 (31.0–37.2)	32.2 (27.5–37.2)
Nebraska	4,789	345	24.0 (23.1–25.0)	22.0 (21.1–22.9)	916	69	20.2 (18.4–22.1)	22.9 (19.4–26.8)	1,553	104	32.1 (30.1–34.2)	29.5 (25.9–33.2)
Nevada	1,112	462	20.3 (18.6–22.1)	18.5 (17.0–20.1)	286	136	29.8 (25.7–34.4)	31.0 (24.4–38.5)	322	150	33.9 (29.3–38.8)	30.1 (23.2–38.1)
New Hampshire	2,064	281	26.5 (25.1–28.1)	23.0 (21.6–24.4)	447	62	22.3 (19.9–24.9)	24.7 (19.6–30.7)	584	80	31.0 (28.2–34.1)	33.7 (27.2–40.9)
New Jersey	3,751	1,576	22.9 (21.8–24.1)	20.4 (19.4–21.4)	1,089	485	31.2 (28.6–33.9)	34.0 (29.0–39.4)	1,308	585	39.9 (37.1–42.7)	36.1 (31.0–41.5)
New Mexico	2,099	398	25.3 (24.0–26.8)	23.0 (21.7–24.4)	631	136	34.3 (31.3–37.5)	38.7 (33.4–44.2)	616	111	30.2 (27.4–33.1)	25.6 (21.9–29.8)
New York	3,509	3,445	22.6 (21.6–23.6)	20.4 (19.6–21.2)	976	1,083	32.0 (29.7–34.4)	32.8 (28.9–37.1)	1,086	1,085	34.8 (32.5–37.3)	33.3 (29.2–37.7)
North Carolina	1,477	1,921	24.4 (23.0–26.0)	22.1 (20.8–23.5)	517	695	36.9 (33.6–40.4)	43.6 (38.2–49.2)	524	663	36.0 (32.7–39.5)	36.4 (30.8–42.3)
North Dakota	2,307	141	24.3 (23.1–25.6)	23.3 (22.1–24.5)	378	27	19.3 (17.0–21.7)	21.7 (17.7–26.2)	749	46	35.0 (32.3–37.9)	35.9 (31.1–41.0)
Ohio	4,741	2,598	29.1 (28.0–30.2)	25.9 (24.9–27.0)	1,291	760	29.6 (27.5–31.7)	32.4 (28.7–36.4)	1,804	936	38.1 (36.0–40.3)	34.0 (30.3–37.8)
Oklahoma	2,423	814	27.8 (26.5–29.1)	26.0 (24.8–27.2)	667	257	32.4 (30.0–35.0)	32.9 (28.8–37.2)	947	314	41.4 (38.8–44.0)	37.4 (33.3–41.8)
Oregon	1,650	847	26.6 (25.2–28.0)	23.9 (22.7–25.2)	342	193	23.3 (20.8–25.9)	23.7 (19.8–28.1)	443	236	30.1 (27.3–33.0)	27.0 (22.9–31.5)
Pennsylvania	2,128	2,915	29.2 (27.8–30.6)	25.4 (24.2–26.7)	556	789	27.4 (24.9–30.0)	28.9 (24.9–33.4)	658	956	34.9 (32.1–37.8)	35.2 (30.3–40.4)
Rhode Island	1,968	229	27.4 (25.9–29.0)	24.7 (23.2–26.1)	508	64	28.1 (25.3–31.1)	33.2 (27.4–39.6)	616	74	35.1 (32.1–38.1)	34.0 (28.2–40.4)
South Carolina	4,286	1,082	28.0 (26.9–29.1)	24.9 (23.9–25.8)	1,340	371	34.9 (32.8–37.0)	38.5 (34.4–42.7)	1,445	362	36.1 (34.0–38.2)	35.5 (31.4–39.7)
South Dakota	2,077	145	22.2 (20.6–23.9)	20.0 (18.5–21.6)	468	32	22.6 (19.5–26.1)	22.4 (17.6–28.1)	621	46	33.0 (29.2–37.0)	28.6 (22.7–35.3)
Tennessee	2,107	1,540	30.1 (28.6–31.7)	27.4 (26.0–28.8)	710	547	36.1 (33.2–39.0)	36.7 (32.1–41.5)	799	562	40.5 (37.5–43.5)	37.0 (32.7–41.5)
Texas	3,818	4,438	21.3 (19.9–22.9)	20.8 (19.5–22.3)	1,127	1,572	36.0 (32.1–40.1)	35.5 (29.1–42.4)	1,474	1,697	41.8 (37.6–46.0)	38.7 (32.2–45.6)
Utah	2,512	414	19.3 (18.4–20.2)	20.2 (19.4–21.1)	531	89	22.0 (19.9–24.2)	22.4 (19.4–25.7)	695	110	27.6 (25.4–30.0)	25.9 (22.6–29.5)
Vermont	2,184	138	27.7 (26.4–29.1)	23.7 (22.6–24.9)	430	30	22.2 (19.9–24.6)	22.5 (18.6–26.9)	538	36	28.3 (25.8–31.0)	27.0 (22.5–31.9)
Virginia	3,184	1,628	25.1 (24.0–26.2)	23.1 (22.2–24.1)	835	481	29.9 (27.7–32.3)	30.7 (26.9–34.9)	1,064	567	36.6 (34.3–39.1)	36.6 (32.4–41.0)
Washington	4,154	1,359	24.1 (23.2–25.0)	22.3 (21.5–23.2)	808	294	21.9 (20.2–23.8)	22.1 (19.3–25.1)	1,002	327	25.5 (23.8–27.4)	23.7 (20.9–26.8)
West Virginia	2,501	561	39.2 (37.7–40.8)	34.6 (33.1–36.0)	856	206	37.3 (35.0–39.6)	37.5 (33.7–41.4)	996	226	41.4 (39.1–43.8)	39.0 (35.1–43.0)
Wisconsin	1,856	1,136	25.6 (24.2–27.1)	22.9 (21.6–24.2)	463	294	26.1 (23.4–29.0)	26.9 (22.5–31.8)	493	293	27.9 (24.9–31.0)	26.2 (21.2–31.9)
Wyoming	1,470	113	25.4 (23.9–26.9)	23.4 (22.1–24.8)	290	26	23.2 (20.4–26.1)	23.6 (19.1–28.9)	499	40	36.4 (33.2–39.6)	35.4 (30.2–41.1)
State median	**N/A**	**N/A**	**24.9**	**22.8**	**N/A**	**N/A**	**28.9**	**30.3**	**N/A**	**N/A**	**34.9**	**33.7**

Abbreviations: CI = confidence interval; N/A = not applicable.

* Estimates were age-standardized to the 2000 projected U.S. population aged ≥18 years using three groups (18–44, 45–64, and ≥65 years).

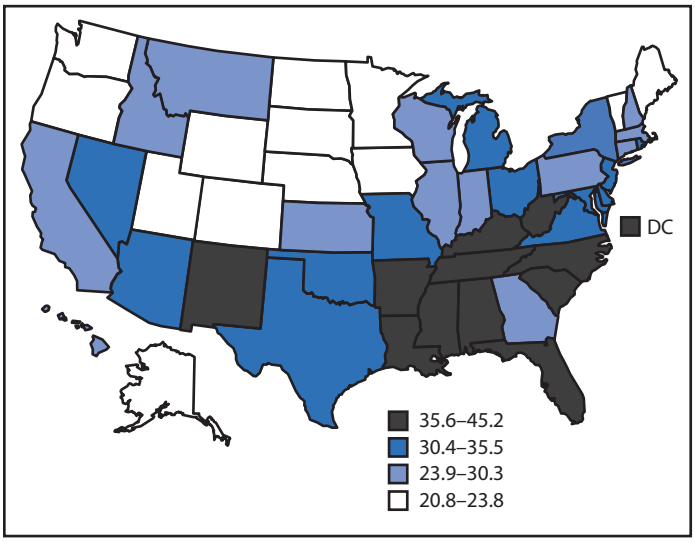
† Respondents were classified as having arthritis if they responded "yes" to the question "Have you ever been told by a doctor or other health care professional that you have arthritis, rheumatoid arthritis, gout, lupus, or fibromyalgia?"

§ Severe joint pain was defined as a response of 7–10 to "Please think about the past 30 days, keeping in mind all of your joint pain or aching and whether or not you have taken medication. On a scale of 0 to 10 where 0 is no pain or aching and 10 is pain or aching as bad as it can be, during the past 30 days, how bad was your joint pain on average?"

¶ Physical inactivity was defined as reporting "no" to the question "During the past month, other than your regular job, did you participate in any physical activities or exercises such as running, calisthenics, golf, gardening, or walking for exercise?"

** Among adults aged ≥18 years with arthritis.

FIGURE. Age-standardized,* state-specific percentage of severe joint pain† among U.S. adults aged ≥18 years with arthritis§ — Behavioral Risk Factor Surveillance System, United States, 2017



Abbreviation: DC = District of Columbia.

* Estimates were age-standardized to the 2000 projected U.S. population aged ≥18 years using three age groups (18–44, 45–64, and ≥65 years).

† Severe joint pain was defined as a response of 7–10 to the question "Please think about the past 30 days, keeping in mind all of your joint pain or aching and whether or not you have taken medication. On a scale of 0 to 10 where 0 is no pain or aching, and 10 is pain or aching as bad as it can be, during the past 30 days, how bad was your joint pain on average?"

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Drug Overdose Deaths Involving Cocaine and Psychostimulants with Abuse Potential — United States, 2003–2017

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In 2016, a total of 63,632 persons died from drug overdoses in the United States (*1*). Drug overdose deaths involving cocaine, psychostimulants with abuse potential (psychostimulants), or both substances combined increased 42.4% from 12,122 in 2015 to 17,258 in 2016.* Psychostimulants with abuse potential include drugs such as methamphetamine, 3,4-methylenedioxy-methamphetamine (MDMA), dextroamphetamine, levoamphetamine, methylphenidate (Ritalin), and caffeine. From 2015 to 2016, cocaine-involved and psychostimulant-involved death rates increased 52.4% and 33.3%, respectively (*1*). A total of 70,237 persons died from drug overdoses in the United States in 2017; approximately two thirds of these deaths involved an opioid (*2*). CDC analyzed 2016–2017 changes in age-adjusted death rates involving cocaine and psychostimulants by demographic characteristics, urbanization levels, U.S. Census region, 34 states, and the District of Columbia (DC). CDC also examined trends in age-adjusted cocaine-involved and psychostimulant-involved death rates from 2003 to 2017 overall, as well as with and without co-involvement of opioids. Among all 2017 drug overdose deaths, 13,942 (19.8%) involved cocaine, and 10,333 (14.7%) involved psychostimulants. Death rates increased from 2016 to 2017 for both drug categories across demographic characteristics, urbanization levels, Census regions, and states. In 2017, opioids were involved in 72.7% and 50.4% of cocaine-involved and psychostimulant-involved overdoses, respectively, and the data suggest that increases in cocaine-involved overdose deaths from 2012 to 2017 were driven primarily by synthetic opioids. Conversely, increases in psychostimulant-involved deaths from 2010 to 2017 occurred largely independent of opioids, with increased co-involvement of synthetic opioids in recent years. Provisional data from 2018 indicate that deaths involving cocaine and psychostimulants are continuing to increase.† Increases in stimulant-involved deaths are part of a growing polysubstance landscape. Increased surveillance and evidence-based multisectoral prevention and response strategies are needed to address deaths involving cocaine and psychostimulants and opioids. Enhancing linkage to care, building state and local capacity, and public health/public safety collaborations are critical components of prevention efforts.

Drug overdose deaths were identified in the National Vital Statistics System multiple cause-of-death mortality files,§ using *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 type of drug is indicated by the following ICD-10 multiple cause-of-death codes: cocaine (T40.5); psychostimulants with abuse potential (T43.6); opioids (T40.0–T40.4, and T40.6)¶; and synthetic opioids other than methadone (T40.4). Some deaths involved more than one type of drug; these deaths were included in the rates for each drug category. Thus, categories were not mutually exclusive.**

Age-adjusted death rates†† were examined for the period 2016– 2017 for cocaine and psychostimulants. Death rates were stratified by age group, sex, race/ethnicity, urbanization level,§§ U.S. Census region,¶¶ and state. State-level analyses were conducted for 34 states and DC, all of which had adequate drug-specificity data recorded on death certificates

* https://wonder.cdc.gov.

† https://www.cdc.gov/nchs/nvss/vsrr/drug-overdose-data.htm.

§ https://www.cdc.gov/nchs/nvss/mortality_public_use_data.htm.

¶ T40.0 (opium), T40.1 (heroin), T40.2 (natural/semisynthetic opioids), T40.3 (methadone), T40.4 (synthetic opioids other than methadone), and T40.6 (other and unspecified narcotics).

** A death involving both cocaine and psychostimulants with abuse potential (e.g., methamphetamine) would be included in both the cocaine and the psychostimulant with abuse potential death rates.

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

§§ Categories of 2013 NCHS Urban-Rural Classification Scheme for Counties (https://www.cdc.gov/nchs/data_access/urban_rural.htm): *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):* counties in micropolitan statistical areas; *Noncore (nonmetropolitan counties):* nonmetropolitan counties that did not qualify as micropolitan.

¶¶ *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.

for 2016 and 2017.*** Analyses comparing changes in death rates from 2016 to 2017 used z-tests when deaths were ≥100 and nonoverlapping confidence intervals based on a gamma distribution when deaths were <100.††† Trends in age-adjusted cocaine-involved and psychostimulant-involved death rates from 2003 to 2017 were analyzed overall, and with and without any opioids and synthetic opioids, using Joinpoint regression.§§§ Changes presented represent statistically significant findings unless otherwise specified.

In 2017, among 70,237 drug overdose deaths that occurred in the United States, 13,942 (19.8%) involved cocaine, representing a 34.4% increase from 2016 (Table). Nearly three fourths (72.7%) of cocaine-involved deaths in 2017 also involved opioids. Cocaine-involved death rates increased among both sexes and among persons aged ≥15 years, non-Hispanic whites (whites), non-Hispanic blacks (blacks), and Hispanics. The largest relative rate change occurred among females aged 15–24 years (40.0%), and the largest absolute rate change was among males aged 25–44 and 45–64 years (increase of 2.7 per 100,000). Among racial/ethnic groups, the highest rate of cocaine-involved deaths in 2017 occurred in blacks (8.3 per 100,000), who also experienced the largest relative rate change (36.1%) compared with 2016. By urban-rural status, counties in medium metro areas experienced the largest absolute rate increase (1.3 per 100,000) in 2017, whereas the largest relative rate increase occurred in micropolitan counties (57.9%). The Midwest Census region had the largest relative rate increase (43.6%), whereas the highest 2017 rate was in the Northeast (7.0 per 100,000). Death rates involving cocaine increased in 15 states, with the largest relative increases in Wisconsin (84.6%) and Maryland (72.0%), and the largest absolute rate increases in Ohio (3.9) and Maryland (3.6). In 2017, the highest death rates were in DC (17.6) and Ohio (14.0).

*** State-level analyses comparing death rates from 2016 to 2017 included 34 states and DC that met the following criteria: 1) >80% of drug overdose death certificates named at least one specific drug in 2016 and 2017; 2) change from 2016 to 2017 in the percentage of death certificates reporting at least one specific drug was <10 percentage points; and 3) ≥20 deaths occurred during 2016 and 2017 in at least one drug category examined. States whose reporting of any specific drug or drugs involved in an overdose changed by ≥10 percentage points from 2016 to 2017 were excluded because drug-specific overdose numbers and rates might have changed substantially from 2016 to 2017 as a result of changes in reporting.

††† Z-tests were used if the number of deaths was ≥100, and 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 2015 or 2016. Note that the method of comparing confidence intervals is a conservative method for 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/NVSR61/NVSR61_04.pdf.

§§§ For all analyses, a p-value of <0.05 was considered to be statistically significant. https://surveillance.cancer.gov/joinpoint/.

Summary

What is already known about this topic?

Overdose deaths involving cocaine and psychostimulants continue to increase. During 2015–2016, age-adjusted cocaine-involved and psychostimulant-involved death rates increased by 52.4% and 33.3%, respectively.

What is added by this report?

From 2016 to 2017, death rates involving cocaine and psychostimulants increased across age groups, racial/ethnic groups, county urbanization levels, and multiple states. Death rates involving cocaine and psychostimulants, with and without opioids, have increased. Synthetic opioids appear to be the primary driver of cocaine-involved death rate increases, and recent data point to increasing synthetic opioid involvement in psychostimulant-involved deaths.

What are the implications for public health practice?

Continued increases in stimulant-involved deaths require expanded surveillance and comprehensive, evidence-based public health and public safety interventions.

During 2003–2017, rates for all cocaine-involved deaths peaked initially in 2006, decreased during 2006–2012, and increased again during 2012–2017. Rates of overdose deaths involving cocaine and any opioid increased from 2013 to 2017, and those involving cocaine and synthetic opioids increased from 2012 to 2017 (Figure 1). Cocaine-involved death rates without any opioid decreased from 2006 to 2012 and then increased from 2012 to 2017, whereas cocaine-involved death rates without synthetic opioids increased from 2003 to 2006, decreased from 2006 to 2010, and then increased from 2010 to 2017 (Figure 1).

In 2017, a total of 10,333 deaths involving psychostimulants occurred, representing 14.7% of drug overdose deaths and a 37.0% increase from 2016 (Table). During 2016–2017, the age-adjusted rate for psychostimulant-involved deaths increased by 33.3%. Approximately half (50.4%) of psychostimulant-involved deaths also involved opioids in 2017. Psychostimulant-involved death rates increased among both sexes and among persons aged ≥15 years, whites, blacks, non-Hispanic American Indians/Alaska Natives (AI/AN), non-Hispanic Asian/Pacific Islanders (A/PI), and Hispanics. The largest relative rate increase occurred among females aged 25–44 years (48.0%). Among racial/ethnic groups, the largest relative rate increase occurred among whites (40.0%), whereas AI/AN experienced the largest absolute rate increase (1.6 per 100,000) and the highest death rate (8.5) in 2017. Counties in medium metro areas experienced the largest absolute rate increase (1.3 per 100,000), and the largest relative rate increase (46.4%). Among Census regions, both the largest relative increase (63.2%) and the largest absolute rate increase (1.2)

TABLE. Number and age-adjusted rate of drug overdose deaths* involving cocaine† and psychostimulants with abuse potential,§,¶ by opioid involvement, sex, age group, race and Hispanic origin,†† U.S. Census region, urbanization level,§§ and selected states¶¶ — United States, 2016 and 2017**

	Involving cocaine				Involving psychostimulants with abuse potential			
	2016	2017	Change from 2016 to 2017***		2016	2017	Change from 2016 to 2017***	
Decedent characteristic	No. (Rate)	No. (Rate)	Absolute rate change	% Change in rate	No. (Rate)	No. (Rate)	Absolute rate change	% Change in rate
Overall	**10,375 (3.2)**	**13,942 (4.3)**	**1.1†††**	**34.4†††**	**7,542 (2.4)**	**10,333 (3.2)**	**0.8†††**	**33.3†††**
With any opioid**	7,263 (2.3)	10,131 (3.2)	0.9†††	39.1†††	3,416 (1.1)	5,203 (1.7)	0.6†††	54.5†††
Sex								
Male	7,493 (4.7)	10,021 (6.2)	1.5†††	31.9†††	5,348 (3.4)	7,240 (4.5)	1.1†††	32.4†††
Female	2,882 (1.8)	3,921 (2.5)	0.7†††	38.9†††	2,194 (1.4)	3,093 (1.9)	0.5†††	35.7†††
Age group (yrs)								
0–14	§§§	§§§	§§§	§§§	11§§§	§§§	§§§	§§§
15–24	757 (1.7)	924 (2.1)	0.4†††	23.5†††	571 (1.3)	780 (1.8)	0.5†††	38.5†††
25–34	2,525 (5.7)	3,463 (7.6)	1.9†††	33.3†††	1,762 (3.9)	2,593 (5.7)	1.8†††	46.2†††
35–44	2,431 (6.0)	3,282 (8.0)	2.0†††	33.3†††	1,831 (4.5)	2,548 (6.2)	1.7†††	37.8†††
45–54	2,629 (6.1)	3,497 (8.3)	2.2†††	36.1†††	1,914 (4.5)	2,477 (5.8)	1.3†††	28.9†††
55–64	1,721 (4.2)	2,335 (5.6)	1.4†††	33.3†††	1,244 (3.0)	1,648 (3.9)	0.9†††	30.0†††
≥65	303 (0.6)	432 (0.8)	0.2†††	33.3†††	206 (0.4)	278 (0.5)	0.1†††	25.0†††
Sex/Age group (yrs)								
Male								
15–24	553 (2.5)	633 (2.9)	0.4†††	16.0†††	388 (1.7)	499 (2.3)	0.6†††	35.3†††
25–44	3,569 (8.3)	4,784 (11.0)	2.7†††	32.5†††	2,536 (5.9)	3,551 (8.2)	2.3†††	39.0†††
45–64	3,108 (7.6)	4,229 (10.3)	2.7†††	35.5†††	2,251 (5.5)	2,955 (7.2)	1.7†††	30.9†††
Female								
15–24	204 (1.0)	291 (1.4)	0.4†††	40.0†††	183 (0.9)	281 (1.3)	0.4†††	44.4†††
25–44	1,387 (3.3)	1,961 (4.6)	1.3†††	39.4†††	1,057 (2.5)	1,590 (3.7)	1.2†††	48.0†††
45–64	1,242 (2.9)	1,603 (3.7)	0.8†††	27.6†††	907 (2.1)	1,170 (2.7)	0.6†††	28.6†††
Race and Hispanic origin††								
White, non-Hispanic	6,443 (3.4)	8,614 (4.6)	1.2†††	35.3†††	5,777 (3.0)	7,995 (4.2)	1.2†††	40.0†††
Black, non-Hispanic	2,599 (6.1)	3,554 (8.3)	2.2†††	36.1†††	477 (1.2)	663 (1.6)	0.4†††	33.3†††
Hispanic	1,097 (2.0)	1,438 (2.5)	0.5†††	25.0†††	846 (1.5)	1,125 (2.0)	0.5†††	33.3†††
American Indian/Alaska Native, non-Hispanic	56 (2.1)	65 (2.4)	0.3	14.3	181 (6.9)	222 (8.5)	1.6†††	23.2†††
Asian/Pacific Islander, non-Hispanic	85 (0.4)	129 (0.6)	0.2	50.0	171 (0.8)	218 (1.0)	0.2†††	25.0†††
U.S. Census region of residence								
Northeast	2,957 (5.3)	3,860 (7.0)	1.7†††	32.1†††	431 (0.8)	648 (1.2)	0.4†††	50.0†††
Midwest	2,575 (3.9)	3,711 (5.6)	1.7†††	43.6†††	1,176 (1.9)	1,959 (3.1)	1.2†††	63.2†††
South	4,005 (3.3)	5,365 (4.4)	1.1†††	33.3†††	2,483 (2.1)	3,508 (3.0)	0.9†††	42.9†††
West	838 (1.1)	1,006 (1.3)	0.2†††	18.2†††	3,452 (4.4)	4,218 (5.3)	0.9†††	20.5†††
County urbanization level§§								
Large central metro	4,301 (4.2)	5,513 (5.3)	1.1†††	26.2†††	2,561 (2.5)	3,178 (3.0)	0.5†††	20.0†††
Large fringe metro	2,734 (3.5)	3,701 (4.7)	1.2†††	34.3†††	1,235 (1.6)	1,843 (2.3)	0.7†††	43.8†††
Medium metro	2,082 (3.2)	2,945 (4.5)	1.3†††	40.6†††	1,821 (2.8)	2,672 (4.1)	1.3†††	46.4†††
Small metro	569 (2.1)	777 (2.9)	0.8†††	38.1†††	698 (2.6)	972 (3.6)	1.0†††	38.5†††
Micropolitan (non-metro)	474 (1.9)	740 (3.0)	1.1†††	57.9†††	745 (3.0)	994 (4.0)	1.0†††	33.3†††
Non-core (non-metro)	215 (1.3)	266 (1.6)	0.3†††	23.1†††	482 (2.9)	674 (4.1)	1.2†††	41.4†††
States with very good to excellent reporting¶¶ (n = 27)								
Alaska	15§§§	17§§§	§§§	§§§	49 (6.3)	66 (9.1)	2.8	44.4
Connecticut	237 (6.9)	284 (8.4)	1.5†††	21.7†††	25 (0.7)	39 (1.2)	0.5	71.4
District of Columbia	89 (13.5)	122 (17.6)	4.1	30.4	§§§	§§§	§§§	§§§
Georgia	209 (2.0)	258 (2.4)	0.4	20.0	243 (2.4)	364 (3.6)	1.2†††	50.0†††
Hawaii	§§§	10§§§	§§§	§§§	102 (6.8)	106 (7.4)	0.6	8.8
Illinois	507 (4.0)	743 (5.7)	1.7†††	42.5†††	112 (0.9)	171 (1.4)	0.5†††	55.6†††
Iowa	15§§§	19§§§	§§§	§§§	80 (2.7)	93 (3.3)	0.6	22.2

See table footnotes on the next page.

TABLE. (*Continued*) Number and age-adjusted rate of drug overdose deaths* involving cocaine† and psychostimulants with abuse potential,§,¶ by opioid involvement, sex, age group, race and Hispanic origin,†† U.S. Census region, urbanization level,§§ and selected states¶¶ — United States, 2016 and 2017**

	Involving cocaine				Involving psychostimulants with abuse potential			
	2016	2017	Change from 2016 to 2017***		2016	2017	Change from 2016 to 2017***	
Decedent characteristic	No. (Rate)	No. (Rate)	Absolute rate change	% Change in rate	No. (Rate)	No. (Rate)	Absolute rate change	% Change in rate
Maine	61 (5.0)	94 (7.7)	2.7	54.0	28 (2.3)	44 (3.8)	1.5	65.2
Maryland	314 (5.0)	532 (8.6)	3.6†††	72.0†††	43 (0.8)	65 (1.2)	0.4	50.0
Massachusetts	567 (8.5)	687 (10.1)	1.6†††	18.8†††	45 (0.7)	64 (1.0)	0.3	42.9
Nevada	37 (1.2)	50 (1.6)	0.4	33.3	228 (7.5)	257 (8.3)	0.8	10.7
New Hampshire	61 (5.0)	51 (3.9)	−1.1	−22.0	13§§§	26 (2.3)	§§§	§§§
New Mexico	58 (3.0)	57 (2.9)	−0.1	−3.3	135 (7.1)	158 (8.2)	1.1	15.5
New York	991 (4.9)	1,306 (6.5)	1.6†††	32.7†††	150 (0.8)	191 (1.0)	0.2†††	25.0†††
North Carolina	500 (5.1)	708 (7.2)	2.1†††	41.2†††	115 (1.2)	176 (1.8)	0.6†††	50.0†††
Ohio	1,124 (10.1)	1,556 (14.0)	3.9†††	38.6†††	243 (2.3)	556 (5.3)	3.0†††	130.4†††
Oklahoma	31 (0.8)	45 (1.1)	0.3	37.5	263 (7.1)	275 (7.2)	0.1	1.4
Oregon	26 (0.7)	39 (0.9)	0.2	28.6	150 (3.6)	170 (4.0)	0.4	11.1
Rhode Island	112 (10.7)	111 (11.2)	0.5	4.7	10§§§	12§§§	§§§	§§§
South Carolina	143 (3.0)	234 (4.7)	1.7†††	56.7†††	125 (2.7)	189 (4.0)	1.3†††	48.1†††
Tennessee	249 (3.8)	306 (4.6)	0.8†††	21.1†††	186 (2.9)	320 (5.0)	2.1†††	72.4†††
Utah	48 (1.7)	47 (1.5)	−0.2	−11.8	143 (5.1)	198 (6.8)	1.7†††	33.3†††
Vermont	21 (4.0)	38 (6.9)	2.9	72.5	§§§	§§§	§§§	§§§
Virginia	254 (3.0)	351 (4.1)	1.1†††	36.7†††	76 (0.9)	113 (1.4)	0.5	55.6
Washington	90 (1.2)	111 (1.4)	0.2	16.7	326 (4.4)	392 (5.2)	0.8†††	18.2†††
West Virginia	143 (8.5)	191 (11.6)	3.1†††	36.5†††	117 (7.0)	221 (13.6)	6.6†††	94.3†††
Wisconsin	147 (2.6)	265 (4.8)	2.2†††	84.6†††	76 (1.4)	128 (2.3)	0.9†††	64.3†††
States with good reporting¶¶ (n = 8)								
Arizona	82 (1.2)	136 (2.0)	0.8†††	66.7†††	454 (6.7)	572 (8.5)	1.8†††	26.9†††
California	366 (0.9)	433 (1.0)	0.1	11.1	1,579 (3.8)	1,916 (4.6)	0.8†††	21.1†††
Colorado	106 (1.9)	96 (1.7)	−0.2	−10.5	200 (3.6)	301 (5.2)	1.6†††	44.4†††
Kentucky	145 (3.5)	185 (4.3)	0.8	22.9	192 (4.7)	330 (8.0)	3.3†††	70.2†††
Michigan	500 (5.3)	643 (6.7)	1.4†††	26.4†††	88 (0.9)	145 (1.6)	0.7†††	77.8†††
Minnesota	43 (0.8)	68 (1.3)	0.5	62.5	140 (2.6)	161 (2.9)	0.3	11.5
Missouri	103 (1.8)	132 (2.2)	0.4	22.2	185 (3.3)	248 (4.3)	1.0†††	30.3†††
Texas	584 (2.1)	694 (2.4)	0.3†††	14.3†††	577 (2.1)	653 (2.3)	0.2	9.5

Source: National Vital Statistics System, Mortality File. https://wonder.cdc.gov/.

* Deaths are classified using the *International Classification of Diseases, Tenth Revision* (ICD–10). Drug overdose deaths are 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 cocaine (T40.5) as a contributing cause.

§ Drug overdose deaths, as defined, that have psychostimulants with abuse potential (T43.6) as a contributing cause.

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

** Drug overdose deaths, as defined, that have any opioid (T40.0–T40.4, and T40.6).

†† 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 2013 urbanization classification https://www.cdc.gov/nchs/data_access/urban_rural.htm.

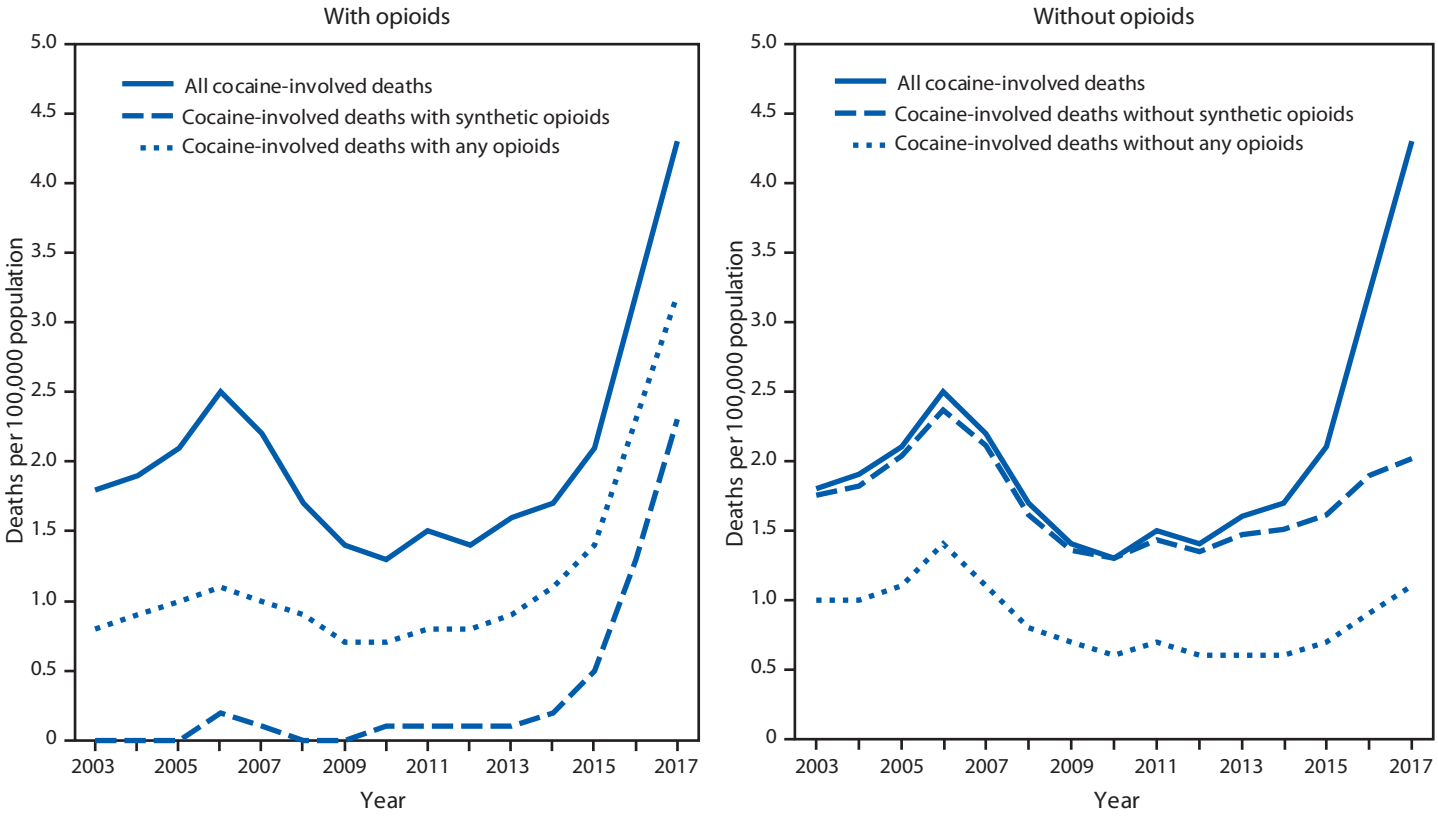
¶¶ Analyses were limited to states meeting the following criteria: For states with very good to excellent reporting, ≥90% of drug overdose deaths mention at least one specific drug in 2016, with the change in drug overdose deaths mentions of at least one specific drug differing by <10 percentage points between 2016 and 2017. States with good reporting had 80% to <90% of drug overdose deaths mention of at least one specific drug in 2016, with the change in the percentage of drug overdose deaths mentioning at least one specific drug differing by <10 percentage points between 2016 and 2017. States included also were required to have stable rate estimates, based on ≥20 deaths, in at least one drug category (i.e., cocaine and psychostimulants with abuse potential) in both 2016 and 2017.

*** Absolute rate change is the difference between 2016 and 2017 rates. Percentage change (i.e., relative change) is the absolute rate change divided by the 2016 rate, multiplied by 100. Nonoverlapping confidence intervals based on the gamma method were used if the number of deaths was <100 in 2016 or 2017, and z-tests were used if the number of deaths was ≥100 in both 2016 and 2017. Note that the method of comparing confidence intervals is a conservative method for statistical significance; caution should be observed when interpreting a nonsignificant difference when the lower and upper limits being compared overlap only slightly. Confidence intervals for 2016 and 2017 rates of cocaine-involved deaths for Asian/Pacific Islanders overlapped only slightly: (0.35–0.54), (0.53–0.76) Confidence intervals of 2016 and 2017 rates of deaths involving psychostimulants with abuse potential for Virginia overlapped only slightly: (0.71–1.13), (1.10–1.60).

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

§§§ Data with <10 deaths are not reported. Rates based on <20 deaths are not considered reliable and not reported.

FIGURE 1. Age-adjusted rates* of drug overdose deaths† involving cocaine§ with and without synthetic opioids other than methadone (synthetic opioids) and any opioids¶ — United States, 2003–2017,††**



Source: National Vital Statistics System, Mortality File. https://wonder.cdc.gov/.

* Rate per 100,000 population age-adjusted to the 2000 U.S. standard population using the vintage year population of the data year.

† Deaths are classified using the *International Classification of Diseases, Tenth Revision* (ICD-10). Drug overdoses are identified using underlying cause-of-death codes X40–X44 (unintentional), X60–X64 (suicide), X85 (homicide), and Y10–Y14 (undetermined).

§ Drug overdose deaths, as defined, that involve cocaine (T40.5).

¶ Drug overdose deaths, as defined, that involve any opioid (T40.0–T40.4 and T40.6) and synthetic opioids other than methadone (T40.4).

** Because deaths might involve more than one drug, some deaths are included in more than one category. In 2017, 12% of drug overdose deaths did not include information on the specific type of drug(s) involved. Some of these deaths might have involved opioids or stimulants.

†† Joinpoint regression examining changes in trends during 2003–2017 indicated that cocaine-involved overdose death rates remained stable from 2003 to 2006, then decreased annually by 10.8% (95% confidence interval [CI] = −18.1 to −3.0) from 2006 to 2012 followed by a 28.5% (CI = 19.8–37.9) annual increase from 2012 to 2017. Death rates involving cocaine and any opioid remained stable from 2003 to 2013, then increased annually by 41.6% (CI = 29.1–55.2) from 2013 to 2017. Death rates involving cocaine and synthetic opioids remained stable from 2003 to 2012, then increased annually by 114.2% (CI = 82.5–151.5) from 2012 to 2017. Death rates involving cocaine without any opioid remained stable from 2003 to 2006, then decreased annually by 13.8% (CI = −21.5 to −5.3) from 2006 to 2012, followed by a 14.9% (CI = 4.8–26.1) annual increase from 2012 to 2017. Death rates involving cocaine without synthetic opioids increased annually by 11.4% (CI = 2.1–21.6) from 2003 to 2006, then decreased annually by 14.9% (CI = −22.2 to −7.0) from 2006 to 2010, followed by a 6.9% annual increase (CI = 4.4–9.4) from 2010 to 2017.

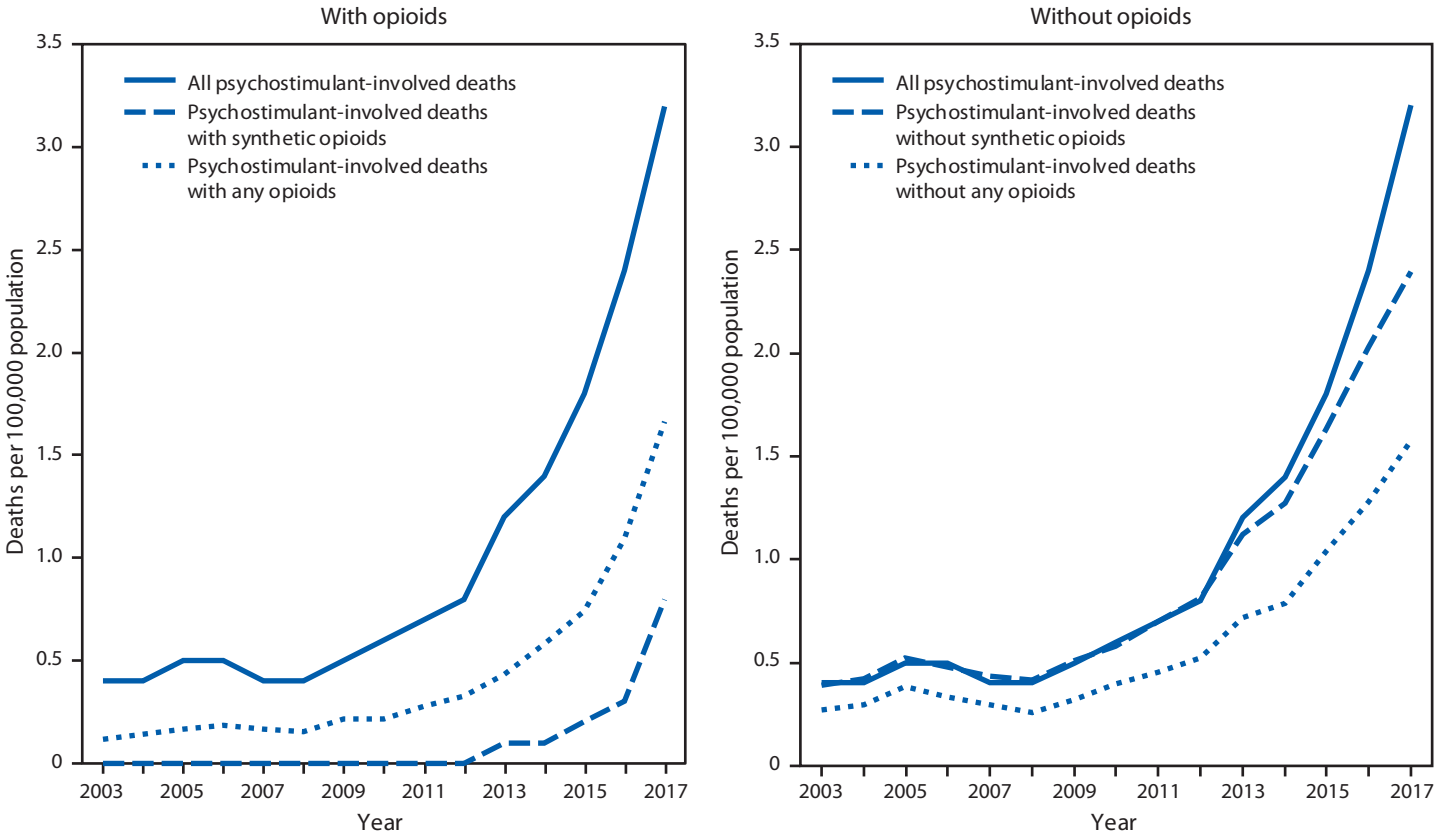
occurred in the Midwest, whereas the highest psychostimulant-involved death rate (5.3) occurred in the West. Death rates increased in 17 states, with the largest relative increases in Ohio (130.4%) and West Virginia (94.3%), and the largest absolute rate increases in West Virginia (6.6 per 100,000) and Kentucky (3.3). In 2017, the highest death rates were in West Virginia (13.6 per 100,000) and Alaska (9.1).

During 2003–2017, rates for all psychostimulant-involved deaths increased from 2010 to 2017. Death rates involving psychostimulants and any opioid increased from 2003 to 2010, followed by sharper increases from 2010 to 2015 and from 2015 to 2017. Death rates involving psychostimulants and synthetic opioids increased from 2010 to 2015, followed by a sharper increase from 2015 to 2017 (Figure 2). Rates of psychostimulant-involved deaths without any opioid involvement increased from 2008 to 2017, and rates without synthetic opioid involvement increased from 2008 to 2017 (Figure 2).

Discussion

Deaths involving cocaine and psychostimulants have increased in the United States in recent years; among 70,237 drug overdose deaths in 2017, nearly a third (23,139 [32.9%])

FIGURE 2. Age-adjusted rates* of drug overdose deaths† involving psychostimulants with abuse potential§ (psychostimulants) with and without synthetic opioids other than methadone (synthetic opioids) and any opioids¶ — United States, 2003–2017,††**



Source: National Vital Statistics System, Mortality File. https://wonder.cdc.gov/.

* Rate per 100,000 population age-adjusted to the 2000 U.S. standard population using the vintage year population of the data year.

† Deaths are classified using the *International Classification of Diseases, Tenth Revision* (ICD-10). Drug overdoses are identified using underlying cause-of-death codes X40–X44 (unintentional), X60–X64 (suicide), X85 (homicide), and Y10–Y14 (undetermined).

§ Drug overdose deaths, as defined, that involve psychostimulants with abuse potential (T43.6).

¶ Drug overdose deaths, as defined, that involve any opioid (T40.0-T40.4, and T40.6) and synthetic opioids other than methadone (T40.4).

** Because deaths might involve more than one drug, some deaths are included in more than one category. In 2017, 12% of drug overdose deaths did not include information on the specific type of drug(s) involved. Some of these deaths may have involved opioids or stimulants.

†† Joinpoint regression examining changes in trends during 2003–2017 indicated that psychostimulant-involved overdose death rates remained stable from 2003 to 2010, then increased annually by 28.6% (95% confidence interval [CI] = 25.5–31.8) from 2010 to 2017. Death rates involving psychostimulants and any opioid increased annually by 6.9% (CI = 1.0–13.1) from 2003 to 2010, then increased annually by 28.2% (CI = 18.2–39.1) from 2010 to 2015, followed by a 50.8% (CI = 31.6–72.8) annual increase from 2015 to 2017. Death rates involving psychostimulants and synthetic opioids were greater than zero only during 2010–2017. From 2010 to 2015, these rates increased annually by 44.7% (CI = 2.8–103.5), followed by a 142.8% (CI = 43.7–310.2) annual increase from 2015 to 2017. Death rates involving psychostimulants without any opioids remained stable from 2003 to 2008, then increased annually by 22.3% (CI = 20.6–24.0) from 2008 to 2017. Death rates involving psychostimulants without synthetic opioids remained stable from 2003 to 2008, then increased annually by 22.3% (CI = 20.7–23.9) from 2008 to 2017.

involved cocaine, psychostimulants, or both. From 2016 to 2017, death rates involving cocaine and psychostimulants each increased by approximately one third, and increases occurred across all demographic groups, Census regions, and in several states. In 2017, nearly three fourths of cocaine-involved and roughly one half of psychostimulant-involved overdose deaths, respectively, involved at least one opioid, respectively, involved at least one opioid. After initially peaking in 2006, trends in overall cocaine-involved death rates declined through 2012, when they began to rise again. The 2006–2012 decrease paralleled a decline in cocaine supply coupled with an increase in cost.¶¶¶ Similar patterns in death rates involving both cocaine and opioids were observed, with increases for cocaine- and synthetic opioid-involved deaths occurring from 2012 to 2017. From 2010 to 2017, increasing rates of deaths involving psychostimulants occurred and persisted even in the absence of opioids. Drug overdoses continue to evolve

¶¶¶ https://www.justice.gov/archive/ndic/pubs38/38661/cocaine.htm.

along with emerging threats, changes in the drug supply, mixing of substances with or without the user's knowledge, and polysubstance use (*3*–*8*). In addition, the availability of psychostimulants, particularly methamphetamine, appears to be increasing across most regions.**** In 2017, among drug products obtained by law enforcement that were submitted for laboratory testing, methamphetamine and cocaine were the most and third most frequently identified drugs, respectively.†††† Previous studies also found that heroin and synthetic opioids (e.g., illicitly-manufactured fentanyl) have contributed to increases in stimulant-involved deaths (*3*,*9*,*10*). Current findings further support that increases in stimulant-involved deaths are part of a growing polysubstance landscape. Although synthetic opioids appear to be driving much of the increase in cocaine-involved deaths, increases in psychostimulant-involved deaths have occurred largely without opioid co-involvement; however, recent data suggest increasing synthetic opioid involvement in these deaths.

The findings in this report are subject to at least four limitations. First, at autopsy, substances tested for and circumstances under which tests are performed vary by time and jurisdiction. Therefore, recent improvements in toxicologic testing might account for some reported increases. Second, 15% and 12% of death certificates in 2016 and 2017, respectively, did not include mention of specific drugs involved. The percentage of death certificates with at least one drug specified varied widely by state, ranging from 54.7% to 99.3% in 2017, limiting comparisons across states. Third, potential racial misclassification might lead to underestimates for certain groups, primarily AI/AN and A/PI.§§§§ Finally, certain trend analyses were limited, given small numbers of deaths and the inability to calculate stable rates among some stimulant-opioid drug combinations before 2003.

Preliminary 2018 data indicate continued increases in drug overdose deaths.¶¶¶¶ The rise in deaths involving cocaine and psychostimulants and the continuing evolution of the drug landscape indicate a need for a rapid, multifaceted, and broad approach that includes more timely and comprehensive surveillance efforts to inform tailored and effective prevention and response strategies. CDC currently funds 45 states and DC for opioid surveillance***** and/or prevention activities.††††† The contribution of opioids to increases in stimulant-involved overdose deaths underscores the importance of continued opioid overdose surveillance and prevention measures, including existing efforts to expand naloxone availability to persons at risk for drug overdose. CDC is expanding drug overdose surveillance efforts to include stimulants and is implementing multiple, evidence-based opioid prevention efforts, such as enhancing linkage to care, building state and local capacity, and public health/public safety collaborations.§§§§§ Because some stimulant deaths are also increasing without opioid co-involvement, prevention and response strategies need to evolve accordingly. Increased efforts are required to identify and improve access to care for persons using stimulants, implement upstream prevention efforts focusing on shared risk and protective factors that address substance use/misuse, and improve risk reduction messaging (e.g., not using alone). Continued collaborations among public health, public safety, and community partners are critical to understanding the local illicit drug supply and reducing risk as well as linking persons to medication-assisted treatment and risk-reduction services.

**** https://www.dea.gov/sites/default/files/2018-11/DIR-032-18%202018%20NDTA%20final%20low%20resolution.pdf.

†††† https://www.nflis.deadiversion.usdoj.gov/DesktopModules/ReportDownloads/Reports/NFLIS-Drug-AR2017.pdf.

§§§§ https://www.cdc.gov/nchs/data/series/sr_02/sr02_172.pdf.

¶¶¶¶ https://www.cdc.gov/nchs/nvss/vsrr/drug-overdose-data.htm.

***** https://www.cdc.gov/drugoverdose/foa/state-opioid-mm.html.

††††† https://www.cdc.gov/drugoverdose/states/state_prevention.html; https://www.cdc.gov/drugoverdose/foa/ddpi.html.

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

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Progress Toward Measles Elimination — European Region, 2009–2018

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In 2010, all 53 countries* in the World Health Organization (WHO) European Region (EUR) reconfirmed their commitment to eliminating measles and rubella and congenital rubella syndrome (*1*); this goal was included as a priority in the European Vaccine Action Plan 2015–2020 (*2*). The WHO-recommended elimination strategies in EUR include 1) achieving and maintaining ≥95% coverage with 2 doses of measles-containing vaccine (MCV) through routine immunization services; 2) providing measles and rubella vaccination opportunities, including supplementary immunization activities (SIAs), to populations susceptible to measles or rubella; 3) strengthening surveillance by conducting case investigations and confirming suspected cases and outbreaks with laboratory results; and 4) improving the availability and use of evidence for the benefits and risks associated with vaccination (*3*). This report updates a previous report (*4*) and describes progress toward measles elimination in EUR during 2009–2018. During 2009–2017, estimated regional coverage with the first MCV dose (MCV1) was 93%–95%, and coverage with the second dose (MCV2) increased from 73% to 90%. In 2017, 30 (57%) countries achieved ≥95% MCV1 coverage, and 15 (28%) achieved ≥95% coverage with both doses. During 2009–2018, >16 million persons were vaccinated during SIAs in 13 (24%) countries. Measles incidence declined to 5.8 per 1 million population in 2016, but increased to 89.5 in 2018, because of large outbreaks in several EUR countries. To achieve measles elimination in EUR, measures are needed to strengthen immunization programs by ensuring ≥95% 2-dose MCV coverage in every district of each country, offering supplemental measles vaccination to susceptible adults, maintaining high-quality surveillance for rapid case detection and confirmation, and ensuring effective outbreak preparedness and response.

Immunization Activities

Since 2002, all 53 countries in EUR have included 2 MCV doses in routine childhood vaccination schedules. WHO and the United Nations Children's Fund (UNICEF) estimate vaccination coverage for all countries in the region using annual, government-reported administrative coverage data (calculated as the number of doses administered divided by the estimated target population) and vaccination coverage surveys (*5*). During 2009–2017, annual estimates of MCV1 coverage were available for all 53 countries, and the number of countries with annual MCV2 coverage estimates increased from 47 (89%) to 52 (98%). During 2009–2017, regional coverage estimates for MCV1 and MCV2 ranged from 93% to 95% and 73% to 90%, respectively (Figure). In 2017, 30 (57%) countries achieved ≥95% MCV1 coverage, and 15 (28%) had ≥95% estimated coverage with both doses (Table 1). During 2009–2017, >16 million persons were vaccinated in 21 SIAs conducted in 13 countries (Supplementary Table, https://stacks.cdc.gov/view/cdc/77666). Reported administrative vaccination coverage was ≥95% in nine (43%) SIAs, and the weighted average SIA coverage was 88%; no post-SIA coverage surveys were reported.

Surveillance Activities

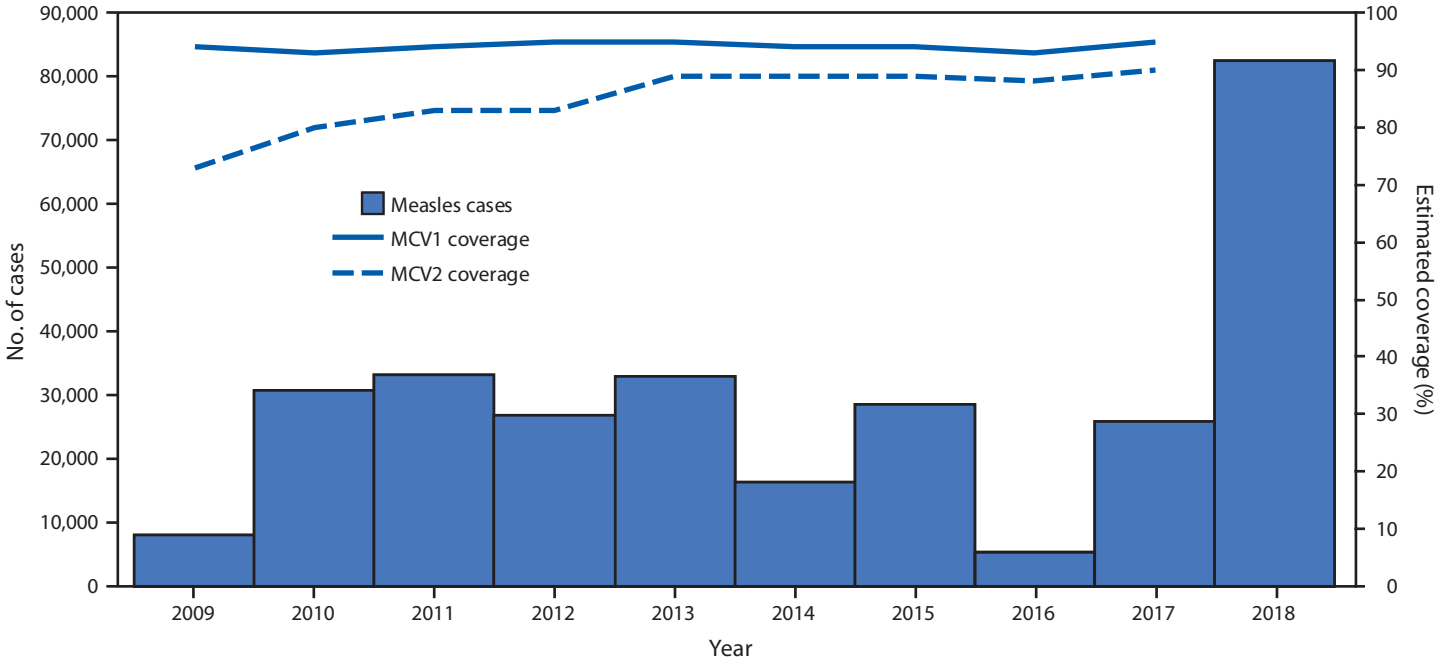
Measles surveillance data are reported monthly to WHO from all EUR countries either directly or via the European Centre for Disease Prevention and Control.† As of 2018, 47 (89%) countries report case-based measles surveillance data; six (11%)§ report aggregate data. Suspected measles cases are investigated and classified as laboratory-confirmed, epidemiologically linked (to a laboratory-confirmed case), clinically compatible, or discarded (a suspected case that does not meet the clinical or laboratory definition) (*6*). The WHO European Measles and Rubella Laboratory Network provides laboratory

* The European Region, with a population of approximately 900 million, is one of six WHO regions and consists of 53 countries: Albania, Andorra, Armenia, Austria, Azerbaijan, Belarus, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Georgia, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Kazakhstan, Kyrgyzstan, Latvia, Lithuania, Luxembourg, Malta, Monaco, Montenegro, Netherlands, North Macedonia, Norway, Poland, Portugal, Republic of Moldova, Romania, Russia, San Marino, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Tajikistan, Turkey, Turkmenistan, Ukraine, United Kingdom, and Uzbekistan.

† For Iceland, Norway, and the 28 member states of the European Union (Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, and the United Kingdom).

§ Belgium, Bosnia and Herzegovina, Kazakhstan, North Macedonia, Serbia, and Ukraine report aggregated surveillance data to WHO.

FIGURE. Estimated coverage with the first and second doses of measles-containing vaccine* and the number of confirmed measles cases† — World Health Organization (WHO) European Region, 2009–2018§



Abbreviations: MCV1 = first dose of a measles-containing vaccine; MCV2 = second dose of a measles-containing vaccine.
* WHO and United Nations Children's Fund estimates, July 15, 2018, update. https://www.who.int/immunization/monitoring_surveillance/data/en/.
† Cases reported to WHO, as of March 1, 2019. https://www.who.int/immunization/monitoring_surveillance/data/en/.
§ Date range for estimated coverage = 2009–2017; date range for confirmed measles cases = 2009–2018.

confirmation and genotyping of measles virus isolates from patients with reported cases (*7*). Key measles case-based surveillance performance indicators include 1) the number of suspected cases discarded as nonmeasles or nonrubella (target: ≥2 per 100,000 population); 2) the percentage of case investigations conducted within 48 hours of report (target: ≥80%); 3) the percentage of suspected cases (excluding those that are epidemiologically linked) with an adequate specimen collected within 28 days of rash onset and tested in a WHO-accredited or proficient laboratory (target: ≥80%); and 4) the percentage of cases for which the origin of infection (i.e., the source of the virus) is determined (target: ≥80%). During 2009–2018, the number of EUR countries that met the target for suspected cases discarded as nonmeasles at the national level increased from one (3%) in 2009 to 10 (21%) in 2018 (Table 2). From 2009 to 2018, the number of countries achieving the targets for timely investigations of suspected cases and adequate specimen collection increased from one (3%) to 24 (51%) and from 13 (36%) to 38 (81%), respectively.

Measles Incidence and Genotypes

During 2009–2018, annual regional measles incidence varied from 8.8 per 1 million population (7,884 cases) in 2009 to an average of 30.1 (average 28,021 cases) during 2010–2015. Incidence declined to a low of 5.8 (5,273 cases) in 2016, before increasing approximately fourteenfold to a high of 89.5 (82,596 cases) in 2018 (Table 1) (Figure). These 82,596 cases were reported from 47 (89%) EUR countries; 73,295 (89%) were reported by eight countries: Ukraine (53,218 cases; 64% of total); Serbia (5,076; 6%); France (2,913; 4%); Israel (2,919; 4%); Georgia (2,203; 3%); Greece (2,193; 3%); Italy (2,517; 3%); and Russia (2,256; 3%). The highest measles incidences in 2018 were in Ukraine (1,209.2 per 1 million) and Serbia (579.3). Among all measles cases reported in 2018, adults aged ≥20 years accounted for 30,561 (37%). The countries with the highest proportions of adult measles cases were Italy (68%), Serbia (67%), and Russia (42%). Among 179 measles deaths reported in EUR countries during 2009–2018, 114 (64%) occurred during 2017–2018, including 93 (82%) from four countries: Romania (46), Ukraine (20), Serbia (15), and

TABLE 1. Measles-containing vaccine (MCV) schedule, estimated coverage with the first and second doses of MCV,* number of confirmed measles cases,† and confirmed measles incidence, by country — World Health Organization (WHO) European Region, 2009, 2017, and 2018

Country	MCV schedule§		2009				2017				2018**	
			Coverage (%)				Coverage (%)					
	Age for MCV1	Age for MCV2	MCV1	MCV2	No. of measles cases	Measles incidence¶	MCV1	MCV2	No. of measles cases	Measles incidence¶	No. of measles cases	Measles incidence¶
Albania	12 mos	5 yrs	97	98	0	0.0	96	98	12	4.1	1,466	499.6
Andorra	12 mos	3 yrs	98	82	0	0.0	99	94	0	0.0	0	0.0
Armenia	12 mos	6 yrs††	96	96	1	0.3	96	97	1	0.3	19	6.5
Austria	10 mos	11 mos	76	64	47	5.6	96	84	94	10.8	77	8.8
Azerbaijan	12 mos	6 yrs	85	83	0	0.0	98	97	0	0.0	71	7.2
Belarus	12 mos	6 yrs	99	99	1	0.1	97	98	1	0.1	235	24.9
Belgium	12 mos	11–12 yrs	95	83	33	3.0	96	85	367	32.1	120	10.4
Bosnia and Herzegovina	12 mos	6 yrs	93	88	0	0.0	69	80	27	7.7	89	25.4
Bulgaria	13 mos	12 yrs	96	93	2,545	341.3	94	92	165	23.3	13	1.8
Croatia	12 mos	6 yrs	95	98	2	0.5	89	95	7	1.7	23	5.5
Cyprus	12–15 mos	4–6 yrs	87	88	0	0.0	90	88	4	3.4	14	11.8
Czech Republic	15 mos	5 yrs	98	98	5	0.5	97	90	149	14.0	199	18.7
Denmark	15 mos	4 yrs	84	85	8	1.4	97	88	4	0.7	8	1.4
Estonia	12 mos	13 yrs	95	96	0	0.0	93	91	1	0.8	10	7.7
Finland	12–18 mos	6 yrs	98	NR	3	0.6	94	92	10	1.8	15	2.7
France	12 mos	18 mos	89	NR	1,541	24.6	90	80	518	8.0	2,913	44.7
Georgia	12 mos	5 yrs	83	71	23	5.4	95	90	96	24.5	2,203	563.8
Germany	11–14 mos	15–23 mos	97	93	572	7.1	97	93	936	11.4	532	6.5
Greece	12–15 mos	4–6 yrs	99	77	2	0.2	97	83	1,067	95.6	2,193	196.8
Hungary	15 mos	11 yrs	99	99	1	0.1	99	99	36	3.7	14	1.4
Iceland	18 mos	12 yrs	92	93	0	0.0	92	95	3	9.0	0	0.0
Ireland	12 mos	4–5 yrs	90	NR	197	43.1	92	NR	25	5.3	90	18.7
Israel	12 mos	6 yrs	97	92	5	0.7	98	96	16	1.9	2,919	345.3
Italy	13–15 mos	5–6 yrs	90	NR	173	2.9	92	86	5,393	90.9	2,517	42.5
Kazakhstan	12 mos	6 yrs	99	99	0	0.0	99	99	2	0.1	576	31.3
Kyrgyzstan	12 mos	6 yrs	99	98	0	0.0	95	96	5	0.8	1,008	164.4
Latvia	12–15 mos	7 yrs	92	92	0	0.0	96	89	5	2.6	20	10.4
Lithuania	15–16 mos	6–7 yrs	96	94	0	0.0	94	92	2	0.7	30	10.4
Luxembourg	12 mos	15–23 mos	96	NR	0	0.0	99	86	4	6.9	4	6.8
Malta	13 mos	3 yrs	82	85	1	2.4	91	83	0	0.0	5	11.6
Monaco	12 mos	16 mos	92	NR	0	0.0	87	79	0	0.0	0	0.0
Montenegro	13 mos	6 yrs	86	96	0	0.0	58	83	0	0.0	203	322.6

See table footnotes on the next page.

Italy (12). EUR reported 17,587 measles virus sequences to the WHO global measles nucleotide surveillance database. The most predominant measles virus genotypes detected were D4 (21% overall, 66% during 2009–2012), D8 (45% overall, 76% during 2013–2016), and B3 (33% overall, 58% during 2017–2018) (*8*) (Supplementary Figure, https://stacks.cdc.gov/view/cdc/77667).

Regional Verification of Measles Elimination

The European Regional Verification Commission for Measles and Rubella Elimination was established in 2011 to evaluate the status of measles and rubella elimination¶ in EUR countries based on documentation submitted annually by national verification committees (*1*). By the end of 2017, 43 (91%) countries had interrupted endemic measles virus transmission for ≥12 months, including 37 (70%)** that had sustained interruption for ≥36 months and were verified to have eliminated endemic measles virus transmission (*8*).

Discussion

After relatively stable albeit high measles incidence in EUR during 2009–2016, the number of reported measles cases tripled from 2017 to 2018, including outbreaks in eight countries reporting >2,000 measles cases each. The 2018 measles resurgence was attributable to measles virus transmission that

¶ Elimination defined as interruption of endemic measles transmission for >36 months in the presence of a well-functioning surveillance system.

** Countries that had interrupted endemic measles virus transmission for >12 months include Albania, Andorra, Armenia, Azerbaijan, Belarus, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Greece, Estonia, Finland, Hungary, Iceland, Ireland, Israel, Latvia, Lithuania, Luxembourg, Malta, Montenegro, Netherlands, North Macedonia, Norway, Monaco, Portugal, Republic of Moldova, San Marino, Slovakia, Slovenia, Spain, Sweden, Tajikistan, Turkmenistan, United Kingdom, and Uzbekistan.

TABLE 1. (*Continued*) Measles-containing vaccine (MCV) schedule, estimated coverage with the first and second doses of MCV,* number of confirmed measles cases,† and confirmed measles incidence, by country — World Health Organization (WHO) European Region, 2009, 2017, and 2018

Country	MCV schedule§		2009				2017				2018**	
			Coverage (%)				Coverage (%)					
	Age for MCV1	Age for MCV2	MCV1	MCV2	No. of measles cases	Measles incidence¶	MCV1	MCV2	No. of measles cases	Measles incidence¶	No. of measles cases	Measles incidence¶
Netherlands	14 mos	9 yrs	96	93	15	0.9	93	90	16	0.9	24	1.4
North Macedonia	12 mos	6 yrs	96	97	3	1.4	83	97	20	9.6	64	30.7
Norway	15 mos	11 yrs	93	96	2	0.4	96	91	1	0.2	12	2.2
Poland	13–15 mos	10 yrs	98	95	162	4.2	96	93	63	1.7	335	8.8
Portugal	12 mos	5 yrs	95	95	3	0.3	98	95	34	3.3	171	16.6
Republic of Moldova§§	12 mos	7 yrs	90	98	0	0.0	93	92	0	0.0	340	84.1
Romania	12 mos	5 yrs	96	94	8	0.4	86	75	9,072	461.0	1,087	55.5
Russia	12 mos	6 yrs¶¶	98	97	101	0.7	98	97	897	6.2	2,256	15.7
San Marino	15 mos	10 yrs	88	92	0	0.0	82	78	0	0.0	0	0.0
Serbia	12 mos	7 yrs	95	87	0	0.0	86	91	702	79.9	5,076	579.3
Slovakia	14 mos	10 yrs	99	99	0	0.0	96	97	10	1.8	572	105.0
Slovenia	12 mos	5 yrs	95	98	0	0.0	93	94	8	3.8	9	4.3
Spain	12 mos	3–4 yrs	98	90	43	0.9	96	93	157	3.4	225	4.8
Sweden	18 mos	6–8 yrs	97	95	3	0.3	97	95	46	4.6	38	3.8
Switzerland	12 mos	15–24 mos	92	83	999	129.1	95	89	105	12.4	51	6.0
Tajikistan	12 mos	6 yrs	89	93	177	23.7	98	98	651	73.0	0	0.0
Turkey	12 mos	6 yrs	97	88	8	0.1	96	86	69	0.9	557	6.8
Turkmenistan	12–15 mos	6 yrs	99	99	0	0.0	99	99	0	0.0	0	0.0
Ukraine	12 mos	6 yrs	75	68	24	0.5	86	84	4,782	108.1	53,218	1,209.2
United Kingdom	12 mos	40 mos	86	79	1,176	18.7	92	88	280	4.2	953	14.3
Uzbekistan	12 mos	6 yrs	95	8	0	0.0	99	99	0	0.0	22	0.7
European Region	—	—	**94**	**73**	**7,884**	**8.8**	**95**	**90**	**25,863**	**28.1**	**82,596**	**89.5**

Abbreviations: MCV1 = first dose of MCV; MCV2 = second dose of MCV; NR = not reported (country did not report coverage for the year specified).
* WHO and United Nations Children's Fund estimates of national immunization coverage, 2018. https://www.who.int/immunization/monitoring_surveillance/data/en/.
† Includes confirmed cases by laboratory or epidemiologic linkage and clinically compatible cases meeting the WHO clinical case definition of measles for which no adequate specimen was collected and that cannot be epidemiologically linked to a laboratory-confirmed case of measles.
§ MCV schedule is the 2017 schedule.
¶ Per 1 million population.
** 2018 MCV1 and MCV2 coverage estimates not available.
†† Also recommended for males aged 16–17 years who have not previously received 2 MCV doses.
§§ Catch-up vaccination at age 15 years is also performed.
¶¶ Catch-up monovalent measles vaccine is also recommended for persons aged 18–55 years.

began in 2017 and continued during 2018 in France, Greece, Romania, Russia, Serbia, and Ukraine. In addition, measles virus importations followed by widespread measles virus transmission occurred in countries that had achieved elimination, including Albania, Belarus, Czech Republic, Israel, and Montenegro. Despite high reported national coverage, factors associated with the resurgence included persistent measles virus reservoirs in EUR countries with limited resources and weak immunization systems, an accumulation of susceptible young children in marginalized communities with suboptimal coverage, and an accumulation of susceptible young adults who had escaped both natural measles infection and measles vaccination over a prolonged period of decreased measles incidence.

Outbreak response differed among countries. In some countries, large outbreaks caused substantial financial and human resource burdens, which resulted in delayed or inadequate outbreak responses and ongoing disease transmission. In other countries, outbreak response vaccination campaigns were not implemented because of insufficient political commitment, poor acceptance of mass immunization by health authorities and the public, lack of infrastructure to vaccinate specific susceptible population groups, and vaccine supply challenges. To achieve better outbreak control, countries in the region will need to adhere to their commitment to eliminate measles and rubella and ensure that dedicated financial and human resources are available for strong vaccination and surveillance programs, including outbreak preparedness and response.

The measles resurgence and the European Vaccine Action Plan midterm review in 2018 (*9*) highlighted ongoing challenges, including inadequate vaccine delivery infrastructure in some middle-income countries that resulted in suboptimal vaccination coverage and vaccine stock-outs; prevalent antivaccine sentiment; large populations of unvaccinated persons, including ethnic and religious minorities and adults; an increased proportion of cases in persons aged ≥20 years, who are difficult to reach with routine immunization services; and nosocomial outbreaks that affected patients and health care personnel with spread to the community.

TABLE 2. Percentage of countries reporting case-based surveillance (CBS) data monthly that meet surveillance indicator performance targets — World Health Organization (WHO) European Region, 2009–2018

CBS characteristic	Year									
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
No. (%) of countries reporting CBS data monthly	36 (68)	38 (72)	41 (77)	41 (77)	46 (87)	46 (87)	46 (87)	46 (87)	47 (89)	47 (89)
% Countries meeting performance targets/surveillance indicator (performance target)										
Completeness* (≥80%)	75	71	76	90	93	91	24	87	98	100
Timeliness† (≥80%)	31	26	49	85	87	76	11	72	70	79
Discarded cases§ (≥2 per 100,000 population)	3	3	2	0	11	7	7	7	13	21
Timely investigation¶ (≥80%)	3	5	24	34	33	30	28	26	40	51
Laboratory investigation** (≥80%)	36	50	68	66	61	70	59	61	81	81
Origin of infection†† (≥80%)	47	45	41	49	54	48	41	37	62	60

* Percentage of measles or rubella routine surveillance reports submitted from subnational to national level.
† Percentage of measles or rubella routine surveillance reports submitted from subnational to national level by the deadline set by national program.
§ The rate of suspected measles or rubella cases investigated and discarded as nonmeasles and nonrubella, using laboratory testing in a proficient laboratory or epidemiological linkage to another confirmed disease.
¶ Percentage of suspected measles or rubella cases with an adequate case investigation initiated within 48 hours of case notification.
** Percentage of suspected measles or rubella cases with an adequate specimen collected and tested in a WHO-accredited or proficient laboratory.
†† Percentage of confirmed measles or rubella cases for which the origin of infection (i.e., source of virus) has been identified.

To address these challenges and accelerate measles elimination efforts in EUR, the European Regional Office has targeted the following areas for action: 1) achieving and maintaining ≥95% vaccination coverage; 2) improving understanding of barriers to vaccination in vulnerable groups and increasing vaccine demand; 3) closing immunity gaps in the population through innovative and locally tailored approaches; 4) ensuring high-quality measles surveillance for rapid case detection and targeted outbreak response activities; and 5) strengthening infection prevention and control practices, particularly during outbreaks. The midterm review also highlighted the recent recommendation by the WHO Strategic Advisory Group of Experts on Immunization that countries institutionalize school entry checks to close immunity gaps as a key strategy for achieving measles elimination (*10*).

The findings in this report are subject to at least two limitations. First, surveillance data likely underestimate actual disease incidence because not all patients seek care, and it is likely that not all cases are reported. Second, measles surveillance performance and data quality vary among countries in the region, which might have led to reporting bias for some countries.

In EUR, 70% of countries have been verified as having achieved measles elimination; however, the recent resurgence highlighted challenges to achieving and maintaining elimination. All countries need to strengthen immunization programs to achieve and sustain high population immunity, maintain high-quality surveillance, and ensure outbreak preparedness and prompt response to contain outbreaks. Elimination efforts that focus on reaching vulnerable communities and adults will likely provide opportunities to improve access to vaccination services for all and help achieve European Vaccine Action Plan and future universal health goals.

Summary

What is already known about this topic?

Many countries in the World Health Organization European Region (EUR) have made substantial progress toward measles elimination.

What is added by this report?

By end of 2017, 37 (70%) EUR countries had sustained interruption of measles transmission for ≥36 months and were verified to have eliminated endemic measles. During 2017–2018, however, a resurgence of measles occurred in EUR, with large-scale outbreaks in Ukraine, Serbia, and some countries that had achieved elimination.

What are the implications for public health practice?

To achieve regional measles elimination, measures are needed to strengthen immunization programs to achieve high population immunity, maintain high-quality surveillance for rapid case detection, and ensure outbreak preparedness and prompt response to contain outbreaks.

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Increase in Measles Cases — United States, January 1–April 26, 2019

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On April 29, 2019, this report was posted as an MMWR *Early Release on the* MMWR *website (https://www.cdc.gov/mmwr).*

As of April 26, 2019, CDC had reported 704 cases of measles in the United States since the beginning of 2019, representing the largest number of cases reported in the country in a single year since 1994, when 963 cases occurred, and since measles was declared eliminated* in 2000 (*1*,*2*). Measles is a highly contagious, acute viral illness characterized by fever and a maculopapular rash; complications include pneumonia, encephalitis, and death. Among the 704 cases, 503 (71%) were in unvaccinated persons and 689 (98%) occurred in U.S. residents. Overall, 66 (9%) patients were hospitalized. Thirteen outbreaks have been reported in 2019, accounting for 663 cases, 94% of all reported cases. Six of the 13 outbreaks were associated with underimmunized close-knit communities and accounted for 88% of all cases. High 2-dose measles vaccination coverage in the United States has been critical to limiting transmission (*3*). However, increased global measles activity poses a risk to U.S. elimination, particularly when unvaccinated travelers acquire measles abroad and return to communities with low vaccination rates (*4*). Health care providers should ensure persons are up to date with measles, mumps, rubella (MMR) vaccine, including before international travel, and rapidly report all suspected cases of measles to public health authorities.

Measles cases are classified according to the Council of State and Territorial Epidemiologists' case definition for measles (*5*). Cases are considered to be internationally imported if at least part of the exposure period (7–21 days before rash onset) occurred outside the United States and rash occurred within 21 days of entry into the United States, with no known exposure to measles in the United States during the exposure period. An outbreak of measles is defined as a chain of transmission of three or more cases linked in time and place and is determined by local and state health department investigations.

During January 1–April 26, 2019, a total of 704 measles cases were reported in 22 states (Figure 1); the highest number of weekly cases (87) were reported during the week ending March 23 (Figure 2). Median patient age was 5 years (interquartile range = 1 year to 18.5 years); 25 (4%) patients were aged <6 months, 68 (10%) 6–11 months, 76 (11%) 12–15 months, 167 (24%) 16 months–4 years, 203 (29%) 5–19 years, 138 (20%) 20–49 years, and 27 (4%) ≥50 years (Table). Among all measles patients, 503 (71%) were unvaccinated, 76 (11%) were vaccinated (received ≥1 measles, mumps, and rubella (MMR) vaccine), and the vaccination status of 125 (18%) was unknown. Overall, 66 (9%) patients were hospitalized, and 24 (3%) had pneumonia. No deaths or cases of encephalitis were reported to CDC.

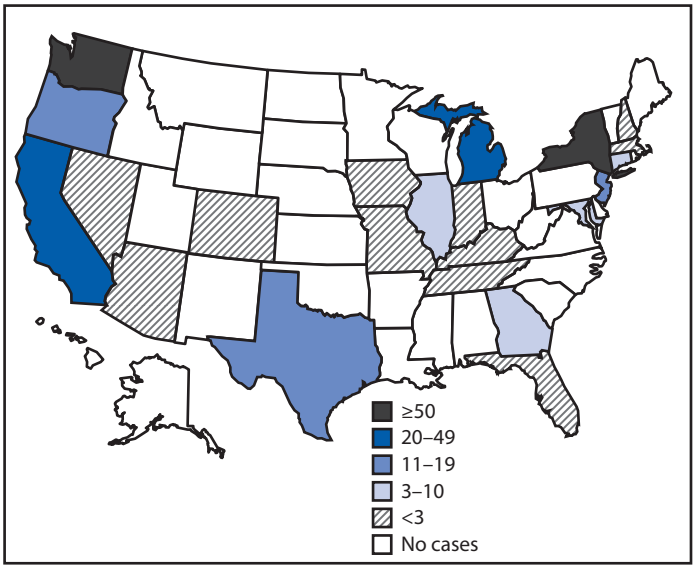
Of the 704 total cases, 663 (94%) were associated with outbreaks; 13 outbreaks have been reported in 2019. Outbreak-related cases have been reported in 12 states† and New York City; multistate transmission was documented in four outbreaks. Six outbreaks were associated with underimmunized close-knit communities and accounted for 88% of all cases. New York state and New York City accounted for 474 (67%) of all cases reported in 2019 and have had ongoing transmission since October 2018.

Among the 704 cases, 689 (98%) occurred in U.S. residents. Forty-four cases were directly imported from other countries, including 34 (77%) that occurred in U.S. residents; 23 imports resulted in no known secondary cases. Among the 44 internationally imported measles cases, 40 (91%) were in unvaccinated persons or persons whose vaccination status was unknown; all 40 were age-eligible for vaccination, including two infant travelers

* Defined as absence of sustained measles transmission that is continuous for ≥12 months in a defined geographic area.

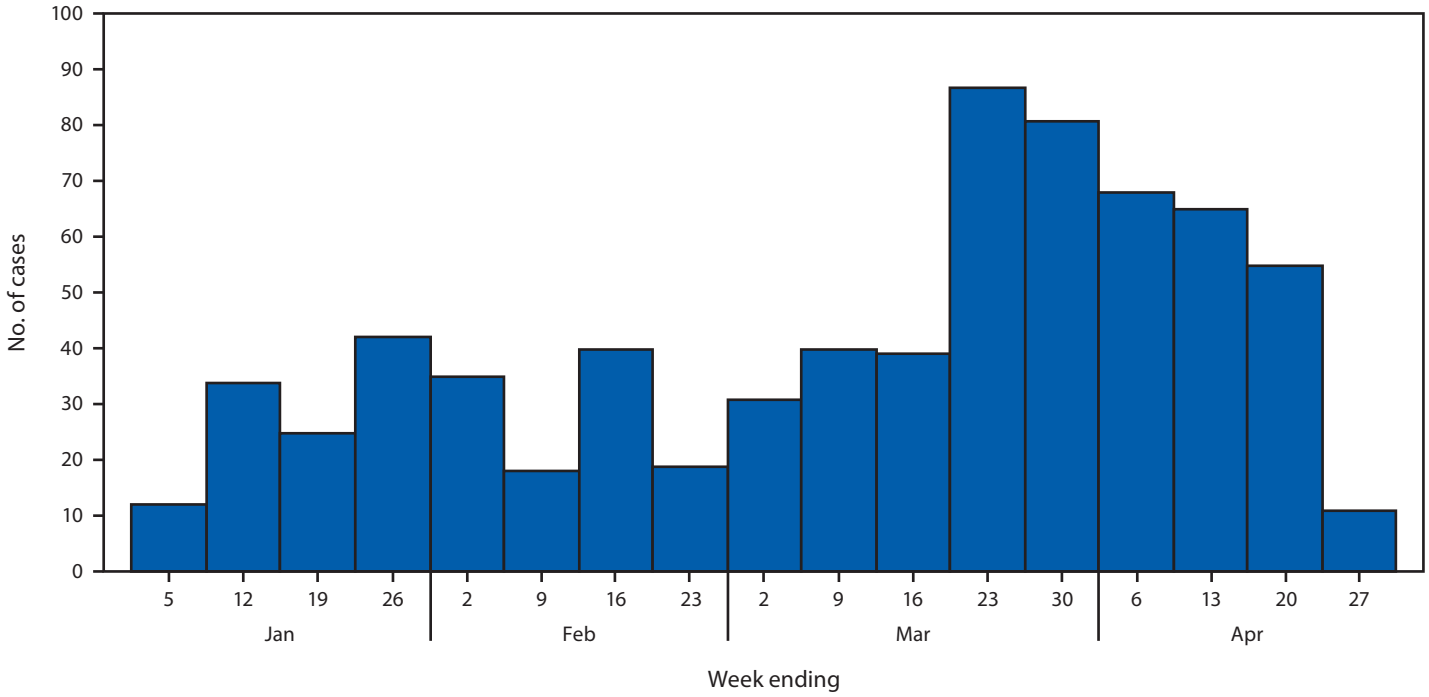
† California, Connecticut, Georgia, Illinois, Maryland, Michigan, Missouri, New Jersey, New York, Oregon, Texas, and Washington.

FIGURE 1. Reported number of measles cases (N = 704) — United States, January 1–April 26, 2019*



* Data are preliminary as of April 26, 2019.

FIGURE 2. Number of reported measles cases (N = 704), by week of rash onset — United States, January 1–April 26, 2019*



* Data are preliminary as of April 26, 2019. Data for the week ending April 27 are for a partial week.

aged 6–11 months. Source countries included Philippines (14 cases), Ukraine (8), Israel (5), Thailand (3), Vietnam (2), Germany (2), and one importation each from Algeria, France, India, Lithuania, Russia, and the United Kingdom. Four travelers went to multiple countries during their exposure period, including Italy/Singapore, Thailand/Cambodia, Ukraine/Israel, and Cambodia/Thailand/China/Singapore. Among 245 (35%) cases for which molecular sequencing was performed, B3 and D8 were the only genotypes identified, which were the most commonly detected genotypes worldwide in the past 12 months.

Discussion

Before 2019, the highest number of measles cases following elimination in the United States occurred in 2014, when 667 cases were reported; 383 (57%) of those cases were associated with an outbreak in an underimmunized Amish community in Ohio (*6*). Worldwide, 7 million measles cases are estimated to occur annually, and since 2016, measles incidence has increased in five of the six World Health Organization regions (*7*), contributing to increased opportunities for measles importations into the United States. Fortunately, the majority of importations do not lead to outbreaks because of rapid implementation of control measures by state and local health departments. Additionally, the United States benefits from a long-standing vaccination program, with overall measles vaccination coverage of >91% in children aged 19–35 months (*8*). However, unimmunized or underimmunized subpopulations within U.S. communities are at risk for large outbreaks of long duration that are resource intensive to control (*9*). Recent outbreaks have been driven by misinformation about measles and MMR vaccine, which has led to undervaccination in vulnerable communities.

Unvaccinated U.S. residents traveling internationally are at risk for acquiring measles. Health care providers should vaccinate persons without contraindications and without acceptable evidence of immunity to measles before travel to any country outside the United States. Only written (not self-report) documentation of age-appropriate vaccination, laboratory evidence of immunity, laboratory confirmation of disease, or birth before 1957 is considered acceptable presumptive evidence of immunity. In addition to routine recommendations for MMR vaccination (*3*), infants aged 6–11 months should receive 1 dose of MMR vaccine, and adults should receive a second dose before international travel (*3*); infants who receive MMR vaccine before their first birthday should receive 2 additional doses (1 dose at age 12–15 months and another dose at least 28 days after the first dose). Measles is a nationally notifiable disease in the United States; health care providers should rapidly report all cases of suspected measles to public health authorities to ensure that timely control measures are implemented. High coverage with MMR vaccine is the most effective strategy to limit transmission and maintain elimination of measles in the United States.

TABLE. Selected characteristics of patients with reported measles — United States, January 1–April 26, 2019*

Characteristic	No. (%)
Total	**704 (100)**
Age group	
<6 mos	25 (4)
6–11 mos	68 (10)
12–15 mos	76 (11)
16 mos–4 yrs	167 (24)
5–19 yrs	203 (29)
20–49 yrs	138 (20)
≥50 yrs	27 (4)
Vaccination status	
Vaccinated	76 (11)
Unvaccinated	503 (71)
Unknown	125 (18)
Hospitalizations	66 (9)
Complications	
Pneumonia	24 (3)
Encephalitis	0 —
Death	0 —
Residency	
U.S. resident	689 (98)
Internationally imported measles cases	
Total	**44 (6)**
Vaccination status†	
Vaccinated†	4 (9)
Unvaccinated/Unknown	40 (91)
U.S. resident	34 (77)
Source countries†	
Philippines	14 (32)
Ukraine	8 (18)
Israel	5 (11)
Thailand	3 (7)
Vietnam	2 (5)
Germany	2 (5)
Other	10 (23)

* Data are preliminary as of April 26, 2019.
† Percentages are of all 44 international importations.

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Summary

What is already known about this topic?

Measles was eliminated in the United States in 2000.

What is added by this report?

During January 1–April 26, 2019, a total of 704 cases were reported, the highest number of cases reported since 1994. Outbreaks in close-knit communities accounted for 88% of all cases. Of 44 cases directly imported from other countries, 34 were in U.S. residents traveling internationally; most were not vaccinated.

What are the implications for public health practice?

Unvaccinated U.S. residents traveling internationally are at risk for acquiring measles. Close-knit communities with low vaccination rates are at risk for sustained measles outbreaks. High coverage with measles, mumps, rubella (MMR) vaccination is the most effective way to limit transmission and maintain elimination of measles in the United States.

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Notes from the Field

Outbreak of Multidrug-Resistant *Shigella sonnei* Infections in a Retirement Community — Vermont, October–November 2018

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On October 22, 2018, the Vermont Department of Health (VDH) notified CDC's Waterborne Disease Prevention Branch of an outbreak of diarrhea caused by *Shigella sonnei* among residents, visitors, and staff members of a retirement community in Chittenden County, the state's most populous county. High-quality single nucleotide polymorphism (SNP) analysis predicted initial isolates were multidrug resistant (MDR), and were closely related to a concurrent multistate cluster (differing by 0–11 SNPs). In the United States, rates of MDR shigellosis are increasing (*1*); outbreaks of MDR shigellosis are more common among men who have sex with men and are rare in retirement community settings (*2*). CDC collaborated with VDH to identify additional cases, determine transmission routes, and recommend prevention and control measures.

A confirmed case was defined as isolation of *S. sonnei* from the stool of a facility resident, visitor, or staff member during October 1–November 8. A probable case was defined as diarrheal illness without a positive culture in this population during the same period. Overall, 75 cases (24 confirmed and 51 probable) with onset dates from October 9 through November 3 were identified (Figure), including six cases in visitors to the facility. The attack rate was 15% (46 of 311) among residents and 11% (23 of 209) among staff members. The median patient age was 80 years (range = 21–99 years); 75% were female. Six patients were hospitalized (median duration of hospitalization = 4 days; range = 2–10 days). Two patients, both of whom had other serious comorbidities, died; shigellosis was not thought to be the primary cause of death in these patients. Antibiotic susceptibility testing at CDC determined that outbreak isolates were resistant to trimethoprim-sulfamethoxazole, ampicillin, and ceftriaxone and had decreased susceptibility to azithromycin.

A review of facility records and key informant interviews identified early cases among one staff member who prepared food while ill during October 11–14 and among six visitors who dined at the facility on October 14th. This information supported foodborne transmission as a leading hypothesis for spread within the facility. A case-control study was conducted using a standardized questionnaire administered to residents and staff members asking about meal exposures and other known risk factors for shigellosis. Controls were residents and staff members at the facility during October 1–November 8 who met neither the probable nor confirmed case definitions. Thirty-six case-patients and 172 controls were included in the analysis. Illness was associated with eating several facility meals during October 11–14, with the strongest associations being dining at the facility on October 14 (odds ratio [OR] = 5.6; 95% confidence interval [CI] = 2.4–14.1), specifically at brunch (OR = 5.5; 95% CI = 2.3–13.3) and breakfast (OR = 5.3; 95% CI = 1.2–22.9). Illness was not associated with attending large gatherings, and no patient reported recent sexual contact or recreational water use. Patient interviews did not identify a direct epidemiologic link with the concurrent multistate cluster.

Food handling was an important mode of transmission of shigellosis within this facility. Reports of staff members working while ill highlights the importance of having clear, nonpunitive sick leave policies. This outbreak investigation also demonstrates that MDR shigellosis can affect a range of populations and underscores the need for evidence-based prevention strategies for all vulnerable groups.

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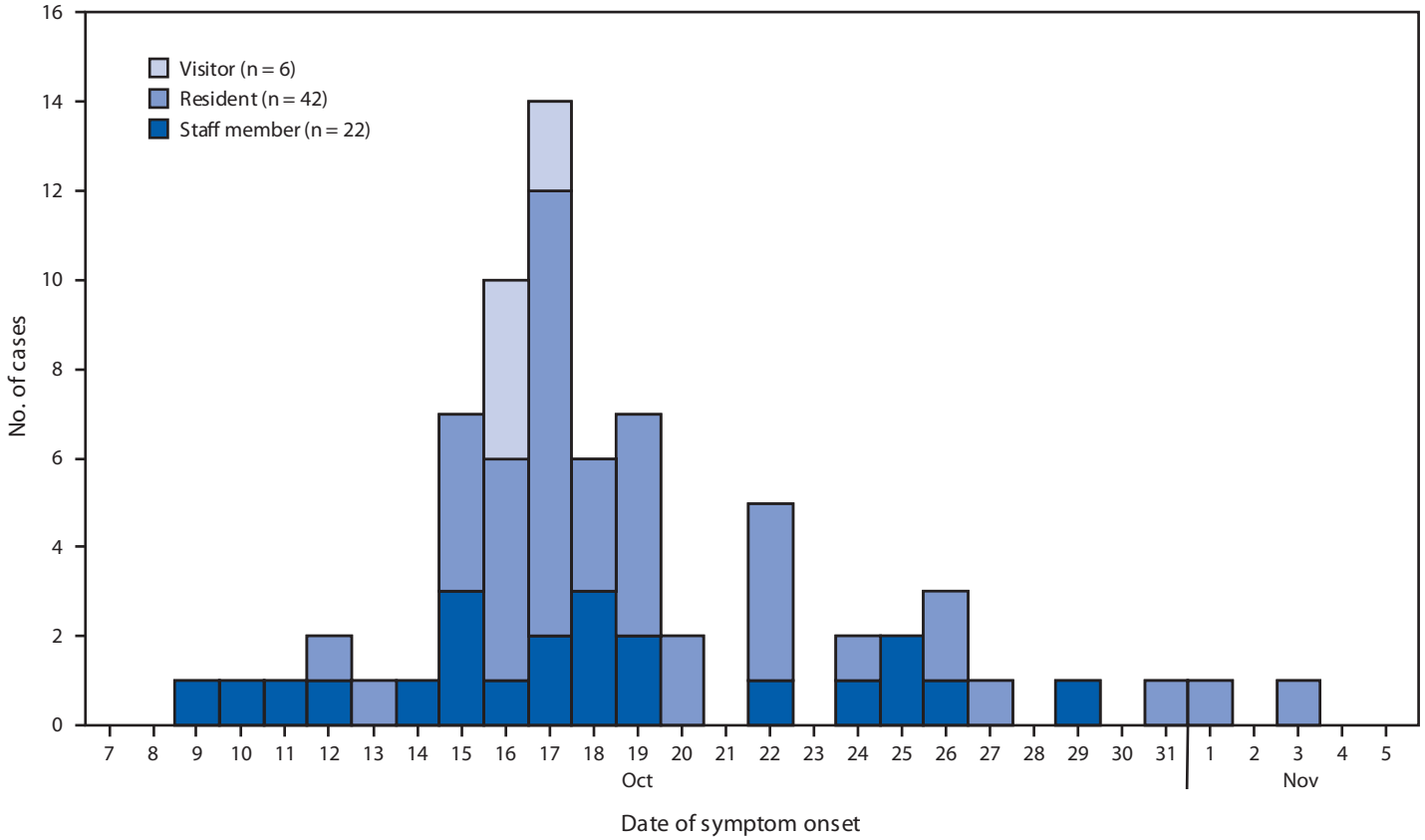
All authors have completed and submitted the ICMJE form for disclosure of potential conflicts of interest. No potential conflicts of interest were disclosed.

FIGURE. Confirmed and probable cases of shigellosis at a retirement community outbreak, by date of illness onset and facility affiliation (N = 70*) — Vermont, October–November, 2018



* Five patients (four residents and one staff member) had illness onset within the outbreak period of October 1–November 8 but are not included in figure because exact illness onset date was not known.

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Notes from the Field

Live Poultry Shipment Box Sampling at Feed Stores as an Indicator for Human *Salmonella* Infections — Michigan, 2016–2018

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Salmonella infection is estimated to cause 1.2 million human illnesses, 23,000 hospitalizations, and 450 deaths in the United States each year (*1*). An estimated 11% of *Salmonella* illnesses annually are caused by animal contact (*2*); contact with live poultry has become an increasing public health concern as backyard flock ownership has grown in popularity (*3*). Backyard poultry are usually purchased at agricultural feed stores that source birds from mail-order hatcheries (*4*). When a hatchery doesn't have enough poultry to fill an order, it will often enlist a second hatchery as a source. Using a common industry practice, the second hatchery will drop-ship (i.e., ship under the original hatchery's name and address) the poultry directly to the mail-order customer (retail feed store or individual customer) (*5*).

During human *Salmonella* outbreak investigations, real-time environmental sampling at mail-order hatcheries rarely occurs because of challenges involved in tracing poultry to its source. Environmental swabbing of arriving shipments and shipping information has been used to characterize *Salmonella* strains (*6*). This report describes an efficient method for detecting outbreak strains in live poultry by sampling poultry shipment box bedding/liners upon arrival at agricultural retail feed stores.

During 2016–2018, the Michigan Department of Health and Human Services (MDHHS) sampled live poultry shipping boxes at agricultural feed stores in Michigan. Upon arrival at stores, the bedding/liners from poultry boxes were placed into sterile collection bags by health department personnel with gloved hands. Photos were taken of the postal service labels to document shipment origin. In the case of drop-shipping, although the address of the hatchery to which the order was placed appears on the shipping label, postal service labels indicate the origin of the shipment. Samples were cultured, screened by polymerase chain reaction, and characterized by conventional serotyping and molecular subtyping processes (pulsed-field gel electrophoresis and whole genome sequencing of isolates) by MDHHS Bureau of Laboratories.

During 2016–2018, a total of 136 samples were collected at three agricultural feed store chains in 20 different Michigan locations, primarily during the spring months. The sampled boxes originated in nine different hatcheries, with approximately 65% originating at a single hatchery in Michigan. Thirty-five samples (26%) were culture-confirmed as six different serotypes of *Salmonella enterica*; of these, molecular subtyping linked four subtypes (Enteritidis, Braenderup, Muenster, and Senftenberg) with human illness outbreaks that occurred during 2016–2018. Results were shared with local health officials and the sampled agricultural feed store.

Sampling of poultry shipment boxes upon arrival at agricultural feed stores in the spring can provide an early indicator of *Salmonella* species present in hatchery-sourced live poultry. For example, in 2018, shipping box sampling occurred during February–March, and the first human cases in Michigan in which any live poultry exposure was reported had illness onsets in April, at least a month later. Sampling poultry shipment boxes is also quick, easy, and can have high yields.

The mail-order hatchery industry practice of drop-shipping (*5*) can complicate traceback investigations because hatchery records must be requested and reviewed to discover the actual source of poultry. Using postal service labels to determine hatchery of origin is an efficient method for tracking the source to a specific hatchery and simplifies traceback during outbreak investigations. Implicated hatcheries can be notified about infections earlier and mitigation steps initiated sooner, potentially resulting in fewer human illnesses. Testing for the presence of *Salmonella*, either by sampling shipment boxes or sampling at the implicated hatchery directly, provides hatcheries with early vital information to inform appropriate *Salmonella* mitigation strategies.

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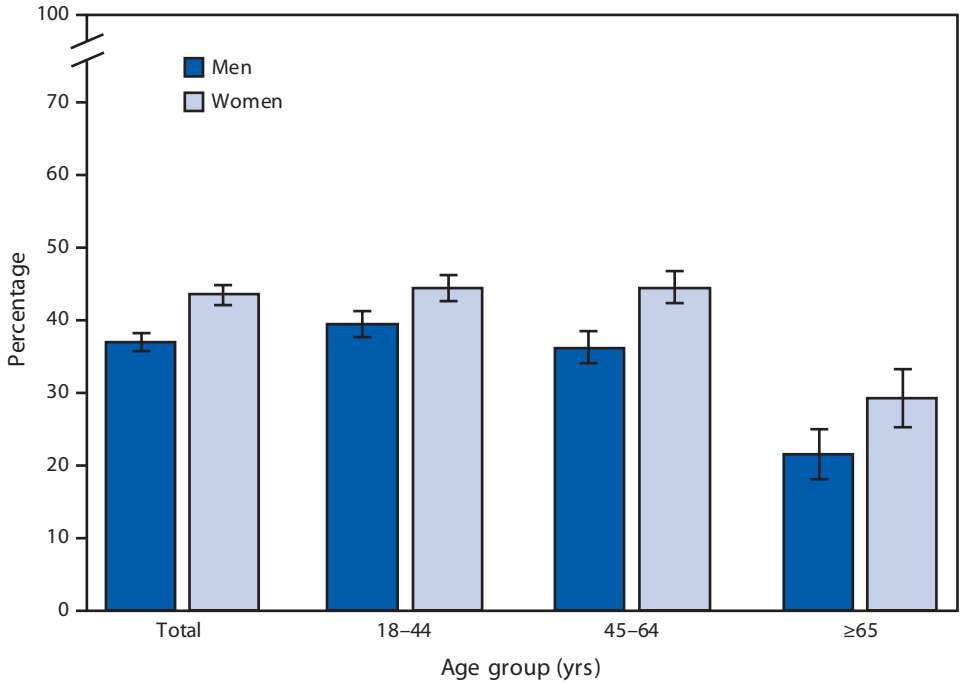
QuickStats

FROM THE NATIONAL CENTER FOR HEALTH STATISTICS

Percentage* of Employed Adults Aged ≥18 Years with Any Work-Loss Days Because of Illness or Injury in the Past 12 Months,† by Sex and Age Group — National Health Interview Survey,§ 2017



* With 95% confidence intervals shown with error bars.
† Respondents who had worked during the past year were asked, "During the past 12 months, about how many days did you miss work at a job or business because of illness or injury (do not include maternity leave)?" Responses are only shown for employed adults.
§ Estimates are based on household interviews of a sample of the civilian, noninstitutionalized U.S. population, and are shown for sample adults aged ≥18 years who had a job anytime during the past 12 months.

Among employed adults aged ≥18 years, women (43.5%) were more likely than men (37.0%) to have missed at least 1 day of work because of illness or injury during the past 12 months. This pattern was consistent for women and men aged 18–44 (44.5% versus 39.4%), 45–64 (44.5% versus 36.3%), and ≥65 years (29.3% versus 21.6%). Among women, having any work-loss days was similar for those aged 18–44 and 45–64 years and then declined for those aged ≥65 years. Among men, having any work-loss days decreased with age.

Source: National Health Interview Survey, 2017 data. https://www.cdc.gov/nchs/nhis.htm.

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