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State-Level Economic Costs of Opioid Use Disorder and Fatal Opioid Overdose — United States, 2017

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Approximately 47,000 persons in the United States died from an opioid-involved overdose in 2018 (*1*), and 2.0 million persons met the diagnostic criteria for an opioid use disorder in 2017 (*2*). The economic cost of the U.S. opioid epidemic in 2017 was estimated at $1,021 billion, including cost of opioid use disorder estimated at $471 billion and cost of fatal opioid overdose estimated at $550 billion (*3*). CDC used national-level cost estimates to estimate the state-level economic cost of opioid use disorder and fatal opioid overdose during 2017. Cases and costs of state-level opioid use disorder and fatal opioid overdose and per capita costs were calculated for each of the 38 states and the District of Columbia (DC) that met drug specificity requirements for mortality data (*4*). Combined costs of opioid use disorder and fatal opioid overdose (combined costs) varied substantially, ranging from $985 million in Wyoming to $72,583 million in Ohio. Per capita combined costs also varied considerably, ranging from $1,204 in Hawaii to $7,247 in West Virginia. States with high per capita combined costs were mainly in two regions: the Ohio Valley and New England. Federal and state public health agencies can use these data to help guide decisions regarding research, prevention and response activities, and resource allocation.

Estimated case counts of state-level opioid use disorder were extracted from the National Survey on Drug Use and Health (NSDUH) 2-Year Restricted-Use Data Analysis System (2016–2017) provided by the Substance Abuse and Mental Health Services Administration (*5*). NSDUH is a nationally representative sample of the U.S. civilian noninstitutionalized population aged ≥12 years. Cases of opioid use disorder were identified by using questions on opioid abuse or dependence during the past year.* Case counts of state-level fatal opioid overdose and population estimates in 2017 were extracted from CDC's WONDER database (*6*). Cases of fatal opioid overdose were identified using *International Classification of Diseases, Tenth Revision* underlying cause-of-death codes X40–X44, X60–X64, X85, and Y10–Y14 and then multiple causes-of-death codes T40.0–T40.4 and T40.6.† This report is limited to DC and the 38 states that met the requirement that at least one specific drug is named on the death certificate (*4*).

* NSDUH classified respondents as having opioid use disorder during the past year if they had a heroin use disorder (dependence or abuse), pain reliever use disorder (dependence or abuse), or both during the past year.

† Cases of fatal opioid overdose include all opioid-related overdose deaths regardless of intent (intentional, unintentional, homicide, or undetermined).

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Cost per case of opioid use disorder ($221,219) was derived by dividing the total U.S. cost of opioid use disorder ($470,975 million) during 2017 by the number of opioid use disorder cases the same year (2.129 million) (*3*). Cost per case of fatal opioid overdose ($11.548 million) was derived by dividing the total cost of fatal opioid overdose ($549,691 million) by the number of fatal opioid overdose cases (47,600) (*3*). State-level cost of opioid use disorder was calculated by multiplying the U.S. cost of opioid use disorder per case by the number of cases of opioid use disorder in each state. State-level cost of fatal opioid overdose was calculated by multiplying the U.S. cost of fatal opioid overdose per death by the number of deaths in each state. To facilitate comparison across states, CDC divided state-level combined costs of opioid use disorder and fatal opioid overdose by state population to generate per capita costs. The 38 states and DC were ranked by per capita combined costs. Cost components of opioid use disorder and fatal opioid overdose include the costs of health care, substance use treatment, criminal justice, lost productivity, reduced quality of life, and the value of statistical life lost. These components were calculated by multiplying the number of state cases of opioid use disorder or fatal opioid overdose by national cost estimates per case for each component (*3*).[§]

[§] Cost estimates per case for components of opioid use disorder based on the value of a statistical life were as follows: health care, $14,705; substance use treatment, $1,660; criminal justice, $6,961; lost productivity, $14,707; and reduced quality of life, $183,186. Cost estimates per case for components of fatal opioid overdose were as follows: health care, $5,462; lost productivity, $1.443 million; and value of statistical life, $10.1 million.

Cases of opioid use disorder and fatal opioid overdose varied substantially among states, and the combined costs ranged from $985 million in Wyoming to $72,583 million in Ohio (Table 1). Per capita combined costs also varied widely among states, ranging from $1,204 in Hawaii to $7,247 in West Virginia. The state-level per capita combined costs exhibited geographic patterns (Figure); states with high per capita combined costs were located mainly in the Ohio Valley and New England. Three adjacent states in the Ohio Valley (West Virginia, Ohio, and Kentucky) had the first, second, and fourth highest per capita combined costs ($7,247, $6,226, and $5,491, respectively). Per capita costs of fatal opioid overdose were highest in West Virginia ($5,298) and Ohio ($4,252). Per capita combined costs in four neighboring New England states were among the eight highest: New Hampshire (third highest, $5,953), Massachusetts (fifth highest, $5,381), Maine (sixth highest, $5,099), and Connecticut (eighth highest, $4,800).

States with lower per capita combined costs were mainly in western regions: California, Hawaii, and Wyoming in the West; Minnesota in the Midwest; and Texas in the Southwest. Combined per capita costs were lowest in Hawaii ($1,204) and Minnesota ($1,509). Per capita cost of fatal opioid overdose was the lowest in Hawaii ($429), and per capita cost of opioid use disorder was the lowest in Minnesota ($635). The two most populous states (California and Texas) and the least populous state (Wyoming) were among the states with the lowest per capita combined costs: California, third lowest

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TABLE 1. Case counts and costs of opioid use disorder and fatal opioid overdose and per capita cost, by jurisdiction — 38 states and the District of Columbia, 2017*

Jurisdiction†	Estimated case count of opioid use disorder	Case count of fatal opioid overdose	Cost of opioid use disorder, $ (millions)	Cost of fatal opioid overdose, $ (millions)	Combined cost of opioid use disorder and fatal opioid overdose, $ (millions)	Per capita cost of opioid use disorder, $	Per capita cost of fatal opioid overdose, $	Per capita combined cost of opioid use disorder and fatal opioid overdose, $
Hawaii	5,000	53	1,106.1	612.1	1,718.1	775	429	1,204
Minnesota	16,000	422	3,539.5	4,873.3	8,412.8	635	874	1,509
California	165,000	2,199	36,501.1	25,394.3	61,895.5	923	642	1,566
Wyoming	2,000	47	442.4	542.8	985.2	764	937	1,701
Texas	146,000	1,458	32,298.0	16,837.2	49,135.1	1,141	595	1,736
Iowa	17,000	206	3,760.7	2,378.9	6,139.6	1,196	756	1,952
Georgia	41,000	1,014	9,070.0	11,709.8	20,779.8	870	1,123	1,992
Mississippi	20,000	185	4,424.4	2,136.4	6,560.8	1,483	716	2,199
Colorado	35,000	578	7,742.7	6,674.8	14,417.5	1,381	1,190	2,571
Oklahoma	26,000	388	5,751.7	4,480.7	10,232.4	1,463	1,140	2,603
Oregon	37,000	344	8,185.1	3,972.6	12,157.7	1,976	959	2,935
New York	103,000	3,224	22,785.5	37,231.2	60,016.7	1,148	1,876	3,024
Missouri	34,000	952	7,521.4	10,993.8	18,515.3	1,230	1,798	3,029
Arizona	50,000	928	11,060.9	10,716.7	21,777.6	1,576	1,527	3,104
New Mexico	12,000	332	2,654.6	3,834.0	6,488.6	1,271	1,836	3,107
Washington	68,000	742	15,042.9	8,568.7	23,611.6	2,031	1,157	3,188
Wisconsin	36,000	926	7,963.9	10,693.6	18,657.4	1,374	1,845	3,219
Illinois	73,000	2,202	16,149.0	25,429.0	41,578.0	1,261	1,986	3,248
Florida	140,000	3,245	30,970.6	37,473.7	68,444.3	1,476	1,786	3,262
Virginia	63,000	1,241	13,936.8	14,331.2	28,268.0	1,645	1,692	3,337
South Carolina	37,000	749	8,185.1	8,649.5	16,834.6	1,629	1,722	3,351
Alaska	6,000	102	1,327.3	1,177.9	2,505.2	1,794	1,592	3,386
Tennessee	44,000	1,269	9,733.6	14,654.6	24,388.2	1,449	2,182	3,631
North Carolina	76,000	1,953	16,812.6	22,553.5	39,366.1	1,637	2,195	3,832
Utah	30,000	456	6,636.6	5,265.9	11,902.5	2,140	1,698	3,837
Vermont	5,000	114	1,106.1	1,316.5	2,422.6	1,774	2,111	3,884
Indiana	56,000	1,176	12,388.3	13,580.6	25,968.9	1,858	2,037	3,895
Nevada	34,000	412	7,521.4	4,757.8	12,279.3	2,509	1,587	4,096
Michigan	81,000	2,033	17,918.7	23,477.3	41,396.1	1,799	2,357	4,155
Rhode Island	6,000	277	1,327.3	3,198.8	4,526.1	1,253	3,019	4,271
District of Columbia	2,000	244	442.4	2,817.7	3,260.2	638	4,060	4,698
Connecticut	28,000	955	6,194.1	11,028.5	17,222.6	1,726	3,074	4,800
Maryland	30,000	1,985	6,636.6	22,923.0	29,559.6	1,097	3,788	4,884
Maine	12,000	360	2,654.6	4,157.3	6,812.0	1,987	3,112	5,099
Massachusetts	67,000	1,913	14,821.7	22,091.6	36,913.2	2,161	3,220	5,381
Kentucky	50,000	1,160	11,060.9	13,395.8	24,456.8	2,483	3,007	5,491
New Hampshire	14,000	424	3,097.1	4,896.4	7,993.5	2,306	3,646	5,953
Ohio	104,000	4,293	23,006.8	49,576.1	72,582.9	1,973	4,252	6,226
West Virginia	16,000	833	3,539.5	9,619.6	13,159.1	1,949	5,298	7,247

Source: Florence C, Luo F, Rice K. The economic burden of opioid use disorder and fatal opioid overdose in the United States, 2017. Drug Alcohol Depend 2021;218:108350. https://linkinghub.elsevier.com/retrieve/pii/S0376871620305159

* Estimated case counts of opioid use disorder in 2017 were extracted from the National Survey on Drug Use and Health's 2-Year Restricted-Use Data Analysis System (2016–2017); cases of opioid use disorder were identified by using questions on opioid abuse or dependence during the past year; case counts of fatal opioid overdose and population estimates in 2017 were extracted from CDC's WONDER database; cases of fatal opioid overdose were identified using *International Classification of Diseases, Tenth Revision* codes for the underlying cause-of-death (X40–X44, X60–X64, X85, and Y10–Y14) and then for multiple causes-of-death (T40.0–T40.4 and T40.6).

† Jurisdictions are listed in ascending order of per capita combined cost of opioid use disorder and fatal opioid overdose.

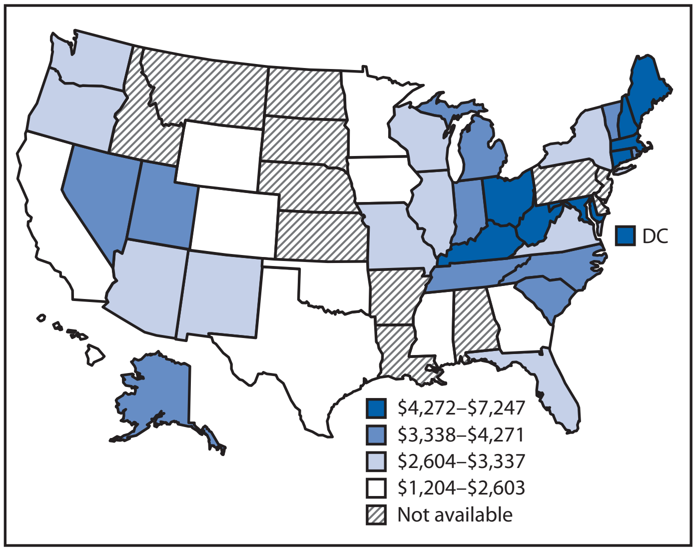
($1,566), Wyoming, fourth lowest ($1,701) and Texas, fifth lowest ($1,736).

Reduced quality of life was the largest component of the cost of opioid use disorder, and the value of statistical life lost was the largest component of the cost of fatal opioid overdose (Table 2). These two components together accounted for approximately 84% of combined costs, followed by lost productivity.

Discussion

The opioid overdose epidemic had a substantial economic impact on the United States during 2017. Individual states differed widely in overall and per capita economic cost. Per capita combined costs of opioid use disorder and fatal opioid overdose were highest in states in the Ohio Valley and New England

FIGURE. Per capita combined costs* of opioid use disorder and fatal opioid overdose — United States, 2017



Abbreviation: DC= District of Columbia.
* Per capita combined costs are combined costs of opioid use disorder and fatal opioid overdose divided by state population and are expressed in 2017 U.S. dollars.

regions. Three states in New England (Connecticut, Maine, and Massachusetts) had high per capita combined costs in 2017. However, previous reports have shown that these states had low per capita lifetime medical and work-loss costs from all fatal injuries (including opioid overdose) in 2014 (*7*). Further investigation is needed to ascertain why states that have relatively low costs for other types of injuries have relatively high costs related to opioid use disorder and fatal overdose.

Several effective strategies have been identified to improve opioid prescribing consistent with clinical guidelines, treat opioid use disorder, and prevent fatal overdose. Pain clinic laws and combined implementation of mandated provider review of state-run prescription drug monitoring program data have reduced the amounts of opioids prescribed and prescription opioid overdose death rates (*8*). Treatment with Food and Drug Administration–approved medications (methadone, buprenorphine, or naltrexone) is the most effective form of treatment for opioid use disorder (*9*). Overdose education and nasal naloxone distribution programs reduced opioid overdose mortality rates in Massachusetts (*10*).

The findings in this report are subject to at least four limitations. First, this study is limited to the 38 states and DC that met drug specificity requirements for mortality data, so the rankings of combined costs and per capita costs do not apply to all 50 states. Second, the cost of opioid use disorder was measured for a single year rather than a lifetime, even though opioid use disorder might have a long-lasting effect on a person's life. Third, the estimated case counts of opioid use

Summary

What is already known about this topic?

The U.S. economic cost of opioid use disorder ($471 billion) and fatal opioid overdose ($550 billion) during 2017 totaled $1,021 billion.

What is added by this report?

In the 39 jurisdictions studied, combined costs of opioid use disorder and fatal opioid overdose varied from $985 million in Wyoming to $72,583 million in Ohio. Per capita combined costs varied from $1,204 in Hawaii to $7,247 in West Virginia. States with high per capita combined costs were located mainly in the Ohio Valley and New England.

What are the implications for public health practice?

Federal and state public health agencies can use these data to help guide decisions regarding research, prevention and response activities, and resource allocation.

disorder likely underrepresent the true prevalence of opioid use disorder because NSDUH does not include persons who are incarcerated or experiencing homelessness, two groups that often have high rates of opioid use disorder. Finally, this study did not directly calculate state costs per case of opioid use disorder and fatal opioid overdose but rather applied the national costs per case of opioid use disorder and fatal opioid overdose to individual states. Population characteristics of opioid use disorder and fatal opioid overdose cases at the state level might differ from those at the national level, potentially biasing state cost estimates.

These estimated costs of opioid use disorder and fatal opioid overdose and their per capita costs at the state level can assist federal and state decision makers in understanding the magnitude of opioid use disorder and fatal opioid overdose in their jurisdictions. Federal and state public health agencies can use these data to help guide decisions regarding research, prevention and response activities, and resource allocation.

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TABLE 2. Cost components of opioid use disorder and fatal opioid overdose, by jurisdiction — 38 states and the District of Columbia, 2017*

Jurisdiction[†]	Estimated case counts of opioid use disorder	Cost components of opioid use disorder, $ (millions)					Case counts of fatal opioid overdose	Cost components of fatal opioid overdose, $ (millions)		
		Health care	Substance use treatment	Criminal justice	Lost productivity	Reduced quality of life		Health care	Lost productivity	Value of statistical life lost
Hawaii	5,000	73.5	8.3	34.8	73.5	915.9	53	0.3	76.5	535.3
Minnesota	16,000	235.3	26.6	111.4	235.3	2,931.0	422	2.3	609.0	4,262.0
California	165,000	2,426.4	273.9	1,148.5	2,426.6	30,225.7	2,199	12.0	3,173.5	22,208.8
Wyoming	2,000	29.4	3.3	13.9	29.4	366.4	47	0.3	67.8	474.7
Texas	146,000	2,147.0	242.4	1,016.2	2,147.2	26,745.2	1,458	8.0	2,104.1	14,725.1
Iowa	17,000	250.0	28.2	118.3	250.0	3,114.2	206	1.1	297.3	2,080.5
Georgia	41,000	602.9	68.1	285.4	603.0	7,510.6	1,014	5.5	1,463.4	10,240.9
Mississippi	20,000	294.1	33.2	139.2	294.1	3,663.7	185	1.0	267.0	1,868.4
Colorado	35,000	514.7	58.1	243.6	514.7	6,411.5	578	3.2	834.1	5,837.5
Oklahoma	26,000	382.3	43.2	181.0	382.4	4,762.8	388	2.1	559.9	3,918.6
Oregon	37,000	544.1	61.4	257.5	544.2	6,777.9	344	1.9	496.4	3,474.2
New York	103,000	1,514.7	171.0	716.9	1,514.8	18,868.2	3,224	17.6	4,652.7	32,560.8
Missouri	34,000	500.0	56.4	236.7	500.0	6,228.3	952	5.2	1,373.9	9,614.7
Arizona	50,000	735.3	83.0	348.0	735.3	9,159.3	928	5.1	1,339.2	9,372.4
New Mexico	12,000	176.5	19.9	83.5	176.5	2,198.2	332	1.8	479.1	3,353.0
Washington	68,000	1,000.0	112.9	473.3	1,000.1	12,456.6	742	4.1	1,070.8	7,493.8
Wisconsin	36,000	529.4	59.8	250.6	529.4	6,594.7	926	5.1	1,336.4	9,352.2
Illinois	73,000	1,073.5	121.2	508.1	1,073.6	13,372.6	2,202	12.0	3,177.8	22,239.1
Florida	140,000	2,058.8	232.4	974.5	2,059.0	25,646.0	3,245	17.7	4,683.0	32,772.9
Virginia	63,000	926.4	104.6	438.5	926.5	11,540.7	1,241	6.8	1,791.0	12,533.5
South Carolina	37,000	544.1	61.4	257.5	544.2	6,777.9	749	4.1	1,080.9	7,564.5
Alaska	6,000	88.2	10.0	41.8	88.2	1,099.1	102	0.6	147.2	1,030.2
Tennessee	44,000	647.0	73.0	306.3	647.1	8,060.2	1,269	6.9	1,831.4	12,816.3
North Carolina	76,000	1,117.6	126.2	529.0	1,117.7	13,922.1	1,953	10.7	2,818.5	19,724.4
Utah	30,000	441.2	49.8	208.8	441.2	5,495.6	456	2.5	658.1	4,605.4
Vermont	5,000	73.5	8.3	34.8	73.5	915.9	114	0.6	164.5	1,151.3
Indiana	56,000	823.5	93.0	389.8	823.6	10,258.4	1,176	6.4	1,697.1	11,877.0
Nevada	34,000	500.0	56.4	236.7	500.0	6,228.3	412	2.3	594.6	4,161.0
Michigan	81,000	1,191.1	134.5	563.8	1,191.3	14,838.1	2,033	11.1	2,933.9	20,532.3
Rhode Island	6,000	88.2	10.0	41.8	88.2	1,099.1	277	1.5	399.8	2,797.6
District of Columbia	2,000	29.4	3.3	13.9	29.4	366.4	244	1.3	352.1	2,464.3
Connecticut	28,000	411.8	46.5	194.9	411.8	5,129.2	955	5.2	1,378.2	9,645.0
Maryland	30,000	441.2	49.8	208.8	441.2	5,495.6	1,985	10.8	2,864.7	20,047.5
Maine	12,000	176.5	19.9	83.5	176.5	2,198.2	360	2.0	519.5	3,635.8
Massachusetts	67,000	985.3	111.2	466.4	985.4	12,273.5	1,913	10.4	2,760.7	19,320.4
Kentucky	50,000	735.3	83.0	348.0	735.3	9,159.3	1,160	6.3	1,674.1	11,715.4
New Hampshire	14,000	205.9	23.2	97.4	205.9	2,564.6	424	2.3	611.9	4,282.2
Ohio	104,000	1,529.4	172.6	723.9	1,529.5	19,051.3	4,293	23.4	6,195.4	43,357.2
West Virginia	16,000	235.3	26.6	111.4	235.3	2,931.0	833	4.6	1,202.1	8,412.9

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Progress in Immunization Safety Monitoring — Worldwide, 2010–2019

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High levels of coverage with safe and effective immunizations are critical to the successful control and prevention of vaccine-preventable diseases worldwide. In addition to stringent standards to regulate the safety of vaccines, robust postlicensure monitoring systems help ensure that the benefits of vaccines continue to outweigh the risks for the populations who receive them. National Expanded Programmes on Immunization (EPI) are typically responsible for identifying and investigating adverse events following immunization (AEFI), including assessment of causality. National regulatory authorities (NRAs) are mandated to perform postlicensure surveillance of adverse drug reactions, including those associated with receipt of vaccines. This report describes global progress toward meeting World Health Organization (WHO) indicators on minimal country capacity for vaccine safety surveillance and coordination of AEFI reporting between countries' EPI and NRAs. In 2019, among 194 countries, 129 (66.5%) reported having an operational national AEFI causality review committee, compared with 94 (48.5%) in 2010. During 2010–2019, the proportion of countries reporting ≥10 AEFI per 100,000 surviving infants per year (an indicator of country capacity to monitor immunization safety) increased, from 41.2% to 56.2%. In 2019, however, only 46 (23.7%) countries reported AEFI data from both EPI and NRAs. Although global progress has been made toward strengthening systems for vaccine safety monitoring over the past decade, new indicators for monitoring global immunization safety performance are needed to better reflect program functionality. Continued global efforts will be vital to address barriers to routine reporting of AEFI, build national capacity for AEFI investigation and data management, and improve sharing of AEFI data at national, regional, and global levels.

In 2014, WHO's Global Advisory Committee for Vaccine Safety proposed two performance indicators to assess minimum country capacity for vaccine safety monitoring: 1) having a national causality review committee and 2) reporting ≥10 AEFI per 100,000 surviving infants per year (*1*). WHO monitors annual country progress toward meeting these indicators using aggregate passive AEFI data collected through the collaborative WHO and UNICEF Joint Reporting Form (JRF), a questionnaire for the joint collection of data (*2*). NRAs also report case-based AEFI data to the WHO Collaborating Centre for International Drug Monitoring at the Uppsala Monitoring Centre (UMC) in Sweden through VigiBase, the global database of individual case safety reports (*3*). Coordination of AEFI reporting between EPI and NRAs helps to ensure data quality, completeness, and usability, so that any safety signals* can be detected and responded to quickly (*4*). When country EPI and NRA programs coordinate, the AEFI data reported globally through each system align. To assess the degree of coordination of AEFI reporting between national EPI and NRA programs, publicly available data reported globally during 2010 and 2015–2019 through the JRF were compared with those reported through VigiBase, the pharmacovigilance database developed by UMC (*4*). Reporting to either system is voluntary and varies by year. Countries not reporting to VigiBase or through the JRF during the reporting period were included in the denominator when calculating proportions and considered as not meeting the measured goals. Countries were classified as low, lower middle, upper middle, and high income, based on World Bank income group classifications, to categorize differences in reporting trends (*5*).

In 2010, only 94 (48.5%) of 194 countries reported having an operational national AEFI causality review committee, compared with 126 (64.9%) in 2015, 132 (68.0%) in 2018, and 129 (66.5%) in 2019, representing an increase of 37.2% from 2010 to 2019. In 2019, among 194 WHO member states that reported to the JRF, 167 (86.0%) reported having a national system to monitor AEFI in all age groups. The proportion of countries achieving the indicator of ≥10 AEFI reports per 100,000 surviving infants was higher during 2018 (61.9%) and 2019 (56.2%) than in 2010 (41.2%) in all regions (Table). The largest increase (from seven [14.9%] countries in 2010 to 27 [57.4%] in 2019) occurred in the African Region (AFR). Whereas an increase in the percentage of countries achieving the indicator was reported in all regions from 2010 to 2018 and 2019, declines were observed from 2018 to 2019 in the South-East Asia Region (SEAR) (81.8% to 63.6%), Eastern Mediterranean Region (EMR) (from 57.1% to 52.4%), European Region (EUR) (66.0% to 52.8%), and Western Pacific Region (WPR) (44.4% to 40.7%). The highest percentage of countries achieving the indicator in 2019 was in the Region of the Americas (AMR) (71.4%), followed by SEAR (63.6%); the lowest percentage (40.7%) was in WPR.

Among the 194 countries, 164 reported the source of national AEFI data in 2019. The primary data source was EPI

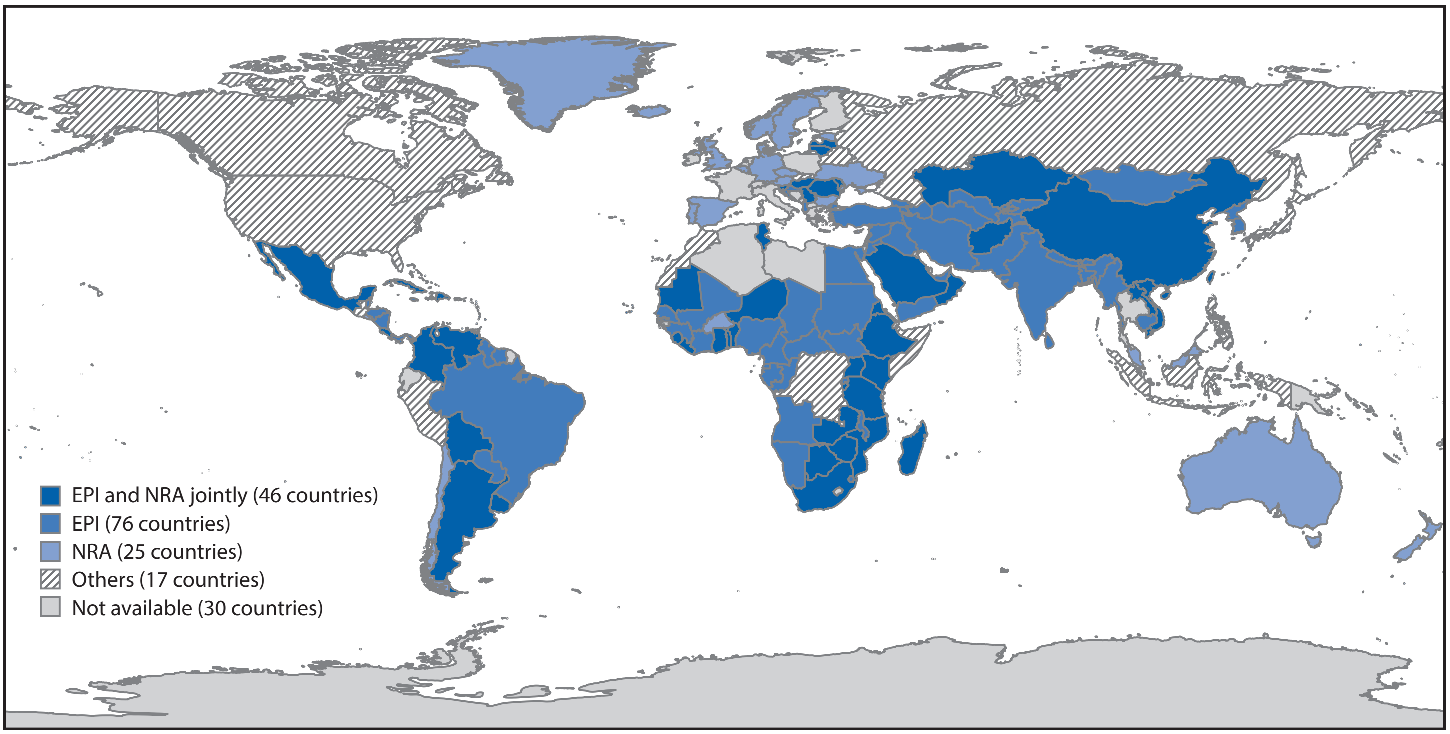
* Defined as "information (from one or multiple sources) which suggests a new potentially causal association, or a new aspect of a known association, between an intervention and an event or set of related events, either adverse or beneficial, that is judged to be of sufficient likelihood to justify verificatory action."

TABLE. Number of countries reporting ≥10 adverse events following immunization per 100,000 surviving infants, by World Health Organization (WHO) region and year — worldwide, 2010 and 2015–2019*

WHO region	No. of countries in region	No (%),† by year					
		2010	2015	2016	2017	2018	2019
AFR	47	7 (14.9)	13 (27.7)	22 (46.8)	20 (42.6)	27 (57.4)	27 (57.4)
AMR	35	21 (60.0)	22 (62.9)	24 (68.6)	21 (60.0)	25 (71.4)	25 (71.4)
EMR	21	8 (38.1)	9 (42.9)	10 (47.6)	12 (57.1)	12 (57.1)	11 (52.4)
EUR	53	34 (64.2)	34 (43.4)	37 (69.8)	45 (84.9)	35 (66.0)	28 (52.8)
SEAR	11	4 (36.4)	3 (27.0)	7 (63.6)	9 (81.8)	9 (81.8)	7 (63.6)
WPR	27	6 (22.2)	12 (44.4)	11 (40.7)	13 (48.1)	12 (44.4)	11 (40.7)
All regions	**194**	**80 (41.2)**	**93 (47.9)**	**111 (57.2)**	**120 (61.9)**	**120 (61.9)**	**109 (56.2)**

Abbreviations: AFR = African Region; AMR = Region of the Americas; EMR = Eastern Mediterranean Region; EUR = European Region; SEAR = Southeast Asia Region; WPR = Western Pacific Region.
* Data from WHO/UNICEF Joint Reporting Form data for 2010, 2015, 2016, 2017, 2018, and 2019.
† Missing data were included in the denominator.

FIGURE 1. Sources of data for adverse events following immunization reported on the WHO/UNICEF Joint Reporting Form — worldwide, 2019



Abbreviations: EPI = Expanded Programmes on Immunization; NRA = national regulatory authorities; WHO = World Health Organization.

for 76 (39.2%) countries, NRA for 25 (12.9%) countries, and both for 46 (23.7%) countries (Figure 1). Seventeen (8.8%) countries[†] reported that other independent safety monitoring institutions served as the source of the national AEFI data (such as the Vaccine Adverse Event Reporting System in the United States). During 2018, the absolute numbers of AEFI reported through the JRF, compared with those received by VigiBase, varied by country income status (Figure 2) and WHO region (Figure 3). Higher income countries and those in AMR and EUR tended to report more frequently to VigiBase. High-income countries also tended to report more serious AEFI[§] than did low- and middle-income countries.

† Belarus, Canada, Democratic Republic of the Congo, Guatemala, Haiti, Indonesia, Japan, Monaco, Morocco, Peru, Philippines, Russian Federation, San Marino, Slovakia, Somalia, Timor-Leste, and the United States.

§ Serious AEFI are those that are life-threatening, result in hospitalization or a prolongation of hospitalization, result in persistent or substantial disability, or where the outcome is a birth defect or death, as defined by WHO. Nonserious AEFI are those that do not pose a potential risk to the health of the recipient.

Summary

What is already known about this topic?

Assessing vaccination safety is important to maintaining public confidence in immunization programs. Reporting of adverse events following immunization (AEFI) can be hampered by uncoordinated action between national regulatory authorities and national Expanded Programmes on Immunization.

What is added by this report?

During 2010–2019, countries with AEFI review committees increased from 94 (48.5%) to 129 (66.5%) of 194, and those reporting ≥10 AEFI per 100,000 surviving infants increased from 80 (41.2%) to 109 (56.2%). In 2019, however, only 46 (23.7%) reported combined data from national regulatory authorities and Expanded Programmes on Immunization.

What are the implications for public health practice?

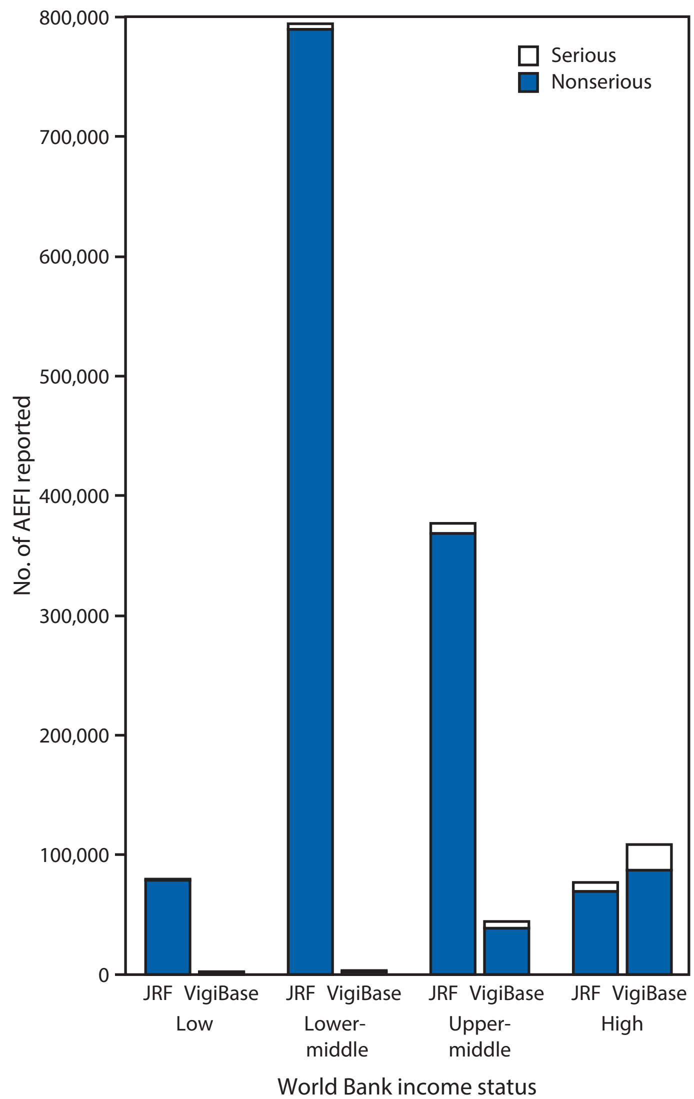
Updated AEFI surveillance indicators, reduced barriers to reporting, and improved coordination among authorities are needed to strengthen national vaccine safety surveillance systems.

Discussion

Modern vaccines are safe and effective. However, because vaccines are targeted toward healthy persons seeking to reduce their risk for disease, national immunization programs need to be able to detect and respond to any vaccine safety concerns, ensure effective vaccine safety monitoring is in place, and maintain public confidence in immunization programs. Most WHO regions made progress toward achieving the minimum capacity for vaccine safety monitoring in 2018 and 2019, when compared with 2010, by establishing national AEFI causality committees and reporting ≥10 AEFI per 100,000 surviving infants. Progress has been particularly notable in AFR, where WHO implemented vaccine safety trainings, standardized AEFI data collection tool development, and supported development of national AEFI surveillance system guidelines (*4*).

Much work is still needed to strengthen global vaccine safety monitoring, particularly in WPR, AFR, EUR, and EMR. Barriers to routine reporting of AEFI include 1) lack of reporting tools, 2) poor health care worker understanding of AEFI, 3) weak or poorly coordinated NRA and EPI reporting systems, and 4) health care worker fear of punishment (*6*). Vaccine safety systems are further challenged by a lack of investigative and causality assessment capacity. These issues are particularly relevant in low- and middle-income countries (*7*). Countries that perform consistently well over time have demonstrated a national commitment to addressing these barriers and allocating resources. In Eritrea (in AFR), for example, the number of AEFI reports from EPI increased approximately eightyfold, from 11 in 2016 to 966 in 2018, after NRAs and EPI began an integrated approach to AEFI surveillance. Aided by a GAVI grant,[¶] Eritrea has conducted vaccine pharmacovigilance, provided AEFI training to health care professionals, and established an AEFI causality assessment committee.

FIGURE 2. Serious and nonserious* adverse events following immunization (AEFI) reported globally to the WHO/UNICEF Joint Reporting Form (JRF) (164 countries) and VigiBase (95 countries), by country income status† — worldwide, 2018



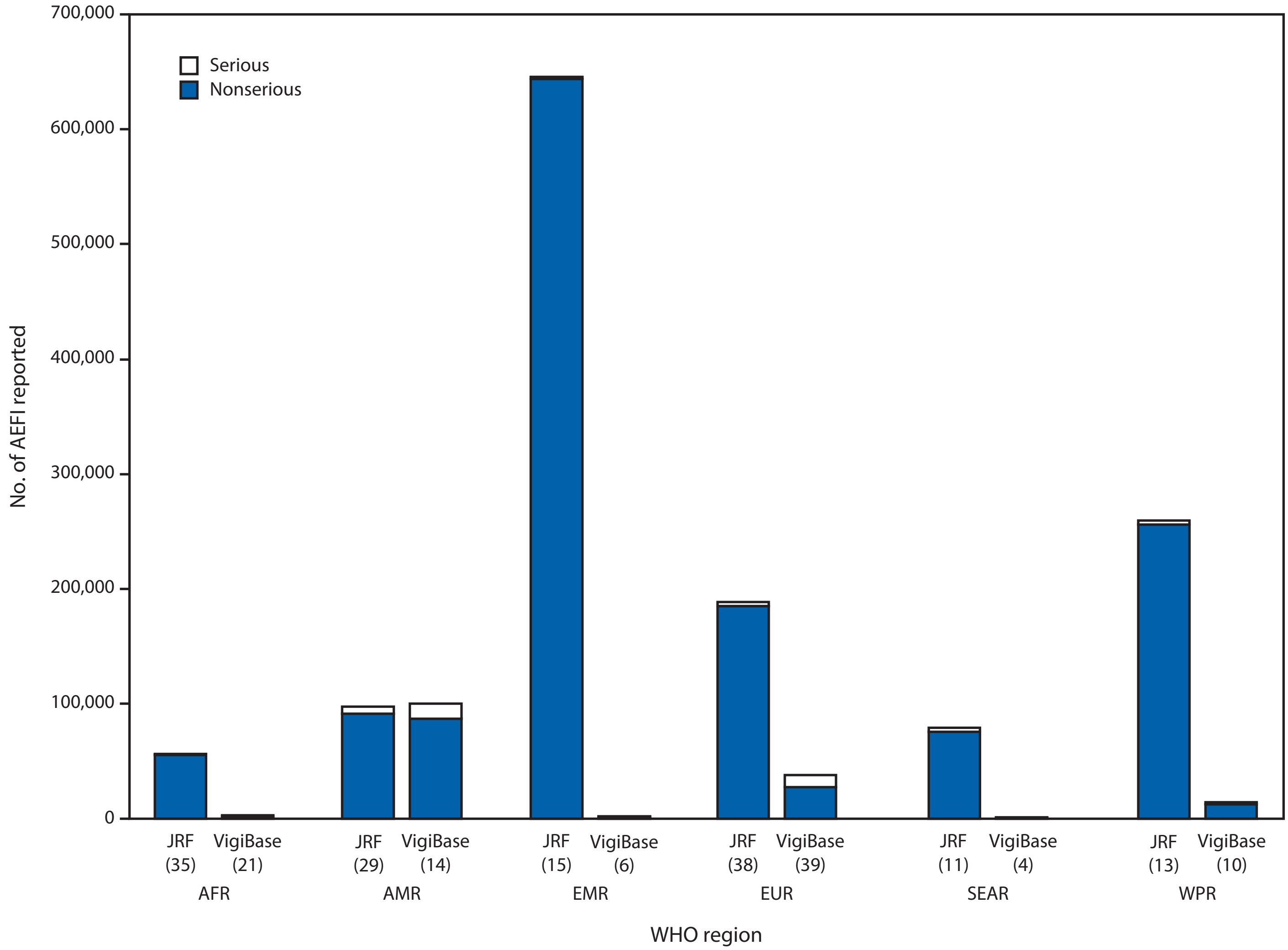
Abbreviation: WHO = World Health Organization.

* Serious AEFI are those that are life-threatening, result in hospitalization or a prolongation of hospitalization, result in persistent or substantial disability, or where the outcome is a birth defect or death, as defined by the World Health Organization. A nonserious AEFI does not pose a potential risk to the health of the recipient.

† Country income classification based on World Bank Country and Lending Groups classification gross national income (GNI) data (low: GNI ≤$1,035; lower-middle: GNI = $1,036–$4,045; upper-middle: GNI = $4,046–12,535; high: GNI ≥12,536). https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups

¶ https://www.gavi.org

FIGURE 3. Serious and nonserious* adverse events following immunization (AEFI) reported globally to the WHO/UNICEF Joint Reporting Form (JRF) (164 countries) and VigiBase (95 countries), by WHO region — worldwide, 2018



Abbreviations: AFR = African Region; AMR = Region of the Americas; EMR = Eastern Mediterranean Region; EUR = European Region; SEAR = South-East Asia Region; WHO = World Health Organization; WPR = Western Pacific Region.

* Serious AEFIs are those that are life-threatening, result in hospitalization or a prolongation of hospitalization, result in persistent or substantial disability, or where the outcome is a birth defect or death, as defined by the World Health Organization. A nonserious AEFI does not pose a potential risk to the health of the recipient.

The WHO Global Vaccine Safety Blueprint emphasizes the importance of sharing global vaccine safety data in a national vaccine pharmacovigilance plan (*4*). Sharing data at global and regional levels is critical for monitoring very rare adverse events and for sharing information across countries. At the national level, coordination between EPI and NRA systems is critical to ensure prompt recognition of and response to AEFI, and to protect public health and maintain community trust in the immunization program. Over the past decade, WHO and UMC have collaborated to improve AEFI reporting from country EPIs and NRAs through adaptations in VigiBase-related tools and JRF reporting processes (*8*). Still, only 23.7% of countries reporting to JRF use data that have a combined EPI and NRA data source. The numbers of AEFI reported by NRAs (to UMC) and EPI (to JRF) differ, especially in low- and middle-income countries. Barriers to sharing data at national and global levels include the licensing and operation of AEFI data management and surveillance systems, particularly from data management software developers. To address this, UMC subsidizes country subscription fees for VigiFlow,** an optional national data management system associated with VigiBase.

The findings in this report are subject to at least two limitations. First, the current WHO indicators for minimum safety capacity can provide an inaccurate picture of the quality of the program. For example, many countries only reach minimum capacity for vaccine safety monitoring because they conduct

** https://www.who-umc.org/global-pharmacovigilance/vigiflow/

periodic immunization campaigns or other intensified activities, such that an influx in funding, training, and attention to AEFI might contribute to an increase in the number of reports (*9*). Second, the available JRF indicators are unable to capture the performance of AEFI review committees once established, the quality of AEFI investigations, and the quality of surveillance among different target populations. New indicators need to differentiate between serious and nonserious AEFI. Safety Blueprint 2.0, which was endorsed by WHO's Global Advisory Committee for Vaccine Safety and the Strategic Advisory Group of Experts on Immunization, explains the need for more robust indicators for monitoring safety system performance and stated the case for national, regional, and global investment in safety systems (*10*).

Despite overall progress across the WHO regions in achieving minimum indicators of vaccine safety monitoring, new indicators for monitoring global immunization safety performance are needed to better reflect program functionality. Continued efforts will be vital to address barriers to routine reporting of AEFI, build national capacity for AEFI investigation and data management, and improve sharing of AEFI data at national, regional, and global levels.

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Update: COVID-19 Pandemic–Associated Changes in Emergency Department Visits — United States, December 2020–January 2021

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During March 29–April 25, 2020, emergency department (ED) visits in the United States declined by 42% after the declaration of a national emergency for COVID-19 on March 13, 2020. Among children aged ≤10 years, ED visits declined by 72% compared with prepandemic levels (*1*). To assess the continued impact of the COVID-19 pandemic on EDs, CDC examined trends in visits since December 30, 2018, and compared the numbers and types of ED visits by patient demographic and geographic factors during a COVID-19 pandemic period (December 20, 2020–January 16, 2021) with a prepandemic period 1 year earlier (December 15, 2019–January 11, 2020). After an initial decline during March–April 2020 (*1*), ED visits increased through July 2020, but at levels below those during the previous year, until December 2020–January 2021 when visits again fell to 25% of prepandemic levels. During this time, among patients aged 0–4, 5–11, 12–17, and ≥18 years, ED visits were lower by 66%, 63%, 38%, and 17%, respectively, compared with ED visits for each age group during the same period before the pandemic. Differences were also observed by region and reasons for ED visits during December 2020–January 2021; more visits during this period were for infectious diseases or mental and behavioral health–related concerns and fewer visits were for gastrointestinal and upper-respiratory–related illnesses compared with ED visits during December 2019–January 2020. Although the numbers of ED visits associated with socioeconomic factors and mental or behavioral health conditions are low, the increased visits by both adults and children for these concerns suggest that health care providers should maintain heightened vigilance in screening for factors that might warrant further treatment, guidance, or intervention during the COVID-19 pandemic.

Data were obtained from the National Syndromic Surveillance Program (NSSP),* a collaborative system developed and maintained by CDC, state and local health departments, and academic and private sector health partners. NSSP collects electronic health data in near real-time, including ED visits from a subset of hospitals in 49 states (all but Hawaii) and the District of Columbia. This study analyzed information collected from approximately 71% of nonfederal facilities, nationwide, using data for all ED visits from participating hospitals in the 46 states that reported ED visits consistently during the prepandemic (December 15, 2019–January 11, 2020) and pandemic (December 20, 2020–January 16, 2021) periods assessed. All hospitals in Hawaii, Ohio, South Dakota, and Wyoming, and hospitals in other states that started or stopped reporting during 2019–2021 were excluded. Patient diagnoses were analyzed using a subset of records that included at least one specific, billable *International Classification of Diseases, Tenth Revision, Clinical Modification* (ICD-10-CM) code. Facilities that did not report diagnostic codes consistently or reported incomplete codes during 2019–2021 were excluded. ED visits were categorized using the Clinical Classifications Software Refined tool from the Healthcare Cost and Utilization Project, which combines ICD-10-CM codes into clinically meaningful groups (*2*).

This analysis was limited to the top 200 diagnostic categories (pediatric = 455 total diagnostic categories; adult = 497 total diagnostic categories) for each patient-level category evaluated during the assessed periods. The 10 categories with the highest and lowest significant (p<0.05) prevalence ratios (PRs)† were identified. Trends in ED visits during December 30, 2018–January 16, 2021 were examined; overall analysis of trends focused on the prepandemic period during December 15, 2019–January 11, 2020 and the pandemic period during December 20, 2020–January 16, 2021, with comparisons by patient sex, age, U.S. Department of Health and Human Services (HHS) region,§ and reason for the visit. Estimates of weekly change¶ and PRs were

* https://www.cdc.gov/nssp/index.html

† PR and associated 95% confidence interval of visits was calculated for each diagnostic category as the proportion of ED visits during the pandemic period (December 20, 2020–January 16, 2021) divided by the proportion of visits during the comparison prepandemic period (December 15, 2019–January 11, 2020) ([ED visits in diagnostic category in pandemic period/all ED visits in pandemic period]/[ED visits in diagnostic category in comparison period/all ED visits in comparison period]).

§ HHS Region 1: Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont; Region 2: New Jersey, New York. Region 3: Delaware, District of Columbia, Maryland, Pennsylvania, Virginia, and West Virginia; Region 4: Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, and Tennessee; Region 5: Illinois, Indiana, Michigan, Minnesota, and Wisconsin; Region 6: Arkansas, Louisiana, New Mexico, Oklahoma, and Texas; Region 7: Iowa, Kansas, Missouri, and Nebraska; Region 8: Colorado, Montana, North Dakota, and Utah; Region 9: Arizona, California, Nevada; Region 10: Alaska, Idaho, Oregon, and Washington.

¶ The weekly change in ED visits during the pandemic and comparison prepandemic periods was calculated as the difference in total counts between the two periods, divided by 4 weeks ([visits (pandemic period) in diagnostic category – visits (comparison period) in diagnostic category]/4).

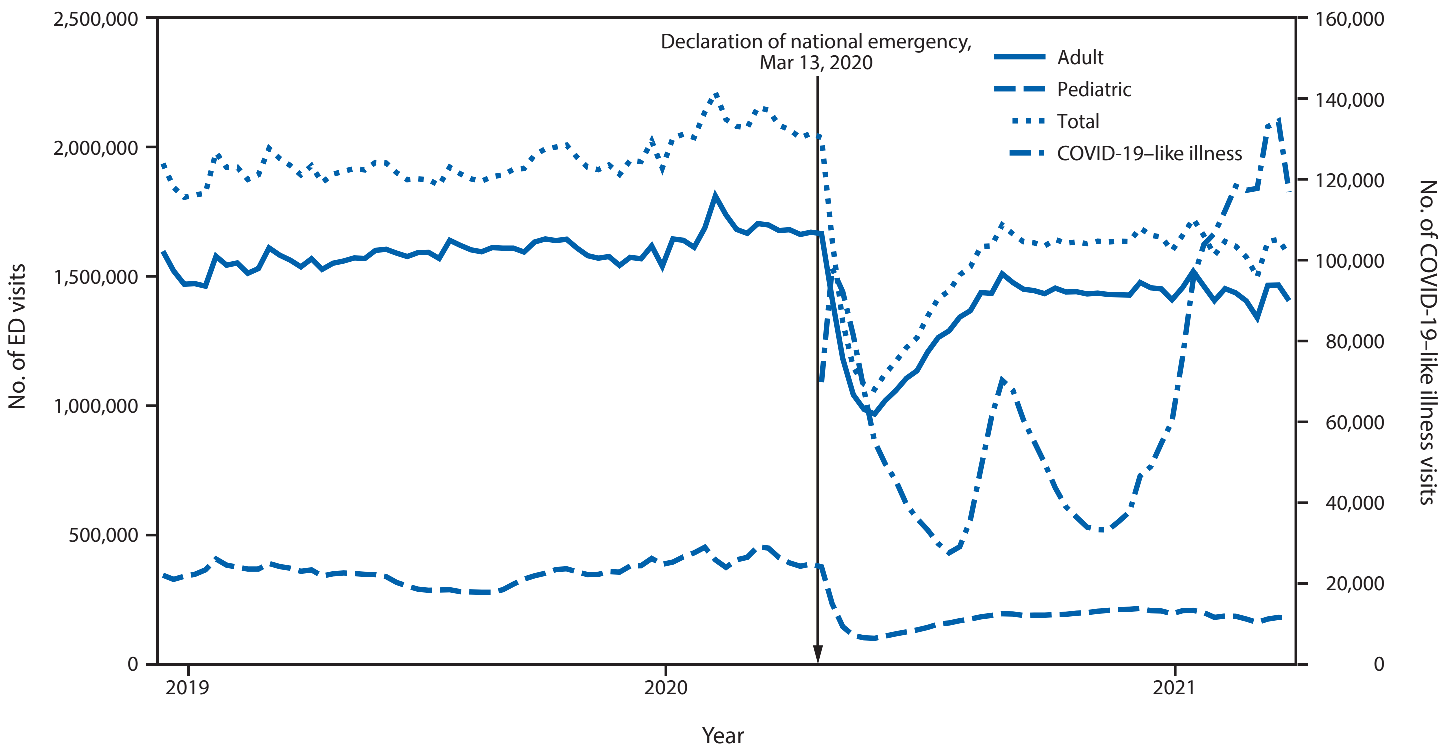
calculated to assess differences in numbers of ED visits between the two periods. All analyses were conducted using R software (version 4.0.; The R Foundation) This activity was reviewed by CDC and was conducted consistent with applicable federal law and CDC policy.**

After decreasing by 42% during March–April 2020 (*1*), overall U.S. ED visits increased through July 2020 then stabilized in August 2020 at levels 15% below those during the same prepandemic period. During December 2020–January 2021, numbers of visits declined again to a level 25% lower than those during the previous year (December 2019–January 2020) (Figure), including a 23% decline in visits by males and a 27% decline in visits by females. During December 2020–January 2021, the numbers of ED visits in all age groups were lower than were those during the prepandemic period. The largest observed decline in visits was among children, especially those aged 0–4 years (66%) and 5–11 years (63%) (Supplementary Figure 1, https://stacks.cdc.gov/view/cdc/104808). ED visits by adults aged ≥18 years were 17% lower than ED visits during the prepandemic period (Figure). During December 2020–January 2021, ED visits varied by HHS region, ranging from an overall 29% decrease in the upper Midwest to a 21% decrease in the Northeast. ED visits by adults and pediatric patients declined in all regions (Supplementary Figure 2, https://stacks.cdc.gov/view/cdc/104808), ranging from a 23% decrease in the West (Region 9) to a 14% decrease in the Northeast (Region 3) among adults, and from 65% in the Northeast (Region 2) to 53% in the Midwest (Region 7) among children.

During December 2020–January 2021, the proportion of ED visits for infectious disease–related concerns (i.e., exposure, encounters, screening, or contact with infectious disease) was higher than that during the same period before the pandemic for adults (PR = 5.86) and children (PR = 9.22), as were the proportion of visits related to socioeconomic and psychosocial (mental and behavioral health–related concerns) factors (adults PR = 1.37; children PR = 2.56). Among adults, the proportion of ED visits during this period was also higher than that during the prepandemic period for menopausal disorders (PR = 1.89); respiratory failure, insufficiency, and arrest (PR = 1.62); acute pulmonary embolism (PR = 1.59); cardiac arrest and ventricular fibrillation (PR = 1.45); malaise and fatigue (PR = 1.34);

** 45 C.F.R. part 46, 21 C.F.R. part 56; 42 U.S.C. Sect. 241(d); 5 U.S.C. Sect. 552a; 44 U.S.C. Sect. 3501 et seq.

FIGURE. Weekly number of total,* adult,† and pediatric§ emergency department (ED) visits and COVID-19–like illness visits — National Syndromic Surveillance Program, United States,¶ December 30, 2018–January 16, 2021



* Total, adult, and pediatric visits include visits for COVID-19–like illness.
† Patients aged ≥18 years.
§ Patients aged <18 years.
¶ Forty-six states and the District of Columbia. All facilities in Hawaii, Ohio, South Dakota, and Wyoming, and facilities in other states that started or stopped reporting to the National Syndromic Surveillance Program during 2019–2021 were excluded.

acute and unspecified renal failure (PR = 1.33); and symptoms of mental and substance-use conditions (PR = 1.28) (Table 1). Among children, the proportion of ED visits during this period was higher compared with the prepandemic period for calculus of the urinary tract (PR = 2.70); open wounds to limbs, subsequent encounter (PR = 2.67); suicidal ideation, attempt, and intentional self-harm (PR = 2.64); sexually transmitted infections (HIV and viral hepatitis) (PR = 2.57); schizophrenia spectrum and other psychotic disorders (PR = 2.55); lifestyle and life management factors (e.g., tobacco use, lack of physical exercise, high-risk sexual behavior, sleep deprivation or insomnia, or stress or burnout) (PR = 2.55); feeding and eating disorders (PR = 2.52); and open wounds of the head and neck, subsequent encounter (PR = 2.51) (Table 2). Decreases in the proportion of ED visits related to gastrointestinal and upper respiratory–related factors were identified in both adults and children, with the largest declines among children for influenza (PR = 0.01), acute bronchitis (PR = 0.17), pneumonia except that caused by tuberculosis (PR = 0.30), otitis media (0.36), and sinusitis (PR = 0.42).

Discussion

After a decline in ED visits in the United States associated with the COVID-19 pandemic during March–April 2020 (*1*), ED visits steadily increased through July 2020, and then stabilized through the fall. During December 2020–January 2021, visits declined again to a level 25% lower than that during December 2019–January 2020. These declines were highest in children aged ≤10 years, who had 65% fewer ED visits during December 2020–January 2021 than during December 2019–January 2020. Although ED visits increased among adults during December 2020–January 2021, they

TABLE 1. Prepandemic to pandemic* changes in the number of weekly emergency department (ED) visits† among adults aged ≥18 years and prevalence ratios (PRs),§ by diagnostic categories¶ with the highest and lowest PRs — National Syndromic Surveillance Program (NSSP), United States,†† December 15, 2019–January 16, 2021**

Diagnostic category	Absolute change in mean no. of weekly ED visits	PR (95% CI)
Highest PRs		
Exposure, encounters, screening, or contact with infectious disease	54,570	5.86 (5.81–5.92)
Menopausal disorders	1,789	1.89 (1.85–1.93)
Respiratory failure, insufficiency, and arrest	6,884	1.62 (1.61–1.64)
Acute pulmonary embolism	1,056	1.59 (1.55–1.62)
Cardiac arrest and ventricular fibrillation	601	1.45 (1.42–1.49)
Socioeconomic/Psychosocial factors	878	1.37 (1.35–1.39)
Malaise and fatigue	2,605	1.34 (1.33–1.35)
Acute and unspecified renal failure	2,317	1.33 (1.32–1.34)
Symptoms of mental and substance use conditions	239	1.28 (1.25–1.30)
Abnormal findings without diagnosis	2,227	1.27 (1.26–1.28)
Lowest PRs		
Influenza	−34,870	0.03 (0.03–0.03)
Acute bronchitis	−21,984	0.26 (0.26–0.27)
Sinusitis	−8,227	0.41 (0.40–0.42)
Otitis media	−4,945	0.41 (0.41–0.42)
Other specified upper respiratory infections	−33,488	0.48 (0.48–0.49)
Intestinal infection	−2,398	0.62 (0.61–0.64)
Cornea and external disease	−3,258	0.70 (0.69–0.71)
Noninfectious gastroenteritis	−5,944	0.71 (0.70–0.72)
Viral infection	−9,986	0.74 (0.73–0.75)
Other specified and unspecified disorders of the ear	−3,394	0.75 (0.74–0.76)

Abbreviation: CI = confidence interval.

* Prepandemic period analyzed was December 15, 2019–January 11, 2020; pandemic period analyzed was December 20, 2020–January 16, 2021.

† The weekly change in ED visits during the pandemic and comparison prepandemic periods was calculated as the difference in total counts between the two periods, divided by 4 weeks. Absolute change in mean number of ED visits for each diagnostic category is presented as a data label within parentheses. In the pandemic period, the average weekly visits across facilities for adults was 403 (range = 0.25–5,906) and in the comparison period, the average weekly visits across facilities for adults was 493 (range = 0.25–11,756).

§ Ratio calculated as the proportion of all ED visits in each diagnostic category during the pandemic period, divided by the proportion of all ED visits in that category during the comparison period. Ratios >1 indicate a higher proportion of visits in that category during the pandemic period than during the comparison period; ratios <1 indicate a lower proportion during the pandemic period than during the comparison period.

¶ ED visits were categorized using the Clinical Classifications Software Refined tool from the Healthcare Cost and Utilization Project, which combines *International Classification of Diseases, Tenth Revision, Clinical Modification* codes into clinically meaningful groups. https://www.hcup-us.ahrq.gov/toolssoftware/ccsr/dxccsr.jsp

** The analysis was limited to the top 200 diagnostic categories for each patient-level category (pediatric = 455 total diagnostic categories; adult = 497 total diagnostic categories) evaluated during the assessed period. The 10 categories with the highest and lowest significant (p<0.05) PRs were identified.

†† Only facilities consistently reporting informative discharge diagnoses in the two periods (i.e., not null and with terms like "unknown") were included in the analysis. Forty-six states and the District of Columbia are included. All facilities in Hawaii, Ohio, South Dakota, and Wyoming, and facilities in other states that started or stopped reporting to the NSSP during 2019–2021 were excluded.

TABLE 2. Prepandemic to pandemic* changes in the number of weekly emergency department (ED) visits† among children aged <18 years and prevalence ratios (PRs),§ by diagnostic categories¶ with the highest and lowest PRs — National Syndromic Surveillance Program (NSSP), United States,†† December 15, 2019–January 16, 2021**

Diagnostic category	Absolute change in mean no. of weekly ED visits	PR (95% CI)
Highest PRs		
Exposure, encounters, screening, or contact with infectious disease	6,175	9.22 (9.01–9.43)
Calculus of urinary tract	18	2.70 (2.44–2.98)
Open wounds to limbs, subsequent encounter	9	2.67 (2.34–3.06)
Suicidal ideation/attempt/intentional self-harm	174	2.64 (2.57–2.72)
Sexually transmitted infections (excluding HIV and hepatitis)	5	2.57 (2.26–2.94)
Socioeconomic/Psychosocial factors	22	2.56 (2.41–2.72)
Lifestyle/Life management factors	12	2.55 (2.36–2.76)
Schizophrenia spectrum and other psychotic disorders	6	2.55 (2.27–2.86)
Feeding and eating disorders	2	2.52 (2.18–2.92)
Open wounds of head and neck, subsequent encounter	4	2.51 (2.26–2.79)
Lowest PRs		
Influenza	−33,554	0.01 (0.01–0.01)
Acute bronchitis	−15,308	0.17 (0.16–0.17)
Pneumonia (except that caused by tuberculosis)	−5,665	0.30 (0.29–0.31)
Otitis media	−20,187	0.36 (0.35–0.36)
Sinusitis	−1,085	0.42 (0.39–0.45)
Other specified upper respiratory infections	−43,194	0.48 (0.48–0.48)
Cornea and external disease	−3,900	0.51 (0.49–0.52)
Viral infection	−21,378	0.53 (0.52–0.53)
Intestinal infection	−1,726	0.58 (0.56–0.61)
Diseases of middle ear and mastoid (except otitis media)	−486	0.62 (0.57–0.67)

Abbreviation: CI = confidence interval.

* Prepandemic period analyzed was December 15, 2019–January 11, 2020; pandemic period analyzed was December 20, 2020–January 16, 2021.

† The weekly change in ED visits during the pandemic and comparison prepandemic periods was calculated as the difference in total counts between the two periods, divided by 4 weeks. Absolute change in mean number of ED visits for each category in the figures is presented as a data label within parentheses. In the pandemic period, the average weekly visits across facilities for pediatrics was 50 (range = 0.25–1,316) and in the comparison period the average weekly visits across facilities for pediatrics was 122 (range = 0.25–2,565).

§ Ratio calculated as the proportion of all ED visits in each diagnostic category during the pandemic period, divided by the proportion of all ED visits in that category during the comparison period. Ratios >1 indicate a higher proportion of visits in that category during the pandemic period than during the comparison period; ratios <1 indicate a lower proportion during the pandemic period than during the comparison period.

¶ ED visits were categorized using the Clinical Classifications Software Refined tool from the Healthcare Cost and Utilization Project, which combines *International Classification of Diseases, Tenth Revision, Clinical Modification* codes into clinically meaningful groups. https://www.hcup-us.ahrq.gov/toolssoftware/ccsr/dxccsr.jsp

** The analysis was limited to the top 200 diagnostic categories for each patient-level category (pediatric = 455 total diagnostic categories; adult = 497 total diagnostic categories) evaluated during the assessed period. The 10 categories with the highest and lowest significant (p<0.05) PRs were identified.

†† Only facilities consistently reporting informative discharge diagnoses in the two periods (i.e., not null and with terms like "unknown") were included in the analysis. Forty-six states and the District of Columbia are included. All facilities in Hawaii, Ohio, South Dakota, and Wyoming, and facilities in other states that started or stopped reporting to the NSSP during 2019–2021 were excluded.

were 17% below those during the prepandemic period. There was a decline in ED visits among children for conditions such as influenza, acute bronchitis, and pneumonia, which could reflect reduced transmission of other pathogens; therefore the decreased visits might represent appropriate use of ED care or that children might be disproportionately affected by changes in care-seeking behaviors because of the COVID-19 pandemic. The reasons for ED visits have changed during the pandemic period compared with those during the prepandemic period. More visits were associated with severe respiratory and cardiovascular conditions during the pandemic period; more adults and children have also been seeking emergency care for mental or behavioral health and socioeconomic and psychosocial concerns. However, weekly numbers for visits for some categories of mental or behavioral health diagnoses (e.g., feeding and eating disorders) remain relatively low, particularly among pediatric patients.

Decreases in the numbers of ED visits among children might disproportionately affect families that lack reliable access to primary care and might instead use EDs for treatment (*3*), possibly preventing them from obtaining needed care. In addition, the wide regional variations in numbers of ED visits might indicate differences in public health messaging and risk perceptions regarding COVID-19, stay-at-home policies, transmission patterns, access to testing and primary care, as well as other factors. Possible barriers to necessary medical care should be addressed with targeted public health messaging and clinical guidance to ensure that treatment for critical conditions is not delayed. Although the numbers of ED visits associated with socioeconomic factors and mental or behavioral health conditions are low, the increased proportion of these visits by both adults and children suggests that health care providers should maintain heightened vigilance in screening for factors that might warrant further treatment, guidance, or intervention during the COVID-19 pandemic (*4*,*5*).

The findings in this report are subject to at least four limitations. First, diagnostic categories rely on the use of specific codes, which might be missing or used inconsistently across hospitals (*6*). Second, NSSP coverage is not uniform across or within states; some hospitals report statewide and others do not report statewide or have no data available for some counties. However, given that NSSP data represent 71% of U.S. EDs, trends identified at the national level likely represent actual patterns in persons seeking care during the COVID-19 pandemic. Third, this analysis did not analyze NSSP data by age, sex, race, and ethnicity within each region; future studies that evaluate this information can help guide interventions to address the increased prevalence of socioeconomic factors and mental or behavioral health conditions associated with ED visits. Finally, ED visits and trends are likely the result of many factors that can be challenging to fully understand with limited patient data available; additional studies are needed to help guide public health communication strategies on ED use.

These findings provide updates for clinical and public health stakeholders on the changing profile of ED visits associated with the COVID-19 pandemic. CDC is available to provide support to sites interested in participating in NSSP to monitor for critical trends in ED visits. As the nation continues to manage the impact of the ongoing pandemic, public understanding of the importance of seeking guidance and emergency care for acute and mental or behavioral health conditions is necessary. Wider access to health messages, triage help lines, and virtual visits that help all persons, especially caregivers of children and adolescents, can help determine when seeking immediate care might be warranted and might also result in fewer patients seeking ED care (*7*).

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Summary

What is already known about this topic?

During March 29–April 25, 2020, U.S. emergency department (ED) visits declined by 42% after the declaration of a national emergency for COVID-19 on March 13, 2020. The number of ED visits increased by July 2020, but remain below prepandemic levels.

What is added by this report?

ED visits during December 2020–January 2021 were 25% lower than during the same months the year before. Higher proportions of ED patients are seeking care for mental and behavioral health–related concerns, especially pediatric patients.

What are the implications for public health practice?

Efforts to ensure public understanding of the importance of seeking guidance and emergency care for acute and mental or behavioral health conditions are necessary.

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Factors Associated with Participation in Elementary School–Based SARS-CoV-2 Testing — Salt Lake County, Utah, December 2020–January 2021

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During December 3, 2020–January 31, 2021, CDC, in collaboration with the University of Utah Health and Economic Recovery Outreach Project,* Utah Department of Health (UDOH), Salt Lake County Health Department, and one Salt Lake county school district, offered free, in-school, real-time reverse transcription–polymerase chain reaction (RT-PCR) saliva testing as part of a transmission investigation of SARS-CoV-2, the virus that causes COVID-19, in elementary school settings. School contacts† of persons with laboratory-confirmed SARS-CoV-2 infection, including close contacts, were eligible to participate (*1*). Investigators approached parents or guardians of student contacts by telephone, and during January, using school phone lines to offer in-school specimen collection; the testing procedures were explained in the preferred language of the parent or guardian. Consent for participants was obtained via an electronic form sent by e-mail. Analyses examined participation (i.e., completing in-school specimen collection for SARS-CoV-2 testing) in relation to factors§ that were programmatically important or could influence likelihood of SARS-CoV-2 testing, including race, ethnicity, and SARS-CoV-2 incidence in the community (*2*). Crude prevalence ratios (PRs) were calculated using univariate log-binomial regression.¶ This activity was reviewed by CDC and was conducted consistent with federal law and CDC policy.**

Among 856 unique student contacts at 20 elementary schools, 594 who were exposed to 33 index patients at 13 elementary schools were analyzed (Table).†† Among 594 student contacts, 438 (74%) participated (range = 59%–82% across schools), parents or guardians of 100 (17%) students refused, and 56 (9%) could not be reached (Table). Student testing outside of the investigation was not evaluated. Among 436 participants with available information,§§ parents or guardians of 230 (53%) consented to participation after the first contact attempt, an additional 134 (31%) after two attempts, and a further 72 (17%) after three attempts.

Compared with non-Hispanic White students, participation in the testing program was higher among students identifying as Hispanic/Latino White (PR = 1.21) and among members of a racial minority group¶¶ (PR = 1.19). Participation was higher in January (PR = 1.12) than in December. Compared with students living in ZIP codes with lower SARS-CoV-2 incidence than the median in all residential ZIP codes of students included in the analysis (11,461 cases per 100,000 persons), participation was higher among those living in ZIP codes with incidences higher than the median (PR = 1.12). No differences were found based on grade level, close contact with the index patient, having a family member ever receive a positive SARS-CoV-2 test result, cumulative school incidence, number of recent school cases, number of days from exposure to first contact or to testing, ZIP code–level deprivation score (a composite measure of socioeconomic disadvantage) (*3*), or ZIP code–level mask compliance, estimated as the percentage of adult residents who reported always wearing a mask in public.

In Utah's socioeconomically disadvantaged areas, which have large proportions of uninsured and racial and ethnic minority residents, SARS-CoV-2 incidence is elevated, but testing rates are similar to those in other areas; this discrepancy could reflect

* https://eccles.utah.edu/utah-hero/

† To detect any potential school-associated transmission beyond close contacts of cases and to assess broader acceptability of in-school specimen collection school contacts were defined in this investigation as students or staff members in contact with the index patient for a cumulative total of ≥15 minutes during a 24-hour period in a classroom, cafeteria, school bus, or recess space during the index patient's infectious period. Close school contacts were defined as persons within 6 ft of the index patient for a cumulative total of ≥15 minutes over a 24-hour period. Infectious period was estimated as 2 days before to 10 days after symptom onset (if symptomatic) or first positive specimen collection date (if asymptomatic). https://www.cdc.gov/coronavirus/2019-ncov/php/contact-tracing/contact-tracing-plan/investigating-covid-19-case.html

§ Student demographics and school-level characteristics were obtained from the school district. Incidence by each student's ZIP code of residence was obtained from UDOH. ZIP code–level deprivation and mask compliance, estimated as the percentage of the adult population reporting that they always wear a mask in public settings, were obtained from the Utah Behavioral Risk Factor Surveillance System. https://ibis.health.utah.gov/ibisph-view/query/selection/brfss/BRFSSSelection.html

¶ Prevalence ratio estimates that did not include 1.0 were considered statistically significant at $p<0.05$.

** 45 C.F.R. part 46, 21 C.F.R. part 56; 42 U.S.C. Sect. 241(d); 5 U.S.C. Sect. 552a; 44 U.S.C. Sect. 3501 et seq.

†† Students were excluded if testing was offered on days off or during online learning days, potentially requiring additional transportation (253), or if they attended a private school (nine).

§§ The number of times the family was contacted was missing for two participating students.

¶¶ Includes non-Hispanic and Hispanic Asian, non-Hispanic and Hispanic Black/African American, non-Hispanic Native Hawaiian or Other Pacific Islander, non-Hispanic and Hispanic American Indian or Alaska Native, and non-Hispanic and Hispanic Multiracial. Among 96 students that identified as being from a racial minority group, 11 (11%) also identified as Hispanic or Latino.

TABLE. Characteristics associated with participation in school SARS-CoV-2 testing among student contacts (N = 594) — 13 elementary schools, Salt Lake County, Utah, December 2020–January 2021*

Characteristic	No. (%) Total (N = 594)	No. (%) Participants (n = 438)	Prevalence ratio (95% CI)
Student characteristic			
Race/Ethnicity			
White, non-Hispanic	**285**	190 (66.7)	Ref
White, Hispanic/Latino	**213**	172 (80.8)	1.21 (1.09–1.35)
Racial minority†	**96**	76 (79.2)	1.19 (1.04–1.35)
Grade in school			
Kindergarten–grade 2	**258**	197 (76.4)	Ref
Grades 3–4	**162**	118 (72.8)	0.95 (0.85–1.07)
Grades 5–6§	**174**	123 (70.7)	0.93 (0.82–1.04)
Identified as a close contact to index patient¶			
No	**428**	314 (73.4)	Ref
Yes	**166**	124 (74.7)	1.02 (0.92–1.13)
Family member (including nonhousehold) ever received positive SARS-CoV-2 test result			
No	**534**	389 (72.8)	Ref
Yes	**60**	49 (81.7)	1.12 (0.98–1.28)
School/Investigation characteristic			
Cumulative SARS-CoV-2 incidence rate by school			
≤51 cases per 1,000 persons**	**305**	216 (70.8)	Ref
>51 cases per 1,000 persons	**289**	222 (76.8)	1.08 (0.99–1.19)
No. of school cases during 14 days before testing date			
1–4	**402**	300 (74.6)	Ref
>4	**192**	138 (71.9)	0.96 (0.87–1.07)
Days from last school exposure to first time contacted††			
2–4	**142**	106 (74.6)	Ref
5–7	**331**	245 (74.0)	0.99 (0.88–1.11)
8–12	**118**	85 (72.0)	0.97 (0.83–1.12)
Days from last school exposure to test date			
6–7	**316**	231 (73.1)	Ref
8–10	**278**	207 (74.5)	1.02 (0.93–1.12)

See table footnotes on the next page.

a lack of access to testing (*2*). The sociodemographic differences in participation rates observed in this investigation could also suggest a higher level of concern about COVID-19 school safety among racial and ethnic minority parents (*4*) or less concern or better access to other testing resources among non-Hispanic White households. In-school specimen collection could therefore be a useful strategy for facilitating SARS-CoV-2 testing among those at higher risk for infection, who might also have limited access to testing. Higher participation in January compared with December could reflect the absence of potential holiday disincentives to testing or the investigation team's use of school phone lines for recruitment in January.

As schools consider reopening, in-school specimen collection for SARS-CoV-2 testing could help reach potentially underserved populations to reduce community transmission (*5*,*6*). Explaining testing procedures in a parent's or guardian's preferred language, as was done in this situation, might also be important for promoting participation. One limitation is that testing was conducted among persons with a known SARS-CoV-2 exposure; in-school specimen collection without known exposures might result in different participation rates. A second limitation is that testing history among participants was not known; therefore, the degree to which access to testing in the community influenced participation is unknown. However, the high participation rate for RT-PCR saliva testing suggests potential scalability to other school testing strategies, including screening testing (*7*,*8*). School districts should continue universal mask use, physically distancing ≥3 ft (or as much as possible), and quarantining close contacts of persons with COVID-19 (*8*).

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TABLE. (*Continued*) Characteristics associated with participation in school SARS-CoV-2 testing among student contacts (N = 594) — 13 elementary schools, Salt Lake County, Utah, December 2020–January 2021*

Characteristic	No. (%) Total (N = 594)	No. (%) Participants (n = 438)	Prevalence ratio (95% CI)
Month of testing			
December	**227**	156 (68.7)	Ref
January	**367**	282 (76.8)	1.12 (1.01–1.24)
ZIP code–level characteristic††			
Cumulative SARS-CoV-2 incidence rate by ZIP code since March 2020			
≤11,461 cases per 100,000 persons§§	**301**	210 (69.8)	Ref
>11,461 cases per 100,000 persons	**292**	228 (78.1)	1.12 (1.02–1.23)
Deprivation level¶¶			
Very low to average	**315**	226 (71.7)	Ref
High to very high	**278**	212 (76.3)	1.06 (0.97–1.17)
Masking compliance rate by ZIP code since May 2020			
≥81.6%***	**299**	230 (76.9)	Ref
<81.6%	**294**	208 (70.7)	0.92 (0.84–1.01)

Abbreviations: CI = confidence interval; Ref = Reference group.

* Log-binomial regression was conducted to calculate crude prevalence ratios and 95% CIs to identify correlates of participation. Prevalence ratio estimates that did not include 1.0 were considered statistically significant at p<0.05. Participation was defined as completing in-school specimen collection for reverse transcription–polymerase chain reaction SARS-CoV-2 testing.

† Includes non-Hispanic and Hispanic Asian, non-Hispanic and Hispanic Black/African American, non-Hispanic Native Hawaiian or Other Pacific Islander, non-Hispanic and Hispanic American Indian or Alaska Native, and non-Hispanic and Hispanic Multiracial. Among 96 students who identified as members of a racial minority group, 11 (11%) also identified as Hispanic or Latino.

§ All students in this category were in grades 5 or 6 except for two students who were in grade 7 or higher because they were identified as school contacts of the same index patient.

¶ Close school contacts were defined as persons within 6 ft of the index patient for a cumulative total of ≥15 minutes over a 24-hour period.

** Median SARS-CoV-2 incidence rate across schools included in the analysis.

†† Missing data: ZIP code was missing for one nonparticipating student; days between last exposure date and first time family was contacted was missing for three students.

§§ Median SARS-CoV-2 incidence rate across students' ZIP codes included in the analysis.

¶¶ This is a composite index calculated using nine indicators from the Utah Behavioral Risk Factor Surveillance System: 1) median family income; 2) income disparity (a logarithmic ratio of households with <$10,000 income to ≥$50,000 income); 3) percentage of home ownership; 4) percentage of unemployment; 5) percentage of families below poverty threshold; 6) percentage of single-parent households with children aged <18 years; 7) percentage of population aged ≥25 years with <9 years of education; 8) percentage of population aged ≥25 years with at least a high school diploma; and 9) percentage of population at <150% of the poverty threshold. The index is divided into quintiles (very low, low, average, high, and very high).

*** Median masking compliance rate among residential ZIP codes of students included in the analysis.

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Trends in Racial and Ethnic Disparities in COVID-19 Hospitalizations, by Region — United States, March–December 2020

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Persons from racial and ethnic minority groups are disproportionately affected by COVID-19, including experiencing increased risk for infection (*1*), hospitalization (*2*,*3*), and death (*4*,*5*). Using administrative discharge data, CDC assessed monthly trends in the proportion of hospitalized patients with COVID-19 among racial and ethnic groups in the United States during March–December 2020 by U.S. Census region. Cumulative and monthly age-adjusted COVID-19 proportionate hospitalization ratios (aPHRs) were calculated for racial and ethnic minority patients relative to non-Hispanic White patients. Within each of the four U.S. Census regions, the cumulative aPHR was highest for Hispanic or Latino patients (range = 2.7–3.9). Racial and ethnic disparities in COVID-19 hospitalization were largest during May–July 2020; the peak monthly aPHR among Hispanic or Latino patients was >9.0 in the West and Midwest, >6.0 in the South, and >3.0 in the Northeast. The aPHRs declined for most racial and ethnic groups during July–November 2020 but increased for some racial and ethnic groups in some regions during December. Disparities in COVID-19 hospitalization by race/ethnicity varied by region and became less pronounced over the course of the pandemic, as COVID-19 hospitalizations increased among non-Hispanic White persons. Identification of specific social determinants of health that contribute to geographic and temporal differences in racial and ethnic disparities at the local level can help guide tailored public health prevention strategies and equitable allocation of resources, including COVID-19 vaccination, to address COVID-19–related health disparities and can inform approaches to achieve greater health equity during future public health threats.

Data were obtained from the Premier Healthcare Database Special COVID-19 Release (PHD-SR),* an all-payer, administrative database containing patient-level discharge records (including discharges ending in death) from more than 800 nongovernmental, community, and teaching hospitals across the United States. The database represents 20% of U.S. hospital admissions. Analyses were limited to 655 facilities that submitted data during March–December 2020 and did not have unusual race or ethnicity reporting patterns.† COVID-19 hospitalizations were defined as having *International Classification of Diseases, Tenth Revision, Clinical Modification* (ICD-10-CM) discharge diagnosis code B97.29 (other coronavirus as the cause of disease classified elsewhere [recommended before the April 1, 2020 release of U07.1]) during March–April 2020 or code U07.1 (COVID-19, virus identified) during April–December 2020. Patient race and ethnicity variables were categorized as Hispanic or Latino of any race (Hispanic), non-Hispanic Asian (Asian), non-Hispanic Black (Black), non-Hispanic White (White), non-Hispanic all other races (other race),§ or race or ethnicity missing (unknown). Patients with unknown race/ethnicity were not included in the trend analyses.

The cumulative proportion (percentage) of hospitalized patients with COVID-19 was calculated as the number of patients with an index COVID-19 hospitalization¶ during March–December 2020 divided by the total number of patients hospitalized during the same period for any reason, including COVID-19. Monthly proportions of hospitalized patients with COVID-19 were calculated as the number of patients with an index COVID-19 hospitalization during a given month divided by the number of patients with a first hospitalization for any reason during the same month. Proportions were stratified by patient race/ethnicity and by four U.S. Census regions** based on facility location. For each region, aPHRs were calculated for each racial and ethnic

* Data in PHD-SR, formerly known as the PHD COVID-19 Database, are released every 2 weeks; release date March 2, 2021; access date March 3, 2021. http://offers.premierinc.com/rs/381-NBB-525/images/PHD_COVID-19_White_Paper.pdf

† Facilties were excluded if they reported only one category of race (e.g., all unknown or all White) for all hospitalized patients or only one category of ethnicity (e.g., all unknown) for all hospitalized patients during the analytic period of March–December 2020 (n = 99).

§ The other races group includes persons who reported non-Hispanic ethnicity and a race other than Asian, Black, or White, including American Indian/Alaska Native, Native Hawaiian/Pacific Islander, and multiple races.

¶ Index COVID-19 hospitalization was defined a patient's first hospitalization with a discharge diagnosis of COVID-19 (code B97.29 during March–April or U07.1 during April–December) within the March–December study period.

** *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.

minority group compared with White patients using multivariable Poisson regression. Confidence intervals were calculated for the cumulative aPHRs using generalized estimating equations to account for clustering within facilities. Changes in the monthly aPHRs for each racial/ethnic group were examined qualitatively. The racial/ethnic distribution among all patients hospitalized in 2019 was compared with that among all non-COVID-19 patients hospitalized in 2020 to assess consistency of racial/ethnic proportions across pandemic and non-pandemic years. Analyses were conducted using SAS (version 9.4; SAS Institute) and R (version 4.0.2; The R Foundation). This activity was reviewed by CDC and was conducted consistent with applicable federal law and CDC policy.[††]

During March–December 2020, PHD-SR identified 3,780,251 total unique hospitalized patients, including 298,066 (7.9%) unique patients with a COVID-19 diagnosis. The racial/ethnic distributions of non-COVID-19 patient populations were similar in 2019 and 2020 (Supplementary Table https://stacks.cdc.gov/view/cdc/104959). The racial/ethnic distribution of hospitalized COVID-19 patients differed among U.S. Census regions (Table). In every region, Hispanic patients represented the highest cumulative proportion of hospitalized patients with COVID-19 and highest cumulative aPHR relative to White patients. The monthly patterns in proportions of hospitalized patients with COVID-19 by race and ethnicity varied by U.S. Census region early in the pandemic, but all regions showed increasing proportions of patients hospitalized among all racial/ethnic groups later in 2020 (Figure 1). In the Northeast, the proportion peaked in April and was high for all racial and ethnic minority groups. In the Midwest, the proportion was high among several racial and ethnic minority groups during April–May and peaked in November for all groups. In the South, the proportion among Hispanic and Black patients peaked in July. In the West, the proportion among Hispanic patients was high in July and increased more than that in other racial/ethnic groups during November–December, peaking in December.

Racial and ethnic disparities in the proportion of hospitalized patients with COVID-19, as measured by aPHRs, were most pronounced early in the pandemic (Figure 2). In the Northeast, relative to White patients, aPHRs were highest for most racial and ethnic minority groups in April, and remained high for Hispanic patients through July, followed by a decrease among all racial and ethnic minority groups through December. In the Midwest, relative to White patients, the aPHR for Black patients was highest in March, and the aPHRs for Asian and Hispanic patients were highest during May–June; aPHRs decreased through November, with slight increases for Black patients and patients of other race in December. In the South, aPHRs for all racial and ethnic minority groups were highest during May–June and decreased through November, except for an increase among Asian patients during September–December. In the West, aPHRs were highest for Hispanic and Black patients in June and for Asian patients and patients of other races in August; aPHRs decreased through November, with slight increases among Hispanic and Asian patients in December.

Discussion

Analysis of hospitalizations from a database including more than 3.7 million hospital discharges and approximately 300,000 hospitalized COVID-19 patients during March–December 2020 found that racial and ethnic minority groups experienced higher proportions of COVID-19–related hospitalization compared with White patients. This finding is consistent with previous studies documenting racial and ethnic disparities in COVID-19 hospitalization (*2*,*3*) and expands upon earlier studies by documenting how these disparities have shifted over time and how they have differed by region. The largest disparities in the proportion of patients hospitalized with COVID-19 occurred early in the pandemic (April–July 2020) and became less pronounced over time as COVID-19 hospitalizations increased among White patients. However, as of December 2020, disparities remained among racial/ethnic minority groups in all regions, most notably among Hispanic patients in the West.

Racial and ethnic disparities in COVID-19 hospitalization are driven by both a higher risk for exposure to SARS-CoV-2 and a higher risk for severe COVID-19 disease (e.g., due to higher prevalence of underlying medical conditions) among racial and ethnic minority groups, both of which are influenced by social determinants of health.[§§] The regional and temporal patterns in disparities observed in this analysis are likely driven primarily by differences between racial and ethnic minority groups and White persons in SARS-CoV-2 exposure risk associated with occupational and housing conditions and socioeconomic status (*6*,*7*). The declining racial and ethnic disparities observed in late 2020 do not necessarily reflect reduced risk for infection or improved outcomes for certain racial and ethnic minority groups, but rather an increased risk for infection and subsequent hospitalization among White patients as COVID-19 spread throughout the United States (*8*). COVID-19–related hospitalization is one of several measures that can provide insight into the impact of COVID-19

[††] 45 C.F.R. part 46, 21 C.F.R. part 56; 42 U.S.C. Sect. 241(d); 5 U.S.C. Sect. 552a; 44 U.S.C. Sect. 3501 et seq.

[§§] https://www.cdc.gov/coronavirus/2019-ncov/community/health-equity/racial-ethnic-disparities/index.html

TABLE. Racial/ethnic* distribution of COVID-19 and all hospitalized patients, proportion of hospitalized patients with COVID-19, and cumulative unadjusted† and adjusted§ proportionate hospitalization ratios, by U.S. Census region¶ — United States, March–December 2020**

Census region race/ethnicity	No. (%)		Percentage of hospitalized patients with COVID-19	Cumulative proportionate hospitalization ratios	
	COVID-19 hospitalized patients	All hospitalized patients		Unadjusted	Adjusted
Total	**298,066**	**3,780,251**	**7.88**	—	—
Northeast					
White	20,595 (40.4)	299,166 (53.3)	6.88	Referent	Referent
Hispanic	10,589 (20.8)	75,625 (13.5)	14.00	2.0	2.7 (2.4–3.0)
Asian	1,912 (3.8)	18,406 (3.3)	10.39	1.5	2.0 (1.8–2.3)
Black	9,158 (18.0)	72,242 (12.9)	12.68	1.8	2.0 (1.9–2.2)
Other	2,327 (4.6)	19,925 (3.6)	11.68	1.7	2.1 (1.9–2.4)
Unknown	6,363 (12.5)	75,407 (13.4)	8.44	1.2	1.6 (1.5–1.9)
Northeast total	**50,944 (100.0)**	**560,771 (100.0)**	**9.08**	—	—
Midwest					
White	49,017 (65.8)	655,542 (70.0)	7.48	Referent	Referent
Hispanic	6,072 (8.2)	47,733 (5.1)	12.72	1.7	2.7 (2.5–2.9)
Asian	1,413 (1.9)	14,622 (1.6)	9.66	1.3	2.1 (1.8–2.4)
Black	12,110 (16.3)	119,165 (12.7)	10.16	1.4	1.7 (1.6–1.8)
Other	2,588 (3.5)	36,360 (3.9)	7.12	1.0	1.2 (0.9–1.7)
Unknown	3,302 (4.4)	62,543 (6.7)	5.28	0.7	1.2 (1.1–1.4)
Midwest total	**74,502 (100.0)**	**935,965 (100.0)**	**7.96**	—	—
South					
White	60,797 (42.1)	971,381 (53.2)	6.26	Referent	Referent
Hispanic	36,311 (25.1)	283,835 (15.6)	12.79	2.0	2.8 (2.5–3.3)
Asian	1,903 (1.3)	28,102 (1.5)	6.77	1.1	1.6 (1.5–1.8)
Black	31,159 (21.6)	307,445 (16.8)	10.13	1.6	1.9 (1.8–2.0)
Other	3,569 (2.5)	47,421 (2.6)	7.53	1.2	1.7 (1.5–1.9)
Unknown	10,694 (7.4)	186,962 (10.2)	5.72	0.9	1.3 (1.1–1.5)
South total	**144,433 (100.0)**	**1,825,146 (100.0)**	**7.91**	—	—
West					
White	9,056 (32.1)	207,766 (45.3)	4.36	Referent	Referent
Hispanic	10,478 (37.2)	90,759 (19.8)	11.54	2.6	3.9 (3.2–4.8)
Asian	2,029 (7.2)	34,344 (7.5)	5.91	1.4	1.5 (1.2–1.9)
Black	1,703 (6.0)	25,301 (5.5)	6.73	1.5	1.8 (1.5–2.2)
Other	2,331 (8.3)	34,899 (7.6)	6.68	1.5	2.0 (1.6–2.5)
Unknown	2,590 (9.2)	65,300 (14.2)	3.97	0.9	1.4 (1.0–1.9)
West total	**28,187 (100.0)**	**458,369 (100.0)**	**6.15**	—	—

Abbreviation: CI = confidence intervals.

* Hispanic persons could be of any race; Asian, Black, White, and Other race persons were non-Hispanic. Other group includes persons who were a race other than Asian, Black, or White, including American Indian/Alaska Native, Native Hawaiian/Pacific Islander, and multiple races. Race and ethnicity were categorized as "unknown" if race or ethnicity was missing.

† The unadjusted proportionate hospitalization ratio is calculated as the percentage of hospitalized patients with COVID-19 among a racial/ethnic minority group divided by the percentage among White patients for that given region.

§ Adjusted for age group using Poisson regression. Age groups were: <18, 18–39, 40–54, 55–64, 65–74, and ≥75 years.

¶ *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.

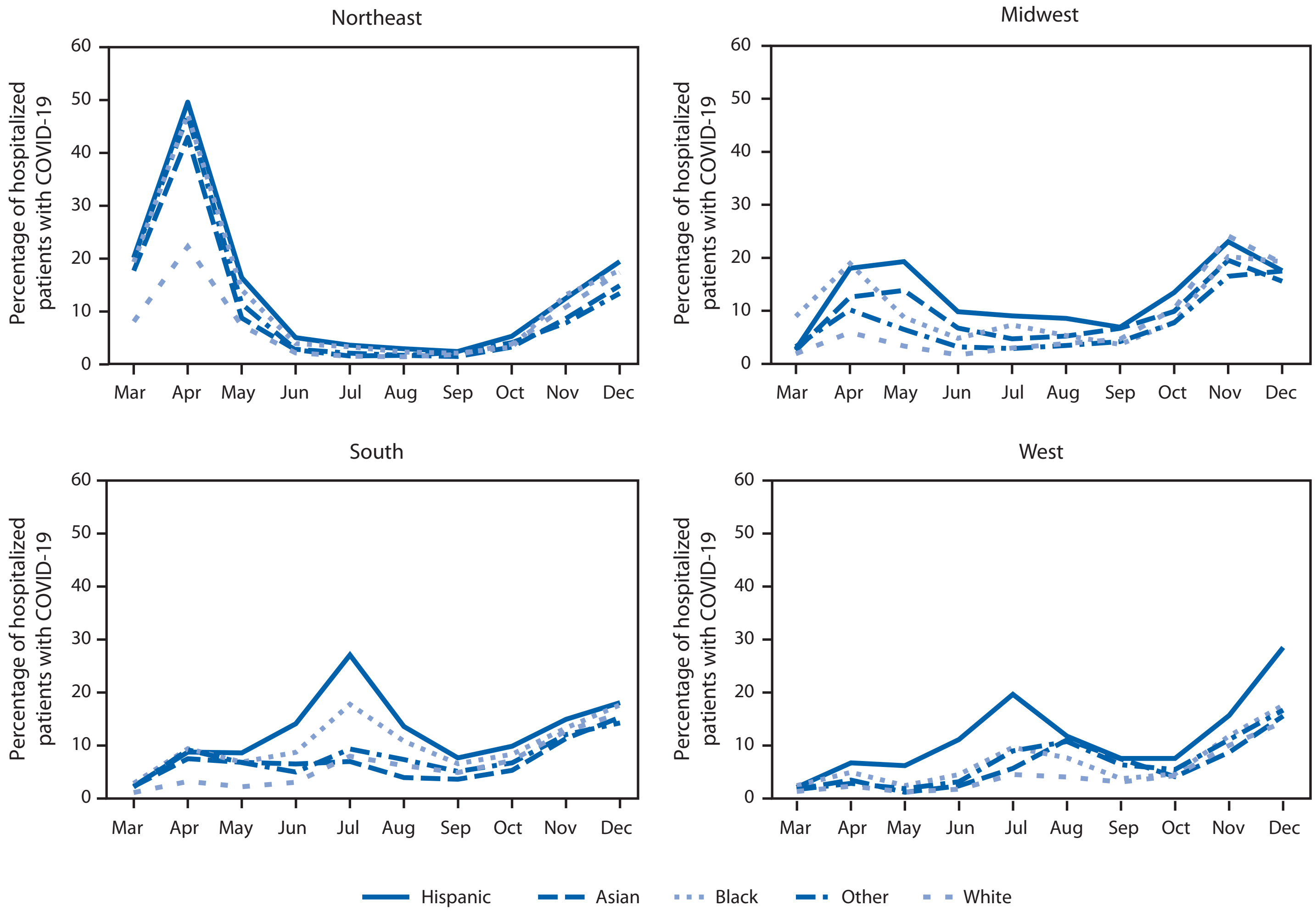
** Data from subset of 655 hospitals in Premier Healthcare Database Special COVID-19 Release.

on racial and ethnic minority populations and should be interpreted in the context of other measures such as COVID-19 incidence and mortality rates. It is important to continue to monitor racial and ethnic disparities in COVID-19 infection and outcomes at national, regional, and local levels.

Changes in the provision of health care services, such as a reduction in elective procedures, during the COVID-19 pandemic could have affected the racial/ethnic distribution of hospitalized patients in 2020, which was used as the denominator for this analysis. However, a supplementary analysis found similar racial and ethnic distributions among persons hospitalized in 2019 and for hospitalizations in 2020 that were not related to COVID-19, indicating that observed disparities in 2020 COVID-19 hospitalizations were not likely due to changes in the patient population served.

The findings in this report are subject to at least three limitations. First, the underlying catchment areas for the facilities in this analysis are not known; therefore, population-based rates could not be calculated. Second, American Indian or Alaska Native patients, Native Hawaiian or Pacific Islander patients,

FIGURE 1. Monthly proportion (percentage) of hospitalized patients with COVID-19, by race/ethnicity* and U.S. Census region† — United States, March–December 2020§



* Hispanic persons could be of any race; Asian, Black, White, and Other race persons were non-Hispanic. Other group includes persons who were a race other than Asian, Black, or White, including American Indian/Alaska Native, Native Hawaiian/Pacific Islander, and multiple races.
† *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.
§ Data from subset of 655 hospitals in Premier Healthcare Database Special COVID-19 Release.

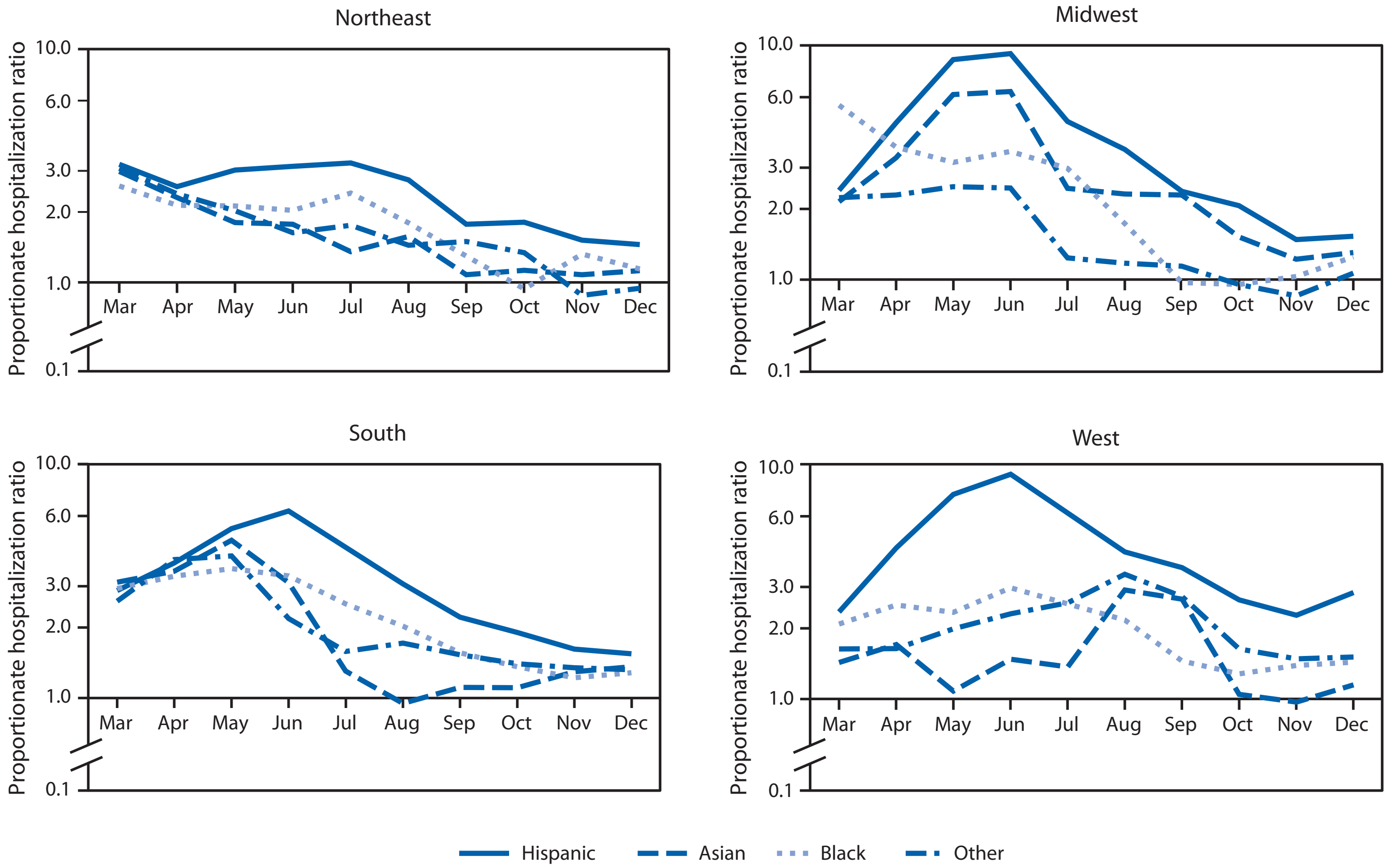
and patients reporting multiple races were aggregated within PHD-SR into a non-Hispanic other race category to protect patient privacy. Therefore, proportions of COVID-19–related hospitalizations among these groups could not be assessed; current data show a high risk for COVID-19 infection, hospitalization, and death among American Indian or Alaska Native persons compared with White persons.¶¶ Finally, the study did not adjust for underlying medical conditions that increase the risk for severe COVID-19 outcomes such as hospitalization and might be more common among racial and ethnic minority groups.***

Disparities in COVID-19 hospitalization by race and ethnicity varied by U.S. Census region and became less pronounced over the course of the pandemic as the proportion of White patients hospitalized with COVID-19 increased. Identification of the specific social determinants of health (e.g., access to health care, occupation and job conditions, housing instability, and transportation challenges) that contribute to geographic

¶¶ https://www.cdc.gov/coronavirus/2019-ncov/covid-data/investigations-discovery/hospitalization-death-by-race-ethnicity.html

*** https://www.cdc.gov/coronavirus/2019-ncov/community/health-equity/racial-ethnic-disparities/disparities-illness.html

FIGURE 2. Monthly age-adjusted* COVID-19 proportionate hospitalization ratios comparing racial and ethnic minority patients† with White patients, by U.S. Census region§ — United States, March–December 2020¶



* Adjusted for age group using Poisson regression. Age groups were: <18, 18–39, 40–54, 55–64, 65–74, and ≥75 years.
† Hispanic persons could be of any race; Asian, Black, White, and Other race persons were non-Hispanic. Other group includes persons who were a race other than Asian, Black, or White, including American Indian/Alaska Native, Native Hawaiian/Pacific Islander, and multiple races.
§ *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.
¶ Data from subset of 655 hospitals in Premier Healthcare Database Special COVID-19 Release.

and temporal differences in racial and ethnic disparities in COVID-19 infection and poor health outcomes is critical (*6*,*7*,*9*,*10*). A better understanding of these factors at a local level can help guide tailored public health prevention strategies and equitable allocation of resources, including COVID-19 vaccination, to better address COVID-19–related health disparities and can inform approaches to achieve greater health equity during future public health threats.

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Summary

What is already known about this topic?

COVID-19 disproportionately affects racial and ethnic minority groups in the United States.

What is added by this report?

Within each U.S. Census region, the proportion of hospitalized patients with COVID-19 was highest for Hispanic or Latino patients. Racial and ethnic disparities were largest during May–July 2020 and became less pronounced as the pandemic spread throughout the country; however, disparities remained in December 2020 in all regions.

What are the implications for public health practice?

Understanding the social determinants of health contributing to geographic and temporal differences in racial and ethnic disparities at a local level can help guide public health prevention strategies and equitable resource allocation, including COVID-19 vaccination, to address COVID-19–related health disparities.

Emergency Department Visits for COVID-19 by Race and Ethnicity — 13 States, October–December 2020

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Hispanic or Latino (Hispanic), non-Hispanic Black or African American (Black), and non-Hispanic American Indian or Alaska Native (AI/AN) persons have experienced disproportionately higher rates of hospitalization and death attributable to COVID-19 than have non-Hispanic White (White) persons (*1*–*4*). Emergency care data offer insight into COVID-19 incidence; however, differences in use of emergency department (ED) services for COVID-19 by racial and ethnic groups are not well understood. These data, most of which are recorded within 24 hours of the visit, might be an early indicator of changing patterns in disparities. Using ED visit data from 13 states obtained from the National Syndromic Surveillance Program (NSSP), CDC assessed the number of ED visits with a COVID-19 discharge diagnosis code per 100,000 population during October–December 2020 by age and race/ethnicity. Among 5,794,050 total ED visits during this period, 282,220 (4.9%) were for COVID-19. Racial/ethnic disparities in COVID-19 ED visit rates were observed across age groups. Compared with White persons, Hispanic, AI/AN, and Black persons had significantly more COVID-19–related ED visits overall (rate ratio [RR] range = 1.39–1.77) and in all age groups through age 74 years; compared with White persons aged ≥75 years, Hispanic and AI/AN persons also had more COVID-19–related ED visits (RR = 1.91 and 1.22, respectively). These differences in ED visit rates suggest ongoing racial/ethnic disparities in COVID-19 incidence and can be used to prioritize prevention resources, including COVID-19 vaccination, to reach disproportionately affected communities and reduce the need for emergency care for COVID-19.

NSSP data were used to assess ED visits with a COVID-19 diagnosis code* during October 1–December 31, 2020. NSSP receives ED visit records from 71% of hospitals in the United States. Data from 13 states (Connecticut, Illinois, Maryland, Massachusetts, Michigan, Nevada, New Mexico, Oregon, Utah, Vermont, Virginia, Washington, and Wisconsin) meeting the following data quality thresholds were included in the study: >85% of facilities in the state report data to NSSP, >85% of the ED visits had complete and valid discharge diagnosis codes, >85% of ED visits included race data, and >85% of ED visits included ethnicity data. Data from before October 1, 2020 did not consistently meet these thresholds across all 13 states. COVID-19 ED visits were categorized by patient race/ethnicity (Hispanic, non-Hispanic AI/AN, non-Hispanic Asian or Pacific Islander [A/PI], non-Hispanic Black, and non-Hispanic White) and age group (0–17, 18–29, 30–44, 45–64, 65–74, and ≥75 years).

Race/ethnicity–specific crude and age-stratified visit rates per 100,000 population were calculated using population denominators from the National Center for Health Statistics' 2019 bridged-race postcensal population estimates (*5*). Visits with patient ethnicity identified as Hispanic or Latino were categorized as Hispanic or Latino, even if race data were missing. Visits with patient ethnicity identified as not Hispanic or Latino with complete race data were categorized into one of the non-Hispanic race categories. Visits with patient ethnicity data missing or visits with patient ethnicity identified as non-Hispanic/Latino but missing patient race data were not included in the analysis.† Race/ethnicity–specific crude and age-stratified RR§ with 95% confidence intervals (CIs) were calculated as the rate of COVID-19 ED visits among a racial/ethnic group divided by the rate of COVID-19 ED visits among White persons. RRs with CIs excluding 1.0 were considered statistically significant, and nonoverlapping CIs were used to identify differences in RRs by age groups. All analyses were conducted using R software (version 4.0.4; The R Foundation). This activity was reviewed by CDC and was conducted consistent with applicable federal law and CDC policy.¶

Among ED visits from 13 states during October 1–December 31, 2020, Hispanic persons were more likely to seek ED care for COVID-19 than were White persons overall (crude RR = 1.77) (Table 1) and for each age group examined (RR range = 1.91–2.92) (Table 2). Likewise, AI/AN persons were more likely to seek ED care for COVID-19 than were White persons, both overall (crude RR = 1.71) and among each age group (RR range = 1.22–3.07) (Table 2). Overall,

* ED visits for COVID-19 are defined as ED visits with any of the following: *International Classification of Diseases, Tenth Revision* (ICD-10) codes U07.1 or J12.82 or Systematized Nomenclature of Medicine (SNOMED) codes 840539006, 840544004, or 840533007.

† A total of 38,199 (13.5%) ED visits with patient ethnicity data missing or visits with patient ethnicity identified as non-Hispanic/Latino but missing patient race data were not included in this analysis. Patient race or patient ethnicity categorized as "unknown," "not categorized," and "refused to answer" are considered missing.

§ RR of COVID-19 ED visits: (COVID-19 ED visits among persons in the racial or ethnic age group of interest/population of persons in the racial or ethnic age group)/(COVID-19 ED visits among White persons in that age group/population of White persons in that age group).

¶ 45 C.F.R. part 46; 21 C.F.R. part 56; 42 U.S.C. Sect. 241(d), 5 U.S.C. Sect. 552a, 44 U.S.C. Sect. 3501 et seq.

Black persons aged ≤74 were more likely to seek ED care for COVID-19 compared with White persons (crude RR = 1.39) (Table 1), (age-stratified RR range = 1.54–2.19) (Table 2), but no differences between Black persons and White persons aged ≥75 years were observed. Fewer A/PI persons sought ED care for COVID-19 than did White persons overall (crude RR = 0.70) (Table 1) and among age groups ≤44 years and ≥75 years (RR range = 0.68–0.82).

Among AI/AN persons, those aged 30–44 years had the highest RR of COVID-19 ED visits compared with other age groups (3.07). The RRs among Hispanic persons aged 45–64 (2.92) and 65–74 years (2.83) and Black persons aged 18–29 (2.11) and 30–44 years (2.19) were higher than the other age-stratified estimates for each respective racial/ethnic group. Among Hispanic, AI/AN, and Black persons, the RR of COVID-19-related ED visits was lowest among those aged ≥75 years compared with other age groups (1.91, 1.22, and 1.03, respectively).

Discussion

Some racial/ethnic groups, including Hispanic, AI/AN, and Black persons, received ED care for COVID-19 at disproportionately higher rates compared with White persons, with higher disparity observed among persons aged <75 years. These findings are consistent with those of previous studies showing disproportionate COVID-19 incidence, hospitalization, and mortality among these racial/ethnic groups (*1–4*). Disparities in ED visits for COVID-19 among Hispanic,

TABLE 1. Emergency department (ED) visits per 100,000 persons, by race/ethnicity — 13 states,* October 1–December 31, 2020

Racial/Ethnic groups	No. of all ED visits	No. (%) of COVID-19 ED visits†	No. of COVID-19 ED visits per 100,000 population§	RR (95% CI)
All	**5,794,050**	**282,220 (4.9)**	**380**	—
Hispanic	759,382	59,204 (7.8)	588	1.77 (1.75–1.78)
AI/AN, non-Hispanic	55,128	3,739 (6.8)	570	1.71 (1.66–1.77)
A/PI, non-Hispanic	125,043	10,788 (8.6)	234	0.70 (0.69–0.72)
Black, non-Hispanic	1,159,086	42,277 (3.6)	463	1.39 (1.38–1.40)
White, non-Hispanic	3,695,411	166,212 (4.5)	333	Referent

Abbreviations: AI/AN = American Indian or Alaska Native; A/PI = Asian or Pacific Islander; RR = rate ratio; CI = confidence interval.

* Connecticut, Illinois, Maryland, Massachusetts, Michigan, New Mexico, Nevada, Oregon, Utah, Vermont, Virginia, Washington, and Wisconsin.

† ED visits for COVID-19 are defined as ED visits with any of the following: *International Classification of Diseases, Tenth Revision* (ICD-10) codes U07.1 or J12.82 or Systematized Nomenclature of Medicine (SNOMED) codes 840539006, 840544004, or 840533007.

§ Race/ethnicity–specific crude visit rates per 100,000 population were calculated using population denominators from the National Center for Health Statistics 2019 bridged-race postcensal population estimates (https://www.cdc.gov/nchs/nvss/bridged_race.htm); 38,199 (13.5%) ED visits with patient ethnicity data missing or visits with patient ethnicity identified as non-Hispanic/Latino but missing patient race data were not included in this analysis. Patient race or patient ethnicity categorized as "unknown," "not categorized," and "refused to answer" are considered missing.

TABLE 2. Emergency department (ED) visits per 100,000 persons, by age group and race/ethnicity — 13 states,* October 1–December 31, 2020

Age group, yrs and race/ethnicity	No. of all ED visits	No. (%) of ED visits for COVID-19†	COVID-19 ED visits per 100,000 population§	RR (95% CI)
All ages	**5,794,050**	**282,220 (4.9)**	**380**	—
0–17				
All	**573,105**	**10,049 (1.8)**	**62**	—
Hispanic	124,665	3,602 (2.9)	110	2.63 (2.51–2.75)
AI/AN, non-Hispanic	5,966	125 (2.1)	76	1.80 (1.51–2.15)
A/PI, non-Hispanic	13,890	337 (2.4)	34	0.82 (0.73–0.92)
Black, non-Hispanic	114,400	1,986 (1.7)	86	2.04 (1.94–2.16)
White, non-Hispanic	314,184	3,999 (1.3)	42	Referent
18–29				
All	**1,001,194**	**28,198 (2.8)**	**231**	—
Hispanic	178,845	8,657 (4.8)	431	2.64 (2.56–2.71)
AI/AN, non-Hispanic	9,803	425 (4.3)	345	2.11 (1.91–2.32)
A/PI, non-Hispanic	20,715	960 (4.6)	110	0.68 (0.63–0.72)
Black, non-Hispanic	270,926	5,984 (2.2)	345	2.11 (2.05–2.18)
White, non-Hispanic	520,905	12,172 (2.3)	163	Referent
30–44				
All	**1,228,221**	**49,760 (4.1)**	**343**	—
Hispanic	193,951	14,933 (7.7)	669	2.77 (2.71–2.83)
AI/AN, non-Hispanic	15,167	970 (6.4)	742	3.07 (2.88–3.27)
A/PI, non-Hispanic	29,106	2,132 (7.3)	183	0.76 (0.73–0.79)
Black, non-Hispanic	295,671	9,507 (3.2)	529	2.19 (2.14–2.24)
White, non-Hispanic	694,326	22,218 (3.2)	242	Referent
45–64				
All	**1,525,724**	**91,806 (6.0)**	**480**	—
Hispanic	176,102	20,730 (11.8)	1,086	2.92 (2.88–2.97)
AI/AN, non-Hispanic	15,996	1,333 (8.3)	844	2.27 (2.15–2.40)
A/PI, non-Hispanic	31,620	4,040 (12.8)	376	1.01 (0.98–1.04)
Black, non-Hispanic	310,487	14,459 (4.7)	658	1.77 (1.74–1.80)
White, non-Hispanic	991,519	51,244 (5.2)	372	Referent
65–74				
All	**682,578**	**46,618 (6.8)**	**646**	—
Hispanic	47,429	6,435 (13.6)	1,577	2.83 (2.76–2.91)
AI/AN, non-Hispanic	4,967	517 (10.4)	1,025	1.84 (1.69–2.01)
A/PI, non-Hispanic	14,302	1,781 (12.5)	562	1.01 (0.96–1.06)
Black, non-Hispanic	96,551	5,766 (6.0)	857	1.54 (1.50–1.58)
White, non-Hispanic	519,329	32,119 (6.2)	556	Referent
≥75				
All	**783,228**	**55,789 (7.1)**	**1102**	—
Hispanic	38,390	4,847 (12.6)	2,027	1.91 (1.85–1.96)
AI/AN, non-Hispanic	3,229	369 (11.4)	1,302	1.22 (1.11–1.36)
A/PI, non-Hispanic	15,410	1,538 (10.0)	781	0.73 (0.70–0.77)
Black, non-Hispanic	71,051	4,575 (6.4)	1,097	1.03 (1.00–1.06)
White, non-Hispanic	655,148	44,460 (6.8)	1,063	Referent

Abbreviations: AI/AN = American Indian or Alaska Native; A/PI = Asian or Pacific Islander; RR = rate ratio; CI = confidence interval.

* Connecticut, Illinois, Maryland, Massachusetts, Michigan, New Mexico, Nevada, Oregon, Utah, Vermont, Virginia, Washington, and Wisconsin.

† ED visits for COVID-19 are defined as ED visits with any of the following: *International Classification of Diseases, Tenth Revision* (ICD-10) codes U07.1 or J12.82 or Systematized Nomenclature of Medicine (SNOMED) codes 840539006, 840544004, or 840533007.

§ Race/ethnicity–specific age-stratified visit rates per 100,000 population were calculated using population denominators from the National Center for Health Statistics 2019 bridged-race postcensal population estimates (https://www.cdc.gov/nchs/nvss/bridged_race.htm); 38,199 (13.5%) ED visits with patient ethnicity data missing or visits with patient ethnicity identified as non-Hispanic/Latino but missing patient race data were not included in this analysis. Patient race or patient ethnicity categorized as "unknown," "not categorized," and "refused to answer" are considered missing.

Summary

What is already known about this topic?

Hispanic, American Indian or Alaska Native, and Black persons have higher rates of hospitalization and death attributable to COVID-19 than do White persons.

What is added by this report?

Data from 13 states indicate that compared with White persons, Hispanic and American Indian or Alaska Native persons experienced 1.7 times the rate, and Black persons experienced 1.4 times the rate of emergency department care visits for COVID-19 during October–December 2020.

What are the implications for public health practice?

Emergency department COVID-19 visit data can provide insight into ongoing areas of racial/ethnic inequity in health status and disease outcomes and can be used to prioritize prevention resources, including COVID-19 vaccination, to reach disproportionately affected groups.

AI/AN, and Black persons were observed across nearly all age groups, with higher rates in adults aged 18–74 years and the lowest rates among adults aged ≥75 years. Whereas the disparity was lower in this age group, Hispanic and AI/AN persons aged ≥75 years still visited the ED more often than, and Black persons ≥75 years visited the ED as often as, their White counterparts did.

The racial/ethnic groups that sought ED care for COVID-19 at disproportionately higher rates have also experienced long-standing, systemic inequities that affect their health (*6*). These inequities include limited access to quality health care, lower general health status and access to quality education, and disproportionate representation in essential jobs with less flexibility to work from home or take medical leave (*7*). Racism and discrimination shape these factors that influence health risks; racism, rather than a person's race or ethnicity, is a key driver of these health inequities (*8*). These types of inequities can increase risks for infection with SARS-CoV-2, the virus that causes COVID-19, and delay medical care, increasing the risk for severe COVID-19 outcomes and the need for emergency care.

Effectively protecting and promoting the health of all persons relies on having data to assess and address health disparities. Continued use of NSSP data for ongoing surveillance of COVID-19–related outcomes can serve as an early signal of health disparities experienced by certain racial/ethnic groups. ED data are available in near real-time, and the ability to stratify these data by race/ethnicity provides one of the fastest ways to identify severe outcomes in population subgroups. However, additional efforts to both improve accuracy and completeness of race/ethnicity data and to collect data on social factors that affect health risks should continue. Facility, provider, and public health efforts to improve collection and reporting of these data could aid in rapidly identifying areas of public health concern and understanding of the underlying causes of disparities.

The findings in this report are subject to at least six limitations. First, COVID-19 ED visit data from the 13 assessed states might differ from such data in other states, which could limit the generalizability of these results. Second, White persons represent a larger percentage of the population in the 13-state subset (66%) compared with the national population distribution (61%), so some racial/ethnic groups have less representation, which limits the numbers of observations available and the subsequent inferences that can be made. Third, COVID-19 ED visit classifications rely on diagnostic codes, which might be used inconsistently across facilities, resulting in misclassification of diagnosis. Fourth, persons seek care in EDs for a variety of reasons, including more severe disease or lack of other health care options, and the reasons that someone sought care in an ED rather than another source are not recorded in NSSP data. Fifth, in NSSP, Native Hawaiian and Other Pacific Islander (NH/PI) and Asian are separate categories. However, these groups were combined in the population estimates used, so these groups were combined into A/PI for this analysis, likely masking previously reported COVID-19 disparities among NH/PI persons (*3*). Race/ethnicity–specific estimates for non-Hispanic persons of multiple and other races were not calculated because population denominators were unavailable. Finally, the race and ethnicity fields were categorized based on terms and codes in each visit record. ED visits using nonstandard race or ethnicity descriptors, or missing race/ethnicity data were not included in this analysis.

The findings from this investigation highlight that Hispanic, AI/AN, and Black persons sought ED care for COVID-19 at higher rates than did White persons. It is important to prioritize prevention resources, management of underlying health conditions, safe school and work conditions, flexible leave policies, and enhanced access to and acceptability of SARS-CoV-2 testing and COVID-19 vaccination services to reach disproportionately affected racial/ethnic groups and reduce the need for emergency care for COVID-19. Efforts such as these are critical to address the drivers of racial/ethnic disparities. ED visits from NSSP are an important data source that can be used for near real-time detection of a variety of health conditions, including COVID-19. Race and ethnicity information in these data allows investigators to better identify areas of inequity in their communities and respond by ensuring equitably accessible preventive services, including COVID-19 vaccination, designed to reach the most affected communities.

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Notes from the Field

Update on Excess Deaths Associated with the COVID-19 Pandemic — United States, January 26, 2020–February 27, 2021

Lauren M. Rossen, PhD[1]; Amy M. Branum, PhD[1]; Farida B. Ahmad, MPH[1]; Paul D. Sutton, PhD[1]; Robert N. Anderson, PhD[1]

Estimates of excess deaths, defined as the number of persons who have died from all causes, above the expected number of deaths for a given place and time, can provide a comprehensive account of mortality likely related to the COVID-19 pandemic, including deaths that are both directly and indirectly associated with COVID-19. Since April 2020, CDC's National Center for Health Statistics (NCHS) has published weekly data on excess deaths associated with the COVID-19 pandemic (*1*). A previous report identified nearly 300,000 excess deaths during January 26–October 3, 2020, with two thirds directly associated with COVID-19 (*2*). Using more recent data from the National Vital Statistics System (NVSS), CDC estimated that 545,600–660,200 excess deaths occurred in the United States during January 26, 2020–February 27, 2021.

Using weekly historical and provisional NVSS mortality data from 2013 through February 27, 2021, expected numbers of deaths were estimated using overdispersed Poisson regression models with spline terms to account for seasonal patterns (*1*,*2*). The average expected number, as well as the upper bound of the 95% prediction interval, were used as thresholds to determine the number of excess deaths.* Observed numbers of deaths were weighted to account for incomplete reporting by jurisdictions (50 states and the District of Columbia), primarily in the most recent 8 weeks, where the weights were estimated based on completeness of provisional data during the past year (*1*). Weekly NVSS data on excess deaths occurring from January 26 (the week ending February 1, 2020) through February 27, 2021, were then examined to quantify the number of excess deaths from all causes and the number of deaths from all causes other than COVID-19.†

During January 26, 2020–February 27, 2021, an estimated 545,600–660,200 more persons than expected died in the United States from all causes (Figure). The estimated number of excess deaths peaked during the weeks ending April 11, 2020, August 1, 2020, and January 2, 2021. Approximately 75%–88% of excess deaths were directly associated with COVID-19. Excluding deaths directly associated with COVID-19, an estimated 63,700–162,400 more persons than expected died from other causes.

Estimates of excess deaths provide insight into the impact of the COVID-19 pandemic beyond tracking data on the numbers of deaths directly associated with COVID-19.§ Data on reported COVID-19 deaths might be limited by factors such as the availability and use of diagnostic testing and the accurate and complete reporting of cause-of-death information on the death certificate (*3*). Excess death analyses are not subject to these limitations because they examine historical trends in all-cause mortality to determine the degree to which observed numbers of deaths differ from historical trends.

The findings in this report are subject to at least three limitations. First, because of reporting lags, estimated numbers of deaths in the most recent weeks are likely underestimated and might increase as more data become available.¶ Second, different methods for estimating the expected numbers of deaths might lead to different results, and the models employed for this report might not fully account for population growth or aging. Another report on provisional 2020 mortality data, which described annual mortality rates by demographic factors and leading causes of death, but did not examine trends in excess deaths, found that age-adjusted death rates, which do account for population growth and aging, increased by 15.9% from 2019 to 2020 (*3*). Finally, estimates of excess deaths not associated with COVID-19 might represent misclassified COVID-19 deaths or deaths indirectly associated with the pandemic (e.g., because of disruptions in health care access or utilization). For example, a previous report described declines in emergency department visits for heart attack, stroke, and hyperglycemic crisis in early 2020 (*4*). The excess death analyses presented here cannot distinguish between excess deaths that might have been misclassified COVID-19 deaths or those that might have been indirectly associated with the pandemic.

These updated estimates indicate that approximately one half to two thirds of one million excess deaths occurred during January 26, 2020–February 27, 2021, suggesting that the

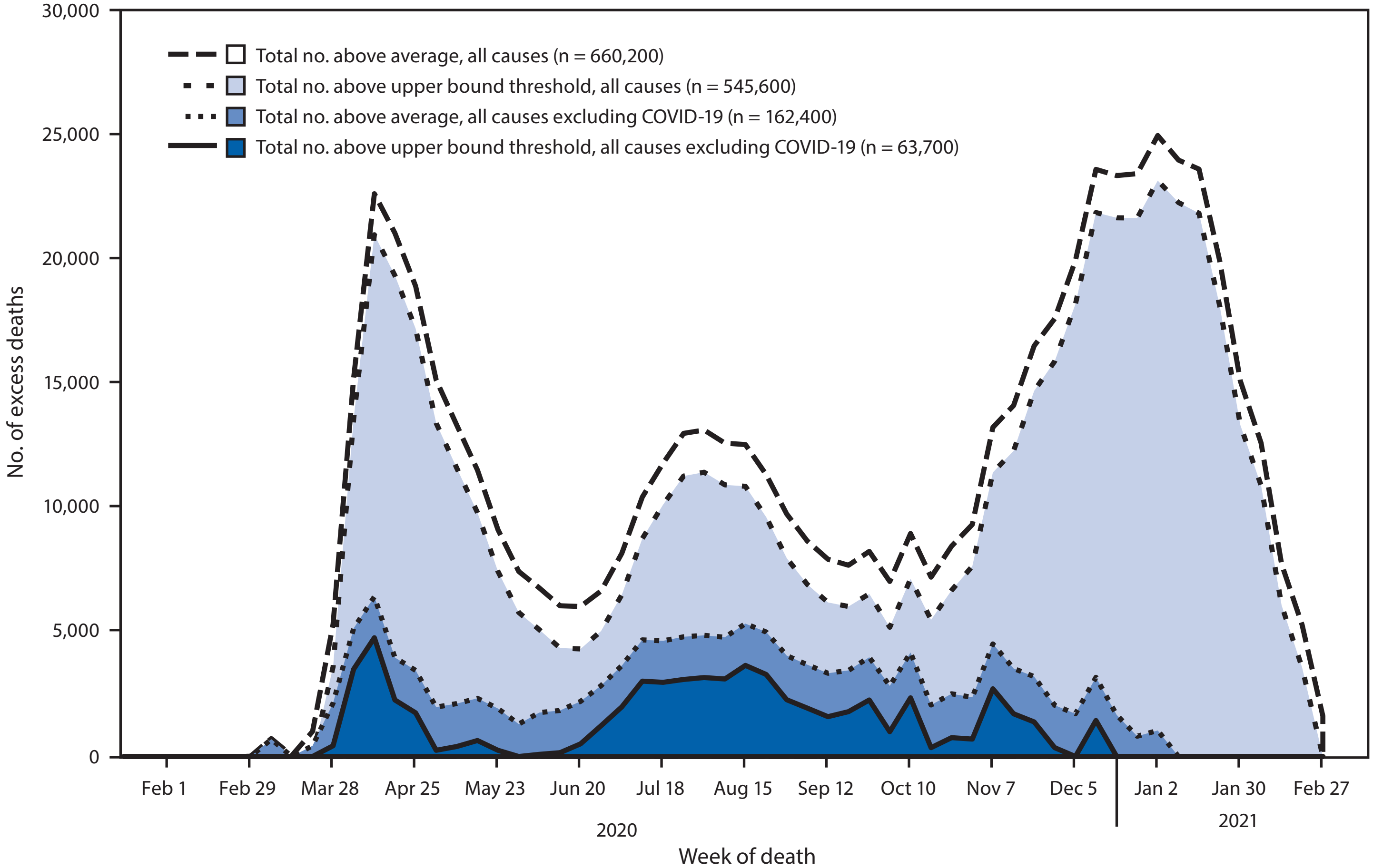
* The average expected number and the upper bound of the 95% prediction interval (the range of values likely to contain the value of a single new observation, given what has already been observed) were used to determine the number of excess deaths or observed numbers above each threshold.

† Deaths from all causes excluding COVID-19 were calculated by subtracting the number of confirmed or presumed COVID-19 deaths from the total number of deaths. Deaths with confirmed or presumed COVID-19 were assigned the *International Classification of Diseases, Tenth Revision* code U07.1 as a contributing or underlying cause of death on the death certificate.

§ https://covid.cdc.gov/covid-data-tracker/#trends_dailytrendsdeaths

¶ Data are provisional and subject to change. Data during the most recent 8 weeks are incomplete because of the lag in time between the death and the completion of the death certificate, submission to NCHS, and processing of the data for reporting purposes. This delay can range from 1 week to 8 weeks or more depending on the jurisdiction and cause of death.

FIGURE. Weekly and total numbers of excess deaths from all causes, and from all causes other than COVID-19* above the average number expected and the upper bound of the 95% prediction interval† — United States, January 26, 2020–February 27, 2021



* Weekly numbers of deaths from all causes and from all causes other than COVID-19 were obtained from the National Vital Statistics System.

† The average expected number and the upper bound of the 95% prediction interval (the range of values likely to contain the value of a single new observation) were estimated using overdispersed Poisson regression models of 2013 mortality data to the most recent week, with spline terms to account for seasonal patterns. The numbers of excess deaths correspond to the observed numbers of deaths above each threshold. Total numbers of excess deaths were summed from January 26, 2020, through February 27, 2021.

overall impact of the COVID-19 pandemic on mortality is substantially greater than the number of COVID-19 deaths. These data can help guide efforts to prevent infection and mortality directly or indirectly associated with COVID-19. CDC's NCHS continues to provide weekly data on excess deaths (*1*) to enable near real-time tracking of mortality associated with the COVID-19 pandemic.

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All authors have completed and submitted the International Committee of Medical Journal Editors form for disclosure of potential conflicts of interest. No potential conflicts of interest were disclosed.

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Errata

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In the report "Community-Associated Outbreak of COVID-19 in a Correctional Facility — Utah, September 2020–January 2021," on page 467 in the first paragraph, the fourth sentence should have read, "Two days later, the roommate received a positive SARS-CoV-2 test result, becoming the first person with a **known community-associated** case of COVID-19 at facility A."

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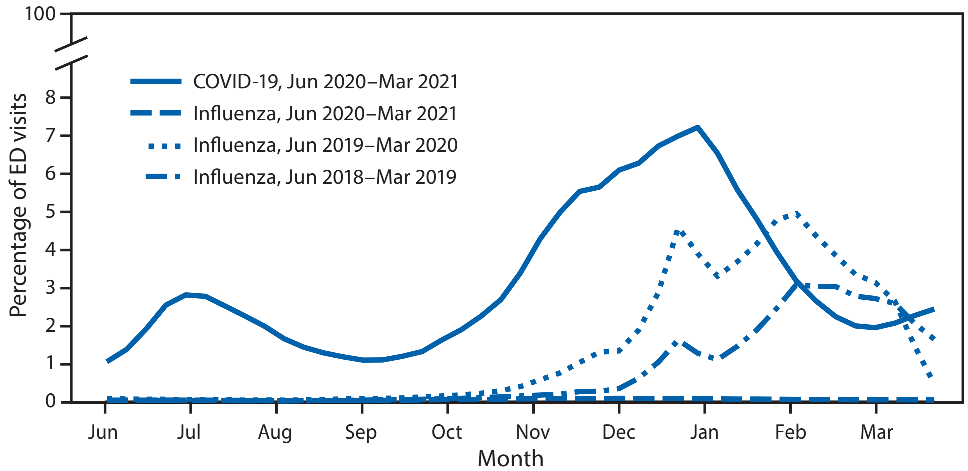
In the report "Willingness to Receive a COVID-19 Vaccination Among Incarcerated or Detained Persons in Correctional and Detention Facilities — Four States, September–December 2020," on page 473, the third footnote should have read, "§ **The denominator for the response rate was resident census of each facility, which included per-sons in restricted areas who were not approached for inter-view. Because not all facility residents were approached, the response rate was at least 64.2% (5,110 participants among a cumulative census of 7,955).**" On page 474, the footnote should have read, "¶ **45 C.F.R. part 46, 21 C.F.R. part 56; 42 U.S.C. Sect. 241(d); 5 U.S.C. Sect. 552a; 44 U.S.C. Sect. 3501 et seq.**"

COVID-19 Stats

COVID-19* and Influenza† Discharge Diagnoses as a Percentage of Emergency Department (ED) Visits,§ by Year — United States, June 2018–March 2021



* COVID-19 visits were identified using *International Classification of Diseases, Tenth Revision*, *Clinical Modification* (ICD-10-CM) and SNOMED Clinical Terms (SNOMED CT) diagnosis codes. ICD-10-CM codes included U07.1, COVID-19 and J12.82 (pneumonia due to coronavirus disease 2019). SNOMED CT codes included 840539006 (disease caused by SARS-CoV-2 [disorder]), 840544004 (suspected disease caused by SARS-CoV-2 [situation]), and 840533007 (SARS-CoV-2 [organism]).

† Influenza visits were identified using *International Classification of Diseases, Ninth Revision*, *Clinical Modification* (ICD-9-CM), ICD-10-CM, and SNOMED CT diagnosis codes. ICD-9-CM codes included those beginning with 487 (influenza) and 488.01, 488.09, 488.11, 488.19, 488.81, and 488.89 (influenza due to certain identified influenza viruses with pneumonia and other manifestations). ICD-10-CM codes included those that start with J09 (influenza due to certain identified influenza viruses), J10 (influenza due to other identified influenza virus), and J11 (influenza due to unidentified influenza virus). SNOMED CT codes included 442696006 (influenza caused by influenza A virus subtype H1N1 [disorder]); 442438000 (influenza caused by influenza A virus [disorder]), 24662006 (influenza caused by influenza B virus [disorder]), 6142004 (influenza [disorder]), and 195878008 (pneumonia and influenza [disorder]).

§ Data include ED visits from 71% of U.S. facilities in all states except Hawaii; some states have a higher proportion of facilities sending data than others. Data are presented as ED visits for influenza or COVID-19 as the weekly percentage of all ED visits during June–March for a given year.

In late June 2020, the percentage of ED visits for COVID-19 increased and reached a peak of 2.8% of all ED visits in early July before declining through August. This decline was followed by a larger and more prolonged increase beginning in September 2020 that reached a peak (7.2%) in early January 2021. Influenza activity generally begins in October with increased activity throughout the winter months. By the beginning of February 2018, the percentage of ED visits for influenza reached 3.1%, and by the beginning of February 2019, reached 5.0%. During June 2020–March 2021, ED visits for influenza accounted for less than 0.1% of all visits.

Source: National Syndromic Surveillance Program, June 2018–March 2021. https://www.cdc.gov/nssp/index.html

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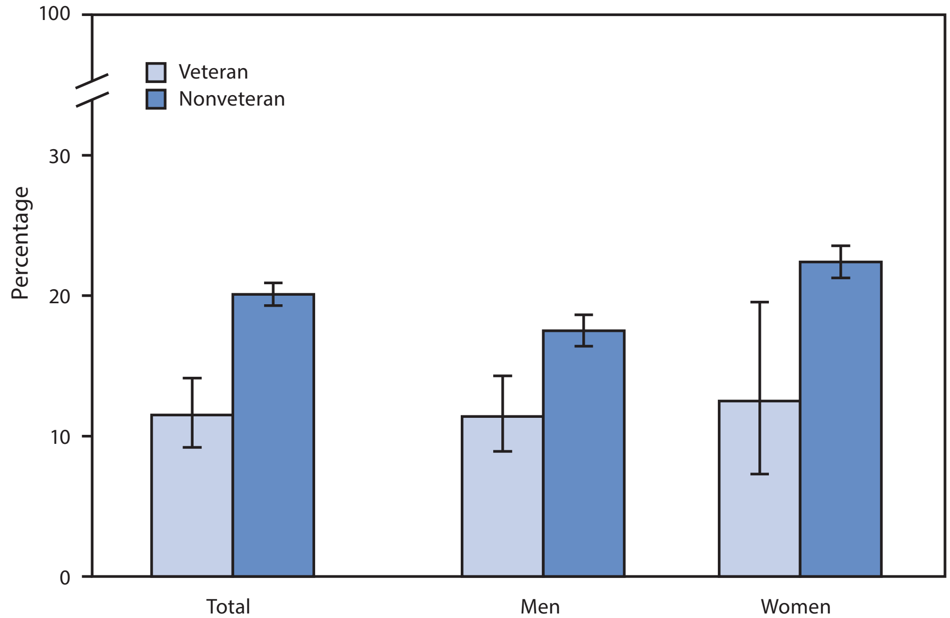
QuickStats

FROM THE NATIONAL CENTER FOR HEALTH STATISTICS

Age-Adjusted Percentage* of Adults Aged 25–64 Years Who Are Very Worried About Their Ability to Pay Medical Bills if They Get Sick or Have an Accident,† by Sex and Veteran Status — National Health Interview Survey, United States, 2019§



* Percentages are age-adjusted using the projected 2000 U.S. population as the standard population using age groups 25–34, 35–49, and 50–64 years; 95% confidence intervals indicated by error bars.
† Based on a response of "very worried" to a question asking, "If you get sick or have an accident, how worried are you that you will be able to pay your medical bills? Are you very worried, somewhat worried, or not at all worried?"
§ Estimates are based on household interviews of a sample of the civilian, noninstitutionalized U.S. population.

In 2019, among adults aged 25–64 years, veterans (11.5%) were less likely than nonveterans (20.1%) to be very worried about their ability to pay their medical bills if they get sick or have an accident. This pattern was found for both men and women, with veterans less likely than nonveterans to be very worried about medical bills: 11.4% versus 17.5% for men and 12.5% versus 22.4% for women, respectively.

Source: National Center for Health Statistics, National Health Interview Survey, 2019 data. https://www.cdc.gov/nchs/nhis.htm

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