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Economic Cost of Injury — United States, 2019

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Unintentional and violence-related injuries, including suicide, homicide, overdoses, motor vehicle crashes, and falls, were among the top 10 causes of death for all age groups in the United States and caused nearly 27 million nonfatal emergency department (ED) visits in 2019.*,† CDC estimated the economic cost of injuries that occurred in 2019 by assigning costs for medical care, work loss, value of statistical life, and quality of life losses to injury records from the CDC's Web-based Injury Statistics Query and Reporting System (WISQARS).§ In 2019, the economic cost of injury was $4.2 trillion, including $327 billion in medical care, $69 billion in work loss, and $3.8 trillion in value of statistical life and quality of life losses. More than one half of this cost ($2.4 trillion) was among working-aged adults (aged 25–64 years). Individual persons, families, organizations, communities, and policymakers can use targeted proven strategies to prevent injuries and violence. Resources for best practices for preventing injuries and violence are available online from CDC's National Center for Injury Prevention and Control.¶

The economic cost estimate for injuries that occurred in 2019 uses the societal perspective, including tangible and intangible costs to multiple payers, and a 1-year time horizon (period over which costs are assessed) for nonfatal injuries. Costs are presented in 2019 U.S. dollars (USD). WISQARS nonfatal injury counts are hospital ED injury visits from the nationally representative National Electronic Injury Surveillance System – All Injury Program. WISQARS fatal injury counts are from CDC's National Vital Statistics System mortality data.

Medical and work loss costs (*1*,*2*) were adjusted for patient clinical and demographic characteristics, including comorbidities, sex, and age, and modified to 2019 USD.** Medical costs were assigned to WISQARS records by injury outcome (fatal or nonfatal), mechanism (e.g., fall), intent (e.g., unintentional), and place of death (e.g., inpatient hospital) or ED visit disposition (treated and released or hospitalized, including transferred). Work loss costs for nonfatal injuries were assigned by injury mechanism and ED visit disposition

* Data on leading causes of death and years of potential life lost are available from https://wisqars.cdc.gov/data/lcd (Accessed November 29, 2021).

† Data on estimated number of nonfatal emergency department visits for injuries are available from https://wisqars.cdc.gov/data/non-fatal/explore (Accessed November 29, 2021).

§ https://www.cdc.gov/injury/wisqars

¶ https://www.cdc.gov/injury

** U.S. Bureau of Economic Analysis. National Income and Product Accounts: Table 2.5.4: Price Indexes for Personal Consumption Expenditures by Function (37. Health) and Table 1.1.4: Price Indexes for Gross Product D. (1. Gross domestic product); 2020. https://www.bea.gov/itable (Accessed August 3, 2020).

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to injured persons of all ages; this approach assumes injured children and older adults incur lost productivity among working-aged adult caregivers. Aggregated medical and work loss costs (e.g., combined intents by mechanism or combined mechanisms by ED visit disposition) from reference sources were assigned when specific estimates by intent or mechanism were not available.

The cost of injury mortality includes value of statistical life, a monetary estimate of the collective value placed on mortality risk reduction as derived in research studies through revealed preferences (e.g., observed wage differences for dangerous occupations) or stated preferences from surveys of individual persons' willingness to pay for mortality risk reduction (*3*). Value of statistical life estimates were assigned by decedent age: 0–17 years, $16.9 million (*4*); 18–65 years, $10.7 million (*3*); and values descending from $6 million (aged 66 years) to $410,000 (aged ≥100 years), reflecting the estimate for persons aged 18–65 years adjusted for older adults' decreasing general life expectancy and baseline quality of life. Cost of nonfatal injury morbidity includes quality of life losses measured in terms of quality-adjusted life years (QALY; 1 QALY equals 1 year of perfect health) (*5*) and valued at $540,000 per QALY (*3*). Injury count, rate per 100,000 population, cost by type (medical, work loss, value of statistical life, and quality of life loss), and total cost are reported by intent, sex, and age group. All reported data can be queried online using WISQARS. This activity was reviewed by CDC and was conducted consistent with applicable federal law and CDC policy.[††]

In 2019, the economic cost of injury was $4.2 trillion, including $327 billion in medical care, $69 billion in work loss, and $3.8 trillion in value of statistical life and quality of life losses (Table). The economic costs were $2.2 trillion for fatal injuries and $2.0 trillion for nonfatal injuries. The number of injury deaths and associated economic cost were higher among males (169,628 and $1.6 trillion, respectively) than among females (76,413 and $607 billion, respectively). The cost of nonfatal injury was similar for males and females ($1 trillion). Except for nonfatal self-harm, the age-adjusted rate, number, and economic cost for all injury outcomes (fatal and nonfatal) and intents (unintentional, homicide or assault) were higher for males than for females.

Economic cost was highest for persons aged 25–44 and 45–64 years ($1.2 trillion each), followed by those aged ≥65 years ($906 billion), 15–24 years ($512 billion), and 0–14 years ($396 billion). Although the injury fatality rate was highest among those aged ≥65 years (132.1 per 100,000; mostly unintentional [112.0]), the economic cost of fatal injuries was higher for those aged 25–44 years ($808 billion) and 45–64 years ($755 billion) than for those aged ≥65 years

[††]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.

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TABLE. Number, rates, and estimated costs* of injuries, by outcome, intent, sex, and age group — United States, 2019

		Sex		Age group, yrs				
Outcome and intent	**Total**	**Male**	**Female**	**0–14**	**15–24**	**25–44**	**45–64**	**≥65**
Total cost	**4,208,579**	**2,609,647**	**1,598,906**	**396,491**	**512,206**	**1,213,049**	**1,180,231**	**905,945**
Medical	**326,774**	179,673	147,094	33,151	38,522	82,724	77,607	94,514
Work loss	**68,729**	37,085	31,642	7,472	8,751	18,165	16,758	17,545
Value of statistical life and quality of life	**3,813,077**	2,392,888	1,420,170	355,868	464,932	1,112,160	1,085,866	793,886
Fatal injuries								
All intents†								
No. of deaths	**246,041**	169,628	76,413	5,590	23,051	75,488	70,453	71,435
Rate§	**71.1**	102.8	40.8	9.2	54.0	86.2	84.6	132.1
Costs	**2,186,049**	1,578,711	607,338	94,559	267,218	808,334	754,570	261,368
Medical	**3,786**	2,226	1,560	88	205	612	723	2,158
Value of statistical life	**2,182,263**	1,576,484	605,778	94,471	267,013	807,722	753,847	259,210
Unintentional								
No. of deaths	**173,040**	112,720	60,320	3,907	11,755	48,586	48,251	60,527
Rate§	**49.2**	68.2	31.3	6.5	27.5	55.5	57.9	112.0
Costs	**1,447,643**	1,006,091	441,552	66,086	134,498	520,291	516,874	209,894
Medical	**3,265**	1,834	1,430	58	114	421	588	2,084
Value of statistical life	**1,444,378**	1,004,257	440,122	66,028	134,384	519,870	516,286	207,810
Homicide								
No. of deaths	**19,141**	15,264	3,877	893	4,774	8,787	3,614	1,071
Rate§	**6.0**	9.6	2.4	1.5	11.2	10.0	4.3	2.0
Costs	**209,019**	167,502	41,517	15,109	55,581	94,105	38,710	5,514
Medical	**204**	170	34	18	47	84	40	14
Value of statistical life	**208,816**	167,332	41,484	15,092	55,533	94,021	38,670	5,500
Suicide								
No. of deaths	**47,511**	37,256	10,255	546	5,954	15,584	16,250	9,173
Rate§	**13.9**	22.4	6.0	0.9	14.0	17.8	19.5	17.0
Costs	**463,193**	359,092	104,102	9,235	70,567	166,836	173,946	42,610
Medical	**252**	179	73	7	39	87	71	47
Value of statistical life	**462,941**	358,912	104,029	9,227	70,528	166,749	173,875	42,562

See table footnotes on the next page.

($261 billion) because of higher value of statistical life cost. The economic cost of suicide deaths was highest among those aged 25–44 years ($167 billion) and 45–64 years ($174 billion). The economic cost of deaths from homicide was highest among those aged 25–44 years ($94 billion), followed by those aged 15–24 years ($56 billion). The economic cost of nonfatal injuries was highest among those aged ≥65 years ($645 billion), primarily because of quality of life loss costs from unintentional injuries, followed by those aged 45–64 years ($426 billion), 25–44 years ($405 billion), 0–14 years ($302 billion), and 15–24 years ($245 billion). The economic cost of nonfatal injuries from assault and self-harm were highest among those aged 25–44 years ($66 billion and $10 billion, respectively).

Discussion

This report used injury incidence data to estimate the economic cost of injuries that occurred in the United States during 2019. Economic cost was highest among working-aged adults, highlighting that injuries during the most productive part of people's lives result in a high societal cost. These findings highlight the need for targeted prevention strategies to achieve long-term value, or even cost-savings, by preventing injury morbidity and mortality through addressing the causes of unintentional and violence-related injuries at the individual, family, organizational, and community levels.

The 2019 economic cost of injuries ($4.2 trillion) is more than six times as high as a comparable estimate in 2013 ($671 billion) (*6*,*7*). Even though the number of nonfatal ED injury visits in 2019 was approximately 15% lower than it was in 2013, the 2019 nonfatal injury economic cost ($2.0 trillion) is more than four times as high as the 2013 estimate ($457 billion) (*6*), primarily because of including the cost of diminished quality of life. The 2019 fatal injury economic cost ($2.2 trillion) is substantially higher than the similar estimate in 2013 ($214 billion) (*7*). This difference reflects a 28% higher number of injury deaths in 2019 and mortality cost based on value of statistical life, which represents a value that is approximately 10 times as high as the value attributed to mortality based on foregone employment compensation, which was used in the previous estimate.

The findings in this report are subject to at least five limitations. First, the economic cost of nonfatal injuries is underestimated because only injuries treated in an ED are included (injuries initially treated in urgent care or doctor's offices not included),

TABLE. (*Continued*) Number, rates, and estimated costs* of injuries, by outcome, intent, sex, and age group — United States, 2019

		Sex		Age group, yrs				
Outcome and intent	**Total**	**Male**	**Female**	**0–14**	**15–24**	**25–44**	**45–64**	**≥65**
Nonfatal injuries¶								
All intents**								
No. of injuries	**25,933,780**	13,973,305	11,960,119	4,102,128	3,842,368	7,275,609	5,929,789	4,778,380
Rate§	**7,881.5**	8,699.3	7,037.9	6,772.5	9,001.2	8,305.5	7,116.6	8,839.3
Costs	**2,022,531**	1,030,936	991,568	301,932	244,988	404,716	425,661	644,577
Medical	**322,988**	177,447	145,534	33,063	38,317	82,112	76,884	92,356
Work loss	**68,729**	37,085	31,642	7,472	8,751	18,165	16,758	17,545
Quality of life	**1,630,814**	816,404	814,392	261,397	197,919	304,438	332,019	534,676
Unintentional								
No. of injuries	**23,973,103**	12,865,348	11,107,407	3,953,061	3,319,180	6,412,723	5,556,825	4,727,632
Rate§	**7,256.4**	8,001.0	6,484.9	6,526.3	7,775.5	7,320.5	6,669.0	8,745.4
Costs	**1,840,193**	920,286	919,881	291,077	199,765	324,816	386,194	637,937
Medical	**285,673**	154,120	131,548	30,854	28,092	65,722	69,641	91,250
Work loss	**62,889**	33,896	28,991	7,081	7,124	15,763	15,554	17,341
Quality of life	**1,491,631**	732,271	759,342	253,143	164,549	243,330	300,999	529,345
Assault								
No. of injuries	**1,421,988**	854,340	567,648	101,918	348,467	659,136	277,316	33,403
Rate§	**452.2**	537.8	366.7	168.3	816.3	752.4	332.8	61.8
Costs	**149,534**	92,853	56,680	8,533	35,651	66,450	33,297	5,352
Medical	**23,689**	17,116	6,573	1,046	5,883	11,386	4,625	609
Work loss	**2,605**	1,821	784	125	605	1,229	555	80
Quality of life	**123,240**	73,916	49,324	7,362	29,163	53,836	28,117	4,663
Self-harm								
No. of injuries	**460,416**	186,954	273,455	46,429	157,635	158,489	82,642	15,221
Rate§	**147.9**	118.1	178.9	76.7	369.3	180.9	99.2	28.2
Costs	**26,705**	12,528	14,176	2,277	8,169	10,020	5,089	1,150
Medical	**12,601**	5,340	7,260	1,157	4,127	4,425	2,432	459
Work loss	**3,104**	1,259	1,845	266	994	1,098	627	120
Quality of life	**11,000**	5,929	5,071	854	3,047	4,497	2,031	571

Abbreviation: USD = U.S. dollars.

* In millions of 2019 USD.

† Fatal all intents estimates include injuries with legal intervention intent, undetermined intent, unknown sex, and unknown age.

§ Per 100,000. Age-adjusted rate is presented for "Total," "Male," and "Female" columns.

¶ Nonfatal injuries are an estimated number of hospital visits for injury care that start in an emergency department (with disposition treated and released, transferred, or hospitalized; visits with observed, left against medical advice, and unknown disposition were not included) based on a nationally representative probability sample of hospitals.

** Nonfatal all intents estimates include injuries with legal intervention intent, unknown sex, and unknown age. Nonfatal assault, self-harm, and legal intervention include cases that are confirmed or suspected; all other cases are considered unintentional.

other costs such as property damage and criminal justice are not included, and nonfatal costs address only the first year following an injury. The cost of nonfatal injury includes observed medical care and work loss attributable to injuries based on comparing injured patients and non-injured persons during the year following the injured patient's initial ED visit (*1*,*2*). A 1-year time horizon is appropriate for many injury types but does not address the long-term physical and mental health consequences of some injuries (e.g., traumatic brain injury and violence-related injuries). Second, although injury-related medical care and work loss have costs to specific, identifiable payers (including individual persons, health insurance payors, and employers), the highest cost elements presented here are value of statistical life and quality of life losses; these costs are not readily identifiable through financial transactions and thus not as visible to some stakeholders as are direct costs, such as medical care. Third, although this study aimed for a reasonable use of available value of statistical life data, the relationship between value of statistical life and age (particularly, value of statistical life for older adults) is likely more complex than applied here and would benefit from further direct study (*8*). Fourth, quality of life loss estimates might indirectly capture some work loss; therefore, the nonfatal economic cost estimate might partially double count such costs. Finally, this report provides an initial assessment of the economic cost of injury by intent based on injured person sex and age group. Estimation of injury costs by other demographic and geographic factors within the United States can provide additional meaningful information for injury prevention.

Individual persons, families, organizations, communities, and policymakers can use targeted proven strategies to prevent injuries and violence. Data and resources that can assist in measuring and preventing injuries and violence, including suicide, overdoses, falls, firearm violence, motor vehicle crashes, traumatic brain injury, adverse childhood experiences, youth violence, sexual violence, and intimate partner violence,

Summary

What is already known about this topic?

Unintentional and violence-related injuries, including suicide, were among the top 10 causes of U.S. deaths for all age groups and caused nearly 27 million nonfatal emergency department visits in 2019.

What is added by this report?

Fatal and nonfatal injury data from CDC's Web-based Injury Statistics Query and Reporting System were matched to medical care, work loss, value of statistical life, and quality of life loss costs. The estimated U.S. economic cost of injuries in 2019 was $4.2 trillion. More than one half of this cost ($2.4 trillion) was among working-aged adults (aged 25–64 years).

What are the implications for public health practice?

Unintentional and violence-related injuries are costly and preventable. Resources for best practices for preventing injuries and violence are available online from CDC's National Center for Injury Prevention and Control.

are available online from CDC's National Center for Injury Prevention and Control. Opportunities to investigate injury data and costs are available online from WISQARS.

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State-Level Economic Costs of Fatal Injuries — United States, 2019

Cora Peterson, PhD[1]; Feijun Luo, PhD[1]; Curtis Florence, PhD[1]

Unintentional and violence-related injury fatalities, including suicide, homicide, overdoses, motor vehicle crashes, and falls, were among the 10 leading causes of death for all age groups in the United States in 2019.* There were 246,041 injury deaths in 2019 (unintentional injury was the most frequent cause of death after heart disease and cancer) with an economic cost of $2.2 trillion (*1*). Extending a national analysis (*1*), CDC examined state-level economic costs of fatal injuries based on medical care costs and the value of statistical life assigned to 2019 injury records from the CDC's Web-based Injury Statistics Query and Reporting System (WISQARS).† West Virginia had the highest per capita cost ($11,274) from fatal injury, more than twice that of New York, the state with the lowest cost ($4,538). The five areas with the highest per capita total fatal injury costs were West Virginia, New Mexico, Alaska, District of Columbia (DC), and Louisiana; costs were lowest in New York, California, Minnesota, Nebraska, and Texas. All U.S. states face substantial avoidable costs from injury deaths. Individual persons, families, organizations, communities, and policymakers can use targeted proven strategies to prevent injuries and violence. Resources for best practices for preventing injuries and violence are available online from the CDC's National Center for Injury Prevention and Control.§

The economic cost estimate for injuries that occurred in 2019 uses the societal perspective, including tangible and intangible costs to multiple payers. Costs are presented in 2019 U.S. dollars (USD). WISQARS fatal injury counts are from CDC's National Vital Statistics System mortality data. In 2019, approximately 70% of U.S. injury deaths (173,040) were attributable to unintentional injuries (among which 36% were related to drug poisoning, 23% to falls, and 22% to motor vehicle traffic); approximately 20% were suicides; and 8% were homicides.¶ Medical costs were adjusted for patient characteristics (*2*), including comorbidities, sex, and age, and were modified to 2019 USD** and assigned to WISQARS records by injury mechanism (e.g., fall), intent (e.g., unintentional), and place of death (e.g., inpatient hospital). Aggregated medical costs (e.g., combined intents by mechanism or combined mechanisms by place of death) from reference sources were assigned when specific estimates by intent or mechanism were not available. The average medical cost among 2019 injury deaths was approximately $15,400††; however, many injury deaths had lower costs because the deaths occurred outside a health care setting (*2*).

The cost of injury mortality includes value of statistical life, a monetary estimate of the collective value that persons place on mortality risk reduction as derived in research studies through revealed preferences (e.g., observed wage differences for dangerous occupations) or stated preferences from surveys of persons' willingness to pay for mortality risk reduction (*3*). Value of statistical life estimates were assigned by decedent age: 0–17 years, $16.9 million (*4*); 18–65 years, $10.7 million (*3*); values descending from $6 million (aged 66 years) to $410,000 (aged ≥100 years), reflecting the estimate for persons aged 18–65 years adjusted for older adults' decreasing general life expectancy and baseline quality of life. Per capita fatal injury costs by U.S. state are presented graphically by injury intent (Figure). Injury fatality rates by state, intent, sex, and age group (0–24 years, 25–64 years, and ≥65 years) were examined to better understand the contributing circumstances in states with the highest per capita total injury costs. All reported data can be queried online using WISQARS. This activity was reviewed by CDC and was conducted consistent with applicable federal law and CDC policy.§§

The five areas with the highest per capita total fatal injury costs were West Virginia, New Mexico, Alaska, DC, and Louisiana; those with the lowest costs were New York, California, Minnesota, Nebraska, and Texas (Figure).¶¶ West Virginia had the highest per capita cost ($11,274) from fatal injury, more than twice that of New York, the state with the lowest cost ($4,538). The five states

* https://wisqars.cdc.gov/data/lcd

† https://www.cdc.gov/injury/wisqars

§ https://www.cdc.gov/injury

¶ Data available at https://wisqars.cdc.gov/data/explore-data/home. To access injury-related deaths by mechanism or intent for 2019, select 2019 as both the From and To years and then click the Explore Data Button. When the visualization appears, click the Filter Data button to view data by injury mechanism or intent.

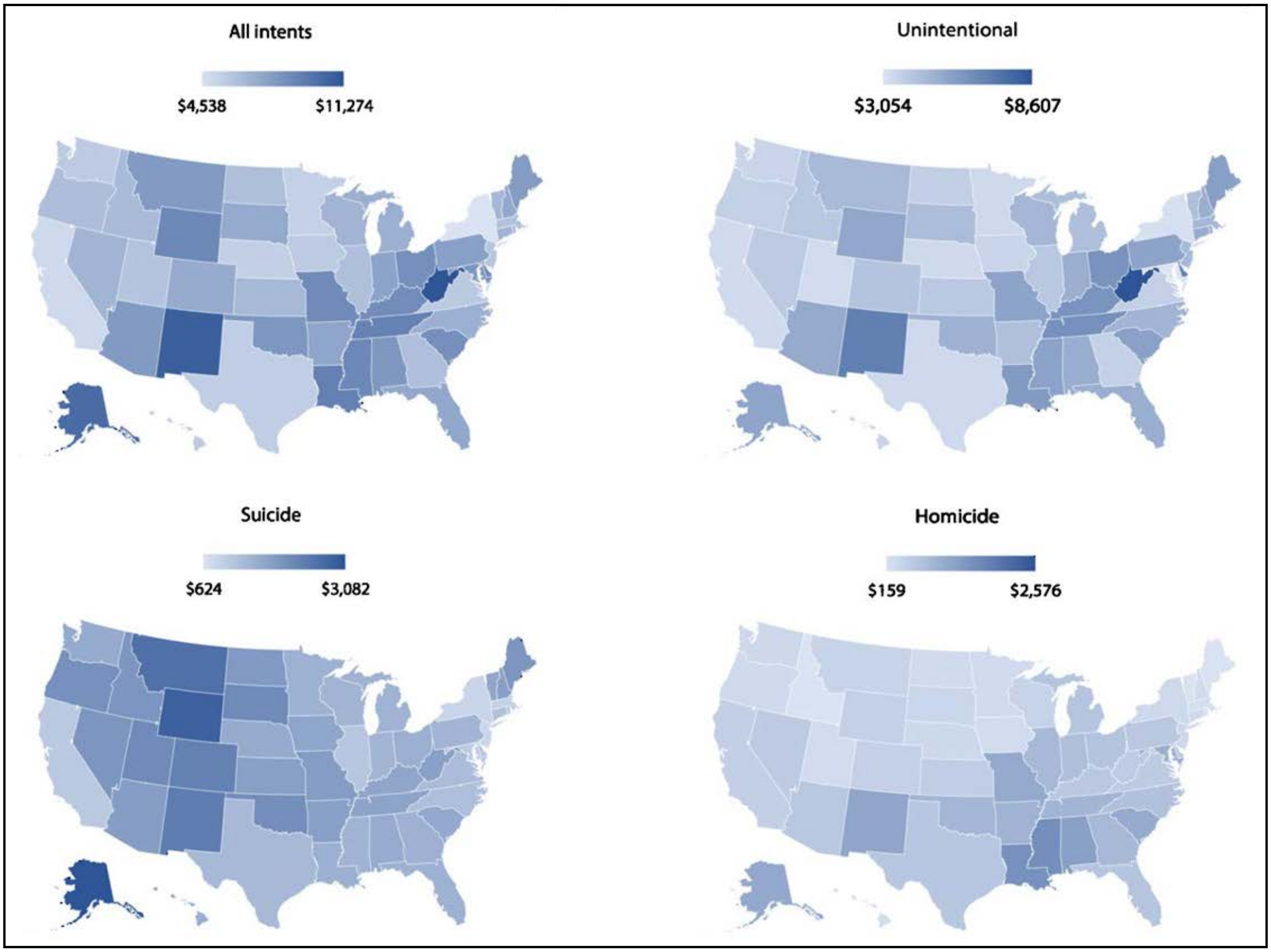
** U.S. Bureau of Economic Analysis. National Income and Product Accounts: Table 2.5.4: Price Indexes for Personal Consumption Expenditures by Function (37. Health); 2020. https://www.bea.gov/itable (Accessed August 3, 2020).

†† Data available at https://wisqars.cdc.gov/cost and can be accessed using the following data selections: Injury Outcome = Fatal: Data Year = 2019; Mechanism = All Injury; Intent = All Intents; Geography = United States; Age Groups = 0 to 4 to Unknown; Sex = Males, Females, and Unknown; Cost Measure = Average; Cost Type = Medical Costs; and Report Layout Down/Row = None.

§§ 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.

¶¶ Data available at https://wisqars.cdc.gov/cost and can be accessed using the following data selections: Injury Outcome = Fatal; Data Year = 2019; Mechanism = All Injury; Intent = All Intents; Geography = United States; Age Groups = 0 to 4 to Unknown; Sex = Males, Females, and Unknown; Cost Measure = Per Capita; Cost Type = Combined Costs; and Report Layout Down/Row = State and Intent (or State only for All Intents).

FIGURE. State-level fatal injury costs*,† per capita, by intent — United States, 2019



Abbreviation: USD = U.S. dollars.
* 2019 USD.
† https://wisqars.cdc.gov/cost

with the highest per capita costs for unintentional injury deaths were West Virginia, New Mexico, Delaware, Tennessee, and Ohio; the states with the lowest costs were Maryland, New York, Utah, California, and Nebraska. Per capita unintentional injury cost in West Virginia ($8,607) was approximately triple that in Maryland ($3,054). The five states with the highest per capita costs for suicide were Alaska, Wyoming, Montana, New Mexico, and Colorado; those areas with the lowest costs were DC, New Jersey, New York, Massachusetts, and Maryland. Per capita suicide cost in Alaska ($3,082) was approximately five times than that in DC ($624). The five areas with the highest per capita costs for homicide were DC, Mississippi, Louisiana, Alabama, and New Mexico; the states with the lowest costs were Idaho, Maine, Vermont, Rhode Island, and Massachusetts. Per capita homicide cost in DC ($2,576) was more than 16 times as high as that in Idaho ($159).

State-level injury fatality rates in 2019 by intent, sex, and age group suggest that the five areas with the highest per capita total fatal injury cost face different challenges in injury prevention. West Virginia had the highest age-adjusted unintentional injury fatality rate in the nation (including the highest for males, females, and persons aged 25–64 years) and the second highest for persons aged ≥65 years.*** New Mexico had the

*** Data available at https://wisqars.cdc.gov/data/explore-data/home using the following steps: 1) select 2019 as both the From and To years and then click the Explore Data Button; 2) when the visualization appears, click the Filter Data button; 3) to query by intent, make a selection under Intent of Death; 4) to query by age, make a selection under Ages; 5) to query by sex, make a selection under Sex; 6) leave all other filters set to their default values; 7) click the Apply Filters button to create the U.S. Map of Injury-Related Deaths; and 8) click the Download Data/Image button to view age-adjusted and crude rates by state.

second highest age-adjusted unintentional injury fatality rate (including the second highest for males and females and third highest for persons aged 25–64 years) and was among the five states with the highest age-adjusted rate of both suicide (including for males, females, and each of the three assessed age groups) and homicide deaths (including for females and persons aged 25–64 years). Alaska had the nation's second highest age-adjusted suicide rate (including for males, females, and persons aged 25–64 years, and the highest rate for persons aged 0–24 years) and the highest age-adjusted homicide rate for females. DC had the lowest age-adjusted suicide rate among all areas but the highest homicide rate (including for males and persons aged 0–24 and 25–64 years). Louisiana was among the top three states for the highest rate of age-adjusted homicide deaths (including for males, females, and each of the three assessed age groups).

Summary

What is already known about this topic?

In 2019, injuries accounted for 246,041 U.S. deaths; the economic cost of these injuries was $2.2 trillion.

What is added by this report?

West Virginia had the highest per capita cost ($11,274) from fatal injury, more than twice that of New York, the state with the lowest cost ($4,538). The highest per capita fatal injury costs occurred in Alaska, District of Columbia, Louisiana, New Mexico, and West Virginia; the lowest occurred in California, Minnesota, Nebraska, New York, and Texas.

What are the implications for public health practice?

All states face substantial avoidable costs due to injury deaths. Resources for best practices for preventing injuries and violence are available online from CDC's National Center for Injury Prevention and Control.

Discussion

All U.S. states face substantial avoidable costs from injury deaths. Identifying the economic cost of injuries is an essential part of the public health approach to injury and violence prevention and can support identification of cost-effective interventions. These findings highlight the need for targeted prevention strategies to achieve long-term value, or even cost savings, by preventing injury morbidity and mortality through addressing the causes of unintentional and violence-related injuries at the individual person, family, organizational, and community levels.

The number of injury deaths and a higher proportion of younger decedents had the biggest impact on each state's total fatal injury cost. The cost of medical care for 2019 injury fatalities is marginal in comparison to the value of statistical life (*1*), which aims to capture complex costs related to mortality. Value of statistical life represents a value that is approximately 10 times higher than the value attributed to mortality based on foregone employment compensation, which was used to estimate states' economic cost of fatal injuries in 2014 (*5*). At that time, similar to the results presented in this report, Alaska, Louisiana, New Mexico, Oklahoma, and West Virginia had the highest per capita total injury costs among U.S. states.

The findings in this report are subject to at least four limitations. First, although injury-related medical care incurs costs to specific, identifiable payers (including individual persons, health insurance payors, and employers), value of statistical life aims to capture costs of mortality that are not readily identifiable through financial transactions and thus are not as visible to some stakeholders. Second, available average medical costs in reference sources were not state-specific. Third, on the basis of available data, this study assigned value of statistical life by age group; however, the relationship between value of statistical life and age (and in particular, value of statistical life for older adults) is likely more complex than applied here and would benefit from further direct study (*6*). Finally, this report provides an initial assessment of states' economic costs of injury by intent. Observed differences in per capita total fatal injury costs likely reflect important differences in affected populations (e.g., children, youths, and young adults versus older adults) and injury mechanism (e.g., firearm, fall, or drug poisoning) that must be understood to effectively target prevention resources.

Individual persons, families, organizations, communities, and policymakers can use targeted proven strategies to prevent injuries and violence. Data and resources that can assist in measuring and preventing injuries and violence, including suicide, overdoses, falls, firearm violence, motor vehicle crashes, traumatic brain injuries, adverse childhood experiences, youth violence, sexual violence, and intimate partner violence, are available online from CDC's National Center for Injury Prevention and Control. Opportunities to investigate national and state-level injury data and costs are available online from WISQARS.

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Incidence of Nonfatal Traumatic Brain Injury–Related Hospitalizations — United States, 2018

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Traumatic brain injury (TBI), which can disrupt normal brain function and result in short- and long-term adverse clinical outcomes, including disability and death, is preventable. To describe the 2018 incidence of nonfatal TBI-related hospitalizations in the United States by sociodemographic characteristics, injury intent, and mechanism of injury, CDC analyzed data from the Healthcare Cost and Utilization Project (HCUP) National (Nationwide) Inpatient Sample. During 2018, there were 223,050 nonfatal TBI-related hospitalizations; rates among persons aged ≥75 years were approximately three times higher than those among persons aged 65–74 years, and the age-adjusted rate among males was approximately double that among females. Unintentional falls were the most common mechanism of injury leading to nonfatal TBI-related hospitalization, followed by motor vehicle crashes. Proper and consistent use of recommended restraints (i.e., seatbelts, car seats, and booster seats) and, particularly for persons aged ≥75 years, learning about individual fall risk from health care providers are two steps the public can take to prevent the most common injuries leading to nonfatal TBIs. The findings in this report could be used by public health officials and clinicians to identify priority areas for prevention programs.

Estimates for nonfatal TBI-related hospitalizations were obtained from the 2018 HCUP National Inpatient Sample files. The National Inpatient Sample is a stratified sample of approximately 20% of hospital discharges in the United States and is sponsored by the Agency for Healthcare Research and Quality. Records were included if the primary diagnosis was an injury and a TBI-related *International Classification of Diseases, Tenth Revision, Clinical Modification* (ICD-10-CM) code (S02.0, S02.1–, S02.80X–S02.82X, S02.91, S04.02, S04.03–, S04.04–, S06–, S07.1, and T74.4) was present in any diagnosis field. A record could potentially include multiple external cause of injury codes; injury mechanism/intent categories were based on the first cause code found, as it was considered the first valid external cause of injury code. ICD-10-CM codes and more detailed methods are available online (*1*). Rates were calculated using bridged race population estimates obtained from the National Center for Health Statistics as denominators. Nonfatal hospitalizations were weighted to provide national estimates, and 95% CIs were calculated using complex survey procedures in SAS (version 9.4; SAS Institute). Age-adjusted rates were calculated using the direct method and the 2000 U.S. Census Bureau standard population. This activity was reviewed by CDC and was conducted consistent with applicable federal law and CDC policy.*

In 2018, there were 223,050 nonfatal TBI-related hospitalizations in the United States. Among nonfatal TBI-related hospitalizations with known age, 16,480 (7.4%) occurred among infants, children, and adolescents aged 0–17 years, and 70,445 (31.6%) occurred among adults aged ≥75 years (Table 1). National rates of nonfatal TBI-related hospitalizations were highest among persons aged ≥75 years (321.4 per 100,000 population) and among males (81.3 per 100,000 population, age-adjusted). The rate of nonfatal TBI-related hospitalizations among persons aged ≥75 years was approximately three times higher than that among those aged 65–74 years (105.5 per 100,000 population), and the rate among males was approximately double that among females (44.4 per 100,000 population, age-adjusted). Age-adjusted rates of nonfatal TBI-related hospitalizations were similar among non-Hispanic White persons (59.0 per 100,000 population), non-Hispanic Black persons (60.0 per 100,000 population), and Hispanic persons (59.6 per 100,000).

In 2018, approximately 75% of nonfatal TBI-related hospitalizations were caused by either unintentional falls (51.0%) or motor vehicle crashes (23.8%) (Table 2). Rates for nonfatal TBI-related hospitalizations attributable to unintentional falls were highest among adults aged ≥75 years (263.3 per 100,000 population), 65–74 years (69.9 per 100,000 population), and 55–64 years (33.2 per population). Among all age groups, the highest rates of motor vehicle crashes leading to a nonfatal TBI-related hospitalization were among persons aged 15–24 years (24.6 per 100,000 population) and aged 25–34 years (21.9 per 100,000 population). Among the major examined unintentional and intentional mechanisms of injuries that contributed to a nonfatal TBI-related hospitalization (e.g., motor vehicle crashes, falls, being struck by or against an object, self-harm, and assault), higher total estimates and age-adjusted rates were observed among males compared with females for all mechanisms of injury (Table 3).

Discussion

Nationally, 223,050 nonfatal TBI-related hospitalizations occurred during 2018. Rates varied by age group, sex, principal

* 45 C.F.R. part 46.102(l)(2), 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.

TABLE 1. Weighted estimated number* and rate† of nonfatal traumatic brain injury–related hospitalizations§ (N = 223,050), by selected sociodemographic characteristics — National Inpatient Sample, Healthcare Cost and Utilization Project, United States, 2018

Characteristic	No. Crude*	No. Adjusted¶	Rate† (95% CI) Crude*	Rate† (95% CI) Adjusted¶
Age group, yrs (% of adjusted total)				
0–17	16,480 (7.4)	—	22.5 (19.7–25.2)	—
0–4	6,540 (3.0)	—	33.1 (28.1–38.1)	—
5–9	2,415 (1.1)	—	12.0 (10.0–13.9)	—
10–14	3,190 (1.4)	—	15.3 (12.9–17.7)	—
15–24	19,850 (8.9)	—	46.3 (42.7–49.9)	—
25–34	21,010 (9.4)	—	46.1 (42.3–49.8)	—
35–44	17,745 (8.0)	—	43.1 (39.6–46.6)	—
45–54	21,115 (9.5)	—	50.8 (47.2–54.3)	—
55–64	28,610 (12.8)	—	67.8 (63.7–71.8)	—
65–74	32,115 (14.4)	—	105.5 (100.0–110.9)	—
≥75	70,445 (31.6)	—	321.4 (306.0–336.8)	—
Sex				
Male	134,650	134,635	83.7 (79.0–88.4)	81.3 (79.3–83.2)
Female	88,380	88,380	53.3 (50.7–55.9)	44.4 (43.3–45.5)
Race/Ethnicity**				
White, non-Hispanic	145,350	145,340	72.3 (68.3–76.3)	59.0 (57.5–60.4)
Black, non-Hispanic	25,195	25,195	58.7 (52.6–64.9)	60.0 (57.2–62.8)
Hispanic	28,550	28,545	47.9 (42.3–53.4)	59.6 (56.5–62.7)
Other	17,490	17,490	75.7 (68.1–83.2)	77.8 (74.0–81.6)
Unknown	6,465	6,465	—	—
Urbanization of patient's residence				
Large central metro††	72,630	72,630	72.2 (65.0–79.3)	69.1 (66.4–71.9)
Large fringe metro§§	51,345	51,345	62.7 (55.9–69.5)	57.4 (54.8–59.9)
Medium metro¶¶	49,640	49,635	72.6 (63.8–81.4)	65.8 (62.7–68.8)
Small metro***	19,400	19,400	65.2 (57.1–73.3)	57.8 (54.8–60.9)
Micropolitan (nonmetro)†††	16,095	16,095	59.0 (52.6–65.5)	52.5 (49.8–55.2)
Noncore (nonmetro)§§§	11,370	11,370	60.5 (53.9–67.1)	53.7 (50.6–56.7)
Unknown	2,570	2,560	—	—
Total	**223,050**	**223,035**	**68.3 (64.7–71.8)**	**62.4 (61.0–63.7)**

* Hospitalizations with missing/unknown age were included.
† All rates are per 100,000 population.
§ In-hospital deaths (20,515) and patients who transferred from another hospital (45,205) were excluded.
¶ Hospitalizations with missing/unknown age were excluded. Rates were age-adjusted using the direct method to the 2000 U.S. Census Bureau standard population.
** Other includes non-Hispanic Asian, non-Hispanic Native Hawaiian or Other Pacific Islander, non-Hispanic American Indian or Alaska Native, and non-Hispanic Other.
†† Central counties of metropolitan areas of ≥1 million population.
§§ Fringe counties of metropolitan areas of ≥1 million population.
¶¶ Counties in metropolitan areas of 250,000–999,999 population.
*** Counties in metropolitan areas of 50,000–249,999 population.
††† Micropolitan counties.
§§§ Not metropolitan or micropolitan counties.

mechanism of injury and, within each principal mechanism of injury, by age group. Consistent with findings from a previous CDC surveillance report (*1*), the highest estimates and rates of nonfatal TBI-related hospitalizations occurred among adults aged ≥75 years and among males, and unintentional falls and motor vehicle crashes were the most common mechanisms of nonfatal TBI-related injury.

The highest rate of nonfatal TBI-related hospitalizations was among persons aged ≥75 years, the oldest age group in this study; hospitalizations among this age group can be complicated by the presence of underlying medical conditions, including hypertension, diabetes mellitus, or coronary heart disease (*2*). Older age is a known major risk factor for TBI (*2*), and following a TBI, older adults perform worse on measured cognitive abilities (e.g., naming and vocabulary) when compared with older adults without a history of TBI (*3*). Consistent with previous data suggesting that males are more likely than are females in the general adult population to sustain a TBI (*4*), this study found higher age-adjusted rates of nonfatal TBI-related hospitalizations among males compared with females across all mechanisms of injury. Reported incidence of TBI by sex is complex and potentially affected by several factors, including differing biologic vulnerabilities to injury and sex differences in care-seeking behavior (*5*).

Unintentional fall was the leading mechanism of injury contributing to a nonfatal TBI diagnosis for which the patient was hospitalized. During 2018, the highest rate of nonfatal TBI-related hospitalization attributable to falls was among adults

TABLE 2. Weighted estimated number and rate* of nonfatal traumatic brain injury–related hospitalizations† (N = 223,050), by age group and mechanism of injury — National Inpatient Sample, Healthcare Cost and Utilization Project, United States, 2018

	Mechanism of injury						
Age group, yrs	Motor vehicle crashes	Unintentional falls§	Unintentionally struck by or against an object	Other or unspecified unintentional injury	Intentional self-harm¶	Assault	Other**
0–4							
No. (row %)	655 (10.0)	3,365 (51.5)	180 (2.8)	605 (9.3)	—¶	1,135 (17.4)	600 (9.2)
Rate (95% CI)	3.3 (2.6–4.1)	17.0 (14.4–19.6)	0.9 (0.6–1.3)	3.1 (2.4–3.8)	—¶	5.7 (4.3–7.2)	3.0 (1.7–4.4)
5–9							
No. (row %)	870 (36.4)	690 (28.9)	140 (5.9)	385 (16.1)	—¶	—††	305 (12.8)
Rate (95% CI)	4.3 (3.4–5.3)	3.4 (2.7–4.2)	0.7 (0.4–0.9)	1.9 (1.4–2.4)	—¶	—††	1.5 (0.7–2.3)
10–14							
No. (row %)	1,160 (37.3)	545 (17.5)	290 (9.3)	745 (24.0)	—††	—††	370 (11.9)
Rate (95% CI)	5.6 (4.5–6.7)	2.6 (2.0–3.3)	1.4 (1.0–1.8)	3.6 (2.8–4.3)	—††	—††	1.8 (1.1–2.5)
15–24							
No. (row %)	10,550 (53.1)	2,330 (11.7)	590 (3.0)	2,670 (13.5)	275 (1.4)	1,795 (9.0)	1,640 (8.3)
Rate (95% CI)	24.6 (22.3–26.9)	5.4 (4.8–6.1)	1.4 (1.1–1.7)	6.2 (5.5–6.9)	0.6 (0.5–0.8)	4.2 (3.7–4.7)	3.8 (2.9–4.7)
25–34							
No. (row %)	10,000 (47.6)	3,130 (14.9)	460 (2.2)	2,550 (12.1)	295 (1.4)	2,945 (14.0)	1,630 (7.8)
Rate (95% CI)	21.9 (19.8–24.1)	6.9 (6.1–7.6)	1.0 (0.8–1.2)	5.6 (4.9–6.2)	0.6 (0.5–0.8)	6.5 (5.7–7.2)	3.6 (2.6–4.5)
35–44							
No. (row %)	7,170 (40.4)	3,925 (22.1)	445 (2.5)	2,010 (11.3)	215 (1.2)	2,470 (13.9)	1,510 (8.5)
Rate (95% CI)	17.4 (15.5–19.3)	9.5 (8.7–10.4)	1.1 (0.9–1.3)	4.9 (4.3–5.5)	0.5 (0.4–0.7)	6.0 (5.3–6.7)	3.7 (2.7–4.6)
45–54							
No. (row %)	7,035 (33.3)	6,745 (31.9)	585 (2.8)	2,510 (11.9)	210 (1.0)	2,185 (10.3)	1,845 (8.7)
Rate (95% CI)	16.9 (15.3–18.6)	16.2 (15.0–17.5)	1.4 (1.1–1.7)	6.0 (5.4–6.7)	0.5 (0.3–0.7)	5.3 (4.6–5.9)	4.4 (3.4–5.5)
55–64							
No. (row %)	6,840 (23.9)	14,005 (49.0)	725 (2.5)	2,615 (9.1)	165 (0.6)	1,680 (5.9)	2,580 (9.0)
Rate (95% CI)	16.2 (14.7–17.7)	33.2 (31.2–35.2)	1.7 (1.4–2.0)	6.2 (5.6–6.8)	0.4 (0.2–0.5)	4.0 (3.4–4.5)	6.1 (4.8–7.4)
65–74							
No. (row %)	4,755 (14.8)	21,280 (66.3)	655 (2.0)	1,750 (5.4)	100 (0.3)	595 (1.9)	2,980 (9.3)
Rate (95% CI)	15.6 (14.1–17.1)	69.9 (66.1–73.7)	2.2 (1.8–2.5)	5.7 (5.1–6.4)	0.3 (0.2–0.5)	2.0 (1.6–2.3)	9.8 (8.2–11.4)
≥75							
No. (row %)	3,970 (5.6)	57,720 (82.0)	1,285 (1.8)	1,445 (2.1)	—††	290 (0.4)	5,680 (8.1)
Rate (95% CI)	18.1 (16.3–20.0)	263.3 (250.2–276.4)	5.9 (5.1–6.7)	6.6 (5.7–7.4)	—††	1.3 (1.0–1.7)	25.9 (21.4–30.4)
Total§§							
No. (row %)	**53,015 (23.8)**	**113,740 (51.0)**	**5,355 (2.4)**	**17,285 (7.7)**	**1,320 (0.6)**	**13,195 (5.9)**	**19,140 (8.6)**
Rate (95% CI)	**16.2 (14.9–17.6)**	**34.8 (33.2–36.4)**	**1.6 (1.5–1.8)**	**5.3 (4.9–5.7)**	**0.5 (0.4–0.5)**	**4.0 (3.7–4.4)**	**5.9 (4.8–6.9)**
Adjusted¶¶							
No. (row %)	53,005 (23.8)	113,735 (51.0)	5,355 (2.4)	17,285 (7.7)	1,320 (0.6)	13,195 (5.9)	19,140 (8.6)
Rate (95% CI)	16.0 (15.4–16.5)	29.8 (29.1–30.5)	1.5 (1.4–1.6)	5.2 (4.9–5.4)	0.5 (0.4–0.5)	4.1 (3.9–4.3)	5.4 (5.0–5.7)

Abbreviation: TBI = traumatic brain injury.
* All rates are per 100,000 population.
† In-hospital deaths and patients who transferred from another hospital were excluded.
§ Excluded falls of undetermined intent.
¶ Injuries in persons aged <10 years were excluded because determining intent in younger children can be difficult. Rates for nonfatal TBI-related hospitalizations because of intentional self-harm were age-adjusted to the population aged ≥10 years.
** Includes undetermined intent, legal intervention, war, intentional self-harm for age <10 years, and cases without information about cause of injury.
†† Entry suppressed because of data confidentiality concerns associated with unweighted case counts ≤10.
§§ Hospitalizations with missing/unknown age were included.
¶¶ Hospitalizations with missing/unknown age were excluded. Rates were age-adjusted using the direct method to the 2000 U.S. Census Bureau standard population.

aged ≥75 years, consistent with older age being a major risk factor for falls (*6*). Health care providers should evaluate older adult patients for signs and symptoms of TBI if they have fallen or had a fall-related injury, such as a hip fracture (*7*). Further, more older adults receive aspirin and anticoagulant therapies (e.g., warfarin [Coumadin] and non-vitamin K oral anticoagulants) as part of routine management of chronic conditions. The prevalence of anticoagulant use in this population can result in an increased likelihood of intracranial hemorrhage (*8*) and further complications from TBIs. Consistent with previous epidemiologic data (*1*), the age-adjusted rate for nonfatal TBI-related hospitalization attributable to falls was higher among males than among females. This finding might be related to circumstances of the fall, such as a larger proportion of males falling from heights (e.g., ladders) (*9*), which are more likely to result in moderate to severe injuries, including TBI.

TABLE 3. Weighted estimated number and age-adjusted rate* of nonfatal traumatic brain injury–related hospitalizations† (N = 223,035), by sex and mechanism of injury — National Inpatient Sample, Healthcare Cost and Utilization Project, United States, 2018

	Mechanism of injury						
Sex	Motor vehicle crashes	Unintentional falls§	Unintentionally struck by or against an object	Other or unspecified unintentional injury	Intentional self-harm¶	Assault	Other**
Male							
No. (row %)	34,660 (25.7)	60,345 (44.8)	3,560 (2.6)	12,440 (9.2)	970 (0.7)	10,615 (7.9)	12,045 (8.9)
Rate* (95% CI)	21.2 (20.4–22.0)	35.9 (34.9–36.8)	2.2 (2.0–2.3)	7.6 (7.2–7.9)	0.7 (0.6–0.8)	6.6 (6.2–7.0)	7.3 (6.7–7.8)
Female							
No. (row %)	18,335 (20.7)	53,390 (60.4)	1,790 (2.0)	4,840 (5.5)	350 (0.4)	2,580 (2.9)	7,095 (8.0)
Rate* (95% CI)	10.8 (10.3–11.3)	24.4 (23.7–25.1)	0.9 (0.8–1.1)	2.8 (2.6–3.0)	0.2 (0.2–0.3)	1.6 (1.5–1.8)	3.6 (3.3–3.9)
Total							
No. (row %)	**53,005 (23.8)**	**113,735 (51.0)**	**5,355 (2.4)**	**17,285 (7.7)**	**1,320 (0.6)**	**13,195 (5.9)**	**19,140 (8.6)**
Rate* (95% CI)	**16.0 (15.4–16.5)**	**29.8 (29.1–30.5)**	**1.5 (1.4–1.6)**	**5.2 (4.9–5.4)**	**0.5 (0.4–0.5)**	**4.1 (3.9–4.3)**	**5.4 (5.0–5.7)**

Abbreviation: TBI = traumatic brain injury.
* Hospitalizations with missing age were excluded. Rates were age-adjusted using the direct method to the 2000 U.S. Census Bureau standard population (per 100,000 population).
† In-hospital deaths and patients who transferred from another hospital were excluded.
§ Falls of undetermined intent were not included.
¶ Injuries in persons aged <10 years were excluded because determining intent in younger children can be difficult. Rates for nonfatal TBI-related hospitalizations because of intentional self-harm were age-adjusted to the population aged ≥10 years.
** Includes undetermined intent, legal intervention, war, intentional self-harm for those aged <10 years, and cases without information about cause of injury.

The second most common mechanism of injury among all age groups was motor vehicle crashes, with the age-adjusted rate among males being approximately double that among females. Males are involved in more motor vehicle crash fatalities when compared with females,† and data from one state suggest that this finding might be the result of a higher incidence of speeding and loss-of-control crashes among males (*10*). The likelihood of nonfatal TBI-related hospitalization from a motor vehicle crash can be reduced for persons of all ages, including older adults, by consistently and properly wearing a seatbelt while driving or riding in a motor vehicle, never driving under the influence of drugs or alcohol, and driving at recommended speeds. Consistently and properly buckling children into age- and weight/height-appropriate car or booster seats§ can prevent pediatric TBIs caused by a motor vehicle crash. New adolescent and young adult drivers can help prevent TBIs attributed to motor vehicle crashes by engaging in graduated driving licensing systems that help build driving skills (e.g., lane merging, passing, and maintaining a safe distance while driving) and limiting driving under high-risk conditions. Motorcyclists and bicyclists can reduce the likelihood of TBI during a crash by properly and consistently wearing a helmet.

The findings in this report are subject to at least three limitations. First, persons who only sought care in the emergency department or outside the hospital setting (e.g., urgent care, primary care, and specialty care), who received a TBI diagnosis in federal, military, or Veterans Administration hospitals, or who did not seek care at all were not included. Therefore, this report is not a complete accounting of all nonfatal TBIs in the United States. Second, this analysis did not differentiate nonfatal TBI cases by severity of injury. Finally, the mechanism and intent of injury were unknown for 8.4% of nonfatal TBI-related hospitalizations, and as a result, estimates by mechanism of injury and injury intent are undercounts.

A TBI can happen to anyone at any age; during 2018, the oldest age group (aged ≥75 years) experienced the highest numbers and rates of nonfatal TBI-related hospitalizations. Among all nonfatal TBI-related hospitalizations, unintentional falls were the leading cause of injury, with half of these hospitalizations occurring among older adults, highlighting the need to intensify prevention efforts for falls, particularly among this age group. The CDC's Stopping Elderly Accidents, Deaths, and Injuries (STEADI)¶ initiative can support health care providers in screening for fall risk, assessing modifiable risk factors, and intervening to reduce risk by updating patients' personalized fall prevention plans. Proper restraint use (i.e., seatbelts, car seats, and booster seats) is a proven strategy for reducing motor vehicle occupant injuries, including TBIs. The CDC's Motor Vehicle Prioritizing Interventions and Cost Calculator for States (MV PICCS)** can aid states in identifying strategies that could effectively reduce motor vehicle crash injuries. TBIs are preventable. The findings in this report could be used by public health officials to support identification of priority areas for TBI prevention programs and groups at increased risk for TBI.

† https://cdan.dot.gov/query
§ https://www.cdc.gov/transportationsafety/child_passenger_safety/
¶ https://www.cdc.gov/steadi/
** https://www.cdc.gov/transportationsafety/calculator/index.html

Summary

What is already known about the topic?

Traumatic brain injury (TBI), an injury that can disrupt normal brain function, contributes to a substantial number of hospitalizations each year.

What is added by this report?

During 2018, there were 223,050 nonfatal TBI-related hospitalizations in the United States. Rates were highest among males and persons aged ≥75 years. Unintentional falls and motor vehicle crashes were the most common injuries leading to a nonfatal TBI-related hospitalization.

What are the implications for public health practice?

Proper and consistent restraint use (i.e., seatbelts, car seats, and booster seats) and learning about individual fall risk from health care providers are two steps the public can take to prevent the most common injuries leading to a nonfatal TBI.

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Vital Signs: HIV Infection, Diagnosis, Treatment, and Prevention Among Gay, Bisexual, and Other Men Who Have Sex with Men — United States, 2010–2019

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Abstract

Background. Men who have sex with men (MSM) accounted for two thirds of new HIV infections in the United States in 2019 despite representing approximately 2% of the adult population.

Methods. CDC analyzed surveillance data to determine trends in estimated new HIV infections and to assess measures of undiagnosed infection and HIV prevention and treatment services including HIV testing, preexposure prophylaxis (PrEP) use, antiretroviral therapy (ART) adherence, and viral suppression, as well as HIV-related stigma.

Results. The estimated number of new HIV infections among MSM was 25,100 in 2010 and 23,100 in 2019. New infections decreased significantly among White MSM but did not decrease among Black or African American (Black) MSM and Hispanic/Latino MSM. New infections increased among MSM aged 25–34 years. During 2019, approximately 83% of Black MSM and 80% of Hispanic/Latino MSM compared with 90% of White MSM with HIV had received an HIV diagnosis. The lowest percentage of diagnosed infection was among MSM aged 13–24 years (55%). Among MSM with a likely PrEP indication, discussions about PrEP with a provider and PrEP use were lower among Black MSM (47% and 27%, respectively) and Hispanic/Latino MSM (45% and 31%) than among White MSM (59% and 42%). Among MSM with an HIV diagnosis, adherence to ART and viral suppression were lower among Black MSM (48% and 62%, respectively) and Hispanic/Latino MSM (59% and 67%) compared with White MSM (64% and 74%). Experiences of HIV-related stigma among those with an HIV diagnosis were higher among Black MSM (median = 33; scale = 0–100) and Hispanic/Latino MSM (32) compared with White MSM (26). MSM aged 18–24 years had the lowest adherence to ART (45%) and the highest median stigma score (39).

Conclusion. Improving access to and use of HIV services for MSM, especially Black MSM, Hispanic/Latino MSM, and younger MSM, and addressing social determinants of health, such as HIV-related stigma, that contribute to unequal outcomes will be essential to end the HIV epidemic in the United States.

Introduction

Gay, bisexual, and other men who have sex with men (MSM) have been disproportionately affected by HIV since the onset of the epidemic and have been a priority population for HIV prevention and treatment (*1*). Despite focused prevention efforts, approximately two thirds of new HIV infections in the United States occur in MSM (*2*). Advances in HIV prevention and treatment have made HIV infection increasingly preventable, but new infections have continued. Preexposure prophylaxis (PrEP) is highly effective in preventing infection, and consistent antiretroviral therapy (ART) enables persons with HIV to become virally suppressed and prevents transmission to others (*3*,*4*). By maximizing these advances, the Ending the HIV Epidemic in the U.S. (EHE) initiative aims to reduce the number of new HIV infections in the United States by 90% by 2030; 57 state and local jurisdictions began implementing the initiative in 2020.* EHE goals cannot be achieved without substantial reductions in HIV infections among MSM. CDC analyzed data from three national surveillance systems to assess HIV prevention and treatment outcomes among MSM in the United States during the years before EHE implementation and the progress needed to reach EHE and other national goals (Supplementary Box, https://stacks.cdc.gov/view/cdc/111462).

Methods

CDC assessed select outcomes related to the use of important HIV prevention services and steps in the HIV care continuum†

* https://www.hiv.gov/federal-response/ending-the-hiv-epidemic/overview
† https://www.cdc.gov/hiv/pdf/library/factsheets/cdc-hiv-care-continuum.pdf

among MSM overall and by race/ethnicity and age group using data from the National HIV Surveillance System (NHSS), National HIV Behavioral Surveillance (NHBS), and Medical Monitoring Project (MMP). All methods are described elsewhere (Supplementary Appendix, https://stacks.cdc.gov/view/cdc/111463), including the outcomes and years of data analyzed. To assess changes in estimated HIV infections, the z-test was used to compare changes from 2010 to 2019; p-values <0.05 indicated statistically significant change. Estimates from MMP were weighted to represent the population of adults with diagnosed HIV infection in the United States. Unweighted frequencies, weighted percentages, and 95% CIs were generated from NHBS and MMP data. Estimates with a denominator sample size <30 were not reported. All analyses were conducted using SAS software (version 9.4; SAS Institute). This activity was reviewed by CDC and was conducted consistent with applicable federal law and CDC policy.[§]

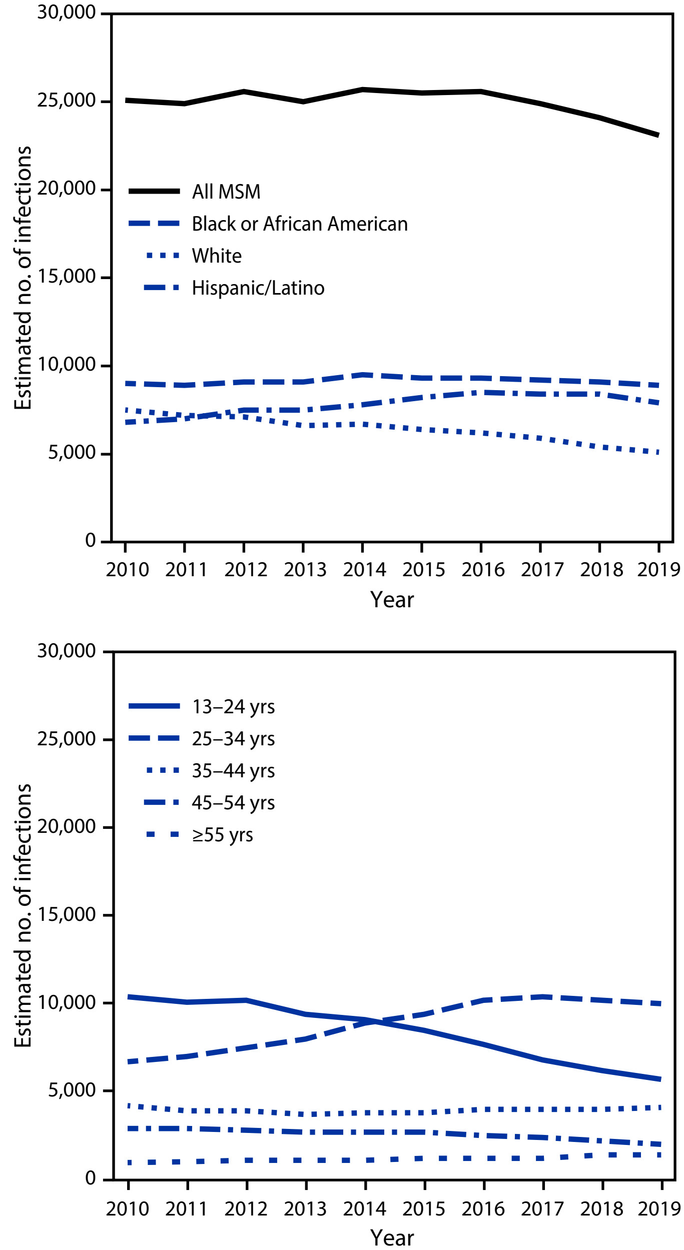
Results

Estimated number of new HIV infections and percentage of infections that were diagnosed. Using NHSS data, the estimated number of new HIV infections among MSM was 25,100 in 2010 and 23,100 in 2019 (p = 0.05) (Figure). During this period, infections significantly decreased from 7,500 to 5,100 among White MSM (p<0.01) but did not decline significantly among Black or African American (Black) MSM (9,000 to 8,900; p = 0.90) and Hispanic/Latino MSM (6,800 to 7,900; p = 0.10). Infections decreased among MSM aged 13–24 years (10,400 to 5,700; p<0.01) and 45–54 years (2,900 to 2,000; p<0.01) but increased among MSM aged 25–34 years (6,700 to 10,000; p<0.01).

Among the estimated 692,900 MSM living with HIV infection in 2019, 85% had received an HIV diagnosis (Table 1). A lower percentage of Black MSM (83%) and Hispanic/Latino MSM (80%) with HIV had received a diagnosis than did White MSM (90%). The lowest percentages of diagnosed infection were among MSM aged 13–24 years (55%) and 25–34 years (71%).

Uses of and barriers to prevention and treatment services. CDC examined NHBS data collected in 2017 among MSM who attended venues where the majority of attending men were MSM in 23 U.S. urban areas[¶] and did not report

FIGURE. Estimated number of new HIV infections among gay, bisexual, and other men who have sex with men, by race/ethnicity and age category — United States, 2010–2019



Abbreviation: MSM = men who have sex with men.

a positive HIV test >12 months before the interview. Among these 7,577 MSM, 79% were tested for HIV in the past 12 months (Table 1). Among 1,181 MSM who visited a health care provider but had not tested in the past 12 months, 78% were not offered an HIV test. Neither HIV testing in the past 12 months nor having visited a provider without testing in the past 12 months differed by race/ethnicity. MSM aged 45–54 years and ≥55 years had the lowest percentages of testing in the past 12 months; visiting providers without a test did not differ by age group.

[§] 45 C.F.R. part 46.102(l)(2), 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.

[¶] Atlanta, Georgia; Baltimore, Maryland; Boston, Massachusetts; Chicago, Illinois; Dallas, Texas; Denver, Colorado; Detroit, Michigan; Houston, Texas; Los Angeles, California; Memphis, Tennessee; Miami, Florida; Nassau and Suffolk counties, New York; New Orleans, Louisiana; New York City, New York; Newark, New Jersey; Philadelphia, Pennsylvania; Portland, Oregon; San Diego, California; San Francisco, California; San Juan, Puerto Rico; Seattle, Washington; Virginia Beach, Virginia; and Washington, DC.

TABLE 1. Percentage of HIV infections diagnosed, percentage of persons receiving HIV testing in the past 12 months, and percentage of missed opportunities for HIV testing in the past 12 months among gay, bisexual, and other men who have sex with men, by race/ethnicity and age group — United States, 2017 and 2019

Characteristic	Diagnosed HIV infection (2019)*		Tested in past 12 mos (2017)†		Missed opportunity for testing in past 12 mos (2017)†,§	
	No.	% (95% CI)	No.	% (95% CI)	No.	% (95% CI)
Total	**692,900**	**84.8 (84.1–85.5)**	**7,577**	**78.6 (77.1–80.0)**	**1,181**	**77.8 (73.9–81.7)**
Race/Ethnicity						
American Indian/Alaska Native	—¶	—¶	53	69.0** (53.1–84.8)	—††	—††
Asian	—¶	—¶	194	81.0 (73.3–88.7)	35	88.6 (78.0–99.1)
Black/African American	219,200	82.6 (81.4–83.9)	1,965	80.7 (78.1–83.4)	283	73.6 (65.3–82.0)
Hispanic/Latino§§	186,800	80.3 (79.0–81.7)	2,098	77.3 (74.8–79.9)	315	75.6 (68.4–82.9)
Native Hawaiian/Other Pacific Islander	—¶	—¶	35	85.1** (65.7–100.0)	—††	—††
White	239,600	90.0 (88.7–91.3)	2,804	78.0 (75.5–80.5)	481	78.6 (72.5–84.7)
Multiple races¶¶	—¶	—¶	387	81.2 (75.2–87.2)	48	82.7** (64.9–100.0)
Age group, yrs						
13–24	37,100	55.1 (52.8–57.6)	—***	—***	—***	—***
18–24	—***	—***	1,359	79.7 (76.5–83.0)	197	77.0 (67.8–86.2)
25–34	164,600	71.2 (70.0–72.4)	3,266	81.3 (79.2–83.4)	372	80.9 (74.6–87.1)
35–44	135,200	84.0 (82.8–85.3)	1,397	79.3 (76.1–82.4)	200	74.7 (65.2–84.2)
45–54	155,300	92.4 (91.4–93.5)	999	71.8 (67.6–76.0)	220	71.9 (62.6–81.2)
≥55	200,600	96.1 (95.0–97.2)	556	65.0 (58.2–71.9)	192	82.5 (73.0–91.9)

* Based on data reported through December 2020 to the National HIV Surveillance System for year-end 2019. Percentages are estimated based on a CD4 depletion model. Defined as the number of persons who received an HIV diagnosis divided by the estimated number of persons with HIV (diagnosed and undiagnosed).

† Based on data collected by National HIV Behavioral Surveillance in 2017 in 23 U.S. urban areas (Atlanta, Georgia; Baltimore, Maryland; Boston, Massachusetts; Chicago, Illinois; Dallas, Texas; Denver, Colorado; Detroit, Michigan; Houston, Texas; Los Angeles, California; Memphis, Tennessee; Miami, Florida; Nassau and Suffolk counties, New York; New Orleans, Louisiana; New York City, New York; Newark, New Jersey; Philadelphia, Pennsylvania; Portland, Oregon; San Diego, California; San Francisco, California; San Juan, Puerto Rico; Seattle, Washington; Virginia Beach, Virginia; and Washington, DC). Excludes persons who tested HIV-positive >12 months ago.

§ Defined as visiting a health care provider in the past 12 months without being offered an HIV test. Excludes persons who tested HIV-positive >12 months ago and who tested in the past 12 months.

¶ Estimates are not available because of high relative standard errors.

** Estimates have a CI width >30 and should be interpreted with caution.

†† Estimates are not available because denominator sample sizes are <30.

§§ Hispanic/Latino men who have sex with men could be any race.

¶¶ Represents persons identified as having multiple race categories selected.

*** National HIV Behavioral Surveillance did not collect data from persons aged 13–17 years. Data from the National HIV Surveillance System are presented for persons aged 13–24 years.

Approximately one half (52%) of HIV-negative MSM with likely PrEP indications** reported having discussed PrEP with a health care provider in the past 12 months, and approximately one third (36%) had used PrEP in the past 12 months (Table 2). Discussing and using PrEP were lowest among MSM aged 18–24 years (44% and 27%, respectively) and ≥55 years (46% and 24%), and varied by race/ethnicity (Black MSM [47% and 27%], Hispanic/Latino MSM [45% and 31%], and White MSM [59% and 42%]).

Using MMP data collected during June 2018–May 2019 among MSM with diagnosed HIV infection, an estimated 58% were fully ART dose-adherent in the past 30 days (Table 3). Adherence was lowest among MSM aged 18–24 years (45%) and 25–34 years (48%) and Black MSM (48% compared with 64% among White MSM). Overall, 68% of MSM with diagnosed HIV infection were virally suppressed. Black MSM (62%), American Indian or Alaska Native MSM (65%), and MSM aged 25–34 years (65%) had the lowest percentages of viral suppression.

The median HIV-related stigma score†† among MSM with diagnosed HIV infection was 29 on a scale of 0 to 100. MSM aged 18–24 years had the highest median score (39). Black MSM (33) and Hispanic/Latino MSM (32) had higher median scores than did White MSM (26).

Discussion

These findings indicate that new HIV infections among Black MSM and Hispanic/Latino MSM did not decrease during the decade before EHE implementation despite decreases or

** MSM likely indicated for PrEP included those who 1) received a negative NHBS HIV test result after the NHBS interview; 2) had two or more male sex partners or any male sex partner with HIV infection within the past 12 months; and 3) engaged in condomless anal sex or had a bacterial sexually transmitted infection within the past 12 months.

†† Participants indicated their agreement with the following statements: 1) "During the past 12 months, I have been hurt by how people reacted to learning I have HIV;" 2) "During the past 12 months, I have stopped socializing with some people because of their reactions to my HIV status;" 3) "During the past 12 months, I have lost friends by telling them I have HIV;" 4) "I am very careful who I tell that I have HIV;" 5) "I worry that people who know I have HIV will tell others;" 6) "I feel that I am not as good a person as others because I have HIV;" 7) "Having HIV makes me feel unclean;" 8) "Having HIV makes me feel that I'm a bad person;" 9) "Most people think that a person with HIV is disgusting;" and 10) "Most people with HIV are rejected when others find out." Median scores and 95% CIs were calculated on a scale of 0 (no stigma) to 100 (highest stigma).

TABLE 2. Percentage of gay, bisexual, and other men who have sex with men with a likely indication for preexposure prophylaxis who discussed preexposure prophylaxis with a health care provider in the past 12 months or used preexposure prophylaxis in the past 12 months, by race/ethnicity and age group — United States, 2017

Characteristic	Discussed PrEP with health care provider in past 12 mos*		Used PrEP in past 12 mos*	
	No.	% (95% CI)	No.	% (95% CI)
Total	**4,466**	**51.5 (49.1–53.9)**	**4,466**	**35.5 (33.0–38.0)**
Race/Ethnicity				
American Indian/Alaska Native	—¶	—¶	—¶	—¶
Asian	111	61.1 (48.3–74.0)	111	47.4 (34.1–60.6)
Black/African American	962	47.2 (42.5–51.8)	962	27.2 (22.7–31.7)
Hispanic/Latino†	1,250	45.2 (41.2–49.2)	1,250	31.3 (27.5–35.2)
Native Hawaiian/Other Pacific Islander	—¶	—¶	—¶	—¶
White	1,841	58.5 (54.9–62.0)	1,841	42.2 (38.4–46.0)
Multiple races§	230	45.9 (36.0–55.7)	230	30.1 (21.5–38.7)
Age group, yrs				
18–24	837	43.6 (38.3–49.0)	837	26.7 (22.2–31.2)
25–34	2,073	52.6 (49.2–56.0)	2,073	36.8 (33.3–40.3)
35–44	845	59.9 (55.0–64.8)	845	44.7 (39.7–49.8)
45–54	480	48.8 (41.4–56.1)	480	35.7 (28.4–42.9)
≥55	231	46.4 (36.9–56.0)	231	23.7 (15.1–32.3)

Abbreviations: MSM = men who have sex with men; NHBS = National HIV Behavioral Surveillance; PrEP = preexposure prophylaxis.

* Based on data collected by NHBS in 2017 in 23 U.S. urban areas (Atlanta, Georgia; Baltimore, Maryland; Boston, Massachusetts; Chicago, Illinois; Dallas, Texas; Denver, Colorado; Detroit, Michigan; Houston, Texas; Los Angeles, California; Memphis, Tennessee; Miami, Florida; Nassau and Suffolk counties, New York; New Orleans, Louisiana; New York City, New York; Newark, New Jersey; Philadelphia, Pennsylvania; Portland, Oregon; San Diego, California; San Francisco, California; San Juan, Puerto Rico; Seattle, Washington; Virginia Beach, Virginia; and Washington, DC). Restricted to MSM with likely clinical indications for PrEP, who had a negative NHBS HIV test result after the NHBS interview, had a male sex partner who was HIV-positive or two or more male sex partners in the past 12 months, and had condomless anal sex with a male sex partner or a sexually transmitted infection (i.e., syphilis, gonorrhea, or chlamydia) in the past 12 months.

† Hispanic/Latino MSM could be any race.

§ Represents persons identified as having multiple race categories selected.

¶ Estimates not available because denominator sample sizes are <30.

stable numbers among other MSM subgroups, and new infections increased among MSM aged 25–34 years. Use of many prevention and treatment strategies were less prevalent among Black MSM, Hispanic/Latino MSM, and younger MSM. Longstanding inequities in access to and delivery of needed services among some racial/ethnic and age groups, particularly Black MSM and Hispanic/Latino MSM, have persisted despite focused efforts to prevent HIV in these populations for decades. Efforts to reduce these and other disparities must address their root causes, including systemic racism, stigma, discrimination, homophobia, poverty, homelessness, and unequal access to care and prevention services (*1*).

Achieving the EHE goals to reduce the number of HIV infections by 90% by 2030 will require that at least 95% of infections are diagnosed and 95% of persons with diagnosed HIV infection are virally suppressed (Supplementary Box, https://stacks.cdc.gov/view/cdc/111462); the most recent available data indicate that among MSM, only 85% of HIV infections are diagnosed and 68% of MSM with diagnosed HIV infection are virally suppressed. Approximately 20% of MSM not previously receiving a diagnosis of HIV infection had not been tested for HIV in the past year, which is inconsistent with CDC recommendations that all sexually active MSM be tested at least annually (5). Missed clinical opportunities for testing were common among MSM who had not been tested in the past year. Further, PrEP was used by only one third of MSM for whom it was likely indicated, well below the EHE target of 50% PrEP coverage (Supplementary Box, https://stacks.cdc.gov/view/cdc/111462). Median HIV-related stigma scores were nearly double the national target (*6*). The persistence of HIV-related stigma might hinder access to testing, prevention, and treatment for MSM, thus potentially undermining progress toward national goals. Together, these findings suggest the need for innovative approaches that can better deliver testing, prevention, and treatment services to MSM.

Several innovative and culturally appropriate strategies have successfully reduced barriers to access of services and might help achieve national goals of improving prevention, diagnosis, and treatment of HIV infection among MSM.[§§] For example, HIV testing scale-up has been determined to be cost-effective across diverse local conditions (*7*). Some jurisdictions have successfully implemented programs that increased screening frequency among MSM (*8*). Numerous strategies have been implemented to deliver HIV testing services to MSM by expanding or tailoring existing clinical screening programs, enhancing community-based testing options, or providing HIV self-tests (*9*). HIV self-testing can be a cost-saving delivery strategy (*10*) with potential to mitigate HIV-related

§§ https://www.cdc.gov/hiv/research/interventionresearch/compendium/index.html

TABLE 3. Among gay, bisexual, and other men who have sex with men with diagnosed HIV infection, percentage with antiretroviral therapy adherence, percentage with viral suppression, and median HIV-related stigma scores, by race/ethnicity and age group — United States, 2018 and 2019

	ART adherence (2018)*		Viral suppression (2019)†		HIV-related stigma score (2018)§	
Characteristic	**No.**	**% (95% CI)**	**No.**	**%**	**No.**	**Median (95% CI)**
Total	**1,869**	**58.3 (54.9–61.7)**	**528,606**	**68.1**	**1,873**	**29.3 (28.0–30.5)**
Race/Ethnicity						
American Indian/Alaska Native	—¶	—¶	1,538	64.7	—¶	—¶
Asian	—¶	—¶	9,779	71.7	—¶	—¶
Black/African American	503	48.3 (40.2–56.3)	161,072	61.6	528	32.8 (29.3–36.3)
Hispanic/Latino**	440	58.7 (53.4–64.1)	135,301	66.6	436	32.0 (29.6–34.3)
Native Hawaiian/Other Pacific Islander	—¶	—¶	590	66.2	—¶	—¶
White	784	64.1 (59.4–68.9)	195,335	73.5	770	26.1 (24.0–28.2)
Multiple races††	104	55.7 (44.8–66.7)	24,643	74.5	103	30.4 (24.2–36.6)
American Indian/Alaska Native, Asian, or Native Hawaiian/Other Pacific Islander§§	38	60.2¶¶ (40.2–80.2)	—§§	—§§	36	20.3 (12.0–28.7)
Age group, yrs						
13–24	—***	—***	19,520	66.2	—***	—***
18–24	53	44.6¶¶ (29.5–59.6)	—***	—***	56	39.3 (30.0–48.7)
25–34	319	47.7 (39.7–55.7)	105,957	65.0	332	33.6 (30.6–36.6)
35–44	346	53.7 (47.5–59.9)	101,620	66.1	353	31.5 (29.7–33.4)
45–54	523	55.7 (50.3–61.1)	140,157	69.3	517	28.7 (26.8–30.6)
≥55	628	69.6 (64.9–74.4)	161,352	70.6	615	25.4 (23.5–27.3)

Abbreviations: ART = antiretroviral therapy; MSM = men who have sex with men; NHBS = National HIV Behavioral Surveillance; PrEP = preexposure prophylaxis.
* Based on data collected by the Medical Monitoring Project during June 2018–May 2019. ART adherence was defined as taking 100% of ART doses in the past 30 days among MSM currently taking ART.
† Based on data reported through December 2020 to the National HIV Surveillance System for year-end 2019. Viral suppression was defined as the number of MSM with a viral load test result of <200 copies of HIV RNA per mL at last test divided by the number of MSM with diagnosed HIV infection.
§ Based on data collected by the Medical Monitoring Project during June 2018–May 2019. HIV-related stigma was measured using a 10-item scale that measures four dimensions of HIV stigma: personalized stigma during the past 12 months, current disclosure concerns, current negative self-image, and current perceived public attitudes about persons with HIV. The stigma score ranged from 0 to 100, with 0 indicating no stigma and 100 indicating highest stigma. A median score was calculated based on responses on a five-point Likert scale to each item. Median scores with nonoverlapping 95% CIs were considered to be meaningfully different. Median scores were interpreted in the context of the national goal of reducing HIV-related stigma by 2025 by at least 50% from the 2018 baseline median score of 31.
¶ Estimates are not available because denominator sample sizes are <30.
** Hispanic/Latino MSM could be any race.
†† Represents persons identified as having multiple race categories selected.
§§ Viral suppression percentages are presented separately for American Indian or Alaska Native persons, Asian persons, and Native Hawaiian or Other Pacific Islander persons.
¶¶ Estimates have a CI width >30 and should be interpreted with caution.
*** The Medical Monitoring Project did not collect data from persons aged 13–17 years. Data from the National HIV Surveillance System are presented for persons aged 13–24 years.

stigma and better reach MSM (*11*). Multiple jurisdictions have demonstrated that HIV self-test distribution programs can successfully deliver HIV testing to racial/ethnic minority MSM and MSM not reached by other testing programs (*12*). CDC recently supported a national self-test distribution program designed to improve access to HIV testing for those who had not been previously reached.¶¶

To improve HIV care outcomes, strategies and approaches supported by the Ryan White HIV/AIDS Program (RWHAP) can be scaled up to reach all U.S. facilities that provide HIV care. RWHAP-funded facilities deliver comprehensive care and essential support services to approximately one half of persons with diagnosed HIV infection in the United States through enhanced collaboration with local partners, community engagement, effective data collection, and provider training. RWHAP activities have led to recent increases in viral suppression among MSM from 84.7% in 2015 to 89.1% in 2019 (*13*). These activities also reduced racial/ethnic disparities by as much as one third by addressing structural factors, such as unstable housing, that impede access to HIV care and treatment (*14*). Other programs have used surveillance data to identify persons not receiving care and have successfully engaged them using interventions such as patient navigation to reduce barriers to access (*15*).

Prevention of new infections can be enhanced by ensuring that PrEP providers are available in communities most affected by HIV and by integrating PrEP services into existing clinical settings, such as sexually transmitted disease (STD) clinics. As part of the EHE initiative, CDC supports local efforts to build the capacity of STD clinics to implement innovative,

¶¶ https://together.takemehome.org

Summary

What is already known about this topic?

Gay, bisexual, and other men who have sex with men (MSM) are disproportionately affected by HIV.

What is added by this report?

This analysis of national surveillance data found that the estimated number of new HIV infections among MSM did not change overall during 2010–2019; infections decreased among White MSM but not among Black MSM or Hispanic/Latino MSM. Most measures of use of HIV prevention and treatment services were lower among Black MSM and Hispanic/Latino MSM than White MSM and younger MSM compared with other age groups.

What are the implications for public health practice?

Improving access to and use of HIV services for MSM, particularly Black MSM, Hispanic/Latino MSM, and younger MSM, is essential to ending the HIV epidemic in the United States.

locally tailored strategies to provide PrEP and other HIV prevention services to MSM at risk for acquiring HIV.*** Such clinics often function as safety nets for populations with limited access to other sources of care, thus providing crucial prevention services to underserved populations and reducing racial/ethnic disparities in care (*16*). Local programs have highlighted opportunities to improve rapid PrEP initiation and navigation services for STD clinic patients with ongoing risk for HIV infection (*17*).

Emerging interventions and delivery strategies for testing, prevention, and treatment might also reduce barriers to accessing services and reaching EHE goals. Telehealth and other novel care models can provide additional options for accessing and improving adherence to HIV treatment and PrEP (*18,19*). Development of long-acting HIV medications could further expand access and facilitate adherence to PrEP and ART (*20*). Such innovative interventions and delivery strategies should be prioritized for use among the most disproportionately affected groups, including Black and Hispanic/Latino MSM and younger MSM. Their implementation should be designed to address structural factors that often limit access to and use of these technologies. To further promote engagement in HIV services and reduce HIV-related stigma, MSM should be engaged in HIV prevention or treatment services regardless of their HIV status (i.e., a status neutral approach) (*1*). This approach helps persons with HIV and persons at higher risk for infection receive the services needed to prevent HIV transmission or acquisition without status-specific structures that reinforce stigma and other related barriers.

*** https://www.cdc.gov/hiv/funding/announcements/ps20-2010/index.html

The findings in this report are subject to at least seven limitations. First, data were collected before the onset of the COVID-19 pandemic and do not reflect disruptions in HIV testing, prevention, or treatment services. Second, MMP and NHBS data were self-reported and are subject to recall and social desirability biases. Third, NHBS behavioral measures of likely PrEP indication did not correspond directly with clinical guidelines and might have underestimated MSM with likely PrEP indications who discussed PrEP with a health care provider or used PrEP. Fourth, viral suppression measures presented here did not include data from jurisdictions without complete laboratory reporting and therefore might not be representative of all persons with diagnosed HIV infection in the United States. Fifth, the small number of MSM in some subgroups might have reduced the reliability of their estimates. Sixth, outcomes based on NHSS data for MSM aged 13–24 years were presented for a single age category, potentially obscuring differences in this developmentally diverse group. Finally, NHSS data presented by transmission category (i.e., male-to-male sexual contact) are based on sex at birth. Therefore, estimates based on NHSS data included some persons with a gender identity other than male (e.g., transgender women) who were classified as MSM based on their sex at birth.

Intensified and innovative efforts to expand access to HIV testing, prevention, and treatment services for MSM, particularly Black MSM, Hispanic/Latino MSM, and younger MSM, are required to decrease health disparities and reduce new HIV infections by 90% to reach EHE goals. Jurisdictions should identify and implement those programs and interventions most responsive to local needs and acceptable to disproportionately affected populations of MSM. All programs should implement a status neutral approach to reduce barriers to prevention, testing, and treatment by breaking down institutional barriers and reducing HIV-related stigma.

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Notes from the Field

COVID-19 Vaccination Coverage Among Persons Experiencing Homelessness — Six U.S. Jurisdictions, December 2020–August 2021

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COVID-19 outbreaks have been reported in homeless shelters across the United States (*1*). Many persons experiencing homelessness are older adults or persons with underlying medical conditions, placing them at increased risk for severe COVID-19–associated illness. The proportion of persons experiencing homelessness who are fully vaccinated against COVID-19 in the United States is currently unknown. Many persons experiencing homelessness express a willingness to receive the COVID-19 vaccine (*2*,*3*).

Through conversations with public health and housing assistance partners, CDC identified six* urban public health jurisdictions with data on vaccination coverage among persons experiencing homelessness. These six jurisdictions reported data on COVID-19 vaccinations† administered to persons experiencing intermittent homelessness during December 13, 2020–August 31, 2021. Full vaccination status§ and evidence of coverage with at least 1 COVID-19 vaccine dose¶ among persons experiencing homelessness were obtained by performing data linkage between immunization information systems and homeless services data systems or through data collection during vaccination events at homeless service sites. Total populations of persons experiencing homelessness were estimated using either the total number of persons accessing homeless services during the study period or an annual census of persons experiencing homelessness.** Vaccination coverage and size of the general population in each jurisdiction were obtained from CDC's COVID Data Tracker†† or from local health departments. The percentage point differences in vaccination coverage between persons experiencing homelessness and the general population were calculated, along with 95% CIs. This activity was reviewed by CDC and was conducted consistent with applicable federal law and CDC policy.§§

Full COVID-19 vaccination coverage among persons experiencing homelessness ranged from 18.6% to 44.5% in the six jurisdictions compared with 43.6% to 59.8% in the general population in each jurisdiction or corresponding area (Table). In each jurisdiction, full vaccination coverage among persons experiencing homelessness was substantially lower (11.2–37.2 percentage points) than that among the general population of the respective jurisdiction. Coverage with at least 1 COVID-19 vaccine dose across the six jurisdictions ranged from 22.0% to 52.0% among persons experiencing homelessness, and from 46.5% to 65.7% in the respective general populations.

These estimates highlight relatively low COVID-19 vaccination coverage among persons experiencing homelessness compared with coverage in the general populations in a convenience sample of six jurisdictions. Estimating vaccination coverage for persons experiencing homelessness is challenging because housing status is not routinely collected in vaccination records. In addition, because homelessness could be temporary, estimating population size is difficult. Some health departments have overcome these challenges by fostering relationships with health clinics and homeless service providers. The use of integrated data systems to link deidentified, individual-level records across housing, health care, and public health systems is an emerging potential solution.

The findings in this report are subject to at least three limitations. First, because of varying data collection methods, comparison across jurisdictions was not possible. Second, the systems used for estimating homelessness rely on use of homeless services, and not all persons experiencing homelessness access these services, particularly persons living unsheltered. Finally, because of nonrandom selection and inclusion of only six jurisdictions, these findings are not generalizable to all persons experiencing homelessness in the United States, particularly in rural areas

* The six jurisdictions included Chicago, Illinois; Detroit, Michigan; Fairfax, Virginia; Los Angeles County, California; Hennepin County, Minnesota; and the District of Columbia. Most jurisdictions included persons living sheltered and those living unsheltered.

† On December 12, 2020, the Advisory Committee on Immunization Practices issued an interim recommendation for the use of a vaccine for the prevention of COVID-19 in persons aged ≥16 years.

§ Fully vaccinated persons included those who received 2 doses on different days (regardless of time interval) of the 2-dose mRNA series or received 1 dose of a single-dose vaccine, at least 14 days earlier.

¶ Coverage with at least 1 dose included all persons who received at least 1 dose of the 2-dose mRNA series COVID-19 vaccine or those who received 1 dose of the single-dose vaccine.

** https://www.ncbi.nlm.nih.gov/books/NBK519593/

†† https://data.cdc.gov/Vaccinations/COVID-19-Vaccinations-in-the-United-States-County/8xkx-amqh (Accessed August 31, 2021).

§§ 45 C.F.R. part 46.102(l)(2), 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.

TABLE. COVID-19 vaccination coverage among persons experiencing homelessness and the general population — six U.S. jurisdictions,* December 2020–August 2021

	Jurisdiction (corresponding area for general population)					
Characteristic	**Chicago, Illinois**	**Detroit, Michigan (Wayne County)**	**Fairfax, Virginia (Fairfax County, Falls Church City, Fairfax City)**	**Los Angeles County, California**	**Hennepin County, Minnesota**	**District of Columbia**
Earliest date of available data	Dec 13, 2020	Dec 19, 2020	Jan 25, 2021	Dec 15, 2020	May 1, 2021	Jan 29, 2021
Latest date of available data	Aug 31, 2021	Aug 30, 2021	Jul 31, 2021	Jul 31, 2021	Jul 31, 2021	Jul 31, 2021
Date of vaccine eligibility for persons experiencing homelessness	Jan 20, 2021	Jan 14, 2021	Jan 25, 2021	Mar 15, 2021	Jan 15, 2021	Jan 29, 2021
Estimated population size						
Persons experiencing homelessness, no.†	4,477	5,118	1,859	66,436	7,635	6,381
General population, no.§	2,693,959	1,749,343	1,183,521	10,039,107	1,265,843	705,749
Fully vaccinated¶						
Persons experiencing homelessness,** no. (%)	1,993 (44.5)	950 (18.6)	465 (25.0)	23,353 (35.2)	1,712 (22.4)	1,265 (19.8)
General population,†† no. (%)	1,500,931 (55.7)	762,637 (43.6)	707,528 (59.8)	5,375,111 (53.5)	754,489 (59.6)	386,475 (54.8)
Difference (95% CI)	11.2 (9.7–12.7)	25.0 (23.9–26.1)	34.8 (32.8–36.8)	18.4 (18.0–18.8)	37.2 (36.2–38.1)	34.9 (33.9–35.9)
≥1 dose§§						
Persons experiencing homelessness,** no. (%)	2,326 (52.0)	1,337 (26.1)	557 (30.0)	29,412 (44.3)	2,184 (28.6)	1,407 (22.0)
General population,†† no (%)	1,642,339 (61.0)	814,140 (46.5)	777,970 (65.7)	6,225,192 (62.0)	820,182 (64.8)	432,833 (61.3)
Percentage point difference¶¶ (95% CI)	9.0 (7.5–10.5)	20.4 (19.2–21.6)	35.8 (33.6–37.9)	17.7 (17.4–18.1)	36.2 (35.2–37.2)	39.3 (38.2–40.3)

* The six jurisdictions included Chicago, Illinois; Detroit, Michigan; Fairfax, Virginia; Los Angeles County, California; Hennepin County, Minnesota; and the District of Columbia. Most jurisdictions included persons living sheltered and those living unsheltered.
† Population sizes for persons experiencing homelessness (all ages) were estimated using entry and exit dates in homeless service access data (Detroit, Fairfax, and Hennepin County), point-in-time count estimates (Chicago and Los Angeles), or both (District of Columbia).
§ Population sizes for the general population (all ages) for each jurisdiction or corresponding area were obtained from National Census Population Estimates from the 2019 Vintage U.S. Census Bureau Annual Estimates of the Resident Population for the United States: https://www2.census.gov/programs-surveys/popest/datasets/2010-2019/counties/totals/ (Accessed August 31, 2021). Population size for Chicago was obtained from the 2019 1-year American Community Survey estimate: https://www.census.gov/data/developers/data-sets/acs-1year.html (Accessed August 31, 2021). Population size for Fairfax was obtained from 2019 5-year American Community Survey estimate: https://www.census.gov/data/developers/data-sets/acs-5year.html (Accessed August 31, 2021).
¶ Fully vaccinated persons (homeless and general population) includes all persons who received 2 doses on different days (regardless of interval between doses) of the 2-dose mRNA series or received 1 dose of a single-dose vaccine and were at least 14 days after completion.
** Numbers of vaccinated persons experiencing homelessness were identified by performing record matching between immunization information systems and homeless service access data (Detroit and Hennepin County), using health care provider reports of vaccinations for persons experiencing homelessness (Chicago), or both (Fairfax, Los Angeles, and District of Columbia).
†† Numbers of vaccinated persons in the general population were obtained from CDC's COVID Data Tracker: https://covid.cdc.gov/covid-data-tracker/#datatracker-home (Accessed August 31, 2021). Numbers of vaccinated persons in the general population for Chicago and Fairfax were obtained from the respective public health departments. Vaccinated persons included all persons in the jurisdiction from December 13, 2020, through the stated end date.
§§ Includes all persons who received at least 1 dose of COVID-19 vaccine, including those who received 1 dose of the single-dose vaccine.
¶¶ Between persons experiencing homelessness and the general population.

Given low COVID-19 vaccination coverage and increased risk for infection with SARS-CoV-2, the virus that causes COVID-19, in congregate settings (*4*), it is important that state and local health departments continue to follow CDC guidance to plan and respond to COVID-19 among persons experiencing homelessness.¶¶ Vaccine access for persons experiencing homelessness can be enhanced by using multiple strategies (*5*), including pop-up vaccination clinics in convenient locations, mobile clinics in partnership with trusted providers, and street outreach teams. COVID-19 vaccination coverage can be improved by strengthening partnerships across health departments, health care clinics, and homeless service providers. Furthermore, including persons who have experienced homelessness in vaccination planning is critical to helping ensure approaches are tailored to the needs of persons experiencing homelessness.

¶¶ https://www.cdc.gov/coronavirus/2019-ncov/community/homeless-shelters/plan-prepare-respond.html (Accessed April 1, 2021).

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Correction and Republication: Symptoms of Depression, Anxiety, Post-Traumatic Stress Disorder, and Suicidal Ideation Among State, Tribal, Local, and Territorial Public Health Workers During the COVID-19 Pandemic — United States, March–April 2021

On July 2, 2021, *MMWR* published "Symptoms of Depression, Anxiety, Post-Traumatic Stress Disorder, and Suicidal Ideation Among State, Tribal, Local, and Territorial Public Health Workers During the COVID-19 Pandemic — United States, March–April 2021" (*1*). On October 12, 2021, the authors informed *MMWR* that some data were inaccurate because 420 incomplete participant responses were incorrectly assigned scores for depression. This error resulted in a change in overall depression prevalence from 32.0% to 30.8%, and other similar changes in stratified prevalences of depression, prevalence ratios of depression, and the overall proportion of respondents who reported at least one mental health condition. The authors have corrected the *MMWR* report by excluding the 420 records from the depression analysis and confirmed that the interpretation and the conclusions of the original report were not affected by these corrections. *MMWR* has republished the report (*2*), which includes the original report with clearly marked corrections in supplementary materials.

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2. Bryant-Genevier J, Rao CY, Lopes-Cardozo B, et al. Symptoms of depression, anxiety, post-traumatic stress disorder, and suicidal ideation among state, tribal, local, and territorial public health workers during the COVID-19 pandemic—United States, March–April 2021. MMWR Morb Mortal Wkly Rep 2021;70:947–52. https://www.cdc.gov/mmwr/volumes/70/wr/mm7048a6.htm?s_cid=mm7048a6_w

Symptoms of Depression, Anxiety, Post-Traumatic Stress Disorder, and Suicidal Ideation Among State, Tribal, Local, and Territorial Public Health Workers During the COVID-19 Pandemic — United States, March–April 2021

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Increases in mental health conditions have been documented among the general population and health care workers since the start of the COVID-19 pandemic (*1*–*3*). Public health workers might be at similar risk for negative mental health consequences because of the prolonged demand for responding to the pandemic and for implementing an unprecedented vaccination campaign. The extent of mental health conditions among public health workers during the COVID-19 pandemic, however, is uncertain. A 2014 survey estimated that there were nearly 250,000 state and local public health workers in the United States (*4*). To evaluate mental health conditions among these workers, a nonprobability–based online survey was conducted during March 29–April 16, 2021, to assess symptoms of depression, anxiety, post-traumatic stress disorder (PTSD), and suicidal ideation among public health workers in state, tribal, local, and territorial public health departments. Among 26,174 respondents, 52.8% reported symptoms of at least one mental health condition in the preceding 2 weeks, including depression (30.8%), anxiety (30.3%), PTSD (36.8%), or suicidal ideation (8.4%). The highest prevalence of symptoms of a mental health condition was among respondents aged ≤29 years (range = 13.6%–47.4%) and transgender or nonbinary persons (i.e., those who identified as neither male nor female) of all ages (range = 30.4%–65.5%). Public health workers who reported being unable to take time off from work were more likely to report adverse mental health symptoms. Severity of symptoms increased with increasing weekly work hours and percentage of work time dedicated to COVID-19 response activities. Implementing prevention and control practices that eliminate, reduce, and manage factors that cause or contribute to public health workers' poor mental health might improve mental health outcomes during emergencies.

A nonprobability–based convenience sample of public health workers was invited to complete a self-administered, online, anonymous survey during March 29–April 16, 2021. All persons who worked at a state, tribal, local, or territorial health department for any length of time in 2020 were eligible to participate.* National public health membership associations† emailed a link to the survey to all members (approximately 24,000), and supervisors were asked to cascade the survey to all workers within their organization; 26,174 public health workers responded to the survey. The survey included questions on traumatic events or stressors experienced since March 2020,§ demographics, workplace factors, and self-reported mental health symptoms, including depression, anxiety, PTSD, or suicidal ideation, in the past 2 weeks. Mental health symptoms were evaluated using the 9-item Patient Health Questionnaire (PHQ-9) for depression (*5*), the 2-item General Anxiety Disorder (GAD-2) for anxiety (*6*), the 6-item Impact of Event Scale (IES-6) for PTSD (*7*),¶ and one item of the PHQ-9 for suicidal ideation.** Prevalence of symptoms of mental health conditions and suicidal ideation were assessed by demographic characteristics and workplace factors.†† Univariate prevalence ratios were calculated using Poisson regression with 95% confidence intervals estimated using a robust standard error. Analyses were completed using RStudio software (version 1.2.1335; RStudio). This activity was reviewed by CDC and was conducted consistent with applicable federal law and CDC policy.§§

Overall, 52.8% of respondents reported symptoms of at least one adverse mental health condition in the preceding 2 weeks. Prevalences of symptoms of depression, anxiety, PTSD, and suicidal ideation were 30.8%, 30.3%, 36.8%, and 8.4%,

* Respondents who did not report working at a state, tribal, local, or territorial public health agency or department in 2020 were excluded from the analysis.

† Membership associations that participated were the Association of Public Health Laboratories (APHL), the Association of State and Territorial Health Officials (ASTHO), the Council of State and Territorial Epidemiologists (CSTE), and the National Association of County and City Health Officials (NACCHO).

§ Respondents were asked if they had experienced specific traumatic events or stressors since March 2020, when COVID-19 was declared a pandemic; choices were yes/no/skip question.

¶ Symptoms of depression, anxiety, and post-traumatic stress disorder were scored and categorized by severity according to thresholds established by these validated tools. Those who scored ≥10.0 out of 27 on the PHQ-9 for depression, ≥3.0 out of 6 on the GAD-2 for anxiety, or ≥1.75 out of 4 on the IES-6 for PTSD were considered symptomatic for the respective conditions.

** Respondents who indicated that they would be better off dead or thought of hurting themselves at any time in the past 2 weeks were categorized as experiencing suicidal ideation.

†† Mental health outcome counts might not sum to total number of respondents because of missing data; counts for each category are those who answered all validated survey questions for that outcome.

§§ 45 C.F.R. part 46.102(l)(2), 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.

Summary

What is already known about this topic?

Increases in mental health conditions have been documented among the general population and health care workers during the COVID-19 pandemic; however, data on public health workers are limited.

What is added by this report?

Among 26,174 surveyed state, tribal, local, and territorial public health workers, 52.8% reported symptoms of at least one mental health condition in the past 2 weeks. Symptoms were more prevalent among those who were unable to take time off or worked ≥41 hours per week.

What are the implications for public health practice?

Implementing prevention and control practices that eliminate, reduce, and manage factors that cause or contribute to public health workers' poor mental health might improve mental health outcomes during emergencies.

respectively (Table 1). The highest prevalences of symptoms of a mental health condition or suicidal ideation were among respondents aged ≤29 years (range = 13.6%–47.4%), transgender or nonbinary persons of all ages (range = 30.4%–65.5%), and those who identified as multiple races (range = 12.1%–43.4%); prevalence of symptoms of PTSD was higher among respondents who had a postbaccalaureate graduate education (40.7%).

Most (92.6%) respondents reported working directly on COVID-19 response activities; the majority (59.2%) worked ≥41 hours in a typical week since March 2020. The prevalences of all four mental health outcomes and the severity of symptoms of depression or PTSD increased as the percentage of work time spent directly on COVID-19 response activities and number of work hours in a typical week increased (Table 1) (Figure). Public health workers who were unable to take time off from work when they needed were nearly twice as likely to report symptoms of an adverse mental health condition (prevalence ratio range = 1.84–1.95) as were those who could take time off. Among those not able to take time off from work (8,586), the most common reasons were concern about falling behind on work (64.4%), no work coverage (60.6%), and feeling guilty (59.0%); 18.2% reported that their employer did not allow time off from work. Needing mental health counseling/services in the last 4 weeks, but not receiving these services, was reported by nearly one in five (19.6%) respondents. Employee assistance programs were available to nearly two thirds (66.1%) of respondents but were accessed by only 11.7% of those respondents; 27.3% of all respondents did not know whether their employer offered an employee assistance program.

Respondents reported experiencing traumatic events or stressors since March 2020, including feeling overwhelmed by workload or family/work balance (72.0%), receiving job-related threats because of work (11.8%), and feeling bullied, threatened or harassed because of work (23.4%); 12.6% of respondents reported having received a diagnosis of COVID-19 (Table 2). Respondents who reported traumatic events or stressors, either personal or work-related, were more likely to report symptoms of PTSD than respondents who did not experience these events or stressors.

Discussion

Among a convenience sample of 26,174 state, tribal, local, and territorial public health workers, approximately one half experienced symptoms of a mental health condition in the 2 weeks preceding the survey, with highest prevalences reported among younger respondents, and transgender or nonbinary respondents. Public health workers who reported certain workplace practices, such as long work hours and the inability to take time off, were more likely to have experienced symptoms of a mental health condition. Implementing prevention and control practices that eliminate, reduce, and manage workplace factors[¶¶] that cause or contribute to public health workers' adverse mental health status[***] might improve mental health outcomes during this and other public health emergencies.

The overall prevalence of symptoms of mental health conditions among public health workers was higher than previously reported in the general population (approximately 40.9%) (*1*). Prevalences of symptoms of depression and anxiety among public health workers were similar to those in previous reports among health care workers (*3*); however, prevalence of PTSD symptoms among public health workers was 10%–20% higher than that previously reported among health care workers (*2*), frontline personnel (*3*), and the general public (*1*). Symptoms of PTSD disproportionately affected public health workers who experienced work-related traumatic stressors (e.g., felt inadequately compensated or felt unappreciated at work), particularly those factors that affect workers' personal lives (e.g., felt disconnected from family and friends because of workload). Traumatic and stressful work experiences related to the COVID-19 pandemic might have played a role in elevating the risk for experiencing symptoms of PTSD among public health workers.

Increases in adverse mental health symptoms among workers have been linked to increased absenteeism, high turnover, lower productivity, and lower morale, which could influence the effectiveness of public health organizations during emergencies (*8*,*9*). Among public health worker respondents, nearly 20% reported that their employer did not allow them to take time off; the inability to take time off had the largest impact on reporting

¶¶ https://www.cdc.gov/niosh/twh/guidelines.html

*** https://unhealthywork.org/category/mental-health-outcomes/

TABLE 1. Mental health symptoms among 26,174 state, tribal, local, and territorial public health workers during the past 2 weeks, by demographic characteristics and work factors — United States, March–April 2021

		Depression* (n = 22,692†)		Anxiety* (n = 23,610†)		PTSD* (n = 22,248†)		Suicidal ideation (n = 23,317†)	
Characteristic	No.	Prevalence, %	PR (95% CI)	Prevalence, %	PR (95% CI)	Prevalence, %	PR (95% CI)	Prevalence, %	PR (95% CI)
Overall	**26,174***	**30.8**	—	**30.3**	—	**36.8**	—	**8.4**	—
Age group, yrs									
≤29	3,525	40.3	2.11 (1.93–2.30)	44.7	2.81 (2.56–3.09)	47.4	2.03 (1.88–2.19)	13.6	2.98 (2.46–3.60)
30–39	5,461	34.3	1.80 (1.65–1.96)	37.1	2.33 (2.12–2.56)	42.3	1.81 (1.68–1.95)	10.3	2.26 (1.87–2.73)
40–49	5,102	31.4	1.64 (1.50–1.80)	29.1	1.83 (1.66–2.01)	37.3	1.60 (1.48–1.73)	7.5	1.65 (1.36–2.01)
50–59	4,925	27.6	1.45 (1.32–1.58)	23.5	1.47 (1.33–1.63)	32.0	1.37 (1.26–1.48)	6.0	1.32 (1.08–1.62)
≥60	2,830	19.1	Ref	15.9	Ref	23.4	Ref	4.6	Ref
Sex									
Male	3,904	27.1	Ref	24.4	Ref	33.2	Ref	9.9	Ref
Female	19,873	31.2	1.15 (1.09–1.22)	31.2	1.28 (1.20–1.36)	37.2	1.12 (1.07–1.18)	7.9	0.81 (0.72–0.90)
Transgender or nonbinary	147	61.9	2.29 (1.98–2.64)	61.1	2.21 (1.88–2.59)	65.5	1.97 (1.74–2.24)	30.4	3.10 (2.37–4.06)
Race/Ethnicity									
Hispanic	1,974	30.0	0.95 (0.89–1.03)	29.9	0.95 (0.89–1.02)	37.5	1.01 (0.95–1.07)	9.9	1.20 (1.03–1.39)
AI/AN, NH	156	35.8	1.14 (0.92–1.41)	32.7	1.04 (0.83–1.31)	41.6	1.12 (0.92–1.35)	7.3	0.89 (0.50–1.57)
Asian, NH	1,009	28.3	0.90 (0.81–1.00)	27.6	0.88 (0.79–0.98)	38.3	1.03 (0.94–1.12)	10.1	1.22 (1.00–1.49)
Black, NH	2,177	24.4	0.77 (0.71–0.84)	21.7	0.69 (0.64–0.75)	29.8	0.80 (0.75–0.86)	6.5	0.79 (0.67–0.94)
NH/PI, NH	96	26.5	0.84 (0.59–1.21)	22.2	0.71 (0.48–1.04)	25.3	0.68 (0.47–0.98)	11.1	1.34 (0.75–2.42)
White, NH	17,218	31.5	Ref	31.4	Ref	37.2	Ref	8.3	Ref
Multiple races, NH	614	39.6	1.26 (1.14–1.39)	37.2	1.19 (1.07–1.32)	43.4	1.17 (1.06–1.28)	12.1	1.46 (1.17–1.83)
Highest educational degree attained									
Less than bachelor's	5,386	31.0	Ref	27.1	Ref	30.1	Ref	6.5	Ref
Bachelor's	9,180	31.4	1.01 (0.96–1.07)	30.6	1.13 (1.07–1.20)	36.8	1.22 (1.16–1.29)	9.1	1.40 (1.24–1.59)
Graduate	9,375	30.4	0.98 (0.93–1.04)	32.0	1.18 (1.12–1.25)	40.7	1.35 (1.29–1.42)	8.9	1.37 (1.22–1.56)
Hrs worked per wk									
≤40	9,993	23.5	Ref	24.4	Ref	27.3	Ref	7.6	Ref
41–60	11,466	33.3	1.42 (1.35–1.48)	32.3	1.32 (1.26–1.38)	40.4	1.48 (1.42–1.54)	8.4	1.10 (1.00–1.21)
>60	3,018	45.6	1.94 (1.84–2.05)	41.6	1.70 (1.61–1.80)	54.2	1.99 (1.89–2.08)	11.0	1.44 (1.27–1.63)
% of time spent on COVID–19 response activities									
None	1,787	22.5	Ref	23.0	Ref	22.3	Ref	7.6	Ref
1–25	5,151	23.6	1.05 (0.95–1.17)	23.5	1.02 (0.92–1.13)	24.3	1.09 (0.98–1.21)	7.5	0.99 (0.82–1.21)
26–50	3,432	27.6	1.23 (1.11–1.37)	26.7	1.16 (1.05–1.29)	31.6	1.42 (1.28–1.57)	8.4	1.12 (0.91–1.37)
51–75	3,283	30.6	1.36 (1.23–1.51)	30.6	1.33 (1.20–1.47)	37.0	1.66 (1.50–1.84)	8.6	1.14 (0.93–1.40)
≥76	10,620	36.9	1.64 (1.50–1.81)	35.9	1.56 (1.42–1.71)	47.0	2.11 (1.92–2.32)	8.9	1.18 (0.99–1.41)
Can take time off from work									
Yes	13,507	22.6	Ref	23.0	Ref	27.9	Ref	6.2	Ref
No	8,586	44.1	1.95 (1.87–2.03)	42.4	1.85 (1.77–1.92)	51.5	1.84 (1.78–1.91)	12.0	1.92 (1.76–2.10)

Abbreviations: AI/AN = American Indian or Alaska Native; CI = confidence interval; IES-6 = 6-item Impact of Event Scale; GAD-2 = General Anxiety Disorder; NH = non-Hispanic; NH/PI = Native Hawaiian or Pacific Islander; PHQ-9 = 9-item Patient Health Questionnaire; PR = prevalence ratio; PTSD = post-traumatic stress disorder; Ref = referent group.

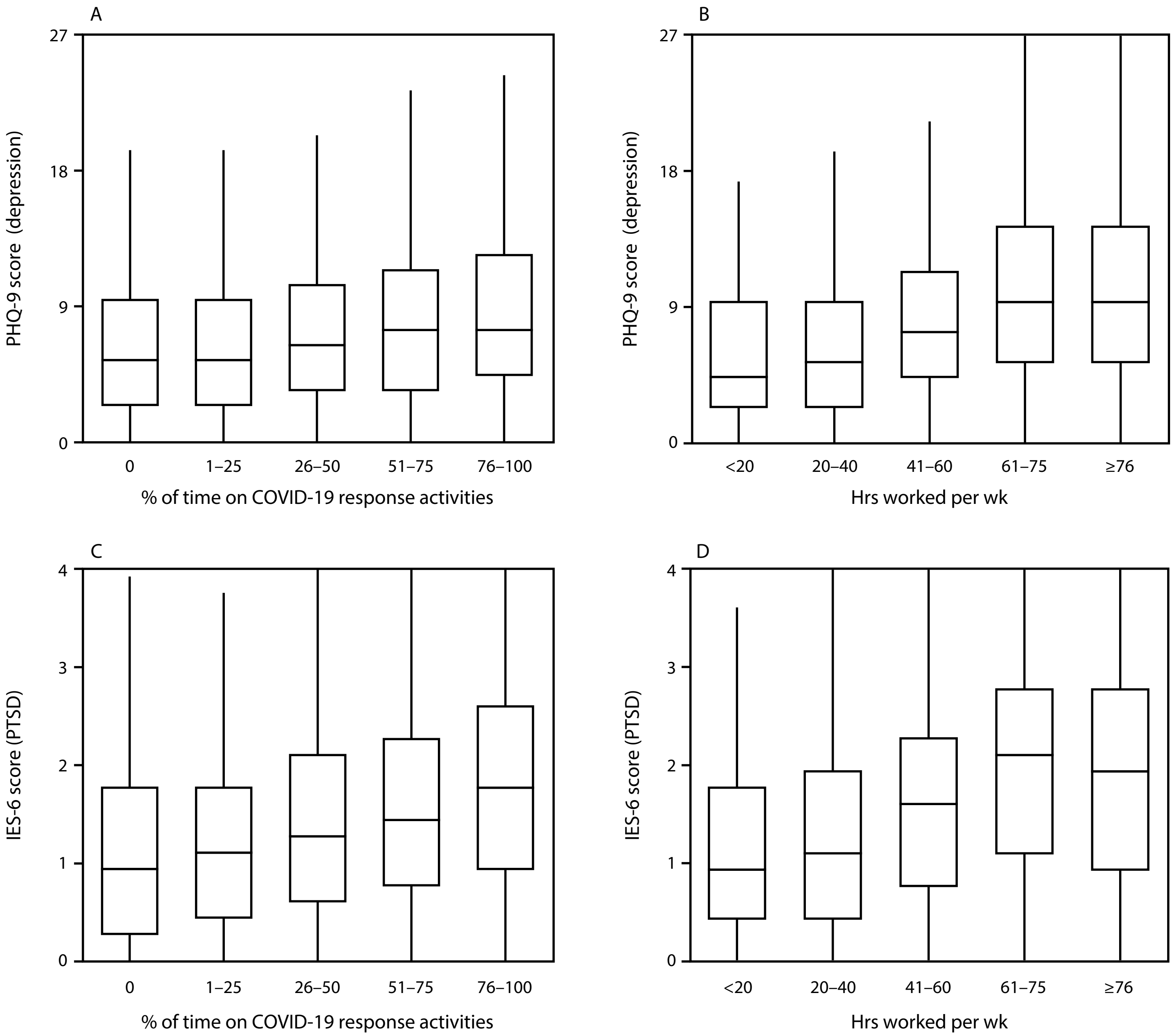
* Symptoms of mental health conditions were scored and categorized by severity. Respondents who scored ≥10.0 out of 27 on the PHQ-9 for depression, ≥3.0 out of 6 on the GAD-2 for anxiety, or ≥1.75 out of 4 on the IES-6 for PTSD were considered symptomatic for the respective conditions. Respondents who indicated that they would be better off dead or thought of hurting themselves at any time in the past 2 weeks were categorized as experiencing suicidal ideation.

† Some categories might not sum to 26,174 because of missing data. Denominators for categories are respondents who answered the questions to be scored.

symptoms of mental health. Approximately one quarter of public health workers did not know whether their workplace offered an employee assistance program. Even where available, employee assistance programs were not commonly accessed. Several strategies could reduce adverse mental health symptoms among public health workers during public health emergencies. For example, expanding staffing size (e.g., recruiting surge personnel to backfill positions) and implementing flexible schedules might reduce the need for long work hours; encouraging workers to take regular breaks and time off could help avoid overwork and reduce the risk for adverse mental health outcomes. In addition, implementing, evaluating, and promoting use of employee assistance programs could improve employee resiliency and coping.

The findings in this report are subject to at least four limitations. First, the study used a nonprobability–based convenience sample of public health worker respondents, and a completion rate could not be determined. Although the participating national public health membership associations reach many public health workers, the findings might not be representative of all state, tribal, local, and territorial public health workers in

FIGURE. Distribution* of 9-item Patient Health Questionnaire scores for depression and 6-item Impact of Event Scale scores for post-traumatic stress disorder† among state, tribal, local, and territorial public health worker respondents,§ by percentage of work time spent directly on COVID-19 response activities for the majority of 2020 (panels A, C), and hours worked in a typical week since March 2020 (panels B, D) — United States, March–April 2021



Abbreviations: IES-6 = 6-item Impact of Event Scale; PHQ-9 = 9-item Patient Health Questionnaire; PTSD = post-traumatic stress disorder.

* Upper and lower levels of boxes indicate 75th and 25th percentiles, respectively; horizontal line indicates median; whiskers indicate observation nearest to 1.5 × interquartile range.

† Self-reported symptoms of depression or PTSD were evaluated; respondents who scored ≥10.0 out of 27 on the PHQ-9 for depression or ≥1.75 out of 4 on the IES-6 for PTSD were considered symptomatic for the respective conditions.

§ Only public health worker respondents who completed all PHQ-9 items (n = 22,692) or all IES-6 items (n = 22,248) are included.

the United States. Second, self-reported mental health symptoms were assessed using screening instruments, which does not constitute clinical diagnosis of a mental health disorder; however, the screening instruments have been clinically validated (*5*–*7*). Third, participants were surveyed about symptoms experienced in the 2 weeks preceding the survey, which might not reflect all symptoms experienced during the pandemic. Finally, not all traumatic stressors or events experienced by public health workers were assessed by the survey, such as non–COVID-19 illnesses or financial insecurity.

TABLE 2. Traumatic events or stressors reported by 26,174 state, tribal, local, and territorial public health workers and comparisons* of symptoms of post-traumatic stress disorder† — United States, March–April 2021

Traumatic event or stressor/Response	No.§	PTSD prevalence, %	PTSD PR (95% CI)
Personal-related			
Had COVID-19			
Yes¶	2,834	36.7	1.03 (0.98–1.09)
Maybe**	3,310	42.4	1.19 (1.14–1.25)
No	16,266	35.6	Ref
Got divorced or separated			
Yes	747	49.6	1.36 (1.27–1.47)
No	22,084	36.3	Ref
Experienced death of a loved one			
Yes	7,580	42.3	1.24 (1.20–1.29)
No	15,403	34.0	Ref
Worried about the health of family and loved ones			
Yes	20,857	39.4	3.11 (2.77–3.48)
No	2,203	12.7	Ref
Felt isolated and alone			
Yes	12,944	49.8	2.49 (2.38–2.60)
No	10,080	20.0	Ref
Work-related			
Felt overwhelmed by workload or family/work balance			
Yes	16,563	45.4	3.10 (2.91–3.30)
No	6,451	14.7	Ref
Felt disconnected from family and friends because of workload			
Yes	14,051	49.0	2.77 (2.64–2.91)
No	8,964	17.7	Ref
Felt inadequately compensated for work			
Yes	13,703	45.2	1.85 (1.78–1.93)
No	9,101	24.4	Ref
Felt unappreciated at work			
Yes	12,362	46.5	1.82 (1.76–1.90)
No	10,551	25.5	Ref
Experienced stigma or discrimination because of work			
Yes	5,962	56.2	1.88 (1.82–1.94)
No	16,944	29.9	Ref
Received job-related threats because of work			
Yes	2,699	61.8	1.85 (1.78–1.92)
No	20,262	33.4	Ref
Felt bullied, threatened, or harassed because of work			
Yes	5,376	59.0	1.97 (1.91–2.03)
No	17,594	30.0	Ref
Interacted often with the public			
Yes	11,143	41.1	1.23 (1.19–1.28)
No	13,318	33.3	Ref
Worried about workplace exposure to COVID-19			
Yes	11,197	42.6	1.36 (1.31–1.41)
No	11,805	31.3	Ref

Abbreviations: IES-6 = 6-item Impact of Event Scale; PR = prevalence ratio; PTSD = post-traumatic stress disorder; Ref = referent group.
* Referent group for all prevalence ratio calculations was not experiencing the traumatic event/stressor (i.e., "No" category).
† Experienced symptoms of post-traumatic stress disorder in the 2 weeks preceding survey, defined as having an IES-6 score ≥1.75 out of 4.
§ Some categories might not sum to 26,174; only those respondents who completed IES-6 questions (N = 22,248) are included in analysis.
¶ Positive COVID-19 test or diagnosis by medical professional.
** Had symptoms compatible with COVID-19 but not tested or test inconclusive.

During the COVID-19 pandemic, public health workers have experienced symptoms of depression, anxiety, PTSD, and suicidal ideation. Addressing work practices that contribute to stress and trauma is critical to managing workers' adverse mental health status during emergency responses. Furthermore, strengthening work systems to encourage behavior changes that promote mental health, such as building awareness of symptoms of mental health conditions and developing sustainable coping strategies, might improve mental health conditions, particularly for public health workers who are at increased risk, including those who are younger (*10*) or transgender or nonbinary persons. In addition, employee assistance programs could be evaluated and adjusted to be more accessible and acceptable to workers and focus more on building workplace cultures that promote wellness and destigmatize requests for mental health assistance.

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[1]Epidemic Intelligence Service, CDC; [2]CDC COVID-19 Response Team; [3]Minnesota Department of Health; [4]Council of State and Territorial Epidemiologists, Atlanta, Georgia; [5]National Association of County and City Health Officials, Washington, DC; [6]Association of Public Health Laboratories, Silver Spring, Maryland; [7]Association of State and Territorial Health Officials, Arlington, Virginia.

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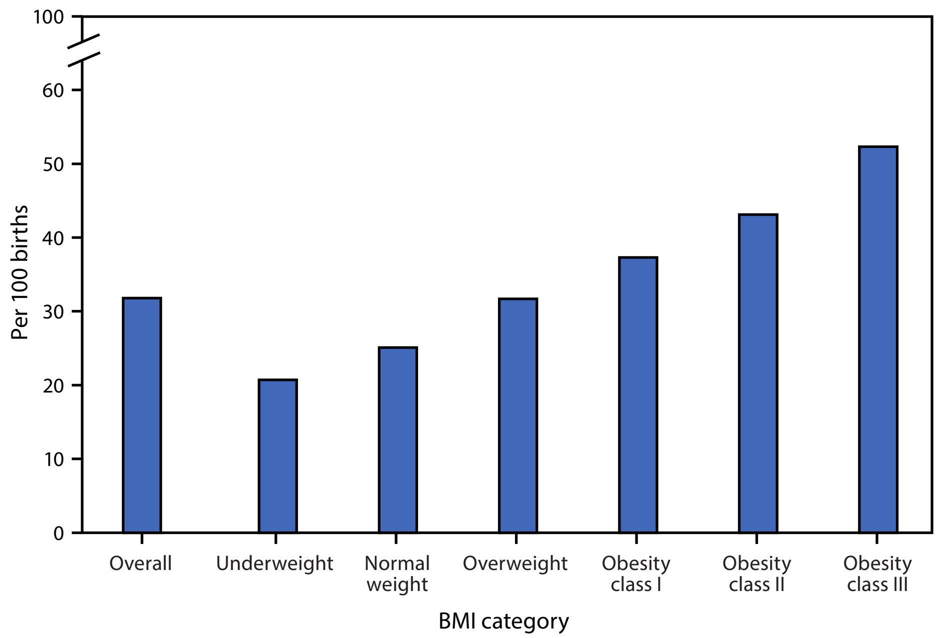
QuickStats

FROM THE NATIONAL CENTER FOR HEALTH STATISTICS

Rate of Cesarean Delivery, by Maternal Prepregnancy Body Mass Index Category* — United States, 2020



Abbreviation: BMI = body mass index.

* BMI = weight (kg)/height (m^2). BMI categories are underweight (<18.5), normal weight (18.5–24.9), overweight (25.0–29.9), obesity class I (30.0–34.9), obesity class II (35.0–35.9), and obesity class III (≥40.0).

In 2020, 31.8% of live births were to women who had a cesarean delivery. The rate of cesarean delivery was lowest for women who were underweight before pregnancy (20.7%); the rate rose steadily as BMI increased to obesity class III (52.3%). One quarter (25.1%) of women of normal weight had a cesarean delivery.

Sources: National Vital Statistics System, natality file. https://wonder.cdc.gov/natality-expanded-current.html; Defining adult overweight and obesity. https://www.cdc.gov/obesity/adult/defining.html#:~:text=Class%203%3A%20BMI%20of%2040%20or%20higher.%20Class,body%20fatness%20or%20the%20health%20of%20an%20individual

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