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Prevalence of Self-Reported Hypertension and Antihypertensive Medication Use Among Adults — United States, 2017–2021

Ahlia Sekkarie, PhD[1]; Jing Fang, MD[1]; Donald Hayes, MD[1]; Fleetwood Loustalot, PhD[1]

Abstract

Hypertension, or high blood pressure, is a major risk factor for heart disease and stroke. It increases with age and is highest among non-Hispanic Black or African American persons, men, persons aged ≥65 years, those of lower socioeconomic status, and those who live in the southern United States. Hypertension affects approximately one half of U.S. adults, and approximately one quarter of those persons have their blood pressure under control. Reducing population-level hypertension prevalence and improving control is a national priority. In 2017, updated guidelines for high blood pressure in adults recommended lowering the blood pressure threshold for diagnosis of hypertension. Analysis of data from the Behavioral Risk Factor Surveillance System found that age-standardized, self-reported diagnosed hypertension was approximately 30% during 2017–2021, with persistent differences by age, sex, race and ethnicity, level of education, and state of residence. During this period, the age-standardized prevalence of antihypertensive medication use among persons with hypertension increased by 3.1 percentage points, from 59.8% to 62.9% (p<0.001). Increases in antihypertensive medication use were observed in most sociodemographic groups and in many states. Assessing current trends in hypertension diagnosis and treatment can help guide the development of policies and implementation of interventions to reduce this important risk factor for cardiovascular disease and can aid in addressing health disparities.

Introduction

Hypertension, or high blood pressure, is a major risk factor for heart disease and stroke (*1*). Hypertension affects approximately one in two U.S. adults aged ≥18 years, approximately one quarter of whom have their blood pressure under control (*1*). Prevalence of hypertension is highest among non-Hispanic Black or African American (Black) persons, men, persons aged ≥65 years, those of lower socioeconomic status, and those who live in the southern United States (*2*). Improving population-level hypertension prevalence and control is a national priority.* In 2017, updated guidelines for high blood pressure in adults recommended lowering the blood pressure threshold for diagnosis of hypertension (*3*). This change would be expected to lead to increased diagnosed hypertension prevalence. CDC analyzed data from the Behavioral Risk Factor Surveillance System (BRFSS) to examine characteristics and trends in prevalence of self-reported diagnosed hypertension and antihypertensive medication use.

* https://www.cdc.gov/bloodpressure/docs/SG-CTA-HTN-Control-Report-508.pdf

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Methods

Data Source and Primary Measures

CDC analyzed data from BRFSS, a state-based telephone survey of noninstitutionalized U.S. adults aged ≥18 years.[†] The median response rates for the 50 states and the District of Columbia in 2017, 2019, and 2021 were 45.8% (range = 30.6%–64.1%), 49.4% (37.3%–73.1%), and 43.8% (23.5%–60.5%), respectively.[§] Self-reported diagnosed hypertension (hypertension) was defined as an affirmative response to the question, "Have you ever been told by a doctor, nurse, or other health professional that you have high blood pressure?" Respondents who reported that they were told they had blood pressure levels that were borderline high, elevated, prehypertensive, or had high blood pressure only during pregnancy were not classified as having hypertension. To determine whether persons with hypertension were being treated, respondents who answered the first question affirmatively were then asked, "Are you currently taking medicine for your high blood pressure?" Hypertension and treatment were assessed by age group (18–44, 45–64, and ≥65 years), sex (female and male), race and ethnicity (non-Hispanic White [White]; Black; Hispanic or Latino; non-Hispanic Asian [Asian]; non-Hispanic Native Hawaiian or other Pacific Islander [NH/OPI]; non-Hispanic American Indian or Alaska Native [AI/AN]; and non-Hispanic other [other] persons), highest level of education attained (less than high school graduate, high school diploma or general educational development certificate, some college, or college graduate or higher), and state of residence.

Data Analysis

Prevalence estimates were age-standardized to the 2000 U.S. Census Bureau population using three age groups (18–44, 45–64, and ≥65 years) for all characteristics except age-specific estimates. Prevalence differences (i.e., percentage point differences) between 2017 and 2021 were assessed using t-tests adjusted for sex, age, and race and ethnicity in a logistic regression model. P-values <0.05 were considered statistically significant. All analyses were conducted using SAS-callable SUDAAN (version 11.0.4; RTI International) to account for the complex sampling design and weighting. This activity was reviewed by CDC, deemed not research, and was conducted consistent with applicable federal law and CDC policy.[¶]

Results

During 2017, 2019, and 2021, a total of 444,023, 409,810, and 431,639 participants, respectively, were interviewed. After investigators excluded participants who were pregnant (0.5%–0.6%), missing data for hypertension variables (0.4%–0.5%),

[†] https://www.cdc.gov/brfss

[§] https://www.cdc.gov/brfss/annual_data/2021/pdf/2021-DQR-508.pdf

[¶] 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.

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and other covariates (3.2%–3.9%), the final analytic samples for 2017, 2019, and 2021 were 425,417 (96% of original sample), 392,100 (96%), and 410,318 (95%), respectively.

Hypertension Prevalence

From 2017 to 2021, the overall age-standardized prevalence of hypertension did not change, remaining at almost exactly 30% (Table 1). In 2021, hypertension prevalence was higher among men (33.2%) than among women (27.0%), among adults aged ≥65 years (60.6%) than among those aged 18–44 years (14.5%) and 45–64 years (40.3%), among Black adults (40.2%) than among Asian adults (22.7%), and among persons with less than a high school education (33.8%) than among those with some college (31.2%) or a college degree or higher education (25.5%).

Although the overall prevalence of hypertension remained unchanged, among persons with less than high school education, hypertension prevalence declined from 36.1% in 2017 to 33.8% in 2021 (p = 0.006). In contrast, a small but statistically significant increase in hypertension prevalence was observed among persons with some college (from 30.2% to 31.2%; p = 0.013) and among persons with college degrees or higher education (from 24.7% to 25.5%; p = 0.004).

TABLE 1. Age-standardized prevalence* of hypertension among adults aged ≥18 years, by sociodemographic characteristics and state and the District of Columbia — Behavioral Risk Factor Surveillance System, United States, 2017–2021

Characteristic	Prevalence (95% CI)			2017 vs. 2021	
	2017	2019	2021	Percentage point difference	p-value†
Total	**30.1 (29.8–30.3)**	**30.0 (29.7–30.2)**	**30.1 (29.8–30.4)**	**0**	**0.890**
Sex					
Men	32.9 (32.5–33.4)	33.0 (32.7–33.4)	33.2 (32.8–33.6)	0.3	0.272
Women	27.2 (26.8–27.5)	26.9 (26.6–27.2)	27.0 (26.6–27.4)	–0.2	0.348
Age group, yrs					
18–44	14.3 (14.0–14.7)	14.3 (13.9–14.6)	14.5 (14.1–14.9)	0.2	0.333
45–64	40.6 (40.1–41.1)	40.6 (40.1–41.2)	40.3 (39.7–40.8)	–0.3	0.408
≥65	60.5 (59.9–61.1)	60.1 (59.6–60.6)	60.6 (60.0–61.2)	0.1	0.902
Race and ethnicity§					
AI/AN	37.3 (35.1–39.5)	34.7 (32.5–36.8)	36.5 (34.5–38.5)	–0.8	0.673
Asian	23.7 (21.8–25.7)	23.7 (22.1–25.4)	22.7 (20.8–24.7)	–1.0	0.570
Black or African American	40.0 (39.2–40.9)	39.7 (38.9–40.5)	40.2 (39.3–41.1)	0.2	0.831
NH/OPI	33.3 (29.6–37.3)	30.3 (26.0–34.9)	31.1 (27.2–35.4)	–2.2	0.673
White	29.1 (28.8–29.4)	29.4 (29.1–29.7)	29.3 (29.0–29.6)	0.2	0.351
Hispanic or Latino	28.4 (27.4–29.4)	27.3 (26.4–28.3)	27.5 (26.5–28.6)	–0.9	0.343
Other	30.0 (27.1–33.0)	29.0 (26.8–31.2)	30.1 (27.7–32.7)	0.1	0.954
Highest level of education attained					
Less than high school	36.1 (35.1–37.1)	34.9 (34.0–35.9)	33.8 (32.7–34.9)	–2.3	0.006
High school graduate or GED	32.5 (32.0–33.1)	32.5 (32.0–33.0)	32.6 (32.0–33.2)	0.1	0.745
Some college	30.2 (29.7–30.7)	30.3 (29.8–30.8)	31.2 (30.6–31.7)	1.0	0.013
College graduate or higher	24.7 (24.3–25.1)	25.2 (24.9–25.6)	25.5 (25.1–25.9)	0.8	0.004
Residence					
Alabama	38.7 (37.2–40.3)	38.9 (37.5–40.3)	38.9 (37.1–40.7)	0.2	0.724
Alaska	32.1 (29.6–34.6)	32.6 (30.1–35.1)	29.4 (27.8–31.2)	–2.6	0.111
Arizona	28.0 (27.2–28.9)	29.7 (28.2–31.3)	28.0 (26.9–29.2)	–0	0.779
Arkansas	38.4 (36.0–40.8)	37.8 (36.0–39.6)	37.4 (35.5–39.2)	–1.0	0.718
California	27.0 (25.9–28.1)	26.6 (25.6–27.6)	26.3 (24.9–27.6)	–0.7	0.335
Colorado	24.3 (23.4–25.2)	24.2 (23.2–25.1)	24.6 (23.7–25.6)	0.3	0.833
Connecticut	27.3 (26.2–28.4)	27.5 (26.3–28.7)	27.8 (26.5–29.1)	0.5	0.704
Delaware	31.4 (29.5–33.4)	32.8 (30.8–34.9)	31.7 (29.7–33.7)	0.3	0.837
District of Columbia	28.3 (26.8–29.8)	29.2 (27.4–31.1)	29.6 (27.8–31.4)	1.3	0.319
Florida¶	29.8 (28.6–31.2)	28.5 (27.2–29.9)	—	—	—
Georgia	31.6 (30.2–33.1)	32.7 (31.2–34.3)	34.6 (33.2–36.0)	2.9	0.003
Hawaii	28.3 (27.1–29.7)	27.8 (26.6–29.2)	26.4 (25.1–27.7)	–1.9	0.016
Idaho	27.7 (26.2–29.3)	28.5 (26.8–30.3)	28.2 (27.0–29.4)	0.5	0.802
Illinois	29.9 (28.6–31.4)	29.5 (28.2–30.8)	26.8 (25.0–28.7)	–3.2	0.006
Indiana	32.8 (31.8–33.8)	32.4 (31.2–33.5)	31.8 (30.8–32.9)	–1.0	0.152
Iowa	28.3 (27.2–29.4)	28.9 (27.9–29.9)	28.5 (27.4–29.6)	0.2	0.720
Kansas	30.6 (29.9–31.3)	31.3 (30.3–32.3)	31.6 (30.8–32.4)	1.0	0.080
Kentucky	36.3 (34.8–37.8)	37.6 (35.9–39.2)	36.9 (35.3–38.7)	0.6	0.888
Louisiana	37.1 (35.5–38.7)	37.3 (35.7–38.9)	37.3 (35.6–39.0)	0.2	0.834
Maine	30.0 (28.6–31.5)	30.9 (29.5–32.4)	28.2 (27.0–29.4)	–1.9	0.054
Maryland	30.2 (29.1–31.3)	31.6 (30.6–32.6)	31.7 (30.6–32.7)	1.5	0.100

See table footnotes on the next page.

TABLE 1. (*Continued*) Age-standardized prevalence* of hypertension among adults aged ≥18 years, by sociodemographic characteristics and state and the District of Columbia — Behavioral Risk Factor Surveillance System, United States, 2017–2021

Characteristic	Prevalence (95% CI)			2017 vs. 2021	
	2017	2019	2021	Percentage point difference	p-value†
Massachusetts	25.9 (24.4–27.4)	25.3 (24.2–26.5)	26.2 (25.0–27.5)	0.4	0.783
Michigan	31.5 (30.4–32.6)	31.4 (30.3–32.6)	31.5 (30.4–32.7)	0	0.968
Minnesota	24.4 (23.7–25.2)	26.2 (25.4–26.9)	26.8 (26.0–27.6)	2.4	<0.001
Mississippi	38.2 (36.4–40.1)	40.9 (39.2–42.6)	40.6 (38.8–42.5)	2.4	0.036
Missouri	29.0 (27.8–30.4)	27.8 (26.5–29.2)	32.1 (30.9–33.3)	3.1	0.001
Montana	25.9 (24.5–27.4)	25.7 (24.5–26.9)	27.0 (25.7–28.3)	1.1	0.326
Nebraska	28.5 (27.5–29.5)	28.7 (27.8–29.6)	29.6 (28.6–30.5)	1.1	0.188
Nevada	30.5 (28.5–32.6)	29.9 (27.7–32.2)	29.7 (27.4–32.1)	–0.8	0.480
New Hampshire	26.0 (24.5–27.5)	27.8 (26.2–29.5)	26.1 (24.7–27.5)	0.1	0.710
New Jersey¶	30.4 (29.0–31.8)	—	27.5 (26.3–28.8)	–2.9	0.003
New Mexico	28.5 (27.0–30.0)	28.8 (27.3–30.4)	29.8 (28.4–31.4)	1.4	0.238
New York	27.1 (26.1–28.2)	27.0 (26.0–28.0)	27.6 (26.9–28.3)	0.4	0.300
North Carolina	32.0 (30.5–33.6)	32.4 (30.9–34.0)	31.3 (29.9–32.8)	–0.7	0.515
North Dakota	28.3 (27.1–29.5)	28.2 (26.7–29.7)	29.3 (27.9–30.7)	1.0	0.367
Ohio	31.7 (30.5–32.9)	31.2 (30.0–32.4)	32.0 (31.0–33.1)	0.4	0.527
Oklahoma	35.4 (34.0–36.8)	35.5 (34.1–36.8)	37.1 (35.5–38.7)	1.7	0.178
Oregon	27.5 (26.2–28.8)	27.6 (26.3–28.9)	27.5 (26.2–28.9)	0	0.816
Pennsylvania	28.8 (27.5–30.2)	29.4 (28.1–30.7)	29.6 (28.3–31.0)	0.8	0.326
Rhode Island	30.0 (28.4–31.6)	30.3 (28.7–32.0)	29.5 (28.0–31.1)	–0.5	0.509
South Carolina	34.6 (33.4–35.8)	34.7 (33.3–36.1)	34.0 (32.8–35.3)	–0.6	0.416
South Dakota	28.0 (26.2–29.8)	28.1 (26.1–30.1)	30.5 (28.0–33.1)	2.5	0.093
Tennessee	35.6 (34.0–37.4)	35.9 (34.4–37.4)	34.4 (32.8–36.1)	–1.2	0.346
Texas	32.5 (30.8–34.2)	30.8 (29.5–32.2)	31.8 (30.3–33.4)	–0.6	0.637
Utah	25.6 (24.6–26.6)	26.6 (25.6–27.5)	27.0 (26.0–28.0)	1.5	0.032
Vermont	26.0 (24.7–27.3)	26.1 (24.6–27.6)	25.6 (24.2–27.0)	–0.4	0.434
Virginia	30.4 (29.2–31.6)	31.0 (29.9–32.1)	31.4 (30.3–32.5)	1.0	0.136
Washington	27.8 (26.8–28.8)	28.4 (27.5–29.3)	27.6 (26.6–28.6)	–0.2	0.879
West Virginia	38.9 (37.3–40.5)	38.6 (36.9–40.3)	38.1 (36.7–39.6)	–0.7	0.364
Wisconsin	27.9 (26.3–29.4)	27.7 (26.2–29.3)	27.9 (26.5–29.4)	0.1	0.660
Wyoming	28.4 (26.9–29.9)	27.8 (26.1–29.6)	26.8 (25.0–28.6)	–1.6	0.118

Abbreviations: AI/AN = American Indian or Alaska Native; BRFSS = Behavioral Risk Factor Surveillance System; GED = general educational development certificate; NH = non-Hispanic; NH/OPI = Native Hawaiian or other Pacific Islander.

* Directly standardized to the 2000 U.S. Census Bureau standard population.

† Adjusted for sex, age group, and race and ethnicity.

§ Persons of Hispanic or Latino (Hispanic) origin might be of any race but are categorized as Hispanic; all racial groups are non-Hispanic. The "other" category includes participants of multiple racial and ethnicity groups.

¶ New Jersey in 2019 and Florida in 2021 were unable to collect enough BRFSS data to meet the minimum requirements for inclusion in the BRFSS public-use data set.

By state, the age-standardized prevalence of hypertension ranged from 24.6% in Colorado to 40.6% in Mississippi in 2021. From 2017 to 2021, increases in the prevalence of hypertension were observed in five states (Georgia, Minnesota, Mississippi, Missouri, and Utah) and decreases were observed in three states (Hawaii, Illinois, and New Jersey). Hypertension prevalence was, in general, higher in southeastern and Appalachian states and lower in western states (Figure).

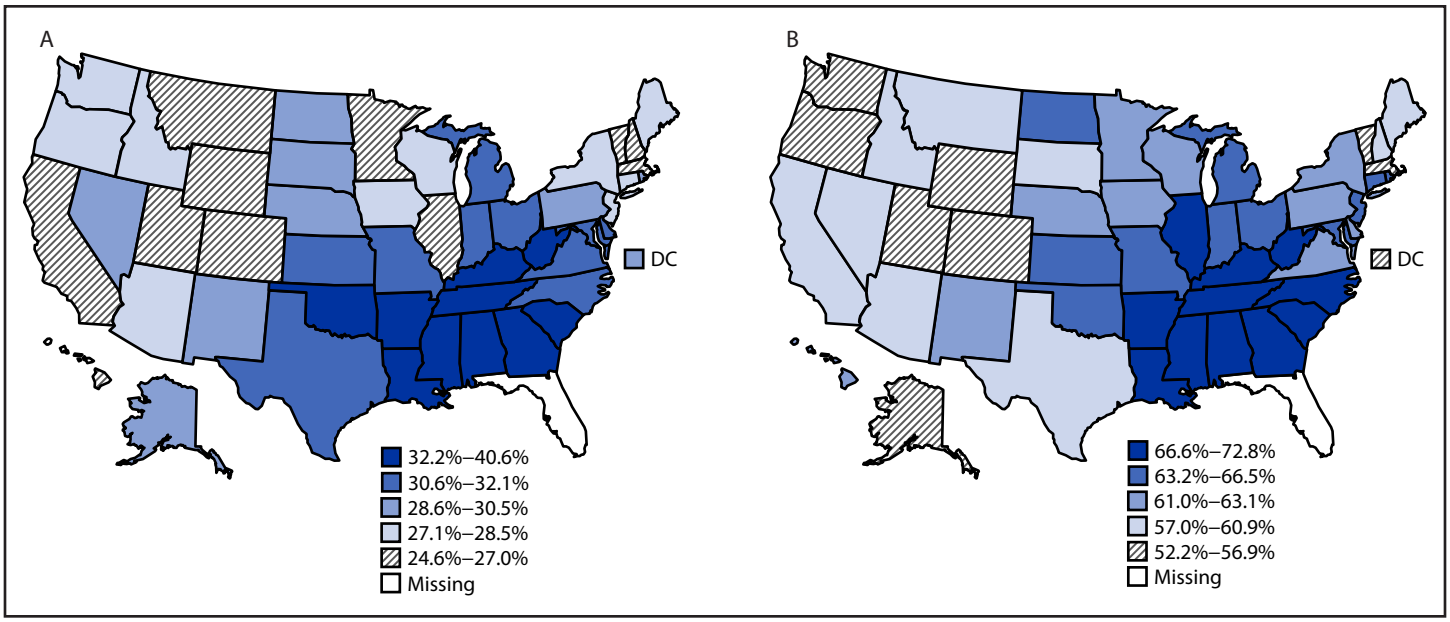
Antihypertensive Medication Use

From 2017 to 2021, age-standardized prevalence of antihypertensive medication use among adults with self-reported hypertension increased by 3.1 percentage points, from 59.8% to 62.9% (p<0.001) (Table 2). In 2021, the prevalence of medication use was higher among women (68.5%) than among men (59.4%), among adults aged ≥65 years (92.5%) than among those aged 18–44 years (42.5%), and among Black (71.3%) than among White adults (62%).

From 2017 to 2021, increases in antihypertensive medication use among persons with hypertension were reported among both men and women, persons aged 18–44 and 45–64 years, White adults, Black adults, and persons at all education levels except among those with less than a high school education, among whom medication use prevalence did not change.

By state, the prevalence of medication use among persons with reported hypertension ranged from 52.2% in Utah to 72.8% in Mississippi in 2021. Antihypertensive medication use increased in 11 states and did not decrease significantly in any state. In general, similar to the prevalence of hypertension, the prevalence of medication use among persons with hypertension was higher in southeastern and Appalachian states and lower in western states (Figure).

FIGURE. Age-standardized prevalence* of self-reported diagnosed hypertension among adults (A) and use of antihypertensive medication among adults with hypertension (B), by state and the District of Columbia — Behavioral Risk Factor Surveillance System, United States, 2021



Abbreviation: DC = District of Columbia.

* Data are categorized as quintiles. In 2021, Florida was unable to collect enough Behavioral Risk Factor Surveillance System data to meet the minimum requirements for inclusion in the Behavioral Risk Factor Surveillance System public-use data set.

Discussion

Among U.S. adults, the age-standardized prevalence of self-reported diagnosed hypertension remained stable at approximately 30% from 2017 to 2021. Among persons with self-reported hypertension, reported antihypertensive medication use increased by approximately 3 percentage points from 2017 to 2021. Prevalences of hypertension and antihypertensive medication use among persons with hypertension differed by age, sex, race and ethnicity, education, and state of residence.

The 2017 Guideline for High Blood Pressure in Adults recommended lowering the blood pressure threshold for diagnosis of hypertension from ≥140 mmHg (systolic) to ≥130 mmHg, and from ≥90 mmHg (diastolic) to ≥80 mmHg (*3*). Significant increases in diagnosed hypertension prevalence would be anticipated with lower thresholds for diagnosis (*4*); however, despite this lower threshold, the prevalence of self-reported diagnosed hypertension did not change between 2017 and 2021. Using these lower thresholds for the diagnosis of hypertension (*3*), approximately one half of adults aged ≥18 years had hypertension during 2017–2020 (*1*). However, this analysis found that approximately one third of adults reported a diagnosis of hypertension. Several reasons could account for this finding. First, broad implementation of changes to clinical guidelines takes time, and differing guidelines that use higher thresholds (140/90 mmHg)** might attenuate any changes in diagnosed hypertension prevalence. Second, some clinical performance measures, which serve as tools to advance the translation of guidelines into clinical practice, were not modified to align with the lower thresholds (*5*). For example, the threshold for adequately controlled blood pressure for various insured populations used by one organization remains at the higher threshold of 140/90 mmHg.†† In addition, the COVID-19 pandemic might have affected blood pressure levels and diagnosis of hypertension. Early in the COVID-19 pandemic, an increase in measured blood pressure levels was reported in one longitudinal study (*6*). However, self-reported diagnosed hypertension prevalence did not increase among the overall U.S. population, which might have resulted, in part, from fewer visits to health care providers during the pandemic (*7*).

Application of the 2017 Hypertension Guideline was also expected to increase the number of adults who needed to initiate or increase medication to treat hypertension (*8*). Before 2017, reported antihypertensive medication use had been decreasing among persons with hypertension (*9*). Data in this report provide evidence that starting in 2017, antihypertensive medication use increased overall and across most sociodemographic subgroups and many states.

An increase in medication use will likely lead to improved control of hypertension among those treated. BRFSS does not measure hypertension control; however, data from the National Health and Nutrition Examination Survey showed that the prevalence of

** https://www.aafp.org/family-physician/patient-care/clinical-recommendations/all-clinical-recommendations/highbloodpressure.html

†† https://www.ncqa.org/hedis/measures/controlling-high-blood-pressure/

TABLE 2. Age-standardized prevalence* of antihypertensive medication use among adults aged ≥18 years with hypertension, by sociodemographic characteristics and state and the District of Columbia — Behavioral Risk Factor Surveillance System, United States, 2017–2021

Characteristic	Prevalence (95% CI)			2017 vs. 2021	
	2017	2019	2021	Percentage point difference	p-value†
Total	**59.8 (59.0–60.5)**	**59.6 (58.9–60.3)**	**62.9 (62.1–63.7)**	**3.1**	**<0.001**
Sex					
Men	56.8 (55.9–57.7)	56.7 (55.8–57.6)	59.4 (58.5–60.3)	2.6	<0.001
Women	64.4 (63.1–65.6)	64.3 (63.1–65.4)	68.5 (67.1–69.8)	4.1	<0.001
Age group, yrs					
18–44	38.0 (36.7–39.4)	37.7 (36.4–39.0)	42.5 (41.1–44.0)	4.5	<0.001
45–64	80.0 (79.3–80.6)	80.0 (79.3–80.7)	82.2 (81.5–82.9)	2.2	<0.001
≥65	91.9 (91.5–92.4)	92.1 (91.7–92.4)	92.5 (92.1–93.0)	0.6	0.061
Race and ethnicity§					
AI/AN	58.7 (53.9–63.3)	63.4 (59.0–67.7)	64.0 (59.4–68.3)	5.3	0.073
Asian	58.8 (53.6–63.7)	61.1 (56.1–65.8)	65.7 (60.2–70.9)	6.9	0.167
Black or African American	67.9 (66.0–69.7)	67.4 (65.5–69.3)	71.3 (69.4–73.1)	3.3	0.002
NH/OPI	53.2 (46.2–60.0)	63.7 (54.6–71.9)	62.0 (53.4–69.8)	8.8	0.191
White	58.9 (58.1–59.8)	57.9 (57.1–58.7)	62.0 (61.2–62.9)	3.1	<0.001
Hispanic or Latino	54.3 (52.1–56.5)	56.3 (54.2–58.5)	56.0 (53.7–58.4)	1.8	0.501
Other	56.3 (48.5–63.7)	58.1 (52.6–63.4)	57.1 (51.3–62.6)	0.8	0.706
Highest level of education attained					
Less than high school	59.4 (57.1–61.7)	57.6 (55.5–59.7)	60.6 (57.9–63.3)	1.2	0.868
High school graduate or GED	59.7 (58.4–61.0)	59.4 (58.1–60.6)	62.4 (60.9–63.9)	2.7	<0.001
Some college	59.7 (58.4–61.0)	60.8 (59.4–62.1)	63.9 (62.4–65.3)	4.2	<0.001
College graduate or higher	60.1 (58.7–61.5)	59.5 (58.3–60.6)	63.4 (62.2–64.6)	3.3	<0.001
Residence					
Alabama	70.1 (66.6–73.4)	70.7 (67.4–73.8)	70.8 (66.5–74.8)	0.7	0.216
Alaska	52.8 (46.4–59.2)	45.5 (41.0–50.0)	54.3 (49.8–58.7)	1.5	0.395
Arizona	56.6 (54.2–59.0)	55.2 (51.0–59.2)	57.1 (54.0–60.2)	0.5	0.578
Arkansas	69.5 (64.0–74.4)	65.1 (60.8–69.1)	66.9 (62.3–71.1)	−2.6	0.609
California	52.9 (49.8–56.0)	53.5 (50.7–56.3)	57.3 (53.2–61.4)	4.4	0.142
Colorado	52.6 (49.5–55.8)	50.5 (47.4–53.6)	54.3 (51.5–57.0)	1.6	0.522
Connecticut	56.9 (53.5–60.2)	57.0 (53.4–60.6)	63.2 (59.3–67.0)	6.3	0.011
Delaware	59.2 (53.5–64.6)	60.1 (54.6–65.4)	62.1 (57.0–67.1)	3.0	0.443
District of Columbia	62.2 (57.7–66.5)	58.4 (52.7–63.9)	54.1 (49.5–58.6)	−8.1	0.166
Florida¶	58.5 (55.0–62.0)	59.2 (55.0–63.2)	—	—	—
Georgia	63.6 (59.6–67.4)	62.5 (58.4–66.5)	69.5 (65.7–73.1)	5.9	0.126
Hawaii	57.9 (54.2–61.5)	54.7 (51.0–58.4)	62.6 (58.2–66.8)	4.7	0.052
Idaho	48.7 (44.8–52.6)	54.8 (50.4–59.0)	57.0 (53.5–60.4)	8.3	0.007
Illinois	60.1 (55.6–64.4)	54.3 (50.8–57.7)	67.1 (61.5–72.3)	7.0	0.001
Indiana	60.5 (57.8–63.1)	64.8 (61.5–68.0)	66.5 (63.6–69.3)	6.0	<0.001
Iowa	60.7 (57.4–64.0)	61.8 (59.0–64.6)	62.4 (59.3–65.5)	1.7	0.088
Kansas	59.5 (57.5–61.4)	59.3 (56.8–61.7)	65.8 (63.6–67.9)	6.3	<0.001
Kentucky	67.6 (64.1–70.9)	69.3 (65.7–72.8)	69.3 (65.7–72.6)	1.7	0.106
Louisiana	69.1 (65.2–72.7)	64.5 (60.7–68.2)	70.0 (65.9–73.8)	0.9	0.593
Maine	56.4 (52.1–60.7)	53.1 (49.4–56.7)	58.5 (55.1–61.8)	2.1	0.050
Maryland	62.6 (58.9–66.0)	63.1 (60.3–65.9)	63.9 (61.0–66.7)	1.3	0.805
Massachusetts	59.1 (53.5–64.5)	57.5 (53.8–61.1)	55.8 (51.6–60.0)	−3.3	0.279
Michigan	59.5 (56.5–62.3)	58.8 (55.7–61.8)	65.1 (61.9–68.2)	5.7	0.010
Minnesota	58.5 (55.8–61.1)	57.0 (54.7–59.4)	61.4 (58.9–63.8)	2.9	0.028
Mississippi	72.3 (67.8–76.4)	69.7 (66.0–73.2)	72.8 (68.4–76.8)	0.5	0.539
Missouri	63.4 (59.1–67.4)	58.5 (54.6–62.3)	64.3 (61.1–67.3)	0.9	0.550
Montana	51.8 (47.5–56.1)	52.3 (48.3–56.2)	60.5 (56.4–64.4)	8.7	0.021
Nebraska	61.1 (57.9–64.3)	58.8 (56.1–61.4)	63.1 (60.3–65.9)	2.0	0.157
Nevada	55.4 (49.3–61.3)	51.7 (45.6–57.7)	57.4 (51.2–63.3)	2.0	0.092
New Hampshire	62.3 (55.9–68.3)	57.4 (52.5–62.1)	60.8 (55.7–65.7)	−1.5	0.529
New Jersey¶	59.0 (55.1–62.8)	—	64.3 (60.3–68.2)	5.3	0.012
New Mexico	56.2 (51.8–60.5)	58.7 (54.3–63.0)	61.2 (57.2–65.0)	5.0	0.328
New York	56.8 (53.8–59.7)	62.0 (58.7–65.2)	62.3 (60.0–64.5)	5.5	0.001
North Carolina	63.3 (58.9–67.5)	58.9 (55.0–62.7)	68.0 (63.9–71.8)	4.7	0.505
North Dakota	63.3 (59.1–67.3)	59.0 (54.5–63.5)	64.3 (59.9–68.4)	0.9	0.438
Ohio	61.2 (58.0–64.3)	57.8 (54.7–60.9)	63.8 (61.0–66.6)	2.6	0.255
Oklahoma	64.6 (61.0–68.0)	63.8 (60.4–67.2)	64.4 (60.7–67.9)	−0.2	0.822

See table footnotes on the next page.

TABLE 2. (*Continued*) Age-standardized prevalence* of antihypertensive medication use among adults aged ≥18 years with hypertension, by sociodemographic characteristics and state and the District of Columbia — Behavioral Risk Factor Surveillance System, United States, 2017–2021

Characteristic	Prevalence (95% CI)			2017 vs. 2021	
	2017	2019	2021	Percentage point difference	p-value†
Oregon	53.9 (50.1–57.7)	55.6 (51.8–59.3)	55.3 (51.8–58.7)	1.4	0.566
Pennsylvania	61.1 (57.0–65.0)	60.9 (57.1–64.6)	62.0 (58.4–65.5)	0.9	0.442
Rhode Island	65.5 (60.1–70.6)	60.9 (55.9–65.7)	66.2 (61.5–70.6)	0.6	0.473
South Carolina	69.2 (65.8–72.5)	66.1 (62.5–69.6)	70.2 (66.6–73.5)	1.0	0.108
South Dakota	64.7 (58.6–70.3)	55.5 (50.1–60.8)	59.0 (52.9–64.9)	–5.7	0.976
Tennessee	65.6 (61.2–69.6)	64.4 (60.8–68.0)	70.3 (66.3–74.1)	4.8	0.026
Texas	58.0 (53.8–62.1)	63.1 (59.2–66.8)	60.9 (57.0–64.7)	2.9	0.102
Utah	52.5 (49.7–55.4)	50.8 (48.4–53.3)	52.2 (49.7–54.7)	–0.4	0.519
Vermont	51.8 (47.8–55.7)	54.9 (50.0–59.8)	53.3 (48.9–57.6)	1.5	0.909
Virginia	58.7 (55.4–62.0)	61.7 (58.6–64.7)	63.0 (59.7–66.0)	4.2	0.074
Washington	54.3 (51.6–57.0)	52.1 (49.6–54.6)	53.2 (50.6–55.7)	–1.1	0.925
West Virginia	62.1 (58.7–65.5)	67.0 (63.2–70.7)	69.6 (66.3–72.8)	7.5	0.054
Wisconsin	57.1 (52.5–61.7)	56.9 (52.1–61.7)	61.5 (56.2–66.6)	4.4	0.806
Wyoming	53.5 (49.2–57.7)	49.8 (45.1–54.5)	56.3 (51.1–61.4)	2.8	0.364

Abbreviations: AI/AN = American Indian or Alaska Native; BRFSS = Behavioral Risk Factor Surveillance System; GED = general educational development certificate; NH = non-Hispanic; NH/OPI = Native Hawaiian or other Pacific Islander.
* Directly standardized to the 2000 U.S. Census Bureau standard population.
† Adjusted for sex, age group, and race and ethnicity.
§ Persons of Hispanic or Latino (Hispanic) origin might be of any race but are categorized as Hispanic; all racial groups are non-Hispanic. The "other" category includes participants of multiple racial and ethnicity groups.
¶ New Jersey (2019) and Florida (2021) were unable to collect sufficient BRFSS data to meet the minimum requirements for inclusion in the BRFSS public-use data set.

controlled blood pressure, using the 2017 blood pressure guideline definitions, did not significantly change from 2009–2012 (25.8%) to 2017–2020 (24.3%; p-value trend = 0.417) (*10*).

Limitations

The findings in this report are subject to at least five limitations. First, results are based on self-reported data, which likely underestimate actual hypertension prevalence. Second, median response rates of <50% across states might limit representatives of the BRFSS sample, resulting in either under- or overestimates of prevalence. However, the application of sampling weights likely reduces the impact of some nonresponse bias. Third, findings do not extend to adults in long-term care facilities, prisons, or those without a telephone, because BRFSS only collects data from noninstitutionalized adults with a landline or mobile telephone. Fourth, New Jersey in 2019 and Florida in 2021 were unable to collect sufficient BRFSS data to meet the minimum requirements for inclusion in the public-use data set; this might further limit the representativeness of the sample. Finally, because of small sample sizes in some demographic categories and jurisdictions, changes in prevalence might not be detectable.

Implications for Public Health Practice

Using the most recent self-reported state-level hypertension surveillance data, this report found that hypertension remains a significant public health concern with approximately one third of U.S. adults reporting hypertension, and approximately 60% of those persons reporting antihypertensive medication use. These findings can be used to increase awareness of hypertension and promote lifestyle modifications and antihypertensive medication use to optimize blood pressure control and reduce disparities in prevalence and control. Knowledge of trends in diagnosed hypertension and treatment is an essential tool for guiding state-level, individual, clinical, and public health policies and interventions, such as those promoted by the Million Hearts national initiative, to prevent cardiovascular disease.[§§]

Summary

What is already known about this topic?

High blood pressure (hypertension) is a major risk factor for heart disease and stroke. It increases with age and varies by different populations and states. In 2017, updated guidelines recommended lowering the blood pressure threshold for diagnosis of hypertension in adults.

What is added by this report?

From 2017 to 2021, approximately one third of U.S. adults reported diagnosed hypertension; prevalence varied by sociodemographic characteristics and state of residence. Among persons reporting hypertension, the prevalence of antihypertensive medication use increased by approximately 3 percentage points.

What are the implications for public health practice?

Knowledge of hypertension diagnosis and treatment prevalence and trends can help guide the development of policies and implementation of evidence-based interventions to reduce disparities in this important risk factor for cardiovascular disease.

[§§] https://millionhearts.hhs.gov/about-million-hearts/optimizing-care/bp-control.html

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Yanfeng Li, Wen Zhou, Division for Heart Disease and Stroke Prevention, National Center for Chronic Disease Prevention and Health Promotion, CDC.

Corresponding author: Ahlia Sekkarie, asekkarie@cdc.gov.

[1]Division for Heart Disease and Stroke Prevention, National Center for Chronic Disease Prevention and Health Promotion, CDC.

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Years of Potential Life Lost and Mean Age of Adults Experiencing Nontraumatic, Out-of-Hospital Cardiac Arrests — Chicago, 2014–2021

Shaveta Khosla, PhD[1]; Marina Del Rios, MD[2]; Pavitra Kotini-Shah, MD[1]; Joseph Weber, MD[3]; Terry Vanden Hoek, MD[1]; Illinois Heart Rescue

Abstract

Approximately 1,000 out-of-hospital cardiac arrests (OHCAs) are assessed by emergency medical services in the United States every day, and approximately 90% of patients do not survive, leading to substantial years of potential life lost (YPLL). Chicago emergency medical services data were used to assess changes in mean age and YPLL from nontraumatic OHCA in adults in biennial cycles during 2014–2021. Among 21,070 reported nontraumatic OHCAs during 2014–2021, approximately 60% occurred among men and 57% among non-Hispanic Black or African American (Black) persons. YPLL increased from 52,044 during 2014–2015 to 88,788 during 2020–2021 (p = 0.002) and mean age decreased from 64.7 years during 2014–2015, to 62.7 years during 2020–2021. Decrease in mean age occurred among both men (p<0.001) and women (p = 0.002) and was largest among Black men. Mean age decreased among patients without presumed cardiac etiology from 56.3 to 52.5 years (p<0.001) and among patients with nonshockable rhythm from 65.5 to 62.7 years (p<0.001). Further study is needed to assess whether similar trends are occurring elsewhere, and to understand the mechanisms that underlie these trends in Chicago because these mechanisms could help guide prevention efforts. Increased public awareness of the risk of cardiac arrest and knowledge of how to intervene as a bystander could help decrease associated mortality.

Introduction

Approximately 1,000 out-of-hospital cardiac arrests (OHCAs) are assessed by emergency medical services (EMS) in the United States every day. Approximately 90% result in death* (*1*,*2*), leading to substantial years of potential life lost (YPLL). YPLL due to OHCA are higher than that from other causes of death (*3*). Recent decreases in mean age of in-hospital cardiac arrest patients have been reported (*4*,*5*); however, whether such a decrease has occurred among OHCA patients is not known. This study describes changes in YPLL from OHCA and mean age at OHCA among nontraumatic cases in adults in Chicago during 2014–2021.

* https://cpr.heart.org/en/resources/cpr-facts-and-stats

Methods

During 2014–2021, a total of 22,158 OHCAs were reported to Chicago's Cardiac Arrest Registry to Enhance Survival (CARES) and served by Chicago EMS. The following cases were excluded: pediatric cases (among persons aged <18 years; 588), trauma cases (462), and cases missing patient age (38), resulting in 21,070 cases included. Annual data were combined to create 2-year cycles. Mean values were calculated for continuous variables. Frequencies were calculated for categorical variables.

For YPLL calculations, patients who were missing survival information (35) or who survived to hospital discharge (1,756) were excluded. YPLL was calculated using a standard age of 75 years† (i.e., among patients younger than age 75 years who died, age was subtracted from 75 and then summed). Patients aged ≥75 years (5,541) contributed zero YPLL. Deaths that occurred before or during hospital admission (13,738) contributed to positive YPLL. For the YPLL rate, the denominator was the adult U.S. Census Bureau population estimate (*6*) of the first year in each 2-year cycle. Rates were expressed per 100,000 adult population per biennial cycle. Trends in mean age were calculated using linear regression models; p-value of the slope (i.e., p-value corresponding to the t-test for whether slope is significantly different from zero) was reported. This study was determined to be not human subjects research by the Institutional Review Board at University of Illinois Chicago.§

If the first monitored rhythm was categorized as ventricular fibrillation, unknown shockable rhythm, or ventricular tachycardia, the rhythm was considered shockable. If the first monitored rhythm was categorized as asystole, idioventricular or pulseless electrical activity, or unknown unshockable rhythm, the rhythm was considered not shockable. Cardiac etiology was presumed unless the arrest was known or likely to have had a noncardiac cause (e.g., drowning, asphyxia, electrocution, overdose, poisoning, or hemorrhage). More

† Many departments of health in U.S. states use age 75 years as the benchmark for YPLL calculations. https://health.mo.gov/data/ypll/; https://www-doh.state.nj.us/doh-shad/view/sharedstatic/YearsOfPotentialLifeLost.pdf

§ 45 C.F.R. part 46.101(c); 21 C.F.R. part 56.

details on the variables can be found in CARES data dictionary (*7*). SAS software (version 9.4; SAS Institute) was used for statistical analysis.

Results

Approximately 60% of the 21,070 adult OHCAs occurred among men, 57% among Black or African American (Black) adults, 26% among White adults, 12% among Hispanic or Latino (Hispanic) adults, and 2% among Asian adults; the rest were classified as other.[¶] The percentage of OHCAs increased over time among adults aged 26–45 and 56–65 years, and decreased among those aged >75 years. Consistent with this pattern, overall YPLL increased from 52,044 during 2014–2015 to 88,788 during 2020–2021 (p = 0.002). YPLL among Black adults increased from 29,956 during 2014–2015 to 52,477 during 2020–2021 (p = 0.003) (Figure 1). YPLL per 100,000 adult population per biennial cycle increased from 2,450 during 2014–2015 to 4,136 during 2020–2021.

The mean age for the entire study period, 63.5 years (Table), decreased from 64.7 during 2014–2015 to 62.7 during 2020–2021 (p<0.001). The mean age at which OHCA occurred among men decreased from 62.5 to 60.6 years, with a biennial change of –0.6 years (p<0.001); among women, the mean age decreased from 67.6 to 66.1 years with a biennial change of –0.5 years (p = 0.002). The downward trend began before the COVID-19 pandemic (2014–2019). Among Black adults, the mean age decreased from 64.2 years during 2014–2015 to 62.3 years during 2020–2021 (p<0.001) and among White adults decreased from 66.5 to 65.1 years (p = 0.02). Mean age was consistently lowest among Hispanic adults and highest among Asian adults (Figure 2). When race and ethnicity and sex are considered together, the largest decrease in mean age occurred among Black men (from 62.1 years during 2014–2015 to 60.3 years during 2020–2021; biennial change of –0.6 years; p<0.001).

Approximately 14% of OHCAs had an initial shockable rhythm, and 84.7% had a presumed cardiac etiology (Table). The mean age of persons without presumed cardiac etiology decreased from 56.3 years during 2014–2015 to 52.5 years during 2020–2021 (biennial change = –1.0 years; p<0.001) (Figure 2). The mean age of patients presumed to have cardiac etiology decreased from 65.8 years during 2014–2015 to 64.8 during 2020–2021 (biennial change = –0.3 years; p = 0.007). The mean age of patients with nonshockable rhythm decreased from 65.5 years during 2014–2015 to 62.7 years during 2020–2021 (biennial change = –0.9 years; p<0.001). Cases with shockable rhythm did not show this decrease in mean age; instead, an increase in mean age occurred (p = 0.03).

Summary

What is already known about this topic?

Approximately 1,000 out-of-hospital cardiac arrests are assessed by emergency medical services in the United States every day, and approximately 90% of patients do not survive.

What is added by this report?

The overall years of potential life lost increased from 52,044 years during 2014–2015 to 88,788 years during 2020–2021, and the mean age of out-of-hospital cardiac arrests in Chicago decreased progressively from 64.7 years during 2014–2015, to 62.7 years during 2020–2021.

What are the implications for public health practice?

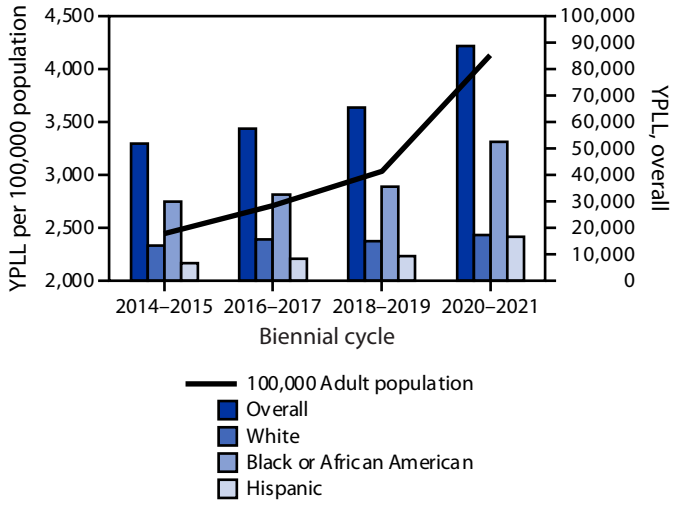
Increased public awareness of the risk for cardiac arrest and knowledge of how to intervene as a bystander could help decrease associated mortality. Improved understanding of the reasons for the observed decrease in mean age at cardiac arrest could help guide prevention efforts.

Discussion

The mean age of OHCA in Chicago decreased from 2014–2015 to 2020–2021 overall, for men and women, Black and White adults, as well as for cases in persons with or without presumed cardiac etiology and for nonshockable rhythm type. Decreases in mean age were more pronounced

[¶] Persons of Hispanic or Latino (Hispanic) origin might be of any race but are categorized as Hispanic; all racial groups are non-Hispanic.

FIGURE 1. Years of potential life lost from nontraumatic out-of-hospital cardiac arrest among adults per 100,000 population,* overall, and by race and ethnicity† — Chicago, 2014–2021



Abbreviation: YPLL = years of potential life lost.

* YPLL rate was calculated using the adult U.S. Census Bureau population estimate of the baseline year as the denominator (i.e., 2014 population estimate for the 2014–2015 cycle, 2016 population estimate for the 2016–2017 cycle, and so on).

† Persons of Hispanic or Latino (Hispanic) origin might be of any race but are categorized as Hispanic; all racial groups are non-Hispanic. Asian group was not presented separately because of a smaller number of cases that were applicable to YPLL calculations, and a resulting higher variability in YPLL.

TABLE. Characteristics of adult nontraumatic out-of-hospital cardiac arrests, by biennial cycles — Chicago, 2014–2021

Characteristic	No. (%)				
	Overall N = 21,070	2014–2015 n = 4,486	2016–2017 n = 4,700	2018–2019 n = 5,233	2020–2021 n = 6,651
Mean age, yrs	**63.5**	64.7	63.8	63.2	62.7
Age group, yrs					
18–25	**414 (2.0)**	82 (1.8)	102 (2.2)	83 (1.6)	147 (2.2)
26–35	**986 (4.7)**	164 (3.7)	222 (4.7)	249 (4.8)	351 (5.3)
36–45	**1,664 (7.9)**	326 (7.3)	337 (7.2)	432 (8.3)	569 (8.6)
46–55	**3,401 (16.1)**	727 (16.2)	771 (16.4)	856 (16.4)	1,047 (15.7)
56–65	**4,949 (23.5)**	1,015 (22.6)	1,098 (23.4)	1,249 (23.9)	1,587 (23.9)
66–75	**4,181 (19.8)**	874 (19.5)	904 (19.2)	1,069 (20.4)	1,334 (20.1)
76–85	**3,348 (15.9)**	784 (17.5)	778 (16.6)	805 (15.4)	981 (14.8)
>85	**2,127 (10.1)**	514 (11.5)	488 (10.4)	490 (9.4)	635 (9.6)
Race and ethnicity*					
Asian	**513 (2.4)**	120 (2.7)	84 (1.8)	139 (2.7)	170 (2.6)
Black or African American	**11,932 (56.6)**	2,516 (56.1)	2,663 (56.7)	2,868 (54.8)	3,885 (58.4)
White	**5,522 (26.2)**	1,320 (29.4)	1,399 (29.8)	1,289 (24.6)	1,514 (22.8)
Hispanic or Latino	**2,606 (12.4)**	444 (9.9)	525 (11.2)	625 (11.9)	1,012 (15.2)
Other	**497 (2.4)**	86 (1.9)	29 (0.6)	312 (6.0)	70 (1.0)
Sex					
Men	**12,683 (60.2)**	2,590 (57.7)	2,813 (59.8)	3,172 (60.6)	4,108 (61.8)
Women	**8,386 (39.8)**	1,896 (42.3)	1,887 (40.2)	2,061 (39.4)	2,542 (38.2)
Shockable rhythm†					
Yes	**2,880 (13.7)**	772 (17.2)	733 (15.6)	692 (13.2)	683 (10.3)
No	**18,190 (86.3)**	3,714 (82.8)	3,967 (84.4)	4,541 (86.8)	5,968 (89.7)
Presumed cardiac etiology§					
Yes	**17,854 (84.7)**	3,953 (88.1)	4,116 (87.6)	4,279 (81.8)	5,506 (82.8)
No	**3,216 (15.3)**	533 (11.9)	584 (12.4)	954 (18.2)	1,145 (17.2)

* Persons of Hispanic or Latino (Hispanic) origin might be of any race but are categorized as Hispanic; all racial groups are non-Hispanic. "Other" includes those with mixed, unknown, or other race and ethnicity.

† If the first monitored rhythm was categorized as ventricular fibrillation, unknown shockable rhythm, or ventricular tachycardia, the rhythm was considered shockable. If the first monitored rhythm was categorized as asystole, idioventricular/pulseless electrical activity, or unknown unshockable rhythm, the rhythm was considered not shockable.

§ Cardiac etiology was presumed unless the arrest was known or likely to have had a noncardiac cause (e.g., drowning, asphyxia, electrocution, overdose, poisoning, or hemorrhage).

for patients without presumed cardiac etiology, those with nonshockable rhythm, men, and Black adults. Survival for OHCA is low (*1*–*3*), and earlier age of death results in a larger number of YPLL.

The decrease in mean age at OHCA occurrence among patients with noncardiac etiology might be related to the increase in opioid-related overdose (*8*), which coincides with the steady increase in nonshockable cases over time with a substantial decrease in mean age. Although this change could be related to overdose, the pandemic might have played a role during 2020–2021. It is not fully known why shockable cases did not reflect this trend of decreasing mean age. The larger decrease in mean age of persons experiencing cardiac arrest among men and among Black adults increased disparities that already existed on the basis of race and sex.

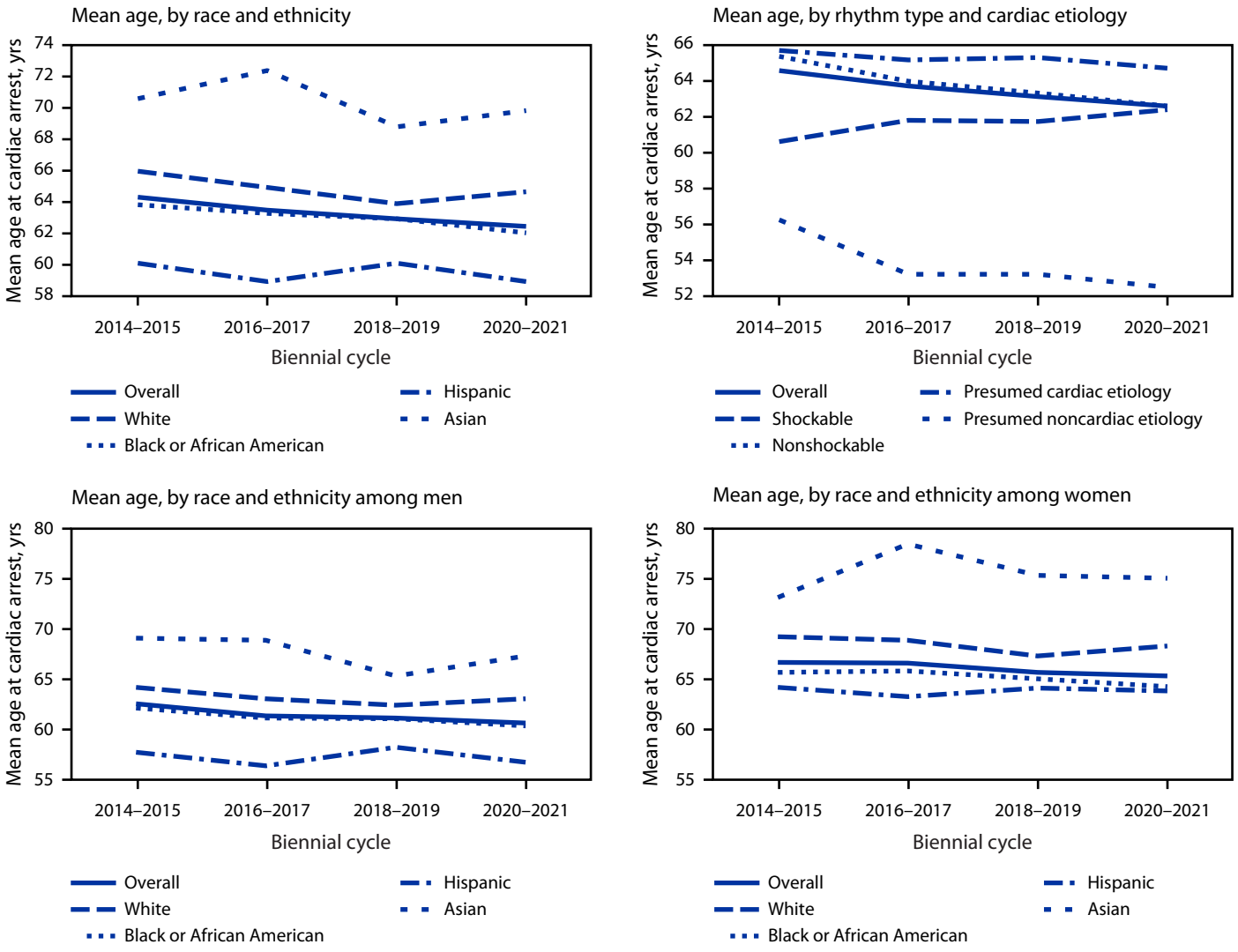
Limitations

The findings in this report are subject to at least three limitations. First, because of the limited number of cases, racial and ethnic groups other than Asian, Black, White, and Hispanic could not be assessed individually. Second, cases that occurred near the city boundary of Chicago might have been served by either Chicago EMS or a different EMS agency. Finally, the contribution of specific causes of OHCA, such as drug overdose or thromboembolic events associated with COVID-19, to the observed trends could not be assessed in this analysis.

Implications for Public Health Practice

This analysis shows a concerning trend at the population level that cannot be entirely attributed to the COVID-19 pandemic because it began before the pandemic. Additional research and enhanced surveillance mechanisms (e.g., hotspot identification and cross-linkage of socioeconomic, comorbidity, substance use, and medication use data) could help elucidate the factors contributing to these observed trends and guide prevention efforts (*9*,*10*). Promotion of regular health checks is important to identify persons at risk for OHCA and intervene appropriately. Efforts to increase public awareness of the risk of cardiac arrest and knowledge of how to intervene as a bystander could help decrease mortality associated with OHCA. Improved understanding of the mechanisms that underlie the trends observed in Chicago could help guide

FIGURE 2. Trends in mean age for out-of-hospital cardiac arrest among adults, by various characteristics* — Chicago, 2014–2021



* Persons of Hispanic or Latino (Hispanic) origin might be of any race but are categorized as Hispanic; all racial groups are non-Hispanic.

prevention efforts. Similar analyses in other jurisdictions could help determine whether trends observed in Chicago are more widespread.

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Corresponding author: Shaveta Khosla, skhosl2@uic.edu.

[1]Department of Emergency Medicine, University of Illinois Chicago, Chicago, Illinois; [2]Department of Emergency Medicine, University of Iowa, Carver College of Medicine, Iowa City, Iowa; [3]Department of Emergency Medicine, John H. Stroger, Jr. Hospital, Chicago, Illinois.

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Racial and Ethnic Differences in Social Determinants of Health and Health-Related Social Needs Among Adults — Behavioral Risk Factor Surveillance System, United States, 2022

Machell Town, PhD[1]; Paul Eke, PhD[1]; Guixiang Zhao, MD, PhD[1]; Craig W. Thomas, PhD[1]; Jason Hsia, PhD[1]; Carol Pierannunzi, PhD[2]; Karen Hacker, MD[3]

Abstract

Social determinants of health (SDOH) are a broad array of social and contextual conditions where persons are born, live, learn, work, play, worship, and age that influence their physical and mental wellbeing and quality of life. Using 2022 Behavioral Risk Factor Surveillance System data, this study assessed measures of adverse SDOH and health-related social needs (HRSN) among U.S. adult populations. Measures included life satisfaction, social and emotional support, social isolation or loneliness, employment stability, food stability/security, housing stability/security, utility stability/security, transportation access, mental well-being, and health care access. Prevalence ratios were adjusted for age, sex, education, marital status, income, and self-rated health. Social isolation or loneliness (31.9%) and lack of social and emotional support (24.8%) were the most commonly reported measures, both of which were more prevalent among non-Hispanic (NH) American Indian or Alaska Native, NH Black or African American, NH Native Hawaiian or other Pacific Islander, NH multiracial, and Hispanic or Latino adults than among NH White adults. The majority of prevalence estimates for other adverse SDOH and HRSN were also higher across all other racial and ethnic groups (except for NH Asian) compared with NH White adults. SDOH and HRSN data can be used to monitor needed social and health resources in the U.S. population and help evaluate population-scale interventions.

Introduction

Social determinants of health (SDOH) are the nonmedical factors that influence health outcomes. They are the conditions in which persons are born, live, learn, work, play, worship, and age that affect a wide range of health risks, functioning, and quality of life.* Examples of SDOH measures include economic stability, transportation availability, housing and food security, access to health care, built environment, and social connectedness (*1*). SDOH are driven by intersecting systematic influences such as economic policies and institutional racism that unequally affect different populations. SDOH and health-related social needs (HRSN) play a significant role in health status, health care utilization, and well-being of individual persons and populations (*2*). Whereas HRSN focus primarily on screening and connecting persons to resources and services to fulfill unmet social needs, SDOH exist at the community or population level and reflect the policies and environments that support health or create barriers to health (*2*). Some adverse SDOH have been linked to a higher risk for poor health outcomes, including chronic diseases (*3*,*4*).

This study measured the prevalence of adverse SDOH and HRSN across U.S. adult populations using data from the 2022 Behavioral Risk Factor Surveillance System (BRFSS). Understanding disparities in SDOH and HRSN among populations is essential to determining and deploying strategies toward advancing health equity. For the first time, data from a new Social Determinants and Health Equity (SD/HE) module in BRFSS were used to investigate adverse SDOH and HRSN by race and ethnicity in the United States.

Methods

Data Source

BRFSS is a state-based landline and cellular telephone survey of noninstitutionalized U.S. civilian residents aged ≥18 years.† BRFSS collects data on health-related risk behaviors, chronic diseases and conditions, health care access, and use of preventive services in all 50 states, the District of Columbia, and participating U.S. territories. The optional SD/HE module was introduced in 2022. Details of the 2022 BRFSS survey and SD/HE module are described elsewhere (*5*); data were collected by 39 states, District of Columbia, Puerto Rico, and U.S. Virgin Islands.§ SD/HE module questions were developed based on the Center for Medicare & Medicaid Services' Accountable Health Communities Health-Related Social Needs Screening Tool¶ and from a previous BRFSS SDOH optional module

* https://health.gov/healthypeople/priority-areas/social-determinants-health
† https://www.cdc.gov/brfss/
§ Alabama, Alaska, Arizona, California, Connecticut, Delaware, District of Columbia, Florida, Georgia, Idaho, Indiana, Iowa, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Montana, Nebraska, Nevada, New Hampshire, New Jersey, New Mexico, North Carolina, Ohio, Oklahoma, Rhode Island, South Carolina, Tennessee, Texas, Utah, Vermont, Washington, West Virginia, Wisconsin, Wyoming, Puerto Rico, and U.S. Virgin Islands.
¶ https://innovation.cms.gov/innovation-models/ahcm

administered in 2017.** SDOH measures include employment instability, food insecurity, housing insecurity, utility insecurity, and lack of reliable transportation. HRSN measures included life dissatisfaction, lack of social and emotional support, social isolation or loneliness, receiving food stamps or Supplemental Nutrition Assistance Program (SNAP), and mental stress. Two additional adverse SDOH measures, lack of health insurance and cost barrier for needed medical care, were from the BRFSS core section (Box).

** https://www.cdc.gov/brfss/questionnaires/pdf-ques/2017_BRFSS_Pub_Ques_508_tagged.pdf

Prevalence of adverse SDOH and HRSN were examined by race and ethnicity, which were categorized as non-Hispanic (NH) American Indian or Alaska Native (AI/AN), NH Asian (Asian), NH Black or African American (Black), NH Native Hawaiian or other Pacific Islander (NH/OPI), NH White (White), NH multiracial (multiracial), or Hispanic or Latino (Hispanic) based on self-identified race and ethnicity information. The analysis included 323,877 participants (among 338,778 survey respondents) with complete demographic and general health status information.

BOX. Adverse social determinants of health and health-related social needs measures — Behavioral Risk Factor Surveillance System, United States, 2022

Life dissatisfaction
- Defined with a response of "dissatisfied/very dissatisfied" to the question, "In general, how satisfied are you with your life? Are you…"

Lack of social and emotional support
- Defined with a response of "sometimes/rarely/never" to the question, "How often do you get the social and emotional support that you need? Is that…"

Social isolation or loneliness
- Defined with a response of "always/usually/sometimes" to the question, "How often do you feel socially isolated from others? Is it…"

Loss or reduced hours of employment
- Defined with a response of "yes" to the question, "In the past 12 months, have you lost employment or had hours reduced?"

Receiving food stamps or SNAP
- Defined with a response of "yes" to the question, "During the past 12 months, have you received food stamps, also called SNAP, the Supplemental Nutrition Assistance Program on an EBT card?"

Food insecurity
- Defined with a response of "always/usually/sometimes" to the question, "During the past 12 months, how often did the food that you bought not last, and you didn't have money to get more? Was that…"

Housing insecurity
- Defined with a response of "yes" to the question, "During the last 12 months, was there a time when you were not able to pay your mortgage, rent, or utility bills?"

Experiencing threat to shut off utility services
- Defined with a response of "yes" to the question, "During the last 12 months, was there a time when an electric, gas, oil, or water company threatened to shut off services?"

Lack of reliable transportation
- Defined with a response of "yes" to the question, "During the past 12 months, has a lack of reliable transportation kept you from medical appointments, meetings, work, or from getting things needed for daily living?"

Mental stress
- Defined with a response of "always/usually" to the question, "Stress means a situation in which a person feels tense, restless, nervous or anxious, or is unable to sleep at night because their mind is troubled all the time. Within the last 30 days, how often have you felt this kind of stress? Was it…"

Lack of health insurance
- Defined with a response of "no coverage of any type" to the question, "What is the current primary source of your health insurance?"

Cost barrier for needed medical care
- Defined with a response of "yes" to the question, "Was there a time in the past 12 months when you needed to see a doctor but could not because you could not afford it?"

Abbreviations: EBT = electronic benefits transfer; SNAP = Supplemental Nutrition Assistance Program.

Data Analysis

Those who responded "don't know/not sure," refused to answer, or had missing responses for demographic variables (except for those with unknown income) were excluded. Participants with missing information for a specific SDOH or HRSN were excluded from the respective analyses.

Weighted[††] prevalence estimates were calculated overall and by racial and ethnic group, U.S. Census Bureau regions, and covariates (age, sex, education, marital status, income, and self-rated health). Statistical significance was determined based on whether there was an overlap between 95% CIs for any two estimates. Adjusted prevalence estimates were obtained by conducting log-linear regression analyses with a robust variance estimator, which adjusted for covariates. Analyses were conducted using SAS-callable SUDAAN (version 11.0.3; RTI International) to account for the complex survey design. This activity was reviewed by CDC, deemed not research, and was conducted consistent with applicable federal law and CDC policy.[§§]

Results

The most commonly reported adverse SDOH or HRSN were social isolation or loneliness (31.9%) and lack of social and emotional support (24.8%), which are proxies for social connectedness (Supplementary Table, https://stacks.cdc.gov/view/cdc/148477). Receiving food stamps or SNAP was most prevalent among Black adults (21.9%) and AI/AN adults (21.3%); lack of reliable transportation was most prevalent among AI/AN adults (16.2%). The following were most prevalent among NH/OPI adults: lack of social and emotional support (38.3%), loss or reduced hours of employment (21.4%), food insecurity (29.0%), housing insecurity (22.8%), and experiencing threat to shut off utility services (19.2%). Life dissatisfaction (11.2%) and social isolation or loneliness (41.0%) were most prevalent among multiracial adults. Lack of health insurance (21.0%) was most prevalent among Hispanic adults. The lowest prevalences of most adverse SDOH and HRSN measures were among Asian and White adults (Supplementary Table, https://stacks.cdc.gov/view/cdc/148477).

Differences by Demographics and Health Status

The prevalence of adverse SDOH and HRSN also differed by other demographic characteristics and by general health status (Supplementary Table, https://stacks.cdc.gov/view/cdc/148477). For example, with increasing age, educational level, and household income, the prevalence of adverse SDOH and HRSN generally decreased. Adults who reported fair or poor self-rated health had the highest prevalence for all adverse SDOH and HRSN. Adults living in the U.S. Census Bureau South Region had the highest prevalences of receiving food stamps or SNAP, food insecurity, experiencing threat to shut off utility services, lack of health insurance, and cost barrier for needed medical care.

Adjusted Analyses

After adjustment for covariates (Table), when compared with that of White adults, the prevalence of life dissatisfaction was 24% higher for multiracial adults, 14% lower for Black adults, and 33% lower for Hispanic adults; lack of social and emotional support ranged from 6% more prevalent in the Hispanic group to 76% more prevalent in the Asian group. Across all other racial and ethnic groups compared with White adults, the majority of prevalence estimates were higher for loss or reduced hours of employment (22% to 73%), receiving food stamps or SNAP (31% to 77%), food insecurity (35% to 133%), housing insecurity (34% to 105%), experiencing a threat to shut off utility services (50% to 149%, except for 39% lower among Asian adults), lack of reliable transportation (8% to 86%), and cost barrier for needed medical care (23% to 49%). Lack of health insurance coverage was 92% more prevalent for Hispanic adults than for White adults. The prevalence of mental stress was lower for three groups when compared with White adults: 22% less for Hispanic adults, 25% less for Black adults, and 39% less for Asian adults.

Discussion

In this large state-based survey of adverse SDOH and HRSN among U.S. adults, significant differences were reported among racial and ethnic groups in measures of social and emotional support, employment instability, food insecurity, housing insecurity, and utility and transportation instability. Estimates indicate elevated prevalences of adverse SDOH and HRSN among AI/AN, Black, NH/OPI, multiracial, and Hispanic adults when compared with White adults. Most adverse SDOH and HRSN estimates were not significantly different between Asian and White adults. Adults who reported having fair or poor health were more likely to have adverse SDOH and HRSN than those reporting better health. Disparities in chronic disease prevalence, severity, complications, and management, as well as related risk factors among racial and ethnic groups, are well documented (*6*). For example, racial and ethnic differences in cardiovascular disease mortality among U.S. adults that are not indicative of biologic differences but intersecting systematic influences are correlated with adverse SDOH (*7*,*8*).

This study identified the extent of differences in adverse SDOH and HRSN among racial and ethnic populations,

[††] https://www.cdc.gov/brfss/annual_data/2022/pdf/2022-Weighting-Description-508.pdf

[§§] 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.

and by U.S. Census Bureau regions, demographic characteristics, and general health status. Findings are consistent with the differential impact that societal structural and systemic infrastructure have on SDOH and HRSN among racial and ethnic populations in the United States (*9*). Further studies using the BRFSS SD/HE module will examine which SDOH and HRSN are most relevant to specific health outcomes and whether addressing these SDOH and HRSN could lead to improvement in health equity.

Limitations

The findings in this report are subject to at least five limitations. First, the BRFSS SD/HE module was not administered in all jurisdictions, so the study sample is not representative of the entire U.S. adult population. Second, self-reported survey data are susceptible to recall bias and social desirability bias. Third, missing data on income and some of the SDOH measures might have introduced information bias. Fourth, the analysis did not stratify by other demographic variables that could mask disparities. Finally, this study did not consider the impact of other SDOH measures such as racism and built environment.

TABLE. Adjusted* prevalences and adjusted* prevalence ratios for having adverse social determinants of health and health-related social needs, by race and ethnicity among adults — Behavioral Risk Factor Surveillance System, United States, 2022

Characteristic	Race and ethnicity,† no. (95% CI)						
	AI/AN	Asian	Black or African American	NH/OPI	White	Hispanic or Latino	Multiracial
Respondents, no.§	4,750	7,549	25,851	690	245,585	33,451	6,001
Life dissatisfaction							
AP	6.7 (5.5–8.2)	6.0 (4.8–7.4)	5.9 (5.4–6.5)	4.9 (2.6–9.2)	6.9 (6.7–7.2)	4.7 (4.2–5.1)	8.6 (7.5–9.9)
APR	0.97 (0.79–1.19)	0.86 (0.69–1.07)	0.86 (0.78–0.94)	0.70 (0.37–1.33)	Ref	0.67 (0.61–0.75)	1.24 (1.08–1.43)
Lack of social and emotional support							
AP	26.8 (24.3–29.6)	39.5 (36.7–42.5)	29.3 (28.3–30.4)	36.3 (30.3–43.4)	22.5 (22.1–22.9)	23.8 (22.9–24.8)	27.2 (25.2–29.3)
APR	1.19 (1.08–1.32)	1.76 (1.63–1.89)	1.30 (1.25–1.36)	1.61 (1.35–1.93)	Ref	1.06 (1.01–1.11)	1.21 (1.12–1.31)
Social isolation or loneliness							
AP	32.5 (29.7–35.4)	33.0 (30.6–35.6)	32.4 (31.2–33.6)	37.9 (31.9–44.9)	32.4 (32.0–32.8)	29.3 (28.4–30.3)	36.4 (34.2–38.8)
APR	1.00 (0.92–1.09)	1.02 (0.94–1.10)	1.00 (0.96–1.04)	1.17 (0.98–1.39)	Ref	0.90 (0.87–0.94)	1.12 (1.05–1.20)
Loss or reduced hours of employment							
AP	13.4 (11.3–15.8)	11.7 (9.9–13.7)	15.2 (14.3–16.2)	18.9 (14.1–25.4)	10.9 (10.6–11.2)	14.4 (13.7–15.1)	16.1 (14.4–18.1)
APR	1.22 (1.03–1.45)	1.07 (0.91–1.26)	1.39 (1.30–1.49)	1.73 (1.29–2.33)	Ref	1.32 (1.24–1.39)	1.48 (1.31–1.66)
Receiving food stamps or SNAP							
AP	15.2 (13.4–17.2)	10.6 (8.6–13.0)	17.7 (16.9–18.5)	11.0 (7.9–15.4)	10.0 (9.7–10.3)	13.1 (12.5–13.7)	15.1 (13.7–16.6)
APR	1.52 (1.34–1.72)	1.05 (0.85–1.30)	1.77 (1.68–1.86)	1.10 (0.79–1.54)	Ref	1.31 (1.24–1.38)	1.50 (1.36–1.67)
Food insecurity							
AP	18.4 (16.8–20.2)	13.0 (11.0–15.4)	20.0 (19.1–20.9)	26.2 (19.5–35.3)	11.2 (10.9–11.6)	15.2 (14.6–15.9)	15.8 (14.0–17.8)
APR	1.64 (1.49–1.80)	1.16 (0.97–1.38)	1.78 (1.68–1.87)	2.33 (1.73–3.15)	Ref	1.35 (1.28–1.43)	1.40 (1.24–1.59)
Housing insecurity							
AP	15.1 (13.3–17.1)	8.5 (6.9–10.5)	17.6 (16.8–18.5)	19.6 (14.3–26.9)	9.6 (9.3–9.9)	12.8 (12.2–13.4)	14.0 (12.4–15.8)
APR	1.58 (1.39–1.79)	0.89 (0.72–1.10)	1.84 (1.73–1.95)	2.05 (1.49–2.81)	Ref	1.34 (1.26–1.41)	1.46 (1.29–1.65)
Experiencing threat to shut off utility services							
AP	10.1 (8.8–11.7)	4.1 (2.9–5.6)	12.5 (11.7–13.3)	16.6 (11.7–23.3)	6.6 (6.4–6.9)	6.7 (6.2–7.1)	10.0 (8.6–11.5)
APR	1.53 (1.32–1.77)	0.61 (0.44–0.85)	1.88 (1.75–2.02)	2.49 (1.76–3.52)	Ref	1.00 (0.92–1.09)	1.50 (1.29–1.74)
Lack of reliable transportation							
AP	11.9 (10.5–13.5)	7.0 (5.6–8.7)	10.3 (9.6–11.0)	13.6 (8.4–22.0)	7.3 (7.0–7.6)	7.9 (7.4–8.4)	11.2 (9.8–12.8)
APR	1.64 (1.44–1.87)	0.96 (0.77–1.20)	1.41 (1.31–1.53)	1.86 (1.15–3.02)	Ref	1.08 (1.00–1.17)	1.54 (1.34–1.77)
Mental stress							
AP	15.6 (13.7–17.8)	9.6 (8.1–11.5)	12.0 (11.2–12.7)	18.7 (14.8–23.7)	15.9 (15.5–16.2)	12.3 (11.6–13.0)	16.8 (15.2–18.5)
APR	0.98 (0.86–1.12)	0.61 (0.51–0.73)	0.75 (0.71–0.81)	1.18 (0.93–1.50)	Ref	0.78 (0.73–0.83)	1.06 (0.96–1.17)
Lack of health insurance							
AP	7.5 (6.2–9.1)	6.2 (5.0–7.6)	7.1 (6.5–7.8)	8.5 (5.8–12.4)	6.7 (6.5–7.0)	12.9 (12.4–13.5)	7.3 (6.1–8.7)
APR	1.11 (0.91–1.36)	0.91 (0.74–1.13)	1.06 (0.96–1.17)	1.26 (0.86–1.84)	Ref	1.92 (1.81–2.04)	1.08 (0.90–1.30)
Cost barrier for needed medical care							
AP	11.4 (9.8–13.2)	8.6 (7.4–9.9)	11.2 (10.5–11.9)	15.6 (12.1–20.2)	10.5 (10.2–10.8)	12.9 (12.4–13.6)	13.7 (12.4–15.1)
APR	1.09 (0.93–1.26)	0.81 (0.70–0.95)	1.06 (0.99–1.13)	1.49 (1.15–1.92)	Ref	1.23 (1.17–1.30)	1.30 (1.18–1.44)

Abbreviations: AI/AN = American Indian or Alaska Native; AP = adjusted prevalence; APR = adjusted prevalence ratio; NH/OPI = Native Hawaiian or other Pacific Islander; Ref = referent group; SNAP = Supplemental Nutrition Assistance Program.

* Adjusted for age, sex, education, marital status, household income, and self-rated health.

† Persons of Hispanic or Latino (Hispanic) origin might be of any race but are categorized as Hispanic; all racial groups are non-Hispanic.

§ Because of some missing data, the number of respondents for individual social determinants of health and health-related social needs might be smaller than the number of total respondents.

Summary

What is already known about this topic?

Social determinants of health are the nonmedical factors that influence health outcomes.

What is added by this report?

Social isolation or loneliness and lack of social and emotional support were the most commonly reported measures among U.S. adults. The majority of prevalence estimates for adverse social determinants of health and health-related social needs were significantly higher across all other racial and ethnic groups except non-Hispanic Asian adults when compared with non-Hispanic White adults.

What are the implications for public health practice?

Decision makers and policymakers can use this information to understand and assess the impact of social determinants of health and health-related social needs on health and to evaluate interventions.

Implications for Public Health Practice

This information has implications for developing more strategic and effective programs that address health disparities. For example, increased economic resources and social belonging interventions can improve health (*10*). Information on the differential prevalence of adverse SDOH and HRSN across demographic characteristics can be helpful in effective allocation of resources. The public health community, the social service system, policymakers, the health care system, and others can use this information to address the SDOH and HRSN that influence health. Trends in SDOH and HRSN measures can be monitored in the U.S. population and can help evaluate population-scale interventions.

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Corresponding author: Machell Town, mpt2@cdc.gov.

[1]Division of Population Health, National Center for Chronic Disease Prevention and Health Promotion, CDC; [2]eLittle Communications Group, St. Louis, Missouri; [3]National Center for Chronic Disease Prevention and Health Promotion, CDC.

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Please note: This report has been corrected.

Morbidity and Mortality Weekly Report

Early Estimate of Nirsevimab Effectiveness for Prevention of Respiratory Syncytial Virus–Associated Hospitalization Among Infants Entering Their First Respiratory Syncytial Virus Season — New Vaccine Surveillance Network, October 2023–February 2024

Heidi L. Moline, MD[1]; Ayzsa Tannis, MPH[1]; Ariana P. Toepfer, MPH[1]; John V. Williams, MD[2,3]; Julie A. Boom, MD[4,5]; Janet A. Englund, MD[6]; Natasha B. Halasa, MD[7]; Mary Allen Staat, MD[8,9]; Geoffrey A. Weinberg, MD[10]; Rangaraj Selvarangan, PhD[11]; Marian G. Michaels, MD[2,3]; Leila C. Sahni, PhD[4,5]; Eileen J. Klein, MD[6]; Laura S. Stewart, PhD[7]; Elizabeth P. Schlaudecker, MD[8,9]; Peter G. Szilagyi, MD[10]; Jennifer E. Schuster, MD[12]; Leah Goldstein, MPH[1]; Samar Musa, MPH[2,3]; Pedro A. Piedra, MD[4,5]; Danielle M. Zerr, MD[6]; Kristina A. Betters, MD[7]; Chelsea Rohlfs, MBA[9]; Christina Albertin, MPH[10]; Dithi Banerjee, PhD[12]; Erin R. McKeever, MPH[1]; Casey Kalman, MPH[1]; Benjamin R. Clopper, MPH[1]; New Vaccine Surveillance Network Product Effectiveness Collaborators; Meredith L. McMorrow, MD[1,*]; Fatimah S. Dawood, MD[1,*]

Abstract

Respiratory syncytial virus (RSV) is the leading cause of hospitalization among infants in the United States. In August 2023, CDC's Advisory Committee on Immunization Practices recommended nirsevimab, a long-acting monoclonal antibody, for infants aged <8 months to protect against RSV-associated lower respiratory tract infection during their first RSV season and for children aged 8–19 months at increased risk for severe RSV disease. In phase 3 clinical trials, nirsevimab efficacy against RSV-associated lower respiratory tract infection with hospitalization was 81% (95% CI = 62%–90%) through 150 days after receipt; post-introduction effectiveness has not been assessed in the United States. In this analysis, the New Vaccine Surveillance Network evaluated nirsevimab effectiveness against RSV-associated hospitalization among infants in their first RSV season during October 1, 2023–February 29, 2024. Among 699 infants hospitalized with acute respiratory illness, 59 (8%) received nirsevimab ≥7 days before symptom onset. Nirsevimab effectiveness was 90% (95% CI = 75%–96%) against RSV-associated hospitalization with a median time from receipt to symptom onset of 45 days (IQR = 19–76 days). The number of infants who received nirsevimab was too low to stratify by duration from receipt; however, nirsevimab effectiveness is expected to decrease with increasing time after receipt because of antibody decay. Although nirsevimab uptake and the interval from receipt of nirsevimab were limited in this analysis, this early estimate supports the current nirsevimab recommendation for the prevention of severe RSV disease in infants. Infants should be protected by maternal RSV vaccination or infant receipt of nirsevimab.

Introduction

Respiratory syncytial virus (RSV) is the leading cause of hospitalization in U.S. infants, responsible for 50,000–80,000 hospitalizations annually in children aged <5 years (*1*,*2*). The highest hospitalization rates occur during the first months of life, and risk declines with increasing age in infancy and during early childhood (*3*). In August 2023, CDC's Advisory Committee on Immunization Practices (ACIP) recommended nirsevimab, a long-acting monoclonal antibody, for all infants aged <8 months born during or entering their first RSV season, and for children aged 8–19 months at increased risk for severe RSV disease and entering their second RSV season (*4*). In a pooled analysis of data from prelicensure randomized placebo-controlled clinical trials, 1 dose of nirsevimab given at age <8 months was 79% efficacious against medically attended RSV-associated lower respiratory tract infection and 81% efficacious against RSV-associated lower respiratory tract infection with hospitalization through 150 days after injection (*4*). In September 2023, a maternal RSV vaccine also became available to prevent RSV disease in young infants. ACIP recommends either nirsevimab or maternal RSV vaccination to protect infants born during or entering their first RSV season (*5*). In October 2023, in response to nirsevimab shortages, CDC recommended that health care settings with limited supply of nirsevimab prioritize nirsevimab for infants aged <6 months and infants with underlying conditions at highest risk for severe disease (*6*). In January 2024, additional doses of nirsevimab became available, and CDC recommended that health care settings with adequate nirsevimab supply return to the original ACIP recommendations for nirsevimab use (*7*). This analysis provides the first U.S. estimate for post-introduction nirsevimab effectiveness among U.S. infants during their first RSV season.

Methods

Data Collection and Inclusion Criteria

The New Vaccine Surveillance Network (NVSN) is a population-based, prospective surveillance platform for acute respiratory illness (ARI) in infants, children, and adolescents aged <18 years that monitors pediatric respiratory viruses

*These senior authors contributed equally to this report.

at seven U.S. pediatric academic medical centers to assess immunization effectiveness.[†] Demographic, clinical, and immunization data were systematically collected through parent/guardian interviews, medical record abstraction, and state immunization information systems. Respiratory specimens were collected from enrolled children and tested for RSV and other common respiratory viruses by real-time reverse transcription–polymerase chain reaction.[§] Receipt of nirsevimab was ascertained through parent report and verified through state immunization information systems, birth hospital, or primary care provider records.[¶]

Infants were eligible for this analysis if they were aged <8 months as of October 1, 2023, or born after October 1, 2023, were hospitalized with ARI[**] during October 1, 2023–February 29, 2024, and had verified nirsevimab status, reported gestational age at birth, and medical record review to assess for underlying medical conditions. Infants were excluded if they were enrolled before nirsevimab became available at their site,[††] received any doses of palivizumab, had reported maternal RSV vaccination during pregnancy, or inconclusive or unknown RSV test results. For a site to be included in this analysis, at least five infants enrolled at the site had to have received nirsevimab ≥7 days before symptom onset.

Data Analysis

Nirsevimab effectiveness against RSV-associated hospitalization was estimated using a test-negative, case-control design. Case-patients were infants who received a positive RSV test result. Control patients were infants who received a negative RSV test result. Infants were considered nirsevimab recipients if they received nirsevimab ≥7 days before symptom onset to account for RSV incubation period and time to peak antibody concentration.[§§] Infants who received nirsevimab <7 days before symptom onset were excluded. Pearson's chi-square tests were used to compare demographic characteristics among case-patients and control patients and by nirsevimab status. Effectiveness was estimated using multivariable logistic regression models, comparing the odds of receipt of nirsevimab among case-patients and control patients. Regression models controlled for age at enrollment in months, month of illness, enrollment site, and presence of one or more high-risk medical conditions for severe RSV disease.[¶¶] Preterm status (birth at <28, 28–31, 32–33, 34–36, and ≥37 weeks' gestation) and insurance type were evaluated as potential confounders but did not change estimates and were not included in the final model. Effectiveness was calculated as (1– adjusted odds ratio) × 100%. Analyses were conducted using SAS software (version 9.4; SAS Institute). This activity was reviewed by CDC, deemed not research, and was conducted consistent with applicable federal law and CDC policy.[***]

Results

Among 1,036 eligible infants, 699 infants at four sites met inclusion criteria,[†††] including 407 (58%) case-patients and 292 (42%) control patients (Table). Receipt of nirsevimab was more frequent among infants with high-risk medical conditions than those without these conditions (46% versus 6%, p<0.001). There was no difference in the frequency of receipt of nirsevimab by preterm status or insurance type. Time since receipt of nirsevimab to ARI symptom onset ranged from 7 to 127 days with a median of 45 days (IQR = 19–76 days)

[†] Children's Mercy Hospital, Kansas City, Missouri; Cincinnati Children's Hospital Medical Center, Cincinnati, Ohio; Golisano Children's Hospital, Rochester, New York; Seattle Children's Hospital, Seattle, Washington; Texas Children's Hospital, Houston, Texas; UPMC Children's Hospital of Pittsburgh, Pittsburgh, Pennsylvania; Vanderbilt University Medical Center, Nashville, Tennessee.

[§] All enrolled children are tested for the following viruses: adenoviruses, SARS-CoV-2, rhinovirus/enterovirus, RSV, human metapneumovirus, enterovirus-D68, parainfluenza viruses, human coronaviruses, and influenza viruses.

[¶] Primary care provider record verification was performed in sites without mandatory reporting of nirsevimab administration to state immunization information systems.

[**] ARI is defined as one or more of the following signs or symptoms present for <14 days before enrollment encounter: fever, cough, earache, nasal congestion, runny nose, sore throat, vomiting after coughing, wheezing, shortness of breath, rapid or shallow breathing, apnea, apparent life-threatening event, or brief resolved unexplained event.

[††] 2023: Houston, Texas, October 5; Nashville, Tennessee, October 8; Seattle, Washington, October 8; Cincinnati, Ohio, October 10; Kansas City, Missouri, November 1; Pittsburgh, Pennsylvania, November 2; Rochester, New York November 6.

[§§] In clinical trials, peak neutralizing antibody concentration levels were reached in adults by day 6 after intramuscular administration. https://www.accessdata.fda.gov/drugsatfda_docs/label/2023/761328s000lbl.pdf

[¶¶] High-risk medical conditions were defined as chronic lung disease of prematurity (bronchopulmonary dysplasia, bronchiolitis obliterans, chronic respiratory failure with continuous positive airway pressure/bilevel positive airway pressure/ventilator, pulmonary hypertension, or interstitial lung disease) (11); hemodynamically significant congenital heart disease (abnormalities of aortic arch, hypoplastic left heart syndrome, pulmonary atresia, tricuspid atresia, Tetralogy of Fallot, transposition of the great arteries, partial or total anomalous pulmonary venous return, other abnormalities of heart valves, double outlet right ventricle, or other severe congenital heart malformations) (21); severe immunocompromise (one); severe cystic fibrosis (two); neuromuscular disease (autonomic dysfunction, instability or dysautonomia, agenesis or hypoplasia of the corpus callosum, muscular dystrophy or spinal muscular atrophy, disorders of tone, or other neuromuscular condition) (11); or congenital pulmonary abnormalities that impair the ability to clear secretions (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.

[†††] Among the 337 infants excluded from this analysis, reasons for exclusion included enrollment at a site with fewer than five infants who had received nirsevimab (296 from Rochester, Cincinnati, and Kansas City), receipt of nirsevimab <7 days before symptom onset (20), missing or inconclusive RSV test result (20), maternal receipt of RSV vaccine during pregnancy (22), and receipt of palivizumab (10); reasons for exclusion are not mutually exclusive.

TABLE. Characteristics of infants born during or entering their first respiratory syncytial virus season who were hospitalized with acute respiratory illness, by respiratory syncytial virus test result and receipt of nirsevimab*,† — New Vaccine Surveillance Network, October 2023–February 2024

Characteristic	Overall total, no. (column %)	RSV test result			Receipt of nirsevimab		
		Positive no. (column %)	Negative no. (column %)	p-value§	Yes no. (row %)	No no. (row %)	p-value§
All children	**699**	**407 (58)**	**292 (42)**	—	**59 (8)**	**640 (92)**	—
Age group at admission, mos							
<1	111 (16)	51 (13)	60 (21)	<0.001	10 (9)	101 (91)	0.028
1–2	214 (31)	144 (35)	70 (24)		18 (8)	196 (92)	
3–4	131 (19)	90 (22)	41 (14)		9 (7)	122 (93)	
5–6	121 (17)	67 (16)	54 (18)		6 (5)	115 (95)	
7–8	96 (14)	49 (12)	47 (16)		9 (9)	87 (91)	
9–10	23 (3)	6 (1)	17 (6)		6 (26)	17 (74)	
11–12	3 (0)	0 (—)	3 (1)		1 (33)	2 (67)	
Gestational age							
Preterm (<37 wks)¶	146 (21)	77 (19)	69 (24)	0.129	15 (10)	131 (90)	0.377
Term (≥37 wks)	551 (79)	329 (81)	222 (76)		44 (8)	507 (92)	
Unknown	2 (0)	1 (0)	1 (0)		0 (—)	2 (100)	
High-risk medical condition**							
None	660 (94)	396 (97)	264 (90)	<0.001	41 (6)	619 (94)	<0.001
≥1	39 (6)	11 (3)	28 (10)		18 (46)	21 (54)	
Sex							
Female	293 (42)	182 (45)	111 (38)	0.076	28 (10)	265 (90)	0.367
Male	406 (58)	225 (55)	181 (62)		31 (8)	375 (92)	
Race and ethnicity††							
American Indian or Alaska Native	1 (0)	1 (0)	0 (—)	0.002	0 (—)	1 (100)	0.511
Asian	47 (7)	27 (7)	20 (7)		3 (6)	44 (94)	
Black or African American	89 (13)	41 (10)	48 (16)		8 (9)	81 (91)	
Native Hawaiian or other Pacific Islander	225 (32)	126 (31)	99 (34)		23 (10)	202 (90)	
White	30 (4)	12 (3)	18 (6)		5 (17)	25 (83)	
Hispanic or Latino	8 (1)	3 (1)	5 (2)		0 (—)	8 (100)	
Multiple race or other non-specified	280 (40)	188 (46)	92 (32)		18 (6)	262 (94)	
Unknown	19 (3)	9 (2)	10 (3)		2 (11)	17 (89)	

See table footnotes on the next page.

(Figure). Overall, six (1%) case-patients and 53 (18%) control patients received nirsevimab; among all included infants, receipt of nirsevimab ranged from 4% to 12% by site. Nirsevimab effectiveness was 90% (95% CI = 75–96) against RSV-associated hospitalization.

Discussion

In this multisite analysis of 699 infants hospitalized with ARI during their first RSV season, receipt of nirsevimab was 90% effective against RSV-associated hospitalization at a median of 45 days from receipt of nirsevimab to ARI symptom onset. This early effectiveness estimate supports existing recommendations for the prevention of severe RSV disease in infants in their first RSV season.

The strengths of this first estimate of U.S. post-introduction nirsevimab effectiveness include enrollment of infants using a standardized ARI definition, systematic RSV testing, and receipt of nirsevimab verification with state immunization information systems or medical records for all infants. However, it is important to note that nirsevimab effectiveness during a full RSV season is expected to be lower than the estimate reported here, because antibody levels from passive immunization wane over time. In this analysis, the median interval from receipt of nirsevimab was 45 days, whereas the median duration of the U.S. RSV season before the COVID-19 pandemic was 189 days (*8*). In clinical trials, nirsevimab remained highly efficacious against RSV-associated lower respiratory tract infection in infants through 150 days after receipt of nirsevimab, consistent with an extended half-life of 63–73 days (*9*).

Estimating effectiveness under real-world conditions for the full duration of an RSV season and in children aged 8–19 months at high risk for severe RSV disease who are recommended to receive nirsevimab before their second RSV season remains important. Thus, CDC will continue to monitor nirsevimab effectiveness.

TABLE. (*Continued*) Characteristics of infants born during or entering their first respiratory syncytial virus season who were hospitalized with acute respiratory illness, by respiratory syncytial virus test result and receipt of nirsevimab*,† — New Vaccine Surveillance Network, October 2023–February 2024

Characteristic	Overall total, no. (column %)	RSV test result			Receipt of nirsevimab		
		Positive no. (column %)	Negative no. (column %)	p-value§	Yes no. (row %)	No no. (row %)	p-value§
Insurance status							
Public	385 (55)	198 (49)	187 (64)	<0.001	37 (10)	348 (90)	0.296
Private	233 (33)	155 (38)	78 (27)		17 (7)	216 (93)	
Public and private	4 (1)	2 (0)	2 (1)		1 (25)	3 (75)	
Self-pay (none)	51 (7)	31 (8)	20 (7)		4 (8)	47 (92)	
Unknown	26 (4)	21 (5)	5 (2)		0 (—)	26 (100)	
Site							
Houston, TX	195 (28)	110 (27)	85 (29)	0.050	24 (12)	171 (88)	0.013
Nashville, TN	93 (13)	47 (12)	46 (16)		9 (10)	84 (90)	
Pittsburgh, PA	235 (34)	153 (38)	82 (28)		9 (4)	226 (96)	
Seattle, WA	176 (25)	97 (24)	79 (27)		17 (10)	159 (90)	
RSV test result							
Positive	407 (58)	NA	NA	—	6 (1)	401 (99)	<0.001
Negative	292 (42)	NA	NA		53 (18)	239 (82)	

Abbreviations: BPAP = bilevel positive airway pressure; CPAP = continuous positive airway pressure; NA = not applicable; RSV = respiratory syncytial virus.

* Overall, 337 infants enrolled during the analysis period were excluded. Reasons for exclusion included enrollment at sites with fewer than five infants who had received nirsevimab (296 from Rochester, Cincinnati, and Kansas City), receipt of nirsevimab <7 days before symptom onset (20), missing or inconclusive RSV test result (20), maternal receipt of RSV vaccine during pregnancy (22), and receipt of palivizumab (10); reasons for exclusion are not mutually exclusive.

† Current season receipt of nirsevimab documented by registry or provider (654: 94%) or medical record only (45: 6%).

§ Pearson's chi-square tests were used to compare demographic characteristics among case-patients and control patients and by receipt of nirsevimab.

¶ <28 weeks (12: 2%); 28–31 weeks (12: 2%); 32–33 weeks (48: 7%); 34–36 weeks (74: 11%).

** High-risk medical conditions were defined as chronic lung disease of prematurity (bronchopulmonary dysplasia, bronchiolitis obliterans, chronic respiratory failure with CPAP/BIPAP/ventilator, pulmonary hypertension [neonatal, primary, or secondary], or interstitial lung disease) (12); hemodynamically significant congenital heart disease (abnormalities of aortic arch, hypoplastic left heart syndrome, pulmonary atresia, tricuspid atresia, Tetralogy of Fallot, transposition of the great arteries, partial or total anomalous pulmonary venous return, other abnormalities of heart valves, double outlet right ventricle, or other congenital heart malformations) (21); severe immunocompromise (one); severe cystic fibrosis (two); neuromuscular disease (autonomic dysfunction, instability or dysautonomia, agenesis or hypoplasia of the corpus callosum, muscular dystrophy or spinal muscular atrophy, disorders of tone, or other neuromuscular condition) (12); or congenital pulmonary abnormalities that impair the ability to clear secretions (none).

†† Persons of Hispanic or Latino (Hispanic) origin might be of any race but are categorized as Hispanic; all racial groups are non-Hispanic.

Limitations

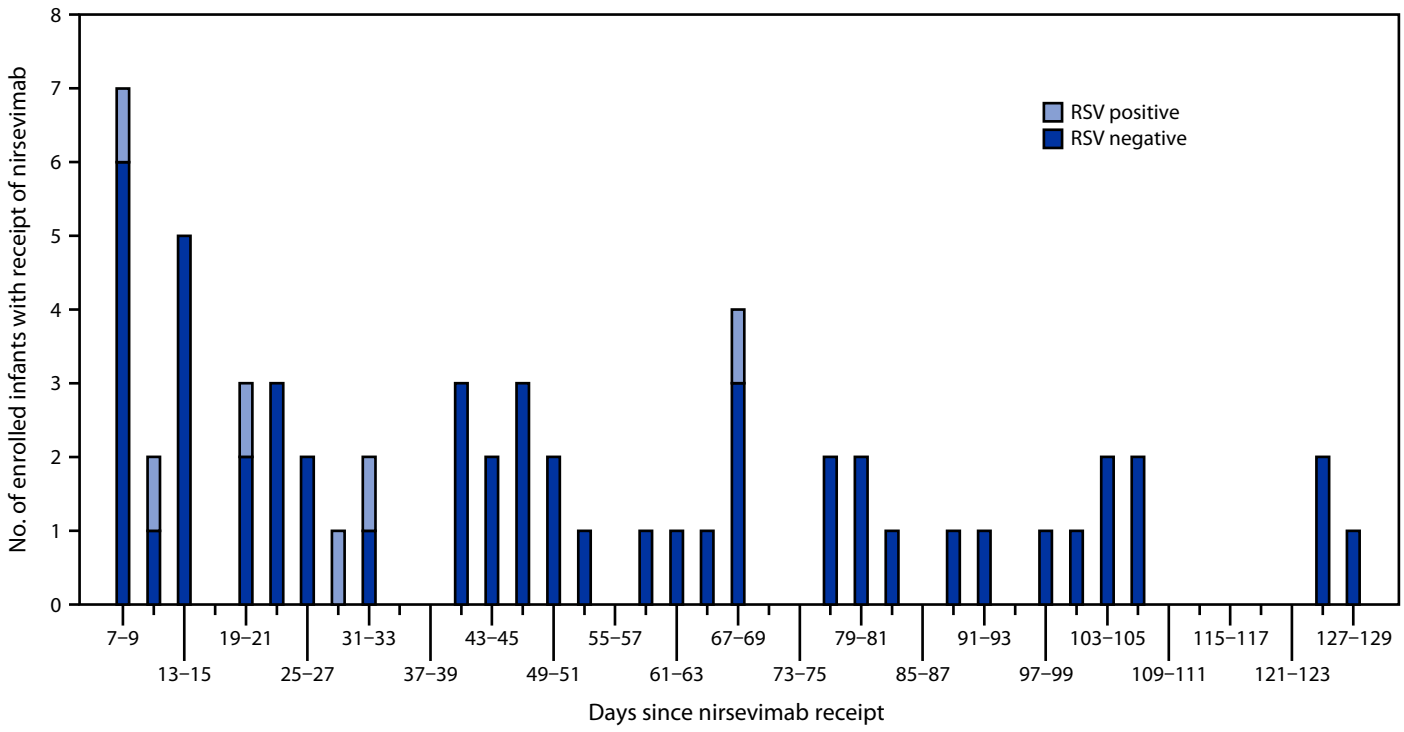
The findings in this report are subject to at least five limitations. First, only a small proportion of hospitalized infants with ARI received nirsevimab, likely in part because of delayed availability in this first season of introduction and intermittent supply shortages, and infants who received nirsevimab were more likely to have underlying conditions.§§§ Thus, results might not be fully generalizable to all infants eligible for receipt of nirsevimab in their first RSV season. Second, the low number of case-patients who received nirsevimab did not allow for stratified estimates by time since receipt of nirsevimab. Third, because nirsevimab became available at most sites in the United States after seasonal RSV circulation began, some infants in this analysis might have had RSV infection before receipt of nirsevimab, which might have affected estimated effectiveness. Fourth, nirsevimab effectiveness was not estimated by dosage (50 mg for infants weighing <5 kg or 100 mg for infants weighing ≥5 kg) because nirsevimab dosage was not ascertained. Finally, the effectiveness estimate in this report is limited to the prevention of RSV-associated hospitalization. RSV among infants also causes a considerable increase in outpatient and emergency department visits; additional studies are warranted to assess nirsevimab effectiveness against these outcomes.

Implications for Public Health Practice

Receipt of a single dose of nirsevimab was highly effective against RSV-associated hospitalization in infants entering their first RSV season. This finding supports current CDC recommendations that all infants should be protected by maternal RSV vaccination or infant receipt of nirsevimab, to reduce the risk for RSV-associated hospitalization in their first RSV season (*4*,*6*).

§§§ https://www.cdc.gov/vaccines/imz-managers/coverage/rsvvaxview/index.html (Accessed January 30, 2024).

FIGURE. Time from receipt of nirsevimab* to symptom onset among infants born during or entering their first respiratory syncytial virus season who were hospitalized with acute respiratory illness, by respiratory syncytial virus test result — New Vaccine Surveillance Network, October 2023–February 2024



Abbreviation: RSV = respiratory syncytial virus.
* Days 0–6 are not included because infants with receipt of nirsevimab within 7 days of symptom onset were excluded from this analysis.

Summary

What is already known about this topic?

Respiratory syncytial virus (RSV) is the leading cause of hospitalization among U.S. infants. In August 2023, CDC recommended nirsevimab, a long-acting monoclonal antibody, to protect infants aged <8 months against RSV-associated lower respiratory tract infection in their first RSV season.

What is added by this report?

Nirsevimab effectiveness was 90% against RSV-associated hospitalization in infants in their first RSV season. Median time from receipt of nirsevimab to symptom onset was 45 days (IQR = 19–76).

What are the implications for public health practice?

To reduce the risk for RSV-associated hospitalization, infants should be protected by maternal RSV vaccination or infant receipt of nirsevimab.

Corresponding author: Heidi L. Moline, ick6@cdc.gov.

[1]Coronavirus and Other Respiratory Viruses Division, National Center for Immunization and Respiratory Diseases, CDC; [2]UPMC Children's Hospital of Pittsburgh, Pittsburgh, Pennsylvania; [3]Department of Pediatrics, University of Pittsburgh School of Medicine, Pittsburgh, Pennsylvania; [4]Texas Children's Hospital, Houston, Texas; [5]Baylor College of Medicine, Houston, Texas; [6]Department of Pediatrics, Seattle Children's Hospital, Seattle, Washington; [7]Department of Pediatrics, Vanderbilt University Medical Center, Nashville, Tennessee; [8]Division of Infectious Diseases, Cincinnati Children's Hospital Medical Center, Cincinnati, Ohio; [9]Department of Pediatrics, University of Cincinnati College of Medicine, Cincinnati, Ohio; [10]Department of Pediatrics, University of Rochester Medical Center and University of Rochester–Golisano Children's Hospital, Rochester, New York; [11]Department of Pathology and Laboratory Medicine, Children's Mercy Hospital, Kansas City, Missouri; [12]Department of Pediatrics Children's Mercy Hospital, Kansas City, Missouri.

New Vaccine Surveillance Network Product Effectiveness Collaborators

Ruth Link-Gelles, Coronavirus and Other Respiratory Viruses Division, National Center for Immunization and Respiratory Diseases, CDC; Amanda Payne, Coronavirus and Other Respiratory Viruses Division, National Center for Immunization and Respiratory Diseases, CDC; Ryan Wiegand, Coronavirus and Other Respiratory Viruses Division, National Center for Immunization and Respiratory Diseases, CDC; Ximena Aguilera Correa, Department of Pediatrics, Vanderbilt University Medical Center; Claudia Guevara Pulido, Department of Pediatrics, Vanderbilt University Medical Center; Hanna Grioni, Department of Pediatrics, Seattle Children's Hospital; Bonnie Strelitz, Department of Pediatrics, Seattle Children's Hospital; Vasanthi Avadhanula, Baylor College of Medicine; Flor M. Munoz, Texas Children's Hospital and Baylor College of Medicine; Wende Fregoe, Department of Pediatrics, University of Rochester Medical Center and University of Rochester–Golisano Children's Hospital; Saranya Peri, Department of Pathology and Laboratory Medicine, Children's Mercy Kansas City; Anjana Sasidharan, Department of Pathology and Laboratory Medicine, Children's Mercy Kansas City; Monika Johnson, Department of Pediatrics, University of Pittsburgh School of Medicine; Klancie Dauer, Department of Pediatrics, University of Pittsburgh School of Medicine.

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Notes from the Field

Emergency Department Visits for Unsupervised Pediatric Melatonin Ingestion — United States, 2019–2022

Devin I. Freeman[1,2]; Jennifer N. Lind, PharmD[2]; Nina J. Weidle, PharmD[2,3]; Andrew I. Geller, MD[2]; Nimalie D. Stone, MD[2]; Maribeth C. Lovegrove, MPH[2]

The prevalence of melatonin use by U.S. adults quintupled from 0.4% during 1999–2000 to 2.1% during 2017–2018 (*1*). This rise coincided with a 530% increase in poison center calls for pediatric melatonin exposures during 2012–2021 and a 420% increase in emergency department (ED) visits for unsupervised melatonin ingestion by infants and young children during 2009–2020 (*2*,*3*). CDC analyzed public health surveillance data to describe circumstances involved in these ingestions to help guide development of interventions.

Investigations and Outcomes

Data from the National Electronic Injury Surveillance System – Cooperative Adverse Drug Event Surveillance Project were used to identify cases of ED visits for unsupervised melatonin ingestion by infants and children aged ≤5 years during 2019–2022, based on the treating clinician's diagnosis and supporting documentation in the ED record.* Case narratives were used to code circumstances and details about ingested melatonin products. Cases were weighted to allow calculation of national estimates and corresponding 95% CIs. SAS software (version 9.4; SAS Institute) SURVEYMEANS was used to account for sample weights and complex sample design. This activity was reviewed by CDC, deemed not research, and was conducted consistent with applicable federal law and CDC policy.†

Based on 295 cases, an estimated 10,930 ED visits (95% CI = 7,609–14,251) occurred for unsupervised melatonin ingestion by infants and children aged ≤5 years in the United States during 2019–2022 (Table), accounting for 7.1% of all ED visits for unsupervised medication exposures by persons in this age group. Approximately one half (52.4%) of all estimated ED visits for melatonin ingestion by infants and children aged ≤5 years involved children aged 3–5 years, and most (93.5%) did not result in hospitalization. Melatonin was the only medication involved in 90.2% of ED visits for melatonin ingestions.

A solid dosage form product was accessed by infants and children aged ≤5 years in 95.7% of ED visits for melatonin ingestions by persons in this age group. Gummy formulations (47.3%) were the most commonly documented dosage form; however, an unspecified solid formulation was documented in approximately one half (49.2%) of visits. Access to ≥10 units (e.g., gummies or tablets) was documented in more than one third (35.8%; 95% CI = 28.6%–43.0%) of visits for solid melatonin ingestions. Ingestion of adult or family formulations§ of melatonin was documented in 47.7% of visits; however, intended age group of formulation was not specified in 45.0% of visits. At least 32.8% of infants and children accessed melatonin from a bottle; however, container type was not documented for 56.6% of visits.

Preliminary Conclusions and Actions

During 2019–2022, melatonin was implicated in 7% of all ED visits for unsupervised medication exposures by infants and young children. Few visits were found to result in hospitalization in this study. Similarly, a recent study of poison center calls found that 98% of pediatric melatonin exposures resulted in minimal or no effects and increases in hospitalizations for pediatric melatonin ingestion coincided with increased use (*2*). However, another recent investigation of melatonin products found that the actual content of the melatonin product was not always the same as the labeled ingredients or strength, and these discrepancies in ingredients or strength could pose additional risk.¶

Approximately one half of visits for melatonin ingestions by infants and children aged ≤5 years involved children aged 3–5 years, whereas most visits for unsupervised medication exposures overall involve infants and children aged 1–2 years (*3*). At least half of ED visits for melatonin ingestions involved flavored products (gummies or chewable tablets) that are frequently used by (*4*) and might appeal to young children.

Melatonin products do not require child-resistant packaging,** although such packaging can be voluntarily implemented. Among ED visits with documentation of container type, approximately three quarters involved melatonin accessed from bottles, suggesting that infants and children opened bottles or that bottles were not properly closed.

* https://health.gov/healthypeople/objectives-and-data/data-sources-and-methods/data-sources/national-electronic-injury-surveillance-system-cooperative-adverse-drug-event-surveillance-project-neiss-cades

† 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.

§ Products that are family formulations include dosing instructions for both adults and children aged <12 years and are not marketed specifically for pediatric use (e.g., the product name does not indicate "children's").

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** 16 CFR Sect. 1700.14; 38 FR 21247, amended in 41 FR 22266; and 48 FR 57480.

TABLE. Cases and national estimates of emergency department visits for unsupervised melatonin ingestion by infants and children aged ≤5 years — United States, 2019–2022

Characteristic	No. of cases	National estimates of emergency department visits	
		No.	% (95% CI)
Total	**295**	**10,930**	**100**
Year			
2019	42	2,032	18.6 (10.7–26.4)
2020	74	3,294	30.1 (19.8–40.5)
2021	78	2,135	19.5 (11.7–27.3)
2022	101	3,469	31.7 (18.3–45.2)
Age group, yrs			
0–2	159	5,201	47.6 (38.0–57.2)
3–5	136	5,729	52.4 (42.8–62.0)
Sex			
Female	123	4,569	41.8 (33.2–50.4)
Male	172	6,360	58.2 (49.6–66.8)
Race			
Black or African American	82	1,946*	17.8 (7.6–28.0)
White	117	5,718	52.3 (38.7–65.9)
Other or not specified	96	3,266	29.9 (16.6–43.2)
Hospitalized			
Yes	19	—†	—†
No	276	10,223	93.5 (89.3–97.8)
Additional implicated medications			
No	269	9,854	90.2 (84.8–95.5)
Route§			
Oral ingestion	291	10,782	98.6 (96.3–100.0)
Dosage form¶			
Solid	278	10,465	95.7 (92.3–99.2)
Gummy	140	4,953	47.3 (35.5–59.2)
Chewable tablet	19	—†	—†
Unspecified solid dosage form	119	5,146	49.2 (37.1–61.3)
No. of units accessed**			
1–9	81	3,211	30.7 (21.9–39.5)
10–19	35	1,423	13.6 (8.3–18.9)
≥20	59	2,320	22.2 (14.1–30.2)
Unspecified	103	3,510	33.5 (23.2–43.9)
Intended age group of formulation††			
Family or adult	128	5,210	47.7 (39.6–55.8)
Pediatric	21	—†	—†
Unspecified	146	4,919	45.0 (36.7–53.3)
Container type			
Bottle	94	3,590	32.8 (23.1–42.6)
Other or no container	28	—†	—†
Unspecified	173	6,188	56.6 (46.0–67.2)

Source: National Electronic Injury Surveillance System – Cooperative Adverse Drug Event Surveillance Project, CDC.

* Coefficient of variation = 32.9%. Estimates with a coefficient of variation >30% might be statistically unstable.

† Estimates based on <20 cases and total estimates of <1,200 emergency department visits are considered statistically unreliable and are not shown.

§ Four cases (not shown) were for removal of a pill or tablet from the patient's nose.

¶ Three cases (not shown) involved ingestion of liquid melatonin, and 14 involved ingestion of a melatonin product with an unspecified dosage form.

** Only assessed for emergency department visits involving ingestion of solid dosage form melatonin products.

†† Based on information from case narratives as well as information about available products. For example, the age group of formulation was coded as "pediatric" for cases specifying a specific product that is intended for pediatric use. Age group of formulation was coded as "family or adult" for cases specifying a product intended for family or adult use, a specific adult recipient, or a dosage strength >1 mg per unit.

Summary

What is already known about this topic?

Unsupervised exposures of infants and young children to melatonin have increased substantially in recent years.

What is added by this report?

During 2019–2022, melatonin was implicated in approximately 11,000 (7%) emergency department visits among infants and young children for unsupervised medication ingestions. Many incidents involved ingestion of flavored products (e.g., gummy formulations).

What are the implications for public health practice?

Approximately 11,000 emergency department visits for unsupervised melatonin ingestions by infants and young children during 2019–2022 highlights the importance of educating parents and other caregivers about keeping all medications and supplements (including gummies) out of children's reach and sight.

Selecting products with child-resistant packaging might be advisable in homes with young children.

Surveillance data have limitations. Analyzing only cases resulting in ED visits likely underestimates overall melatonin ingestions by infants and young children. Detailed narrative information was not always documented; therefore, misclassification might occur, and involvement of specific product types or circumstances might be higher than reported.

The occurrence of approximately 11,000 ED visits for unsupervised melatonin ingestions by infants and young children during 2019–2022 highlights the continued need to educate parents and other caregivers about the importance of keeping all medications and supplements (including gummies) out of children's reach and sight (*5*). The Up and Away Campaign†† is an initiative led by CDC in collaboration with other government and nongovernmental partners to educate families about the importance of safe medicine storage around young children.

†† https://www.upandaway.org

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Corresponding author: Maribeth C. Lovegrove, MLovegrove@cdc.gov.

[1]Oak Ridge Institute for Science and Education, Oak Ridge, Tennessee; [2]Division of Healthcare Quality Promotion, National Center for Emerging and Zoonotic Infectious Diseases, CDC; [3]Chenega Enterprise Systems & Solutions, Atlanta, Georgia.

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