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Tobacco Product Use Among U.S. Middle and High School Students — National Youth Tobacco Survey, 2023

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Abstract

Tobacco product use during adolescence increases the risk for lifelong nicotine addiction and adverse health consequences. CDC and the Food and Drug Administration analyzed data from the 2023 National Youth Tobacco Survey to assess tobacco product use patterns among U.S. middle school (grades 6–8) and high school (grades 9–12) students. In 2023, 10.0% of middle and high school students (2.80 million) reported current (i.e., past 30-day) use of any tobacco product. Current use of any tobacco product by high school students declined by an estimated 540,000, from 2.51 million in 2022 to 1.97 million in 2023. From 2022 to 2023, current e-cigarette use among high school students declined from 14.1% to 10.0%. Among middle and high school students, e-cigarette products were the most used tobacco product in 2023 (7.7%; 2.13 million), followed by cigarettes (1.6%), cigars (1.6%), nicotine pouches (1.5%), smokeless tobacco (1.2%), other oral nicotine products (1.2%), hookahs (1.1%), heated tobacco products (1.0%), and pipe tobacco (0.5%). Among students who had ever used an e-cigarette, 46.7% reported current use. In 2023, among students reporting current e-cigarette use, 89.4% used flavored products and 25.2% used an e-cigarette daily; the most commonly reported brands were Elf Bar, Esco Bars, Vuse, JUUL, and Mr. Fog. Given the number of middle and high school students that use tobacco products, sustained efforts to prevent initiation of tobacco product use among young persons and strategies to help young tobacco users quit are critical to reducing U.S. youth tobacco product use.

Introduction

Commercial tobacco use* among U.S. youths can lead to lifelong nicotine addiction (*1*) and subsequent disability, disease, and death (*2*). This report presents findings from the 2023 National Youth Tobacco Survey (NYTS) and describes the prevalence of ever use (i.e., ever having used, even once or twice) and current use of nine tobacco product types, flavored tobacco products, and e-cigarette use behaviors among U.S. middle and high school students. In addition, 2023 NYTS results are compared with those reported for 2022 NYTS data (*3*).

Methods

Data Collection

The NYTS is a cross-sectional, school-based, self-administered web-based survey of U.S. middle and high school students. A stratified, three-stage cluster sampling procedure

* The term "tobacco" as used in this report refers to commercial tobacco products and not to sacred and traditional use of tobacco by some American Indian communities.

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was used to generate a nationally representative sample of U.S. students attending private or public middle (grades 6–8) and high (grades 9–12) schools. In 2023, data were collected during March 9–June 16; a total of 22,069 students from 179 schools participated, with an overall response rate of 30.5%.

Data Analysis

National weighted prevalence estimates, 95% CIs, and population totals[†] were calculated for ever use (i.e., ever having used, even once or twice) and current use (i.e., use on ≥1 days during the past 30 days) of nine commercial tobacco products[§] (e-cigarettes, cigarettes, cigars, smokeless tobacco, nicotine pouches,[¶] hookahs, pipe tobacco, heated tobacco products,[**] and other oral nicotine products) by student characteristics. Three composite measures were also reported for use of any tobacco product,[††] any combustible tobacco product,[§§] and multiple tobacco products.[¶¶] Current e-cigarette use (i.e., use on ≥1 day during the past 30 days) was reported by frequency of use, device type,[***] brand,[†††] and flavor.[§§§]

[†] Data were weighted to account for complex survey design and to adjust for nonresponse. The weighted proportions of students in each grade matched national population proportions for U.S. public and private schools derived from data from Market Data Retrieval Inc. 2021–2022 Common Core of Data and the National Center for Education Statistics 2019–2020 Private School Universe Study. Population total estimates were rounded down to the nearest 10,000 persons.

[§] Products include e-cigarettes, cigarettes, cigars (cigars, cigarillos, or little cigars), smokeless tobacco (chewing tobacco, snuff, dip, or snus), hookahs, heated tobacco products, nicotine pouches, pipe tobacco, bidis (small brown cigarettes wrapped in a leaf), and other oral nicotine products (lozenges, discs, tablets, gums, dissolvable tobacco products, and other products). In 2023, dissolvable tobacco products were reclassified from smokeless tobacco to other oral nicotine products.

[¶] Small, flavored pouches contain nicotine that comes from tobacco. Users place them in their mouth. Nicotine pouches are different from other smokeless tobacco products such as snus, dip, or chewing tobacco, because they do not contain any tobacco leaf.

[**] Heated tobacco products heat processed tobacco leaf in the form of sticks ("heatsticks"), plugs, or capsules to produce a vapor that the user inhales. They are different from e-cigarettes, which heat a liquid to produce a vapor.

[††] Any tobacco product use was defined as use of one or more of the following tobacco products: e-cigarettes, cigarettes, cigars, smokeless tobacco, hookahs, heated tobacco products, nicotine pouches, pipe tobacco, bidis, or other oral nicotine products.

[§§] Any combustible tobacco product use is defined as use of one or more of the following tobacco products: cigarettes, cigars, hookahs, pipe tobacco, or bidis.

[¶¶] Multiple tobacco product use was defined as use of two or more of the following tobacco products: e-cigarettes, cigarettes, cigars, smokeless tobacco, hookahs, heated tobacco products, nicotine pouches, pipe tobacco, bidis, or other oral nicotine products.

[***] Categories used are "disposables," "prefilled or refillable pods or cartridges," "tanks or mod system," or "don't know the type." Disposable e-cigarettes come prefilled with e-liquid and are designed to be discarded once empty. Some pods or cartridges come prefilled with e-liquid that is replaced after use, although others can be refilled by the user. Tank or mod-type devices can also be refilled but are also usually customizable.

[†††] Brand response options included blu, Breeze, Elf Bar, Esco Bars, Fume, HQD, JUUL, Kangvape (including Onee Stick), Logic, Mr. Fog, NJOY, SMOK (including NOVO), Suorin (including Air Bar), Vuse, "some other brand(s) not listed here" with space for a write-in name, and "not sure/I don't know the brand." Write-in responses corresponding to an original response option were recoded.

[§§§] Flavor type was determined by response to the question, "In the past 30 days when you used e-cigarettes, what flavors did you use? (Select one or more)." Those who selected "some other flavor not listed here" could provide a write-in response; write-in responses corresponding to an original response option were recoded.

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Changes in current-use prevalence since 2022 were estimated using t-tests; details of the 2022 NYTS data collection and estimates have been published previously (*3*). P-values <0.05 were considered statistically significant. Analyses were conducted using SAS-callable SUDAAN software (version 11.0.4; Research Triangle Institute). Estimates with an unweighted denominator <50 or a relative SE >30% were suppressed. This activity was reviewed by CDC, deemed not research, and was conducted consistent with applicable federal law and CDC policy.¶¶¶

Results

Tobacco Product Use by Population

In 2023, 22.2% of U.S. middle and high school students reported ever using any tobacco product, corresponding to 6.21 million persons (Table 1); 10.0% of students reported current use of any tobacco product, corresponding to 2.80 million persons (Table 2). Overall, current use of any tobacco product was reported by 11.2% of female, 8.9% of male, 12.6% of non-Hispanic multiracial (multiracial), 11.7% of Hispanic or Latino (Hispanic), 9.5% of non-Hispanic White (White), 9.3% of non-Hispanic Black or African American (Black), and 8.0% of non-Hispanic American Indian or Alaska Native (AI/AN) students.**** Current use of any combustible tobacco product was reported by 4.7% of Black, 3.9% of Hispanic, 3.7% of multiracial, and 2.7% of White and AI/AN students.

Types of Tobacco Products Used

E-cigarettes were the most commonly reported currently used tobacco product among all students (7.7%) and both middle school (4.6%) and high school students (10.0%). Other currently used tobacco products included cigarettes (1.6%), cigars (1.6%), nicotine pouches (1.5%), smokeless tobacco (1.2%), other oral nicotine products (1.2%), hookahs (1.1%), heated tobacco products (1.0%), and pipe tobacco (0.5%). Among students who had ever used e-cigarettes, 46.7% reported current e-cigarette use.

Characteristics of E-cigarette Use

Among students reporting current e-cigarette use, 25.2% reported using e-cigarettes daily. Frequent use (≥20 of the past 30 days) was reported by 34.7% of current e-cigarette users (Table 3). Disposable e-cigarettes were the most commonly reported device type used (60.7%), followed by prefilled or refillable pods or cartridges (16.1%), and tanks or mod systems (modifiable devices allowing users to customize the substances in the device) (5.9%). Among students who currently used e-cigarettes, Elf Bar was the most commonly reported brand (56.7%), followed by Esco Bars (21.6%), Vuse (20.7%), JUUL (16.5%), and Mr. Fog (13.6%).

Among students reporting current e-cigarette use, 89.4% reported using a flavored product during the past 30 days, excluding those who only used tobacco-flavored or unflavored e-cigarettes (Table 3). Among students who currently used e-cigarettes, fruit- (63.4%) and candy- (35.0%) flavored categories were reported most commonly; 6.4% of students reported use of tobacco-flavored e-cigarettes. Among those who currently used disposable e-cigarettes, the top reported flavor categories were fruit (70.5%), candy (39.8%), mint (32.0%), menthol (18.7%), unflavored (7.8%), alcoholic drinks (7.2%), and tobacco-flavored (5.4%) (Supplementary Table 1, https://stacks.cdc.gov/view/cdc/134700). Among students reporting current use of any tobacco product, 86.9% used a flavored product, ranging from 40.4% of cigarette users (menthol) to 89.4% of e-cigarette users (Supplementary Table 2, https://stacks.cdc.gov/view/cdc/134701). Among students currently using tobacco products, use of products with "ice" or "iced"†††† included in the flavor name was reported by 57.9% of e-cigarette users, 25.9% of nicotine pouch users, and 22.6% of cigar users; use of concept flavors§§§§ was reported by 16.1% of e-cigarette users and 13.4% of cigar users (Supplementary Table 3, https://stacks.cdc.gov/view/cdc/134702).

Tobacco Product Use Over Time

From 2022 to 2023, among high school students, statistically significant declines (p<0.05) occurred in current use of any tobacco product (from 16.5% to 12.6%), e-cigarettes (from 14.1% to 10.0%), cigars (from 2.8% to 1.8%), and any combustible tobacco product (from 5.2% to 3.9%). Among middle school students, statistically significant increases (p<0.05) occurred in current use of any tobacco product (from 4.5% to 6.6%) and multiple tobacco products (from 1.5% to 2.5%). Among middle school and high school students combined, no

¶¶¶ 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.

**** Estimates among non-Hispanic Asian and non-Hispanic Native Hawaiian or other Pacific Islander students were statistically unreliable for all current measures and are not reported.

†††† Current users were asked, "Did any of the flavors you used in the past 30 days have names or descriptions that included the word 'ice' or 'iced' (for example, blueberry ice or strawberry ice)?" Those who reported using only "unflavored" e-cigarettes (n = 60) or nicotine pouches (n = 11) were not asked the question.

§§§§ Current users were asked, "Did any of the flavors that you used in the past 30 days have a name that did not describe a specific flavor, such as 'solar,' 'purple,' 'jazz,' 'island bash,' 'fusion,' or some other word or phrase?" Those who reported using only "unflavored" e-cigarettes (n = 60) or nicotine pouches (n = 11) were not asked the question.

TABLE 1. Percentage of middle and high school students who reported ever using tobacco products,* by product, overall and by school level, sex, and race and ethnicity — National Youth Tobacco Survey, United States, 2023

	% (95% CI)									
	Sex		Race and ethnicity†							
Tobacco product	Female	Male	AI/AN, NH	Asian, NH	Black or African American, NH	White, NH	Hispanic or Latino	Multiracial, NH	Total	Total estimated weighted no.§
Overall										
Any tobacco product¶	23.7 (21.5–26.0)	20.8 (18.9–22.8)	22.7 (16.8–30.0)	12.1 (6.5–21.5)	20.1 (17.7–22.6)	23.1 (20.2–26.2)	23.8 (22.2–25.4)	27.9 (22.5–33.9)	**22.2 (20.5–23.9)**	**6,210,000**
E-cigarettes	19.4 (17.5–21.5)	14.7 (13.2–16.3)	15.4 (10.7–21.8)	—**	12.9 (11.1–14.8)	18.4 (15.9–21.1)	18.2 (16.3–20.2)	20.8 (15.9–26.8)	**17.0 (15.6–18.5)**	**4,750,000**
Cigarettes	7.0 (6.0–8.1)	6.5 (5.4–7.7)	9.5 (5.6–15.5)	—	4.1 (2.9–5.8)	7.5 (6.3–8.9)	7.4 (5.9–9.2)	8.7 (6.0–12.4)	**6.7 (6.0–7.6)**	**1,840,000**
Cigars††	3.8 (2.9–4.8)	5.8 (4.8–7.0)	—	—	4.7 (3.4–6.4)	5.2 (4.1–6.6)	4.7 (4.0–5.5)	6.9 (4.8–9.8)	**4.8 (4.0–5.6)**	**1,300,000**
Hookahs	3.4 (2.4–4.8)	2.7 (1.9–3.8)	—	—	4.5 (2.7–7.2)	2.5 (1.7–3.5)	3.5 (2.7–4.5)	3.6 (2.4–5.2)	**3.0 (2.4–3.9)**	**820,000**
Smokeless tobacco (composite)††	2.2 (1.7–2.9)	3.7 (2.8–4.8)	—	—	1.3 (0.8–2.1)	3.4 (2.5–4.6)	2.9 (2.2–3.8)	5.0 (3.3–7.5)	**3.0 (2.4–3.6)**	**800,000**
Other oral nicotine products††	2.7 (2.1–3.4)	3.2 (2.6–4.1)	4.9 (2.8–8.5)	—	1.7 (1.1–2.6)	3.2 (2.4–4.1)	3.5 (2.7–4.6)	4.2 (2.4–7.2)	**3.0 (2.5–3.5)**	**800,000**
Nicotine pouches	1.7 (1.2–2.4)	3.0 (2.2–4.1)	—	—	—	3.0 (2.3–3.9)	2.0 (1.2–3.2)	—	**2.3 (1.8–3.0)**	**580,000**
Pipe tobacco	1.5 (1.1–2.0)	1.9 (1.4–2.5)	—	—	—	1.8 (1.3–2.5)	2.0 (1.5–2.7)	2.3 (1.3–3.9)	**1.7 (1.4–2.0)**	**440,000**
Heated tobacco products	1.5 (1.1–2.0)	1.5 (1.0–2.1)	—	—	1.7 (1.0–2.9)	1.4 (0.9–2.0)	1.8 (1.3–2.4)	1.6 (0.9–3.0)	**1.5 (1.1–2.0)**	**370,000**
Any combustible tobacco product§§	10.9 (9.3–12.8)	11.6 (10.1–13.2)	11.1 (7.0–17.1)	4.4 (2.4–7.8)	11.2 (8.5–14.7)	11.6 (9.7–13.7)	12.0 (10.4–13.8)	14.4 (11.0–18.5)	**11.2 (9.9–12.7)**	**3,090,000**
Multiple tobacco products¶¶	10.1 (8.7–11.8)	9.6 (8.4–10.9)	11.0 (7.2–16.3)	3.6 (2.1–6.0)	7.3 (5.5–9.7)	10.8 (9.1–12.8)	10.3 (8.9–11.8)	13.3 (10.1–17.3)	**9.8 (8.7–11.1)**	**2,750,000**
High school students (grades 9–12)										
Any tobacco product¶	30.1 (26.9–33.5)	25.9 (23.5–28.5)	29.0 (19.1–41.5)	—	21.8 (18.8–25.2)	31.4 (28.0–34.9)	27.3 (24.8–29.8)	35.1 (27.3–43.7)	**27.9 (25.8–30.2)**	**4,390,000**
E-cigarettes	26.0 (23.2–29.0)	19.5 (17.6–21.5)	20.3 (12.5–31.2)	—	14.7 (11.7–18.2)	26.0 (23.0–29.2)	22.3 (20.0–24.9)	27.5 (20.9–35.3)	**22.6 (20.9–24.5)**	**3,550,000**
Cigarettes	8.8 (7.3–10.6)	8.3 (7.0–9.7)	—	—	3.0 (1.8–5.0)	10.5 (9.0–12.1)	8.8 (6.9–11.1)	10.5 (6.8–15.7)	**8.5 (7.7–9.5)**	**1,310,000**
Cigars††	4.8 (3.6–6.4)	7.9 (6.3–9.9)	—	—	4.8 (3.2–7.1)	7.8 (6.1–10.0)	5.4 (4.4–6.6)	9.6 (6.4–14.0)	**6.4 (5.3–7.7)**	**980,000**
Hookahs	4.0 (2.7–5.9)	3.5 (2.3–5.4)	—	—	—	3.6 (2.5–5.3)	3.9 (2.7–5.5)	3.3 (1.9–5.8)	**3.7 (2.8–5.1)**	**560,000**
Smokeless tobacco (composite)††	2.2 (1.5–3.2)	4.3 (3.3–5.7)	—	—	—	3.8 (2.8–5.1)	2.9 (2.1–4.0)	6.9 (4.1–11.4)	**3.3 (2.6–4.1)**	**500,000**
Other oral nicotine products††	2.8 (2.0–4.0)	4.0 (3.1–5.3)	—	—	1.6 (0.9–2.7)	4.1 (3.0–5.4)	3.8 (3.0–4.8)	—	**3.5 (2.8–4.2)**	**520,000**
Nicotine pouches	2.0 (1.4–2.9)	4.1 (3.0–5.6)	—	—	—	4.5 (3.5–5.7)	1.8 (1.1–2.8)	—	**3.1 (2.4–4.0)**	**430,000**
Pipe tobacco	1.7 (1.2–2.5)	2.4 (1.8–3.2)	—	—	—	2.7 (2.0–3.5)	2.2 (1.5–3.2)	3.3 (2.0–5.5)	**2.1 (1.7–2.5)**	**310,000**
Heated tobacco products	1.7 (1.2–2.5)	1.6 (1.0–2.4)	—	—	—	1.8 (1.2–2.8)	1.5 (0.9–2.3)	—	**1.6 (1.2–2.3)**	**230,000**
Any combustible tobacco product§§	13.6 (11.3–16.2)	14.9 (13.0–16.9)	—	—	10.7 (8.2–14.0)	16.4 (14.1–19.1)	13.8 (11.7–16.3)	17.5 (12.6–23.7)	**14.2 (12.6–16.1)**	**2,190,000**
Multiple tobacco products¶¶	12.8 (10.5–15.4)	12.6 (11.1–14.2)	14.2 (8.0–24.0)	4.6 (2.5–8.3)	7.1 (4.9–10.1)	15.4 (13.1–18.1)	11.7 (10.0–13.6)	17.1 (12.2–23.3)	**12.7 (11.1–14.4)**	**1,990,000**

See table footnotes on the next page.

TABLE 1. (*Continued*) Percentage of middle and high school students who reported ever using tobacco products,[*] by product, overall and by school level, sex, and race and ethnicity — National Youth Tobacco Survey, United States, 2023

	% (95% CI)									
	Sex		Race and ethnicity[†]							
Tobacco product	Female	Male	AI/AN, NH	Asian, NH	Black or African American, NH	White, NH	Hispanic or Latino	Multiracial, NH	Total	Total estimated weighted no.[§]
Middle school students (grades 6–8)										
Any tobacco product[¶]	15.4 (12.9–18.3)	13.8 (11.3–16.6)	15.3 (9.7–23.2)	—	17.8 (12.9–24.0)	12.3 (10.0–14.9)	18.7 (16.5–21.1)	17.6 (13.0–23.6)	**14.7 (12.5–17.1)**	**1,780,000**
E-cigarettes	11.0 (9.1–13.3)	8.2 (6.9–9.8)	—	—	10.6 (8.5–13.1)	8.4 (6.8–10.3)	12.3 (10.5–14.4)	11.3 (6.3–19.5)	**9.7 (8.3–11.3)**	**1,170,000**
Cigarettes	4.6 (3.6–5.9)	4.0 (2.7–5.9)	—	—	5.5 (3.9–7.8)	3.5 (2.5–5.1)	5.3 (3.8–7.2)	—	**4.3 (3.3–5.5)**	**510,000**
Cigars[††]	2.4 (1.6–3.6)	2.9 (2.0–4.2)	—	—	4.6 (2.8–7.4)	1.7 (1.1–2.6)	3.5 (2.3–5.3)	—	**2.6 (1.9–3.7)**	**310,000**
Hookahs	—	1.7 (1.2–2.3)	—	—	—	0.9 (0.5–1.6)	2.9 (2.1–4.0)	—	**2.1 (1.4–3.2)**	**240,000**
Smokeless tobacco (composite)[††]	2.3 (1.6–3.1)	2.7 (1.8–4.0)	—	—	—	2.9 (1.9–4.4)	2.5 (1.6–3.9)	—	**2.4 (1.8–3.3)**	**290,000**
Other oral nicotine products[††]	2.4 (1.8–3.2)	2.1 (1.6–2.7)	—	—	—	2.0 (1.4–2.9)	2.9 (1.8–4.4)	2.9 (1.6–5.2)	**2.2 (1.8–2.7)**	**260,000**
Nicotine pouches	—	—	—	—	—	1.0 (0.6–1.8)	—	—	—	—
Pipe tobacco	1.1 (0.6–2.0)	1.1 (0.6–2.0)	—	—	—	—	1.7 (1.2–2.4)	—	**1.1 (0.7–1.6)**	**120,000**
Heated tobacco products	1.2 (0.7–1.9)	—	—	—	—	0.8 (0.5–1.5)	2.1 (1.6–2.8)	—	**1.2 (0.8–1.8)**	**130,000**
Any combustible tobacco product[§§]	7.5 (5.7–10.0)	7.2 (5.1–9.9)	6.6 (3.6–11.7)	—	11.9 (7.0–19.4)	5.3 (3.8–7.3)	9.3 (7.3–11.7)	9.8 (6.4–14.8)	**7.3 (5.6–9.4)**	**870,000**
Multiple tobacco products[¶¶]	6.7 (5.3–8.6)	5.5 (4.2–7.2)	—	—	7.6 (4.7–12.2)	4.7 (3.5–6.2)	8.0 (6.0–10.6)	7.9 (5.3–11.6)	**6.1 (4.9–7.5)**	**740,000**

Abbreviations: AI/AN = American Indian or Alaska Native; NH = non-Hispanic.

* Ever use is defined as ever having used the product, even once or twice. Because of missing data on the ever use questions, denominators for each tobacco product might be different. For each question, response options were "yes" or "no."

† Hispanic or Latino persons could be of any race. Estimates among NH Native Hawaiian or other Pacific Islander students, overall and by school level, were statistically unreliable for all measures and are not presented in this table.

§ Estimated weighted total number of ever tobacco product users was rounded down to the nearest 10,000 persons. Overall estimates were reported based on 22,069 U.S. middle and high school students. School level was determined by reported grade level: high school (grades 9–12; n = 10,879) and middle school (grades 6–8; n = 11,067). The sum of subgroup estimates might not sum to overall population estimates because of rounding or exclusion of students who did not report sex, race and ethnicity, or grade level.

¶ Any tobacco product use is defined as ever use of one or more of the following tobacco products: e-cigarettes, cigars, cigarettes, smokeless tobacco (composite), hookahs, nicotine pouches, heated tobacco products, pipe tobacco, bidis (small brown cigarettes wrapped in a leaf), or other oral nicotine products.

** Dashes indicate that data were statistically unreliable because of an unweighted denominator <50 or a relative SE >30%.

†† Cigars were defined as cigars, cigarillos, or little cigars. Smokeless tobacco (composite) was defined as chewing tobacco, snuff, dip, or snus. Other oral nicotine products were defined as lozenges, discs, tablets, gums, dissolvable tobacco products, and other products. In 2023, dissolvable tobacco products were reclassified from smokeless tobacco to other oral nicotine products.

§§ Any combustible tobacco product use was defined as ever use of one or more of the following tobacco products: cigarettes, cigars, hookahs, pipe tobacco, or bidis.

¶¶ Multiple tobacco product use was defined as ever use of two or more of the following tobacco products: e-cigarettes, cigars, cigarettes, smokeless tobacco (composite), hookahs, nicotine pouches, heated tobacco products, pipe tobacco, bidis, or other oral nicotine products.

significant change in current use of any composite measure or individual tobacco product was observed.

Discussion

Current use of any tobacco product by high school students declined by an estimated 540,000 students, from 2.51 million in 2022 (*3*) to 1.97 million in 2023. In 2023, 22.2% of middle and high school students (representing 6.21 million) reported ever using any tobacco product, and 10.0% of students (representing 2.80 million) reported current use of any tobacco product. Similar to 2022 (*3*), ever use of any tobacco product was lowest among non-Hispanic Asian students and did not differ significantly across most racial and ethnic groups.

E-cigarettes have been the most commonly used tobacco product among U.S. youths since 2014 (*4*). Youth e-cigarette use is a critical public health concern, because approximately

TABLE 2. Percentage of middle and high school students who reported current (past 30-day) tobacco product use, by product,* overall and by school level, sex, and race and ethnicity — National Youth Tobacco Survey, United States, 2023

Tobacco product	% (95% CI)								Total estimated weighted no.§
	Sex		Race and ethnicity†						
	Female	Male	AI/AN, NH	Black or African American, NH	White, NH	Hispanic or Latino	Multiracial, NH	Total	
Overall									
Any tobacco product¶	11.2 (9.5–13.1)	8.9 (7.7–10.3)	8.0 (4.7–13.2)	9.3 (7.5–11.3)	9.5 (7.7–11.6)	11.7 (10.1–13.4)	12.6 (8.8–17.7)	**10.0 (8.9–11.2)**	**2,800,000**
E-cigarettes	9.3 (8.1–10.8)	6.1 (5.0–7.4)	5.9 (3.4–10.0)	5.6 (4.5–7.1)	7.7 (6.3–9.4)	8.5 (7.4–9.8)	10.2 (6.8–15.1)	**7.7 (6.8–8.6)**	**2,130,000**
Cigarettes	1.4 (1.0–1.9)	1.8 (1.4–2.4)	—**	—	1.6 (1.1–2.3)	2.1 (1.5–3.1)	1.6 (1.0–2.8)	**1.6 (1.2–2.1)**	**430,000**
Cigars	1.3 (0.9–2.0)	1.8 (1.4–2.3)	—	2.3 (1.4–3.8)	1.0 (0.7–1.4)	2.2 (1.7–2.8)	—	**1.6 (1.2–2.0)**	**420,000**
Nicotine pouches	0.8 (0.5–1.3)	2.1 (1.5–3.0)	—	—	1.4 (0.9–2.2)	1.9 (1.1–3.3)	—	**1.5 (1.0–2.1)**	**400,000**
Smokeless tobacco (composite)††	—	1.6 (1.1–2.3)	—	—	1.2 (0.7–1.8)	1.6 (1.1–2.4)	—	**1.2 (0.9–1.7)**	**330,000**
Other oral nicotine products	1.1 (0.9–1.4)	1.2 (0.9–1.7)	0.5 (0.3–0.8)	—	1.2 (0.9–1.5)	1.5 (1.1–2.0)	—	**1.2 (1.0–1.4)**	**310,000**
Hookahs	1.3 (0.8–2.1)	0.9 (0.6–1.3)	—	—	0.7 (0.4–1.1)	1.3 (1.0–1.7)	1.3 (0.7–2.4)	**1.1 (0.8–1.5)**	**290,000**
Heated tobacco products	0.7 (0.5–1.0)	1.2 (0.8–1.9)	—	1.0 (0.5–1.7)	0.7 (0.4–1.2)	1.5 (1.0–2.2)	—	**1.0 (0.7–1.3)**	**260,000**
Pipe tobacco	0.5 (0.3–0.7)	0.6 (0.4–0.9)	—	—	0.5 (0.3–0.8)	0.9 (0.5–1.4)	—	**0.5 (0.4–0.7)**	**130,000**
Any combustible tobacco product§§	3.3 (2.6–4.1)	3.5 (2.9–4.2)	2.7 (1.5–4.9)	4.7 (3.1–7.0)	2.7 (2.2–3.5)	3.9 (3.1–4.8)	3.7 (2.4–5.5)	**3.4 (2.9–4.0)**	**920,000**
Multiple tobacco products¶¶	3.4 (2.7–4.2)	3.4 (2.7–4.2)	2.0 (1.1–3.5)	3.2 (1.8–5.5)	3.1 (2.4–4.0)	3.9 (3.4–4.5)	4.1 (2.6–6.5)	**3.4 (2.9–3.9)**	**940,000**
High school students (grades 9–12)									
Any tobacco product¶	14.1 (11.6–17.0)	11.2 (9.4–13.1)	—	9.8 (7.7–12.5)	13.6 (11.2–16.5)	12.4 (10.6–14.4)	17.2 (11.3–25.3)	**12.6 (11.1–14.3)**	**1,970,000**
E-cigarettes	12.2 (10.3–14.5)	8.0 (6.3–10.0)	—	5.6 (4.2–7.4)	11.3 (9.2–13.7)	9.7 (8.0–11.8)	14.2 (9.0–21.8)	**10.0 (8.8–11.4)**	**1,560,000**
Cigarettes	1.5 (1.0–2.2)	2.3 (1.8–2.9)	—	—	2.2 (1.4–3.4)	2.2 (1.6–3.0)	—	**1.9 (1.5–2.4)**	**290,000**
Cigars	1.4 (0.8–2.3)	2.3 (1.7–3.0)	—	1.9 (1.2–3.0)	1.4 (0.9–2.2)	2.3 (1.6–3.3)	—	**1.8 (1.4–2.4)**	**280,000**
Nicotine pouches	—	2.6 (1.9–3.6)	—	—	2.2 (1.4–3.4)	1.6 (0.9–2.7)	—	**1.7 (1.2–2.5)**	**260,000**
Smokeless tobacco (composite)††	—	2.1 (1.4–3.0)	—	—	1.7 (1.1–2.6)	1.7 (1.1–2.7)	—	**1.5 (1.1–2.2)**	**230,000**
Other oral nicotine products	0.9 (0.7–1.3)	1.5 (1.0–2.2)	—	—	1.3 (1.0–1.8)	1.6 (1.1–2.2)	—	**1.2 (1.0–1.6)**	**180,000**
Hookahs	1.4 (0.8–2.4)	0.9 (0.6–1.5)	—	—	—	1.0 (0.6–1.6)	—	**1.1 (0.8–1.6)**	**170,000**
Heated tobacco products	0.7 (0.4–1.2)	1.4 (0.8–2.5)	—	—	—	1.6 (0.9–2.7)	—	**1.0 (0.7–1.6)**	**150,000**
Pipe tobacco	0.5 (0.3–0.9)	0.7 (0.4–1.2)	—	—	0.6 (0.4–1.0)	—	—	**0.6 (0.4–0.9)**	**90,000**
Any combustible tobacco product§§	3.6 (2.7–4.7)	4.3 (3.6–5.2)	—	4.5 (3.2–6.2)	3.8 (3.0–5.0)	3.8 (2.8–5.0)	5.3 (3.3–8.6)	**3.9 (3.4–4.6)**	**600,000**
Multiple tobacco products¶¶	3.5 (2.7–4.7)	4.3 (3.4–5.5)	—	—	4.3 (3.2–5.7)	3.9 (3.0–5.1)	6.1 (3.6–10.2)	**3.9 (3.3–4.7)**	**610,000**

See table footnotes on the next page.

one half of students ever using e-cigarettes reported using them currently, indicating that many young persons who try e-cigarettes remain e-cigarette users. In 2023, 10.0% of high school students and 4.6% of middle school students used e-cigarettes during the past 30 days. From 2022 (*3*) to 2023, a significant decline in current e-cigarette use occurred among high school students (from 14.1% to 10.0%), while no statistically significant change occurred among middle school students (from 3.3% in 2022 to 4.6% in 2023). The decline since 2022 in high school student e-cigarette use is likely attributable to multiple factors, such as ongoing efforts at the national, state, and local levels to implement tobacco control strategies, including Food and Drug Administration (FDA) regulatory actions. Continued surveillance is needed to determine the trajectory of

TABLE 2. (*Continued*) Percentage of middle and high school students who reported current (past 30-day) tobacco product use, by product,* overall and by school level, sex, and race and ethnicity — National Youth Tobacco Survey, United States, 2023

	% (95% CI)								
	Sex		Race and ethnicity†						
Tobacco product	Female	Male	AI/AN, NH	Black or African American, NH	White, NH	Hispanic or Latino	Multiracial, NH	Total	Total estimated weighted no.§
Middle school students (grades 6–8)									
Any tobacco product¶	7.5 (5.9–9.4)	5.7 (4.1–8.0)	—	8.5 (5.8–12.4)	4.1 (3.2–5.2)	10.3 (7.5–14.0)	6.0 (3.4–10.5)	**6.6 (5.1–8.5)**	**800,000**
E-cigarettes	5.6 (4.5–7.1)	3.5 (2.5–4.8)	—	5.7 (3.9–8.2)	3.1 (2.2–4.2)	6.6 (5.3–8.2)	—	**4.6 (3.6–5.8)**	**550,000**
Cigarettes	1.1 (0.7–1.9)	—	—	—	0.8 (0.4–1.4)	—	—	**1.1 (0.6–1.9)**	**120,000**
Cigars	1.2 (0.7–2.2)	1.0 (0.6–1.8)	—	—	—	1.8 (1.1–3.1)	—	**1.1 (0.7–1.8)**	**130,000**
Nicotine pouches	—	—	—	—	0.5 (0.3–0.8)	—	—	**—**	**—**
Smokeless tobacco (composite)††	0.6 (0.4–1.0)	—	—	—	—	—	—	**0.7 (0.5–1.2)**	**80,000**
Other oral nicotine products	1.3 (0.9–1.8)	0.8 (0.6–1.3)	—	—	1.0 (0.6–1.6)	1.3 (0.8–2.0)	—	**1.1 (0.8–1.4)**	**120,000**
Hookahs	—	0.8 (0.5–1.5)	—	—	0.4 (0.2–0.7)	1.8 (1.1–2.9)	—	**1.0 (0.6–1.8)**	**120,000**
Heated tobacco products	0.8 (0.4–1.3)	—	—	—	—	1.3 (0.8–2.3)	—	**0.8 (0.5–1.4)**	**90,000**
Pipe tobacco	—	—	—	—	—	—	—	**0.4 (0.2–0.6)**	**40,000**
Any combustible tobacco product§§	2.8 (1.8–4.4)	2.3 (1.4–3.6)	—	—	1.3 (0.9–1.9)	3.7 (2.4–5.6)	—	**2.5 (1.7–3.8)**	**300,000**
Multiple tobacco products¶¶	3.1 (2.2–4.4)	2.0 (1.3–3.0)	—	—	1.5 (1.0–2.2)	3.5 (2.5–4.9)	—	**2.5 (1.8–3.5)**	**300,000**

Abbreviations: AI/AN = American Indian or Alaska Native; NH = non-Hispanic.

* Current use is defined as use on ≥1 days during the past 30 days for each product. Because of missing data on past 30-day use questions, denominators for each tobacco product might be different.

† Hispanic or Latino persons could be of any race. Estimates among NH Asian and NH Native Hawaiian or other Pacific Islander students, overall and by school level, were statistically unreliable for all measures and are not presented in this table.

§ Estimated weighted total number of current tobacco product users was rounded down to the nearest 10,000 persons. Overall estimates were reported based on 22,069 U.S. middle and high school students. School level was determined by reported grade level: high school (grades 9–12; n = 10,879) and middle school (grades 6–8; n = 11,067). The sum of subgroup estimates might not sum to overall population estimates because of rounding or exclusion of students who did not report sex, race and ethnicity, or grade level.

¶ Any tobacco product use is defined as current use of one or more of the following tobacco products on ≥1 days during the past 30 days: e-cigarettes, cigars, cigarettes, smokeless tobacco (composite), hookahs, nicotine pouches, heated tobacco products, pipe tobacco, bidis (small brown cigarettes wrapped in a leaf), or other oral nicotine products.

** Dashes indicate that data were statistically unreliable because of an unweighted denominator <50 or a relative SE >30%.

†† Cigars were defined as cigars, cigarillos, or little cigars. Smokeless tobacco (composite) was defined as chewing tobacco, snuff, dip, or snus. Other oral nicotine products were defined as lozenges, discs, tablets, gums, dissolvable tobacco products, and other products. In 2023, dissolvable tobacco products were reclassified from smokeless tobacco to other oral nicotine products.

§§ Any combustible tobacco product use was defined as current use of one or more of the following tobacco products: cigarettes, cigars, hookahs, pipe tobacco, or bidis.

¶¶ Multiple tobacco product use was defined as current use of two or more of the following tobacco products: e-cigarettes, cigars, cigarettes, smokeless tobacco (composite), hookahs, nicotine pouches, heated tobacco products, pipe tobacco, bidis, or other oral nicotine products.

middle school e-cigarette use. Despite the decline in e-cigarette use among high school students, close to 40% of high school students using e-cigarettes reported frequent use, and 29.9% reported daily use. Furthermore, 550,000 middle school students currently used e-cigarettes, including 20.7% reporting frequent use. Similar patterns were observed in 2022 for both middle school and high school students. These findings are concerning, because adolescents have reported symptoms of nicotine dependence when using tobacco products only 1–3 days per month (*1*). Efforts aimed at reducing nicotine dependence among adolescents by preventing initiation of tobacco products is important (*5*).

Among students who reported current e-cigarette use, disposables were the most commonly used device type. Disposable e-cigarettes have been gaining market share; they are relatively inexpensive, have a high nicotine content, and are available in flavors appealing to youths (e.g., fruit and candy) (*6*). In January 2020, FDA announced that it would prioritize enforcement against prefilled e-cigarettes in flavors other than tobacco and menthol (*7*). In 2023, NYTS for the first time assessed tobacco-flavored product use, use of flavors that included the word "ice" or "iced" in their name, and use of concept flavors. These results, combined with results of other flavored tobacco

TABLE 3. Percentage of middle and high school students reporting current (past 30-day) e-cigarette use,* overall by selected characteristics and school level — National Youth Tobacco Survey, United States, 2023

	Overall		High school		Middle school	
Characteristic	**Estimated weighted no.†**	**% (95% CI)**	**Estimated weighted no.†**	**% (95% CI)**	**Estimated weighted no.†**	**% (95% CI)**
Among all students	**2,130,000**	**7.7 (6.8–8.6)**	**1,560,000**	**10.0 (8.8–11.4)**	**550,000**	**4.6 (3.6–5.8)**
Among current e-cigarette users						
Frequency of use during past 30 days						
1–5 days	**980,000**	**46.1 (39.8–52.7)**	630,000	40.7 (33.1–48.7)	340,000	62.0 (55.7–67.9)
6–19 days	**400,000**	**19.1 (15.0–24.1)**	300,000	19.7 (14.1–26.8)	90,000	17.3 (12.2–24.0)
20–30 days	**740,000**	**34.7 (28.4–41.7)**	620,000	39.7 (31.3–48.6)	110,000	20.7 (14.6–28.6)
Daily e-cigarette use§	**530,000**	**25.2 (19.2–32.3)**	**460,000**	**29.9 (22.1–39.1)**	**60,000**	**11.4 (7.5–17.0)**
Device type most often used¶						
Disposables	**1,240,000**	**60.7 (53.3–67.6)**	1,000,000	65.2 (56.3–73.1)	240,000	47.9 (39.5–56.5)
Prefilled or refillable pods or cartridges	**330,000**	**16.1 (12.2–21.0)**	240,000	16.0 (11.1–22.5)	80,000	16.7 (11.4–23.8)
Tanks or mod system	**120,000**	**5.9 (4.4–7.8)**	90,000	6.0 (4.3–8.4)	20,000	4.4 (2.5–7.5)
Don't know the type	**350,000**	**17.3 (12.7–23.1)**	190,000	12.8 (8.7–18.4)	150,000	31.1 (22.2–41.5)
Any brand**						
Elf Bar	**1,160,000**	**56.7 (50.6–62.6)**	900,000	59.1 (52.9–65.1)	260,000	50.0 (37.5–62.5)
Esco Bars	**440,000**	**21.6 (16.2–28.3)**	370,000	24.9 (18.1–33.1)	60,000	12.0 (6.9–20.2)
Vuse	**420,000**	**20.7 (16.4–25.9)**	330,000	22.2 (16.9–28.6)	80,000	16.3 (10.8–23.8)
JUUL	**330,000**	**16.5 (12.9–20.9)**	240,000	16.3 (11.8–22.1)	80,000	16.8 (11.4–24.1)
Mr. Fog	**280,000**	**13.6 (7.9–22.4)**	230,000	15.1 (8.2–26.3)	—††	—
SMOK (including NOVO)	**230,000**	**11.3 (6.3–19.5)**	—	—	30,000	6.7 (3.9–11.1)
Breeze	**230,000**	**11.6 (7.6–17.4)**	200,000	13.2 (8.0–21.2)	30,000	6.6 (4.1–10.5)
Kangvape (including Onee Stick)	**180,000**	**8.8 (6.6–11.7)**	130,000	8.7 (6.5–11.6)	—	—
Fume	**180,000**	**9.0 (6.4–12.6)**	140,000	9.2 (6.0–13.9)	40,000	8.2 (4.7–14.0)
NJOY	**150,000**	**7.5 (5.5–10.3)**	120,000	8.1 (5.6–11.7)	20,000	5.4 (3.1–9.2)
blu	**120,000**	**6.0 (4.4–8.3)**	70,000	5.2 (3.4–7.8)	40,000	8.1 (5.0–12.9)
HQD	**110,000**	**5.5 (3.4–8.5)**	80,000	5.7 (3.3–9.7)	—	—
Logic	**80,000**	**3.9 (2.5–6.1)**	50,000	3.7 (2.3–5.8)	—	—
Suorin (including Air Bar)	**70,000**	**3.8 (2.5–5.6)**	50,000	3.8 (2.3–6.3)	—	—
Lost Mary§§	**50,000**	**2.6 (1.4–4.8)**	40,000	3.3 (1.8–5.9)	—	—
Some other brand not listed	**350,000**	**17.3 (11.6–24.9)**	290,000	19.5 (12.4–29.2)	50,000	10.9 (6.0–19.0)
Not sure or don't know the brand	**490,000**	**23.9 (19.3–29.2)**	300,000	19.8 (15.6–24.9)	180,000	35.4 (24.3–48.3)
Usual brand¶¶						
Elf Bar	**630,000**	**31.1 (26.2–36.4)**	460,000	30.2 (24.8–36.2)	170,000	33.9 (24.6–44.7)
Vuse	**170,000**	**8.7 (5.8–12.9)**	150,000	10.0 (6.4–15.3)	—	—
Esco Bars	**120,000**	**6.0 (3.4–10.4)**	110,000	7.7 (4.3–13.5)	—	—
JUUL	**70,000**	**3.4 (1.9–6.1)**	—	—	—	—
Mr. Fog	—	—	—	—	—	—
SMOK (including NOVO)	—	—	—	—	—	—
Breeze	—	—	—	—	—	—
Kangvape (including Onee Stick)	—	—	—	—	—	—
Fume	—	—	—	—	—	—
NJOY	—	—	—	—	—	—
blu	—	—	—	—	—	—
HQD	—	—	—	—	—	—
Logic	—	—	—	—	—	—
Suorin (including Air Bar)	—	—	—	—	—	—
Lost Mary	—	—	—	—	—	—
No usual brand	**90,000**	**4.4 (2.8–7.0)**	70,000	4.7 (2.8–7.5)	—	—
Some other brand not listed	**270,000**	**13.2 (7.8–21.5)**	230,000	15.4 (8.6–25.9)	—	—
Not sure or don't know the brand	**400,000**	**19.8 (16.0–24.1)**	240,000	16.0 (12.5–20.4)	150,000	30.5 (22.1–40.4)
Flavored e-cigarette use***						
Any flavor other than tobacco-flavored or unflavored	**1,900,000**	**89.4 (86.2–91.9)**	1,410,000	90.3 (86.6–93.1)	480,000	87.1 (79.9–92.0)
Exclusive use of tobacco-flavored or unflavored	**110,000**	**5.6 (3.9–7.9)**	80,000	5.4 (3.4–8.4)	30,000	6.2 (3.4–11.0)
Unspecified	**100,000**	**5.0 (3.5–7.2)**	60,000	4.3 (2.8–6.6)	—	—

See table footnotes on the next page.

TABLE 3. (*Continued*) Percentage of middle and high school students reporting current (past 30-day) e-cigarette use,* overall by selected characteristics and school level — National Youth Tobacco Survey, United States, 2023

Characteristic	Overall		High school		Middle school	
	Estimated weighted no.†	% (95% CI)	Estimated weighted no.†	% (95% CI)	Estimated weighted no.†	% (95% CI)
Flavor type used among current e-cigarette users†††						
Fruit	**1,280,000**	**63.4 (59.8–66.9)**	930,000	62.6 (57.9–67.0)	340,000	66.3 (59.5–72.5)
Candy, desserts, or other sweets	**700,000**	**35.0 (29.1–41.5)**	510,000	34.4 (27.5–42.1)	190,000	37.0 (28.6–46.4)
Mint	**560,000**	**27.8 (22.0–34.4)**	470,000	31.6 (24.2–40.1)	80,000	16.5 (11.6–22.9)
Menthol	**400,000**	**20.1 (15.5–25.8)**	340,000	23.3 (17.6–30.1)	50,000	10.4 (7.2–14.8)
Unflavored	**230,000**	**11.6 (8.8–15.1)**	160,000	10.9 (7.8–15.0)	60,000	13.2 (8.7–19.5)
Non-alcoholic drinks§§§	**220,000**	**11.3 (6.4–19.1)**	—	—	30,000	7.4 (4.1–13.0)
Alcoholic drinks§§§	**170,000**	**8.4 (5.5–12.7)**	130,000	9.0 (5.5–14.4)	—	—
Tobacco-flavored	**120,000**	**6.4 (4.5–9.0)**	70,000	5.3 (3.7–7.4)	—	—
Clove or spice §§§	**120,000**	**6.0 (4.3–8.2)**	70,000	5.1 (3.3–7.7)	40,000	7.9 (4.6–13.1)
Chocolate	**90,000**	**4.9 (3.4–7.1)**	50,000	3.4 (1.9–6.2)	40,000	8.0 (4.3–14.3)
Some other flavor	**120,000**	**6.0 (4.2–8.5)**	60,000	4.6 (3.0–7.0)	50,000	10.0 (5.9–16.4)
Use of any flavors that included the word "ice" or "iced" (such as "blueberry ice" or "strawberry ice")¶¶¶						
Yes	**1,100,000**	**57.9 (52.5–63.1)**	800,000	57.0 (51.3–62.6)	290,000	61.0 (52.8–68.5)
No	**560,000**	**29.5 (24.8–34.8)**	440,000	31.6 (26.1–37.7)	110,000	24.1 (18.2–31.1)
Don't know	**230,000**	**12.6 (9.8–16.0)**	160,000	11.4 (8.3–15.5)	70,000	15.0 (10.2–21.5)
Use of any concept flavors with a name that did not describe a specific flavor (such as "solar," "purple," "jazz," "island bash," or "fusion")****						
Yes	**300,000**	**16.1 (13.5–19.0)**	210,000	15.4 (12.2–19.3)	80,000	17.7 (12.3–24.7)
No	**1,110,000**	**58.5 (52.5–64.3)**	850,000	60.9 (52.8–68.4)	250,000	52.8 (45.5–60.0)
Don't know	**480,000**	**25.4 (21.6–29.7)**	330,000	23.7 (19.0–29.2)	140,000	29.5 (22.6–37.5)

* Current (past 30-day) use of e-cigarettes was determined by asking, "During the past 30 days, on how many days did you use e-cigarettes?" Current use was defined as use on ≥1 days during the past 30 days.

† Estimated total number of users was rounded down to the nearest 10,000 persons. The sum of subgroup estimates might not sum to overall population estimates because of rounding or exclusion of students who did not report grade level (n = 102), device type (n = 53), any brand (n = 54), usual brand (n = 61), flavor types used (n = 84), use of flavor including the word "ice" or "iced" (n = 136), or use of flavors without specific flavor descriptor (n = 143).

§ Daily e-cigarette use was defined as use on all 30 of the past 30 days.

¶ Device type was determined by the question, "Which of the following best describes the type of e-cigarette you have used in the past 30 days? If you have used more than one type, please think about the one you use most often."

** All current e-cigarette users were asked, "During the past 30 days, what e-cigarette brands did you use? (Select one or more)." Those who selected "some other brand(s) not listed here" could provide a write-in response. Write-in responses corresponding to an original response option were recoded.

†† Data were statistically unreliable because of an unweighted denominator <50 or a relative SE >30%.

§§ Lost Mary was not included in the list of prespecified response options, but it was the most commonly provided write-in response for "some other brand(s) not listed here."

¶¶ If a single brand was selected for the question, "During the past 30 days, what e-cigarette brands did you use (Select one or more)," it was reported as the respondent's usual brand. Those who selected one or more brands were asked, "During the past 30 days, what brand of e-cigarettes did you usually use? (Choose only one answer)." Those who selected "some other brand(s) not listed here" could provide a write-in response. Write-in responses corresponding to an original response option were recoded.

*** All current e-cigarette users were asked, "In the past 30 days when you used e-cigarettes, what flavors did you use? (Select one or more)?" Those who provided no valid responses were defined as "Unspecified" flavored users.

††† Flavor type was determined by response to the question, "In the past 30 days when you used e-cigarettes, what flavors did you use? (Select one or more)." Those who selected "some other flavor not listed here" could provide a write-in response; write-in responses corresponding to an original response option were recoded.

§§§ These flavor options provided examples: "Alcoholic drinks (such as wine, margarita, or other cocktails)"; "Non-alcoholic drinks (such as coffee, soda, lemonade, or other beverage)"; and "Spice (such as cinnamon, vanilla, or clove)."

¶¶¶ Current e-cigarette users were asked, "Did any of the flavors you used in the past 30 days have names or descriptions that included the word 'ice' or 'iced' (for example, blueberry ice or strawberry ice)?" Those who reported using only unflavored e-cigarettes (n = 60) did not receive the question.

**** Current e-cigarette users were asked, "Did any of the flavors that you used in the past 30 days have a name that did not describe a specific flavor, such as ''solar,' 'purple,' 'jazz,' 'island bash,' and 'fusion,' or some other word or phrase?" Those who reported using only "unflavored" e-cigarettes (n = 60) did not receive the question.

product use research, continue to demonstrate the high appeal of flavored tobacco products among young persons.

Multiple factors continue to influence tobacco product use and initiation among middle and high school students, including availability of flavored products, marketing, and misperceptions regarding harm. Continued surveillance provides an understanding of the prevalence and frequency of tobacco product use, the popularity of specific brands and flavors, and how product use behaviors change over time as the tobacco product marketplace continues to diversify.

Limitations

The findings in this report are subject to at least three limitations. First, data were obtained by self-report, which can result in social desirability and recall biases, although previous

Summary

What is already known about this topic?

Use of tobacco products in any form by youths is unsafe.

What is added by this report?

In 2023, 10.0% of middle and high school students reported current tobacco product use. From 2022 to 2023, current e-cigarette use among high school students declined from 14.1% to 10.0%. E-cigarettes remained the most commonly used tobacco product among youths. Among middle school and high school students who currently use e-cigarettes, 25.2% used e-cigarettes daily, and 89.4% used flavored e-cigarettes.

What are the implications for public health?

Tobacco use declined among high school students; however, sustained public health monitoring with implementation of evidence-based tobacco control strategies, including effective youth interventions, media campaigns, Food and Drug Administration regulations, and other proven tobacco prevention policies might further reduce youth tobacco product use.

research suggests that self-reported measures of tobacco use among persons aged 12–21 years correlate with biomarkers of tobacco use (*8*). Second, these findings might not be generalizable to youths who are home-schooled, have dropped out of school, are in detention centers, or are enrolled in alternative schools. Finally, the response rate for the 2023 NYTS was lower than that for the 2022 NYTS (30.5% in 2023 versus 45.2% in 2022). The lower response rate can increase the potential for bias and result in higher SEs for some estimates; higher SEs can reduce the power to detect a significant difference, if there is one, when doing year to year comparisons, especially for certain population groups. Adjustments were made to the survey weights to reduce the potential for nonresponse bias. Therefore, 2023 NYTS estimates may be compared with 2022 NYTS estimates for the same population groups.

Implications for Public Health Practice

In 2023, 10.0% (representing 2.80 million) of U.S. middle and high school students reported current tobacco product use. A significant decline in current e-cigarette use occurred among high school students from 2022 to 2023 (from 14.1% to 10.0%). Given the negative health consequences of tobacco use (*2*) and the unique harms associated with adolescent nicotine exposure (*1*), prevention of tobacco use by youths is imperative. Thus, a continued comprehensive approach to tobacco use prevention is needed to further reduce tobacco use among youths, based on knowledge about youth product use behaviors. Further, longstanding and proven tobacco prevention policies, such as price increases, comprehensive smoke-free policies (that include e-cigarettes), counter-marketing campaigns, and health care intervention, will continue to reduce youth initiation and tobacco use (*5*).

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Tuberculosis Testing and Latent Tuberculosis Infection Treatment Practices Among Health Care Providers — United States, 2020–2022

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Abstract

CDC recommends testing persons at increased risk for tuberculosis (TB) infection as part of routine health care, using TB blood tests, when possible, and, if a diagnosis of latent TB infection (LTBI) is made, prescribing a rifamycin-based, 3- or 4-month treatment regimen (short-course) to prevent the development of TB disease. In 2022, approximately three quarters (73%) of reported TB cases in the United States occurred among non–U.S.-born persons. To assess TB-related practices among health care providers (HCPs) in the United States, CDC analyzed data from the 2020–2022 Porter Novelli DocStyles surveys. Approximately one half (53.3%) of HCPs reported routinely testing non–U.S.-born patients for TB, and of those who did, 35.7% exclusively ordered recommended blood tests, 44.2% exclusively ordered skin tests, and 20.2% ordered TB skin tests and blood tests. One third (33.0%) of HCPs reported prescribing recommended short-course LTBI treatment regimens, and 4.0% reported doing none of the treatment practices available for patients with LTBI (i.e., prescribing short-course regimens, longer course regimens, or referring patients to a health department). Further efforts are needed to identify and overcome barriers for providers to test for and treat persons at risk for TB.

Introduction

CDC estimates that up to 13 million persons in the United States have latent tuberculosis infection (LTBI) (*1*). Approximately 5%–10% of persons with LTBI in the United States who remain untreated will develop tuberculosis (TB) disease at some point in their lifetime. TB disease is infectious and can be fatal. In 2022, approximately three quarters (73%) of reported TB cases in the United States occurred among non–U.S.-born persons (2). The most common countries of birth among non–U.S.-born persons with TB have been China India, Mexico, Philippines, and Vietnam.* Efforts to eliminate TB in the United States include finding and treating persons with TB disease, expanding LTBI testing and treatment to prevent progression to TB disease, and addressing disparities among groups disproportionately experiencing impacts of TB. Since 1992, TB cases have generally decreased in the United States; however, ongoing TB prevention and control efforts are needed to continue this trend and achieve TB elimination in the United States (<1 case per million persons annually) (*2*).

Persons who were born in countries where TB disease is common are at increased risk for TB infection (*3*). In addition, many persons born outside the United States have received the Bacille Calmette-Guérin (BCG) TB vaccine. This vaccine is often given to infants and small children in countries where TB is common to decrease the risk for childhood TB meningitis and disseminated disease; however, it is not thought to prevent pulmonary TB disease in adolescents and adults, and protection wanes over time (*4*). Having previously received the BCG vaccine can cause a false-positive reaction to TB skin tests, leading to falsely diagnosing TB infection or conversely, misattributing a positive TB test result to childhood BCG vaccination, even though the patient does have TB infection (*5*). TB blood tests are not affected by previous BCG vaccination. When possible, CDC recommends that health care providers (HCPs) test persons at risk for TB using TB blood tests (interferon-gamma release assays), and if a diagnosis of LTBI is made, prescribe a short-course LTBI treatment regimen in preference to longer course 6- or 9-month isoniazid monotherapy (*2*,*6*). Persons at increased risk for TB infection should be tested for TB infection as part of routine health care (*6*). TB-related questions were added to the Porter Novelli DocStyles survey to assess HCP testing and treatment practices.

Methods

Data Collection

Porter Novelli conducts online surveys of U.S. HCPs. TB questions were included in the 2020, 2021, and 2022 DocStyles annual fall surveys. Each year Porter Novelli sets quotas to collect completed surveys from 1,000 primary care physicians (i.e., family practitioners and internists) and 250 each of obstetricians/gynecologists, pediatricians, and nurse practitioners or physician assistants. Respondents must practice in the United States; actively see patients; work in an individual, group, or inpatient or hospital practice; and have been practicing for ≥3 years. Respondents were asked, “Do you routinely test non–U.S.-born patients for tuberculosis (TB)?” and instructed to select one of the following response options: “Yes, with a TB blood test,” “Yes, with a TB skin test,” “Yes, with a TB blood test and skin test,” “No, I do not regularly

* https://www.cdc.gov/tb/statistics/reports/2021/table11.htm

test for TB," "I refer patients to the health department," and "Prefer not to answer." Respondents were also asked to select all of the following LTBI treatment regimens they prescribe: "Isoniazid & Rifapentine - 3 months (3HP)," "Rifampin - 4 months (4R)," "Isoniazid & Rifampin - 3 months (3HR)," "Isoniazid - 6 months (6H)," "Isoniazid - 9 months (9H)," "I refer patients to the health department," and "None of these." Additional information on methods and response rates is available on the Porter Novelli website.†

Data Analysis

Data from the three survey years were combined by retaining variables that were consistent among the years and, for respondents who participated in more than 1 year, respondents' most recent survey participation year of data. DocStyles respondents who responded "prefer not to answer" to either TB question were excluded (47), and obstetricians/gynecologists were excluded because they were not asked questions about TB (563). Data from 3,647 DocStyles respondents for 2020–2022 were retained and analyzed. Percentages were calculated for demographic characteristics and TB-related variables. Pearson's chi-square and Fisher's exact tests were performed to examine associations between demographic characteristics and responses to TB questions. Associations were considered statistically significant if p-values were <0.05. For significant chi-square associations, post-hoc calculations of adjusted standardized residuals were performed. Bonferroni corrections were applied to chi-square p-values and adjusted standardized residual critical values to reduce the likelihood of type I error (*7*). Analyses were conducted using SPSS software (version 27; IBM). This activity was reviewed by CDC, deemed not research, and was conducted consistent with applicable federal law and CDC policy.§

Results

TB Testing Practices

Among 3,647 respondents, approximately one half (1,945; 53.3%) reported routinely testing non–U.S.-born patients for TB. A total of 1,446 (39.6%) reported not regularly testing non–U.S.-born patients for TB, and 256 (7.0%) reported referring non–U.S.-born patients to a health department for TB testing (Table 1). The groups with the highest proportion reporting that they routinely test non–U.S.-born patients for TB were pediatricians (63.1%), providers aged >55 years (60.3%), those in practice for >25 years (60.4%), and those practicing in group outpatient settings (56.7%). The HCPs with the highest percentage reporting that they did not regularly test non–U.S.-born patients for TB (50.2%) were those working in inpatient or hospital practices. The HCP groups with the highest percentage reporting referring non–U.S.-born patients to a health department for TB testing were nurse practitioners (14.1%) and those working in rural settings (12.8%). Among the 1,945 providers who reported regularly testing non–U.S.-born patients for TB, 859 (44.2%) reported using TB skin tests, 694 (35.7%) reported using TB blood tests, and 392 (20.2%) reported using TB skin tests and blood tests (Table 2). Among the 859 respondents who reported using a TB skin test, this practice was more prevalent among those who worked in rural settings (59.6% of respondents practicing in rural settings).

LTBI Treatment Practices

Among all 3,647 respondents, one third (1,203; 33.0%) reported prescribing recommended short-course regimens to treat LTBI, 1,349 (37.0%) reported prescribing longer course treatments, and 1,490 (40.9%) reported referring patients to a health department for LTBI treatment (Table 3) (responses were not mutually exclusive). More than one half (59.1%) reported prescribing any LTBI treatment (either short- or long-course regimens). By provider group characteristic, those who most commonly prescribed short-course treatment regimens included internists (41.1%), those practicing in urban settings (39.4%), and in inpatient or hospital practices (39.7%). The highest percentages of providers who reported referring patients to a health department for LTBI treatment were nurse practitioners (64.3%), physician assistants (60.7%), and those working in rural settings (56.4%). Among providers across all U.S. Census Bureau regions, those in the West reported the lowest prevalence of health department referrals for LTBI treatment (32.0%), but when offering treatment, these providers most often reported prescribing longer-course LTBI treatment regimens (43.6%). Overall, 9.6% of physician assistants reported doing "none of these" LTBI treatment practices, the highest prevalence among all specialty groups (2.2% family practitioner, 3.9% internist, 6.2% nurse practitioner, and 3.2% pediatrician).

Discussion

CDC and the U.S. Preventive Services Task Force recommend testing persons at increased risk for TB infection as part of routine health care (3). HCPs are encouraged to use TB blood tests to test for TB infection; however, blood tests might not be available to all HCPs (3). It is not generally recommended to use both a TB skin test and a TB blood test to test the same person (3). Although recommended short-course LTBI treatment regimens are effective, safe, and associated with

† https://styles.porternovelli.com/docstyles
§ 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.

TABLE 1. Type of tuberculosis testing practices* for non–U.S.-born patients, by health care provider characteristics (N = 3,647) — DocStyles survey, United States, 2020–2022

Characteristic	No. (column %)	Testing practice, no. (row %)			p-value[§]
	Total	Any type of TB test[†]	Do not regularly test for TB	Refer patients to a health department	
Overall	**3,647 (100.0)**	**1,945 (53.3)**	**1,446 (39.6)**	**256 (7.0)**	—
Specialty					
Family practitioner	**1,073 (29.4)**	606 (56.5)	403 (37.6)	64 (6.0)	<0.001[¶]
Internist	**1,286 (35.3)**	670 (52.1)	548 (42.6)	68 (5.3)	
Nurse practitioner	**305 (8.4)**	127 (41.6)**	135 (44.3)	43 (14.1)[††]	
Pediatrician	**629 (17.2)**	397 (63.1)[††]	192 (30.5)**	40 (6.4)	
Physician assistant	**354 (9.7)**	145 (41.0)**	168 (47.5)	41 (11.6)	
Gender[§§]					
Female	**1,518 (41.6)**	737 (48.6)	655 (43.1)	126 (8.3)	<0.001[¶,¶¶]
Male	**2,115 (58.0)**	1,198 (56.6)	788 (37.3)	129 (6.1)	
Other	**14 (0.4)**	10 (71.4)	3 (21.4)	1 (7.1)	
Age group, yrs					
25–40	**1,328 (36.4)**	653 (49.2)**	571 (43.0)	104 (7.8)	<0.001[¶]
41–55	**1,500 (41.1)**	798 (53.2)	606 (40.4)	96 (6.4)	
>55	**819 (22.5)**	494 (60.3)[††]	269 (32.8)	56 (6.8)	
Yrs in practice					
3–10	**1,291 (35.4)**	627 (48.6)**	559 (43.3)	105 (8.1)	<0.001[¶]
11–25	**1,727 (47.4)**	938 (54.3)	681 (39.4)	108 (6.3)	
>25	**629 (17.2)**	380 (60.4)[††]	206 (32.8)[¶]	43 (6.8)	
U.S. Census Bureau region* **					
Northeast	**780 (21.4)**	429 (55.0)	300 (38.5)	51 (6.5)	0.364
Midwest	**959 (26.3)**	475 (49.5)	413 (43.1)	71 (7.4)	
South	**1,131 (31.0)**	590 (52.2)	448 (39.6)	93 (8.2)	
West	**777 (21.3)**	451 (58.0)	285 (36.7)	41 (5.3)	
Urban-rural status[†††]					
Urban	**1,387 (38.0)**	779 (56.2)	523 (37.7)	85 (6.1)	<0.001[¶]
Suburban	**1,868 (51.2)**	995 (53.3)	752 (40.3)	121 (6.5)	
Rural	**392 (10.7)**	171 (43.6)**	171 (43.6)	50 (12.8)[††]	
Work setting					
Individual outpatient practice	**573 (15.7)**	301 (52.5)	215 (37.5)	57 (9.9)	<0.001[¶]
Group outpatient practice	**2,436 (66.8)**	1,381 (56.7)[††]	911 (37.4)**	144 (5.9)**	
Inpatient practice	**638 (17.5)**	263 (41.2)**	320 (50.2)[††]	55 (8.6)	
Approximate patient household income					
<$25,000	**234 (6.4)**	121 (51.7)	94 (40.2)	19 (8.1)	0.999
$25,000–$49,999	**895 (24.5)**	460 (51.4)	362 (40.4)	73 (8.2)	
$50,000–$99,999	**1,436 (39.4)**	743 (51.7)	597 (41.6)	96 (6.7)	
$100,000–$249,999	**749 (20.5)**	438 (58.5)	258 (34.4)	53 (7.1)	
≥$250,000	**333 (9.1)**	183 (55.0)	135 (40.5)	15 (4.5)	

Abbreviation: TB = tuberculosis.

* Respondents were asked to select one response to the question "Do you routinely test non–U.S.-born patients for tuberculosis (TB)?" Those who selected "Prefer not to answer" were removed from the DocStyles sample (47). Percentages might not sum to 100 because of rounding.

† Responses of "TB skin test," "TB blood test," or "TB skin test and blood test" were grouped into the category of "Any type of TB test" for analysis.

§ Associations between provider characteristics and responses to TB testing questions were calculated using Pearson's chi-square tests with Bonferroni-corrected p-values unless otherwise indicated, in which case Fisher's exact test was used.

¶ Value is statistically significant at $p<0.05$.

** Adjusted standardized residual ≤−3.6, indicating significantly less than expected cell value.

†† Adjusted standardized residual ≥3.6, indicating significantly greater than expected cell value.

§§ The "Other" option for gender was not available in the 2020 survey.

¶¶ Because of small cell sizes, significance was calculated using the Monte Carlo approximation for Fisher's exact test (based on 10,000 sampled tables at a 99% CI). Adjusted standardized residuals were not calculated.

*** https://www2.census.gov/geo/pdfs/maps-data/maps/reference/us_regdiv.pdf

††† Determined by the question, "How would you describe the community where you primarily work?"

higher completion rates than are longer regimens (*8*), more HCPs indicated that they prescribe longer regimens or refer patients to a health department, with only one third reporting prescribing short-course regimens. The reasons for this were not identified in the survey; however, because of limited supplies of recommended drugs and intermittent shortages (*9*), short-course regimens might not be available at all times for all HCPs. Because not all health departments provide LTBI treatment or have the capacity to manage LTBI patients, future work is needed to identify barriers and implement interventions to facilitate prescribing LTBI treatment and managing LTBI patients by primary care providers.

TABLE 2. Type of test used by health care providers who reported any tuberculosis testing of non–U.S.-born patients, by health care provider characteristics (N = 1,945) — DocStyles survey, United States, 2020–2022

Characteristic	Total (column %)	Type of test used, no. (row %)*			p-value†
		TB skin test	TB blood test	TB skin test and blood test	
Overall	**1,945 (100.0)**	**859 (44.2)**	**694 (35.7)**	**392 (20.2)**	—
Specialty					
Family practitioner	**606 (31.2)**	279 (46.0)	206 (34.0)	121 (20.0)	0.164
Internist	**670 (34.4)**	254 (37.9)	274 (40.9)	142 (21.2)	
Nurse practitioner	**127 (6.5)**	62 (48.8)	46 (36.2)	19 (15.0)	
Pediatrician	**397 (20.4)**	196 (49.4)	116 (29.2)	85 (21.4)	
Physician assistant	**145 (7.5)**	68 (46.9)	52 (35.9)	25 (17.2)	
Gender§					
Female	**737 (37.9)**	344 (46.7)	239 (32.4)	154 (20.9)	0.150¶
Male	**1,198 (61.6)**	511 (42.7)	452 (37.7)	235 (19.6)	
Other	**10 (0.5)**	4 (40.0)	3 (30.0)	3 (30.0)	
Age group, yrs					
25–40	**653 (33.6)**	253 (38.7)	262 (40.1)	138 (21.1)	0.059
41–55	**798 (41.0)**	357 (44.7)	270 (33.8)	171 (21.4)	
>55	**494 (25.4)**	249 (50.4)	162 (32.8)	83 (16.8)	
Yrs in practice					
3–10	**627 (32.2)**	247 (39.4)	252 (40.2)	128 (20.4)	0.114
11–25	**938 (48.2)**	416 (44.3)	322 (34.3)	200 (21.3)	
>25	**380 (19.5)**	196 (51.6)	120 (31.6)	64 (16.8)	
U.S. Census Bureau region**					
Northeast	**429 (22.1)**	186 (43.4)	151 (35.2)	92 (21.4)	0.999
Midwest	**475 (24.4)**	213 (44.8)	178 (37.5)	84 (17.7)	
South	**590 (30.3)**	279 (47.3)	196 (33.2)	115 (19.5)	
West	**451 (23.2)**	181 (40.1)	169 (37.5)	101 (22.4)	
Urban-rural status††					
Urban	**779 (40.1)**	291 (37.4)§§	312 (40.1)	176 (22.6)	<0.001***
Suburban	**995 (51.2)**	466 (46.8)	342 (34.4)	187 (18.8)	
Rural	**171 (8.8)**	102 (59.6)¶¶	40 (23.4)	29 (17.0)	
Work setting					
Individual outpatient practice	**301 (15.5)**	142 (47.2)	104 (34.6)	55 (18.3)	0.999
Group outpatient practice	**1,381 (71.0)**	610 (44.2)	495 (35.8)	276 (20.0)	
Inpatient practice	**263 (13.5)**	107 (40.7)	95 (36.1)	61 (23.2)	
Approximate patient household income					
<$25,000	**121 (6.2)**	56 (46.3)	45 (37.2)	20 (16.5)	0.999
$25,000–$49,999	**460 (23.7)**	199 (43.3)	170 (37.0)	91 (19.8)	
$50,000–$99,999	**743 (38.2)**	351 (47.2)	256 (34.5)	136 (18.3)	
$100,000–$249,999	**438 (22.5)**	188 (42.9)	154 (35.2)	96 (21.9)	
≥$250,000	**183 (9.4)**	65 (35.5)	69 (37.7)	49 (26.8)	

Abbreviation: TB = tuberculosis.

* Respondents were asked to select one response to the question "Do you routinely test non–U.S.-born patients for tuberculosis (TB)?" Those who selected "Prefer not to answer" were removed from the DocStyles sample (47). Percentages might not sum to 100 because of rounding.

† Associations between provider characteristics and responses to TB testing questions were calculated using Pearson's chi-square tests with Bonferroni-corrected p-values unless otherwise indicated, in which case Fisher's exact test was used.

§ The "Other" option for gender was not available in the 2020 survey.

¶ Because of small cell sizes, significance was calculated using the Monte Carlo approximation for Fisher's exact test (based on 10,000 sampled tables at a 99% CI). Adjusted standardized residuals were not calculated.

** https://www2.census.gov/geo/pdfs/maps-data/maps/reference/us_regdiv.pdf

†† Based on responses to the question, "How would you describe the community where you primarily work?"

§§ Adjusted standardized residual ≤−3.6, indicating significantly less than expected cell value.

¶¶ Adjusted standardized residual ≥3.6, indicating significantly greater than expected cell value.

*** Value is statistically significant at p<0.05.

Overall, U.S. TB case rates have declined during the past 2 decades (*2*); however, this trend could stagnate if actions to prevent TB are not implemented by HCPs serving groups experiencing disproportionate risk for TB and progressing from LTBI to TB disease. Because of gaps in provider knowledge and practice identified in this analysis of DocStyles results, priorities include continuing medical education about TB testing and LTBI treatment, especially among physician assistants and nurse practitioners; implementing interventions to improve HCP adherence to recommended practices (e.g., electronic medical record prompts); and identifying provider groups that

TABLE 3. Latent tuberculosis infection treatment prescribing practices reported by health care providers, by health care provider characteristics (N = 3,647) — DocStyles survey, United States, 2020–2022

	Treatment regimens for latent tuberculosis infection prescribed, no. (row %)*											
	Short course treatment regimen (3HP, 3HR, or 4R)			Longer course treatment regimen (6H or 9H)			Refer patients to a health department			None of these		
Characteristic	**Yes**	**No**	**p-value†**	**Yes**	**No**	**p-value†**	**Yes**	**No**	**p-value†**	**Yes**	**No**	**p-value†**
Overall	**1,203 (33.0)**	**2,444 (67.0)**	—	**1,349 (37.0)**	**2,298 (63.0)**	—	**1,490 (40.9)**	**2,157 (59.1)**	—	**147 (4.0)**	**3,500 (96.0)**	—
Specialty												
Family practitioner	392 (36.5)	681 (63.5)	<0.001§	425 (39.6)	648 (60.4)	<0.001§	418 (39.0)	655 (61.0)	<0.001§	24 (2.2)¶	1,049 (97.8) **	<0.001§
Internist	529 (41.1)**	757 (58.9)¶		580 (45.1)**	706 (54.9)¶		378 (29.4)¶	908 (70.6)**		50 (3.9)	1,236 (96.1)	
Nurse practitioner	71 (23.3)¶	234 (76.7)**		45 (14.8)¶	260 (85.2)**		196 (64.3)**	109 (35.7)¶		19 (6.2)	286 (93.8)	
Pediatrician	136 (21.6)¶	493 (78.4)**		249 (39.6)	380 (60.4)		283 (45.0)	346 (55.0)		20 (3.2)	609 (96.8)	
Physician assistant	75 (21.2)¶	279 (78.8)**		50 (14.1)¶	304 (85.9)**		215 (60.7)**	139 (39.3)¶		34 (9.6) **	320 (90.4)¶	
Gender††												
Female	418 (27.5)	1,100 (72.5)	<0.001§,§§	468 (30.8)¶	1,050 (69.2)**	<0.001§	748 (49.3)**	770 (50.7)¶	<0.001§	74 (4.9)	1,444 (95.1)	0.082§§
Male	779 (36.8)	1,336 (63.2)		875 (41.4)**	1,240 (58.6)¶		737 (34.8)¶	1,378 (65.2)**		73 (3.5)	2,042 (96.5)	
Other	6 (42.9)	8 (57.1)		6 (42.9)	8 (57.1)		5 (35.7)	9 (64.3)		0 (—)	14 (100.0)	
Age group, yrs												
25–40	458 (34.5)	870 (65.5)	0.999	422 (31.8)¶	906 (68.2)**	0.001§	594 (44.7)**	734 (55.3)¶	0.019§	60 (4.5)	1,268 (95.5)	0.999
41–55	482 (32.1)	1,018 (67.9)		613 (40.9)**	887 (59.1)¶		561 (37.4)	939 (62.6)		59 (3.9)	1,441 (96.1)	
>55	263 (32.1)	556 (67.9)		314 (38.3)	505 (61.7)		335 (40.9)	484 (59.1)		28 (3.4)	791 (96.6)	
Yrs in practice												
3–10	446 (34.5)	845 (65.5)	0.999	424 (32.8)¶	867 (67.2)**	0.012§	572 (44.3)	719 (55.7)	0.006§	54 (4.2)	1,237 (95.8)	0.999
11–25	558 (32.3)	1,169 (67.7)		692 (40.1)**	1,035 (59.9)¶		643 (37.2)¶	1,084 (62.8)**		75 (4.3)	1,652 (95.7)	
>25	199 (31.6)	430 (68.4)		233 (37.0)	396 (63.0)		275 (43.7)	354 (56.3)		18 (2.9)	611 (97.1)	
U.S. Census Bureau region¶¶												
Northeast	252 (32.3)	528 (67.7)	0.110	308 (39.5)	472 (60.5)	<0.001§	311 (39.9)	469 (60.1)	<0.001§	28 (3.6)	752 (96.4)	0.999
Midwest	297 (31.0)	662 (69.0)		322 (33.6)	637 (66.4)		425 (44.3)	534 (55.7)		35 (3.6)	924 (96.4)	
South	354 (31.3)	777 (68.7)		380 (33.6)	751 (66.4)		505 (44.7)	626 (55.3)		53 (4.7)	1,078 (95.3)	
West	300 (38.6)	477 (61.4)		339 (43.6)**	438 (56.4)¶		249 (32.0)¶	528 (68.0)**		31 (4.0)	746 (96.0)	
Urban-rural status* **												
Urban	547 (39.4)**	840 (60.6)¶	<0.001§	573 (41.3)**	814 (58.7)¶	<0.001§	456 (32.9)¶	931 (67.1)**	<0.001§	66 (4.8)	1,321 (95.2)	0.999
Suburban	547 (29.3)¶	1,321 (70.7)**		680 (36.4)	1,188 (63.6)		813 (43.5)	1,055 (56.5)		69 (3.7)	1,799 (96.3)	
Rural	109 (27.8)	283 (72.2)		96 (24.5)¶	296 (75.5)**		221 (56.4)**	171 (43.6)¶		12 (3.1)	380 (96.9)	
Work setting												
Individual outpatient practice	196 (34.2)	377 (65.8)	0.007§	190 (33.2)	383 (66.8)	0.999	235 (41.0)	338 (59.0)	0.277	26 (4.5)	547 (95.5)	0.060
Group outpatient practice	754 (31.0)¶	1,682 (69.0)**		933 (38.3)	1,503 (61.7)		1,030 (42.3)	1,406 (57.7)		80 (3.3)	2,356 (96.7)	
Inpatient practice	253 (39.7)**	385 (60.3)¶		226 (35.4)	412 (64.6)		225 (35.3)	413 (64.7)		41 (6.4)	597 (93.6)	

See table footnotes on the next page.

TABLE 3. (*Continued*) Latent tuberculosis infection treatment prescribing practices reported by health care providers, by health care provider characteristics (N = 3,647) — DocStyles survey, United States, 2020–2022

Characteristic	Short course treatment regimen (3HP, 3HR, or 4R) Yes	Short course treatment regimen (3HP, 3HR, or 4R) No	p-value†	Longer course treatment regimen (6H or 9H) Yes	Longer course treatment regimen (6H or 9H) No	p-value†	Refer patients to a health department Yes	Refer patients to a health department No	p-value†	None of these Yes	None of these No	p-value†
Approximate patient household income												
<$25,000	79 (33.8)	155 (66.2)	0.999	72 (30.8)	162 (69.2)	0.999	102 (43.6)	132 (56.4)	0.999	9 (3.8)	225 (96.2)	0.870
$25,000–$49,999	300 (33.5)	595 (66.5)		323 (36.1)	572 (63.9)		378 (42.2)	517 (57.8)		31 (3.5)	864 (96.5)	
$50,000–$99,999	451 (31.4)	985 (68.6)		533 (37.1)	903 (62.9)		583 (40.6)	853 (59.4)		75 (5.2)	1,361 (94.8)	
$100,000–$249,999	251 (33.5)	498 (66.5)		276 (36.8)	473 (63.2)		315 (42.1)	434 (57.9)		27 (3.6)	722 (96.4)	
≥$250,000	122 (36.6)	211 (63.4)		145 (43.5)	188 (56.5)		112 (33.6)	221 (66.4)		5 (1.5)	328 (98.5)	

Treatment regimens for latent tuberculosis infection prescribed, no. (row %)*

Abbreviations: 3HP = 3 months of once-weekly isoniazid plus rifapentine; 3HR = 3 months of daily isoniazid plus rifampin; 4R = 4 months of daily rifampin; 6H = 6 months of daily or twice weekly isoniazid; 9H = 9 months of daily or twice weekly isoniazid; LTBI = latent tuberculosis infection.

* Respondents could select more than one response. Respondents were asked to select one response to the question, "Do you routinely test non–U.S.-born patients for tuberculosis (TB)?" Those who selected "Prefer not to answer" were removed from the DocStyles sample (47). Percentages might not sum to 100 because of rounding.

† Associations between provider characteristics and selection or nonselection of response options for LTBI testing variable were calculated using Pearson's chi-square tests with Bonferroni-corrected p-values unless otherwise indicated, in which case Fisher's exact test was used.

§ Value is statistically significant at $p<0.05$.

¶ Adjusted standardized residual ≤−3.6, indicating significantly less than expected cell value.

** Adjusted standardized residual ≥3.6, indicating significantly greater than expected cell value.

†† The "Other" option for gender was not available in the 2020 survey.

§§ Because of small cell sizes, significance was calculated using the Monte Carlo approximation for Fisher's exact test (based on 10,000 sampled tables at a 99% CI). Adjusted standardized residuals were not calculated.

¶¶ https://www2.census.gov/geo/pdfs/maps-data/maps/reference/us_regdiv.pdf

*** Determined by the question, "How would you describe the community where you primarily work?"

might need resources to overcome barriers to implementing recommended TB testing and LTBI treatment.

Limitations

The findings in this report are subject to at least four limitations. First, surveys relied on self-reported data, which are subject to recall and social desirability biases. Second, because participant characteristics might differ from the overall U.S. HCP population, results are not generalizable. Third, closed-ended survey questions did not allow for nuance in response. Finally, HCPs' reasons for LTBI testing and treatment practices were not collected. Despite these limitations, DocStyles surveys provide valuable insights and can help guide outreach, education, and training efforts.

Implications for Public Health Practice

CDC and partners provide resources¶ for providers on recommended practices for testing and treating TB and LTBI. To eliminate TB in the United States, further efforts are needed to address barriers for providers to test for and treat persons at risk for TB.

¶ https://www.cdc.gov/tb/education/provider_edmaterials.htm

Summary

What is already known about this topic?

CDC recommends testing persons at increased risk for tuberculosis (TB) infection as part of routine health care using TB blood tests, when possible, and if a diagnosis of latent TB infection (LTBI) is made, prescribing a short-course treatment regimen. In 2022, approximately three quarters of reported U.S. TB cases occurred among non–U.S.-born persons.

What is added by this report?

Among 3,647 health care providers, approximately one half (53%) reported routinely testing non–U.S.-born patients for TB. More than one half (59%) reported prescribing any LTBI treatment; 33% reported prescribing short-course regimens. In addition, 41% referred patients to a health department for treatment.

What are the implications for public health practice?

Identifying and overcoming barriers to recommended testing and treatment is important to prevent disease and achieve TB elimination goals.

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Vaccination Coverage by Age 24 Months Among Children Born in 2019 and 2020 — National Immunization Survey-Child, United States, 2020–2022

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Abstract

National Immunization Survey-Child data collected in 2022 were combined with data from previous years to assemble birth cohorts and assess coverage with routine vaccines by age 24 months by birth cohort. Overall, vaccination coverage was similar among children born during 2019–2020 compared with children born during 2017–2018, except that coverage with both the birth dose of hepatitis B vaccine and ≥1 dose of hepatitis A vaccine increased. Coverage was generally higher among non-Hispanic White (White) children (2–21 percentage points higher than coverage for non-Hispanic Black or African American, Hispanic or Latino, and non-Hispanic American Indian/Alaska Native [AI/AN] children), children living at or above poverty (3.5–22 percentage points higher than coverage for children living below the federal poverty level), privately insured children (2.4–38 percentage points higher than coverage for children with Medicaid, other insurance, or no insurance), and children in urban areas (3–16.5 percentage points higher than coverage for children living in rural areas). Coverage with the full series of *Haemophilus influenzae* type b conjugate vaccine was lower among AI/AN children compared with White children. Trends in vaccination coverage disparities across categories of race and ethnicity, health insurance status, poverty status, and urbanicity were evaluated for the 2016–2020 birth cohorts. Fewer than 5% of 168 trends examined were statistically significant, including six increases (widening of the coverage gap) and one decrease (narrowing of the gap). Analyses revealed a widening of the gap between children living at or above the poverty level (higher coverage) and those living below poverty (lower coverage), for several vaccines. Socioeconomic, demographic, and geographic disparities in vaccination coverage persist; addressing them is important to ensure protection for all children against vaccine-preventable disease.

Introduction

The World Health Organization describes immunization as a "global health and development success story," responsible for preventing 3.5–5 million deaths each year.* In the United States, the Advisory Committee on Immunization Practices (ACIP) recommends vaccines against 15 potentially serious diseases by age 24 months[†] (*1*). For nearly 30 years, the National Immunization Survey-Child (NIS-Child) has monitored coverage with ACIP-recommended childhood vaccines in the United States. National coverage estimates provide an overall picture of the strength of the U.S. immunization program and insight into coverage with new vaccines. Stratification by sociodemographic and geographic variables allows for identification of subpopulations at higher risk for disease because of lower vaccination coverage. NIS-Child data have been used previously to assess the impact of the COVID-19 pandemic on coverage with childhood vaccinations (*2*). This assessment did not identify any consistent or persistent decline in vaccination coverage associated with the COVID-19 pandemic at the national level. Among certain subgroups, however, coverage was lower during the pandemic period. For example, coverage with the combined seven-vaccine series by age 24 months decreased 4–5 percentage points among children living below the federal poverty level or in rural areas.

Methods

Data Collection

NIS-Child uses random-digit-dialing to identify U.S. households that contain children aged 19–35 months.[§] A telephone survey[¶] is conducted with the parent or guardian who is most knowledgeable about the child's immunization history, and consent is requested to contact the child's vaccine providers. If consent is granted, a questionnaire is mailed to all the child's providers to obtain vaccination information, which is synthesized to create the child's comprehensive vaccination

* https://www.who.int/health-topics/vaccines-and-immunization#tab=tab_1

† Vaccination against COVID-19 was recommended for children aged 6 months–4 years in June 2022 (https://www.cdc.gov/mmwr/volumes/71/wr/mm7126e2.htm). Because the recommendation was not in effect until midway through the data collection year, an accurate estimate of COVID-19 vaccine coverage cannot be calculated from the 2022 data.

§ Estimates for U.S. Department of Health and Human Services regions, states, selected local areas, and the U.S. territories of Guam and Puerto Rico (https://www.cdc.gov/vaccines/imz-managers/coverage/childvaxview/data-reports/index.html). Certain local areas that receive federal Section 317 immunization funds are sampled separately and included in the NIS-Child sample every year (Chicago, Illinois; New York, New York; Philadelphia County, Pennsylvania; Bexar County, Texas; and Houston, Texas). National estimates in this report exclude U.S. territories.

¶ The NIS-Child used a landline-only sampling frame during 1995–2010. During 2011–2017, the survey was conducted using a dual-frame design, with both mobile and landline sampling frames included. In 2018, the NIS-Child returned to a single-frame design, with all interviews conducted by mobile telephone.

history. Children born during 2019–2020 were identified using data collected during 2020–2022. The household interview response rate** for 2022 was 25.1%, and 49.7% of children with completed parent or guardian interviews had adequate provider data,†† resulting in data from 27,733 children available for analysis.

Data Analysis

All NIS-Child coverage estimates are based on information supplied by providers. Kaplan-Meier techniques were used to estimate vaccination coverage by age 24 months, except for the birth dose of hepatitis B vaccine (HepB)§§ and rotavirus vaccine.¶¶ Because of a change in ACIP recommendations and an extremely long period of eligibility for catch-up vaccination, coverage with ≥2 doses of hepatitis A vaccine (HepA) was estimated by age 35 months (the maximum age available) as well as by age 24 months.*** The significance of coverage differences was assessed using z-tests; $p<0.05$ was considered statistically significant. Vaccination coverage among children born during 2019–2020 was compared with that among children born during 2017–2018. Five-year trends in coverage and in socioeconomic and demographic disparities by year of birth were evaluated by fitting a linear regression model and testing for the significance of the slope (average annual percentage point change [AAPPC]). Analyses used weighted data and were performed using SAS software (version 9.4; SAS Institute) and SUDAAN software (version 11; RTI International). This activity was reviewed by CDC, deemed not research, and was conducted consistent with applicable federal law and CDC policy.†††

** The Council of American Survey Research Organizations (CASRO) household response rate is calculated as the product of the resolution rate (percentage of the total telephone numbers called that were classified as nonworking, nonresidential, or residential), screening completion rate (percentage of known households that were successfully screened for the presence of age-eligible children), and the interview completion rate (percentage of households with one or more age-eligible children that completed the household survey). For CASRO response rates and the proportions of children with household interviews that had adequate provider data for survey years 2015–2020. https://www.cdc.gov/vaccines/imz-managers/nis/downloads/NIS-PUF20-DUG.pdf

†† Children with at least one vaccination reported by a provider and those who had received no vaccinations were considered to have adequate provider data. "No vaccinations" indicates that the vaccination status is known because the parent or guardian indicated there were no vaccinations and the providers returned no immunization history forms or returned them indicating that no vaccinations had been administered.

§§ Coverage with the birth dose of HepB is measured as the proportion of infants or newborns who received a dose of HepB by age 3 days.

¶¶ Rotavirus is assessed at age 8 months to reflect the maximum age at administration recommended by ACIP.

*** Before 2020, the first dose of HepA was recommended at age 12–23 months, with the second dose administered 6–18 months after the first, depending upon the product type received. During 2020, recommendation was revised to 2 doses between ages 12 and 23 months, ≥6 months apart. Because children in this analysis were vaccinated under both recommendations, coverage estimates for both <24 months and <35 months are provided.

††† 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.

Results

Children Born During 2019–2020

National vaccination coverage. Estimated coverage with most childhood vaccines was similar among children born during 2019–2020 and those born during 2017–2018, with the exception of a 3.3 percentage point increase in coverage with the HepB birth dose and a 1.5 percentage point increase in coverage with ≥1 dose of HepA (Table 1). The proportion of children completely unvaccinated by age 24 months remained at 1%. Coverage among children born during 2019–2020 exceeded 90% for ≥3 doses of poliovirus vaccine (93.0%), ≥3 doses of HepB (92.1%), ≥1 dose of measles, mumps, and rubella vaccine (MMR) (91.6%), and ≥1 dose of varicella vaccine (VAR) (91.1%). The lowest coverage estimates were observed for ≥2 doses of influenza vaccine (61.3%) and for the combined seven-vaccine series§§§ (69.1%).

Vaccination coverage by selected sociodemographic characteristics and geographic locations. Among children born during 2019–2020, coverage was higher among those who were privately insured compared with uninsured children and children insured by Medicaid or other insurance¶¶¶ for all vaccines except the HepB birth dose, which did not differ between privately insured children and those who were insured by Medicaid (Table 2). Compared with children with private insurance (0.6% unvaccinated), a higher proportion of uninsured children (6.0%) and children on Medicaid (1.2%) received no vaccinations by age 24 months.

Numerous disparities in coverage by race and ethnicity were observed. Most notably, non-Hispanic Black or African American (Black) children, Hispanic or Latino, and non-Hispanic American Indian or Alaska Native (AI/AN) children all had lower coverage with ≥4 doses of diphtheria and tetanus toxoids and acellular pertussis vaccine (DTaP), ≥4 doses of pneumococcal conjugate vaccine (PCV), rotavirus vaccine, ≥2 doses of influenza vaccine, and the combined seven-vaccine series compared with non-Hispanic White (White) children. Coverage with the full series of *Haemophilus influenzae* type b conjugate vaccine (Hib) was lower by 12.1 percentage points among AI/AN children compared with White children. (Supplementary Table 1, https://stacks.cdc.gov/view/cdc/134544). Children living below the federal poverty level had lower coverage than children living at or above the poverty

§§§ The combined seven-vaccine series (4:3:1:3*:3:1:4) includes ≥4 doses of DTaP vaccine; ≥3 doses of poliovirus vaccine; ≥1 dose of measles-containing vaccine; ≥3 or ≥4 doses (depending upon product type) of Hib; ≥3 doses of HepB; ≥1 dose of VAR; and ≥4 doses of PCV.

¶¶¶ "Other insurance" includes the Children's Health Insurance Program, military insurance, coverage through the Indian Health Service, and any other type of health insurance not mentioned elsewhere.

TABLE 1. Estimated vaccination coverage by age 24 months,* among children born during 2017–2018 and 2019–2020 for selected vaccines and doses — National Immunization Survey-Child, United States, 2018–2022

Vaccine/Dose	% (95% CI) Birth years† 2017–2018	2019–2020	Difference (2017–2018 to 2019–2020)
DTaP§			
≥3 doses	93.6 (93.1 to 94.1)	93.8 (93.1 to 94.4)	0.2 (−0.6 to 1.0)
≥4 doses	81.6 (80.8 to 82.4)	81.0 (79.9 to 82.0)	−0.6 (−2.0 to 0.7)
Poliovirus (≥3 doses)	**92.6 (92.0 to 93.2)**	**93.0 (92.3 to 93.6)**	**0.4 (−0.5 to 1.2)**
MMR (≥1 dose)¶	**91.3 (90.7 to 91.9)**	**91.6 (90.8 to 92.2)**	**0.2 (−0.7 to 1.2)**
Hib**			
Primary series	92.8 (92.2 to 93.4)	93.4 (92.7 to 94.0)	0.5 (−0.3 to 1.4)
Full series	79.6 (78.7 to 80.5)	79.1 (78.0 to 80.1)	−0.6 (−2.0 to 0.8)
HepB			
Birth dose††	78.1 (77.2 to 79.0)	81.5 (80.5 to 82.4)	3.3 (2.0 to 4.6)§§
≥3 doses	91.8 (91.2 to 92.4)	92.1 (91.4 to 92.7)	0.3 (−0.6 to 1.2)
VAR (≥1 dose)¶	**90.5 (89.9 to 91.2)**	**91.1 (90.4 to 91.8)**	**0.6 (−0.4 to 1.6)**
PCV			
≥3 doses	92.4 (91.8 to 93.0)	92.8 (92.1 to 93.5)	0.4 (−0.5 to 1.3)
≥4 doses	82.2 (81.4 to 83.1)	82.7 (81.7 to 83.7)	0.5 (−0.9 to 1.8)
HepA			
≥1 dose	86.9 (86.2 to 87.7)	88.4 (87.6 to 89.2)	1.5 (0.4 to 2.5)§§
≥2 doses¶¶	46.4 (45.4 to 47.5)	47.7 (46.4 to 48.9)	1.3 (−0.4 to 2.9)
≥2 doses (by age 35 mos)¶¶	78.1 (76.9 to 79.3)	80.0 (78.4 to 81.6)	1.9 (−0.1 to 3.9)
Rotavirus (by age 8 mos)***	**75.7 (74.8 to 76.6)**	**76.6 (75.6 to 77.7)**	**0.9 (−0.4 to 2.3)**
Influenza (≥2 doses)†††	**60.6 (59.6 to 61.6)**	**61.3 (60.1 to 62.5)**	**0.7 (−0.9 to 2.2)**
Combined seven-vaccine series§§§	**70.0 (69.0 to 71.0)**	**69.1 (67.9 to 70.2)**	**−0.9 (−2.5 to 0.6)**
No vaccinations¶¶¶	1.0 (0.9 to 1.2)	1.0 (0.8 to 1.2)	0.0 (−0.3 to 0.2)

Abbreviations: DTaP = diphtheria and tetanus toxoids and acellular pertussis vaccine; HepA = hepatitis A vaccine; HepB = hepatitis B vaccine; Hib = *Haemophilus influenzae* type b conjugate vaccine; MMR = measles, mumps, and rubella vaccine; PCV = pneumococcal conjugate vaccine; VAR = varicella vaccine.

* Includes vaccinations received by age 24 months, except for the HepB birth dose, rotavirus vaccination, and ≥2 HepA doses by age 35 months. For all vaccines except the HepB birth dose and rotavirus vaccination, the Kaplan-Meier method was used to estimate vaccination coverage to account for children whose vaccination history was ascertained before age 24 months (35 months for ≥2 HepA doses).

† Data for the 2017 birth year are from survey years 2018, 2019, and 2020; data for the 2018 birth year are from survey years 2019, 2020, and 2021; data for 2019 birth year are from survey years 2020, 2021, and 2022; data for the 2020 birth year are considered preliminary and are from survey years 2021 and 2022 (data from survey year 2023 are not yet available).

§ Includes children who might have been vaccinated with diphtheria and tetanus toxoids vaccine or diphtheria, tetanus toxoids, and pertussis vaccine. Healthy People 2030 target for ≥4 doses of DTaP by age 2 years is 90%. https://health.gov/healthypeople/objectives-and-data/browse-objectives/vaccination

¶ Includes children who might have been vaccinated with MMR and varicella combination vaccine. Healthy People 2030 target for ≥1 dose of MMR by age 2 years is 90.8%. https://health.gov/healthypeople/objectives-and-data/browse-objectives/vaccination

** Hib primary series: receipt of ≥2 or ≥3 doses, depending on product type received; full series: primary series and booster dose, which includes receipt of ≥3 or ≥4 doses, depending on product type received.

†† One dose HepB administered from birth through age 3 days.

§§ Statistically significantly different ($p<0.05$) from zero.

¶¶ Before 2020, the first Hep A dose was recommended at age 12–23 months, with the second dose given 6–18 months after the first, depending upon the product type received. In 2020, recommendation revised to 2 doses between ages 12 and 23 months, ≥6 months apart. Because children in this analysis were vaccinated under both recommendations, coverage estimates for both 24 months and 35 months are provided.

*** Includes ≥2 doses of Rotarix monovalent rotavirus vaccine or ≥3 doses of RotaTeq pentavalent rotavirus vaccine; if any dose in the series is either RotaTeq or unknown, the default is to a 3-dose series. The maximum age for the final rotavirus dose is 8 months, 0 days.

††† Influenza vaccine doses must be ≥24 days apart (4 weeks with a 4-day grace period); doses could have been received during two influenza seasons.

§§§ The combined seven-vaccine series (4:3:1:3*:3:1:4) includes ≥4 doses of DTaP, ≥3 doses of poliovirus vaccine, ≥1 dose of measles-containing vaccine, the full series of Hib (≥3 or ≥4 doses, depending on product type), ≥3 doses of HepB, ≥1 dose of VAR, and ≥4 doses of PCV.

¶¶¶ Healthy People 2030 target for children who get no recommended vaccines by age 2 years is ≤1.3%. https://health.gov/healthypeople/objectives-and-data/browse-objectives/vaccination

level for all vaccines except the HepB birth dose. Compared with children living in a metropolitan statistical area (MSA)**** principal city, those residing in a non-MSA had lower coverage with approximately one half of the vaccines monitored by NIS-Child. Wide variation in coverage estimates was also observed by jurisdiction (Supplementary Table 2, https://stacks.cdc.gov/view/cdc/134545), especially for ≥2 doses of influenza vaccine, which ranged from 33.0% (Mississippi) to 85.9% (Connecticut).

**** MSA status was determined based on household reported city and county of residence and was grouped into three categories: MSA principal city, MSA nonprincipal city, and non-MSA. MSAs and principal cities were as defined by the U.S. Census Bureau (https://www.census.gov/programs-surveys/metro-micro.html). Non-MSA areas include urban populations not located within an MSA, as well as completely rural areas.

TABLE 2. Estimated vaccination coverage by age 24 months* among children born during 2019–2020,† by selected vaccines and doses and health insurance status§ — National Immunization Survey-Child, United States, 2020–2022

	Health insurance status, % (95% CI)			
Vaccine/Dose	**Private only (Ref) n = 15,668**	**Any Medicaid n = 9,682**	**Other insurance n = 1,961**	**Uninsured n = 422**
DTaP¶				
≥3 doses	96.3 (95.7–96.9)	92.2 (91.1–93.2)**	92.1 (89.5–94.3)**	80.4 (72.7–87.1)**
≥4 doses	87.3 (86.1–88.4)	76.6 (74.8–78.3)**	76.3 (72.3–80.1)**	61.3 (52.3–70.4)**
Poliovirus (≥3 doses)	95.6 (94.9–96.2)	91.3 (90.1–92.3)**	91.6 (88.9–93.8)**	80.0 (72.2–86.9)**
MMR (≥1 dose)††	94.6 (93.9–95.3)	89.6 (88.4–90.7)**	88.9 (85.7–91.6)**	78.3 (70.1–85.6)**
Hib§§				
Primary series	95.7 (95.0–96.4)	91.9 (90.9–92.9)**	91.8 (89.3–94.0)**	78.8 (71.0–85.8)**
Full series	84.4 (83.2–85.6)	75.1 (73.3–76.9)**	76.7 (72.9–80.3)**	61.9 (53.1–70.8)**
HepB				
Birth dose¶¶	83.0 (81.8–84.2)	81.6 (80.1–83.0)	74.9 (70.8–78.5)**	63.7 (53.7–72.7)**
≥3 doses	93.7 (92.9–94.5)	91.3 (90.2–92.3)**	90.8 (88.2–93.1)**	76.2 (68.1–83.6)**
VAR (≥1 dose)††	94.0 (93.2–94.8)	89.5 (88.2–90.6)**	87.7 (84.4–90.5)**	76.5 (68.5–83.8)**
PCV				
≥3 doses	95.6 (94.8–96.3)	91.0 (89.8–92.1)**	91.3 (88.6–93.5)**	79.9 (72.0–86.8)**
≥4 doses	89.3 (88.3–90.4)	78.1 (76.3–79.8)**	79.3 (75.7–82.8)**	55.3 (46.2–64.8)**
HepA				
≥1 dose	91.2 (90.3–92.1)	86.7 (85.3–87.9)**	86.0 (82.8–88.9)**	72.3 (63.5–80.5)**
≥2 doses***	51.9 (50.3–53.5)	44.7 (42.7–46.7)**	43.9 (39.6–48.4)**	—†††
≥2 doses (by age 35 mos)***	85.4 (83.7–87.0)	76.3 (73.5–78.9)**	75.4 (69.7–80.7)**	—†††
Rotavirus (by age 8 mos)§§§	84.1 (82.9–85.3)	71.2 (69.5–72.9)**	72.9 (68.5–76.9)**	52.0 (42.6–61.2)**
Influenza (≥2 doses)¶¶¶	75.5 (74.1–76.9)	49.2 (47.3–51.2)**	61.4 (57.1–65.6)**	37.8 (29.4–47.6)**
Combined seven-vaccine series****	76.6 (75.1–78.0)	63.6 (61.6–65.5)**	66.2 (62.0–70.4)**	42.5 (33.9–52.3)**
No vaccinations	0.6 (0.5–0.8)	1.2 (0.8–1.5)**	0.8 (0.5–1.2)	6.0 (3.4–9.5)**

Abbreviations: DTaP = diphtheria and tetanus toxoids and acellular pertussis vaccine; HepA = hepatitis A vaccine; HepB = hepatitis B vaccine; Hib = *Haemophilus influenzae* type b conjugate vaccine; MMR = measles, mumps, and rubella vaccine; PCV = pneumococcal conjugate vaccine; Ref = referent group; VAR = varicella vaccine.

* Includes vaccinations received by age 24 months, except for the HepB birth dose, rotavirus vaccination, and ≥2 HepA doses by age 35 months. For all vaccines except the HepB birth dose and rotavirus vaccination, the Kaplan-Meier method was used to estimate vaccination coverage to account for children whose vaccination history was ascertained before age 24 months (35 months for ≥2 HepA doses).

† Data for the 2019 birth year are from survey years 2020, 2021, and 2022; data for the 2020 birth year are considered preliminary and are from survey years 2021 and 2022 (data from survey year 2023 are not yet available).

§ Children's health insurance status was reported by parent or guardian. "Other insurance" includes the Children's Health Insurance Program, military insurance, coverage through the Indian Health Service, and any other type of health insurance not mentioned elsewhere.

¶ Includes children who might have been vaccinated with diphtheria and tetanus toxoids vaccine or diphtheria, tetanus toxoids, and pertussis vaccine.

** Statistically significant (p<0.05) difference compared with the Ref.

†† Includes children who might have been vaccinated with MMR and VAR combination vaccine.

§§ Hib primary series: receipt of ≥2 or ≥3 doses, depending on product type received; full series: primary series and booster dose, which includes receipt of ≥3 or ≥4 doses, depending on product type received.

¶¶ One dose HepB administered from birth through age 3 days.

*** Before 2020, the first Hep A dose was recommended at age 12–23 months, with the second dose given 6–18 months after the first, depending upon the product type received. In 2020, recommendation was revised to 2 doses between ages 12 and 23 months, ≥6 months apart. Because children in this analysis were vaccinated under both recommendations, coverage estimates for both 24 months and 35 months are provided.

††† Estimate was not available because the unweighted sample size for the denominator was <30, 95% CI half width divided by the estimate was >0.588, or 95% CI half-width was ≥10.

§§§ Includes ≥2 doses of Rotarix monovalent rotavirus vaccine or ≥3 doses of RotaTeq pentavalent rotavirus vaccine; if any dose in the series is either RotaTeq or unknown, the default is to a 3-dose series. The maximum age for the final rotavirus dose is 8 months, 0 days.

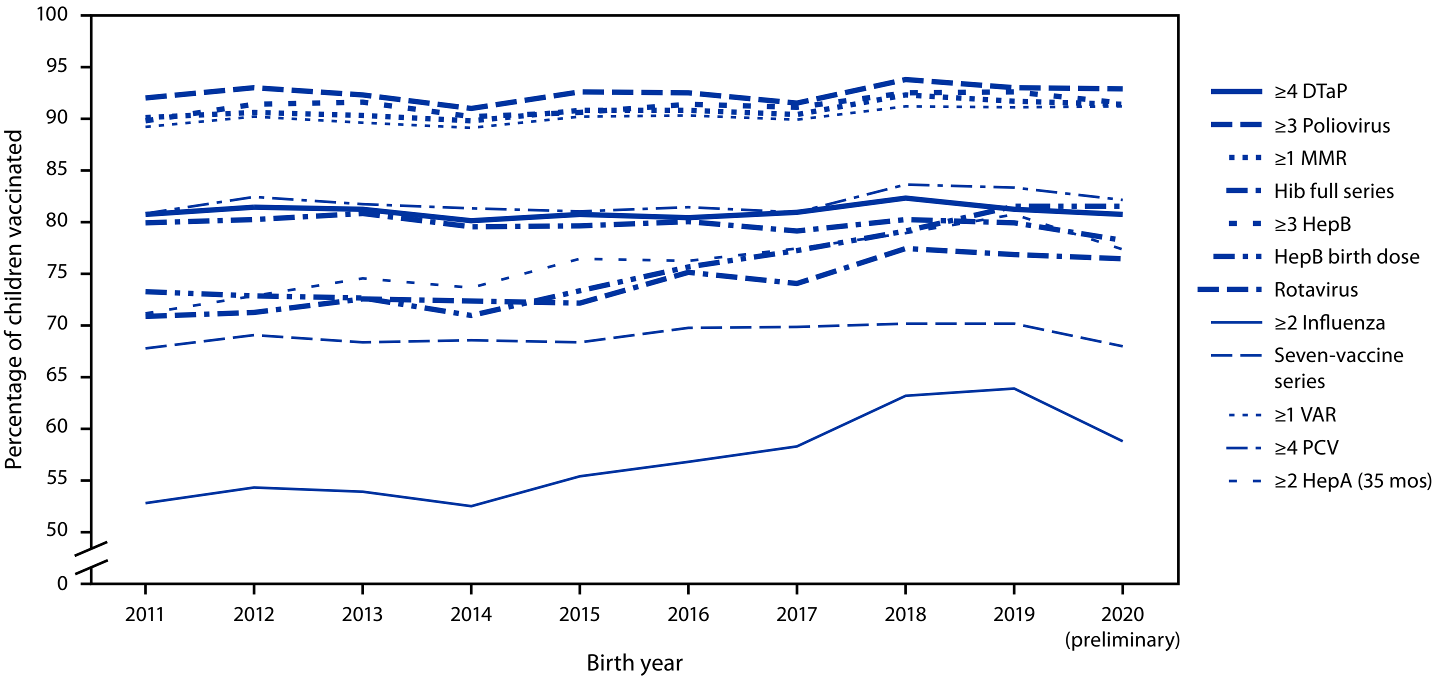
¶¶¶ Influenza vaccine doses must be ≥24 days apart (4 weeks with a 4-day grace period); doses could have been received during two influenza seasons.

**** The combined seven-vaccine series (4:3:1:3*:3:1:4) includes ≥4 doses of DTaP, ≥3 doses of poliovirus vaccine, ≥1 dose of measles-containing vaccine, the full series of Hib (≥3 or ≥4 doses, depending on product type), ≥3 doses of HepB, ≥1 dose of VAR, and ≥4 doses of PCV.

Trends by Birth Cohort

Coverage by birth cohort during 2011–2020 was stable for a majority of vaccines, although a decrease of 5.1 percentage points was observed for ≥2 doses of influenza vaccine among children born in 2020 compared with those born in 2019 (Figure). Examination of trends in overall coverage for the five most recent birth cohorts (2016–2020) revealed increases for the HepB birth dose (1.7 percentage points per year), ≥1 dose of HepA (0.9 percentage points per year), and ≥2 doses of HepA (0.8 percentage points per year); no decreases were found (Supplementary Table 1, https://stacks.cdc.gov/view/cdc/134544).

FIGURE. Estimated coverage with selected individual vaccines*,†,§,¶,,††,§§ and a combined vaccine series by age 24 months,¶¶ by birth year*** — National Immunization Survey-Child, United States, 2012–2022**



Abbreviations: DTaP = diphtheria and tetanus toxoids and acellular pertussis vaccine; HepA = hepatitis A vaccine; HepB = hepatitis B vaccine; Hib = *Haemophilus influenzae* type b conjugate vaccine; MMR = measles, mumps, and rubella vaccine; PCV = pneumococcal conjugate vaccine; VAR = varicella vaccine.

* Includes vaccinations received by age 24 months, except for the HepB birth dose, rotavirus vaccination, and ≥2 HepA doses by 35 months. For all vaccines except the HepB birth dose and rotavirus vaccination, the Kaplan-Meier method was used to estimate vaccination coverage to account for children whose vaccination history was ascertained before age 24 months (35 months for ≥2 HepA doses).

† Includes children who might have been vaccinated with diphtheria and tetanus toxoids vaccine or diphtheria, tetanus toxoids, and pertussis vaccine.

§ Includes children who might have been vaccinated with MMR and varicella combination vaccine.

¶ Hib full series: primary series and booster dose, which includes receipt of ≥3 or ≥4 doses, depending on product type received.

** One dose HepB administered from birth through age 3 days.

†† Includes ≥2 doses of Rotarix monovalent rotavirus vaccine or ≥3 doses of RotaTeq pentavalent rotavirus vaccine; if any dose in the series is either RotaTeq or unknown, the default is to a 3-dose series. The maximum age for the final rotavirus dose is 8 months, 0 days.

§§ Influenza vaccine doses must be ≥24 days apart (4 weeks with a 4-day grace period); doses could have been received during two influenza seasons.

¶¶ The combined seven-vaccine series (4:3:1:3*:3:1:4) includes ≥4 doses of DTaP, ≥3 doses of poliovirus vaccine, ≥1 dose of measles-containing vaccine, the full series of Hib (≥3 or ≥4 doses, depending on product type), ≥3 doses of HepB, ≥1 dose of VAR, and ≥4 doses of PCV.

*** Children born in 2011 are included in survey years 2012, 2013, and 2014; children born in 2012 are included in survey years 2013, 2014, and 2015; children born in 2013 are included in survey years 2014, 2015, and 2016, children born in 2014 are included in survey years 2015, 2016, and 2017; children born in 2015 are included in survey years 2016, 2017, and 2018; children born in 2016 are included in survey years 2017, 2018, and 2019; children born in 2017 are included in survey years 2018, 2019 and 2020; children born in 2018 are included in survey years 2019 and 2020, and 2021; children born in 2019 are included in survey years 2020, 2021, and 2022; data for children born in 2020 are considered preliminary and are from survey years 2021 and 2022 (data from survey year 2023 are not yet available).

Coverage was also estimated by the five most recent birth cohorts within each category of the sociodemographic variables (race and ethnicity, poverty level, health insurance status, and MSA status) (Supplementary Table 1, https://stacks.cdc.gov/view/cdc/134544). Positive linear trends were observed for the HepB birth dose for multiple subgroups of children, including non-Hispanic White and multiple race children, children living at or above the poverty level, privately insured and Medicaid-insured children, and those living in an MSA principal city or an MSA nonprincipal city. Increased coverage with ≥1 dose of HepA (White, any Medicaid insurance, and MSA nonprincipal city), ≥2 doses of HepA (White, at or above poverty level, private insurance only, and non-MSA), and rotavirus vaccine (Black) was observed over time. No decreases were seen for any of the combinations of vaccines and categories of sociodemographic variables.

In addition, trends in disparities were assessed for 2016–2020 birth cohorts (Supplementary Table 3, https://stacks.cdc.gov/view/cdc/134546). Among 168 trends evaluated, six increases (widening of the coverage gap between a variable category and the referent group) and one decrease (narrowing of the gap) were identified.†††† The most common of these was the disparity in coverage by poverty status, with a widening of the gap in coverage with ≥2 HepA doses, ≥2 influenza vaccine doses, and the combined seven-vaccine series between children living below poverty and those living at or above poverty.

Discussion

This report incorporates NIS-Child data collected in 2022 to assess vaccination coverage, disparities in vaccination coverage, and 5-year trends in coverage and disparities in coverage among children born during 2016–2020. For most recommended childhood vaccines, coverage has remained high and stable for a number of years. Among children born during 2019–2020, coverage exceeded 70% for all vaccines except ≥2 doses of influenza vaccine (61.3%) and the combined seven-vaccine series (69.1%). HepB birth dose coverage has been trending upward for several years, exceeding 80% for the first time in 2019. Coverage with ≥1 dose of HepA has increased more slowly, but if the current trend continues, coverage will exceed 90% among children born in 2022. Among children born during 2019–2020, Healthy People 2030§§§§ objectives have been met for coverage with ≥1 dose of MMR by age 24 months (≥90.8%) and for the proportion of children who receive no recommended vaccines by age 24 months (≤1.3%), but not for coverage with ≥4 DTaP doses (≥90.0%).

Disparities persist in vaccination coverage by race and ethnicity, poverty status, MSA status, and health insurance status and are often substantial. Lower coverage with the full series of Hib among AI/AN children compared with White children is particularly concerning given the sharply elevated incidence of Hib disease in the AI/AN population.¶¶¶¶ The largest observed coverage disparities were for ≥2 doses of influenza; influenza vaccination coverage varied widely by jurisdiction as well, with a range of 52.9 percentage points across the United States. Analysis of 5-year trends revealed that only a small proportion of the disparities involving sociodemographic variables changed over time, although it appears that children living below the poverty level might be losing ground compared with children with higher family incomes. Disparities such as these have been documented previously (*3*,*4*). Concern over financial barriers to vaccination led to the creation of the Vaccines for Children (VFC) program,***** which covers the cost of recommended vaccines for eligible children. The program appeared successful in reducing racial and ethnic disparities in coverage (*5*), but additional efforts will be needed to close the remaining coverage gaps. CDC is currently working with partners, such as state Medicaid programs, the Indian Health Service, and the Association of Immunization Managers, to increase awareness of the VFC program (*6*).

Universal and equitable access to vaccination will require overcoming often interrelated economic, logistical, and attitudinal obstacles. Interviews with parents identified issues such as appointment scheduling challenges, incomplete knowledge of the schedule of recommended vaccines, limited availability and high cost of child care for other children in the household, and lack of transportation as factors that limit access to care (*7*). Strategies that have been found useful in addressing barriers to vaccination include identifying venues other than physician offices for the administration of vaccines (such as health departments, child care centers, and pharmacies), strong provider recommendations, reminder and recall interventions, standing orders, vaccination status review at every health care encounter, and expanded use of immunization information systems to provide consolidated immunization histories (*8*,*9*).

Summary

What is already known about this topic?

The Advisory Committee on Immunization Practices recommends vaccines against 15 potentially serious diseases by the age of 24 months.

What is added by this report?

Estimated coverage with most childhood vaccines was similar among children born during 2019–2020 compared with those born during 2017–2018, with only a few exceptions. Disparities in coverage by race and ethnicity, poverty status, insurance status, and urbanicity persist, with a widening of the gap among some subgroups evident over time.

What are the implications for public health practice?

Universal and equitable access to vaccination will require overcoming economic, logistic, and attitudinal obstacles to ensure that all children are protected from vaccine-preventable diseases.

†††† Significant trends in disparities were associated with a statistically significant AAPPC. Positive trends were seen for the HepB birth dose among children living in an MSA nonprincipal city (AAPPC = 0.9); ≥1 dose of HepA among non-Hispanic multiple race children (AAPPC = 0.7); ≥2 doses of HepA among children living below the poverty level (AAPPC = 2.1); ≥2 doses of influenza vaccine among children living below the poverty level (AAPPC = 1.7) and among children with any Medicaid insurance (AAPPC = 1.6); and the combined seven-vaccine series among children living below the poverty level (AAPPC = 1.0). A negative trend was seen for rotavirus vaccine among children with any Medicaid insurance (AAPPC = −1.3).

§§§§ https://health.gov/healthypeople/objectives-and-data/browse-objectives/vaccination

¶¶¶¶ https://cih.jhu.edu/programs/hibvax-study/

***** Eligible children include those aged ≤18 years who are Medicaid-eligible, uninsured, AI/AN, or insured by health plans that do not fully cover routine immunization (if vaccination is received at a federally qualified health center or a rural health clinic). https://www.cdc.gov/vaccines/programs/vfc/

Limitations

The findings in this report are subject to at least three limitations. First, the low household interview response rate (21%–25% over survey years 2018–2022) and the availability of adequate provider data for only 49%–54% of those who completed interviews during these survey years creates the possibility of selection bias. Second, use of weighting to account for nonresponse and households without telephones might not have completely eliminated bias because of these factors. Finally, coverage estimates could be incorrect if some providers did not return vaccination history questionnaires or if administered vaccines were not documented accurately. Total survey error for the 2022 survey year data was assessed and demonstrated that coverage was underestimated by 1.7 percentage points for ≥1 dose of MMR, 3.3 percentage points for the HepB birth dose, and 9.2 percentage points for the combined seven-vaccine series (*10*). An analysis of change in bias of vaccination coverage estimates from 2021 to 2022 determined that a meaningful change in bias was unlikely.

Implications for Public Health Practice

Overall coverage with recommended childhood vaccinations remains high; however, persistent disparities in coverage among children in racial and ethnic minority groups, as well as those who are not privately insured, who live in rural areas, and who live below the poverty level must be addressed to ensure that all children are protected from vaccine-preventable diseases. Data from immunization information systems can be used to identify local areas and population subgroups with lower vaccination coverage; children in these groups might be more susceptible to outbreaks of vaccine-preventable diseases.[†††††] More extensive use of the VFC program, interventions to improve vaccine confidence, enhanced flexibility in scheduling vaccination appointments, and expanded options for the place of vaccination will aid in making the U.S. immunization program more accessible and equitable for all (*7–9*).

††††† https://www.cdc.gov/measles/cases-outbreaks.html

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Vital Signs: Health Worker–Perceived Working Conditions and Symptoms of Poor Mental Health — Quality of Worklife Survey, United States, 2018–2022

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Abstract

Introduction: Health workers faced overwhelming demands and experienced crisis levels of burnout before the COVID-19 pandemic; the pandemic presented unique challenges that further impaired their mental health.

Methods: Data from the General Social Survey Quality of Worklife Module were analyzed to compare self-reported mental health symptoms among U.S. adult workers from 2018 (1,443 respondents, including 226 health workers) and 2022 (1,952, including 325 health workers). Logistic regression was used to examine associations between health workers' reported perceptions of working conditions and anxiety, depression, and burnout.

Results: From 2018 to 2022, health workers reported an increase of 1.2 days of poor mental health during the previous 30 days (from 3.3 days to 4.5 days); the percentage who reported feeling burnout very often (11.6% to 19.0%) increased. In 2022, health workers experienced a decrease in odds of burnout if they trusted management (odds ratio [OR] = 0.40), had supervisor help (OR = 0.26), had enough time to complete work (OR = 0.33), and felt that their workplace supported productivity (OR = 0.38), compared with those who did not. Harassment at work was associated with increased odds of anxiety (OR = 5.01), depression (OR = 3.38), and burnout (OR = 5.83).

Conclusions and implications for public health practice: Health workers continued to face a mental health crisis in 2022. Positive working conditions were associated with less burnout and better mental health. CDC's National Institute for Occupational Safety and Health has developed a national campaign, Impact Wellbeing, to provide employers of health workers with resources to improve the mental health of these workers.

Introduction

Work in health occupations* (which include clinicians as well as those in mental health, public health, long-term care, and other support roles) is stressful owing to demanding working conditions† including taxing work; exposure to infectious diseases; long hours; and challenging interactions with coworkers, patients, and their families. Chronic exposure to stressful working conditions, including not participating in decision-making (*1*) and lack of supportive supervision (*2*), can lead to mental strain, and during the COVID-19 pandemic, contributed to health worker turnover (*3*,*4*). Depressive disorders are a leading cause of disability (*5*), and for workers, are associated with higher rates of absenteeism and presenteeism (working when physically ill) (*6*). In 2021, one in four U.S. essential workers (including health workers) had received a mental disorder diagnosis since the pandemic onset (*7*).

U.S. health workers experienced a 249% increase in rates of work-related injury and illness between 2019 and 2020.§ The pandemic intensified existing risks and workloads because of staff member shortages, high patient loads, supply shortages, fatigue, and grief, exacerbating preexisting crisis levels of burnout (e.g., feeling emotionally exhausted and detached and experiencing a low sense of personal accomplishment at work) (*8*). Health workers experienced increased harassment (i.e., threats, bullying, verbal abuse, or other actions from patients and coworkers that create a hostile work environment) and violence (*9*), which can increase the risk for symptoms of depression, anxiety, posttraumatic stress, and suicidal ideation (*10*). The purpose of this analysis was to ascertain whether U.S. health workers experienced more mental health declines than did other workers during the COVID-19 pandemic.

This report describes and compares self-reported well-being and working conditions for health workers, other essential workers, and all other workers in 2018 and 2022 using cross-sectional data from the Quality of Worklife (QWL) module of the nationally representative General Social Survey (GSS).¶ To identify potential prevention strategies, working conditions

* Health occupations include direct patient-care workers such as nurses, physicians, emergency medical services clinicians, mental health workers, and long-term care workers, and those not engaged in direct patient care such as those in other support roles and public health workers. https://bhw.hrsa.gov/sites/default/files/bureau-health-workforce/about-us/hhs-health-workforce-strategic-plan-2021.pdf

† Working conditions include aspects of work design, the organization, and management of work, including but not limited to employment arrangements, organizational factors, job and task design, and social interactions.

§ https://www.osha.gov/news/newsreleases/national/02172022#:~:text

¶ https://gss.norc.org/Pages/quality-of-worklife.aspx associated with frequency of symptoms of anxiety, depression, and burnout for health workers in 2022 were examined.

Methods

The QWL module contains questions on working and mental health conditions and is administered to respondents aged ≥18 years within GSS who report having been employed during the preceding 2 weeks. Items from the GSS/QWL module** for 2018 (17 items, administered via personal interview) and 2022 (25 items, including eight new items, administered via personal interview, telephone interview, or web-based questionnaire) were analyzed to examine working conditions and related outcomes before and after the onset of the COVID-19 pandemic and across worker groups.†† The total sample comprised 3,395 respondents. In 2018, respondents included 1,443 workers (226 health workers, 379 other essential workers, and 838 other workers ["all other workers"]). In 2022, respondents included 1,952 workers (325 health workers, 467 other essential workers, and 1,160 other workers). Response rates for GSS were 59.5% in 2018 and 50.5% in 2022.

Perceptions of working conditions were measured using five single ordinal items that asked respondents whether 1) they trust management, 2) they were harassed at work, 3) there was enough time to accomplish work, 4) working conditions supported productivity, and 5) supervisors were helpful. Two single ordinal items asked how often there were enough persons or staff members to complete work and whether the respondent participated in decision-making. A composite measure of psychosocial safety climate (*11*), added to the QWL in 2022, was also included.§§ Worker-reported well-being outcomes including general happiness, frequency of sleep problems, days of poor mental health during the previous 30 days (e.g., stress, feeling depressed, and problems with emotions), and turnover intention (intent to find a new job in the next year), were measured by single ordinal items. Presenteeism, added to the QWL in 2022, was also measured by a single ordinal item.

To determine which working conditions were associated with adverse mental health outcomes among health workers in 2022, comparisons of prevalences of self-reported burnout during the previous month, and anxiety and depression during the previous 2 weeks were made across different working conditions. Burnout was measured with a single item about feeling "used up." Anxiety and depression were each measured by two items added to the QWL in 2022 from the four-item Patient Health Questionnaire (PHQ-4), a screening tool for anxiety and depression (*12*); scores (range = 0–3) for the two corresponding items were summed (range = 0–6) then dichotomized such that scores of ≥1 indicated the presence of at least one symptom for several days during the previous 2 weeks.

Differences between worker groups and survey year (i.e., a three by two interaction) for the selected outcomes were analyzed using generalized linear modeling (GLM). Weighted percentages of responses and Wald 95% CIs were estimated from these models. The statistical significance of the main effect of year, worker group, and the interaction was determined by evaluating the improvement in model fit when the effect was added to the model. Fit comparisons were made with a likelihood ratio test; Wald chi-square tests with $p<0.05$ indicated better model fit. CIs were inspected when the interaction was significant; nonoverlapping CIs indicated statistically significant differences at $p<0.05$. All differences reported were statistically significant. Binary logistic regression, ordinal logistic regression, and zero-inflated Poisson regression were used for dichotomous outcomes, ordinal outcomes, and count outcomes with zero-inflation, respectively. Separate bivariate logistic regressions were conducted (using GLM with a logit-link and a binomial distribution) to evaluate the association between working conditions and anxiety symptoms, depression symptoms, and burnout in the health worker group. As before, the statistical significance of the working condition variable was determined by comparison to a null model via likelihood ratio test. Odds ratios, Wald 95% CIs, and weighted percentages of responses were estimated from these models. All statistical analyses were conducted in R (version 4.2.2; The R Foundation) using the svyVGAM package (version 1.2; Thomas Lumley [developer]) to account for the complex sampling design and weighting of GSS. This activity was reviewed by CDC, deemed not research, and was conducted consistent with applicable federal law and CDC policy.¶¶

** Methods for GSS/QWL are described online (https://gss.norc.org/Get-Documentation). GSS is conducted in even-numbered years, and participants are recruited from nationally representative survey panels. The 2018 survey was administered via personal interview. The 2022 survey was administered via both personal and telephone interviews, as well as through a web-based questionnaire. Administration of GSS/QWL is covered by the National Opinion Research Center Institutional Review Board (Federal Wide Assurance number: FWA00000142). Data from GSS/QWL survey are publicly available. Nonresponse weights were used in the analyses.

†† Worker classifications were adapted from categories and industries defined by the Advisory Committee on Immunization Practices (https://www.cdc.gov/vaccines/covid-19/categories-essential-workers.html). North American Industry Classification System codes, published by CDC, were cross-referenced with industry codes for respondents' employment provided in GSS. Health workers include those in the health occupations described above (direct care roles were not differentiated in these analyses); other essential workers include frontline, nonhealth workers; "all other workers" include all remaining workers.

§§ Psychosocial safety climate is shared perceptions within an organization about policies, practices, and procedures, that protect worker psychological health and safety. Items include "Senior management considers psychological health to be as important as productivity," "Senior management show support for stress prevention through involvement and commitment," and "In my organization, the prevention of stress involves all levels of the organization." Responses (strongly disagree [1], disagree [2], neither agree nor disagree [3], agree [4], and strongly agree [5]) were summed. Scores <6 were coded "poor," 6–8 were coded "moderate," and ≥9 were coded "good."

¶¶ 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.

Results

Distribution of survey respondents by age and gender varied by worker group. In both years, health workers and other essential workers were more likely to be women than were respondents in the other worker group. The proportion of persons earning <$35,000 per year decreased in 2022 from 2018 for each worker group (Table 1).

The overall number of poor mental health days in the previous 30 days in 2022 was similar across all three groups of workers (4.1–4.5 days)*** (Table 2). Health workers, however, reported a significant increase in poor mental health days in the previous 30 days from 2018 (3.3 days) to 2022 (4.5 days). During this period, the percentage of health workers who reported feeling burnout very often increased from 11.6% to 19.0%. Overall, 45.6% of health workers reported feeling burnout often or very often in 2022. The percentage of health workers who reported feeling very happy did not change significantly from 2018 to 2022, but rates of feeling very happy did decline among other essential workers and all other workers (from 33.9% to 20.5% and from 33.6% to 26.3%, respectively).

From 2018 to 2022, the percentage of health workers who reported being very likely to look for a new job with another employer increased from 11.1% to 16.5%; overall, 44.2% of health workers reported being somewhat likely or very likely to look for a new job in 2022. In contrast, among all other workers, turnover intention declined from 18.6% to 13.7% during this period. Health workers' reports of being harassed at work more than doubled, from 6.4% in 2018 to 13.4% in 2022. The rates of trusting management decreased from 2018 to 2022 among health workers (from 28.8% to 21.8%) and other essential workers (from 24.9% to 20.6%); however, overall, 78.2% of health workers in 2022 agreed or strongly agreed that they trusted management. Feeling that workplace conditions support productivity declined from 2018 to 2022

*** Control variables were not used in these analyses because the weighting and complex sampling design of GSS/QWL accurately approximates the U.S. population. Moreover, using covariates to make groups statistically equivalent when known demographic differences exist might serve to diminish meaningful differences.

TABLE 1. Demographic characteristics* of health workers, other essential workers,† and all other workers — General Social Survey Quality of Worklife Module, United States, 2018 and 2022

Characteristic	% (95% CI)					
	Health workers		Other essential workers		All other workers	
	2018 n = 226	2022 n = 325	2018 n = 379	2022 n = 467	2018 n = 838	2022 n = 1160
Age group, yrs						
<30	27.4 (19.7–36.7)	26.3 (18.6–35.9)	16.9 (11.8–23.6)	22.1 (17.5–27.5)	29.2 (25.4–33.3)	25.9 (22.0–30.2)
30–39	15.9 (10.4–23.4)	21.2 (16.7–26.6)	21.5 (17.3–26.3)	14.8 (10.9–19.9)	18.2 (15.4–21.4)	20.8 (17.9–24.0)
40–49	20.8 (14.7–28.6)	21.5 (13.7–32.2)	25.3 (19.8–31.8)	24.9 (19.8–30.7)	17.6 (14.2–21.5)	20.1 (17.2–23.5)
50–59	21.9 (15.8–29.6)	21.3 (14.8–29.7)	22.1 (17.3–27.8)	18.4 (14.6–23.0)	22.0 (19.1–25.2)	19.6 (16.2–23.5)
≥60	14.0 (9.8–19.7)	9.6 (5.8–15.5)	14.2 (11.0–18.1)	19.8 (13.9–27.5)	13.0 (10.5–16.0)	13.6 (10.6–17.2)
Gender (women)	**75.8 (65.9–83.5)**	**71.4 (63.7–78.1)**	**49.7 (43.3–56.2)**	**51.2 (45.4–57.1)**	**40.4 (35.7–45.2)**	**40.9 (36.5–45.5)**
Race and ethnicity						
A/PI, NH	6.7 (2.7–15.6)	9.4 (4.2–19.6)	3.3 (1.1–9.4)	4.9 (2.8–8.4)	4.9 (3.4–7.0)	3.6 (2.2–5.8)
AI/AN, NH	0 (0–0)§	0.8 (0.3–2.1)	0.7 (0.2–2.2)	0.2 (0.1–0.5)	0.3 (0.1–0.8)	0.2 (0.1–0.7)
Black or African American, NH	11.2 (7.1–17.1)	17.7 (11.9–25.5)	12.1 (8.6–16.9)	8.6 (6.1–12.0)	9.4 (7.1–12.4)	10.4 (7.5–14.2)
White, NH	66.3 (57.0–74.6)	59.0 (49.9–67.5)	58.3 (51.4–64.9)	70.3 (64.3–75.6)	59.2 (54.7–63.5)	63.0 (57.6–68.1)
Hispanic or Latino	13.1 (8.8–19.0)	10.1 (7.3–13.9)	18.8 (13.8–25.1)	14.1 (9.5–20.5)	17.9 (14.4–22.2)	17.1 (13.6–21.3)
Multiple races, NH	2.5 (1.1–5.5)	2.6 (1.0–7.0)	6.3 (4.1–9.6)	1.9 (0.9–4.1)	7.3 (5.5–9.7)	5.3 (3.4–8.0)
Other race, NH	0.2 (0–1.4)§	0.4 (0.1–1.6)	0.5 (0.1–1.7)	0 (0–0)§	0.9 (0.3–2.7)	0.3 (0.1–0.8)
Education						
No high school diploma	2.4 (0.8–6.9)	6.1 (2.5–13.9)	9.0 (5.9–13.3)	3.6 (1.6–8.2)	10.9 (7.6–15.3)	10.8 (8.1–14.2)
High school diploma	41.2 (32.8–50.2)	32.3 (24.3–41.4)	41.9 (35.8–48.2)	38.8 (31.8–46.3)	52.1 (46.9–57.2)	52.9 (48.0–57.6)
Associate college or junior college degree	13.6 (9.0–20.1)	15.2 (10.3–21.9)	8.2 (5.8–11.3)	9.3 (6.2–13.6)	7.0 (5.1–9.7)	8.1 (5.7–11.4)
Bachelor's degree	22.3 (16.3–29.7)	30.1 (21.9–39.7)	24.5 (19.4–30.5)	27.3 (21.7–33.6)	20.3 (16.9–24.2)	19.0 (15.9–22.5)
Graduate degree	20.6 (13.2–30.6)	16.4 (11.7–22.4)	16.5 (11.4–23.4)	21.1 (15.8–27.5)	9.7 (7.3–12.9)	9.3 (7.1–12.1)
Income						
<$35,000	40.4 (31.7–49.7)	33.9 (25.0–44.2)	43.8 (36.9–50.8)	28.1 (22.9–34.0)	46.0 (41.9–50.2)	39.0 (33.6–44.6)
$35,000–$74,999	39.0 (28.8–50.4)	38.4 (30.1–47.4)	35.1 (29.4–41.3)	42.6 (36.3–49.2)	29.7 (25.8–33.8)	28.6 (24.3–33.3)
$75,000–$149,999	16.1 (10.2–24.7)	20.9 (14.8–28.6)	18.6 (14.0–24.2)	22.3 (16.7–29.0)	17.4 (14.0–21.4)	22.5 (18.7–26.8)
≥$150,000	4.5 (2.2–8.9)	6.8 (3.5–13.1)	2.6 (1.0–6.3)	7.0 (3.9–12.2)	6.9 (4.5–10.3)	10.0 (6.8–14.5)

Abbreviations: AI/AN = American Indian or Alaska Native; A/PI = Asian or Pacific Islander; NH = non-Hispanic.
* All analyses used survey weights provided by the General Social Survey.
† Frontline, nonhealth workers.
§ Value displayed as 0 due to rounding.

TABLE 2. Mental health, well-being, and working conditions* of health workers, other essential workers,[†] and all other workers — General Social Survey Quality of Worklife Module, United States, 2018 and 2022

Variable	Estimate, % (95% CI)					
	Health workers		Other essential workers		All other workers	
	2018 n = 226	2022 n = 325	2018 n = 379	2022 n = 467	2018 n = 838	2022 n = 1,160
General happiness[§,¶]						
Not too happy**	12.8 (12.6–13.1)	14.1 (13.9–14.3)	11.9 (11.7–12.1)	21.2 (21.0–21.4)	12.1 (11.9–12.2)	16.3 (16.2–16.4)
Pretty happy	55.2 (52.3–57.6)	56.2 (53.7–58.4)	54.2 (52.2–55.9)	58.3 (55.5–60.9)	54.4 (53.0–55.6)	57.5 (56.0–58.8)
Very happy	32.0 (27.3–37.1)	29.7 (26.0–33.7)	33.9 (30.3–37.7)	20.5 (18.0–23.2)	33.6 (31.2–36.0)	26.3 (24.4–28.1)
Sleep problems[††,§§]						
Never**	14.4 (14.2–14.7)	11.0 (10.8–11.2)	13.6 (13.4–13.7)	12.0 (11.8–12.1)	14.4 (14.3–14.5)	12.3 (12.2–12.4)
Rarely	28.7 (25.7–31.2)	24.7 (22.8–26.4)	27.8 (25.7–29.7)	26.0 (24.2–27.5)	28.7 (27.1–30.1)	26.4 (25.2–27.5)
Sometimes	35.8 (30.5–40.9)	37.6 (33.5–41.5)	36.3 (32.5–40.1)	37.2 (33.7–40.6)	35.8 (33.3–38.4)	37.0 (34.9–39.1)
Often	21.1 (17.7–24.9)	26.7 (23.4–30.3)	22.3 (19.6–25.2)	24.9 (22.2–27.8)	21.1 (19.3–23.0)	24.3 (22.6–26.1)
Mean days of poor mental health (previous 30 days)[¶¶,¶]	3.3 (3.0–3.6)	4.5 (4.2–4.9)	3.7 (3.4–3.9)	4.1 (3.8–4.3)	3.8 (3.6–4.0)	4.3 (4.0–4.5)
Anxiety symptoms (Yes)***	NA	57.0 (52.3–61.6)	NA	53.1 (49.1–57.1)	NA	51.8 (49.5–54.1)
Depression symptoms (Yes)[†††]	NA	34.4 (30.1–39.0)	NA	38.5 (34.7–42.4)	NA	41.8 (39.5–44.1)
Burnout[§§§,¶]						
Never**	10.7 (10.4–10.9)	6.3 (6.1–6.4)	8.1 (7.9–8.2)	7.8 (7.7–8.0)	9.6 (9.5–9.7)	8.7 (8.6–8.8)
Rarely	21.4 (19.1–23.4)	14.7 (13.4–15.7)	17.7 (16.3–19.0)	17.4 (16.1–18.5)	20.0 (18.8–21.1)	18.7 (17.7–19.6)
Sometimes	36.0 (31.2–40.5)	33.5 (30.5–36.3)	35.3 (32.1–38.2)	35.1 (32.2–37.8)	35.9 (33.7–38.1)	35.6 (33.8–37.4)
Often	20.3 (15.9–25.1)	26.6 (22.4–30.8)	23.8 (20.1–27.6)	24.1 (20.7–27.6)	21.6 (19.3–24.0)	22.9 (20.9–25.0)
Very often	11.6 (9.5–14.0)	19.0 (16.4–21.9)	15.1 (13.1–17.4)	15.5 (13.6–17.7)	12.8 (11.5–14.2)	14.1 (12.9–15.5)
Presenteeism (Yes)[¶¶¶,**]**	NA	27.9 (23.8–32.3)	NA	43.2 (39.2–47.2)	NA	37.4 (35.1–39.6)
Turnover intention[††††,¶]						
Not at all likely**	66.6 (66.3–66.8)	55.9 (55.7–56.1)	60.1 (60.0–60.3)	67.8 (67.6–68.0)	52.2 (52.1–52.3)	61.1 (61.0–61.2)
Somewhat likely	22.3 (17.1–28.0)	27.7 (23.2–32.2)	25.7 (21.6–29.8)	21.6 (18.0–25.4)	29.2 (26.5–31.9)	25.2 (23.0–27.5)
Very likely	11.1 (8.9–13.9)	16.5 (14.0–19.3)	14.2 (12.1–16.5)	10.6 (9.0–12.4)	18.6 (16.9–20.5)	13.7 (12.5–15.1)
Harassed at work (Yes)[§§§§,¶]	6.4 (4.0–10.0)	13.4 (10.5–16.9)	7.9 (5.8–10.5)	10.8 (8.6–13.6)	7.0 (5.7–8.5)	6.6 (5.5–7.9)
Psychosocial safety climate[¶¶¶¶]						
Poor**	NA	9.0 (8.8–9.2)	NA	12.0 (11.8–12.2)	NA	10.9 (10.8–11.0)
Moderate	NA	18.1 (16.0–19.8)	NA	21.9 (19.7–23.7)	NA	20.5 (19.2–21.8)
Good	NA	72.9 (68.5–76.9)	NA	66.1 (62.3–69.8)	NA	68.6 (66.4–70.7)
Supervisor help***,********						
Not at all true**	3.3 (3.0–3.5)	4.3 (4.1–4.5)	5.8 (5.6–5.9)	5.2 (5.0–5.3)	4.4 (4.3–4.5)	4.2 (4.1–4.3)
Not too true	6.9 (5.9–7.7)	8.8 (7.8–9.6)	11.2 (10.0–12.2)	10.2 (9.2–11.1)	8.9 (8.2–9.6)	8.6 (7.9–9.2)
Somewhat true	31.1 (28.6–33.1)	35.2 (32.8–37.2)	38.9 (36.3–41.2)	37.5 (35.3–39.5)	35.5 (33.9–36.9)	34.8 (33.5–36.0)
Very true	58.7 (53.0–64.3)	51.8 (47.2–56.3)	44.2 (40.2–48.3)	47.1 (43.3–50.9)	51.2 (48.4–53.9)	52.5 (50.2–54.7)
Trust in management[†††††,¶]						
Strongly disagree**	3.7 (3.5–4.0)	5.3 (5.1–5.5)	4.5 (4.3–4.7)	5.7 (5.5–5.9)	3.9 (3.7–4.0)	3.3 (3.2–3.5)
Disagree	12.4 (11.4–13.3)	16.5 (15.3–17.5)	14.5 (13.5–15.3)	17.4 (16.2–18.4)	12.8 (12.1–13.4)	11.4 (10.8–11.9)
Agree	55.1 (51.7–58.0)	56.4 (53.0–59.4)	56.1 (53.3–58.6)	56.3 (53.4–59.0)	55.4 (53.6–57.0)	54.2 (52.8–55.5)
Strongly agree	28.8 (24.3–33.7)	21.8 (18.7–25.1)	24.9 (21.9–28.3)	20.6 (18.1–23.3)	27.9 (25.7–30.2)	31.1 (29.1–33.1)
Time to get job done[§§§§§,**]**						
Not at all true**	3.2 (2.9–3.4)	3.2 (3.0–3.4)	5.4 (5.2–5.5)	5.8 (5.6–6.0)	3.4 (3.2–3.5)	3.6 (3.5–3.8)
Not too true	8.8 (7.9–9.5)	8.9 (8.1–9.5)	13.8 (12.6–14.7)	14.6 (13.5–15.6)	9.4 (8.8–9.9)	10.0 (9.3–10.5)
Somewhat true	39.9 (37.2–42.1)	40.0 (37.8–41.9)	46.0 (43.3–48.5)	46.6 (43.9–49.0)	40.9 (39.4–42.2)	41.9 (40.6–43.1)
Very true	48.2 (42.6–53.8)	48.0 (43.5–52.5)	34.8 (31.2–38.7)	33.0 (29.7–36.4)	46.4 (43.7–49.1)	44.5 (42.3–46.8)
Takes part in decisions[¶¶¶¶¶,§§]						
Never**	8.6 (8.4–8.9)	7.7 (7.5–7.8)	11.2 (11.1–11.4)	8.1 (7.9–8.2)	8.5 (8.4–8.6)	7.8 (7.7–7.9)
Rarely	16.2 (14.1–17.8)	14.8 (13.3–16.0)	19.3 (17.5–21.0)	15.4 (14.0–16.5)	16.0 (14.9–17.0)	15.0 (14.1–15.8)
Sometimes	37.8 (33.5–41.7)	37.1 (33.8–40.1)	38.6 (35.0–41.9)	37.4 (34.6–40.1)	37.8 (35.7–39.8)	37.2 (35.5–38.9)
Often	37.4 (32.4–42.6)	40.5 (36.3–44.8)	30.9 (27.6–34.4)	39.1 (35.7–42.7)	37.7 (35.3–40.3)	39.9 (37.8–42.1)
Conditions support productivity****,¶**						
Strongly disagree**	0.9 (0.7–1.2)	2.1 (1.9–2.3)	1.7 (1.5–2.0)	2.8 (2.5–3.0)	1.1 (1.0–1.3)	1.1 (1.0–1.3)
Disagree	8.2 (7.8–8.4)	16.4 (15.7–16.9)	14.0 (13.4–14.4)	20.1 (19.3–20.8)	9.7 (9.4–9.9)	9.6 (9.3–9.8)
Agree	60.5 (58.2–62.3)	65.3 (62.2–68.1)	65.3 (62.7–67.6)	64.3 (61.2–67.0)	62.7 (61.3–63.9)	62.6 (61.4–63.6)
Strongly agree	30.4 (25.6–35.6)	16.2 (13.6–19.1)	19.0 (16.4–22.0)	12.8 (11.0–14.9)	26.5 (24.3–28.8)	26.7 (24.8–28.7)

See table footnotes on the next page.

TABLE 2. (*Continued*) Mental health, well-being, and working conditions* of health workers, other essential workers,† and all other workers — General Social Survey Quality of Worklife Module, United States, 2018 and 2022

	Estimate, % (95% CI)					
	Health workers		Other essential workers		All other workers	
Variable	2018 n = 226	2022 n = 325	2018 n = 379	2022 n = 467	2018 n = 838	2022 n = 1,160
Not enough staff members††††††,¶						
Never**	12.8 (12.6–13.1)	9.8 (9.6–9.9)	10.6 (10.4–10.8)	7.7 (7.6–7.9)	14.8 (14.7–15.0)	15.0 (14.9–15.1)
Rarely	25.1 (22.4–27.4)	21.2 (19.4–22.8)	22.4 (20.6–23.9)	18.0 (16.8–19.1)	27.1 (25.6–28.6)	27.3 (25.9–28.6)
Sometimes	36.3 (31.1–41.3)	37.0 (33.1–40.6)	36.9 (33.3–40.4)	36.3 (33.4–39.1)	35.4 (32.8–37.9)	35.3 (33.1–37.4)
Often	25.7 (21.8–30.1)	32.0 (28.4–36.0)	30.1 (26.8–33.6)	37.9 (34.5–41.4)	22.6 (20.8–24.6)	22.4 (20.8–24.1)

Abbreviations: GSS = General Social Survey; NA = not available.

* All analyses used survey weights provided by GSS.

† Frontline, nonhealth workers.

§ "Taken all together, how would you say things are these days, would you say that you are very happy, pretty happy, or not too happy?" (GSS variable name: happy).

¶ Significant interaction between worker group and year per likelihood ratio test (p<0.05).

** CIs for the lowest level of ordinal scales were calculated using the pooled SE for the other categories in the scale.

†† "During the past 12 months, how often have you had trouble going to sleep or staying asleep?" (GSS variable name: slpprblm).

§§ Significant main effect for year per likelihood ratio test (p<0.05).

¶¶ "Now thinking about your mental health, which includes stress, depression, and problems with emotions, for how many days during the past 30 days was your mental health not good?" Numeric responses range = 0–30 (GSS variable name: mntlhlth).

*** Composite of GSS variables feelnerv ("Over the last 2 weeks, how often have you been bothered by the following problems: feeling nervous, anxious, or on edge") and worry ("Over the last 2 weeks, how often have you been bothered by the following problems: not being able to stop or control worrying"). Response options: not at all (0), several days (1), more than half the days (2), nearly every day (3). Items were summed and scores of ≥1 were coded as "Yes" for anxiety symptoms.

††† Composite of GSS variables feeldown ("Over the last 2 weeks, how often have you been bothered by the following problems: feeling down, depressed, or hopeless") and nointerest ("Over the last 2 weeks, how often have you been bothered by the following problems: little interest or pleasure in doing things"). Response options: not at all (0), several days (1), more than half the days (2), nearly every day (3). Items were summed and scores of ≥1 were coded as "Yes" for depression symptoms.

§§§ "How often during the past month have you felt used up at the end of the day?" (GSS variable name: usedup).

¶¶¶ New item for 2022. "During the past 3 months, how many days did you work while physically ill?" Scores of ≥1 were recoded as "Yes" for presenteeism (GSS variable name: worksick).

**** Significant main effect for worker group per likelihood ratio test (p<0.05).

†††† "Taking everything into consideration, how likely is it you will make a genuine effort to find a new job with another employer within the next year?" (GSS variable name: trynewjb).

§§§§ "In the last 12 months, were you threatened or harassed in any other way by anyone while you were on the job?" (GSS variable name: wkharoth).

¶¶¶¶ New items for 2022. Composite of GSS variables psysamephys ("Senior management considers psychological health to be as important as productivity"), strmgtsup ("Senior management show support for stress prevention through involvement and commitment"), and allorglevel ("In my organization, the prevention of stress involves all levels of the organization"). Response options: strongly disagree (1), disagree (2), neither agree nor disagree (3), agree (4), and strongly agree (5). Items were summed and scores <6 were coded "poor," 6–8 were coded "moderate," and ≥9 were coded "good."

***** "My supervisor is helpful to me in getting the job done" (GSS variable name: suphelp).

††††† "I trust the management at the place where I work" (GSS variable name: trustman).

§§§§§ "I have enough time to get the job done" (GSS variable name: wrktime).

¶¶¶¶¶ "In your job, how often do you take part with others in making decisions that affect you?" (GSS variable name: wkdecide).

****** "Conditions on my job allow me to be about as productive as I could be" (GSS variable name: prodctiv).

†††††† "How often are there not enough people or staff to get all the work done?" (GSS variable name: toofewwk).

among health workers (from 30.4% to 16.2%) and other essential workers (from 19.0% to 12.8%). Overall, 81.5% of health workers agreed or strongly agreed that workplace conditions supported productivity. From 2018 to 2022, a higher percentage of health workers and other essential workers reported that there were often not enough staff members (from 25.7% to 32.0% and from 30.1% to 37.9%, respectively). Finally, presenteeism rates among health workers in 2022 (27.9%) were lower than rates in other essential workers (43.2%) and all other workers (37.4%).

Among health workers who reported being harassed, the odds of reporting anxiety, depression, and burnout were 5.01, 3.38, 5.83 times, respectively, those among health workers who were not harassed (Table 3). Compared with health workers who reported a poor psychosocial safety climate, the odds of reporting burnout were 0.35 and 0.24 times those among health workers who reported moderate and good psychosocial safety climates, respectively. Among health workers who reported that they trusted management and whose supervisors provided help, the odds of reporting burnout were 0.40 and 0.26 times, respectively, those among health workers who reported that they did not trust management or whose supervisors did not provide help. Health workers who took part in decision-making had 0.56 times the odds of reporting depression symptoms compared with health workers who reported they did not. Health workers who reported that there were not enough staff members had 1.91 times the odds of reporting symptoms of anxiety and 2.73 times the odds of reporting burnout compared with those who did not report staffing shortages. Health workers who reported having enough

TABLE 3. Anxiety symptoms, depression symptoms, and burnout* of health workers (N = 325), by working conditions — General Social Survey Quality of Worklife Module, United States, 2022

Working conditions (no. with information)	Anxiety symptoms				Depression symptoms				Burnout			
	OR (95% CI)	%	Chi-square	p-value	OR (95% CI)	%	Chi-square	p-value	OR (95% CI)	%	Chi-square	p-value
Harassment at work (313)[†]												
No (271)	1 (—)	52.8	16.77	<0.01	1 (—)	30.6	12.83	<0.01	1 (—)	41.7	22.94	<0.01
Yes (42)	5.01 (2.45–10.26)	84.9			3.38 (1.53–7.47)	59.8			5.83 (2.56–13.27)	80.6		
Psychosocial safety climate (310)[§]												
Poor (35)	1 (—)	65.2	1.13	0.57	1 (—)	53.1	5.04	0.08[¶]	1 (—)	76.3	10.85	<0.01
Moderate (62)	0.74 (0.25–2.20)	58.2			0.34 (0.13–0.85)	27.6			0.35 (0.13–0.97)	53.3		
Good (213)	0.64 (0.28–1.49)	54.6			0.42 (0.18–0.97)	32.1			0.24 (0.09–0.61)	43.3		
Trust management (310)****												
Disagree (61)[††]	1 (—)	59.0	0.20	0.66	1 (—)	42.7	2.67	0.10	1 (—)	64.7	10.02	<0.01
Agree (249)[§§]	0.88 (0.41–1.88)	55.9			0.62 (0.32–1.21)	31.5			0.40 (0.19–0.86)	42.4		
Supervisor helps (308)[¶¶]												
Not true (50)***	1 (—)	55.2	0.06	0.80	1 (—)	40.0	0.85	0.36	1 (—)	73.3	16.47	<0.01
True (258)[†††]	1.08 (0.47–2.49)	57.2			0.74 (0.35–1.56)	33.0			0.26 (0.11–0.62)	41.8		
Takes part in decisions (312)[§§§]												
Never/Rarely (73)	1 (—)	60.4	0.30	0.58	1 (—)	45.3	4.06	0.04[¶]	1 (—)	38.7	2.59	0.11
Sometimes/Often (239)	0.86 (0.43–1.69)	56.7			0.56 (0.28–1.14)	31.8			1.57 (0.74–3.33)	49.8		
Not enough staff (310)[¶¶¶]												
Never/Rarely (98)	1 (—)	45.3	6.70	0.01	1 (—)	36.0	0.07	0.79	1 (—)	30.9	15.41	<0.01
Sometimes/Often (212)	1.91 (1.02–3.58)	61.3			0.93 (0.53–1.64)	34.3			2.73 (1.31–5.67)	54.9		
Time to get job done (312)******												
Not true (57)***	1 (—)	63.0	0.73	0.39	1 (—)	31.9	0.13	0.71	1 (—)	69.9	10.82	<0.01
True (255)[†††]	0.75 (0.35–1.59)	56.0			1.14 (0.63–2.07)	34.7			0.33 (0.16–0.66)	43.1		
Conditions support productivity (312)[††††]												
Disagree (58)[††]	1 (—)	61.4	0.48	0.49	1 (—)	50.0	6.31	0.01	1 (—)	66.7	9.62	<0.01
Agree (254)[§§]	0.80 (0.37–1.75)	56.1			0.45 (0.22–0.95)	31.2			0.38 (0.18–0.80)	43.0		

Abbreviations: GSS = General Social Survey; OR = odds ratio.

* All analyses used survey weights provided by GSS. Burnout dichotomized where never, rarely, and sometimes = 0 and often and very often = 1.

† "In the last 12 months, were you threatened or harassed in any other way by anyone while you were on the job?" (GSS variable name: wkharoth).

§ Composite of GSS variables psysamephys ("Senior management considers psychological health to be as important as productivity"), strmgtsup ("Senior management show support for stress prevention through involvement and commitment"), and allorglevel ("In my organization, the prevention of stress involves all levels of the organization"). Response options: strongly disagree (1), disagree (2), neither agree nor disagree (3), agree (4), and strongly agree (5). Items were summed and scores <6 were coded "poor," 6–8 were coded "moderate," and ≥9 were coded "good."

¶ p-values were estimated based on the chi-square of the model. Wald 95% CIs were estimated for the ORs.

** "I trust the management at the place where I work" (GSS variable name: trustman).

†† Strongly disagree and Disagree collapsed to create Disagree.

§§ Agree and Strongly agree collapsed to create Agree.

¶¶ "My supervisor is helpful to me in getting the job done" (GSS variable name: suphelp).

*** Not at all true and Not too true collapsed to create Not true.

††† Somewhat true and Very true collapsed to create True.

§§§ "In your job, how often do you take part with others in making decisions that affect you?" (GSS variable name: wkdecide).

¶¶¶ "How often are there not enough people or staff to get all the work done?" (GSS variable name: toofewwk).

**** "I have enough time to get the job done" (GSS variable name: wrktime).

†††† "Conditions on my job allow me to be about as productive as I could be" (GSS variable name: prodctiv).

time to complete work had 0.33 times the odds of reporting burnout compared with health workers who did not. Finally, health workers who reported that conditions at work support productivity had 0.38 times the odds of reporting burnout compared with those who did not.

Discussion

This study provides evidence that during the COVID-19 pandemic, U.S. health workers experienced larger declines in a range of mental health outcomes than did essential and other workers, with the exception of general happiness, which was lower in essential workers. These data support the imperative for action to create a system in which health workers can thrive, as described in the U.S. Surgeon General's 2022 report "Addressing Health Worker Burnout," (*8*) which notes that distressing work environments contributed to a record high number of health workers quitting their jobs. A population-based cross-sectional study in Norway in early 2020, at the beginning of the pandemic, reported lower levels of anxiety and depression among health care workers compared with other workers (*13*). In contrast, the current report finds that U.S. health workers reported a larger increase in number of days of poor mental health and burnout in 2022 compared with 2018 than did other workers, with nearly one half (46%) reporting burnout in 2022. U.S. health workers were also more likely than were other workers to report negative changes in working conditions during that time. In 2022, the prevalence of reported health worker harassment more than doubled, and the very likely intention to find another job increased by almost 50%. Negative working conditions are associated with higher prevalences of depressive symptoms (*1*,*2*), self-rated poor health (*14*), and turnover intention (*8*). Accordingly, the American Public Health Association[†††] and the International Labour Organization promote decent work[§§§] (e.g., work that provides security and social protection; a fair income; and opportunities for growth, development, and productivity) as a public health goal fundamental for protecting workers.

This report identifies modifiable working conditions that contributed to poorer mental health among health workers and suggests preventive actions for employers. Previous research found job stress interventions that changed aspects of the organization (e.g., increased manager social support) were more effective than were secondary (e.g., screening for stressors) or tertiary (e.g., individual stress management) (*15*) interventions. A recent review of management interventions suggests that training managers on mental health awareness and ways to support workers and improve safety culture shows promise for reducing worker stress and improving well-being (*16*). Working conditions that support productivity and foster trust in management might be more readily addressed than providing sufficient staffing, which can be challenging in resource-constrained settings. More positive psychosocial safety climates, which include management prioritization of psychological health and stress prevention, were associated with lower burnout symptoms among health workers in this study. Previous research has demonstrated the link between psychosocial safety climate and reduced exhaustion, improved worker well-being, and improved engagement (*17*). Organizational policies and practices can be modified to improve security and reduce threats of violence.[¶¶¶] The International Organization for Standardization provides guidelines for managing psychosocial risks in the workplace to promote worker safety and health.[****] Employers can also make changes that increase participation in decision-making and reduce workloads.[††††] Evidence suggests that attention to such protective aspects of work could reduce the number of days of poor mental health and prevalences of burnout and turnover intention (*18*). Recent reviews note the limited number of organizational intervention studies addressing health worker mental health (*16*,*19*), reinforcing the need for researchers to join health employers, government, labor, and professional organizations in implementing effective organizational interventions and documenting their impact.

Summary

What is already known about this topic?

The longstanding health worker burnout crisis preceded the COVID-19 pandemic, which began in 2020.

What is added by this report?

Health worker respondents to the General Social Survey Quality of Worklife Module reported more days of poor mental health and were more likely to report burnout in 2022 than in 2018. Positive working conditions, such as trust in management and supervisor help, were associated with lower odds of poor mental health symptoms and burnout.

What are the implications for public health practice?

Health workers continued to face a mental health crisis in 2022. The National Institute for Occupational Safety and Health has developed a campaign, Impact Wellbeing, to provide employers of health workers with resources to modify working conditions and improve worker mental health, thereby supporting the nation's health system.

CDC's National Institute for Occupational Safety and Health (NIOSH) has implemented efforts to promote the mental health and well-being of health workers. One is a national social marketing campaign, Impact Wellbeing, which emphasizes primary prevention strategies such as worker participation in decision-making, supportive supervision, and increasing psychological safety for help-seeking (*20*). NIOSH has also developed burnout prevention training for supervisors of public health workers.[§§§§] Through these efforts, as noted in the Surgeon General's report (*8*), the emphasis is on improving the work environment to support mental health, rather than asking workers to be more resilient or to fix problems themselves.

Limitations

The findings in this report are subject to at least six limitations. First, the data are cross-sectional; causation cannot be inferred, and alternative explanations for the findings are possible. Second, these data are self-reported and subject to biases associated with recall and social desirability that could affect participant response. Third, because of administration during the pandemic, the 2022 GSS used mixed methods, including face-to-face and telephone interviews, and online administration; the 2018 survey was conducted using only face-to-face interviews. Use of these different methods might have influenced response rates and self-reporting of symptoms.

††† https://www.apha.org/Policies-and-Advocacy/Public-Health-Policy-Statements/Policy-Database/2023/01/18/Decent-Work-for-All#:~:text
§§§ https://www.ilo.org/global/topics/decent-work/lang--en/index.htm
¶¶¶ https://www.osha.gov/sites/default/files/publications/osha3148.pdf
**** https://www.iso.org/standard/64283.html
†††† https://www.cdc.gov/niosh/twh/fundamentals.html
§§§§ https://www.cdc.gov/niosh/learning/publichealthburnoutprevention/default.html

Fourth, data were weighted to be nationally demographically representative, but were not adjusted for industry, occupation, and work setting. Fifth, a relatively small number of health workers were included in the 2022 sample. The fourth and fifth limitations might limit generalizability. Finally, measures of symptoms for anxiety and depression were not available in 2018, which precludes prepandemic comparisons.

Implications for Public Health Practice

Health workers continued to face a mental health crisis in 2022. Improving management and supervisory practices might reduce symptoms of anxiety, depression, and burnout. Protecting and promoting health worker mental health has important implications for the nation's health system and public health. Health employers, managers, and supervisors are encouraged to implement the guidance offered by the Surgeon General (*8*) and use CDC resources (*20*) to include workers in decision-making, provide help and resources that enable workers to be productive and build trust, and adopt policies to support a psychologically safe workplace.

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Erratum

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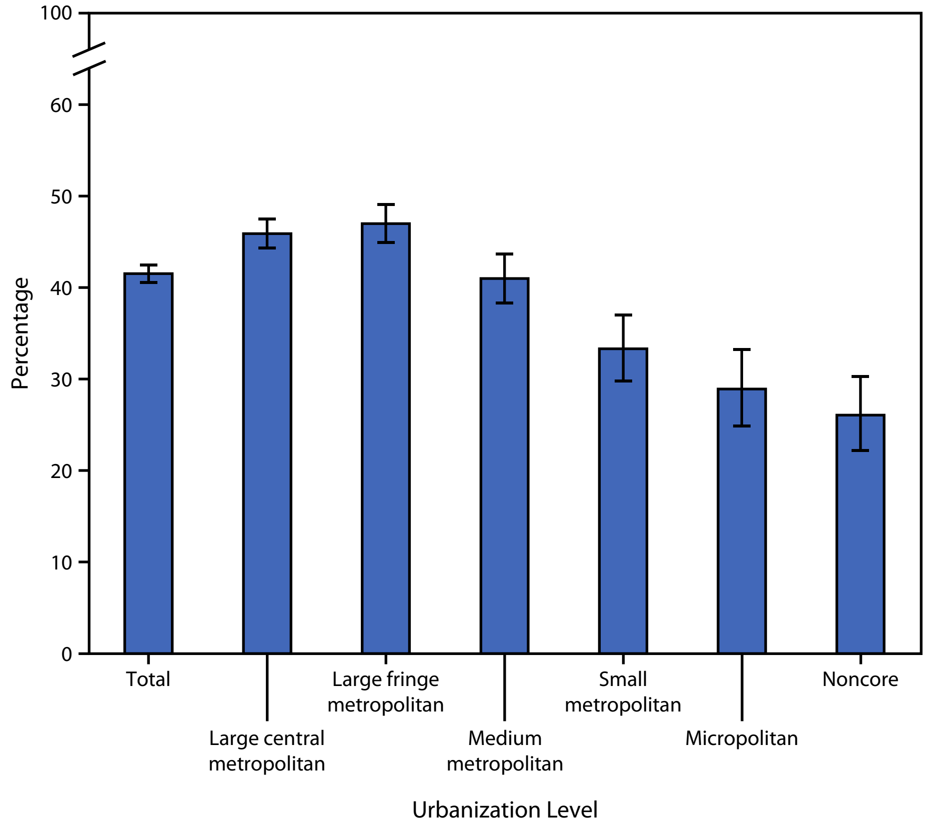
In the report, "Progress Toward Measles and Rubella Elimination — Indonesia, 2013–2022," on page 1135, the last sentence of the Methods section should have read, "This activity was reviewed by CDC, **deemed not research,** and was conducted consistent with applicable federal law and CDC policy.**" The corresponding footnote should have read, "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."

QuickStats

FROM THE NATIONAL CENTER FOR HEALTH STATISTICS

Percentage* of Adults Who Used the Internet in the Past 12 Months to Communicate with a Doctor or Doctor's Office,† by Urbanization Level§ — National Health Interview Survey, United States, July–December 2022¶



* With 95% CIs indicated by error bars.
† Based on a positive response to a question: "During the past 12 months, have you used the Internet for any of the following reasons? To communicate with a doctor or doctor's office." Adults who did not use the Internet were included with those who did not communicate with a doctor or doctor's office using the Internet.
§ Urban-rural classification of county of residence is based on the 2013 National Center for Health Statistics Urban–Rural Classification Scheme for Counties. https://www.cdc.gov/nchs/data/series/sr_02/sr02_166.pdf
¶ Estimates are based on household interviews of a sample of the civilian, noninstitutionalized U.S. population. Questions on use of the Internet were only asked in the last 6 months of 2022.

During July–December 2022, 41.5% of U.S. adults used the Internet in the past 12 months to communicate with a doctor or doctor's office. The percentage of adults who used the Internet to communicate with a doctor or doctor's office was highest among adults living in large central metropolitan (45.9%) and large fringe metropolitan (47.0%) counties, then decreased with decreasing level of urbanization to 26.1% for those living in noncore counties.

Source: National Center for Health Statistics, National Health Interview Survey, 2022. https://www.cdc.gov/nchs/nhis.htm

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