From: Shaun D"Sylva
To: House Labor and Commerce
Subject: Myths About E-Cigarettes
Date: Friday, April 9, 2021 2:44:18 PM

This might be of interest to you as you do your research on e-cigarettes.

The UK Public Health Agency (They run all healthcare in the United Kingdom) have some pretty enlightening facts that would be of value in discussing relative harm of e-cigarettes.

They have no financial ties to industry, just protecting the health of their citizens and have created a goal of stopping combustible cigarette use by 2030.

Clearing up some myths around e-cigarettes - Public health matters (blog.gov.uk)

I find utilizing accurate data and information will provide a basis to ask insightful and informative questions.

Regards,

SD

Shaun D'Sylva
Founder, Clear The Air Alaska
Owner, Fatboy Vapors Alaska
- [redacted]
- Website: **www.fatboyvapors.com**
- [redacted]

Centers for Disease Control and Prevention
MMWR
Morbidity and Mortality Weekly Report
Weekly / Vol. 69 / No. 50
December 18, 2020

Tobacco Product Use Among Middle and High School Students — United States, 2020

Andrea S. Gentzke, PhD[1]; Teresa W. Wang, PhD[1]; Ahmed Jamal, MBBS[1]; Eunice Park-Lee, PhD[2]; Chunfeng Ren, PhD[2]; Karen A. Cullen, PhD[2]; Linda Neff, PhD[1]

Tobacco use is the leading cause of preventable disease and death in the United States; nearly all tobacco product use begins during youth and young adulthood (*1*,*2*). CDC and the Food and Drug Administration (FDA) analyzed data from the 2019 and 2020 National Youth Tobacco Surveys (NYTS) to determine changes in the current (past 30-day) use of seven tobacco products among U.S. middle (grades 6–8) and high (grades 9–12) school students. In 2020, current use of any tobacco product was reported by 16.2% (4.47 million) of all students, including 23.6% (3.65 million) of high school and 6.7% (800,000) of middle school students. Electronic cigarettes (e-cigarettes) were the most commonly used tobacco product among high school (19.6%; 3.02 million) and middle school (4.7%; 550,000) students. From 2019 to 2020, decreases in current use of any tobacco product, any combustible tobacco product, multiple tobacco products, e-cigarettes, cigars, and smokeless tobacco occurred among high school and middle school students; these declines resulted in an estimated 1.73 million fewer current youth tobacco product users in 2020 than in 2019 (6.20 million) (*3*). From 2019 to 2020, no significant change occurred in the use of cigarettes, hookahs, pipe tobacco, or heated tobacco products. The comprehensive and sustained implementation of evidence-based tobacco control strategies at the national, state, and local levels, combined with tobacco product regulation by FDA, is warranted to help sustain this progress and to prevent and reduce all forms of tobacco product use among U.S. youths (*1*,*2*).

NYTS is a cross-sectional, voluntary, school-based, self-administered electronic survey of U.S. middle and high school students. A stratified three-stage cluster sampling procedure generated a nationally representative sample of U.S. students attending public and private schools in grades 6–12. Participants complete the survey in classrooms using a tablet computer.* In

*The survey was programmed using an application that did not require Internet access for use. Eligible students who were absent on the day of survey administration could participate in the NYTS using a web-based make-up survey.

INSIDE

1889 Surveillance for Harmful Algal Bloom Events and Associated Human and Animal Illnesses — One Health Harmful Algal Bloom System, United States, 2016–2018
1895 Health Center Testing for SARS-CoV-2 During the COVID-19 Pandemic — United States, June 5–October 2, 2020
1902 Telehealth Practice Among Health Centers During the COVID-19 Pandemic — United States, July 11–17, 2020
1906 Factors That Might Affect SARS-CoV-2 Transmission Among Foreign-Born and U.S.-Born Poultry Facility Workers — Maryland, May 2020
1911 Update to CDC's Treatment Guidelines for Gonococcal Infection, 2020
1917 Estimated Resource Costs for Implementation of CDC's Recommended COVID-19 Mitigation Strategies in Pre-Kindergarten through Grade 12 Public Schools — United States, 2020–21 School Year
1922 The Advisory Committee on Immunization Practices' Interim Recommendation for Use of Pfizer-BioNTech COVID-19 Vaccine — United States, December 2020
1925 Factors Associated with Positive SARS-CoV-2 Test Results in Outpatient Health Facilities and Emergency Departments Among Children and Adolescents Aged <18 Years — Mississippi, September–November 2020
1931 QuickStats

Continuing Education examination available at https://www.cdc.gov/mmwr/mmwr_continuingEducation.html

U.S. Department of Health and Human Services
Centers for Disease Control and Prevention

2020, data collection occurred during January 16–March 16, 2020.[†] In total, 14,531 students (participation rate = 87.4%) from 180 schools (participation rate = 49.9%) participated, yielding an overall response rate of 43.6% in 2020. Detailed information about NYTS is available elsewhere.[§]

Prevalence, with 95% confidence intervals, of current use of seven tobacco products (e-cigarettes, cigarettes, cigars, smokeless tobacco,[¶] hookahs, pipe tobacco,[**] and heated tobacco products[††]) was reported; current use was defined as use on one or more days during the past 30 days. Three composite measures of current use (any tobacco product,[§§] any combustible tobacco product,[¶¶] and multiple tobacco products[***]) also were reported.

National weighted prevalence estimates and population totals[†††] in 2020 were reported among all students and separately by school level. Estimates were reported overall and by selected demographic characteristics. Differences between the prevalence

[†] The data collection timeline was truncated because of widespread school closures during the coronavirus disease 2019 pandemic; data collection was anticipated to occur through May 2020. For comparison, the 2019 NYTS data were collected during February 15–May 24, 2019.

[§] https://www.cdc.gov/tobacco/data_statistics/surveys/nyts/index.htm.

[¶] Definition of smokeless tobacco includes chewing tobacco, snuff, or dip; snus; and dissolvable tobacco. Use of individual smokeless tobacco products is not reported.

[**] Use of pipe tobacco was assessed among respondents who reported ever use of one or more "other tobacco product" by the question "In the past 30 days, which of the following products have you used on at least one day? (Select one or more)" Respondents could select tobacco product(s) they had used from the list: roll-your-own cigarettes; pipes filled with tobacco (not hookah or waterpipe); snus; dissolvable tobacco products; bidis. Estimates of current use of roll-your-own cigarettes and bidis are not reported.

[††] Respondents were first asked about heated tobacco product use in 2019. Questions assessing awareness, ever use, and current use of heated tobacco products were accompanied by a brief description: "The next section is about heated tobacco products. Some persons refer to these products as "heat-not-burn" tobacco products. Heated tobacco products heat tobacco sticks or capsules to produce a vapor. They are different from e-cigarettes, which heat a liquid to produce a vapor. Some brands of heated tobacco products include iQOS, glo, and Eclipse."

[§§] In 2020, any tobacco product use is defined as current use of one or more of the following tobacco products on ≥1 day during the past 30 days: e-cigarettes, cigarettes, cigars, smokeless tobacco, hookahs, pipe tobacco, bidis, or heated tobacco products. In 2019, consistent with previously published estimates, any tobacco product use is defined as current use of one or more of the following tobacco products on ≥1 day during the past 30 days: e-cigarettes, cigarettes, cigars, smokeless tobacco, hookahs, pipe tobacco, or bidis. In 2020, inclusion of heated tobacco products did not significantly change overall estimates of any current tobacco product use among youths.

[¶¶] In 2019 and 2020, combustible tobacco product use is defined as current use of one or more of the following tobacco products on ≥1 day during the past 30 days: cigarettes, cigars, hookahs, pipe tobacco, or bidis.

[***] In 2020, multiple tobacco product use is defined as current use of two or more of the following tobacco products on ≥1 day during the past 30 days: e-cigarettes, cigarettes, cigars, smokeless tobacco, hookahs, pipe tobacco, bidis, or heated tobacco products. In 2019, consistent with previously published estimates, multiple tobacco product use is defined as current use of two or more of the following tobacco products on ≥1 day during the past 30 days: e-cigarettes, cigarettes, cigars, smokeless tobacco, hookahs, pipe tobacco, or bidis. In 2020, inclusion of heated tobacco products did not change overall estimates of multiple tobacco product use among youth significantly.

[†††] Data were weighted to account for the complex survey design and to adjust for nonresponse. Population estimates of current use were rounded down to the nearest 10,000 persons.

The *MMWR* series of publications is published by the Center for Surveillance, Epidemiology, and Laboratory Services, Centers for Disease Control and Prevention (CDC), U.S. Department of Health and Human Services, Atlanta, GA 30329-4027.

Suggested citation: [Author names; first three, then et al., if more than six.] [Report title]. MMWR Morb Mortal Wkly Rep 2020;69:[inclusive page numbers].

of current use in 2020 and that in 2019 (19,018 participants in 2019; student participation rate = 85.8%; school participation rate = 77.2%; overall response rate = 66.3%) were estimated using t-tests; p-values <0.05 were considered statistically significant. Trend analyses during 2011–2020 were not conducted because the mode of administration changed to an electronic survey in 2019 (*3*). The relative percent change (RPC) from 2019 to 2020 was calculated. Unstable estimates with a relative standard error of >30% or an unweighted denominator of <50 were suppressed. Analyses were conducted using SAS-callable SUDAAN (version 11.0.3; RTI International).

In 2020, among all students, 16.2% (an estimated 4.47 million) reported current use of any tobacco product (Table). Among high school students, 23.6% (3.65 million) reported current use of any tobacco product, 9.4% (1.45 million; 39.8% of any tobacco product users) reported current use of any combustible tobacco product, and 8.2% (1.27 million; 34.7% of any tobacco product users) reported current use of multiple tobacco products. By product, current use among high school students was highest for e-cigarettes (19.6%), followed by cigars (5.0%), cigarettes (4.6%), smokeless tobacco (3.1%), hookahs (2.7%), heated tobacco products (1.4%), and pipe tobacco (0.7%). Among high school students, any tobacco product use was reported by 24.7% of males and 22.5% of females; by 25.9% of non-Hispanic White, 23.3% of Hispanic, 18.4% of non-Hispanic Black, and 15.7% of non-Hispanic students of other races; and by 30.9% of those identifying as lesbian, gay, or bisexual, 22.0% of those identifying as heterosexual, and 20.4% of those reporting "not sure" about their sexual identity.

Among middle school students, 6.7% (800,000) reported current use of any tobacco product, 3.4% (400,000; 50.7% of any tobacco product users) reported current use of any combustible tobacco product, and 2.8% (340,000; 41.8% of any tobacco product users) reported current use of multiple tobacco products. By type of product, current use among middle school students was highest for e-cigarettes (4.7%), followed by cigarettes (1.6%), cigars (1.5%), hookahs (1.3%), heated tobacco products (1.3%), smokeless tobacco (1.2%), and pipe tobacco (0.4%). Among middle school students, any tobacco product use was reported by 6.8% of females and 6.6% of males; by 9.4% of Hispanic, 6.7% of non-Hispanic Black, and 5.7% of non-Hispanic White students; and by 16.5% of those identifying as lesbian, gay, or bisexual, 5.5% of those identifying as heterosexual, and 6.4% of those reporting "not sure" about their sexual identity.

From 2019 to 2020, among high school (Figure 1) and middle school students (Figure 2), significant declines (p<0.05) occurred in current use of any tobacco product (high school: 31.2% to 23.6%, RPC = –24.4%; middle school: 12.5% to 6.7%, RPC = –46.4%), any combustible tobacco product (high school: 12.0% to 9.4%, RPC = –21.7%; middle school: 4.8% to 3.4%, RPC = –29.2%), multiple tobacco products (high school: 10.8% to 8.2%, RPC = –24.1%; middle school: 4.0% to 2.8%, RPC = –30.0%), e-cigarettes (high school: 27.5% to 19.6%, RPC = –28.7%; middle school: 10.5% to 4.7%, RPC = –55.2%), cigars (high school: 7.6% to 5.0%, RPC = –34.2%; middle school: 2.3% to 1.5%, RPC = –34.8%), and smokeless tobacco (high school: 4.8% to 3.1%, RPC = –35.4%; middle school: 1.8% to 1.2%, RPC = –33.3%). During 2019–2010, no significant change in current use of cigarettes, hookahs, pipe tobacco, or heated tobacco products occurred among high or middle school students.

Summary

What is already known?

Tobacco use is the leading cause of preventable disease and death in the United States; nearly all tobacco use begins during youth and young adulthood.

What is added by this report?

In 2020, 23.6% (3.65 million) of high school and 6.7% (800,000) of middle school students reported current (past 30-day) use of any tobacco product. From 2019 to 2020, decreases among high school and middle school students occurred in current use of any tobacco product, combustible tobacco products, multiple tobacco products, e-cigarettes, cigars, and smokeless tobacco.

What are the implications for public health?

The comprehensive and sustained implementation of evidence-based tobacco control strategies, combined with tobacco product regulation by the Food and Drug Administration, is warranted to help sustain this progress and prevent and reduce all forms of tobacco product use among U.S. youths.

Discussion

Use of any tobacco product by youths declined by an estimated 1.73 million from 6.20 million in 2019 (*3*) to 4.47 million in 2020. Despite this decline, in 2020 nearly one in four U.S. high school students and approximately one in 15 middle school students still reported current use of any tobacco product. Continued efforts are warranted to sustain this progress and to prevent and reduce all forms of tobacco product use among U.S. youths (*1*,*2*).

Among both middle and high school students, current use of e-cigarettes declined from 2019 to 2020, reversing previous trends and returning current e-cigarette use to levels similar to those observed in 2018 (*4*). Declines in current cigar smoking and smokeless tobacco product use also occurred, as did youths' use of any combustible tobacco products and multiple tobacco products. Together, these changes contributed to an overall reduction in any tobacco product use by youths during 2019–2020. These declines were likely attributable to multiple factors at the national, state, and local level. For example, in December 2019, the federal minimum age of sale of all tobacco

TABLE. Percentage of middle and high school students who reported current (past 30-day) tobacco product use, by product,* school level, sex, race/ethnicity, and sexual identity — National Youth Tobacco Survey, United States, 2020

Tobacco product	Sex		Race/Ethnicity				Sexual identity			Total	
	Female	Male	White, non-Hispanic	Black, non-Hispanic	Hispanic†	Other, non-Hispanic	Heterosexual	Lesbian, gay, bisexual	Not sure	% (95% CI)	Estimated weighted no.§
	% (95% CI)										
Middle school and high school combined											
E-cigarettes	12.7 (10.9–14.9)	13.4 (11.5–15.5)	15.5 (13.5–17.8)	6.2 (4.8–8.1)	13.7 (11.0–16.9)	7.7 (5.0–11.8)	12.3 (10.6–14.2)	20.2 (16.7–24.1)	7.5 (5.2–10.7)	**13.1 (11.3–15.0)**	**3,580,000**
Cigars	3.4 (2.7–4.4)	3.7 (3.0–4.5)	2.8 (2.1–3.7)	6.5 (5.2–8.2)	4.0 (2.9–5.4)	—¶	3.1 (2.5–3.7)	6.0 (4.4–8.3)	3.0 (1.9–4.7)	**3.5 (2.9–4.3)**	**960,000**
Cigarettes	3.1 (2.4–4.0)	3.6 (2.7–4.7)	3.7 (2.8–4.8)	2.5 (1.8–3.5)	3.6 (2.6–4.9)	—¶	2.7 (2.1–3.6)	7.0 (5.1–9.4)	3.5 (2.2–5.5)	**3.3 (2.6–4.2)**	**910,000**
Smokeless tobacco	1.3 (0.9–1.7)	3.3 (2.5–4.3)	3.0 (2.3–3.9)	1.2 (0.6–2.1)	1.7 (1.3–2.2)	—¶	2.1 (1.6–2.8)	3.3 (2.2–4.8)	1.9 (1.1–3.3)	**2.3 (1.8–2 9)**	**630,000**
Hookahs	2.3 (1.7–3.0)	2.0 (1.6–2.5)	1.3 (1.0–1.7)	2.9 (2.1–4.0)	3.5 (2.5–5.0)	1.8 (1.0–3.1)	1.7 (1.4–2.1)	4.6 (3.4–6.1)	2.7 (1.5–4.7)	**2.1 (1.7–2.6)**	**580,000**
Heated tobacco products	1.4 (1.1–1.8)	1.3 (1.0–1.8)	1.1 (0.7–1.6)	1.1 (0.7–2.0)	2.1 (1.6–2.7)	—¶	1.0 (0.7–1.3)	3.2 (2.1–4.8)	—¶	**1.4 (1.1–1.7)**	**370,000**
Pipe tobacco	0.4 (0.3–0.6)	0.8 (0.5–1.1)	0.6 (0.4–1.0)	—¶	0.6 (0.4–0.9)	—¶	0.4 (0.3–0.7)	—¶	—¶	**0.6 (0.4–0.8)**	**150,000**
Any tobacco product**	15.8 (13.8–18.1)	16.7 (14.5–19.1)	17.8 (15.4–20.3)	13.2 (11.3–15.4)	17.2 (14.3–20.4)	10.1 (6.9–14.6)	15.1 (13.1–17.3)	25.5 (21.8–29.5)	11.1 (8.3–14.7)	**16.2 (14.3–18.4)**	**4,470,000**
Any combustible tobacco product††	6.6 (5.5–7.9)	7.0 (5.8–8.4)	5.9 (4.7–7.4)	9.2 (7.8–10.7)	8.1 (6.4–10.3)	4.9 (3.2–7.4)	5.7 (4.7–6.8)	13.5 (11.0–16.5)	6.9 (5.0–9.3)	**6.8 (5.8–7 9)**	**1,870,000**
Multiple tobacco products§§	5.3 (4.4–6.6)	6.5 (5.2–8.0)	6.1 (4.9–7.6)	4.9 (3.9–6.0)	6.7 (5.1–8.7)	4.3 (2.8–6.4)	5.0 (4.0–6.1)	11.7 (9.4–14.6)	5.6 (3.7–8.2)	**5.9 (4.9–7.1)**	**1,620,000**
High school											
E-cigarettes	18.7 (16.1–21.7)	20.4 (17.8–23.4)	23.2 (20.6–25.9)	9.1 (6.7–12.2)	18.9 (15.2–23.4)	12.1 (8.8–16.4)	18.5 (16.1–21.1)	25.1 (19.6–31.5)	14.5 (9.2–22.0)	**19.6 (17.2–22.2)**	**3,020,000**
Cigars	4.7 (3.6–6.1)	5.4 (4.3–6.9)	4.2 (3.2–5.5)	9.2 (7.0–12.1)	5.6 (3.8–8.2)	—¶	4.4 (3.6–5.5)	7.2 (4.9–10.4)	6.5 (3.9–10.8)	**5.0 (4.1–6.2)**	**770,000**
Cigarettes	3.9 (2.9–5.2)	5.4 (4.0–7.2)	5.3 (4.0–6.9)	2.8 (1.7–4.6)	4.6 (3.2–6.5)	—¶	3.8 (2.8–5.2)	8.0 (5.7–11.2)	7.5 (4.5–12.3)	**4.6 (3.6–6.0)**	**710,000**
Smokeless tobacco	1.4 (1.0–2.0)	4.8 (3.5–6.6)	4.1 (3.0–5.6)	—¶	2.2 (1.5–3.2)	—¶	3.0 (2.2–4.2)	3.0 (1.8–4.9)	—¶	**3.1 (2.3–4.1)**	**480,000**
Hookahs	2.9 (2.1–3.9)	2.6 (1.9–3.4)	1.8 (1.3–2.3)	3.9 (2.5–6.0)	4.4 (2.8–6.9)	—¶	2.2 (1.7–2.8)	5.4 (3.8–7.7)	—¶	**2.7 (2.1–3.5)**	**420,000**
Heated tobacco products	1.5 (1.1–2.1)	1.3 (0.9–2.0)	1.2 (0.8–1.8)	—¶	2.0 (1.4–2.7)	—¶	1.0 (0.7–1.5)	3.0 (1.8–4.8)	—¶	**1.4 (1.1–1 9)**	**210,000**
Pipe tobacco	0.4 (0.3–0.7)	1.0 (0.6–1.7)	0.9 (0.6–1.5)	—¶	—¶	—¶	—¶	—¶	—¶	**0.7 (0.5–1.1)**	**110,000**
Any tobacco product	22.5 (19.8–25.6)	24.7 (21.6–28.1)	25.9 (23.0–29.2)	18.4 (15.5–21.8)	23.3 (19.4–27.7)	15.7 (12.1–20.2)	22.0 (19.4–24.9)	30.9 (25.3–37.2)	20.4 (14.9–27.2)	**23.6 (21.1–26.4)**	**3,650,000**
Any combustible tobacco product	8.7 (7.1–10.5)	10.2 (8.3–12.3)	8.5 (6.8–10.6)	12.5 (10.3–15.1)	10.7 (8.2–14.0)	6.4 (4.1–9.9)	7.8 (6.5–9.5)	16.2 (12.8–20.2)	13.9 (10.0–19.1)	**9.4 (8.0–11.0)**	**1,450,000**
Multiple tobacco products	7.0 (5.5–8.8)	9.5 (7.5–11.9)	8.9 (7.1–11.0)	6.0 (4.5–8.1)	8.8 (6.4–11.8)	5.9 (3.8–9.0)	7.0 (5.6–8.7)	13.9 (10.6–18.0)	10.8 (6.7–17.0)	**8.2 (6.8–10.0)**	**1,270,000**

See table footnotes on the next page.

product types increased from 18 to 21 years (*5*). Under the authority of the 2009 Family Smoking Prevention and Tobacco Control Act, FDA issued guidance in January 2020 to prioritize enforcement against certain flavored e-cigarette products that appeal to youths, including mint and fruit flavors (*6*). Several states and communities also recently restricted the sale of flavored tobacco products, including e-cigarettes.§§§ In addition, public health efforts to address the multistate outbreak of e-cigarette, or vaping, product use–associated lung injury (EVALI) might have contributed to these declines in youth e-cigarette use (*7*). Furthermore, targeted actions to address the

§§§ https://www.tobaccofreekids.org/assets/factsheets/0398.pdf.

TABLE. (*Continued*) Percentage of middle and high school students who reported current (past 30-day) tobacco product use, by product,* school level, sex, race/ethnicity, and sexual identity — National Youth Tobacco Survey, United States, 2020

	Sex		Race/Ethnicity				Sexual identity			Total	
Tobacco product	Female	Male	White, non-Hispanic	Black, non-Hispanic	Hispanic†	Other, non-Hispanic	Heterosexual	Lesbian, gay, bisexual	Not sure	% (95% CI)	Estimated weighted no.§
	% (95% CI)										
Middle school											
E-cigarettes	4.8 (3.4–6.6)	4.5 (3.5–5.9)	4.3 (3.2–5.6)	2.6 (1.5–4.4)	7.1 (5.2–9.7)	—¶	3.8 (2.8–5.1)	12.1 (9.2–15.7)	—¶	**4.7 (3.6–6.0)**	**550,000**
Cigars	1.6 (1.1–2.3)	1.4 (1.0–1.9)	0.8 (0.5–1.5)	3.1 (2.2–4.4)	1.8 (1.2–2.9)	—¶	1.2 (0.9–1.6)	4.1 (2.4–6.9)	—¶	**1.5 (1.2–2.0)**	**180,000**
Cigarettes	2.0 (1.4–2.9)	1.3 (0.9–1.8)	1.3 (0.7–2.2)	2.1 (1.3–3.4)	2.2 (1.5–3.3)	—¶	1.2 (0.8–1.9)	5.2 (3.0–8.8)	—¶	**1.6 (1.2–2.2)**	**190,000**
Smokeless tobacco	1.0 (0.7–1.5)	1.4 (0.9–2.1)	1.4 (1.0–2.0)	—¶	1.0 (0.6–1.7)	—¶	0.9 (0.7–1.3)	3.8 (2.3–6.3)	—¶	**1.2 (0.9–1.6)**	**140,000**
Hookahs	1.5 (1.0–2.4)	1.2 (0.9–1.7)	0.7 (0.4–1.1)	—¶	2.4 (1.4–4.1)	—¶	1.1 (0.8–1.6)	3.2 (2.0–5.0)	—¶	**1.3 (1.0–1.9)**	**160,000**
Heated tobacco products	1.2 (0.9–1.7)	1.3 (0.8–2.2)	0.9 (0.5–1.4)	—¶	2.2 (1.3–3.5)	—¶	1.0 (0.6–1.5)	3.5 (2.0–6.1)	—¶	**1.3 (0.9–1.8)**	**150,000**
Pipe tobacco	—¶	—¶	—¶	—¶	—¶	—¶	—¶	—¶	—¶	**0.4 (0.2–0.7)**	**40,000**
Any tobacco product	6.8 (5.3–8.8)	6.6 (5.3–8.1)	5.7 (4.6–7.2)	6.7 (5.1–8.8)	9.4 (7.3–12.0)	—¶	5.5 (4.4–6.9)	16.5 (13.0–20.5)	6.4 (4.0–9.9)	**6.7 (5.5–8.2)**	**800,000**
Any combustible tobacco product	3.8 (3.0–5.0)	2.9 (2.2–3.8)	2.1 (1.4–3.2)	5.0 (3.6–6.7)	4.8 (3.4–6.7)	—¶	2.6 (2.0–3.5)	9.0 (6.1–13.0)	3.3 (1.8–5.8)	**3.4 (2.7–4.2)**	**400,000**
Multiple tobacco products	3.1 (2.3–4.1)	2.6 (2.0–3.5)	2.2 (1.5–3.1)	3.3 (2.2–5.0)	4.0 (2.7–5.9)	—¶	2.1 (1.6–2.9)	8.2 (5.8–11.7)	—¶	**2.8 (2.2–3.7)**	**340,000**

Abbreviation: CI = confidence interval.

* 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?" Past 30-day use of cigarettes was determined by asking "During the past 30 days, on how many days did you smoke cigarettes?" Past 30-day use of cigars was determined by asking "During the past 30 days, on how many days did you smoke cigars, cigarillos, or little cigars?" Smokeless tobacco was defined as use of chewing tobacco, snuff, dip, snus, or dissolvable tobacco products. Past 30-day use of smokeless tobacco was determined by asking the following question for use of chewing tobacco, snuff, and dip: "During the past 30 days, on how many days did you use chewing tobacco, snuff, or dip?" and the following question for use of snus and dissolvable tobacco products: "In the past 30 days, which of the following products did you use on at least one day?" Responses from these questions were combined to derive overall smokeless tobacco use. Past 30-day use of hookahs was determined by asking "During the past 30 days, on how many days did you smoke tobacco in a hookah or waterpipe?" Past 30-day use of pipe tobacco (not hookahs) was determined by asking "In the past 30 days, which of the following products have you used on at least one day?" Past 30-day use of heated tobacco products was determined by asking "During the past 30 days, on how many days did you use heated tobacco products?" Because of missing data on the past 30-day use questions, denominators for each tobacco product might be different.

† Hispanic persons could be of any race (White; Black or African American; or other race [i.e., American Indian or Alaska Native; Asian; Hawaiian or other Pacific Islander]).

§ Estimated weighted total number of current tobacco product users was rounded down to the nearest 10,000 persons. Overall estimates were reported among 14,531 U.S. middle and high school students. School level was determined by self-reported grade level: high school (grades 9–12; n = 7,453) and middle school (grades 6–8; n = 7,042). Overall population estimates might not directly total to sums of corresponding subgroup population estimates because of rounding or inclusion of students who did not self-report sex, race/ethnicity, sexual identity, or grade level.

¶ Data were statistically unreliable because of unweighted denominator <50 or a relative standard error >30%.

** In 2020, any tobacco product use was defined as use of any tobacco product (e-cigarettes, cigarettes, cigars, smokeless tobacco, hookahs, pipe tobacco, bidis [small brown cigarettes wrapped in a leaf], or heated tobacco products) on ≥1 day during the past 30 days.

†† Any combustible tobacco product use was defined as use of cigarettes, cigars, hookahs, pipe tobacco, or bidis on ≥1 day during the past 30 days.

§§ In 2020, multiple tobacco product use was defined as use of two or more tobacco products (e-cigarettes, cigarettes, cigars, smokeless tobacco, hookahs, pipe tobacco, bidis, or heated tobacco products) on ≥1 day during the past 30 days.

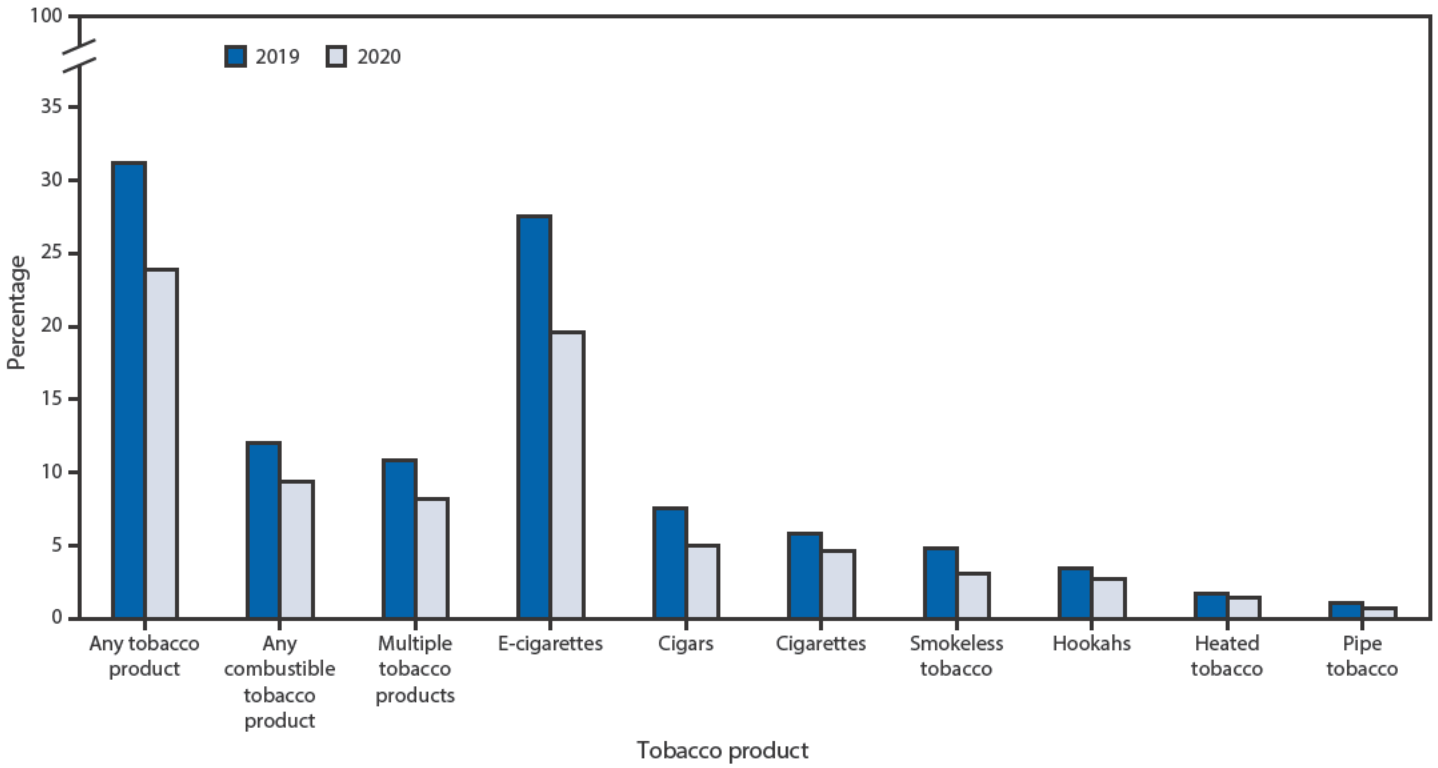
youth e-cigarette epidemic occurred, including FDA's public education campaign to reduce youth e-cigarette, smokeless tobacco, and cigarette use.¶¶¶

Despite declines in youths' use of combustible tobacco products since 2011 (*4*), no change in current cigarette smoking occurred during 2019–2020. Among all students who currently used any tobacco product, approximately 42% (1.87 million) reported smoking combustible tobacco products in 2020. However, a decline in current cigar smoking did occur during 2019–2020. Continued actions are warranted to help ensure sustained progress in preventing and reducing youths' use of all forms of tobacco products, including those that are combustible, noncombustible, and electronic.

The findings in this report are subject to at least three limitations. First, the data collection period was truncated because

¶¶¶ https://www.fda.gov/tobacco-products/public-health-education/youth-and-tobacco.

FIGURE 1. Percentage of current use of selected tobacco products,* any tobacco product,† any combustible tobacco product,§ and multiple tobacco products¶ among high school students — National Youth Tobacco Survey, United States, 2019 and 2020**



* Current use is defined as use on ≥1 day during the past 30 days for each product.

† In 2020, any tobacco product use was defined as use of any tobacco product (e-cigarettes, cigarettes, cigars, smokeless tobacco, hookahs, pipe tobacco, bidis [small brown cigarettes wrapped in a leaf], or heated tobacco products) on ≥1 day during the past 30 days. In 2019, consistent with previously published estimates, any tobacco product use was defined as use of any tobacco product (e-cigarettes, cigarettes, cigars, smokeless tobacco, hookahs, pipe tobacco, or bidis) on ≥1 day during the past 30 days.

§ Any combustible tobacco product use was defined as use of cigarettes, cigars, hookahs, pipe tobacco, or bidis on ≥1 day during the past 30 days.

¶ In 2020, multiple tobacco product use was defined as use of two or more tobacco products (e-cigarettes, cigarettes, cigars, smokeless tobacco, hookahs, pipe tobacco, bidis, or heated tobacco products) on ≥1 day during the past 30 days. In 2019, consistent with previously published estimates, multiple tobacco product use was defined as use of two or more tobacco products (e-cigarettes, cigarettes, cigars, smokeless tobacco, hookahs, pipe tobacco, or bidis) on ≥1 day during the past 30 days.

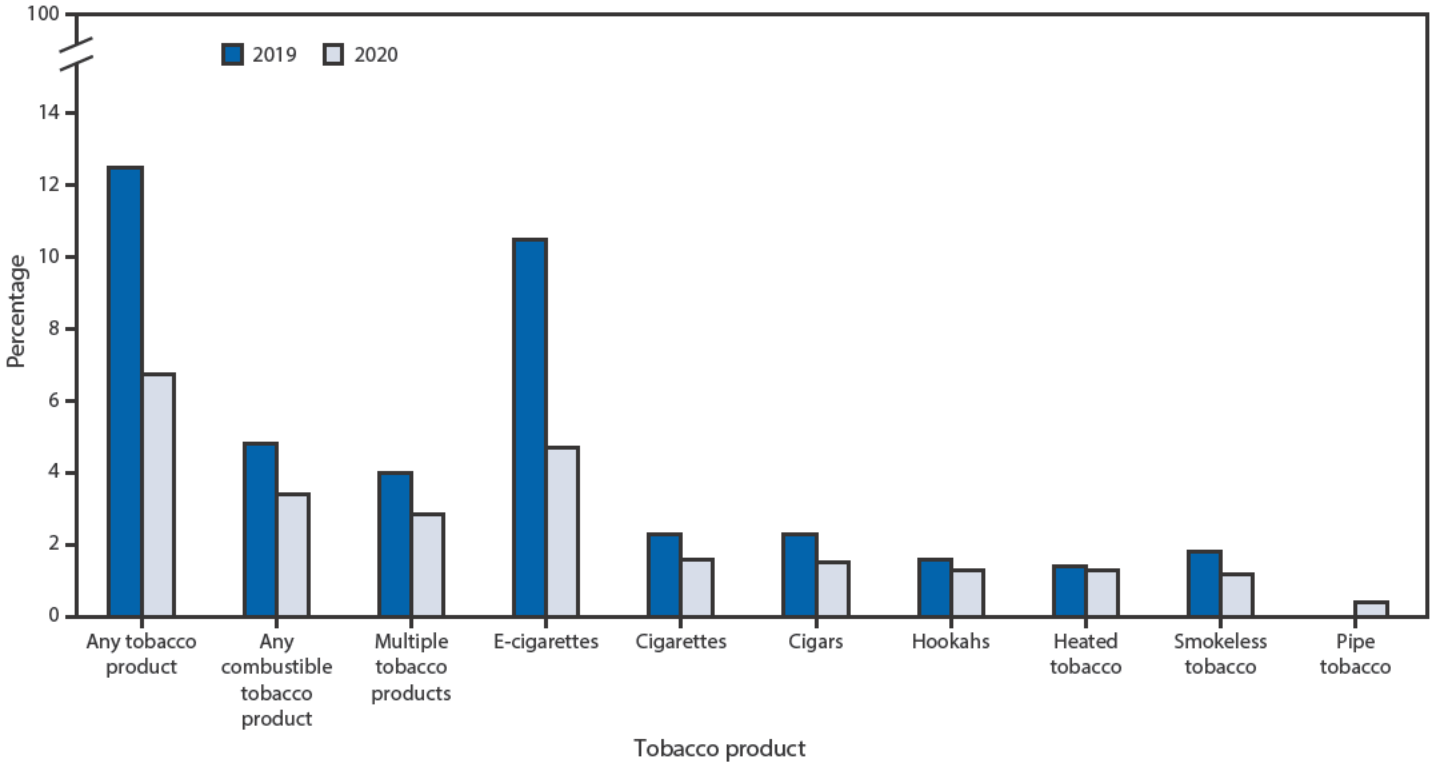
** During 2019–2020, significant declines in the use of any tobacco product ($p<0.001$), any combustible tobacco product ($p = 0.018$), multiple tobacco products ($p = 0.020$), e-cigarettes ($p<0.001$), cigars ($p<0.001$), and smokeless tobacco ($p = 0.031$) were observed. No significant change in use of cigarettes, hookahs, heated tobacco products, or pipe tobacco occurred.

of the coronavirus disease 2019 pandemic, resulting in a lower school participation rate (49.9%) compared with recent NYTS cycles (average across 2011–2019 NYTS cycles = 78.2%). However, the 2020 NYTS student participation rate (87.4%) was high, and the weighted sample yielded nationally representative estimates.**** Second, these data were self-reported and might be subject to recall and response biases. Finally, these findings might not be generalizable to youths who are homeschooled, have dropped out of school, are in detention centers, or are enrolled in alternative schools.

In 2020, approximately one in six U.S. middle and high school students, or approximately 4.47 million youths overall, reported current use of any tobacco product. The comprehensive and sustained implementation of evidence-based tobacco control strategies at the national, state, and local levels, combined with tobacco product regulation by FDA, is warranted for continuing progress toward reducing and preventing all forms of tobacco product use among U.S. youths. Such strategies include increasing prices of tobacco products, protecting persons from exposure to secondhand smoke and e-cigarette aerosol, sustaining hard-hitting media campaigns that warn about the dangers of tobacco product use, restricting youth access to tobacco

**** In addition to standard nonresponse bias analysis assessing differences in responding and nonresponding schools, for the 2020 cycle, extended nonresponse analyses were conducted to examine differences between participating schools (180) and schools that were recruited, but did not participate (74) because of widespread school closures during the coronavirus disease 2019 pandemic. These groups of schools did not differ by U.S. Census region. School participation was significantly higher among nonurban schools and those with a lower proportion of the student population that was non-Hispanic Black. However, both of these indicators were used in the creation of survey weight adjustments to mitigate potential biases.

FIGURE 2. Percentage of current use of selected tobacco products,*,† any tobacco product,§ any combustible tobacco product,¶ and multiple tobacco products among middle school students — National Youth Tobacco Survey, United States, 2019 and 2020††**



* Current use is defined as use on ≥1 day during the past 30 days for each product.

† Estimate for "pipe tobacco, 2019" is suppressed because of relative standard error >30% or unweighted denominator <50.

§ In 2020, any tobacco product use was defined as use of any tobacco product (e-cigarettes, cigarettes, cigars, smokeless tobacco, hookahs, pipe tobacco, bidis [small brown cigarettes wrapped in a leaf], or heated tobacco products) on ≥1 day during the past 30 days. In 2019, consistent with previously published estimates, any tobacco product use was defined as use of any tobacco product (e-cigarettes, cigarettes, cigars, smokeless tobacco, hookahs, pipe tobacco, or bidis) on ≥1 day during the past 30 days.

¶ Any combustible tobacco product use was defined as use of cigarettes, cigars, hookahs, pipe tobacco, or bidis on ≥1 day during the past 30 days.

** In 2020, multiple tobacco product use was defined as use of two or more tobacco products (e-cigarettes, cigarettes, cigars, smokeless tobacco, hookahs, pipe tobacco, bidis, or heated tobacco products) on ≥1 day during the past 30 days. In 2019, consistent with previously published estimates, multiple tobacco product use was defined as use of two or more tobacco products (e-cigarettes, cigarettes, cigars, smokeless tobacco, hookahs, pipe tobacco, or bidis) on ≥1 day during the past 30 days.

†† During 2019–2020, significant declines in the use of any tobacco product ($p<0.001$), any combustible tobacco product ($p = 0.013$), multiple tobacco products ($p = 0.025$), e-cigarettes ($p<0.001$), cigars ($p = 0.012$), and smokeless tobacco ($p = 0.038$) were observed. No significant change in use of cigarettes, hookahs, or heated tobacco products occurred. Because of the suppression of the pipe tobacco estimate in 2019, no comparison was made during 2019–2020.

products, prohibiting the sale of all flavored tobacco products, and development of regulations to reduce youth appeal and addictiveness of tobacco products (*1–3,8–10*). In addition, as the tobacco product landscape continues to diversify, surveillance for all forms of tobacco product use, including novel products, by youths is important to inform public health policy and practice at the local, state, and national levels.

Corresponding author: Andrea Gentzke, msv3@cdc.gov, 404-639-3286.

[1]Office on Smoking and Health, National Center for Chronic Disease Prevention and Health Promotion, CDC; [2]Center for Tobacco Products, Food and Drug Administration, Silver Spring, Maryland.

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

References

1. US Department of Health and Human Services. The health consequences of smoking—50 years of progress. Atlanta, GA: US Department of Health and Human Services, CDC; 2014. https://www.ncbi.nlm.nih.gov/books/NBK179276/pdf/Bookshelf_NBK179276.pdf
2. US Department of Health and Human Services. Preventing tobacco use among youth and young adults. Atlanta, GA: US Department of Health and Human Services, CDC; 2012. https://www.cdc.gov/tobacco/data_statistics/sgr/2012/index.htm
3. Wang TW, Gentzke AS, Creamer MR, et al. Tobacco product use and associated factors among middle and high school students—United States, 2019. MMWR Surveill Summ 2019;68(No. SS-12). PMID:31805035 https://doi.org/10.15585/mmwr.ss6812a1
4. Gentzke AS, Creamer M, Cullen KA, et al. Vital signs: tobacco product use among middle and high school students—United States, 2011–2018. MMWR Morb Mortal Wkly Rep 2019;68:157–64. PMID:30763302 https://doi.org/10.15585/mmwr.mm6806e1

5. Food and Drug Administration. newly signed legislation raises federal minimum age of sale of tobacco products to 21. Silver Spring, MD: US Department of Health and Human Services, Food and Drug Administration; 2019. https://www.fda.gov/tobacco-products/ctp-newsroom/newly-signed-legislation-raises-federal-minimum-age-sale-tobacco-products-21
6. Center for Tobacco Products. Enforcement priorities for Electronic Nicotine Delivery Systems (ENDS) and other deemed products on the market without premarket authorization (revised). Silver Spring, MD: US Department of Health and Human Services, Food and Drug Administration; 2020. https://www.fda.gov/media/133880/download
7. King BA, Jones CM, Baldwin GT, Briss PA. The EVALI and youth vaping epidemics—implications for public health. N Engl J Med 2020;382:689–91. PMID:31951683 https://doi.org/10.1056/NEJMp1916171
8. US Department of Health and Human Services. E-cigarette use among youth and young adults: a report of the Surgeon General. Atlanta, GA: US Department of Health and Human Services, CDC; 2016. https://www.cdc.gov/tobacco/data_statistics/sgr/e-cigarettes/pdfs/2016_sgr_entire_report_508.pdf
9. US Department of Health and Human Services. Surgeon General's advisory on e-cigarette use among youth. Rockville, MD: US Department of Health and Human Services, Office of the Surgeon General; 2018. https://e-cigarettes.surgeongeneral.gov/documents/surgeon-generals-advisory-on-e-cigarette-use-among-youth-2018.pdf
10. CDC. Best practices for comprehensive tobacco control programs—2014. Atlanta, GA: US Department of Health and Human Services, CDC; 2014. https://www.cdc.gov/tobacco/stateandcommunity/best_practices/index.htm

Circulation

RESEARCH LETTER

Association of Cigarette and Electronic Cigarette Use Patterns With Levels of Inflammatory and Oxidative Stress Biomarkers Among US Adults

Population Assessment of Tobacco and Health Study

Andrew C. Stokes, PhD
Wubin Xie, DrPH, MPH
Anna E. Wilson, MPH
Hanqi Yang, BA
Olusola A. Orimoloye, MBBS, MPH
Alyssa F. Harlow, MPH
Jessica L. Fetterman, PhD
Andrew P. DeFilippis, MD, MSc
Emelia J. Benjamin, MD, ScM
Rose Marie Robertson, MD
Aruni Bhatnagar, PhD
Naomi M. Hamburg, MD, MSc
Michael J. Blaha, MD, MPH

The cardiovascular toxicity of electronic cigarettes (e-cigarettes) is not well understood, and population data assessing the cardiovascular effects of e-cigarette use are sparse. In the present study, we used nationally representative data to examine the association of cigarette and e-cigarette use behaviors with biomarkers of inflammation and oxidative stress. Inflammation and oxidative stress are key contributors of smoking-induced cardiovascular disease, and related biomarkers have been studied as predictive factors for cardiovascular events.[1,2]

The PATH study (Population Assessment of Tobacco and Health) is a nationally representative longitudinal cohort in the United States. The Wave 1 survey was administered from 2013 to 2014 and included the collection of blood and urine samples. Additional information on PATH biospecimen procedures is given elsewhere.[3] Our analysis was restricted to Wave 1 adults ≥18 years of age with nonmissing data on biomarkers and cigarette/e-cigarette use. Analytic sample sizes were dependent on the respective biomarker considered.

We classified participants into 4 categories based on cigarette/e-cigarette use behaviors in the past 30 days to assess product exposure: (1) Nonuse included respondents with no cigarette or e-cigarette use; (2) exclusive e-cigarette included individuals with no cigarette use but e-cigarette use; (3) exclusive cigarette included individuals with cigarette use but no e-cigarette use; and (4) dual use included individuals with e-cigarette and cigarette use.

We selected biomarkers of inflammation (high-sensitivity C-reactive protein, interleukin-6, fibrinogen, soluble intercellular adhesion molecule) and oxidative stress (urinary 8-isoprostane) as dependent variables. We used the PATH imputed biomarker variables in which observations under the limit of detection were replaced by limit of detection/$\sqrt{2}$. All biomarkers were right skewed and thus $\log_e$ transformed for analyses.

We adjusted for covariates that may be associated with smoking behaviors or biomarkers of interest. Data on race and ethnicity were combined to classify respondents as non-Hispanic White, non-Hispanic Black, Hispanic, and non-Hispanic other. Additional self-reported measures included sex (male, female); age (18–24, 25–34, 35–44, 45–54, 55–64, ≥65 years); education (less than high school, high school diploma, some college, college or higher); poverty status based on household income (<100%, 100%–199%, ≥200% of poverty level); body mass index (<18.5, 18.5–24.9, 25–29.9, ≥30 kg/m^2); diabetes (yes, no); heart attack (yes, no); heart failure (yes, no); stroke (yes, no); use of other tobacco products, including traditional cigar, filtered cigar, cigarillo, pipe, hookah, snus, dissolvable, smokeless (never, former, current), and marijuana/blunt (never, former, current); recreational drug (never, former, current); prescription drug (never, former, current); secondhand smoke exposure at home or at work (yes, no); and pack-year of cigarette smoking and its squared term.

Key Words: electronic nicotine delivery systems ■ inflammation ■ oxidative stress

https://www.ahajournals.org/journal/circ

Table. Associations of Smoking and e-Cigarette Use With Cardiovascular Biomarkers Among Adult Respondents in the PATH Study Wave 1, 2013 to 2014

Indicators	Compared with nonuse				Compared with exclusive smoking	
	Nonuse (n=2191, 58.6%)	Exclusive e-cigarette use (n=261, 1.9%)	Exclusive smoking (n=3261, 29.6%)	Dual use n=1417, 9.9%)	Exclusive e-cigarette use	Dual use
hsCRP (n=7130)						
Adjusted geometric mean†	1.4 (1.2–1.5)	1.5 (1.3–1.8)	1.7 (1.6–1.8)	1.7 (1.5–1.8)		
Age-, sex-, race/ethnicity–adjusted GMR (95% CI)‡	Ref.	1.15 (0.95–1.39)	1.26 (1.11–1.41)*	1.26 (1.11–1.44)*	0.92 (0.71–0.90)*	1.00 (0.90–1.12)
Multivariable-adjusted GMR (95% CI)§	Ref.	1.08 (0.92–1.27)	1.19 (1.06–1.33)*	1.17 (1.03–1.32)*	0.91 (0.79–1.07)	0.99 (0.89–1.09)
IL-6 (n=6915)						
Adjusted geometric mean†	1.4 (1.3–1.4)	1.4 (1.3–1.6)	1.6 (1.6–1.7)	1.6 (1.5–1.7)		
Age-, sex-, race/ethnicity–adjusted GMR (95% CI)‡	Ref.	1.10 (0.98–1.24)	1.28 (1.20–1.37)*	1.24 (1.16–1.33)*	0.86 (0.73–0.83)*	0.97 (0.91–1.03)
Multivariable-adjusted GMR (95% CI)§	Ref.	1.00 (0.89–1.12)	1.15 (1.07–1.23)*	1.11 (1.03–1.19)*	0.87 (0.78–0.98)*	0.97 (0.91–1.03)
sICAM (n=7021)						
Adjusted geometric mean†	211.3 (205.7–216.9)	231.0 (218.9–243.2)	268.0 (260.5–275.3)	261.3 (253.2–269.3)		
Age-, sex-, race/ethnicity–adjusted GMR (95% CI)‡	Ref.	1.10 (1.04–1.16)*	1.29 (1.24–1.34)*	1.25 (1.21–1.30)*	0.85 (0.75–0.81)*	0.97 (0.94–1.01)
Multivariable-adjusted GMR (95% CI)§	Ref.	1.05 (0.99–1.11)	1.19 (1.15–1.24)*	1.16 (1.11–1.22)*	0.88 (0.83–0.93)*	0.98 (0.94–1.01)
Fibrinogen (n=6877)						
Adjusted geometric mean†	311.7 (306.2–317.1)	315.6 (304.7–326.6)	331.2 (325.9–336.5)	327.2 (319.6–334.8)		
Age-, sex-, race/ethnicity–adjusted GMR (95% CI)‡	Ref.	1.01 (0.97–1.05)	1.06 (1.03–1.08)*	1.04 (1.01–1.07)*	0.95 (0.92–0.97)*	0.99 (0.96–1.01)
Multivariable-adjusted GMR (95% CI)§	Ref.	1.00 (0.96–1.04)	1.04 (1.02–1.06)*	1.03 (1.00–1.06)*	0.96 (0.92–0.99)*	0.99 (0.96–1.01)
Urinary 8-isoprostane (n=7076)						
Adjusted geometric mean†	401.0 (380.2–421.4)	418.2 (366.4–470.0)	514.9 (489.1–540.7)	519.2 (485.6–552.8)		
Age-, sex-, race/ethnicity–adjusted GMR (95% CI)‡	Ref.	1.11 (0.97–1.26)	1.41 (1.31–1.51)*	1.41 (1.31–1.53)*	0.78 (0.66–0.76)*	1.00 (0.93–1.08)
Multivariable-adjusted GMR (95% CI)§	Ref.	1.02 (0.89–1.17)	1.24 (1.15–1.34)*	1.26 (1.15–1.37)*	0.82 (0.72–0.93)*	1.01 (0.94–1.08)

GMR indicates geometric mean ratio; hsCRP, high sensitivity C-reactive protein; IL-6, interleukin-6; PATH, Population Assessment of Tobacco and Health; Ref., referent; and sICAM, soluble intercellular adhesion molecule.

*Coefficients significant at 2-sided $P<0.05$. All models were weighted with Wave 1 blood sample weights.

†Adjusted geometric means were derived from exponentiating predicted margins holding all covariates in the multivariable models at means.

‡Adjusted for age (categorical), sex (male/female), and race/ethnicity (non-Hispanic White, non-Hispanic Black, Hispanic, non-Hispanic other).

§Multivariable models additionally adjusted for education (less than high school, high school, some college, bachelor or above); poverty status (<100% of poverty level, 100%–199% of poverty level, ≥200% of poverty level); diabetes (yes, no); heart attack (yes, no); heart failure (yes, no); stroke (yes, no); use of other tobacco products, including traditional cigar, filtered cigar, cigarillo, pipe, hookah, snus, dissolvable, smokeless (never, former, current), and marijuana/blunt (never, former, current); recreational drug use (never, former, current); prescription drug use (never, former, current); secondhand smoke exposure at home or at work (yes, no); body mass index (underweight, normal, overweight, obese); and pack-year of cigarette smoking and its squared term.

We used multivariable linear models with sequential adjustments for covariates to evaluate the association of cigarette/e-cigarette use behaviors with each biomarker, and geometric mean ratios were obtained by exponentiating the coefficients. The first model was adjusted for age, sex, and race/ethnicity; the

second was additionally adjusted for other covariates listed above.

We analyzed data using Stata, version 15 (StataCorp). We applied PATH-derived blood biomarker sample weights and considered statistical significance using a 2-sided test, with a significance level of 0.05. Missing data on covariates were imputed from multiple imputation with chained equation (20 imputations). Our analysis relied on deidentified data and was therefore exempted from review by the Boston University Medical Center Institutional Review Board. To test the robustness of our results, we repeated the analyses in subgroups of respondents (1) with no past 30-day use of any other tobacco products, (2) excluding nonusers with urinary cotinine ≥ 10ng/mL, and (3) with no missing values on covariates. Analytical code for purposes of reproducing the results is available on request. Restricted-use PATH files are available through an online application.[3]

Of the 7130 participants, 58.6% did not use cigarettes and e-cigarettes, 1.9% used e-cigarettes exclusively, 29.6% exclusively smoked, and 9.9% used both e-cigarette and cigarettes (Table). In the multivariable models, we observed no difference in the biomarker concentration of inflammatory or oxidative stress between participants who used e-cigarettes and nonusers. Exclusive smokers and dual users had higher levels across all biomarkers relative to nonusers. Compared with exclusive smokers, exclusive e-cigarette users had significantly lower levels of almost all inflammatory and oxidative stress biomarkers other than high-sensitivity C-reactive protein (geometric mean ratio, 0.91 [95% CI, 0.79–1.07]). We observed no difference between users of both products and exclusive smokers. The results were similar with all alternative analyses described above (data not shown).

In this nationally representative population study of adults, we observed no difference in inflammatory and oxidative stress biomarkers between exclusive e-cigarette users and nonusers (no cigarettes or vaping), and levels were lower in exclusive e-cigarette users relative to exclusive smokers. These findings are consistent with recent population studies of inflammatory biomarker[4] and toxicant exposure[5] in users of e-cigarettes and cigarettes and highlight the importance of completely replacing cigarette smoking with e-cigarettes or quitting the use of both products for cigarette smokers to derive potential health benefits.

ARTICLE INFORMATION

Correspondence

Andrew C. Stokes, PhD, Boston University School of Public Health, 801 Massachusetts Ave, 3rd Floor, 362, Boston, MA 02118. Email acstokes@bu.edu

Affiliations

American Heart Association Tobacco Regulation and Addiction Center, Dallas, TX (A.C.S., J.L.F., E.J.B., R.M.R., A.B., N.M.H., M.J.B.). Department of Global Health (A.C.S., W.X., A.E.W., H.Y.), Department of Epidemiology (A.F.H., E.J.B.), and Evans Department of Medicine and Whitaker Cardiovascular Institute (J.L.F., E.J.B., N.M.H.), Boston University School of Public Health, MA. Department of Medicine, Vanderbilt University Medical Center, Nashville, TN (O.A.O., A.P.D., R.M.R.). Department of Medicine, University of Louisville, KY (A.B.). Department of Medicine, The Johns Hopkins University, Baltimore, MD (M.J.B.).

Sources of Funding

Research reported in this publication was supported by the National Heart, Lung, and Blood Institute of the National Institutes of Health and the US Food and Drug Administration's Center for Tobacco Products (grants P50HL120163, U54HL120163, and 1K01HL154130-01). The content is solely the responsibility of the authors and does not necessarily represent the official views of the study sponsors.

Disclosures

Dr Stokes reported receiving grants from Ethicon Inc (a Johnson & Johnson company). The other authors report no conflicts.

REFERENCES

1. Conklin, DJ, Schick, S, Blaha, MJ, Carll, A, DeFilippis, A, Ganz, P, Hall, ME, Hamburg, N, O'Toole, T, Reynolds, L, et al. Cardiovascular injury induced by tobacco products: assessment of risk factors and biomarkers of harm: a Tobacco Centers of Regulatory Science compilation. *Am J Physiol Heart Circ Physiol.* 2019;316:H801–H827. doi: 10.1152/ajpheart.00591.2018
2. Carrero JJ, Andersson Franko M, Obergfell A, Gabrielsen A, Jernberg T. hsCRP level and the risk of death or recurrent cardiovascular events in patients with myocardial infarction: a healthcare-based study. *J Am Heart Assoc.* 2019;8:e012638. doi: 10.1161/JAHA.119.012638
3. US Department of Health and Human Services. National Institutes of Health, National Institute on Drug Abuse, US Department of Health and Human Services, Food and Drug Administration, Center for Tobacco Products. Population Assessment of Tobacco and Health (PATH) Study [United States] restricted-use files (ICPSR 36231). Inter-University Consortium for Political and Social Research. June 24, 2020. Accessed September 10, 2020. https://www.icpsr.umich.edu/web/NAHDAP/studies/36231/summary
4. Mainous AG 3rd, Yadav S, Hong YR, Huo J. e-Cigarette and conventional tobacco cigarette use, dual use, and C-reactive protein. *J Am Coll Cardiol.* 2020;75:2271–2273. doi: 10.1016/j.jacc.2020.02.061
5. Goniewicz ML, Smith DM, Edwards KC, Blount BC, Caldwell KL, Feng J, Wang L, Christensen C, Ambrose B, Borek N, et al. Comparison of nicotine and toxicant exposure in users of electronic cigarettes and combustible cigarettes. *JAMA Netw Open.* 2018;1:e185937. doi: 10.1001/jamanetworkopen.2018.5937

Retraction to: Electronic Cigarette Use and Myocardial Infarction Among Adults in the US Population Assessment of Tobacco and Health

After becoming aware that the study in the above-referenced article did not fully account for certain information in the Population Assessment of Tobacco and Health [PATH] Wave 1 survey, the editors of *Journal of the American Heart Association* reviewed the peer review process.

During peer review, the reviewers identified the important question of whether the myocardial infarctions occurred before or after the respondents initiated e-cigarette use, and requested that the authors use additional data in the PATH codebook (age of first MI and age of first e-cigarettes use) to address this concern. While the authors did provide some additional analysis, the reviewers and editors did not confirm that the authors had both understood and complied with the request prior to acceptance of the article for publication.

Post publication, the editors requested Dr. Bhatta et al conduct the analysis based on when specific respondents started using e-cigarettes, which required ongoing access to the restricted use dataset from the PATH Wave 1 survey.[1] The authors agreed to comply with the editors' request. The deadline set by the editors for completion of the revised analysis was not met because the authors are currently unable to access the PATH database. Given these issues, the editors are concerned that the study conclusion is unreliable.

The editors hereby retract the article from publication in *Journal of the American Heart Association*. [original article URL: https://www.ahajournals.org/doi/10.1161/JAHA.119.012317]

Reference

1. Bhatta DN, Glantz SA. Electronic Cigarette Use and Myocardial Infarction Among Adults in the US Population Assessment of Tobacco and Health. *J Am Heart Assoc*. 2019;8:e012317. DOI: 10.1161/JAHA.119.012317.

J Am Heart Assoc. 2020;9:e014519. DOI: 10.1161/JAHA.119.014519.