

U.S. Adults' Attitudes Toward Lowering Nicotine
Levels in CigarettesFatma Romeh M. Ali, PhD, Maeh Al-Shawaf, MPH, Teresa W. Wang, PhD,
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Introduction: This study assessed U.S. adults' attitudes toward lowering the nicotine levels in cigarettes to make them less addictive.

Methods: Data from the 2018 SummerStyles, a web-based panel survey of U.S. adults aged ≥ 18 years ($n=4,037$) fielded in June–July, were analyzed in 2018. Respondents were asked: *Do you favor or oppose requiring cigarette makers to lower the nicotine levels in cigarettes so that they are less addictive?* Responses were *strongly favor, somewhat favor, somewhat oppose, and strongly oppose*. Sociodemographic correlates of favorability (*strongly favor or somewhat favor*) were assessed using multivariable Poisson regression.

Results: Eighty-one percent of adults in 2018 strongly or somewhat favored requiring cigarette makers to lower the nicotine levels in cigarettes to make them less addictive, including 80.6% of current cigarette smokers, 84.3% of former smokers, and 81.3% of never smokers. Favorability was 71.5% among current noncigarette tobacco product users and 81.9% among nonusers. Following adjustment, slight variations in favorability existed by sex, age, race/ethnicity, and other tobacco product use.

Conclusions: Most adults favor requiring cigarette makers to lower the nicotine levels in cigarettes, including 8 in 10 current cigarette smokers. These findings can help inform the U.S. Food and Drug Administration's recent proposal to pursue a nicotine reduction standard for cigarettes.

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INTRODUCTION

Although cigarette smoking has declined considerably in recent decades, it remains the leading cause of preventable disease and death in the U.S., causing an estimated 480,000 deaths annually.¹ Two thirds of smokers want to quit smoking, yet fewer than 1 in 10 are able to quit each year.² This is primarily because cigarettes contain nicotine, which is a highly addictive drug.³

Lowering nicotine levels in cigarettes could make it harder for future generations to become addicted and help current smokers quit.⁴ In 1994, Benowitz and Henningfield⁴ first proposed reducing the nicotine content of cigarettes to nonaddictive levels to reduce the risk of addiction from cigarettes. Subsequent studies supported this approach by showing that considerable reductions in nicotine can result in decreased exposure to toxicants and reduced smoking behavior, dependence, and

secondhand smoke exposure.⁵ Given the available science on the potential benefits of nicotine reduction, the 2014 U.S. Surgeon General's report proposed the gradual reduction of cigarette nicotine content to nonaddicting levels through government action as one of several potential "End Game" strategies to accelerate declines in combustible tobacco smoking and end the tobacco epidemic.¹

In March 2018, the U.S. Food and Drug Administration (FDA) issued an advance notice of proposed

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rulemaking to obtain information for exploring a tobacco product standard to lower nicotine in cigarettes to minimally addictive or nonaddictive levels.⁶ The notice sought comments on key areas, as well as research to inform the agency's consideration of a nicotine product standard.

Population-level attitudes can guide implementation and sustainment of tobacco control interventions.⁷ Studies featuring data collected at various periods during 2010–2015 indicate that 47%–71% of U.S. adults favored reducing nicotine content in cigarettes.^{8–10} As the FDA considers future regulatory action, more recent data on public attitudes toward a proposed nicotine reduction standard could be beneficial, particularly given greater public discussion around the topic following the Surgeon General's Report and the recent FDA announcement. Therefore, this study assesses the prevalence and correlates of favorability among U.S. adults toward lowering nicotine levels in cigarettes to make them less addictive.

METHODS

Study Sample

Data came from the 2018 SummerStyles, a web-based panel survey of adults in the U.S. aged ≥ 18 years ($n=4,037$), fielded by Porter Novelli during June–July 2018. The response rate was 73.2%. Respondents were drawn from GfK's KnowledgePanel, and data were weighted to be nationally representative using Current Population Survey distributions on key demographic variables. This study analyzed de-identified secondary data, and thus human subjects review was not sought.

Measures

Respondents were asked: *Do you favor or oppose requiring cigarette makers to lower the nicotine levels in cigarettes so that they are less addictive?* Response options included *strongly favor*, *somewhat favor*, *somewhat oppose*, and *strongly oppose*. Adults who responded *strongly favor* or *somewhat favor* were considered to favor such a policy.

Statistical Analysis

Prevalence estimates and 95% CIs of favorability were calculated overall and by sociodemographics (sex, age, race/ethnicity, education, annual household income, and U.S. region), cigarette smoking status, and noncigarette tobacco product use. Adjusted prevalence ratios (APRs) and 95% CIs were calculated using multivariable Poisson regression to determine correlates of favorability. Estimates were considered statistically significant if $p < 0.05$. Analyses were conducted in 2018 using Stata, version 14.

RESULTS

Eighty-one percent of adults in 2018 strongly or somewhat favored requiring cigarette makers to lower the nicotine levels in cigarettes so that they are less addictive;

10.3% somewhat opposed and 8.7% strongly opposed the idea (Table 1). Favorability (i.e., strongly or somewhat) was 80.6% among current cigarette smokers, 84.3% among former smokers, and 81.3% among never smokers. Favorability was 71.5% among current noncigarette tobacco product users and 81.9% among nonusers.

Following adjustment, favorability was slightly higher among women than men (APR=1.06, 95% CI=1.03, 1.10) and Hispanics than white non-Hispanics (APR=1.07, 95% CI=1.01, 1.13) (Table 2). Favorability was slightly lower among adults aged 25–44 years (APR=0.87, 95% CI=0.84, 0.91) and 45–64 years (APR=0.95, 95% CI=0.92, 0.98) than those aged ≥ 65 years, adults with some college education than those with a college degree (APR=0.93, 95% CI=0.89, 0.97), and current noncigarette tobacco product users (APR=0.88, 95% CI=0.81, 0.96) than nonusers.

DISCUSSION

This study assessed adults' attitudes toward requiring cigarette makers to lower the nicotine levels in cigarettes in the U.S. In 2018, 8 in 10 adults favored requiring cigarette makers to lower the nicotine levels in cigarettes to make them less addictive, including 8 in 10 cigarette smokers and nearly three quarters of noncigarette tobacco users. This high level of favorability was consistent across all assessed sociodemographics, including sex, age, income, education, and race/ethnicity.

The likelihood of favoring such a policy was slightly lower among middle-aged adults, those with less education, and users of other tobacco products. These findings are generally consistent with previous research on public attitudes toward tobacco control policies.¹¹ Variations by age may be attributable to variations in nicotine dependency and understanding the health implications of nicotine exposure.^{1,12} Variations by education may be attributed to lack of knowledge about the lower addictiveness of low-nicotine cigarettes.¹² Users of other tobacco products might have less favorable attitudes because of concerns that such a standard could eventually lead to restrictions on the availability and characteristics of other tobacco products.

As noted by the U.S. Surgeon General, the overwhelming burden of death and disease from tobacco use in the U.S. is caused by cigarettes and other combustible tobacco products; nicotine is the principle addictive agent in these products.¹ Therefore, lowering nicotine levels in cigarettes to nonaddictive levels is a promising public health intervention. A recent simulation study estimated that if a nicotine reduction policy were implemented by 2020, approximately 5 million additional smokers could quit within a year, and 2.8 million

Table 1. Favorability Toward Lowering Nicotine Levels in Cigarettes Among U.S. Adults, 2018^a

Characteristic	Strongly favor, % (95% CI)	Somewhat favor, % (95% CI)	Somewhat oppose, % (95% CI)	Strongly oppose, % (95% CI)
Overall	52.4 (50.6, 54.2)	28.6 (27.0, 30.2)	10.3 (9.2, 11.4)	8.7 (7.6, 9.7)
Sex				
Female	57.9 (55.4, 60.4)	25.8 (23.6, 27.9)	8.4 (6.9, 9.8)	8.0 (6.6, 9.4)
Male	46.5 (44.0, 49.0)	31.7 (29.3, 34.1)	12.5 (10.8, 14.1)	9.4 (7.9, 10.8)
Age, years				
18–24	48.2 (40.4, 56.0)	31.1 (23.9, 38.3)	12.9 (7.8, 18.1)	7.7 (3.6, 11.9)
25–44	43.3 (40.3, 46.3)	32.1 (29.3, 34.9)	12.8 (10.8, 14.9)	11.8 (9.8, 13.8)
45–64	54.8 (52.2, 57.4)	28.5 (26.2, 30.9)	8.4 (7.0, 9.8)	8.3 (6.8, 9.7)
≥65	66.2 (62.9, 69.4)	21.4 (18.6, 24.2)	7.9 (6.1, 9.7)	4.5 (3.1, 5.9)
Race/ethnicity				
White, non-Hispanic	51.1 (49.1, 53.1)	30.8 (29.0, 32.7)	10.6 (9.4, 11.9)	7.5 (6.4, 8.5)
Black, non-Hispanic	52.3 (46.6, 58.0)	22.5 (17.8, 27.2)	12.8 (8.7, 16.8)	12.4 (8.5, 16.3)
Other, non-Hispanic	52.7 (45.8, 59.6)	26.0 (20.1, 32.0)	9.3 (5.4, 13.3)	12.0 (7.4, 16.5)
Hispanic	57.7 (52.2, 63.2)	25.6 (20.7, 30.5)	7.8 (4.8, 10.9)	8.9 (5.9, 11.9)
Educational attainment				
Less than high school	52.8 (3.5, 45.9)	25.5 (3.1, 19.5)	11.9 (2.2, 7.5)	9.8 (6.0, 13.6)
High school	53.3 (1.7, 50.0)	28.2 (1.5, 25.1)	9.9 (1.1, 7.8)	8.6 (6.7, 10.5)
Some college	50.3 (1.7, 47.0)	28.6 (1.5, 25.6)	11.8 (1.1, 9.7)	9.3 (7.4, 11.2)
College degree	53.3 (1.4, 50.5)	30.1 (1.3, 27.6)	8.9 (0.8, 7.3)	7.7 (6.1, 9.2)
Annual household income				
<\$15,000	48.9 (42.0, 55.9)	27.0 (20.9, 33.2)	10.6 (6.5, 14.6)	13.5 (8.8, 18.1)
\$15,000–\$24,999	56.8 (49.5, 64.0)	22.0 (16.1, 27.9)	10.3 (5.2, 15.4)	10.9 (6.6, 15.3)
\$25,000–\$39,999	53.7 (48.4, 59.0)	27.2 (22.3, 32.1)	10.7 (7.6, 13.9)	8.3 (5.2, 11.5)
\$40,000–\$59,999	51.4 (46.7, 56.1)	27.1 (23.0, 31.3)	12.1 (8.8, 15.3)	9.4 (6.6, 12.2)
≥\$60,000	52.3 (50.1, 54.6)	30.3 (28.3, 32.4)	9.8 (8.4, 11.1)	7.6 (6.4, 8.8)
U.S. Census region ^b				
Northeast	51.6 (47.6, 55.7)	29.0 (25.4, 32.6)	9.2 (6.8, 11.6)	10.2 (7.5, 12.8)
Midwest	51.9 (48.1, 55.7)	31.2 (27.7, 34.7)	9.9 (7.5, 12.3)	7.0 (5.0, 8.9)
South	52.1 (49.1, 55.0)	29.2 (26.5, 31.9)	10.4 (8.6, 12.2)	8.4 (6.8, 9.9)
West	53.9 (50.2, 57.7)	25.2 (21.9, 28.4)	11.5 (9.0, 13.9)	9.4 (7.2, 11.6)
Cigarette smoking status ^c				
Current smoker	40.0 (34.9, 45.1)	40.6 (35.3, 45.8)	9.7 (6.6, 12.8)	9.7 (6.7, 12.7)
Former smoker	54.8 (51.7, 57.8)	29.6 (26.7, 32.4)	10.0 (8.1, 12.0)	5.6 (4.3, 7.0)
Never smoker	54.6 (52.2, 57.0)	26.7 (24.6, 28.8)	10.0 (8.5, 11.4)	8.8 (7.4, 10.1)
Current noncigarette tobacco use ^d				
User	38.7 (32.6, 44.8)	32.8 (27.0, 38.6)	17.4 (12.5, 22.3)	11.1 (7.4, 14.8)
Nonuser	53.6 (51.8, 55.5)	28.3 (26.6, 29.9)	9.6 (8.5, 10.7)	8.5 (7.4, 9.5)

^aRespondents were asked: *Do you favor or oppose requiring cigarette makers to lower the nicotine levels in cigarettes so that they are less addictive?* Responses were *strongly favor*, *somewhat favor*, *somewhat oppose*, and *strongly oppose*.

^bNortheast: Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont. Midwest: Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin. South: Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia. West: Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming.

^cCurrent cigarette smokers are defined as respondents who smoked ≥100 cigarettes in their lifetime and reported smoking *every day* or *some days* at the time of the survey. Former cigarette smokers are defined as respondents who smoked ≥100 cigarettes in their lifetime and reported smoking *not at all* at the time of the survey. Never cigarette smokers are defined as respondents who reported *no* to smoking ≥100 cigarettes in their lifetime.

^dRespondents were asked about the current (past 30-day) use of the following noncigarette tobacco products: cigars or big cigars; cigarillos; little cigars; chewing tobacco, snuff or dip; electronic cigarettes or e-cigarettes; electronic hookahs, hookah pens, or vape pens; some other electronic vapor product such as electronic cigars or electronic pipes; water pipes; roll-your-own cigarettes; flavored cigars; snus; dissolvable tobacco products.

Table 2. APRs of Favorability Toward Lowering Nicotine Levels in Cigarettes Among U.S. Adults, 2018^a

Characteristic	n (%)	% (95% CI) ^b	APR (95% CI) ^c
Overall	4,037	81.0 (79.6, 82.4)	
Sex			
Female	2,040 (50.5)	83.6 (81.7, 85.6)	1.06 (1.03, 1.10)
Male	1,997 (49.5)	78.2 (76.1, 80.3)	Ref
Age, years			
18–24	169 (4.2)	79.3 (73.1, 85.6)	0.95 (0.87, 1.03)
25–44	1,283 (31.8)	75.4 (72.8, 78.0)	0.87 (0.84, 0.91)
45–64	1,659 (41.1)	83.3 (81.4, 85.3)	0.95 (0.92, 0.98)
≥65	926 (22.9)	87.6 (85.3, 89.9)	Ref
Race/ethnicity			
White, non-Hispanic	2,996 (74.2)	81.9 (80.3, 83.4)	Ref
Black, non-Hispanic	357 (8.8)	74.8 (69.7, 79.9)	0.94 (0.88, 1.01)
Other, non-Hispanic	300 (7.4)	78.7 (73.0, 84.4)	0.99 (0.92, 1.06)
Hispanic	384 (9.5)	83.3 (79.2, 87.3)	1.07 (1.01, 1.13)
Education attainment			
Less than high school	247 (6.1)	78.3 (72.8, 83.8)	0.94 (0.87, 1.02)
High school	1,117 (27.7)	81.5 (78.8, 84.2)	0.96 (0.92, 1.00)
Some college	1,162 (28.8)	78.9 (76.2, 81.5)	0.93 (0.89, 0.97)
College degree	1,511 (37.4)	83.5 (81.3, 85.6)	Ref
Annual household income			
<\$15,000	278 (6.9)	76.0 (70.2, 81.8)	0.96 (0.88, 1.03)
\$15,000–\$24,999	238 (5.9)	78.8 (72.6, 85.0)	1.00 (0.92, 1.08)
\$25,000–\$39,999	469 (11.6)	80.9 (76.7, 85.1)	0.99 (0.94, 1.05)
\$40,000–\$59,999	585 (14.5)	78.5 (74.6, 82.5)	0.95 (0.90, 1.00)
≥\$60,000	2,467 (61.1)	82.6 (80.9, 84.4)	Ref
U.S. Census region ^d			
Northeast	758 (18.8)	80.6 (77.3, 84.0)	Ref
Midwest	894 (22.2)	83.1 (80.2, 86.0)	1.04 (0.99, 1.10)
South	1,480 (36.7)	81.3 (79.0, 83.5)	1.02 (0.97, 1.08)
West	905 (22.4)	79.1 (76.0, 82.2)	0.99 (0.93, 1.04)
Cigarette smoking status ^e			
Current smoker	440 (10.9)	80.6 (76.5, 84.7)	1.03 (0.98, 1.09)
Former smoker	1,186 (29.4)	84.3 (82.0, 86.6)	1.04 (1.00, 1.07)
Never smoker	2,303 (57.1)	81.3 (79.4, 83.2)	Ref
Current noncigarette tobacco use ^f			
User	330 (8.2)	71.5 (65.9, 77.2)	0.88 (0.81, 0.96)
Nonuser	3,685 (91.3)	81.9 (80.5, 83.4)	Ref

Note: Boldface indicates statistical significance ($p < 0.05$).

^aFavorability is defined as a report of *strongly favor* or *somewhat favor* to the question: *Do you favor or oppose requiring cigarette makers to lower the nicotine levels in cigarettes so that they are less addictive?*

^bWithin-group differences were determined using standard chi-square tests.

^cAPRs were obtained using Poisson regression model adjusted for all covariates listed in the table.

^dNortheast: Connecticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont. Midwest: Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin. South: Alabama, Arkansas, Delaware, District of Columbia, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, Virginia, and West Virginia. West: Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming.

^eCurrent cigarette smokers are defined as respondents who smoked ≥100 cigarettes in their lifetime and reported smoking *every day* or *some days* at the time of the survey. Former cigarette smokers are defined as respondents who smoked ≥100 cigarettes in their lifetime and reported smoking *not at all* at the time of the survey. Never cigarette smokers are defined as respondents who reported *no* to smoking ≥100 cigarettes in their lifetime.

^fRespondents were asked about the current (past 30-day) use of the following noncigarette tobacco products: cigars or big cigars; cigarillos; little cigars; chewing tobacco, snuff or dip; electronic cigarettes or e-cigarettes; electronic hookahs, hookah pens, or vape pens; some other electronic vapor product such as electronic cigars or electronic pipes; water pipes; roll-your-own cigarettes; flavored cigars; snus; dissolvable tobacco products.

APR, adjusted prevalence ratio.

premature deaths from smoking-attributable disease could be avoided by 2060, and 8.5 million by 2100.¹³ These findings reinforce that public favorability for such a strategy is increasing over time, from nearly 50% in 2010 to 81% in 2018. This growth could be attributable to greater public knowledge of the topic following significant media stories around the FDA's announcement and continued declines in the social acceptability of cigarette smoking.

Limitations

This study is subject to some limitations. First, SummerStyles is a web-based panel survey and may be not fully representative of the U.S. adult population. However, the data are weighted to be nationally representative, and prior SummerStyles tobacco use estimates are consistent with large cross-sectional surveys.¹⁴ Second, small sample sizes prevented analysis of more nuanced tobacco use categories, including polytobacco use. Third, self-reported data may be subject to bias. Finally, the survey did not include questions on certain demographic groups with high tobacco use prevalence (e.g., sexual and gender minorities).

CONCLUSIONS

Most adults favored requiring cigarette makers to lower the nicotine levels in cigarettes in 2018, irrespective of sociodemographics and tobacco use status. The findings of this study can help inform the FDA's ongoing regulatory efforts related to a potential nicotine reduction standard and can serve as a comparison measure for future studies assessing public attitudes toward reducing the levels of nicotine in cigarettes in the U.S. Additionally, future research could help identify strategies for educating the public about such a policy and evaluating its impact on population-level attitudes and cessation behaviors.

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SUPPLEMENTAL MATERIAL

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