



Challenging Assumptions About Race/Ethnicity, Socioeconomic Status, and Cigarette Smoking Among Adolescents

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Abstract

Background Previous research indicates that differences in cigarette smoking exist among those of different race/ethnicity and varying levels of socioeconomic status. However, most research has examined the influence of these factors separately on cigarette smoking despite their observed covariation. To examine the interaction of race/ethnicity and socioeconomic status on adolescent tobacco use and behaviors, this study tests whether or not the social gradient holds for smoking patterns and perceptions of smoking among African American, American Indian/Alaska Native (AIAN), Asian, Hispanic, and White adolescents.

Methods Using data from the 2018 National Survey on Drug Use and Health, the sample included African American/Black (Black), American Indian/Alaska Native (AIAN), Asian, Hispanic, and White adolescents ($N = 12,474$), ages 12–17 years old. Measures included race/ethnicity, annual household income, age, gender, cigarette smoking, perceptions of peer use, parental attitudes, and health risks of smoking; logistic regression analyses were conducted.

Results Findings indicated significant interactions between high income and Black and Hispanic race/ethnicity for having ever smoked a cigarette indicating a difference in comparison to high-income White adolescents ($p's < 0.05$). We also found that the interaction between high income and AIAN race/ethnicity for disapproval of peers smoking was significant compared to White adolescents at the same income levels ($p < 0.05$). No differences were found for smoking health risk perceptions.

Conclusions The relationship between race/ethnicity, income, and smoking may be more complex than previously thought with these results having important preventative implications for identification of adolescents who may be most at risk for tobacco use.

Keywords Race/ethnicity · Socioeconomic status · Cigarette smoking · Adolescents

Introduction

Despite public health efforts to reduce the prevalence of smoking in the USA, over 4 million middle and high school-aged adolescents reported having tried cigarette smoking in 2019 [1]. Because the majority of adult smokers have tried smoking by the age of 18 [2], the need for a clear understanding

of factors associated with smoking during adolescence to help prevent and reduce tobacco use is crucial for reducing smoking prevalence and for preventing smoking initiation.

Research indicates that rates of cigarette smoking among adolescents vary by socioeconomic status (SES) and race/ethnicity [1, 3–7]. In particular, research suggests the existence of socioeconomic gradient differences (e.g., disparities by income) in adolescent smoking; low-SES (e.g., those with lower family income) [1, 3–5] and American Indian/Alaska Native (AIAN) and White adolescents [1, 3, 4, 6, 7] are more likely to smoke compared to other racial/ethnic groups and those of higher SES. Moreover, that White youth report higher rates of smoking compared to African American/Black (Black) and Hispanic/Latino (Hispanic) adolescents, seemingly contradicts the finding that smoking rates vary by SES, as Black and Hispanic adolescents are more likely to live in low-SES households than White adolescents [8]. In this regard, it is important to understand whether differences by SES hold among racial/ethnic minorities in the USA in order to best

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determine whom to target among these vulnerable populations [9].

Smoking-related perceptions, including perceptions about peer use [10, 11], parental disapproval of smoking [12], and the perception of the health implications of smoking [13–15], are risk factors for adolescent smoking. However, adolescent smoking-related perceptions may also vary across race/ethnicity. Compared to White adolescents, AIAN, Black, and Hispanic adolescents perceive that more of their peers smoke [16]; however, research has shown that the perception that friends smoke cigarettes may only be influential for White adolescents [10, 11]. Previous studies have shown that perceptions that parents disapprove of smoking are associated with a lower likelihood of smoking among Black and White adolescents, but same does not appear to hold true for Asian and Hispanic youth [10, 12, 17]. With regard to racial/ethnic differences in health risk perceptions of smoking, Hispanic adolescents may perceive cigarette smoking as less risky for their health compared to their White counterparts [13]. Understanding how smoking-related perceptions vary across race/ethnicity and whether these variations hold across the SES gradient is important in developing tailored smoking prevention strategies.

Although some data suggest significant SES and racial/ethnic tobacco-related disparities among adolescents, most research has focused on examining either racial/ethnic or SES disparities in adolescent smoking, with only two studies examining how the combination of SES and race/ethnicity impacts tobacco use. Results from these studies focused on middle school-aged adolescents are mixed with one study finding that higher income Black youth were more likely to smoke compared to those of lower income [18] and the other finding the reverse [19]. No study to date has examined these effects in the context of smoking-related perceptions or with an older adolescent (i.e., high school) sample.

The aim of this study is to conduct a more complete investigation of the influence of both SES and race/ethnicity on adolescent cigarette smoking and smoking-related perceptions to help further identify and clarify at-risk groups for cigarette smoking. This study tests whether or not the social gradient holds for smoking patterns and perceptions of smoking among Black, AIAN, Asian, Hispanic, and White adolescents. We used data collected from the 2018 National Survey on Drug Use and Health (NSDUH) to examine whether differences in cigarette smoking and smoking-related perceptions exist at the intersection between adolescents' race/ethnicity and SES.

Methods

Sample

The current study focuses only on the adolescent subsample (ages 12–17 years old) identifying as non-Hispanic AIAN,

Black, Asian, White, or Hispanic ($n = 12,474$) of the 2018 NSDUH, an independent, stratified multistage area probability sample of US civilians age 12 or older [20]. The overall response rate for the 2018 NSDUH was 48.8% (including adults and adolescents). Participants who identified as other or multiracial were not included. Because the study used publicly available national data that was de-identified, the study procedures were declared exempt by the Institutional Review Board at the University of California, Merced.

Measures

Cigarette Smoking

To evaluate cigarette smoking behaviors, participants were asked “Have you ever smoked part or all of a cigarette?” (yes, no). Participants who responded “yes” were also asked when they had last smoked; this was recoded into cigarette smoking in the “past year” (yes, no).

Smoking-Related Perceptions

Adolescent perception of peer use was measured using one question “How do you feel about someone your age smoking one or more packs of cigarettes a day?” (neither approve/disapprove, somewhat disapprove, strongly disapprove). This variable was coded as neither approve/disapprove or somewhat/strongly disapprove. Participants were also asked (1) “How do you think your parents would feel about you smoking 1+ packs of cigarettes per day” and (2) “How do you think your close friends would feel about you smoking one or more packs of cigarettes a day?” Response options were neither approve/disapprove, somewhat disapprove, or strongly disapprove and were recoded as neither approve/disapprove or somewhat/strongly disapprove. To assess perceptions of cigarette smoking health risk, participants were asked “How much do people risk harming themselves physically and in other ways when they smoke one or more packs of cigarettes per day?” (no risk, slight risk, moderate risk, or great risk) and responses were recoded into no/slight risk or moderate/great risk.

SES and Race/Ethnicity

To indicate SES of the adolescent, annual household income (a binary categorical variable) was used and divided into two categories: low (less than \$50,000/year) and high (\$50,000 or more/year). Race/ethnicity was categorized into five categories: AIAN, Asian, Black, Hispanic, and White (reference group).

Control Variables

Other variables included in the model were age (continuous; range 12–17 years old), gender (male/female), other substance use, and having ever suffered a major depressive episode (MDE; yes, no). Other substance use included ever alcohol use (yes, no) and ever use of cannabis (yes, no).

Statistical Analysis

Descriptive analyses were conducted to compare cigarette use and perceptions of smoking by race/ethnicity and income (Table 1). Controlling for age, gender, MDE, alcohol, and cannabis use, we used binary logistic regressions to test main and interaction effects of race/ethnicity and income (a binary variable) on each of the outcome variables. To take into account the complex multistage sampling design, data were weighted in accordance with survey directions [21] and all statistical analyses were performed in 2020 with the Stata SE version 16 statistical software.

Results

Descriptive Statistics

One in ten adolescent respondents reported having ever smoked part or all of a cigarette (Table 1). Few (5.5%) reported having smoked part or all of a cigarette in the past year and were classified as being nicotine dependent in the past month (1%). Most adolescents reported that they would disapprove of someone their age (93.4%) or that their friends would disapprove of them smoking a pack or more per day (91.6%). The majority (90.2%) also reported beliefs that smoking a pack of cigarettes or more per day was a great risk for health and that their parents would disapprove if they smoked (95.9%).

Regression Model

Cigarette Use

In regression models controlling for age, gender, MDE, and ever use of alcohol and/or cannabis, Asian (AOR = 0.26, 95% CI: 0.11, 0.61), Black (AOR = 0.25, 95% CI: 0.16, 0.38), and Hispanic (AOR = 0.37, 95% CI: 0.26, 0.52) adolescents were significantly less likely to have ever smoked a cigarette compared to White adolescents (Table 2). Black (AOR = 0.18, 95% CI: 0.10, 0.36) and Hispanic youth (AOR = 0.41, 95% CI: 0.27, 0.62) had lower odds of having smoked a cigarette in the past year compared to White youth. Adolescents of high level of income had lower odds of having ever smoked a cigarette (AOR = 0.40, 95% CI: 0.32, 0.49) and having

smoked a cigarette in the past year (AOR = 0.53, 95% CI: 0.41, 0.68) compared to those of low income level.

Youth Perceptions of Smoking

No differences by racial/ethnic group were found for perceptions that smoking a pack of cigarettes (or more) per day was risky, that they disapproved of others their age smoking, and that their parents disapproved of them smoking (Table 3). Asian adolescents (AOR = 3.40, 95% CI: 1.05, 11.04) were more likely to report that their friends disapproved of their smoking compared to White youth. Adolescents of high level of income had higher odds of reporting beliefs that smoking a pack of cigarettes or more per day was a great risk (AOR = 2.15, 95% CI: 1.72, 2.68), that they disapproved of others their age smoking (AOR = 2.24, 95% CI: 1.68, 3.00), that they believed their friends would disapprove of them smoking (AOR = 1.88, 95% CI: 1.46, 2.43), and that their parents would disapprove of them smoking (AOR = 3.59, 95% CI: 2.57, 5.01) compared to adolescents of low income.

Interactions

For cigarette use, the interaction term for high income and Black and Hispanic race/ethnicity was significant for having ever smoked cigarettes (Black \times high income AOR = 2.85, 95% CI: 1.21, 6.69; Hispanic \times high income AOR = 1.86, 95% CI: 1.10, 3.16). For cigarette smoking-related perceptions, the interaction term for high income and AIAN race/ethnicity was significant for disapproval of others their age smoking (AOR = 0.09, 95% CI: 0.01, 0.63). To further examine the relationship between significant interactions and smoking-related use and perceptions, additional analyses were conducted (Fisher's exact tests and logistic regressions conducted individually for each racial/ethnic group); however, results were inconclusive (see [Supplementary Tables](#) for detailed results). Interactions of income and racial/ethnic group were not significantly associated with past-year cigarette use and adolescent's perceptions about risk of smoking, beliefs that friends would disapprove of them smoking, and parental disapproval of smoking ($p > 0.05$).

Discussion

In the current study, we found that examination of main effects for having smoked cigarettes (ever and past year) indicated that Black, Hispanic, and higher income adolescents were less likely to have smoked cigarettes compared to Whites and those of lower income, which is consistent with the previous research on racial/ethnic and SES differences in smoking [1, 3–7]. However, inclusion of the interaction between income and race/ethnicity revealed important and

Table 1 Prevalence of cigarette use and perceptions of smoking factors: NSDUH 2018

	Overall Unweighted <i>n</i> Weighted % (95% CI)	Race/ethnicity					Income	
		NH AIAN	NH Asian	NH Black	Hispanic	NH White	Low	High
Total	12,474	187 0.7	550 5.9	1798 14.0	3012 25.4	6927 54.0	5688	7599
Ever smoked cigarettes	1283 9.8	39 14.7 (9.6, 22.0)	18 3.7 (2.1, 6.5)	99 5.8 (4.6, 7.4)	283 8.2 (7.0, 9.7)	844 12.2 (11.2, 13.2)	692 11.2 (10.1, 12.3)	694 8.9 (8.1, 9.8)
Smoked in the past year	716 5.5	20 7.5 (4.0, 13.4)	6 1.4 (0.5, 3.7)	37 2.2 (1.5, 3.3)	142 4.4 (3.4, 5.5)	511 7.4 (6.6, 8.2)	379 6.0 (5.2, 6.9)	404 5.3 (4.7, 5.9)
Believe smoking 1+ pack/day is risky [†]	11,064 90.2	152 90.7 (85.2, 94.3)	500 92.9 (89.8, 95.1)	1507 86.2 (84.0, 88.1)	2655 89.8 (88.1, 91.3)	6250 91.1 (90.3, 92.0)	4835 86.5 (85.2, 87.8)	6949 92.8 (91.8, 93.7)
Disapprove of peers smoking [‡]	11,491 93.4	164 88.9 (70.9, 96.3)	524 96.1 (93.5, 97.7)	1590 89.9 (87.9, 91.5)	2736 93.0 (91.6, 94.2)	6477 94.2 (93.4, 94.9)	5048 90.9 (90.0, 91.6)	7191 95.0 (94.4, 95.6)
Friends disapprove of you smoking [‡]	11,242 91.6	161 92.2 (86.5, 95.6)	522 95.0 (91.4, 97.1)	1567 90.2 (88.3, 91.7)	2662 90.2 (88.5, 91.7)	6330 92.2 (91.3, 93.0)	4921 89.1 (88.1, 90.0)	7046 93.3 (92.5, 94.0)
Parents disapprove of you smoking [‡]	11,749 95.9	167 93.7 (86.7, 97.1)	535 98.0 (94.9, 99.2)	1631 94.3 (92.8, 95.5)	2790 95.1 (93.8, 96.1)	6626 96.5 (95.9, 97.0)	5159 93.4 (92.6, 94.2)	7353 97.7 (97.1, 98.1)

Weighted % is calculated with weights to reflect sampling; AIAN = American Indian/Alaska Native; Black = African American/Black; NH = non-Hispanic; low = annual household income of less than \$50,000/year; high = \$50,000 or more/year. [†]Coded 0 = no/slight risk; 1 = moderate/great risk. [‡]Coded 0 = neither approve/disapprove; 1 = somewhat or strongly disapprove

unique relationships with adolescent cigarette smoking, where the SES gradient did not apply equally across all racial/ethnic groups. Specifically, the interactions between high income and Black and Hispanic race/ethnicity for having ever smoked a cigarette were significant indicating a difference in comparison to high income and White race/ethnicity. The interaction findings for cigarette use may be supported by previous findings [18]. Scarcini and colleagues found that higher SES Black middle school youth (eighth grade) were more likely to smoke compared to lower SES Black middle school youth [18]. The authors provided several possible explanations for these findings including the issue of affordability of cigarettes. Previous work has found that price of cigarettes may decrease the likelihood of smoking among racial/ethnic minority adolescents [22]. For Hispanic youth, potential differences in smoking by income may be related to factors such as acculturative stress, behavioral health-related issues (e.g., depression and anxiety), and immigration status [23].

For adolescent smoking-related perceptions, we found that high-income adolescents were more likely to perceive that smoking was a risk, that they disapproved of their peers smoking, that their friends disapproved of them smoking, and that their parents disapproved of them smoking compared

to low-income adolescents. Asian adolescents were also more likely to report beliefs that their friends disapproved of them smoking compared to White adolescents. Our findings that racial/ethnic differences did not exist for health risk perceptions about smoking or perceptions about parental disapproval of smoking differ from previous studies which found differences among Asian, Black, Hispanic, and White adolescents [10, 12, 13, 17]. This may be due in part because previous studies were conducted earlier (1990s–2000s) when smoking was more prevalent and perceptions of risk lower. We also found that the interaction between high income and AIAN race/ethnicity for disapproval of peers smoking was significant compared to White adolescents at the same income levels. To the authors' knowledge, this is the first study to examine interaction effects of race/ethnicity and SES on adolescent smoking-related perceptions, so no comparisons with previous research are possible.

This study's findings present an epidemiological paradox: the health-wealth gradient is not evident in all racial/ethnic groups, but findings indicate that for certain racial/ethnic minority groups, wealth may not decrease the likelihood of smoking and smoking risk factors. These findings appear to challenge the assumption that the SES gradient can be

Table 2 Adjusted odds ratios for cigarette smoking behaviors by race/ethnicity and income

Variables	Ever smoked cigarettes ^a (n = 12,115)	Ever smoked in past year ^a (n = 12,115)
Race/ethnicity		
NH AIAN	1.51 (0.75, 3.05)	1.26 (0.57, 2.79)
NH Asian	0.26 (0.11, 0.61)	0.31 (0.08, 1.15)
NH Black	0.25 (0.16, 0.38)	0.18 (0.10, 0.36)
Hispanic	0.37 (0.26, 0.52)	0.41 (0.27, 0.62)
NH White	1.00	1.00
Income		
Low	1.00	1.00
High	0.40 (0.32, 0.49)	0.53 (0.41, 0.68)
Interactions		
NH AIAN × high income	0.71 (0.24, 2.13)	0.48 (0.14, 1.60)
NH Asian × high income	2.19 (0.79, 6.07)	0.97 (0.21, 4.53)
NH Black × high income	2.85 (1.21, 6.69)	2.68 (0.96, 7.46)
Hispanic × high income	1.86 (1.10, 3.16)	1.51 (0.85, 2.71)
Age	1.12 (1.04, 1.20)	1.09 (0.99, 1.20)
Gender		
Female	0.74 (0.59, 0.94)	0.75 (0.61, 0.93)
Male	1.00	1.00
Lifetime MDE		
Yes	1.78 (1.45, 2.19)	1.54 (1.22, 1.95)
No	1.00	1.00
Ever use alcohol		
Yes	4.75 (3.66, 6.16)	5.49 (3.89, 7.75)
No	1.00	1.00
Ever use cannabis		
Yes	6.62 (5.05, 8.69)	6.36 (4.78, 8.46)
No	1.00	1.00

AOR = adjusted odds ratio; CI = confidence interval. AIAN = American Indian/Alaska Native; Black = African American/Black; NH = non-Hispanic. Low = annual household income of less than \$50,000/year; high = \$50,000 or more/year. ^a Coded 0 = no; 1 = yes. Boldface indicates statistical significance ($p < 0.05$)

ubiquitously applied to all racial/ethnic groups and behaviors. Although significant interactions were found in the current study for both smoking and smoking-related perceptions, analyses conducted to further examine differences were inconclusive (see [Supplementary Tables](#)) due to small sample sizes for racial/ethnic minority groups and insufficient power to detect significant effects. Future research should focus on obtaining large enough sample sizes for each racial/ethnic group for all levels of income to determine the direction and magnitude of these differences.

There are several theories or factors that might explain these findings. First, it is possible that racial/ethnic minority adolescents in higher income groups face unique environmental challenges that put them at risk for smoking behaviors. Specifically, previous research suggests that school environment may moderate smoking behaviors among racial/ethnic minority adolescents [24]. Consistent with social learning

theory [25], which argues that smokers learn to smoke by interaction with other smokers, tobacco use risk among racial/ethnic minority adolescents (e.g., AIAN, Asian, Black, and Hispanic adolescents) appears to decrease as the percentage of racial/ethnic minority students in the school increases because prevalence of tobacco use is lower among racial/ethnic minority groups [26, 27]. Additionally, some previous research indicates an association between perception of racial/ethnic discrimination and increased tobacco use [28, 29]. This literature suggests that racial/ethnic minority adolescents who are higher income often live and attend schools where there is a lower percentage of racial/ethnic minority students and that this may contribute to increased perceptions of racial discrimination which in turn is associated with increased substance use, such as cigarette smoking. Higher income racial/ethnic minority adolescents may also be more likely to attend schools that are academically rigorous, putting additional pressures on

Table 3 adjusted odds ratios for cigarette smoking-related perceptions by race/ethnicity and income

Variables	Believe smoking 1+ pack/day is a great risk ^a (<i>n</i> = 11,963) AOR (95% CI)	Disapprove of peers smoking ^b (<i>n</i> = 12,006)	Perceive friends disapprove of you smoking ^b (<i>n</i> = 11,966)	Parents disapprove of you smoking ^b (<i>n</i> = 11,963)
Race/ethnicity				
NH AIAN	1.17 (0.62, 2.20)	1.71 (0.83, 3.55)	1.18 (0.60, 2.32)	0.71 (0.26, 1.90)
NH Asian	1.93 (0.98, 3.80)	1.16 (0.43, 3.12)	3.40 (1.05, 11.04)	2.42 (0.88, 6.61)
NH Black	0.86 (0.68, 1.09)	0.74 (0.54, 1.02)	0.94 (0.68, 1.28)	1.10 (0.80, 1.51)
Hispanic	1.14 (0.90, 1.44)	1.17 (0.83, 1.64)	0.98 (0.74, 1.30)	1.20 (0.84, 1.71)
NH White	1.00	1.00	1.00	1.00
Income				
Low	1.00	1.00	1.00	1.00
High	2.15 (1.72, 2.68)	2.24 (1.68, 3.00)	1.88 (1.46, 2.43)	3.59 (2.57, 5.01)
Interactions				
NH AIAN × high income	1.83 (0.55, 6.01)	0.09 (0.01, 0.63)	0.84 (0.21, 3.32)	2.07 (0.23, 18.99)
NH Asian × high income	0.49 (0.21, 1.11)	1.27 (0.41, 3.93)	0.37 (0.09, 1.51)	1.57 (0.15, 15.95)
NH Black × high income	0.89 (0.53, 1.51)	0.63 (0.37, 1.07)	0.83 (0.49, 1.41)	0.60 (0.27, 1.34)
Hispanic × high income	0.89 (0.57, 1.38)	0.66 (0.39, 1.13)	0.88 (0.57, 1.35)	0.60 (0.30, 1.17)
Age	1.07 (1.01, 1.13)	0.92 (0.87, 0.98)	0.90 (0.85, 0.95)	0.90 (0.83, 0.99)
Gender				
Female	1.07 (0.91, 1.25)	1.21 (0.97, 1.50)	1.53 (1.29, 1.81)	0.97 (0.75, 1.25)
Male	1.00	1.00	1.00	1.00
Lifetime MDE				
Yes	1.18 (0.94, 1.47)	0.78 (0.63, 0.97)	0.65 (0.51, 0.83)	2.44 (1.73, 3.45)
No	1.00	1.00	1.00	1.00
Ever use alcohol				
Yes	0.83 (0.69, 1.00)	0.54 (0.42, 0.68)	0.58 (0.48, 0.70)	0.81 (0.61, 1.09)
No	1.00	1.00	1.00	1.00
Ever use cannabis				
Yes	0.97 (0.77, 1.21)	0.72 (0.56, 0.93)	0.83 (0.66, 1.06)	0.60 (0.41, 0.88)
No	1.00	1.00	1.00	1.00

AOR = adjusted odds ratio; CI = confidence interval. AIAN = American Indian/Alaska Native; Black = African American/Black; NH = non-Hispanic. Low = annual household income of less than \$50,000/year; high = \$50,000 or more/year. ^a Coded 0 = no/slight risk; 1 = moderate/great risk. ^b Coded 0 = neither approve/disapprove; 1 = somewhat or strongly disapprove. Boldface indicates statistical significance ($p < 0.05$)

these students. Strain theory proposes that deviant behavior, including tobacco and substance use, is a strategy to cope with strain and/or stress [30]. According to this theory, racial/ethnic minority adolescents in this sample may be more likely to begin smoking due to academic pressures and thus may be at increased risk for regular smoking [31].

Study strengths include a large national sample of youth ages 12–17 years that is racially/ethnically diverse. This study had several limitations, including the use of cross-sectional data, which does not allow directional inference. Future research should be conducted to investigate these associations in a longitudinal study to assess whether differences hold across time. All measures included in the analyses were based on self-report. The racial/ethnic categories included in the analyses represent various subgroups, which may mask differences

in tobacco use. Finally, we measured SES using only one variable, annual household income, and did not include other measures of SES including parental education level and perceived economic status in our analysis.

Conclusions

In the current study, racial/ethnic minority adolescents may be at risk for initiating and smoking cigarettes. Our findings challenge previous research demonstrating that disparities in adolescent tobacco use are concentrated among those with the lowest income, suggesting instead that within adolescent populations higher SES may not provide protective effects against risk behaviors. These findings and this line of research may

help practitioners and researchers in further pinpointing which “at-risk” adolescent populations most need prevention and intervention efforts.

Supplementary Information The online version contains supplementary material available at <https://doi.org/10.1007/s40615-021-00974-0>.

Authors' Contributions AE conducted all analyses, interpreted results, and drafted the manuscript. AS conceptualized and designed analyses, interpreted results, and revised the manuscript. MS and MG conceptualized analyses and revised the manuscript. All authors approved the final version of the manuscript.

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Data Availability The data are publicly available from the Substance Abuse and Mental Health Data Archive (<https://www.datafiles.samhsa.gov/study-dataset/national-survey-drug-use-and-health-2018-nsduh-2018-ds0001-nid18758>).

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