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Cigarette Smoking Frequency, Quantity, Dependence, and Quit Intentions during Adolescence: Comparison of Menthol and Non-Menthol Smokers (National Youth Tobacco Survey 2017–2020).

Dale S. Mantey, PhD MPA[1], **Onyema Greg Chido-Amajuoyi, MBBS, MPH**[2,3], **Onyinye Omega-Njemnobi, MBBS**[1], **LaTrice Montgomery, Ph.D.**[4]

[1]Department of Health Promotion and Behavioral Science, University of Texas School of Public Health

[2]Department of Epidemiology, The University of Texas MD Anderson Cancer Center, Houston, TX

[3]Division of Cancer Prevention and Population Sciences, The University of Texas MD Anderson Cancer Center

[4]Department of Psychiatry and Behavioral Neuroscience, Addiction Sciences Division, University of Cincinnati College of Medicine

Abstract

Background: Use of menthol cigarettes is linked to sustained cigarette smoking adults. However, the relationship between menthol and smoking profile has not been thoroughly explored in adolescent cigarette smokers. This study examines the relationship between use of menthol cigarette and smoking frequency (i.e., days per month), quantity (i.e., cigarettes per day), quit intentions, and nicotine dependence (i.e., craving tobacco; use within 30 minutes of waking).

Methods: We pooled four years (2017–2020) of cross-sectional data from the National Youth Tobacco Survey. Participants were 2,699 adolescent, past 30-day cigarette smokers. Multinomial logistic regression models examined the relationship between menthol and cigarette smoking frequency and quantity. Logistic regressions examined the relationship between menthol and

Corresponding Author: Dale S. Mantey, PhD MPA, University of Texas School of Public Health, 1616 Guadalupe, Suite 6.300, Austin, TX 78701, United States of America; dale.s.mantey@uth.tmc.edu.

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Declaration of Interest

The authors have no competing interests to declare. All of the authors contributed to the development of the manuscript and take responsibility for the accuracy of the results. The article is not under review by another journal.

Conflict of Interest

No conflicts of interest to declare.

intentions to quit smoking and nicotine dependence. Models controlled for socio-demographics and other tobacco use.

Results: Menthol cigarette smokers had greater risk of smoking 20–30 days per month relative to 1–5 days per month (RRR: 2.35; 95% CI: 1.29 – 4.25) and greater risk of smoking 11+ cigarettes per day relative to 1 or less cigarettes per day (RRR: 2.02; 95% CI: 1.01 – 4.05), adjusting for covariates. Menthol cigarette smokers had lower odds of intentions to quit smoking (Adj OR: 0.56; 95% CI: 0.40 – 0.80) but great odds of craving tobacco (OR: 1.47; 95% CI: 1.20 – 1.81) and using tobacco within 30 minutes of waking (OR: 1.63; 95% CI: 1.29 – 2.05), adjusting for covariates.

Conclusion: Findings suggest the relationship between menthol and cigarette smoking profile (i.e., frequency, quantity, quit intentions) is different for youth than that of adults. This study adds adolescent-specific evidence to existing research that suggests menthol reinforces sustained cigarette smoking among youth.

INTRODUCTION

Most adult cigarette smokers initiate use during adolescence (Department of Health & Human Services [DHHS], 2012; Perry et al., 2018; Thompson, Mowery, Tebes, & McKee, 2017), though the transition from adolescent experimentation to long-term use is complex and dynamic (Hair et al., 2018; Loukas, Marti, & Perry, 2019; Mantey et al., 2020). Predictors of long-term cigarette smoking among adolescents include cigarette smoking frequency (i.e., days per month) and quantity (i.e., cigarettes per day) (DHHS, 2012) as well as quit intentions and nicotine dependence (Littell & Girvin, 2002; Prochaska, Redding, & Evers, 2015; Prochaska & Velicer, 1997). Given that cigarette smoking remains the leading cause of death in the United States (DHHS, 2014), understanding risk factors for long-term cigarette smoking among adolescents is of critical importance to public health regulatory policy and prevention efforts.

Research has found that adult menthol cigarette smokers report greater rates of nicotine dependence and cigarette smoking frequency (i.e., days per month) than non-menthol cigarette smokers (Azagba et al., 2020; Mantey et al., 2021; Villanti et al., 2012; Villanti et al., 2016). Similarly, adult menthol cigarette smokers report greater rates of quit intentions and cessation attempts (Keeler et al., 2016; Levy et al., 2011; Trinidad et al., 2010; Villanti, et al., 2017) but lower odds of successfully quitting, relative to non-menthol cigarette smokers. This is biologically plausible given that menthol additives interact at the receptor level with the actions of nicotine, increasing nicotine bioavailability as well as risk for nicotine dependence (Alsharari et al., 2015; Benowitz, Herrera, & Jacob, 2004; Benowitz & Samet, 2011; Kabbani, 2013; Trinidad et al., 2011; Villanti et al., 2017).

Menthol cigarettes are disproportionally popular among adolescent cigarette smokers, relative to adults in the United States (Villanti et al., 2017; Villanti et al., 2016). From 2016 to 2018, approximately 50.7% of adolescent cigarette smokers used menthol cigarettes (Sawdey et al., 2020), despite menthol only accounting for approximately 35% of all cigarettes sold in the United States during this time (Federal Trade Commission, 2019). Consequently, it is plausible that adolescent menthol cigarette smokers would be at greater risk of progressing to established, long-term use during adulthood, relative to non-menthol

cigarette smokers (Harrell, et al., 2017; Nonnemaker et al., 2013; Villanti et al., 2017; Wackowski et al., 2017). However, limited research has directly examined for similarities in smoking patterns among adolescent and adult menthol cigarette users.

To date, there is limited research on differences in cigarette smoking frequency, quantity, and quit intentions among adolescent menthol and non-menthol smokers (Azagba et al., 2020; Benowitz & Samet, 2011; Villanti et al., 2017). A recent study found adolescent menthol cigarette smokers were 48% more likely to smoke on 10 or more days per month, relative to non-menthol cigarette smokers, from 2017–2018 (Azagba et al., 2020). Similarly, a descriptive study from 2016–2018 found 30% of adolescent menthol cigarette smokers reported smoking on 20 or more days per month, compared to just 22.3% of non-menthol cigarette smokers ($p<0.001$) (Sawdey et al., 2020). These findings deviate from past literature which as historically found no difference in cigarette smoking frequency and quantity between adolescent menthol and non-menthol smokers (Benowitz & Samet, 2011; Villanti et al., 2017). Similarly, the relationship between nicotine dependence and menthol cigarette smoking is not consistently observed among adolescent cigarette smokers (Cwalina, Majmundar, Unger, Barrington-Trimis, & Pentz, 2019; Villanti et al., 2017), as it is in adults. These gaps in the literature reflect a need for direct research examining specific the role of menthol on cigarette smoking frequency, quantity, and quit intentions among adolescent smokers.

Study Aims & Hypotheses

This study investigated the relationship between cigarette type used (i.e., menthol; non-menthol) and cigarette smoking profile among a nationally representative sample of adolescent cigarette smokers. Specifically, this study examined self-reported: (1) number of days smoked per month (i.e., frequency of use); (2) number of cigarettes smoked per day (i.e., quantity of use); (3) intentions to quit; and (4) symptoms of nicotine dependence

This study had four hypotheses. First, we hypothesized menthol cigarette smokers will self-report smoking more days per month than non-menthol cigarette smokers. Second, we hypothesized menthol cigarette smokers will self-report smoking more cigarettes per day than non-menthol cigarette smokers. Third, we hypothesized menthol cigarette smokers will have greater odds of reporting intentions to quit cigarette smoking. Understanding the role of menthol in adolescent cigarette smoking behaviors and quit intentions will inform public health regulatory policy regarding flavored tobacco products. And fourth, we hypothesized menthol cigarette smokers will have greater odds of reporting symptoms of nicotine dependence. All hypotheses on informed by prior research of menthol cigarette (Villanti et al., 2017; Wang et al., 2019).

METHODS

Study Sample & Population

This study pooled and analyzed four years (2017–2020) of cross-sectional data from the National Youth Tobacco Surveys (NYTS); an annual, cross-sectional survey of tobacco use behaviors among middle and high school students in the United States. The NYTS uses a

stratified, three-stage cluster sample design to obtain a representative sample of middle and high school students in the United States for each year.

This study only examined participants that self-reported combustible cigarette smoking in the past 30-days and had complete data on study variables. Of the n=3,273 past 30-day cigarette smokers over the three years of study, n=574 (17.1%) were excluded due to missing data, resulting in a final sample of n=2,699. We elected to conduct a complete case analysis due to the size of our dataset (Henry, Hevelone, Lipsitz, & Nguyen, 2013) and the categorical coding of our variables (Allison, 2005; Audigier, Husson, & Josse, 2017); these factors indicated comparable utility in minimizing bias across methods of handling missing data (e.g., multiple imputation).

Measures

Menthol Cigarette Smoking: The independent variable of this study was cigarette type. Participants were asked the following question: “Menthol cigarettes are cigarettes that taste like mint. During the past 30 days, were the cigarettes that you usually smoked menthol?” Those that reported “yes” were considered menthol cigarette smokers.

Frequency of Cigarette Smoking: The first outcome variable for this analysis was frequency of cigarette smoking. Participants were asked “During the past 30-days, on how many days did you smoke cigarettes?” Possible responses for frequency of cigarette smoking were limited to categorical ranges by the NYTS questionnaire. Several studies have presented varying methodologies for classification of non-daily cigarette smoking (Hennrikus, Jeffery, & Lando, 1996; Husten, et al., 1998; Saddleson et al., 2016; Wortley, Husten, Trosclair, Chrismon, & Pederson, 2003); however, to our knowledge, there is no established categorization of this variable. Further, a recent study of NYTS data found menthol cigarette smokers are more likely to smoke 10+ days per month (Azagba et al., 2020). In effort to build on prior research, the presented study categorized frequency of cigarette smoking into tertiles (i.e., 3 categories). Cigarette smoking frequency tertiles were coded as follows: “1 to 2” or “3 to 5” (referent group); “6 to 9” or “10 to 19” days per month (coded as 1); and “20 to 29” or “all 30” days per month (coded as 2).

Quantity of Cigarette Smoking: The second outcome variable for this analysis was quantity of cigarette smoking. Participants were asked “During the past 30-days, on the days you smoked, about how many cigarettes did you smoke per day?” Possible responses for quantity of cigarette smoking were limited to categorical ranges by the NYTS questionnaire. Quantity of use was categorized into tertiles (i.e., 3 categories) based on previous findings of adolescent cigarette smoking (Jones, Kann, & Pechacek, 2011; Kozlowski & Giovino, 2014; Warner, 2018). Cigarette smoking quantity tertiles were coded as follows: smoking “less than 1” or “1” cigarette per day (referent group); “2 to 5” or “6 to 10” cigarettes per day (coded as 1); and 11 to 20” or “more than 20” cigarettes per day (coded as 2).

Cessation Intentions/Attempts.—The third outcome variable in this analysis was self-reported intentions to quit cigarette smoking. Participants were asked “Are you seriously thinking about quitting cigarettes?” Those that responded “no, I am not thinking about

quitting cigarettes" or "yes, but not during the next 12 months" were considered to not have current intentions to quit cigarette smoking (referent group). Participants that reported "yes, during the next 30-days/6-months/12-months" were considered to have current intentions to quit cigarette smoking (coded as 1). Furthermore, past 30-day cigarette smokers that reported "I do not smoke cigarettes" were considered to be currently attempting cessation and thus considered to have intentions to quit cigarette smoking.

Symptoms of Nicotine Dependence.—Two validated measures of adolescent nicotine dependence were also examined as outcomes. First, participants were asked "How soon after you wake up do you want to use a tobacco product?" Those that reported using a tobacco product within 30 minutes or less of waking up were considered to exhibit the first symptom of nicotine dependence (Prokhorov et al., 2000; Prokhorov et al., 2017). Second, participants were asked "During the past 30 days, have you had a strong craving or felt like you really needed to use a tobacco product of any kind?" Those that reported "yes" were considered to exhibit the second symptom of nicotine dependence (DiFranza et al., 2007). Each of these variables was examined independently as they are generated from different measures of nicotine dependence (DiFranza et al., 2007; Prokhorov et al., 2000) and represent different domains of dependence (i.e., behavioral; affective) (Kenford et al., 2002).

Covariates

Socio-Demographics: This study controlled for the following socio-demographic covariates: race/ethnicity; biological sex; and grade level. For the purposes of this study, race/ethnicity was categorized as: non-Hispanic, white (referent); non-Hispanic, black; Hispanic/Latino; and "other" (i.e., non-Hispanic, Asian; multiracial; and any other race). Biological sex is a dichotomous variable; males served as the referent group. Grade level was categorized as middle school (6^{th} – 8^{th} grade) and high school (9^{th} – 12^{th} grade). Middle school served as the referent group.

Other Tobacco Use: This study also controlled for past 30-day use of non-cigarette tobacco products. Participants that reported use of any non-cigarette tobacco product in the past 30-days were considered "other tobacco users." These tobacco products included: electronic cigarettes, cigars, cigarillos, little cigars, pipe tobacco, bidis, snus, dissolvable, and hookah. This was included as a covariate in all statistical models given the strong association between use of flavors and multiple tobacco product use among adolescents (Mantey et al., 2019; Sawdey et al., 2020).

Attrition Analysis

Attrition analysis comparing descriptive statistics between complete (n=2,699) and excluded (n=574) cases was conducted to examine possible selection bias due to missingness. The attrition analysis had two components. First, chi-square tests were conducted to determine if there were statistical differences between complete and excluded cases across all study variables. Second, post hoc analyses (i.e., Cohen's W) were conducted for all statistically significant bivariate analyses to determine the degree participants with complete data differed from those who were removed due to incomplete data. Effect sizes of 0.20 or less were categorized as small and not indicative of selection bias due to missingness. These post

hoc analyses are critical to interpreting the findings for this attrition analysis as chi-square test and t-tests are sensitive to sample size (Cohen, 2013; Olivier & Bell, 2013).

Attrition analyses revealed that complete cases and excluded cases differed statistically across race/ethnicity (Cohen's W = 0.16), grade level (Cohen's W = 0.17), other tobacco use (Cohen's W = 0.07), both symptoms of nicotine dependence (Cohen's W = 0.05; Cohen's W = 0.04), and cigarettes smoked per day (Cohen's w = 0.10). Post hoc analyses revealed that all of these statistical associations were small (Cohen, 2013; Olivier & Bell, 2013) with no post hoc analyses result revealing a strength of association greater than 0.20. These findings indicate the statistical differences detected in the bivariate analyses were likely the result of sample size rather than systematic differences between the two samples.

Statistical Analysis

Data were weighted to be representative of US middle school and high school students in each year and to adjust for nonresponse and probability of selection. Description of the weighted structure and sampling frame for NYTS are described elsewhere (DHHS, 2020). Prior to testing study hypotheses, descriptive statistics were reported for each of the outcome variables.

The first two study hypotheses were tested using multivariate, multinomial logistic regression models. The first of these models assessed the relationship between menthol cigarette use and frequency of use, using infrequent smokers (1–5 days per month) as the referent outcome. The second model assessed the relationship between menthol cigarette use and quantity of cigarette smoked, using light smokers (1 or less cigarette per day) as the referent outcome. Multinomial logit coefficients for each multivariate multinomial logistic regression were exponentiated and reported as Relative Risk Ratios (RRR); this was conducted in Stata using the "rrr" function. The third and fourth study hypotheses were tested using multivariate logistic regression models. This model assessed the relationship between menthol cigarette smoking and intentions to quit cigarette smoking. For each of these models, cigarette type (i.e., menthol or non-menthol) served as the independent variable. All statistical models controlled for sex, grade level, race/ethnicity, and past 30-day use of other tobacco products. Year of survey was also included as a covariate in order to account for the random intercept of this variable. Findings were considered statistically significant at p = 0.050. All analyses were conducted using STATA 14.2 (College Station, TX).

RESULTS

Descriptive Statistics

Overall, 58.2% (95% CI: 55.5 – 60.8) of the sample reported smoking on 1–5 days per month, while 19.2% (95% CI: 17.3 – 21.2) reported smoking 6 –19 days per month, and 22.6% (95% CI: 20.4 – 25.1) reported smoking 20–30 days per month. Similarly, 51.2% (95% CI: 48.2 – 54.1) of the sample reported smoking 1 cigarette (or less) per day, 41.1% (95% CI: 38.3 – 44.0) reported smoking 2–10 cigarettes per day, and 7.7% (95% CI: 6.7 – 9.0) reported smoking 10 or more cigarettes per day. Most smokers (59.7%; 95% CI: 57.3 –

62.1) reported intentions to quit while 53.0% (95% CI: 50.2 – 55.8) reported craving tobacco, 30.2% (27.4 – 33.2) used tobacco within 30 minutes of waking. Further detail of descriptive statistics are available in Table 1.

Study Hypotheses

The first multinomial logistic regression model revealed menthol cigarette smokers had a greater relative risk of smoking 20–30 days per month relative to smoking 1–5 days per month (RRR: 1.90; 95% CI: 1.42 – 2.54), adjusting for covariates. Similarly, menthol cigarette smokers had a greater relative risk of smoking 6–19 days per month relative to smoking 1–5 days per month (RRR: 1.35; 95% CI: 1.01 – 1.80), adjusting for covariates. Results of this multivariate logistic regression model are presented in Table 2.

The second multinomial logistic regression model revealed menthol cigarette smokers had a greater relative risk of smoking 2–10 cigarettes per day relative to 1 or less cigarettes per day (RRR: 1.41; 95% CI: 1.14 – 1.74), adjusting for covariates. Similarly, menthol cigarette smokers had a greater relative risk of smoking 11 or more cigarettes per day (RRR: 2.49; 95% CI: 1.74 – 3.57), relative to 1 or less cigarettes per day, adjusting for covariates. Results of this multivariate logistic regression model are presented in Table 3.

As seen in Table 4, menthol cigarette smokers had lower odds reporting current intentions to quit cigarette smoking (OR: 0.69; 95% CI: 0.58 – 0.84), adjusting for covariates. Menthol cigarette smokers also had greater odds of craving tobacco (OR: 1.47; 95% CI: 1.20 – 1.81) and using tobacco within 30 minutes of waking (OR: 1.63; 95% CI: 1.29 – 2.05), adjusting for covariates

DISCUSSION

This study found adolescent menthol cigarette smokers were more likely to be more frequent and heavier cigarette smokers as well as report symptoms of dependence. Similarly, menthol cigarette smokers were less likely to report intentions to quit in the next year. Findings mirror prior research showing adult menthol cigarette smokers (Villanti, et a., 2017; Villanti et al., 2012; Villanti et al., 2016) are more likely to report heavier and more frequent use, relative to non-menthol smokers. Our finding that menthol cigarette smokers were less likely to report intentions to quit cigarette smoking is counter to previous study of adult cigarette smokers (Azagba, et al., 2020; Levy et al., 2011; Trinidad et al., 2010; Villanti et al., 2017). This study suggests a substantial difference in tobacco use profile among menthol cigarette smokers by age group (i.e., youth versus adult), though further study is needed to replicate these findings.

Our findings build on existing literature by providing insights into the factors related to long-term cigarette smoking among adolescents. Menthol has been identified as a risk factor for sustained cigarette smoking into adulthood (Villanti, et a., 2017); however, there is limited understanding of the behavioral mechanisms that precede this relationship. This study indicates that menthol cigarettes may expedite the transition to established cigarette smokers by increasing cigarette smoking frequency and quantity. Our findings also build on two recent studies which found that menthol was associated with more frequent smoking

(Azagba, et al., 2020; Sawdey et al., 2020). Further, this study suggests use of menthol cigarette may inhibit immediate intentions to quit among youth and increase risk for nicotine dependence, suggesting a greater probability of long-term cigarette smoking into young adulthood (Nonnemaker et al., 2013; Villanti et al., 2017).

This study has regulatory implications. Findings suggest the need to consider further restriction of characterizing flavors in combustible cigarettes as a method of reducing adolescent cigarette smoking. As of 2009, menthol is the only characterizing flavor available for conventional cigarettes in the United States (Food & Drug Administration, 2016). Since that time, there has been a substantial increase in the popularity in menthol cigarettes (Sawdey et al., 2020; Villanti et al., 2017; Villanti et al., 2016). This growth in popularity of menthol is concerning given the behavioral ramifications of menthol cigarette smoking among young people found by the presented study and other research (Azagba et al., 2020; Mantey et al., 2021; Sawdey et al., 2020). Though further study of the role of menthol on long-term cigarette smoking among adolescents is needed, the totality of the literature indicates the need to address characterizing flavors to reduce the public health ramifications of adolescent cigarette smoking (Villanti et al., 2017).

Findings must be put in context of tobacco related health disparities among racial/ethnic minorities in the US. The tobacco industry has disproportionately marketed menthol cigarettes to communities of color (Gardiner, 2004; Iglesias-Rios & Parascandola, 2013), resulting in disproportionately higher rates of menthol cigarette smoking among African Americans and Hispanic/Latinos, relative to non-Hispanic Whites (Sawdey et al., 2020; Villanti, et al., 2017). As such, the elevated risk for heavier and more frequent cigarette smoking as well as lower quit initiations among menthol cigarette smokers found in this study raises serious concerns for long-term health disparities. Future research is needed to thoroughly examine the role of race/ethnicity in the context of menthol and long-term cigarette smoking.

This study has limitations. First, this study relies on self-reported data and thus all responses are subject to recall bias. Second, the presented data are cross-sectional and thus no temporal or causal relationships can be examined. Third, it is plausible that cigarette smokers are not exclusively using either menthol or non-menthol products. As the independent variable of this study relied on which type of cigarette participants most frequently used in order to dichotomize smokers, this study is unable to explore the dual use of menthol and non-menthol products. And fourth, this study relied on categorical classifications of frequency and quantity of cigarette smoking as in the NYTS questionnaire. As such, it is plausible that there is more variance and heterogeneity across frequency and quantity of use than is observable in this study. Future research is needed to examine the nuances of these behaviors.

Despite these limitations, the present study expands the understanding of the role of menthol on adolescent cigarette smoking behaviors. These cross-sectional data provide statistical evidence to support future longitudinal research that examines the direct temporal relationship between menthol and cigarette smoking frequency or quantity. Furthermore, this study also suggests the need to explore the interactions of menthol and frequency/quantity of

cigarette smoking (e.g., mediation, effect modification) as a predictor of long-term, sustained cigarette smoking among both youth and young adults. Future research is needed to explore how other factors, such as interpersonal (e.g., sensation seeking; harm perceptions) and socio-environmental (e.g., marketing; retail access) predictors of sustained cigarette smoking during adolescence may also impact differences in cigarette smoking frequency, quantity, and quit intentions.

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Highlights

- Menthol was associated with heavier and more frequent cigarette smoking.
- Menthol was associated with lower intentions to quit smoking.
- Menthol was associated with greater odds of nicotine dependence.

Table 1

Descriptive Statistics of Sociodemographic and Tobacco Use Characteristics (NYTS, 2017–2020; n = 2699).

	Cigarette Smoking, Days Per Month			Cigarettes Smoked Per Day			Nicotine Dependence		Quit Intentions
	1–5 Days	6–19 Days	20–30 Days	1 or Less	2–10	11+	Craving	Use after Waking up	Yes
Total	58.2%	19.2%	22.7%	51.2%	41.1%	7.7%	53.0%	30.2%	59.7%
Cigarette Type									
Non-Menthol	63.5%	18.4%	18.2%	55.9%	38.6%	5.5%	48.8%	25.6%	62.4%
Menthol	50.6%	20.4%	29.1%	44.3%	44.7%	11.0%	59.0%	36.8%	54.7%
Sex									
Males	56.6%	19.7%	23.6%	49.8%	40.6%	9.6%	52.9%	32.9%	62.0%
Females	59.9%	18.5%	21.5%	52.7%	41.7%	5.7%	53.2%	27.2%	57.2%
Grade Level									
Middle School	66.4%	15.3%	18.3%	59.0%	32.3%	8.7%	55.2%	27.7%	58.3%
High School	56.6%	19.9%	23.5%	49.6%	42.9%	7.6%	52.6%	30.7%	60.0%
Race/Ethnicity									
Non-Hispanic White	57.5%	19.6%	22.9%	47.7%	45.8%	6.5%	56.1%	33.6%	58.9%
Hispanic/Latino	60.0%	19.9%	20.1%	58.3%	31.8%	10.0%	48.0%	24.2%	60.5%
Non-Hispanic, Black	57.9%	16.3%	25.9%	59.7%	26.4%	13.9%	42.3%	23.0%	67.9%
Other[b]	58.6%	16.4%	25.0%	53.2%	39.7%	7.1%	50.3%	25.2%	58.5%
Other Tobacco Use[c]									
No	71.4%	15.9%	12.7%	70.8%	25.5%	3.7%	34.0%	10.4%	62.9%
Yes	56.7%	19.6%	23.8%	48.9%	42.9%	8.2%	55.2%	32.5%	59.4%
Year									
2017	59.8%	20.6%	19.6%	49.3%	42.1%	8.6%	47.5%	25.0%	57.2%
2018	58.0%	19.6%	22.4%	47.4%	44.1%	8.5%	54.6%	29.7%	57.4%
2019	54.5%	16.3%	29.2%	49.7%	42.4%	7.9%	56.1%	33.0%	59.3%
2020	60.0%	19.6%	20.4%	62.5%	32.7%	4.8%	55.9%	36.8%	68.9%

NOTE: Columns may not add up to 100% due to rounding. P-value reflects chi-square test.

[a]"No" is defined as not intending to quit smoking in the next 12 months; "Intentions to quit" is defined as being a past 30-day smoker that intends to quit smoking within the next 6 months or is currently attempting cessation.

[b] "Other" is where a response was "Asian, non-Hispanic", "American Indian/Alaska Native, non-Hispanic," or "native Hawaiian and other Pacific Islanders, non-Hispanic"

[c] Past 30-day use of any of the following: electronic cigarettes, cigars, cigarillos, little cigars, pipe tobacco, bidis, snus, dissolvable, and hookah.

Table 2

Association of Menthol Cigarette Smoking and Intentions to Quit Smoking among Middle and High School Cigarette Smokers (NYTS, 2017–2020; n = 2699).

	Intentions to Quit Smoking [a]	**Cravings**	**Use 30 minutes or less after waking**
	Adjusted Odds Ratio (95% Confidence Interval)	**Adjusted Odds Ratio (95% Confidence Interval)**	**Adjusted Odds Ratio (95% Confidence Interval)**
Cigarette Type			
Non-Menthol	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)
Menthol	**0.70*** (0.58–0.84)**	**1.47*** (1.20–1.81)**	**1.63** (1.29–2.05)**
Sex			
Males	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)
Female	**0.79* (0.646–0.96)**	1.07 (0.88–1.30)	**0.79* (0.63–0.99)**
Grade			
Middle School	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)
High School	1.17 (0.93–1.47)	**0.76* (0.69–0.99)**	0.98 (0.75–1.29)
Race/Ethnicity			
Non-Hispanic White	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)
Hispanic/Latino	1.09 (0.86–1.39)	**0.68*** (0.55–0.84)**	**0.61*** (0.47–0.79)**
Non-Hispanic, Black	1.45 (0.99–2.10)	**0.55** (0.36–0.84)**	**0.58* (0.35–0.97)**
Other[b]	0.94 (0.62–1.42)	0.79 (0.54–1.16)	**0.65* (0.45–0.94)**
Other Tobacco Use			
Yes[c]	0.85 (0.62–1.17)	0.79 (0.58–1.09)	**3.63*** (2.22–5.94)**
Year			
2017	1.00 (Referent)	1.00 (Referent)	1.00 (Referent)
2018	1.00 (0.80–1.25)	**1.31* (1.07–1.62)**	1.22 (0.92–1.61)
2019	1.11 (0.87–1.42)	1.31 (0.93–1.83)	1.29 (0.93–1.78)
2020	**1.68** (1.23–2.28)**	1.38 (0.96–1.99)	**1.76* (1.10–2.83)**

[a]"No intentions to quit" (referent group) is defined as not intending to quit smoking in the next 6 months; "Intentions to quit" is defined as being a past 30-day smoker that intends to quit smoking within the next 6 months or currently attempting cessation.

[b]"Other" is where a response was "Asian, non-Hispanic", "American Indian/Alaska Native, non-Hispanic;" or "native Hawaiian and other Pacific Islanders, non-Hispanic".

[c]Past 30-day use of electronic cigarettes, cigars, cigarillos, little cigars, pipe tobacco, bidis, snus, dissolvable, and hookah.

Table 3

Menthol and Cigarette Smoking Frequency among Adolescent Cigarette Smokers (NYTS, 2017–2020; n = 2699).

	Frequency of Cigarette Smoking (in Days per Month)[a]	
	Relative to 1 to 5 Days Per Month	
	Adjusted Relative Risk Ratio (95% Confidence Interval) 6 to 19 Days Per Month	**Adjusted Relative Risk Ratio (95% Confidence Interval) 20–30 Days Per Month**
Cigarette Type		
Non-Menthol	1.00 (Referent)	1.00 (Referent)
Menthol	**1.35* (1.01–1.80)**	**1.90*** (1.41–2.54)**
Sex		
Males	1.00 (Referent)	1.00 (Referent)
Female	0.90 (0.69–1.18)	0.93 (0.74–1.17)
Grade		
Middle School	1.00 (Referent)	1.00 (Referent)
High School	**1.49* (1.03–2.18)**	**1.42* (1.02–1.98)**
Race/Ethnicity		
Non-Hispanic White	1.00 (Referent)	1.00 (Referent)
Hispanic/Latino	1.03 (0.75–1.42)	0.89 (0.67–1.19)
Non-Hispanic, Black	0.91 (0.57–1.47)	1.27 (0.74–2.18)
Other[b]	0.85 (0.56–1.30)	1.15 (0.74–1.78)
Other Tobacco Use		
Yes[c]	1.49 (0.94–2.36)	**2.07** (1.35–3.19)**
Year		
2017	1.00 (Referent)	1.00 (Referent)
2018	0.94 (0.71–1.26)	1.13 (0.84–1.53)
2019	0.81 (0.55–1.20)	1.47 (0.99–2.17)
2020	0.94 (0.59–1.49)	1.00 (0.66–1.52)

[a]Referent Group was 1 to 5 Days Per Month.

[b]"Other" is where a response was "Asian, non-Hispanic", "American Indian/Alaska Native, non-Hispanic;" or "native Hawaiian and other Pacific Islanders, non-Hispanic".

[c]Past 30-day use of electronic cigarettes, cigars, cigarillos, little cigars, pipe tobacco, bidis, snus, dissolvable, and hookah.

Table 4

Menthol and Cigarette Smoking Quantity among Adolescent Cigarette Smokers (NYTS, 2017–2020; n = 2699).

	Quantity of Cigarette Smoking (in Cigarettes per Day)[a]	
	Relative to 1 to Less Cigarettes Per Day	
	Adjusted Relative Risk Ratio (95% Confidence Interval) 2 to 10 Cigarettes Per Day	**Adjusted Relative Risk Ratio (95% Confidence Interval) 11 or More Cigarettes Per Day**
Cigarette Type		
Non-Menthol	1.00 (Referent)	1.00 (Referent)
Menthol	**1.41** (1.14–1.74)**	**2.49*** (1.74–3.57)**
Sex		
Males	1.00 (Referent)	1.00 (Referent)
Female	1.03 (0.84–1.25)	**0.60** (0.42–0.87)**
Grade		
Middle School	1.00 (Referent)	1.00 (Referent)
High School	1.34 (0.99–1.78)	1.00 (0.63–1.58)
Race/Ethnicity		
Non-Hispanic White	1.00 (Referent)	1.00 (Referent)
Hispanic/Latino	**0.59*** (0.47–0.75)**	1.22 (0.80–1.85)
Non-Hispanic, Black	**0.51** (0.31–0.83)**	**1.89* (1.05–3.41)**
Other[b]	0.84 (0.58–1.23)	1.06 (0.56–1.99)
Other Tobacco Use		
Yes[c]	**2.41*** (1.78–3.28)**	**2.86** (1.43–5.70)**
Year		
2017	1.00 (Referent)	1.00 (Referent)
2018	1.03 (0.75–1.41)	0.97 (0.65–1.44)
2019	0.90 (0.64–1.26)	0.75 (0.46–1.20)
2020	**0.58** (0.40–0.85)**	**0.40** (0.23–0.71)**

[d] Participants that reported “During the past 30 days, have you had a strong craving or felt like you really needed to use a tobacco product of any kind”.

[e] Participants that reported smoking their first cigarette of the day within 30 min or less of waking up.

[a] Referent Group was 1 or Less Cigarettes Per Day.

[b] “Other” is where a response was “Asian, non-Hispanic”, “American Indian/Alaska Native, non-Hispanic;” or “native Hawaiian and other Pacific Islanders, non-Hispanic”.

[c] Past 30-day use of electronic cigarettes, cigars, cigarillos, little cigars, pipe tobacco, bidis, snus, dissolvable, and hookah.