Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

HHS Public Access

Author manuscript

Am J Prev Med. Author manuscript; available in PMC 2020 August 28.

Published in final edited form as:

Am J Prev Med. 2019 April ; 56(4): e107–e116. doi:10.1016/j.amepre.2018.11.027.

Menthol Smoking Patterns and Smoking Perceptions Among Youth: Findings From the Population Assessment of Tobacco and Health Study

Amy M. Cohn, PhD[1], **Shyanika W. Rose, PhD**[2], **Joanne D'Silva, MPH**[3], **Andrea C. Villanti, PhD, MPH**[4,5]

[1]Department of Pediatrics, The University of Oklahoma Health Science Center, Oklahoma City, Oklahoma [2]Truth Initiative, Schroeder Institute, Washington, District of Columbia [3]Department of Behavioral and Community Health, University of Maryland, College Park, Maryland [4]Vermont Center on Behavior and Health, Department of Psychiatry, University of Vermont, Burlington, Vermont [5]Department of Health, Behavior and Society, Johns Hopkins Bloomberg School of Public Health, Baltimore, Maryland

Abstract

Introduction—Youth may be attracted to menthol cigarettes because they are perceived as less harmful and harsh to smoke relative to non-menthol cigarettes. This study examined demographic factors and menthol cigarette smoking patterns as correlates of youth harm perceptions of cigarette smoking and ease of smoking menthol versus non-menthol cigarettes.

Methods—Data were from the Wave 1 (2013–2014) youth sample of the Population Assessment of Tobacco and Health Study. Weighted multivariable logistic regression models were used to examine correlations between demographic factors and menthol cigarette smoking patterns (menthol initiation, past 30-day menthol cigarette smoking, and menthol cigarette brand preference), with harm perceptions of cigarette smoking and ease of smoking a menthol cigarette.

Results—Nearly half of ever cigarette smoking youth (43%) first used a menthol cigarette; 21% reported past 30-day menthol cigarette smoking; and 42% of past 30-day smokers providing brand information used a menthol cigarette as their preferred brand. In bivariate analyses, initiation with a menthol cigarette and menthol brand preference (versus non-menthol) were correlated with black race, older age at initiation, and past 30-day menthol cigarette smoking. In adjusted models, past 30-day menthol cigarette smoking and menthol cigarette brand preference, but not menthol initiation, were correlated with the perception that menthol cigarettes are easier to smoke.

Conclusions—Youth who smoke menthol cigarettes perceive them as easier to smoke, even after adjusting for other factors. Age of initiation and black race emerged as correlates of menthol

Address correspondence to: Amy M. Cohn, PhD, Oklahoma Tobacco Research Center, 655 Research Parkway, Suite 400, Oklahoma City OK 73104. amy-cohn@ouhsc.edu.

No financial disclosures were reported by the authors of this paper

SUPPLEMENTAL MATERIAL Supplemental materials associated with this article can be found in the online version at https://doi.org/10.1016/j.amepre.2018.11.027.

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

cigarette initiation, brand preference, and cigarette harm perceptions, and may inform future prevention campaigns.

INTRODUCTION

The cooling sensations and minty flavoring of menthol cigarettes masks the harshness of cigarette smoke, contributing to their appeal among newer users.[1–7] Flavors, like menthol, are a primary reason for tobacco use in youth.[8,9] The 2009 Family Smoking Prevention and Tobacco Control Act banned flavored cigarettes, but exempted menthol flavoring.[10] Menthol cigarette smoking has increased in young adults, whereas non-menthol smoking has decreased,[11,12] and most smokers initiate with a menthol cigarette.[13] This is concerning as experimentation with menthol cigarettes has been linked to smoking progression and nicotine dependence.[11,14–16]

Central reasons for the appeal of menthol cigarette smoking among youth are perceptions that menthol cigarettes are easier to smoke and less harmful than smoking non-menthol cigarettes.[1,17] These perceptions may be influenced by peers and myths about the medicinal effects associated with menthol's soothing and anesthetizing properties.[4,18] Youth may also not be exposed to information about menthol's link to smoking progression, nicotine dependence, and poorer smoking-cessation outcomes.[1,2,16] Analyses of tobacco company documents and menthol cigarette marketing campaigns indicate prominent themes of reduced harm, freshness, and youthfulness associated with menthol smoking.[4–7,19–21] Ahijevych and Garrett[1] found that young adults' perceptions of tobacco product risk, including cigarettes, were based on product characteristics like "throat hit" and flavor profiles, characteristics often used to describe menthol cigarettes. In a recent analysis of the Population Assessment of Tobacco and Health (PATH) Study, use of menthol cigarettes and flavored e-cigarettes, hookah, and cigars was higher among youth who reported that flavored products were easier to use than non-flavored tobacco products.[8] Notably, this study focused on the correlation between product-specific beliefs and past 30-day flavored tobacco product use, but did not focus specifically on past 30-day cigarette smoking, or cigarette harm perceptions among those who initiated smoking with a menthol versus non-menthol cigarette. Further, this study did not focus on other correlates associated with these outcomes beyond flavored tobacco use. Such information is important to refine the targets of tobacco prevention campaigns by identifying which youth are most at risk of cigarette misperceptions.

Appendix Figure 1 (available online) shows a conceptual model of the associations among menthol cigarette smoking, cigarette harm perceptions, and perceived ease of menthol cigarette smoking. According to this model, initiating smoking with a menthol cigarette could lead to greater perceptions of ease of menthol smoking, resulting from more pleasant experiences with the product, supported by findings from recent work.[13] Furthermore, prior to initiation, youth may have expectancies that menthol flavoring may make cigarettes taste better, and thus less harsh to smoke, as youth are likely familiar with mint/menthol taste in food products (e.g., gum). Once a new user has started cigarette smoking and gains experience, perception prior to use may come to reflect actual experience, and this perception could be a predictor of regular cigarette smoking (progression). A similar

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

argument is plausible for cigarette harm perceptions: menthol cigarette smokers, or youth who have tried a menthol cigarette, may perceive cigarettes to be less harmful because menthol flavoring masks the harshness of inhaled cigarette smoke. It is unclear in the literature if cigarette harm perceptions are formed prior to initiation or because of smoking experience, or how harm perceptions change over time.

In summary, lower cigarette harm perceptions and greater perceived ease of smoking menthol cigarettes may be risk factors differentiating youth who have tried a menthol cigarette from youth who have never tried a menthol cigarette or youth who regularly smoke menthol cigarettes from those who do not. This study used the Wave 1 youth sample of the PATH study to examine two aims to address this knowledge gap. Aim 1 examines demographic and tobacco use correlates of three menthol cigarette smoking patterns: initiation with a menthol versus non-menthol cigarette, past 30-day menthol versus non-menthol cigarette smoking, and menthol versus non-menthol cigarette brand preference. Aim 2 examines differences in cigarette harm perceptions and perceived ease of smoking menthol (versus non-menthol) cigarettes across these three menthol smoking patterns and by demographic and tobacco use factors. It was hypothesized that lower cigarette harm perceptions and greater perceived ease of smoking menthol (versus non-menthol) cigarettes would be more likely to occur among youth who initiated smoking with a menthol cigarette and among youth who reported past 30-day menthol cigarette smoking and menthol cigarette brand preference compared with non-menthol smoking youth. Findings can inform the development of health communication messages targeting subgroups of youth menthol cigarette smokers who show greater misperceptions of harm.

METHODS

Study Sample

Data are from the Youth Wave 1 Public Use File of the PATH Study, a nationally representative study of U.S. youth (n=13,651), ages 12 to 17 years (2013 to 2014). Multiple youth could be selected from the same household. Recruitment involved address-based, area-probability sampling, and using an in-person household screener. Black youth were oversampled. Weighting procedures adjusted for oversampling and nonresponse; combined with a probability sample, the weighted data yielded representative estimates of the non-institutionalized, civilian U.S. population. The weighted response rate for the household screener was 54.0%. Among screened households, the weighted response rate was 78.4%. Further details regarding the PATH Study are available elsewhere.[22]

The analytic sample in the current study was divided into three groups: (1) ever cigarette smokers (n=1,838) were youth who ever tried a cigarette in their lifetime, (2) past 30-day cigarette smokers (n=633) were youth who smoked cigarettes in the past 30 days, and (3) past 30-day cigarette smokers, who reported smoking a usual cigarette brand (n=326). Responses of *don't know* and *refused* were treated as missing.

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

Measures

Ever cigarette smokers were asked: *Was the first cigarette you smoked flavored to taste like menthol or mint?* Those who responded *yes* had initiated smoking with a menthol cigarette; those who responded *no* had initiated smoking with a non-menthol cigarette (reference group).

Past 30-day cigarette smokers were asked: *Did you smoke any cigarettes flavored to taste like menthol or mint in the past 30-days?* Those who reported smoking a menthol or mint flavored cigarette in the past 30 days were classified as past 30-day menthol smokers; those who had not smoked a menthol or mint-flavored cigarette in the past 30 days were classified as past 30-day non-menthol smokers (reference group).

Respondents who smoked >100 cigarettes in their lifetime, who were past 30-day cigarette smokers, and who reported having a regular cigarette brand were asked what brand they usually smoked. Those without a usual brand were excluded from analyses. Usual brand cigarette smokers reported the specific sub-brand they smoked. Sub-brands including the term *menthol* or *non-menthol* were classified as either menthol or non-menthol cigarettes. Capsule cigarettes, like Camel Crush, that can be used as either menthol or non-menthol were classified as menthol cigarettes. The variable, usual brand is menthol, was created for all past 30-day youth cigarette smokers who endorsed smoking a usual menthol cigarette brand; non-menthol cigarette brand preference was the reference group.

All respondents were asked: *How much do you think people harm themselves when they smoke cigarettes?* Response options: 1=*no harm*, 2=*a little harm*, 3=*some harm*, and 4=*a lot of harm*. Responses were dichotomized such that higher scores indicated lower harm perceptions (*no/little harm*=1 versus *some/lot of harm*=0/reference), similar to prior work using the PATH study.[23]

All respondents were asked: *Are cigarettes flavored like menthol or mint harder to smoke, about the same, or easier to smoke than regular cigarettes?* Response options were dichotomized (*easier*=1 versus *same/harder*=0/reference), similar to prior work using the PATH study.[8]

Demographic correlates included sex (male, female), race/ethnicity (white, black, other, Hispanic), age at initiation (<12, 12–14, and 15–17 years), and cigarettes per day (CPD; zero, one to five, six to ten, and more than ten). These expanded CPD categories better captured the variability in smoking behavior and allowed for examination of a dose—response relationship between CPD and the outcomes of interest.

Statistical Analysis

Differences in demographic and tobacco use characteristics were examined across menthol (versus non-menthol) cigarette smoking at initiation, past 30-day menthol (versus non-menthol) cigarette smoking, and menthol (versus non-menthol) brand cigarette smoking via weighted cross-tabulations; menthol cigarette smoking group differences were tested using Rao—Scott chi-square.

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

Next, separate crude and adjusted weighted logistic regression models were conducted to examine differences in cigarette harm perceptions and ease of smoking menthol (versus non-menthol) cigarettes across each of the three menthol smoking predictor variables (initiation with a menthol cigarette, past 30-day menthol cigarette smoking, and menthol cigarette brand smoking), controlling for demographic tobacco use factors.

Analyses were conducted in 2018 using PROC SURVEY procedures in SAS version 9.4, to account for the complex survey design. CIs were estimated using the balanced repeated replication method.

RESULTS

Table 1 details characteristics of youth ever cigarette smokers. The sample was primarily male (53.5%) and white (61.7%); followed by Hispanic (20.7%), black (10.1%), and other racial/ethnic minorities (7.5%). Nearly half (46.5%) initiated cigarette smoking between the ages of 12 and 14 years and 43.2% reported that their first cigarette smoked was menthol. One third (33.1%) of ever smokers were past 30-day cigarette smokers, a quarter of whom smoked one to five CPD on average (28.0% of ever smokers), 3% smoked six to ten CPD, and 2% smoked ≥11 CPD. Among ever smokers, past 30-day menthol cigarette smoking was more prevalent than non-menthol cigarette smoking (20.5% vs 13.9%, respectively); however, 58.3% of past 30-day smokers who endorsed a usual cigarette brand preferred a non-menthol brand.

Bivariate analyses also showed that initiation with a menthol cigarette (Table 2) and menthol cigarette brand preference (versus the non-menthol reference groups; Table 4) were both correlated with black race, older age at initiation, and past 30-day menthol cigarette smoking. Menthol cigarette brand preference was also correlated with female sex. Youth who initiated with a menthol cigarette and smokers with a menthol cigarette brand preference did not differ significantly on past 30-day CPD compared with the non-menthol using reference groups.

Compared with past 30-day non-menthol smokers, bivariate analyses showed that past 30-day menthol smokers (Table 3) were more likely to have smoked six to ten CPD (11.6% vs 6.1%, p=0.043) and less likely to have smoked one to five CPD (81.5% vs 89.0%, p=0.04). Past 30-day menthol and non-menthol cigarette smokers did not differ on sex, race/ethnicity, and age of initiation (p>0.05).

In unadjusted logistic regression models (Table 2), menthol initiators reported lower cigarette harm perceptions compared with non-menthol initiators (OR=1.63, 95% CI=1.08, 2.48, p=0.02); however, this effect was nonsignificant after controlling for covariates (AOR=1.50, 95% CI=0.98, 2.30, p=0.06). In the adjusted models, CPD remained significant. Youth who smoked one to five CPD or who smoked ≥11 CPD reported significantly lower cigarette harm perceptions than those who had not smoked cigarettes at all (zero CPD) in the past 30 days (one to five CPD: AOR=2.05, 95% CI=1.37, 3.08, p<0.001, and more than ten CPD: AOR=3.46, 95% CI=1.34, 8.93, p=0.01).

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

In crude and adjusted models, perceived ease of smoking menthol cigarettes did not differ between youth who initiated with a menthol or a non-menthol cigarette. In adjusted models, race/ethnicity and age at initiation remained significant. Specifically, black (versus white) youth smokers were significantly less likely to perceive menthol cigarettes as easier to smoke than non-menthol cigarettes (AOR=0.63, 95% CI=0.43, 0.91, p=0.02). Similarly, youth who initiated smoking at a younger age were less likely to perceive menthol cigarettes as easier to smoke compared with youth who initiated smoking at an older age (15–17 years).

In adjusted logistic regression models (Table 3), cigarette harm perceptions did not differ between past 30-day menthol versus non-menthol cigarette smokers. However, compared with past 30-day non-menthol smokers, past 30-day menthol smokers had approximately twice the odds of perceiving menthol cigarettes as easier to smoke than non-menthol cigarettes (AOR=2.12, 95% CI=1.44, 3.10, p=0.0002). Age at initiation remained significant in adjusted models. Youth who initiated smoking at a younger age (12–14 years) were significantly less likely to perceive menthol cigarettes as easier to smoke compared with youth who initiated smoking at an older age (15–17 years; AOR=0.53, 95% CI=0.32, 0.88, p=0.01).

In adjusted logistic regression models (Table 4), cigarette harm perceptions did not differ between youth reporting a menthol versus non-menthol cigarette brand. However, youth who smoked a menthol cigarette as their usual brand were significantly more likely to perceive menthol cigarettes as easier to smoke compared with youth who smoked a non-menthol cigarette brand (AOR=4.07, 95% CI=2.16, 7.67, p<0.0001). No other demographic or tobacco use correlates emerged.

DISCUSSION

Almost half of youth ever smokers (42%) initiated with a menthol cigarette; 20% reported past 30-day menthol smoking, and 42% with a usual cigarette brand smoked a menthol brand. Consistent with the literature,[24,25] bivariate analyses showed that menthol smokers compared with non-menthol smokers were more likely to be female, black or Hispanic, and started smoking at an older age. Results from adjusted logistic models revealed several unexpected findings. First, there were no differences in cigarette harm perceptions across different patterns of menthol cigarette versus non-menthol cigarette use (initiation, past 30-day use, menthol brand use). This may be because harms associated with smoking are ubiquitous and incontrovertible, and regardless of cigarette flavor preference or experience, most individuals perceive cigarettes to be harmful.[26] Second, study results showed that youth who initiated smoking with a menthol cigarette reported similar beliefs regarding the ease of smoking menthol cigarettes compared with youth who initiated smoking with a non-menthol cigarette. This finding was also surprising, given that menthol's cooling and soothing sensations have been hypothesized to mask the harshness of cigarette smoking and have been marketed as such to enhance the appeal of cigarettes to new and susceptible consumers.[7,27,28] Because of this widespread marketing, it is possible that most youth perceive menthol cigarettes as easier to smoke, regardless of whether they have used it or not. Finally, consistent with the authors' expectations, past 30-day menthol smokers and

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

youth who smoked menthol as their usual cigarette brand perceived menthol cigarettes as easier to smoke than non-menthol cigarettes. This is concerning, as menthol's palatability has been cited as a mechanism linking initiation to established smoking, as well as greater nicotine dependence and difficulty quitting.[29–31] Though this study was cross-sectional, perceived ease of menthol cigarette smoking should be investigated in longitudinal studies, as a putative mechanism linking smoking initiation with cigarette smoking progression and inability to quit.

Several demographic and tobacco use correlates of harm perceptions and ease of menthol smoking emerged, beyond menthol cigarette smoking. Youth who consumed a few CPD (one to five) or who smoked more heavily (11 or more) perceived smoking as less harmful compared with youth who had not smoked at all in the past month. Black youth and younger initiators were less likely to perceive menthol cigarettes as easier to smoke than non-menthol cigarettes. These latter two findings are particularly perplexing, as tobacco companies have historically altered menthol cigarettes to appeal to younger consumers and marketed the cooling and soothing properties of menthol cigarettes to these subgroups.[6,7,27,32] Perhaps few black youth smoke non-menthol cigarettes and, as a result, have little or no experience smoking non-menthol cigarettes to compare with smoking menthol cigarettes. Additionally, any cigarette may be perceived as too harsh and aversive for younger users, regardless of flavoring. This could fit with changing taste preferences of youth.[33]

Initiation with a menthol cigarette and menthol brand use were correlated with being black, older age at smoking initiation, and past 30-day menthol smoking. Furthermore, in some multivariable models, youth who initiated smoking at an older versus younger age were more likely to perceive cigarettes as less harmful to their health and menthol cigarettes as easier to smoke. The literature shows that black smokers tend to initiate smoking later in life,[34] smoke menthol cigarettes,[12,35,36] and have poorer cessation outcomes.[37] In addition, national data show that black smokers who initiate smoking at an older age have lower cessation rates compared with both white smokers who initiate smoking at an older age and black smokers who initiate at a younger age.[34,38] Taken together, these findings suggest that menthol flavoring may play a role in black smokers becoming established smokers, even though they start smoking later. Tobacco prevention programs targeting smoking should place a special emphasis on thwarting initiation and escalation among older black youth to prevent subsequent disparities.

Limitations

This study had several limitations. First, these data are cross-sectional and the temporal association between menthol cigarette smoking patterns assessed in this paper and perceptions of harm and perceived ease of smoking cannot be determined. Second, this study did not measure macro-level factors, like point-of-sale tobacco product exposure or industry marketing, which could also influence harm perceptions and menthol smoking behavior. Third, this was a secondary analysis of existing data limited to existing survey items. As such, it was not possible to examine whether menthol smokers report the taste and sensation of menthol cigarettes as being more appealing than non-menthol cigarettes (if a youth has tried both), as this was not asked in the survey. Further, the question about ease of

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

menthol smoking could have different connotations for more versus less experienced smokers, but this was not asked of study respondents. Younger inexperienced smokers may be unable to make the distinction between easier and harder to smoke. Finally, the majority of the sample was white, and it was not possible to examine interactions of menthol use with race/ethnicity, given small sample sizes for certain racial/ethnic subgroups.

CONCLUSIONS

Past 30-day menthol smokers and menthol brand smokers perceived menthol cigarettes as easier to smoke. These findings suggest that menthol flavoring may play an important role in smoking behavior of youth, as it is correlated with regular smoking. Further, because youth menthol smokers may hold less-negative attitudes about menthol smoking, these findings suggest the potential for greater abuse liability of menthol cigarettes versus non-menthol cigarettes, at least in this age group. Correcting misperceptions about harms associated with menthol cigarette smoking, even though perceived as easier to smoke, could be an important target in youth cigarette prevention campaigns.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

ACKNOWLEDGMENTS

ACV was supported by the Centers of Biomedical Research Excellence P20GM103644 award from the National Institute of General Medical Sciences and National Cancer Institute of NIH under Award Number R03CA212694. AMC was supported by R01DA046359–01. The content is solely the responsibility of the authors and does not necessarily represent the official views of NIH or the Food and Drug Administration.

AMC conceived of the study idea and analyses and wrote the initial draft of the manuscript; ACV, SWR, and JD assisted with manuscript revisions and interpretation of study findings.

REFERENCES

1. Ahijevych K, Garrett BE. The role of menthol in cigarettes as a reinforcer of smoking behavior. Nicotine Tob Res. 2010;12(suppl 2):S110–S116. 10.1093/ntr/ntq203. [PubMed: 21177367]
2. Henningfield JE, Benowitz NL, Ahijevych K, Garrett BE, Connolly GN, Wayne GF. Does menthol enhance the addictiveness of cigarettes? An agenda for research. Nicotine Tob Res. 2003;5(1):9–11. 10.1080/1462220031000070543. [PubMed: 12745502]
3. Clark PI, Gardiner P. Menthol should not be given a free pass based on studies of biomarkers of toxicity. Cancer Epidemiol Biomark Prev. 2011;20(7):1269–1271. 10.1158/1055-9965.EPI-11-0410.
4. Allen B Jr, Cruz TB, Leonard E, Unger JB. Development and validation of a scale to assess attitudes and beliefs about menthol cigarettes among African American smokers. Eval Health Prof. 2010;33(4):414–436. 10.1177/0163278710383276. [PubMed: 21149394]
5. Anderson SJ. Marketing of menthol cigarettes and consumer perceptions: a review of tobacco industry documents. Tob Control 2011;20 (suppl 2):ii20–ii28. 10.1136/tc.2010.041939. [PubMed: 21504928]
6. Carpenter CM, Wayne GF, Connolly GN. The role of sensory perception in the development and targeting of tobacco products. Addiction. 2007;102(1):136–147. 10.1111/j.1360-0443.2006.01649.x. [PubMed: 17207131]

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

7. Carpenter CM, Wayne GF, Pauly JL, Koh HK, Connolly GN. New cigarette brands with flavors that appeal to youth: tobacco marketing strategies. Health Aff (Millwood). 2005;24(6):1601–1610. 10.1377/hlthaff.24.6.1601. [PubMed: 16284034]
8. Villanti AC, Johnson AL, Ambrose BK, et al. Flavored tobacco product use in youth and adults: findings from the first wave of the PATH Study (2013–2014). Am J Prev Med. 2017;53(2):139–151. 10.1016/j.amepre.2017.01.026. [PubMed: 28318902]
9. Villanti AC, Richardson A, Vallone DM, Rath JM. Flavored tobacco product use among U.S. young adults. Am J Prev Med. 2013;44 (4):388–391. 10.1016/j.amepre.2012.11.031. [PubMed: 23498105]
10. Gostin LO. FDA regulation of tobacco: politics, law, and the public's health. JAMA. 2009;302(13):1459–1460. 10.1001/jama.2009.1421. [PubMed: 19809027]
11. Villanti AC, Collins LK, Niaura RS, Gagosian SY, Abrams DB. Menthol cigarettes and the public health standard: a systematic review. BMC Public Health. 2017;17:983 10.1186/s12889-017-4987-z. [PubMed: 29284458]
12. Villanti AC, Mowery PD, Delnevo CD, Niaura RS, Abrams DB, Giovino GA. Changes in the prevalence and correlates of menthol cigarette use in the USA, 2004–2014. Tob Control 2016;25(suppl 2):ii14–ii20. 10.1136/tobaccocontrol-2016-053329. [PubMed: 27729565]
13. D'Silva J, Cohn AM, Johnson AL, Villanti AC. Differences in subjective experiences to first use of menthol and nonmenthol cigarettes in a national sample of young adult cigarette smokers. Nicotine Tob Res. 2018;20(9):1062–1068. 10.1093/ntr/ntx181. [PubMed: 29059351]
14. Hersey JC, Ng SW, Nonnemaker JM, et al. Are menthol cigarettes a starter product for youth. Nicotine Tob Res. 2006;8(3):403–413. 10.1080/14622200600670389. [PubMed: 16801298]
15. Hersey JC, Nonnemaker JM, Homsi G. Menthol cigarettes contribute to the appeal and addiction potential of smoking for youth. Nicotine Tob Res. 2010;12(suppl 2):S136–S146. 10.1093/ntr/ntq173. [PubMed: 21177370]
16. Nonnemaker J, Hersey J, Homsi G, Busey A, Allen J, Vallone D. Initiation with menthol cigarettes and youth smoking uptake. Addiction. 2013;108(1):171–178. 10.1111/j.1360-0443.2012.04045.x. [PubMed: 22862154]
17. Ahijevych K, Garrett BE. Menthol pharmacology and its potential impact on cigarette smoking behavior. Nicotine Tob Res. 2004;6(suppl 1):S17–S28. 10.1080/14622200310001649469. [PubMed: 14982706]
18. Allen B, Unger JB. Sociocultural correlates of menthol cigarette smoking among adult African Americans in Los Angeles. Nicotine Tob Res. 2007;9(4):447–451. 10.1080/14622200701239647. [PubMed: 17454699]
19. Cruz TB, Wright LT, Crawford G. The menthol marketing mix: targeted promotions for focus communities in the United States. Nicotine Tob Res. 2010;12(suppl 2):S147–S153. 10.1093/ntr/ntq201. [PubMed: 21177371]
20. Sutton CD, Robinson RG. The marketing of menthol cigarettes in the United States: populations, messages, and channels. Nicotine Tob Res. 2004;6(suppl 1):S83–S91. 10.1080/14622203310001649504. [PubMed: 14982711]
21. Richardson A, Ganz O, Pearson J, Celcis N, Vallone D, Villanti AC. How the industry is marketing menthol cigarettes: the audience, the message and the medium. Tob Control 2015;24(6):594–600. 10.1136/tobaccocontrol-2014-051657. [PubMed: 25178275]
22. Hyland A, Ambrose BK, Conway KP, et al. Design and methods of the Population Assessment of Tobacco and Health (PATH) Study. Tob Control. 2017;26(4):371–378. 10.1136/tobaccocontrol-2016-052934.
23. Pearson JL, Johnson A, Villanti A, et al. Misperceptions of harm among Natural American Spirit smokers: results from wave 1 of the Population Assessment of Tobacco and Health (PATH) study (2013–2014). Tob Control 2017;26(e1):e61–e67. 10.1136/tobaccocontrol-2016-053265. [PubMed: 27924008]
24. Caraballo RS, Asman K. Epidemiology of menthol cigarette use in the United States. Tob Induc Dis. 2011;9(suppl 1):S1 10.1186/1617-9625-9-S1-S1. [PubMed: 21624147]
25. Rock VJ, Davis SP, Thorne SL, Asman KJ, Caraballo RS. Menthol cigarette use among racial and ethnic groups in the United States, 2004–2008. Nicotine Tob Res. 2010;12(suppl 2):S117–S124. 10.1093/ntr/ntq204. [PubMed: 21177368]

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

26. HHS. The Health Consequences of Smoking—50 Years of Progress: A Report of the Surgeon General. Atlanta, GA: HHS, CDC, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health; 2014.
27. Kreslake JM, Wayne GF, Alpert HR, Koh HK, Connolly GN. Tobacco industry control of menthol in cigarettes and targeting of adolescents and young adults. Am J Public Health. 2008;98(9):1685 10.2105/AJPH.2007.125542. [PubMed: 18633084]
28. Carpenter CM, Wayne GF, Connolly GN. Designing cigarettes for women: new findings from the tobacco industry documents. Addiction. 2005;100(6):837–851. 10.1111/j.1360-0443.2005.01072.x. [PubMed: 15918814]
29. Hoffman AC, Simmons D. Menthol cigarette smoking and nicotine dependence. Tob Induc Dis. 2011;9(suppl 1):S5 10.1186/1617-9625-9-S1-S5. [PubMed: 21624151]
30. Benowitz NL, Samet JM. The threat of menthol cigarettes to U.S. public health. New Engl J Med. 2011;364(23):2179–2181. 10.1056/NEJMp1103610. [PubMed: 21542737]
31. U.S. Food Drug and Administration, Tobacco Products Scientific Advisory Committee (TPSAC). Menthol Cigarettes and Public Health: Review of the Scientific Evidence and Recommendations Rockville, MD: U.S. Food and Drug Administration, Center for Tobacco Products; 2011.
32. Kreslake JM, Wayne GF, Connolly GN. The menthol smoker: tobacco industry research on consumer sensory perception of menthol cigarettes and its role in smoking behavior. Nicotine Tob Res. 2008;10 (4):705–715. 10.1080/14622200801979134. [PubMed: 18418792]
33. Hoffman AC, Salgado RV, Dresler C, Faller RW, Bartlett C. Flavour preferences in youth versus adults: a review. Tob Control 2016;25(suppl 2): ii32–ii39. 10.1136/tobaccocontrol-2016-053192. [PubMed: 27633764]
34. Roberts ME, Colby SM, Lu B, Ferketich AK. Understanding tobacco use onset among African Americans. Nicotine Tob Res. 2016;18(suppl 1): S49–S56. 10.1093/ntr/ntv250. [PubMed: 26980864]
35. Alexander LA, Trinidad DR, Sakuma K-LK, et al. Why we must continue to investigate menthol's role in the African American smoking paradox. Nicotine Tob Res. 2016;18(suppl 1):S91–S101. 10.1093/ntr/ntv209. [PubMed: 26980870]
36. Delnevo CD, Villanti AC, Giovino GA. Trends in menthol and non-menthol cigarette consumption in the USA: 2000–2011. Tob Control. 2014;23 (e2):e154–e155. 10.1136/tobaccocontrol-2013-051385. [PubMed: 24335479]
37. Holford TR, Levy DT, Meza R. Comparison of smoking history patterns among African American and white cohorts in the United States born 1890 to 1990. Nicotine Tob Res. 2016;18(suppl 1):S16–S29. 10.1093/ntr/ntv274. [PubMed: 26980861]
38. Kulak JA, Cornelius ME, Fong GT, Giovino GA. Differences in quit attempts and cigarette smoking abstinence between whites and African Americans in the United States: literature review and results from the International Tobacco Control U.S. Survey. Nicotine Tob Res. 2016;18(suppl 1):S79–S87. 10.1093/ntr/ntv228. [PubMed: 26980868]

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

Table 1.

Sample Characteristics and Menthol Use of Youth Ever Smokers From the Population Assessment of Tobacco and Health, Wave 1

	Ever smokers (*n*=1,838)		
Variable	**%**	***n* (95% CI)**	***p*-value**
Sex			**0.0007**
Male	53.5	966 (51.2, 55.8)	
Female	46.5	872 (44.2, 48.8)	
Race/ethnicity			**<0.001**
White	61.7	1,017 (59.1, 64.2)	
Black	10.1	178 (8.7,11.7)	
Hispanic	20.7	465(18.9, 22.6)	
Other	7.5	178 (6.3, 8.8)	
Age at first cigarette, years			**<0.001**
<12	19.7	375(17.6, 21.9)	
12-14	46.5	866 (44.0, 49.0)	
15-17	33.8	593 (31.5, 36.2)	
Cigarettes per day (past 30 days)			**<0.001**
0	66.8	1,196 (64.3, 69.1)	
1-5	28.0	504 (25.9, 30.3)	
6-10	3.1	62 (2.4, 4.0)	
>10	2.0	37(1.4, 2.9)	
First cigarette was a menthol			**<0.001**
No	56.8	1,012 (54.0, 59.6)	
Yes	43.2	777 (40.4, 46.0)	
Menthol smoker (past 30 days)			**<0.001**
Non-smoker	65.6	1,186 (63.2, 68.0)	
Non-menthol	13.9	250(12.3,15.7)	
Menthol	20.5	383(18.4, 22.8)	
Usual brand menthol (past 30 days)			**0.024**
No	58.3	187 (51.0, 65.2)	
Yes	41.7	139 (34.8, 49.0)	

Am J Prev Med. Author manuscript; available in PMC 2020 August 28.

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

Note: Boldface indicates statistical significance ($p<0.05$). Total missing: age at first cigarette $n=4$, cigarettes per day (past 30 days) $n=39$, menthol initiation status $n=49$, menthol smoker (past 30 days) $n=19$, usual brand is menthol $n=1,512$.

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

Am J Prev Med. Author manuscript; available in PMC 2020 August 28.

Table 2.

Crude and AORs of the Correlation Between Initiation With Smoking Harm Perceptions and Ease of Menthol Smoking Among Youth Ever Smokers

Variable	First cigarette was menthol, % (*n*=777)	First cigarette was non-menthol, % (*n*=l,012)	*p*-value[a]	No/little harm from smoking vs some/a lot harm (ref)		Menthol cigarettes easier to smoke than non-menthol cigarettes vs same/harder (ref)	
				OR (95% CI)	AOR (95% CI)	OR (95% CI)	AOR (95% CI)
First cigarette was a menthol							
Yes	—	—	—	**1.63 (1.08,2.48)**	1.50 (0.98, 2.30)	1.17 (0.90, 0.52)	1.17 (0.89,1.54)
No (ref)	—	—		—	—	—	—
Sex			0.25				
Male	51.8	54.8		—	1.15 (0.79,1.69)	—	1.02 (0.80,1.30)
Female (ref)	48.2	45.2		—	—	—	—
Race/ethnicity			0.0003				
White (ref)	56.2	65.5		—	—	—	—
Black	13.4	7.8		—	1.39 (0.75, 2.56)	—	**0.63 (0.43.0.91)**
Hispanic	22.7	19.5		—	1.37 (0.89, 2.09)	—	1.09 (0.81,1.47)
Other	7.7	7.1		—	1.08 (0.41,2.85)	—	1.09 (0.68,1.75)
Age at first cigarette, years			0.0001				
<12	14.9	21.9		—	1.19 (0.68, 2.08)	—	**0.65(0.45,0.93)**
12-14	46.9	46.7		—	0.97 (0.62,1.51)	—	**0.77(0.60,0.99)**
15-17 (ref)	38.3	31.3		—	—	—	—
Cigarettes per day (past 30 days)			0.09				
O(ref)	62.8	68.8		—	—	—	—
1-5	31.3	26.4		—	**2.05 (1.37,3.08)**	—	0.99 (0.78,1.26)
6-10	3.6	2.9		—	1.65 (0.54, 5.06)	—	0.80 (0.47,1.38)
>10	2.3	1.9		—	**3.46 (1.34, 8.93)**	—	0.76 (0.31,1.84)

Note: Boldface indicates statistical significance ($p<0.05$). Subjects missing in the denominator for each covariate are as follows: menthol initiator: age at first cigarette $n=1$; non-menthol initiator: age at first cigarette $n=2$.

[a]Menthol cigarette group differences were tested using Rao-Scott χ^2.

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

Table 3.

Crude and AORs of the Correlation Between Past 30-day Menthol Cigarette Smoking With Smoking Harm Perceptions and Ease of Smoking Menthol Cigarettes (Among Past 30-day Youth Smokers)

Variable	Menthol smoker, % (*n*=383)	Non-menthol smoker, % (*n*=250)	*p*-value[a]	No/little harm from smoking vs some/a lot harm (ref)		Menthol cigarettes easier to smoke than non-menthol cigarettes vs same/harder (ref)	
				OR (95% CI)	AOR (95% CI)	OR (95% CI)	AOR (95% CI)
Menthol smoker (past 30 days)							
Yes	—	—		1.27 (0.72, 2.22)	1.36 (0.75, 2.48)	**1.97 (1.37, 2.84)**	**2.12 (1.44, 3.10)**
No (ref)	—	—		—	—	—	—
Sex			0.18				
Male	49.7	56.0		—	1.54 (0.79, 3.03)		0.71 (0.47,1.06)
Female (ref)	50.3	44.0		—	—	—	—
Race/ethnicity			0.13				
White (ref)	65.4	68.6		—	—	—	—
Black	10.3	5.7		—	1.45 (0.49, 4.31)	—	0.50 (0.21,1.20)
Hispanic	17.6	17.3		—	1.18 (0.57, 2.46)	—	1.28 (0.75, 2.19)
Other	6.7	8.4		—	1.45 (0.52, 4.08)	—	0.76(0.33,1.77)
Age at first cigarette, years			0.52				
<12	18.4	15.5		—	0.98 (0.45, 2.11)	—	0.68 (0.36,1.28)
12-14	49.0	53.1		—	1.08 (0.59,1.96)	—	**0.53 (0.32, 0.88)**
15-17 (ref)	32.7	31.4		—	—	—	—
Cigarettes per day (past 30 days)			**0.04**				
1-5 (ref)	81.5	89.0		—	—	—	—
6-10	11.6	6.1		—	0.76 (0.25, 2.32)	—	0.78 (0.44,1.39)
>10	6.9	5.0		—	1.73 (0.69, 4.32)	—	0.72 (0.29,1.76)

Note: Boldface indicates statistical significance (p<0.05). Subjects missing in the denominator for each covariate are as follows: Menthol smoker: age at first cigarette *n*=1, past 30-day cigarette user *n*=11; Non-menthol smoker: past 30-day cigarette user *n*=20.

[a]Menthol cigarette group differences were tested using Rao-Scott χ^2.

Author Manuscript Author Manuscript Author Manuscript Author Manuscript

Table 4.

Crude and AORs of the Correlation of Usual Brand (Menthol vs Non-Menthol) With Smoking Harm Perceptions and Ease of Menthol Smoking Among Past 30-day Youth Smokers Reporting a Usual Brand

Variable	Usual brand menthol, % (*n*=139)	Usual brand non-menthol, % (*n*=187)	*p*-value[a]	No/little harm from smoking vs some/a lot harm (ref)		Menthol cigarettes easier to smoke than non-menthol cigarettes vs same/harder (ref)	
				OR (95% CI)	AOR (95% CI)	OR (95% CI)	AOR (95% CI)
Smoke menthol as usual brand (past 30 days)							
Yes	—	—		1.81 (0.94,3.49)	1.99 (0.98, 4.02)	**3.89 (2.30, 6.59)**	**4.07 (2.16, 7.67)**
No (ref)	—	—		—	—	—	—
Sex			**<0.05**				
Male	43.3	58.6		—	1.52 (0.69, 3.38)	—	0.77(0.45,1.33)
Female (ref)	56.7	41.4		—	—	—	—
Race/ethnicity			**<0.01**				
White (ref)	64.1	76.4		—	—	—	—
Black	12.4	2.3		—	0.73 (0.09, 5.87)	—	0.48 (0.12,1.91)
Hispanic	16.4	13.6		—	1.16 (0.36, 3.76)	—	2.27 (0.89, 5.77)
Other	7.1	7.8		—	1.93 (0.52, 7.11)	—	1.41 (0.53,3.78)
Age at first cigarette, years			**0.04**				
<12	17.3	23.5		—	1.08 (0.32, 3.72)	—	0.81 (0.33,1.97)
12-14	50.3	56.6		—	1.18 (0.43, 3.26)	—	0.54 (0.25,1.18)
15-17 (ref)	32.4	19.9		—	—	—	—
Cigarettes per day (past 30 days)			0.48				
1-5 (ref)	73.9	69.5		—	—	—	—
6-10	17.2	17.7		—	0.78 (0.25, 2.49)	—	0.76 (0.40,1.43)
>10	8.9	12.8		—	1.56 (0.49, 4.92)	—	0.79 (0.31, 2.00)

Note: Boldface indicates statistical significance (p<0.05). Subjects missing in the denominator for each covariate are as follows: Cigarettes per day (past 30 days) *n*=7.

[a]Menthol cigarette group differences were tested using Rao-Scott χ^2.