

# BMJ Open

BMJ Open is committed to open peer review. As part of this commitment we make the peer review history of every article we publish publicly available.

When an article is published we post the peer reviewers' comments and the authors' responses online. We also post the versions of the paper that were used during peer review. These are the versions that the peer review comments apply to.

The versions of the paper that follow are the versions that were submitted during the peer review process. They are not the versions of record or the final published versions. They should not be cited or distributed as the published version of this manuscript.

BMJ Open is an open access journal and the full, final, typeset and author-corrected version of record of the manuscript is available on our site with no access controls, subscription charges or pay-per-view fees (<http://bmjopen.bmj.com>).

If you have any questions on BMJ Open's open peer review process please email [info.bmjopen@bmj.com](mailto:info.bmjopen@bmj.com)

# BMJ Open

## BEHAVIORAL INTENTIONS IN RESPONSE TO A POTENTIAL MENTHOL BAN: EXAMINING SMOKERS IN PUBLIC HOUSING

Journal:	<i>BMJ Open</i>
Manuscript ID	bmjopen-2021-059821
Article Type:	Original research
Date Submitted by the Author:	02-Dec-2021
Complete List of Authors:	Dearfield, Craig; The George Washington University Milken Institute of Public Health, Epidemiology Horn, Kimberly; Fralin Biomedical Research Institute at VTC Crandell, Ian; Virginia Tech-Center for Biostatistics and Health Data Sciences Bernat, D; The George Washington University Milken Institute of Public Health, Epidemiology
Keywords:	EPIDEMIOLOGY, Health policy < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, PUBLIC HEALTH

SCHOLARONE™  
Manuscripts



I, the Submitting Author has the right to grant and does grant on behalf of all authors of the Work (as defined in the below author licence), an exclusive licence and/or a non-exclusive licence for contributions from authors who are: i) UK Crown employees; ii) where BMJ has agreed a CC-BY licence shall apply, and/or iii) in accordance with the terms applicable for US Federal Government officers or employees acting as part of their official duties; on a worldwide, perpetual, irrevocable, royalty-free basis to BMJ Publishing Group Ltd ("BMJ") its licensees and where the relevant Journal is co-owned by BMJ to the co-owners of the Journal, to publish the Work in this journal and any other BMJ products and to exploit all rights, as set out in our [licence](#).

The Submitting Author accepts and understands that any supply made under these terms is made by BMJ to the Submitting Author unless you are acting as an employee on behalf of your employer or a postgraduate student of an affiliated institution which is paying any applicable article publishing charge ("APC") for Open Access articles. Where the Submitting Author wishes to make the Work available on an Open Access basis (and intends to pay the relevant APC), the terms of reuse of such Open Access shall be governed by a Creative Commons licence – details of these licences and which [Creative Commons](#) licence will apply to this Work are set out in our licence referred to above.

Other than as permitted in any relevant BMJ Author's Self Archiving Policies, I confirm this Work has not been accepted for publication elsewhere, is not being considered for publication elsewhere and does not duplicate material already published. I confirm all authors consent to publication of this Work and authorise the granting of this licence.

1  
2  
3 **BEHAVIORAL INTENTIONS IN RESPONSE TO A POTENTIAL MENTHOL BAN:**  
4  
5 **EXAMINING SMOKERS IN PUBLIC HOUSING**  
6  
7  
8  
9

10 Craig T. Dearfield, Ph.D.,<sup>1</sup> Kimberly Horn, Ed.D.,<sup>2</sup> Ian Crandell, Ph.D.,<sup>3</sup> and Debra H. Bernat,  
11 Ph.D.<sup>1</sup>  
12  
13

- 14  
15 1. The George Washington University Milken Institute School of Public Health,  
16 Department of Epidemiology, 950 New Hampshire Ave, NW, Fifth floor, Washington,  
17 DC 20052, USA  
18  
19 2. Virginia Tech-Carilion Fralin Biomedical Research Institute, Blacksburg, VA, USA  
20  
21 3. Virginia Tech-Center for Biostatistics and Health Data Sciences, Roanoke, VA, USA  
22  
23  
24  
25  
26  
27

28 **Address Correspondence To:** Craig T. Dearfield, Ph.D.

29 Department of Epidemiology  
30  
31

32 The Milken Institute School of Public Health, The George Washington University  
33  
34

35 950 New Hampshire Ave., 5<sup>th</sup> Floor, Washington DC, 20052, USA  
36  
37

38 Phone: 202-994-0436  
39

40 Email: cdearfield@gwu.edu  
41  
42  
43  
44

45 **Word count:** 2,783  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

## ABSTRACT

**Objectives:** Local, national, and international policies are being proposed to ban the sale of menthol-flavored tobacco products. With more bans being implemented, it is increasingly important to understand reactions to these bans across different socioeconomic statuses. This study examined public housing residents' behavioral intentions if menthol-flavored cigarettes were no longer sold.

**Setting:** 15 District of Columbia Housing Authority properties between March 2019 and March 2021.

**Participants:** 221 District of Columbia Housing Authority residents ages 18-80 who reported smoking menthol cigarettes (83.3% African American/Black).

**Primary and Secondary Outcomes:** Cigarette quitting and switching intentions due to a hypothetical menthol-flavored product sales ban.

**Results:** Nearly one-half (48.0%) of residents said they intended to quit smoking if menthol-flavored products were no longer sold, while 27.2% were unsure if they would quit, and 24.9% reported they would not quit. Older residents (OR=0.94 per year, 95% CI=0.91, 0.97), senior/disabled building versus family building residents (OR=0.50, 95% CI=0.25, 0.97), those who smoked within 30 minutes of waking (OR=0.48, 95% CI=0.23, 0.98), and daily smokers (OR=0.42, 95% CI=0.21, 0.84) had lower odds of reporting quit intentions associated with a menthol ban. Of those not intending to quit, 40.7% reported they would switch to non-menthol cigarettes, 20% to another non-menthol product, 13% to menthol e-cigarettes (13.0%), and 20% to another menthol product.

1  
2  
3 **Conclusions:** Nearly three-quarters of smokers in public housing indicated a possibility of  
4 quitting smoking with a menthol ban. Results suggest that bans that include all flavors in all  
5 tobacco products may be most effective.  
6  
7  
8  
9

### 10 11 12 **Article Summary**

- 13  
14  
15 • A menthol flavor sales ban would remove preferred tobacco products from the market  
16 and may provide an additional unique influence towards cessation for smokers who use  
17 those products, especially African American menthol-flavored product users.  
18  
19

### 20 21 **Strengths and Limitations:**

- 22  
23  
24 • The study fills an important literature gap by providing a current examination of the  
25 potential consequences of a menthol-flavored product ban in a vulnerable population with  
26 high rates of menthol-flavored tobacco use.  
27  
28
- 29  
30  
31 • These data represent residents from one housing authority and may not generalize to  
32 other public housing authorities and other countries.  
33  
34
- 35  
36  
37 • Another limitation is the inability to assess the unique effects of menthol-flavored  
38 products on successful quitting because residents were reacting to a hypothetical ban.  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

## INTRODUCTION

Menthol flavor in cigarettes contributes to decreased cessation efficacy and ongoing tobacco-related health disparities.[1-3] Currently, menthol is the last allowable characterizing flavor in cigarettes in the United States,[1] and menthol-flavored cigarette consumption was stable across the country between 2000 and 2018 when overall cigarette consumption declined.[4] Public housing residents have been shown to have higher smoking rates compared with the general population (33.6% versus 14%).[5, 6] Residents also represent the groups most likely to use menthol-flavored tobacco products, individuals of lower socioeconomic status (SES) and a high proportion of African Americans.[1, 2, 7] The prevalence of menthol-flavored cigarette use among those in families earning less than \$35,000 (7.0%) is over double those in families earning more than \$75,000 a year (2.3%),[8] and approximately 85% of all African American smokers use menthol-flavored cigarettes, compared with approximately 30% of White smokers.[9]

To improve quit rates and address these health disparities, local, state, national, and international policies are being proposed to ban the sale of menthol-flavored tobacco products. On April 29, 2021, the U.S. Food and Drug Administration (FDA) declared their intent to pursue tobacco product standards to ban menthol-flavored cigarettes.[1] The European Union banned menthol-flavored tobacco as part of a larger ban on flavorings in those products in 2020.[10, 11] Additionally, prior to a 2016 World Health Organization report, Brazil, 5 Canadian provinces (Alberta, Ontario, Quebec, New Brunswick and Nova Scotia), Ethiopia, Chile, and Turkey proposed or instituted menthol-specific or comprehensive flavor sales ban for tobacco products.[11] With bans going into effect across the world, often in tandem with smoke-free and

1  
2  
3 clean air rules in public and private spaces, it is increasingly important to understand how people  
4  
5 respond to these bans, particularly those of lower socioeconomic status.  
6  
7

8 A ban on menthol-flavored tobacco products has a particular bearing on individuals  
9  
10 living in the Department of Housing and Urban Development (HUD) housing, due to resident  
11  
12 characteristics and the fact they live in settings where HUD prohibits using lit-tobacco products  
13  
14 inside and within 25 feet of housing authority buildings. A menthol flavor sales ban may provide  
15  
16 an additional unique influence towards cessation for smokers who use those products. These  
17  
18 bans would remove preferred tobacco products from the market for menthol-flavored smokers  
19  
20 who are less likely to successfully quit, especially African American menthol-flavored product  
21  
22 users.[3, 12-15]  
23  
24  
25

26 Evidence from the United States and Canada examining the impact of these bans on  
27  
28 smokers indicates they promote cessation where implemented.[16] Following the  
29  
30 implementation of a ban, menthol-flavored cigarette users are more likely to attempt to quit  
31  
32 compared with nonmenthol-flavored cigarette users.[16-18] Evidence related to behavioral  
33  
34 intentions in response to a hypothetical menthol-flavored product ban indicates many smokers  
35  
36 intend to quit once it goes into effect. In a recent review of studies examining behavioral  
37  
38 intentions if menthol-flavored products were no longer sold, between 24% and 64% of smokers  
39  
40 indicated they would attempt to quit, with most studies estimating between 40 and 50% of US  
41  
42 adults would intend to quit.[16] There are several important variations within these estimates.  
43  
44  
45 Notably, a higher proportion of African American menthol smokers indicate they would quit as a  
46  
47 result of a hypothetical ban as their white menthol smoker peers (76.0% versus 30.3%).[19]  
48  
49  
50 Additionally, those who smoked less frequently, had greater current quit intentions, and had  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60



1  
2  
3 made a quit attempt in the prior year were more likely to say they would quit if a menthol ban  
4 went into effect.[19, 20]  
5  
6

7  
8 Another study examined the expected impact of a forthcoming ban in the European  
9 Union (EU). This study examining eight European countries found similar levels of expected  
10 behavior changes among menthol-flavored smokers, where 27.3% would find a way to get  
11 menthol-flavored products despite the ban, 17.6% would reduce the amount they smoked, and  
12 16% would quit.[21] Of those who anticipated continuing to smoke, 20% said they would switch  
13 to another brand.  
14  
15  
16  
17  
18  
19  
20

21 Evidence suggests that banning the sale of menthol-flavored products may increase  
22 intentions to quit and improve cessation outcomes among users of those products in the general  
23 population, but the behavioral intentions of residents of public housing in response to a potential  
24 menthol-flavored product ban are unexamined. The present study examined public housing  
25 residents' (1) intention to quit if menthol-flavored cigarettes were no longer sold in stores, and  
26 (2) expected alternative tobacco products of choice among those who did not intend to quit. The  
27 study fills an important literature gap by providing a current examination of the potential  
28 consequences of a menthol-flavored product ban in a vulnerable population with high rates of  
29 menthol-flavored tobacco use.  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41

## 42 METHODS

### 43 Study Sample

44  
45 Data were collected from residents of the Washington, DC Housing Authority (DCHA)  
46 between March 2019 and March 2021. Inclusion criteria required participants to be a DCHA  
47 property resident (not using Section 8 vouchers) between the ages of 18 and 80. Residents  
48 represented 15 DCHA properties, 8 family and 7 senior/disabled buildings. The present study  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

1  
2  
3 included residents who reported past 30-day use of menthol-flavored cigarettes and were not  
4 missing data for questions asking about behavioral intentions if menthol-flavored products were  
5  
6 no longer sold (n=221).  
7  
8

## 9 10 **Procedures**

11  
12 Data collection took place in community spaces on DCHA property. Study staff and  
13 DCHA administrators held survey participation events. DCHA and building staff advertised and  
14 told residents about the events. Residents who were interested in participating completed a  
15 screening assessment to establish eligibility and smoking status within the past 30 days. All  
16 eligible participants completed a consent form, which research staff read aloud to potential  
17 participants. Participants completed surveys using audio computer-assisted self-interviewing  
18 software (QDS), where all questions and answer options were read aloud to participants. Patients  
19 and the public were not involved in the design, conduct, reporting, or dissemination plans of the  
20 research. All study procedures were approved by The George Washington University  
21 Institutional Review Board.  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34

## 35 **Measures**

36  
37 *Demographics.* Respondents indicated their gender (male/female), age (in years, open  
38 numerical response), and race/ethnicity. Residents reported if they were Hispanic (yes/no), and  
39 selected as many racial categories as were applicable from the following: American Indian or  
40 Alaskan Native, Asian, Black or African American, Native Hawaiian or Other Pacific Islander,  
41 White, and Other. The study applied DCHA classifications for building type (e.g., family or  
42 senior/disabled).  
43  
44  
45  
46  
47  
48  
49  
50

51  
52 *Cigarette and other tobacco use.* Residents reported past 30-day use of cigarettes, cigars,  
53 little cigars and cigarillos, smokeless tobacco, hookah, and e-cigarettes. Cigarette smokers  
54  
55  
56  
57  
58  
59  
60

1  
2  
3 indicated whether they usually used a menthol-flavored product (yes/no), days used in  
4 the past 30 days (0-30), and the number of quit attempts in the past 3 months (open numerical  
5 response). Daily smoking was defined as smoking all days in the past 30 days.  
6  
7

8  
9  
10 *Nicotine Dependency.* The primary measure of nicotine dependency was smoking within  
11 30 minutes of waking.[22, 23] Residents indicated if they typically first smoked within 5  
12 minutes, between 5 to 30 minutes, between 31 to 60 minutes, or after 60 minutes of waking. This  
13 variable was dichotomized for analysis purposes (smoke within 30 minutes of waking and smoke  
14 31+ minutes after waking).[22, 23]  
15  
16

17  
18  
19 *Quitting and Switching Behavioral Intentions.* Respondents reported whether they were  
20 thinking of quitting smoking cigarettes for good (yes/no). Those who said they were thinking of  
21 quitting indicated how sure they were that they could quit if they tried using a 4-point scale (very  
22 sure to not at all sure). Analysis used a dichotomized version of this variable (very sure/sure and  
23 not sure/not at all sure). Participants indicated if they would consider quitting if menthol-flavored  
24 cigarettes were no longer sold in stores (yes/no/not sure). A dichotomous variable was created  
25 for analysis purposes (yes and no/not sure). Residents who indicated they would not quit  
26 reported what they would do if menthol-flavored products were no longer sold. Response options  
27 included switching to non-menthol-flavored cigarettes, switching to some other non-menthol-  
28 flavored tobacco product, switching to menthol-flavored e-cigarettes, switching to some other  
29 menthol-flavored tobacco product, buying menthol-flavored cigarettes online, something else, or  
30 none of these. Participants could select multiple options.  
31  
32

### 33 **Analysis**

34  
35  
36 Descriptive statistics were used to assess intention to quit if menthol-flavored products  
37 were no longer sold and the alternative products of choice among those who said they would not  
38  
39

quit. Logistic regression modeling, clustered by data collection site, was used to assess characteristics associated with quit intentions if menthol-flavored products were no longer sold. The model included age, gender, senior/disabled or family building residence status, using a tobacco product besides cigarettes, smoking within 30 minutes of waking, daily smoking status, whether they were sure they could quit, and having made a quit attempt in the past 3 months to predict whether residents would quit if menthol-flavored products were no longer sold in stores. Because there was a substantial amount of missing data for race and ethnicity variables and most of the residents (83.3%, N=90/108) identified as Black or African American, it was not included in further analysis. Results from a test for multicollinearity between age and senior/disabled building resident status indicated they were significantly correlated ( $r=0.22$ ,  $p<0.01$ ), but not highly correlated. Both variables were included in the model due to the low risk for multicollinearity. The regression model included 177 cases with full data for all the included variables. All analyses were conducted using SAS software, version 9.4 (SAS Institute Inc., Cary, NC).

## RESULTS

### Descriptive Statistics

The sample included slightly more females and residents of Senior and Disabled buildings (Table 1). The mean age of participating residents was 57. Most residents reported thinking about quitting (regardless of the ban; 83.6%, N=184) and over one-half thought they could quit if they tried (very sure and sure; 54.7%, N=100). Additionally, most residents made at least one recent quit attempt during the last 3 months (60.2%, N=109). Close to one-half of residents were daily smokers (47.7%, N=105) and nearly two-thirds reported smoking within 30

minutes of waking (63.5%, N=150). Under 20% of respondents said they used another tobacco product (17.2%, N=38).

<b>Table 1. Demographics, Tobacco Use Characteristics</b>	
	<b>% (N) or mean (SD)</b>
<b>Demographics</b>	
<b>Gender</b>	
Female	60.6% (134)
Male	39.4% (87)
<b>Age (Mean years, continuous)</b>	57.2 (11.0)
<b>Building Type</b>	
Family	40.7% (90)
Senior or Disabled	59.3% (131)
<b>Tobacco Use Characteristics</b>	
<b>Use Another Tobacco Product</b>	
Yes	17.2% (38)
No	82.8% (183)
<b>Smoke within 30 Minutes of Waking</b>	
Yes	63.5% (139)
No	36.5% (80)
<b>Daily smoker</b>	
Yes	47.7% (105)
No	52.3% (115)
<b>Thinking About Quitting</b>	
Yes	83.6% (184)
No	16.4% (36)
<b>How Sure You Could Quit Cigarettes?</b>	
Very sure	23.5% (43)
Sure	31.2% (57)
Not sure	36.1% (66)
Not at all sure	9.3% (17)
<b>How much support have you received to quit tobacco</b>	
A lot of support	14.6% (26)
Some support	19.1% (34)
A little support	18.5% (33)
No support	47.8% (85)
<b>Made at least 1 quit attempt</b>	
Yes	60.2% (109)
No	39.8% (72)
<b>Would quit if menthol-flavored cigarettes were no longer sold</b>	
Yes	48.0% (106)
Not sure	27.2% (60)
No	24.9% (55)
<b>Changes if Menthol-flavored Products are Banned<sup>1</sup> (n=54)</b>	
<b>Switch to non-menthol-flavored cigarettes</b>	40.7% (22)
<b>Switch to some other non-menthol-flavored product</b>	20.4% (11)
<b>Switch to menthol-flavored e-cigarette</b>	13.0% (7)
<b>Switch to other menthol-flavored product</b>	20.4% (11)
<b>Buy menthol-flavored cigarettes online</b>	13.0% (7)
<b>Something else</b>	9.3% (5)
<b>None of these</b>	14.8% (8)
Note:	
<sup>1</sup> Participants were able to mark multiple options	

Overall, 48.0% (N=106) of residents said they would quit if menthol-flavored products were no longer sold, 27.2% (N=60) indicated they were not sure if they would quit, and 24.9% (N=55) indicated they would not quit. Of those who would continue smoking and answered questions about preferred alternatives (N=54), 40.7% (N=22) indicated they would switch to non-menthol-flavored cigarettes, 20.4% (N=11) indicated switching to another non-menthol-flavored product, 20.4% (N=11) said they would use another menthol-flavored product, 13.0% (N=7) would switch to menthol-flavored flavored e-cigarettes, and 13.0% (N=7) would buy menthol-flavored cigarettes online. An additional 9.3% (N=5) indicated they would do something else and 14.6% (N=8) saying they would not do any of these options. Only one respondent specified the other action they would take as “chew gum” without making clear they would quit using tobacco.

### Regression Results

Regression results indicated that increases in age (OR=0.94, 95% CI=0.91, 0.97) and living in a senior/disabled building (OR=0.50, 95% CI=0.25, 0.97) were associated with decreased odds that the resident would quit cigarettes if menthol-flavored flavored products were no longer available (Table 2). Residents who smoked within 30 minutes of waking (OR=0.48, 95% CI=0.23, 0.84) and daily smokers (OR=0.42, 95% CI=0.21, 0.84) were less likely to say they would quit without menthol-flavored products.

Table 2. Association Between Intentions to Quit if Menthol Were Not Available and Demographics and Tobacco Use		
	Logistic Regression Model	
	OR	95% CI
<b>Demographics</b>		
<b>Gender</b>		
Female	1.33	0.42, 4.18
Male	ref	
<b>Age (Mean years, continuous)</b>	0.94**	0.91, 0.97
<b>Building Type</b>		

Senior or Disabled Family	0.50* ref	0.25, 0.97
<b>Tobacco Use</b>		
<b>Use Another Tobacco Product</b>		
Yes	0.41	0.12, 1.35
No	ref	
<b>Smoke within 30 Minutes of Waking</b>		
Yes	0.48*	0.23, 0.98
No	ref	
<b>Daily Smoker</b>		
Yes	0.42*	0.21, 0.84
No	ref	
<b>How Sure You Could Quit Cigarettes?</b>		
Very Sure/Sure	1.76	0.87, 3.58
Not Sure/Not at all sure	ref	
<b>Made at least 1 quit attempt (3 months)</b>		
Yes	1.17	0.41, 3.32
No	ref	
** p<0.01, * p<0.05		

## DISCUSSION

The primary aim of this study was to examine whether public housing residents would quit if menthol-flavored cigarettes were no longer sold, what factors were associated with intentions to quit if menthol-flavored tobacco products were no longer available, and other alternative products of choice if menthol-flavored cigarettes were no longer sold for those who did not intend to quit. Nearly three-quarters of menthol-flavored cigarette smokers indicated consideration of quitting cigarettes if menthol-flavored products were no longer sold, including those who said “Yes” or “Not sure.” About 1 in 4 said they would continue smoking. Results indicate behavioral intentions for a potential menthol-flavored ban may be similar for vulnerable groups and the general population. In prior evidence assessing responses to a hypothetical menthol ban, findings showed 25–64% of smokers intended to attempt to quit smoking and 11–46% of smokers considered switching to other tobacco products, including 15–30% to e-cigarettes.[16, 21] The current estimate of 48% of these public housing residents indicating they would attempt to quit with a ban in place aligns with the estimates from a range of populations

1  
2  
3 identified in studies in the review. This indicates findings from this vulnerable population with  
4 high rates of menthol-flavored tobacco use is similar to the general population. Additionally,  
5 residents reporting intentions to switch to another tobacco product align with the estimates from  
6 this review. Slightly fewer residents than the general population indicated they may switch to e-  
7 cigarettes. This is potentially due to e-cigarette use being less common in those of higher average  
8 age and lower SES, and primarily of African Americans, which were demographic groups  
9 represented in this sample.[24-26]

10  
11  
12 Results suggest smoking behavior has a high degree of influence on reactions to a  
13 menthol-flavor sales ban in a similar way to previous findings.[19, 20] Smoking within 30  
14 minutes of waking and being a daily smoker significantly reduced the odds of residents'  
15 expressing an intention to quit if menthol-flavored products ceased to be sold. Older residents  
16 had lower odds of reporting intentions to quit, which aligns with evidence that older adults are  
17 less likely to want to quit than younger adults.[2] These findings may be due to older residents  
18 exhibiting more nicotine dependency characteristics and smoking more frequently as they may  
19 have smoked for longer.

20  
21  
22 A menthol-flavored ban may provide additional influence on this population of uniquely  
23 at-risk predominantly African Americans residents, given that they already live in HUD-  
24 mandated smoke-free housing. Evidence from a 40-year simulation of smoking projecting the  
25 influence of a menthol-flavored ban shows that between 323,000 and 633,000 deaths could be  
26 avoided, with the hypothetical ban potentially avoiding an estimated 237,000 deaths in African  
27 Americans.[27] The combination of these two policies (smoke-free housing and menthol-flavor  
28 ban) may exert a robust influence on a significant proportion of residents' smoking cessation  
29 intentions. However, it is important to underscore that 1 in 4 would continue smoking. Many of



1  
2  
3 these residents indicated they would switch to an unflavored product, which may increase their  
4 intent to quit and improve their cessation outcomes.[3, 16] Still, others plan to continue to use  
5 other menthol-flavored products. Prohibiting the sale of all characterizing flavors, as the  
6 proposed FDA nationwide menthol ban would,[1] should be considered to promote cessation  
7 among all resident tobacco users.  
8  
9

10  
11  
12  
13  
14  
15 In the presence of a comprehensive menthol-flavored tobacco product sales ban, policies  
16 and programs will need to address the unique needs of those who report more dependency  
17 symptoms and are older, groups that are consistently less likely to say they will quit.[2] Further,  
18 menthol smokers, and especially African American menthol smokers, are more likely to attempt  
19 to quit, but less likely to sustain cessation.[12] African Americans who use menthol-flavored  
20 products are more likely to report an attempt to quit when asked about their reactions to a  
21 hypothetical sales ban.[16] To reach a population of African American public housing residents  
22 who use menthol-flavored cigarettes, interventions need to be tailored and consistently available  
23 to help them act on their intentions to quit and improve cessation outcomes.[28-31]  
24  
25  
26 Implementing cessation supports along with a menthol-flavored tobacco sales ban would help  
27 this group that is disproportionately impacted by menthol-flavored tobacco products and may be  
28 disproportionately affected by a sales ban.  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41

42  
43 Additionally, the evidence of long-term successful cessation following a menthol-  
44 flavored tobacco sales ban is insufficient. One study examining smokers one year after a  
45 menthol-flavored product ban found no significant difference in sustained cessation between  
46 menthol-flavored and nonmenthol-flavored product users for those who quit after the ban, but  
47 previously daily menthol smokers had a higher odds of sustaining cessation than previously daily  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

1  
2  
3 unflavored smokers if they quit before the ban.[17] Additional research is needed to identify  
4  
5 long-term cessation outcomes for those affected by these sales bans.  
6  
7

8 This study has two limitations. First, these data represent residents from the Washington,  
9  
10 DC housing authority and may not generalize to other public housing authorities and other  
11  
12 countries. A second limitation is the inability to assess the unique effects of menthol-flavored  
13  
14 products on successful quitting because residents were reacting to a hypothetical ban.  
15  
16

17 Despite limitations, these findings add timely evidence describing the impact of a  
18  
19 menthol-flavored-flavor ban on a vulnerable population with high rates of tobacco use in the  
20  
21 United States. Results show how public housing residents may react to a ban, which provides  
22  
23 evidence that a ban could reduce smoking prevalence and help address current tobacco-related  
24  
25 health disparities worldwide. Current results indicate that specialized programs for older and  
26  
27 more dependent low-income African Americans with equivalent thrust may improve outcomes  
28  
29 for those affected by a menthol-flavored product ban.[28, 30] For the new FDA ban and other  
30  
31 international policies to achieve outcomes of reducing avoidable deaths and tobacco-related  
32  
33 health disparities in the United States and in other nations proposing or implementing menthol  
34  
35 flavor bans, it is essential to provide accessible and effective, evidence-based support for  
36  
37 translating quit intentions into successful cessation.  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

1  
2  
3 **Acknowledgements:** The authors would like to thank the participants who gave their time and  
4  
5 knowledge of the subject.  
6

7  
8 **Contributorship Statement:** CTD: conceptualization, data curation, formal analysis,  
9  
10 methodology, software, project administration, writing – original draft, writing – review and  
11  
12 editing; KH: conceptualization, formal analysis, methodology, project administration, resources,  
13  
14 supervision, writing – original draft, writing – review and editing; IC: formal analysis,  
15  
16 investigation, methodology, software; DHB: conceptualization, formal analysis, methodology,  
17  
18 project administration, resources, supervision, writing – original draft, writing – review and  
19  
20 editing  
21  
22

23  
24 **Competing Interests:** The authors have no competing interests to disclose.  
25

26 **Funding:** This work was supported by the National Institutes of Health, National Cancer  
27  
28 Institute (R01 CA226074P to DHB and KH), and pilot funding from the George Washington  
29  
30 Cancer Center (GWCC; PI Bernat).  
31  
32

33 **Data Sharing:** The data underlying this article will be shared on reasonable request to the  
34  
35 corresponding author.  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

## References:

1. U.S. Food and Drug Administration. FDA Commits to Evidence-Based Actions Aimed at Saving Lives and Preventing Future Generations of Smokers. In; 2021.
2. US Department of Health and Human Services. Smoking cessation: a report of the Surgeon General. In: Services UDoHaH, (ed). Atlanta; 2020.
3. U.S. Food and Drug Administration. Preliminary scientific evaluation of the possible public health effects of menthol versus nonmenthol cigarettes. In; 2013.
4. Delnevo CD, Giovenco DP, Villanti AC. Assessment of menthol and nonmenthol cigarette consumption in the US, 2000 to 2018. *JAMA Network Open* 2020;3(8):e2013601-e2013601.
5. Helms VE, King BA, Ashley PJ. Cigarette smoking and adverse health outcomes among adults receiving federal housing assistance. *Preventive medicine* 2017;99:171-177.
6. Cornelius ME, Wang TW, Jamal A, *et al.* Tobacco Product Use Among Adults—United States, 2019. *Morbidity and Mortality Weekly Report* 2020;69(46):1736.
7. National Low Income Housing Coalition. Who lives in federally assisted housing? *Housing Spotlight* 2012;2(2):1-4.
8. Mattingly DT, Hirschtick JL, Meza R, *et al.* Trends in prevalence and sociodemographic and geographic patterns of current menthol cigarette use among US adults, 2005–2015. *Preventive medicine reports* 2020;20:101227.
9. Villanti AC, Mowery PD, Delnevo CD, *et al.* Changes in the prevalence and correlates of menthol cigarette use in the USA, 2004–2014. *Tobacco control* 2016;25(Suppl 2):ii14-ii20.
10. European Network for Smoking and Tobacco Prevention. Ban on menthol cigarettes: European Union member states shall prohibit the placing on the market of tobacco products with a characterising flavour. *Tobacco Prevention & Cessation* 2020;6.
11. World Health Organization. Banning menthol in tobacco products. In. Geneva; 2016.
12. Levy DT, Blackman K, Tauras J, *et al.* Quit attempts and quit rates among menthol and nonmenthol smokers in the United States. *American journal of public health* 2011;101(7):1241-1247.
13. Delnevo CD, Gundersen DA, Hrywna M, *et al.* Smoking-cessation prevalence among US smokers of menthol versus non-menthol cigarettes. *American journal of preventive medicine* 2011;41(4):357-365.
14. Gundersen DA, Delnevo CD, Wackowski O. Exploring the relationship between race/ethnicity, menthol smoking, and cessation, in a nationally representative sample of adults. *Preventive Medicine* 2009;49(6):553-557.
15. Trinidad DR, Pérez-Stable EJ, Messer K, *et al.* Menthol cigarettes and smoking cessation among racial/ethnic groups in the United States. *Addiction* 2010;105:84-94.
16. Cadham CJ, Sanchez-Romero LM, Fleischer NL, *et al.* The actual and anticipated effects of a menthol cigarette ban: a scoping review. *BMC Public Health* 2020;20(1):1-17.
17. Chung-Hall J, Fong GT, Meng G, *et al.* Evaluating the impact of menthol cigarette bans on cessation and smoking behaviours in Canada: longitudinal findings from the Canadian arm of the 2016–2018 ITC Four Country Smoking and Vaping Surveys. *Tobacco Control* 2021.
18. Chaiton MO, Nicolau I, Schwartz R, *et al.* Ban on menthol-flavoured tobacco products predicts cigarette cessation at 1 year: a population cohort study. *Tobacco control* 2020;29(3):341-347.

19. D'Silva J, Amato MS, Boyle RG. Quitting and switching: menthol smokers' responses to a menthol ban. *Tobacco Regulatory Science* 2015;1(1):54-60.
20. O'Connor RJ, Bansal-Travers M, Carter LP, *et al.* What would menthol smokers do if menthol in cigarettes were banned? Behavioral intentions and simulated demand. *Addiction* 2012;107(7):1330-1338.
21. Zatoński M, Herbec A, Zatoński W, *et al.* Characterising smokers of menthol and flavoured cigarettes, their attitudes towards tobacco regulation, and the anticipated impact of the Tobacco Products Directive on their smoking and quitting behaviours: The EUREST-PLUS ITC Europe Surveys. *Tobacco induced diseases* 2018;16.
22. Heatherton TF, Kozlowski LT, Frecker RC, *et al.* The Fagerström test for nicotine dependence: a revision of the Fagerstrom Tolerance Questionnaire. *British journal of addiction* 1991;86(9):1119-1127.
23. Kozlowski LT, Director J, Harford MA. Tobacco dependence, restraint and time to the first cigarette of the day. *Addictive Behaviors* 1981;6(4):307-312.
24. Bao W, Liu B, Du Y, *et al.* Electronic cigarette use among young, middle-aged, and older adults in the United States in 2017 and 2018. *JAMA internal medicine* 2020;180(2):313-314.
25. Webb Hooper M, Kolar SK. Racial/ethnic differences in electronic cigarette use and reasons for use among current and former smokers: findings from a community-based sample. *International journal of environmental research and public health* 2016;13(10):1009.
26. Harlow AF, Stokes A, Brooks DR. Socioeconomic and racial/ethnic differences in e-cigarette uptake among cigarette smokers: longitudinal analysis of the population assessment of tobacco and health (PATH) study. *Nicotine and Tobacco Research* 2019;21(10):1385-1393.
27. Levy DT, Pearson JL, Villanti AC, *et al.* Modeling the future effects of a menthol ban on smoking prevalence and smoking-attributable deaths in the United States. *American journal of public health* 2011;101(7):1236-1240.
28. Kock L, Brown J, Hiscock R, *et al.* Individual-level behavioural smoking cessation interventions tailored for disadvantaged socioeconomic position: a systematic review and meta-regression. *The Lancet Public Health* 2019;4(12):e628-e644.
29. Webb Hooper M, Antoni MH, Okuyemi K, *et al.* Randomized controlled trial of group-based culturally specific cognitive behavioral therapy among African American smokers. *Nicotine & Tobacco Research* 2017;19(3):333-341.
30. Andrews JO, Felton G, Ellen Wewers M, *et al.* The effect of a multi-component smoking cessation intervention in African American women residing in public housing. *Research in nursing & health* 2007;30(1):45-60.
31. Liu JJ, Wabnitz C, Davidson E, *et al.* Smoking cessation interventions for ethnic minority groups—A systematic review of adapted interventions. *Preventive medicine* 2013;57(6):765-775.

# BMJ Open

## BEHAVIORAL INTENTIONS IN RESPONSE TO A POTENTIAL MENTHOL CIGARETTE SALES BAN: EXAMINING SMOKERS IN PUBLIC HOUSING

Journal:	<i>BMJ Open</i>
Manuscript ID	bmjopen-2021-059821.R1
Article Type:	Original research
Date Submitted by the Author:	02-May-2022
Complete List of Authors:	Dearfield, Craig; The George Washington University Milken Institute of Public Health, Epidemiology Horn, Kimberly; Fralin Biomedical Research Institute at VTC Crandell, Ian; Virginia Tech-Center for Biostatistics and Health Data Sciences Bernat, D; The George Washington University Milken Institute of Public Health, Epidemiology
<b>Primary Subject Heading</b>:	Smoking and tobacco
Secondary Subject Heading:	Epidemiology, Public health
Keywords:	EPIDEMIOLOGY, Health policy < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, PUBLIC HEALTH

SCHOLARONE™  
Manuscripts



I, the Submitting Author has the right to grant and does grant on behalf of all authors of the Work (as defined in the below author licence), an exclusive licence and/or a non-exclusive licence for contributions from authors who are: i) UK Crown employees; ii) where BMJ has agreed a CC-BY licence shall apply, and/or iii) in accordance with the terms applicable for US Federal Government officers or employees acting as part of their official duties; on a worldwide, perpetual, irrevocable, royalty-free basis to BMJ Publishing Group Ltd ("BMJ") its licensees and where the relevant Journal is co-owned by BMJ to the co-owners of the Journal, to publish the Work in this journal and any other BMJ products and to exploit all rights, as set out in our [licence](#).

The Submitting Author accepts and understands that any supply made under these terms is made by BMJ to the Submitting Author unless you are acting as an employee on behalf of your employer or a postgraduate student of an affiliated institution which is paying any applicable article publishing charge ("APC") for Open Access articles. Where the Submitting Author wishes to make the Work available on an Open Access basis (and intends to pay the relevant APC), the terms of reuse of such Open Access shall be governed by a Creative Commons licence – details of these licences and which [Creative Commons](#) licence will apply to this Work are set out in our licence referred to above.

Other than as permitted in any relevant BMJ Author's Self Archiving Policies, I confirm this Work has not been accepted for publication elsewhere, is not being considered for publication elsewhere and does not duplicate material already published. I confirm all authors consent to publication of this Work and authorise the granting of this licence.

1  
2  
3 **BEHAVIORAL INTENTIONS IN RESPONSE TO A POTENTIAL MENTHOL**  
4 **CIGARETTE SALES BAN: EXAMINING SMOKERS IN PUBLIC HOUSING**  
5  
6  
7  
8  
9

10 Craig T. Dearfield, Ph.D.,<sup>1</sup> Kimberly Horn, Ed.D.,<sup>2</sup> Ian Crandell, Ph.D.,<sup>3</sup> and Debra H. Bernat,  
11 Ph.D.<sup>1</sup>  
12  
13

- 14  
15 1. The George Washington University Milken Institute School of Public Health,  
16 Department of Epidemiology, 950 New Hampshire Ave, NW, Fifth floor, Washington,  
17 DC 20052, USA  
18  
19 2. Virginia Tech-Carilion Fralin Biomedical Research Institute, Blacksburg, VA, USA  
20  
21 3. Virginia Tech-Center for Biostatistics and Health Data Sciences, Roanoke, VA, USA  
22  
23  
24  
25  
26  
27

28 **Address Correspondence To:** Craig T. Dearfield, Ph.D.

29  
30 Department of Epidemiology

31  
32 The Milken Institute School of Public Health, The George Washington University

33  
34 950 New Hampshire Ave., 5<sup>th</sup> Floor, Washington DC, 20052, USA

35  
36 Phone: 202-994-0436

37  
38 Email: cdearfield@gwu.edu  
39  
40  
41  
42  
43  
44

45 **Word count:** 3,030  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60



## ABSTRACT

**Objectives:** Local, national, and international policies are being proposed to ban the sale of menthol-flavored tobacco products. With more bans being implemented, it is increasingly important to understand reactions to these bans across different socioeconomic statuses. This study examined public housing residents' behavioral intentions if menthol-flavored cigarettes were no longer sold.

**Setting:** 15 District of Columbia Housing Authority properties between March 2019 and March 2021.

**Participants:** 221 District of Columbia Housing Authority residents ages 18-80 who reported smoking menthol cigarettes (83.3% African American/Black).

**Primary and Secondary Outcomes:** Cigarette quitting and switching intentions due to a hypothetical menthol-flavored cigarette sales ban.

**Results:** Nearly one-half (48.0%) of residents said they intended to quit cigarette use if menthol-flavored products were no longer sold, while 27.2% were unsure if they would quit, and 24.9% reported they would not quit. Older residents (OR=0.94 per year, 95% CI=0.91, 0.97), senior/disabled building versus family building residents (OR=0.50, 95% CI=0.25, 0.97), those who smoked within 30 minutes of waking (OR=0.48, 95% CI=0.23, 0.98), and daily smokers (OR=0.42, 95% CI=0.21, 0.84) had lower odds of reporting quit intentions associated with a menthol ban. Of those not intending to quit, 40.7% reported they would switch to non-menthol cigarettes, 20% to another non-menthol product, 13% to menthol e-cigarettes (13.0%), and 20% to another menthol product.

**Conclusions:** Results suggest banning the sale of menthol-flavored products has the potential to impact cigarette smoking cessation. Nearly three-quarters of smokers in public housing indicated

1  
2  
3 a possibility of quitting smoking because of a menthol cigarette ban. Bans that include all flavors  
4  
5 in all tobacco products may be most effective for facilitating overall tobacco cessation.  
6  
7  
8  
9

### 10 **Article Summary**

- 11 • A menthol flavor cigarette sales ban may provide an additional unique influence towards  
12 cessation for smokers who use those products, especially African American menthol-  
13 flavored cigarette users in public housing.  
14  
15  
16  
17  
18

### 19 **Strengths and Limitations:**

- 20 • The study fills an important literature gap by providing a current examination of the  
21 potential consequences of a menthol-flavored cigarette ban in a population with high  
22 rates of menthol-flavored tobacco use.  
23  
24  
25  
26  
27
- 28 • Study data represent residents from one public housing authority and may not generalize  
29 to other US public housing authorities and other countries.  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

## INTRODUCTION

Menthol flavor in cigarettes contributes to ongoing tobacco-related health disparities.[1-3] Menthol flavoring contributes to smoking initiation among youth, increasing the harm of smoke particulates, increasing nicotine dependency symptoms, and making it harder to quit smoking.[2, 4, 5] Menthol is the last allowable flavor in cigarettes in the United States.[1] It is notable that menthol-flavored cigarette consumption based on market share data remained stable across the country between 2000 and 2018 when overall cigarette consumption declined.[6]

To improve quit rates and address tobacco-related health disparities, policies are being proposed to ban the sale of menthol-flavored tobacco products. Following bans in other countries,[7] on April 29, 2021, the U.S. Food and Drug Administration (FDA) declared their intent to pursue tobacco product standards to ban menthol-flavored cigarettes.[1] With bans going into effect across the world, it is increasingly important to understand how people respond to these bans, particularly those of lower socioeconomic status.

Evidence from the United States examining the effect of menthol sales bans on smokers indicates they promote cessation where implemented.[8] Evidence related to behavioral intentions in response to a hypothetical menthol-flavored product ban indicates some smokers intend to quit once it goes into effect. In a recent review of studies examining behavioral intentions if menthol-flavored products were no longer sold, between 24% and 64% of smokers indicate they would attempt to quit, with most studies of smokers in the US estimating between 40 and 50% of adults smokers intend to quit.[8] One study found that a higher proportion of African American menthol smokers report they would quit as a result of a hypothetical ban compared to white menthol smokers (76.0% versus 30.3%).[9] Additionally, those who smoke

1  
2  
3 less frequently, report greater current quit intentions, and report making a quit attempt in the  
4  
5 prior year are more likely to say they would quit if a menthol ban went into effect.[9, 10]  
6  
7

8 A ban on menthol-flavored cigarettes may have a particular bearing on individuals living  
9  
10 in the Department of Housing and Urban Development (HUD) housing. Public housing residents  
11  
12 have been found to have higher smoking rates compared with the general population. The most  
13  
14 recent examination of a nationally representative sample of public housing residents in 2017  
15  
16 showed that 33.6% of residents used tobacco[11] compared with 14% of the general population  
17  
18 at that time.[12] More recent studies of public housing residents in 2019 as part of smoke-free  
19  
20 rule evaluations estimate between 9.5% and 29.0% of residents smoke[13-15] compared with an  
21  
22 estimated 20.8% of adults using any tobacco product and 16.7% of adults using cigarettes in  
23  
24 2019.[16] The 2017 study of public housing residents also showed that over 80% of residents  
25  
26 who smoke are reported to be daily smokers and approximately two-thirds smoke more than 10  
27  
28 cigarettes per day.[11]  
29  
30  
31  
32

33 Public housing residents represent groups most likely to use menthol-flavored tobacco  
34  
35 products in the US, notably individuals of lower socioeconomic status (SES) and a high  
36  
37 proportion of African Americans.[1, 17, 18] The prevalence of menthol-flavored cigarette use  
38  
39 among those in families earning less than \$35,000 (7.0%) is double those in families earning  
40  
41 more than \$75,000 a year (2.3%),[19] and approximately 85% of all African American smokers  
42  
43 use menthol-flavored cigarettes, compared with approximately 30% of White smokers.[20]  
44  
45 Further, African Americans are especially targeted by the tobacco industry to use menthol-  
46  
47 flavored products. [2, 21] A study of one public housing authority found 93.1% of residents who  
48  
49 smoke use menthol-flavored cigarettes.[22] Although this is not nationally representative of all  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

public housing residents, results suggest that residents are susceptible to using menthol-flavored cigarettes.

Evidence suggests that banning the sale of menthol-flavored products may increase intentions to quit and improve cessation outcomes among users in the general population; however, behavioral intentions of public housing residents in response to a potential menthol-flavored product ban are under studied. The present study examined public housing residents' (1) intention to quit if menthol-flavored cigarettes were no longer sold, and (2) expected alternative tobacco products of choice among if they did not intend to quit. The study fills an important literature gap by providing a current examination of the potential consequences of a menthol-flavored product ban in a population with high rates of menthol-flavored tobacco use.

## METHODS

### Study Sample

Data were collected from residents of the Washington, DC Housing Authority (DCHA) between March 2019 and March 2021. Inclusion criteria required participants to be a DCHA property resident (not using Section 8 vouchers) between the ages of 18 and 80. Residents represented 15 DCHA properties, 8 family and 7 senior/disabled buildings. In the overall study, 754 residents completed surveys. Non-smokers were not included in this analysis (n=296) and 237 smokers were not included because they responded to an earlier version of the survey that did not contain questions about a hypothetical menthol ban (n=152), did not usually use menthol cigarettes (n=16), or had missing data for one or more of the menthol cigarette use questions (n=68). One respondent who identified as “non-binary” was omitted from the analysis because confidentiality could not be maintained. Thus, the present sample included 221 residents who

1  
2  
3 reported past 30-day use of menthol-flavored cigarettes and were not missing data for questions  
4 asking about behavioral intentions if menthol-flavored products were no longer sold.  
5  
6

## 7 8 **Procedures**

9  
10 Data collection took place in community spaces on DCHA property. Study staff and  
11 DCHA administrators held survey participation events. DCHA and building staff advertised and  
12 told residents about the events. Flyers for the study were placed in common areas in buildings  
13 notifying residents where and when data collection events would be held, and resident council  
14 presidents and DCHA staff told residents about data collection events during community  
15 meetings. During data collection events, residents frequently found out about the event from  
16 other residents (word-of-mouth).[22, 23] Interested residents completed a screening assessment  
17 to establish residence and age eligibility and past 30-day smoking status. Eligible participants  
18 completed a consent form, which research staff read aloud. Participants completed surveys using  
19 audio computer-assisted self-interviewing software (QDS), where all questions and answer  
20 options were spoken to participants. Participants had the option to skip any question and end the  
21 survey at any point. Patients and the public were not involved in the research design, conduct,  
22 reporting, or dissemination. Residents received a \$25 gift card for their survey participation.  
23  
24 Study procedures were approved by The George Washington University Institutional Review  
25 Board.  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43

## 44 **Measures**

45  
46 *Demographics.* Respondents indicated their gender (male/female), age (in years, open  
47 numerical response), and race/ethnicity. Residents reported if they were Hispanic (yes/no), and  
48 selected as many racial categories as were applicable from the following: American Indian or  
49 Alaskan Native, Asian, Black or African American, Native Hawaiian or Other Pacific Islander,  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

1  
2  
3 White, and Other. The study applied DCHA classifications for building type (e.g., family or  
4 senior/disabled).  
5  
6

7  
8 *Cigarette and other tobacco use.* Residents reported past 30-day use of cigarettes, cigars,  
9 little cigars and cigarillos, smokeless tobacco, hookah, and e-cigarettes using questions derived  
10 from the National Adult Tobacco Survey (NATS).[24] Cigarette smokers indicated whether they  
11 usually used a menthol-flavored product (yes/no), days used in the past 30 days (0-30),  
12 and the number of self-identified quit attempts in the past 3 months (open numerical response).  
13  
14  
15  
16  
17  
18  
19 Daily smoking was defined as cigarette smoking all days in the past 30 days.  
20

21  
22 *Nicotine Dependency.* The primary measure of nicotine dependency was smoking within  
23 30 minutes of waking.[25, 26] Residents indicated if they typically first smoked within 5  
24 minutes, between 5 to 30 minutes, between 31 to 60 minutes, or after 60 minutes of waking. This  
25 variable was dichotomized for analysis purposes (smoke within 30 minutes of waking and smoke  
26 31+ minutes after waking).[25, 26]  
27  
28  
29  
30  
31  
32

33  
34 *Quitting and Switching Behavioral Intentions.* Respondents reported whether they were  
35 currently thinking of quitting smoking cigarettes for good (yes/no) from the NATS.[24] Those  
36 who said they were thinking of quitting indicated how sure they were that they could quit if they  
37 tried using a 4-point scale (very sure to not at all sure). Analysis used a dichotomized version of  
38 this variable (very sure/sure and not sure/not at all sure). Participants indicated if they would  
39 consider quitting if menthol-flavored cigarettes were no longer sold in stores (yes/no/not sure). A  
40 dichotomous variable was created for analysis purposes (yes and no/not sure). Residents who  
41 indicated they would not quit reported what they would do if menthol-flavored products were no  
42 longer sold. Response options included switching to non-menthol-flavored cigarettes, switching  
43 to some other non-menthol-flavored tobacco product, switching to menthol-flavored e-cigarettes,  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

switching to some other menthol-flavored tobacco product, buying menthol-flavored cigarettes online, something else, or none of these. Participants could select multiple options.

## Analysis

Descriptive statistics assessed intention to quit if menthol-flavored products were no longer sold and the alternative products of choice among those who said they would not quit. Logistic regression modeling, clustered by data collection site, assessed characteristics associated with quit intentions if menthol-flavored products were no longer sold. Logistic regression models used complete case analysis. Regression models clustered by data collection site accounted for intragroup correlations that could arise from similarities in residents at each housing site. The model included age, gender, senior/disabled or family building residence status, using a tobacco product besides cigarettes, smoking within 30 minutes of waking, daily smoking status, whether they were sure they could quit, and having made a quit attempt in the past 3 months to predict whether residents would quit if menthol-flavored products were no longer sold. Because most residents (83.3%, N=90/108 [113 missing]) identified as Black or African American, race and ethnicity was not included in further analysis. Results from a test for multicollinearity between age and senior/disabled building resident status indicated these two variables were significantly correlated ( $r=0.22$ ,  $p<0.01$ ), but not highly correlated. Both variables were included in the model due to the low risk for multicollinearity.[27] The regression model included 177 cases with full data for all selected variables. Analyses were conducted using SAS software, version 9.4 (SAS Institute Inc., Cary, NC).

## RESULTS

### Descriptive Statistics



The sample included slightly more females and residents of Senior and Disabled buildings (Table 1). The mean age of participating residents was 57. Most residents reported thinking about quitting (regardless of the ban; 83.2%, N=184) and a high proportion thought they could quit if they tried (very sure and sure; 45.3%, N=100). Additionally, about half of the residents made at least one recent quit attempt during the last 3 months (49.3%, N=109). Close to one-half of residents were daily smokers (47.7%, N=105) and nearly two-thirds reported smoking within 30 minutes of waking (62.9%, N=150). Under 20% of respondents said they used another tobacco product (17.2%, N=38).

<b>Table 1. Demographics, Tobacco Use Characteristics</b>	
	<b>% (N) or mean (SD)</b>
<i>Demographics</i>	
<b>Gender</b>	
Female	60.6% (134)
Male	39.4% (87)
<b>Age (Mean years, continuous)</b>	57.2 (11.0)
<b>Building Type</b>	
Family	40.7% (90)
Senior or Disabled	59.3% (131)
<i>Tobacco Use Characteristics</i>	
<b>Use Another Tobacco Product</b>	
Yes	17.2% (38)
No	82.8% (183)
<b>Smoke within 30 Minutes of Waking</b>	
Yes	62.9% (139)
No	36.2% (80)
Missing	0.9% (2)
<b>Daily smoker</b>	
Yes	47.5% (105)
No	52.0% (115)
Missing	0.5% (1)
<b>Thinking About Quitting</b>	
Yes	83.2% (184)
No	16.3% (36)
Missing	0.5% (1)
<b>How Sure You Could Quit Cigarettes?</b>	
Very sure	19.5% (43)
Sure	25.8% (57)
Not sure	29.9% (66)
Not at all sure	7.7% (17)
Missing	17.2% (38)
<b>How much support have you received to quit tobacco</b>	
A lot of support	11.8% (26)
Some support	15.4% (34)

A little support	14.9% (33)
No support	38.5% (85)
Missing	19.5% (43)
<b>Made at least 1 quit attempt</b>	
Yes	49.3% (109)
No	32.6% (72)
Missing	18.1% (40)
<b>Would quit if menthol-flavored cigarettes were no longer sold</b>	
Yes	48.0% (106)
Not sure	27.2% (60)
No	24.9% (55)
<b>Changes if Menthol-flavored Products are Banned<sup>1</sup> (n=54)</b>	
Switch to non-menthol-flavored cigarettes	40.7% (22)
Switch to some other non-menthol-flavored product	20.4% (11)
Switch to menthol-flavored e-cigarette	13.0% (7)
Switch to other menthol-flavored product	20.4% (11)
Buy menthol-flavored cigarettes online	13.0% (7)
Something else	9.3% (5)
None of these	14.8% (8)
Note: <sup>1</sup> Participants were able to mark multiple options	

Overall, given a menthol ban, 48.0% (N=106) of residents said they would quit, 27.2% (N=60) indicated they were not sure if they would quit, and 24.9% (N=55) indicated they would not quit. Of those who would continue smoking and answered questions about preferred alternatives (N=54), 40.7% (N=22) indicated they would switch to non-menthol-flavored cigarettes, 20.4% (N=11) indicated switching to another non-menthol-flavored product, 20.4% (N=11) said they would use another menthol-flavored product, 13.0% (N=7) would switch to menthol-flavored flavored e-cigarettes, and 13.0% (N=7) would buy menthol-flavored cigarettes online. An additional 9.3% (N=5) indicated they would do something else and 14.6% (N=8) saying they would not do any of these options. Only one respondent specified the other action they would take as “chew gum” without making clear they would quit using tobacco.

## Regression Results

Regression results indicated that increases in age (OR=0.94, 95% CI=0.91, 0.97) and living in a senior/disabled building (OR=0.50, 95% CI=0.25, 0.97) were associated with decreased odds that residents would quit cigarettes if menthol-flavored flavored products were

no longer available (Table 2). Residents who smoked within 30 minutes of waking (OR=0.48, 95% CI=0.23, 0.84) and daily smokers (OR=0.42, 95% CI=0.21, 0.84) were less likely to say they would quit without menthol-flavored products.

<b>Table 2. Association Between Intentions to Quit if Menthol Were Not Available and Demographics and Tobacco Use</b>		
	<b>Logistic Regression Model</b>	
	<b>OR</b>	<b>95% CI</b>
<b>Demographics</b>		
<b>Gender</b>		
Female	1.33	0.42, 4.18
Male	ref	
<b>Age (per year, continuous)</b>	0.94**	0.91, 0.97
<b>Building Type</b>		
Senior or Disabled	0.50*	0.25, 0.97
Family	ref	
<b>Tobacco Use</b>		
<b>Use Another Tobacco Product</b>		
Yes	0.41	0.12, 1.35
No	ref	
<b>Smoke within 30 Minutes of Waking</b>		
Yes	0.48*	0.23, 0.98
No	ref	
<b>Daily Smoker</b>		
Yes	0.42*	0.21, 0.84
No	ref	
<b>How Sure You Could Quit Cigarettes?</b>		
Very Sure/Sure	1.76	0.87, 3.58
Not Sure/Not at all sure	ref	
<b>Made at least 1 quit attempt (3 months)</b>		
Yes	1.17	0.41, 3.32
No	ref	

\*\* p<0.01, \* p<0.05

## DISCUSSION

The primary study aim examined whether public housing residents had intentions to quit if menthol-flavored cigarettes were no longer sold, and what factors were associated with intentions to quit or other alternative products of choice among those who did not intend to quit if menthol-flavored cigarettes were no longer sold. Nearly three-quarters of menthol-flavored cigarette smokers indicated consideration of quitting cigarettes if menthol-flavored products were no longer sold. About 1 in 4 said they would continue smoking. Similar to the present

1  
2  
3 study, prior evidence in the general population assessing responses to a hypothetical menthol  
4 ban, showed 25–64% of smokers intended to attempt to quit smoking and 11–46% of smokers  
5 considered switching to other tobacco products, including 15–30% to e-cigarettes. However, the  
6 intention to quit for African Americans were higher than these ranges. In one U.S. study where  
7 79.4% of African Americans used menthol-flavored cigarettes, 76.0% of smokers expressed an  
8 intention to quit smoking when asked about a hypothetical ban, compared with 30.3% of  
9 whites.[9] Another U.S. study found 44.5% of African Americans who used menthol-flavored  
10 cigarettes said they would quit in the event of a ban on menthol-flavored cigarettes and 23.6%  
11 would switch to a non-menthol brand and try to quit.[28] African American young adults were  
12 also twice as likely to say they would quit than whites in response to hypothetical menthol sales  
13 restrictions.[29] Past studies also show that African American young adults indicated 79.3%  
14 intended to quit in the event of a menthol-flavored product ban.[30] The present study showed  
15 that residents with high rates of menthol-flavored tobacco use is similar to the general population  
16 and other African American populations. Additionally, residents reporting intentions to switch to  
17 another tobacco product aligned with the previously reported estimates.[8] Slightly fewer  
18 residents than the general population indicated they may switch to e-cigarettes. This is  
19 potentially due to e-cigarette use being less common in those of higher average age and lower  
20 SES, and African Americans, the demographic group predominantly represented in this sample.

21  
22 Consistent with previous findings, results suggested smoking behavior has a high degree  
23 of influence on reactions to a menthol-flavor sales ban.[9, 10] Smoking within 30 minutes of  
24 waking and being a daily smoker significantly reduced the odds of residents' expressing an  
25 intention to quit if menthol-flavored products ceased to be sold. Older residents had lower odds  
26 of reporting intentions to quit, aligned with prior evidence that older adults are less likely to want

1  
2  
3 to quit than younger adults.[2] Findings may be due to older residents exhibiting more nicotine  
4 dependency characteristics and smoking more frequently as they may have smoked for longer.  
5  
6

7  
8 A menthol-flavored ban may provide additional influence on this population of uniquely  
9 at-risk predominantly African Americans residents, given that they already live in HUD-  
10 mandated smoke-free housing. Evidence from a 40-year simulation of smoking projecting the  
11 influence of a menthol-flavored ban showed that between 323,000 and 633,000 deaths could be  
12 avoided, with the hypothetical ban potentially avoiding an estimated 237,000 deaths in African  
13 Americans. The combination of these two policies (smoke-free housing and menthol-flavor ban)  
14 may exert a robust influence on a significant proportion of residents' smoking cessation  
15 intentions. However, it is important to underscore that 1 in 4 would continue smoking. Many of  
16 these residents indicated they would switch to an unflavored product, which may increase their  
17 intent to quit and improve their cessation outcomes.[3, 8] Still, others planned to continue to use  
18 other menthol-flavored products. Prohibiting the sale of all characterizing flavors, as the  
19 proposed FDA nationwide menthol ban would,[1] and should be considered to promote cessation  
20 among all resident tobacco users.  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36

37  
38 In the presence of a comprehensive menthol-flavored tobacco product sales ban, policies  
39 and programs should address the unique needs of individuals who report more dependency  
40 symptoms and are older, and groups that are consistently less likely to say they will quit.[2]  
41  
42 Further, menthol smokers, and especially African American menthol smokers, are more likely to  
43 attempt to quit, but less likely to sustain cessation. African Americans who use menthol-flavored  
44 products are more likely to report an attempt to quit when asked about their reactions to a  
45 hypothetical sales ban. To reach a population of African American public housing residents who  
46 use menthol-flavored cigarettes, interventions need to be tailored and consistently available to  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

1  
2  
3 help them act on their intentions to quit and improve cessation outcomes. Implementing  
4  
5 cessation supports along with a menthol-flavored tobacco sales ban would help this group that is  
6  
7 disproportionately impacted by menthol-flavored tobacco products and may be disproportionately  
8  
9 affected by a sales ban.  
10

11  
12 Additionally, the evidence of long-term successful cessation following a menthol-  
13  
14 flavored tobacco sales ban is insufficient. One study examining smokers one year after a  
15  
16 menthol-flavored product ban found no significant difference in sustained cessation between  
17  
18 menthol-flavored and nonmenthol-flavored product users for those who quit after the ban, but  
19  
20 previously daily menthol smokers had a higher odds of sustaining cessation than previously daily  
21  
22 unflavored smokers if they quit before the ban. Additional research is needed to identify long-  
23  
24 term cessation outcomes for those affected by these sales bans.  
25  
26

27  
28 This study has three limitations that warrant mention. First, these data represent residents  
29  
30 from the Washington, DC housing authority and may not generalize to other public housing  
31  
32 authorities and other countries. This is especially important because U.S. public housing consists  
33  
34 of a racially diverse population, and the current study consisted of primarily African American  
35  
36 residents. A second limitation is the inability to assess the unique effects of menthol-flavored  
37  
38 cigarettes on successful quitting because residents were reacting to a hypothetical ban. Third,  
39  
40 conducting complete case analysis for our regression models meant the analysis omitted 44 cases  
41  
42 due to missing data on one or more predictor variables. Because of this, we cannot know how  
43  
44 these residents would have affected the regression results and they may have attributes that made  
45  
46 them skip the question that will be unmeasured.  
47  
48  
49

50  
51 Despite these limitations, study findings add timely evidence describing the impact of a  
52  
53 menthol-flavored-flavor ban on a population with high rates of tobacco use in the United States.  
54  
55  
56  
57

1  
2  
3 Results showed how public housing residents may react to a ban in ways that could reduce  
4 smoking prevalence and address current tobacco-related health disparities. Findings also  
5 indicated that specialized programs for older and more dependent low-income African  
6 Americans may improve outcomes, including intention and action toward cessation. For the new  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

FDA ban and other tobacco control policies to achieve outcomes of reducing avoidable US deaths and tobacco-related health disparities, it is essential to provide accessible and effective, evidence-based support for translating quit intentions into successful cessation.

1  
2  
3 **Acknowledgements:** The authors would like to thank the participants who gave their time and  
4 knowledge of the subject.  
5  
6

7 **Contributorship Statement:** CTD: conceptualization, data curation, formal analysis,  
8 methodology, software, project administration, writing – original draft, writing – review and  
9 editing; KH: conceptualization, formal analysis, methodology, project administration, resources,  
10 supervision, writing – original draft, writing – review and editing; IC: formal analysis,  
11 investigation, methodology, software; DHB: conceptualization, formal analysis, methodology,  
12 project administration, resources, supervision, writing – original draft, writing – review and  
13 editing  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23

24 **Competing Interests:** The authors have no competing interests to disclose.  
25

26 **Funding:** This work was supported by the National Institutes of Health, National Cancer  
27 Institute (R01 CA226074P to DHB and KH), and pilot funding from the George Washington  
28 Cancer Center (GWCC; PI Bernat).  
29  
30  
31  
32

33 **Data Sharing:** The data underlying this article will be shared on reasonable request to the  
34 corresponding author.  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60



## References:

1. U.S. Food and Drug Administration. FDA Commits to Evidence-Based Actions Aimed at Saving Lives and Preventing Future Generations of Smokers. In; 2021.
2. US Department of Health and Human Services. Smoking cessation: a report of the Surgeon General. In: Services UDoHaH, (ed). Atlanta; 2020.
3. U.S. Food and Drug Administration. Preliminary scientific evaluation of the possible public health effects of menthol versus nonmenthol cigarettes. In; 2013.
4. D'Silva J, Cohn AM, Johnson AL, *et al.* Differences in subjective experiences to first use of menthol and Nonmenthol cigarettes in a national sample of young adult cigarette smokers. *Nicotine and Tobacco Research* 2018;20(9):1062-1068.
5. Villanti AC, Collins LK, Niaura RS, *et al.* Menthol cigarettes and the public health standard: a systematic review. *BMC Public Health* 2017;17(1):1-13.
6. Delnevo CD, Giovenco DP, Villanti AC. Assessment of menthol and nonmenthol cigarette consumption in the US, 2000 to 2018. *JAMA Network Open* 2020;3(8):e2013601-e2013601.
7. World Health Organization. Banning menthol in tobacco products. In. Geneva; 2016.
8. Cadham CJ, Sanchez-Romero LM, Fleischer NL, *et al.* The actual and anticipated effects of a menthol cigarette ban: a scoping review. *BMC Public Health* 2020;20(1):1-17.
9. D'Silva J, Amato MS, Boyle RG. Quitting and switching: menthol smokers' responses to a menthol ban. *Tobacco Regulatory Science* 2015;1(1):54-60.
10. O'Connor RJ, Bansal-Travers M, Carter LP, *et al.* What would menthol smokers do if menthol in cigarettes were banned? Behavioral intentions and simulated demand. *Addiction* 2012;107(7):1330-1338.
11. Helms VE, King BA, Ashley PJ. Cigarette smoking and adverse health outcomes among adults receiving federal housing assistance. *Preventive medicine* 2017;99:171-177.
12. Wang TW, Asman K, Gentzke AS, *et al.* Tobacco product use among adults—United States, 2017. *Morbidity and Mortality Weekly Report* 2018;67(44):1225.
13. Lathen LS, Plears ML, Shartle EL, *et al.* The HUD smoke-free rule: Perceptions of residents post-implementation. *Preventive medicine reports* 2020;19:101159.
14. Curry LE, Feld AL, Rogers T, *et al.* Changes in Reported Secondhand Smoke Incursions and Smoking Behavior after Implementation of a Federal Smoke-Free Rule in New York State Federally Subsidized Public Housing. *International Journal of Environmental Research and Public Health* 2022;19(6):3513.
15. Thorpe LE, Anastasiou E, Wyka K, *et al.* Evaluation of secondhand smoke exposure in New York City public housing after implementation of the 2018 federal smoke-free housing policy. *JAMA network open* 2020;3(11):e2024385-e2024385.
16. Cornelius ME, Wang TW, Jamal A, *et al.* Tobacco Product Use Among Adults—United States, 2019. *Morbidity and Mortality Weekly Report* 2020;69(46):1736.
17. National Low Income Housing Coalition. Who lives in federally assisted housing? *Housing Spotlight* 2012;2(2):1-4.
18. U.S. Department of Housing and Urban Development. Resident Characteristics Report, National. In: U.S. Department of Housing and Urban Development, (ed).
19. Mattingly DT, Hirschtick JL, Meza R, *et al.* Trends in prevalence and sociodemographic and geographic patterns of current menthol cigarette use among US adults, 2005–2015. *Preventive medicine reports* 2020;20:101227.

20. Villanti AC, Mowery PD, Delnevo CD, *et al.* Changes in the prevalence and correlates of menthol cigarette use in the USA, 2004–2014. *Tobacco control* 2016;25(Suppl 2):ii14-ii20.
21. Wailoo K. *Pushing Cool: Big Tobacco, Racial Marketing, and the Untold Story of the Menthol Cigarette*. University of Chicago Press; 2021.
22. Horn K, Dearfield CT, Johnson SB, *et al.* Smoking cessation intentions and attempts one year after the federally mandated smoke-free housing rule. *Preventive Medicine Reports* 2021;24:101600.
23. Horn K, Johnson SB, Patiño SR-G, *et al.* Implementation of the Department of Housing and Urban Development’s Smoke-Free Rule: A Socio-Ecological Qualitative Assessment of Administrator and Resident Perceptions. *International Journal of Environmental Research and Public Health* 2021;18(17):8908.
24. National Adult Tobacco Survey. In: Prevention CfDCa, (ed); 2013-2014.
25. Heatherton TF, Kozlowski LT, Frecker RC, *et al.* The Fagerström test for nicotine dependence: a revision of the Fagerstrom Tolerance Questionnaire. *British journal of addiction* 1991;86(9):1119-1127.
26. Kozlowski LT, Director J, Harford MA. Tobacco dependence, restraint and time to the first cigarette of the day. *Addictive Behaviors* 1981;6(4):307-312.
27. Allison PD. *Multiple regression: A primer*. Pine Forge Press; 1999.
28. Pearson JL, Abrams DB, Niaura RS, *et al.* A ban on menthol cigarettes: impact on public opinion and smokers' intention to quit. *American Journal of Public Health* 2012;102(11):e107-e114.
29. Rose SW, Ganz O, Zhou Y, *et al.* Longitudinal response to restrictions on menthol cigarettes among young adult US menthol smokers, 2011–2016. *American journal of public health* 2019;109(10):1400-1403.
30. Wackowski OA, Manderski MTB, Delnevo CD. Young adults’ behavioral intentions surrounding a potential menthol cigarette ban. *nicotine & tobacco research* 2014;16(6):876-880.

# BMJ Open

## BEHAVIORAL INTENTIONS IN RESPONSE TO A POTENTIAL MENTHOL CIGARETTE SALES BAN: A SURVEY EXAMINING SMOKERS IN WASHINGTON, DC PUBLIC HOUSING

Journal:	<i>BMJ Open</i>
Manuscript ID	bmjopen-2021-059821.R2
Article Type:	Original research
Date Submitted by the Author:	14-Jun-2022
Complete List of Authors:	Dearfield, Craig; The George Washington University Milken Institute of Public Health, Epidemiology Horn, Kimberly; Fralin Biomedical Research Institute at VTC Crandell, Ian; Virginia Tech-Center for Biostatistics and Health Data Sciences Bernat, D; The George Washington University Milken Institute of Public Health, Epidemiology
<b>Primary Subject Heading</b>:	Smoking and tobacco
Secondary Subject Heading:	Epidemiology, Public health
Keywords:	EPIDEMIOLOGY, Health policy < HEALTH SERVICES ADMINISTRATION & MANAGEMENT, PUBLIC HEALTH

SCHOLARONE™  
Manuscripts



I, the Submitting Author has the right to grant and does grant on behalf of all authors of the Work (as defined in the below author licence), an exclusive licence and/or a non-exclusive licence for contributions from authors who are: i) UK Crown employees; ii) where BMJ has agreed a CC-BY licence shall apply, and/or iii) in accordance with the terms applicable for US Federal Government officers or employees acting as part of their official duties; on a worldwide, perpetual, irrevocable, royalty-free basis to BMJ Publishing Group Ltd ("BMJ") its licensees and where the relevant Journal is co-owned by BMJ to the co-owners of the Journal, to publish the Work in this journal and any other BMJ products and to exploit all rights, as set out in our [licence](#).

The Submitting Author accepts and understands that any supply made under these terms is made by BMJ to the Submitting Author unless you are acting as an employee on behalf of your employer or a postgraduate student of an affiliated institution which is paying any applicable article publishing charge ("APC") for Open Access articles. Where the Submitting Author wishes to make the Work available on an Open Access basis (and intends to pay the relevant APC), the terms of reuse of such Open Access shall be governed by a Creative Commons licence – details of these licences and which [Creative Commons](#) licence will apply to this Work are set out in our licence referred to above.

Other than as permitted in any relevant BMJ Author's Self Archiving Policies, I confirm this Work has not been accepted for publication elsewhere, is not being considered for publication elsewhere and does not duplicate material already published. I confirm all authors consent to publication of this Work and authorise the granting of this licence.

1  
2  
3 1 **BEHAVIORAL INTENTIONS IN RESPONSE TO A POTENTIAL MENTHOL**  
4  
5 2 **CIGARETTE SALES BAN: A SURVEY EXAMINING SMOKERS IN WASHINGTON,**  
6  
7 **DC PUBLIC HOUSING**  
8  
9  
10 4

11  
12 5 Craig T. Dearfield, Ph.D.,<sup>1</sup> Kimberly Horn, Ed.D.,<sup>2</sup> Ian Crandell, Ph.D.,<sup>3</sup> and Debra H. Bernat,  
13  
14  
15 6 Ph.D.<sup>1</sup>

- 16  
17 7 1. The George Washington University Milken Institute School of Public Health,  
18  
19 8 Department of Epidemiology, 950 New Hampshire Ave, NW, Fifth floor, Washington,  
20  
21 9 DC 20052, USA  
22  
23  
24 10 2. Virginia Tech-Carilion Fralin Biomedical Research Institute, Blacksburg, VA, USA  
25  
26 11 3. Virginia Tech-Center for Biostatistics and Health Data Sciences, Roanoke, VA, USA  
27  
28  
29  
30

31 13 **Address Correspondence To:** Craig T. Dearfield, Ph.D.

32  
33 14 Department of Epidemiology

34  
35 15 The Milken Institute School of Public Health, The George Washington University

36  
37 16 950 New Hampshire Ave., 5<sup>th</sup> Floor, Washington DC, 20052, USA

38  
39  
40 17 Phone: 202-994-0436

41  
42 18 Email: cdearfield@gwu.edu  
43  
44  
45 19

46  
47 20 **Word count:** 3,130  
48  
49 21  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

## ABSTRACT

**Objectives:** Local, national, and international policies are being proposed to ban the sale of menthol-flavored tobacco products. With more bans being implemented, it is increasingly important to understand reactions to these bans among smokers of low socioeconomic status. This study examined public housing residents' behavioral intentions if menthol-flavored cigarettes were no longer sold.

**Setting:** 15 District of Columbia Housing Authority properties between March 2019 and March 2021.

**Participants:** 221 District of Columbia Housing Authority residents ages 18-80 who reported smoking menthol cigarettes (83.3% African American/Black).

**Primary and Secondary Outcomes:** Cigarette quitting and switching intentions due to a hypothetical menthol-flavored cigarette sales ban.

**Results:** Nearly one-half (48.0%) of residents said they intended to quit cigarette use if menthol-flavored products were no longer sold, while 27.2% were unsure if they would quit, and 24.9% reported they would not quit. Older residents (OR=0.94 per year, 95% CI=0.91, 0.97), senior/disabled building versus family building residents (OR=0.50, 95% CI=0.25, 0.97), those who smoked within 30 minutes of waking (OR=0.48, 95% CI=0.23, 0.98), and daily smokers (OR=0.42, 95% CI=0.21, 0.84) had lower odds of reporting quit intentions associated with a menthol ban. Of those not intending to quit, 40.7% reported they would switch to non-menthol cigarettes, 20% to another non-menthol product, 13% to menthol e-cigarettes (13.0%), and 20% to another menthol product.

**Conclusions:** Results suggest banning the sale of menthol-flavored products has the potential to impact cigarette smoking cessation. Nearly three-quarters of smokers in public housing indicated

1 a possibility of quitting smoking because of a menthol cigarette ban. Bans that include all flavors  
2 in all tobacco products may be most effective for facilitating overall tobacco cessation.  
3

#### 4 **Strengths and Limitations:**

- 5 • The study population includes a group with high rates of menthol-flavored tobacco use.
- 6 • Study data represent residents from one public housing authority and may not generalize  
7 to other US public housing authorities or other low socioeconomic status groups.
- 8 • The study assessed resident reactions to a hypothetical ban as opposed to the effect of an  
9 actual menthol-flavored sales ban.

## INTRODUCTION

Menthol flavor in cigarettes contributes to ongoing tobacco-related health disparities.[1-3] Menthol flavoring contributes to smoking initiation among youth, increasing the harm of smoke particulates, increasing nicotine dependency symptoms, and making it harder to quit smoking.[2, 4, 5] Menthol is the last allowable flavor in cigarettes in the United States.[1] It is notable that menthol-flavored cigarette consumption based on market share data remained stable across the country between 2000 and 2018 when overall cigarette consumption declined.[6]

To improve quit rates and address tobacco-related health disparities, policies are being proposed to ban the sale of menthol-flavored tobacco products. Several other countries and many local U.S. jurisdictions ban the sale of flavored tobacco products, including menthol.[7, 8] On April 29, 2021, the U.S. Food and Drug Administration (FDA) declared their intent to pursue tobacco product standards to ban menthol-flavored cigarettes.[1] With bans going into effect across the world and on a local U.S. level., it is increasingly important to understand how people respond to these bans, particularly those of lower socioeconomic status.

Evidence examining the effect of proposed U.S. menthol sales bans on smokers indicates they promote cessation intentions.[9] Evidence related to behavioral intentions in response to a hypothetical menthol-flavored product ban indicates some smokers intend to quit once it goes into effect. In a recent review of studies examining behavioral intentions if menthol-flavored products were no longer sold, between 24% and 64% of smokers indicate they would attempt to quit, with most studies of smokers in the US estimating between 40 and 50% of adults smokers intend to quit.[9] One study found that a higher proportion of African American menthol smokers report they would quit as a result of a hypothetical ban compared to white menthol smokers (76.0% versus 30.3%).[10] Additionally, those who smoke less frequently, report



1 greater current quit intentions, and report making a quit attempt in the prior year are more likely  
2 to say they would quit if a menthol ban went into effect.[10, 11]

3 A ban on menthol-flavored cigarettes may have a particular bearing on individuals living  
4 in the Department of Housing and Urban Development (HUD) housing. In 2018, HUD instituted  
5 a smoke-free rule for all properties prohibiting lit tobacco products in indoor spaces and within  
6 25 feet of housing authority buildings. Public housing residents have been found to have higher  
7 smoking rates compared with the general population. The most recent examination of a  
8 nationally representative sample of public housing residents in 2017 showed that 33.6% of  
9 residents used tobacco[12] compared with 14% of the general population at that time.[13] More  
10 recent studies of public housing residents in 2019 as part of smoke-free rule evaluations estimate  
11 between 9.5% and 29.0% of residents smoke[14-16] compared with an estimated 20.8% of adults  
12 using any tobacco product and 16.7% of adults using cigarettes in 2019.[17] The 2017 study of  
13 public housing residents also showed that over 80% of residents who smoke are reported to be  
14 daily smokers and approximately two-thirds smoke more than 10 cigarettes per day.[12]

15 Public housing residents represent groups most likely to use menthol-flavored tobacco  
16 products in the US, notably individuals of lower socioeconomic status (SES) and a high  
17 proportion of African Americans.[1, 18, 19] The prevalence of menthol-flavored cigarette use  
18 among those in families earning less than \$35,000 (7.0%) is double those in families earning  
19 more than \$75,000 a year (2.3%),[20] and approximately 85% of all African American smokers  
20 use menthol-flavored cigarettes, compared with approximately 30% of White smokers.[21]  
21 Further, African Americans use menthol-flavored products at a disproportionate rate, a disparity  
22 highly correlated with tobacco industry targeted advertising.[2, 22] Of note, the industry heavily  
23 advertised menthol-flavored products specifically in this community.[22] A study of one public

1 housing authority found 93.1% of residents who smoke use menthol-flavored cigarettes.[23]  
2  
3 Although this is not nationally representative of all public housing residents, results suggest that  
4  
5 residents are susceptible to using menthol-flavored cigarettes.  
6  
7

8  
9  
10 Evidence suggests that banning the sale of menthol-flavored products may increase  
11  
12 intentions to quit and improve cessation outcomes among users in the general population;  
13  
14 however, behavioral intentions of public housing residents in response to a potential menthol-  
15  
16 flavored product ban are under studied. The present study examined public housing residents' (1)  
17  
18 intention to quit if menthol-flavored cigarettes were no longer sold, and (2) expected alternative  
19  
20 tobacco products of choice among if they did not intend to quit. The study fills an important  
21  
22 literature gap by providing a current examination of the potential consequences of a menthol-  
23  
24 flavored product ban in a population with high rates of menthol-flavored tobacco use.  
25  
26  
27

## 28 **METHODS**

### 29 **Study Sample**

30  
31 Data were collected from residents of the Washington, DC Housing Authority (DCHA)  
32  
33 between March 2019 and March 2021. Inclusion criteria required participants to be a DCHA  
34  
35 property resident (not using Section 8 vouchers) between the ages of 18 and 80. Residents  
36  
37 represented 15 DCHA properties, 8 family and 7 senior/disabled buildings. In the overall study,  
38  
39 754 residents completed surveys. Non-smokers were not included in this analysis (n=296) and  
40  
41 237 smokers were not included because they responded to an earlier version of the survey that  
42  
43 did not contain questions about a hypothetical menthol ban (n=152), did not usually use menthol  
44  
45 cigarettes (n=16), or had missing data for one or more of the menthol cigarette use questions  
46  
47 (n=68). One respondent who identified gender as “non-binary” was omitted from the analysis  
48  
49 because confidentiality could not be maintained. Thus, the present sample included 221 residents  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

1 who reported past 30-day use of menthol-flavored cigarettes and were not missing data for  
2 questions asking about behavioral intentions if menthol-flavored products were no longer sold.

### 3 **Procedures**

4 Data collection took place in community spaces on DCHA property. Study staff and  
5 DCHA administrators held survey participation events. DCHA and building staff advertised and  
6 told residents about the events. Flyers for the study were placed in common areas in buildings  
7 notifying residents where and when data collection events would be held, and resident council  
8 presidents and DCHA staff told residents about data collection events during community  
9 meetings. During data collection events, residents frequently found out about the event from  
10 other residents (word-of-mouth).[23, 24] Interested residents completed a screening assessment  
11 to establish residence and age eligibility and past 30-day smoking status. Eligible participants  
12 completed a consent form, which research staff read aloud. Participants completed surveys using  
13 audio computer-assisted self-interviewing software (QDS), where all questions and answer  
14 options were spoken to participants. Participants had the option to skip any question and end the  
15 survey at any point. Residents received a \$25 gift card for their survey participation. Study  
16 procedures were approved by The George Washington University Institutional Review Board.

### 17 **Patient and Public Involvement**

18 Patients and the public were not involved in the research design, conduct, reporting, or  
19 dissemination.

### 20 **Measures**

21 *Demographics.* Respondents indicated their gender (male/female), age (in years, open  
22 numerical response), and race/ethnicity. Residents reported if they were Hispanic (yes/no), and  
23 selected as many racial categories as were applicable from the following: American Indian or

1 Alaskan Native, Asian, Black or African American, Native Hawaiian or Other Pacific Islander,  
2 White, and Other. The study applied DCHA classifications for building type (e.g., family or  
3 senior/disabled).

4 *Cigarette and other tobacco use.* Residents reported past 30-day use of cigarettes, cigars,  
5 little cigars and cigarillos, smokeless tobacco, hookah, and e-cigarettes using questions derived  
6 from the National Adult Tobacco Survey (NATS).[25] Cigarette smokers indicated whether they  
7 usually used a menthol-flavored product (yes/no), days used in the past 30 days (0-30),  
8 and the number of self-identified quit attempts in the past 3 months (open numerical response).  
9 Daily smoking was defined as cigarette smoking all days in the past 30 days.

10 *Nicotine Dependency.* The primary measure of nicotine dependency was smoking within  
11 30 minutes of waking.[26, 27] Residents indicated if they typically first smoked within 5  
12 minutes, between 5 to 30 minutes, between 31 to 60 minutes, or after 60 minutes of waking. This  
13 variable was dichotomized for analysis purposes (smoke within 30 minutes of waking and smoke  
14 31+ minutes after waking).[26, 27]

15 *Quitting and Switching Behavioral Intentions.* Respondents reported whether they were  
16 currently thinking of quitting smoking cigarettes for good (yes/no), as derived from the  
17 NATS.[25] Those who said they were thinking of quitting indicated how sure they were that they  
18 could quit if they tried using a 4-point scale (very sure to not at all sure). Analysis used a  
19 dichotomized version of this variable (very sure/sure and not sure/not at all sure). Participants  
20 indicated if they would consider quitting if menthol-flavored cigarettes were no longer sold in  
21 stores (yes/no/not sure). A dichotomous variable was created for analysis purposes (yes and  
22 no/not sure). Residents who indicated they would not quit reported what they would do if  
23 menthol-flavored products were no longer sold. Response options included switching to non-

1 menthol-flavored cigarettes, switching to some other non-menthol-flavored tobacco product,  
2 switching to menthol-flavored e-cigarettes, switching to some other menthol-flavored tobacco  
3 product, buying menthol-flavored cigarettes online, something else, or none of these. Participants  
4 could select multiple options.

## 5 **Analysis**

6 Descriptive statistics assessed intention to quit if menthol-flavored products were no  
7 longer sold and the alternative products of choice among those who said they would not quit.  
8 Logistic regression modeling, clustered by data collection site, assessed characteristics associated  
9 with quit intentions if menthol-flavored products were no longer sold. Logistic regression models  
10 used complete case analysis. Regression models clustered by data collection site accounted for  
11 intragroup correlations that could arise from similarities in residents at each housing site. The  
12 model included age, gender, senior/disabled or family building residence status, using a tobacco  
13 product besides cigarettes, smoking within 30 minutes of waking, daily smoking status, whether  
14 they were sure they could quit, and having made a quit attempt in the past 3 months to predict  
15 whether residents would quit if menthol-flavored products were no longer sold. Because most  
16 residents (85.6%, N=101/118 [103 missing]) identified as Black or African American, race and  
17 ethnicity was not included in further analysis. Results from a test for multicollinearity between  
18 age and senior/disabled building resident status indicated these two variables were significantly  
19 correlated ( $r=0.22$ ,  $p<0.01$ ), but not highly correlated. Both variables were included in the model  
20 due to the low risk for multicollinearity.[28] The regression model included 177 cases with full  
21 data for all selected variables. Analyses were conducted using SAS software, version 9.4 (SAS  
22 Institute Inc., Cary, NC).

## 23 **RESULTS**

## 1 Descriptive Statistics

2 The sample included slightly more females and residents of Senior and Disabled  
3 buildings (Table 1). The mean age of participating residents was 57. Most residents reported  
4 thinking about quitting (regardless of the ban; 83.2%, N=184) and a high proportion thought they  
5 could quit if they tried (very sure and sure; 45.3%, N=100). Additionally, about half of the  
6 residents made at least one recent quit attempt during the last 3 months (49.3%, N=109). Close to  
7 one-half of residents were daily smokers (47.7%, N=105) and nearly two-thirds reported  
8 smoking within 30 minutes of waking (62.9%, N=150). Under 20% of respondents said they  
9 used another tobacco product (17.2%, N=38).

Table 1. Demographics, Tobacco Use Characteristics	
	% (N) or mean (SD)
<i>Demographics</i>	
<b>Gender</b>	
Female	60.6% (134)
Male	39.4% (87)
<b>Age (Mean years, continuous)</b>	57.2 (11.0)
<b>Building Type</b>	
Family	40.7% (90)
Senior or Disabled	59.3% (131)
<i>Tobacco Use Characteristics</i>	
<b>Use Another Tobacco Product</b>	
Yes	17.2% (38)
No	82.8% (183)
<b>Smoke within 30 Minutes of Waking</b>	
Yes	62.9% (139)
No	36.2% (80)
Missing	0.9% (2)
<b>Daily smoker</b>	
Yes	47.5% (105)
No	52.0% (115)
Missing	0.5% (1)
<b>Thinking About Quitting</b>	
Yes	83.2% (184)
No	16.3% (36)
Missing	0.5% (1)
<b>How Sure You Could Quit Cigarettes?</b>	
Very sure	19.5% (43)
Sure	25.8% (57)
Not sure	29.9% (66)
Not at all sure	7.7% (17)
Missing	17.2% (38)
<b>How much support have you received to quit tobacco</b>	

A lot of support	11.8% (26)
Some support	15.4% (34)
A little support	14.9% (33)
No support	38.5% (85)
Missing	19.5% (43)
<b>Made at least 1 quit attempt (past 3 months)</b>	
Yes	49.3% (109)
No	32.6% (72)
Missing	18.1% (40)
<b>Would quit if menthol-flavored cigarettes were no longer sold</b>	
Yes	48.0% (106)
Not sure	27.2% (60)
No	24.9% (55)
<b><i>Changes if Menthol-flavored Products are Banned<sup>1</sup> (n=54)</i></b>	
<b>Switch to non-menthol-flavored cigarettes</b>	40.7% (22)
<b>Switch to some other non-menthol-flavored product</b>	20.4% (11)
<b>Switch to menthol-flavored e-cigarette</b>	13.0% (7)
<b>Switch to other menthol-flavored product</b>	20.4% (11)
<b>Buy menthol-flavored cigarettes online</b>	13.0% (7)
<b>Something else</b>	9.3% (5)
<b>None of these</b>	14.8% (8)
Note:	
<sup>1</sup> Participants were able to mark multiple options	

Overall, given a menthol ban, 48.0% (N=106) of residents said they would quit, 27.2% (N=60) indicated they were not sure if they would quit, and 24.9% (N=55) indicated they would not quit. Of those who would continue smoking and answered questions about preferred alternatives (N=54), 40.7% (N=22) indicated they would switch to non-menthol-flavored cigarettes, 20.4% (N=11) indicated switching to another non-menthol-flavored product, 20.4% (N=11) said they would use another menthol-flavored product, 13.0% (N=7) would switch to menthol-flavored flavored e-cigarettes, and 13.0% (N=7) would buy menthol-flavored cigarettes online. An additional 9.3% (N=5) indicated they would do something else and 14.6% (N=8) saying they would not do any of these options. Only one respondent specified the other action they would take as “chew gum” without making clear they would quit using tobacco.

## Regression Results

Regression results indicated that increases in age (OR=0.94, 95% CI=0.91, 0.97) and living in a senior/disabled building (OR=0.50, 95% CI=0.25, 0.97) were associated with

1 decreased odds that residents would quit cigarettes if menthol-flavored products were  
 2 no longer available (Table 2). Residents who smoked within 30 minutes of waking (OR=0.48,  
 3 95% CI=0.23, 0.84) and daily smokers (OR=0.42, 95% CI=0.21, 0.84) were less likely to say  
 4 they would quit if menthol-flavored products were no longer sold.

<b>Table 2. Association Between Intentions to Quit if Menthol Were Not Available and Demographics and Tobacco Use</b>		
	<b>Logistic Regression Model</b>	
	<b>OR</b>	<b>95% CI</b>
<b>Demographics</b>		
<b>Gender</b>		
Female	1.33	0.42, 4.18
Male	ref	
<b>Age (per year, continuous)</b>	0.94**	0.91, 0.97
<b>Building Type</b>		
Senior or Disabled	0.50*	0.25, 0.97
Family	ref	
<b>Tobacco Use</b>		
<b>Use Another Tobacco Product</b>		
Yes	0.41	0.12, 1.35
No	ref	
<b>Smoke within 30 Minutes of Waking</b>		
Yes	0.48*	0.23, 0.98
No	ref	
<b>Daily Smoker</b>		
Yes	0.42*	0.21, 0.84
No	ref	
<b>How Sure You Could Quit Cigarettes?</b>		
Very Sure/Sure	1.76	0.87, 3.58
Not Sure/Not at all sure	ref	
<b>Made at least 1 quit attempt (3 months)</b>		
Yes	1.17	0.41, 3.32
No	ref	

\*\* p<0.01, \* p<0.05

## DISCUSSION

7 The primary study aim examined whether public housing residents had intentions to quit  
 8 if menthol-flavored cigarettes were no longer sold, and what factors were associated with  
 9 intentions to quit or other alternative products of choice among those who did not intend to quit  
 10 if menthol-flavored cigarettes were no longer sold. Nearly three-quarters of menthol-flavored  
 11 cigarette smokers indicated consideration of quitting cigarettes if menthol-flavored products



1 were no longer sold. About 1 in 4 said they would continue smoking. Similar to the present  
2 study, prior evidence in the general population assessing responses to a hypothetical menthol  
3 ban, showed 25–64% of smokers intended to attempt to quit smoking and 11–46% of smokers  
4 considered switching to other tobacco products, including 15–30% to e-cigarettes. However, the  
5 intention to quit for African Americans were higher than these ranges. In one U.S. study where  
6 79.4% of African Americans used menthol-flavored cigarettes, 76.0% of smokers expressed an  
7 intention to quit smoking when asked about a hypothetical ban, compared with 30.3% of  
8 whites.[10] Another U.S. study found 44.5% of African Americans who used menthol-flavored  
9 cigarettes said they would quit in the event of a ban on menthol-flavored cigarettes and 23.6%  
10 would switch to a non-menthol brand and try to quit.[29] African American young adults were  
11 also twice as likely to say they would quit than whites in response to hypothetical menthol sales  
12 restrictions.[30] Past studies also show that African American young adults indicated 79.3%  
13 intended to quit in the event of a menthol-flavored product ban.[31] The present study showed  
14 that residents with high rates of menthol-flavored tobacco use is similar to the general population  
15 and other African American populations. Additionally, residents reporting intentions to switch to  
16 another tobacco product aligned with the previously reported estimates.[9] Slightly fewer  
17 residents than the general population indicated they may switch to e-cigarettes. This is  
18 potentially due to e-cigarette use being less common in those of higher average age and lower  
19 SES, and African Americans, the demographic group predominantly represented in this sample.

20 Consistent with previous findings, results suggested smoking behavior has a high degree  
21 of influence on reactions to a menthol-flavor sales ban.[10, 11] Smoking within 30 minutes of  
22 waking and being a daily smoker significantly reduced the odds of residents' expressing an  
23 intention to quit if menthol-flavored products ceased to be sold. Older residents had lower odds

1 of reporting intentions to quit, aligned with prior evidence that older adults are less likely to want  
2 to quit than younger adults.[2] Findings may be due to older residents exhibiting more nicotine  
3 dependency characteristics and smoking more frequently as they may have smoked for longer.

4 A menthol-flavored ban may provide additional influence on this population of uniquely  
5 at-risk predominantly African Americans residents, given that they already live in HUD-  
6 mandated smoke-free housing. Evidence from a 40-year simulation of smoking projecting the  
7 influence of a menthol-flavored ban showed that between 323,000 and 633,000 deaths could be  
8 avoided, with the hypothetical ban potentially avoiding an estimated 237,000 deaths in African  
9 Americans. The combination of these two policies (smoke-free housing and menthol-flavor ban)  
10 may exert a robust influence on a significant proportion of residents' smoking cessation  
11 intentions. However, it is important to underscore that 1 in 4 would continue smoking. Many of  
12 these residents indicated they would switch to an unflavored product, which may increase their  
13 intent to quit and improve their cessation outcomes.[3, 9] Still, others planned to continue to use  
14 other menthol-flavored products. While local jurisdictions banned the sales of flavored tobacco  
15 products,[8] a nationwide policy may increase the benefits of removing these products from the  
16 market by reaching smokers in all national jurisdictions. Prohibiting the sale of all characterizing  
17 flavors, as the proposed FDA nationwide menthol ban would,[1] and should be considered to  
18 promote cessation among all resident tobacco users.

19 In the presence of a comprehensive menthol-flavored tobacco product sales ban, policies  
20 and programs should address the unique needs of individuals who report more dependency  
21 symptoms and are older, and groups that are consistently less likely to say they will quit.[2]  
22 Further, menthol smokers, and especially African American menthol smokers, are more likely to  
23 attempt to quit, but less likely to sustain cessation. African Americans who use menthol-flavored

1 products are more likely to report an attempt to quit when asked about their reactions to a  
2 hypothetical sales ban. To reach a population of African American public housing residents who  
3 use menthol-flavored cigarettes, interventions need to be tailored and consistently available to  
4 help them act on their intentions to quit and improve cessation outcomes. Implementing  
5 cessation supports along with a menthol-flavored tobacco sales ban would help this group that is  
6 disproportionately impacted by menthol-flavored tobacco products and may be disproportionately  
7 affected by a sales ban.

8         Additionally, the evidence of long-term successful cessation following a menthol-  
9 flavored tobacco sales ban is insufficient. One study examining smokers one year after a  
10 menthol-flavored product ban found no significant difference in sustained cessation between  
11 menthol-flavored and nonmenthol-flavored product users for those who quit after the ban, but  
12 previously daily menthol smokers had a higher odds of sustaining cessation than previously daily  
13 unflavored smokers if they quit before the ban. Additional research is needed to identify long-  
14 term cessation outcomes for those affected by these sales bans.

15         This study has three limitations that warrant mention. First, these data represent residents  
16 from the Washington, DC housing authority and may not generalize to other public housing  
17 authorities and other countries. This is especially important because U.S. public housing consists  
18 of a racially diverse population, and the current study consisted of primarily African American  
19 residents. A second limitation is the inability to assess the unique effects of menthol-flavored  
20 cigarettes on successful quitting because residents were reacting to a hypothetical ban. Third,  
21 conducting complete case analysis for our regression models meant the analysis omitted 44 cases  
22 due to missing data on one or more predictor variables. Because of this, we cannot know how

1 these residents would have affected the regression results and they may have attributes that made  
2 them skip the question that will be unmeasured.

3           Despite these limitations, study findings add timely evidence describing the impact of a  
4 menthol-flavored-flavor ban on a population with high rates of tobacco use in the United States.  
5 Results showed how public housing residents may react to a ban in ways that could reduce  
6 smoking prevalence and address current tobacco-related health disparities. Findings also  
7 indicated that specialized programs for older and more dependent low-income African  
8 Americans may improve outcomes, including intention and action toward cessation. For the  
9 proposed nationwide FDA ban and other tobacco control policies to achieve outcomes of  
10 reducing avoidable US deaths and tobacco-related health disparities, it is essential to provide  
11 accessible and effective, evidence-based support for translating quit intentions into successful  
12 cessation.

13

1 **Acknowledgements:** The authors would like to thank the participants who gave their time and  
2 knowledge of the subject.

3 **Contributorship Statement:** CTD: conceptualization, data curation, formal analysis,  
4 methodology, software, project administration, writing – original draft, writing – review and  
5 editing; KH: conceptualization, formal analysis, methodology, project administration, resources,  
6 supervision, writing – original draft, writing – review and editing; IC: formal analysis,  
7 investigation, methodology, software; DHB: conceptualization, formal analysis, methodology,  
8 project administration, resources, supervision, writing – original draft, writing – review and  
9 editing

10 **Competing Interests:** The authors have no competing interests to disclose.

11 **Funding:** This work was supported by the National Institutes of Health, National Cancer  
12 Institute (R01 CA226074P to DHB and KH), and pilot funding from the George Washington  
13 Cancer Center (GWCC; PI Bernat).

14 **Data Sharing:** The data underlying this article will be shared on reasonable request to the  
15 corresponding author.

16 **Ethics Approval Statement:** The work on this study was approved by the George Washington  
17 University Institutional Review Board, number 180523.

## 1 References:

- 2 1. U.S. Food and Drug Administration. FDA Commits to Evidence-Based Actions Aimed at  
3 Saving Lives and Preventing Future Generations of Smokers. In; 2021.
- 4 2. US Department of Health and Human Services. Smoking cessation: a report of the  
5 Surgeon General. In: Services UDoHaH, (ed). Atlanta; 2020.
- 6 3. U.S. Food and Drug Administration. Preliminary scientific evaluation of the possible  
7 public health effects of menthol versus nonmenthol cigarettes. In; 2013.
- 8 4. D'Silva J, Cohn AM, Johnson AL, *et al*. Differences in subjective experiences to first use  
9 of menthol and Nonmenthol cigarettes in a national sample of young adult cigarette smokers.  
10 *Nicotine and Tobacco Research* 2018;20(9):1062-1068.
- 11 5. Villanti AC, Collins LK, Niaura RS, *et al*. Menthol cigarettes and the public health  
12 standard: a systematic review. *BMC Public Health* 2017;17(1):1-13.
- 13 6. Delnevo CD, Giovenco DP, Villanti AC. Assessment of menthol and nonmenthol  
14 cigarette consumption in the US, 2000 to 2018. *JAMA Network Open* 2020;3(8):e2013601-  
15 e2013601.
- 16 7. World Health Organization. Banning menthol in tobacco products. In. Geneva; 2016.
- 17 8. Donovan E, Folger S, Akbar M, *et al*. Classifying the comprehensiveness of flavoured  
18 tobacco sales restrictions: development and application of a tool to examine US state and local  
19 tobacco policies. *Tobacco control* 2021.
- 20 9. Cadham CJ, Sanchez-Romero LM, Fleischer NL, *et al*. The actual and anticipated effects  
21 of a menthol cigarette ban: a scoping review. *BMC Public Health* 2020;20(1):1-17.
- 22 10. D'Silva J, Amato MS, Boyle RG. Quitting and switching: menthol smokers' responses to  
23 a menthol ban. *Tobacco Regulatory Science* 2015;1(1):54-60.
- 24 11. O'Connor RJ, Bansal-Travers M, Carter LP, *et al*. What would menthol smokers do if  
25 menthol in cigarettes were banned? Behavioral intentions and simulated demand. *Addiction*  
26 2012;107(7):1330-1338.
- 27 12. Helms VE, King BA, Ashley PJ. Cigarette smoking and adverse health outcomes among  
28 adults receiving federal housing assistance. *Preventive medicine* 2017;99:171-177.
- 29 13. Wang TW, Asman K, Gentzke AS, *et al*. Tobacco product use among adults—United  
30 States, 2017. *Morbidity and Mortality Weekly Report* 2018;67(44):1225.
- 31 14. Lathen LS, Plears ML, Shartle EL, *et al*. The HUD smoke-free rule: Perceptions of  
32 residents post-implementation. *Preventive medicine reports* 2020;19:101159.
- 33 15. Curry LE, Feld AL, Rogers T, *et al*. Changes in Reported Secondhand Smoke Incursions  
34 and Smoking Behavior after Implementation of a Federal Smoke-Free Rule in New York State  
35 Federally Subsidized Public Housing. *International Journal of Environmental Research and  
36 Public Health* 2022;19(6):3513.
- 37 16. Thorpe LE, Anastasiou E, Wyka K, *et al*. Evaluation of secondhand smoke exposure in  
38 New York City public housing after implementation of the 2018 federal smoke-free housing  
39 policy. *JAMA network open* 2020;3(11):e2024385-e2024385.
- 40 17. Cornelius ME, Wang TW, Jamal A, *et al*. Tobacco Product Use Among Adults—United  
41 States, 2019. *Morbidity and Mortality Weekly Report* 2020;69(46):1736.
- 42 18. National Low Income Housing Coalition. Who lives in federally assisted housing?  
43 *Housing Spotlight* 2012;2(2):1-4.
- 44 19. U.S. Department of Housing and Urban Development. Resident Characteristics Report,  
45 National. In: U.S. Department of Housing and Urban Development, (ed).

- 1  
2  
3 1 20. Mattingly DT, Hirschtick JL, Meza R, *et al.* Trends in prevalence and sociodemographic  
4 2 and geographic patterns of current menthol cigarette use among US adults, 2005–2015.  
5 3 Preventive medicine reports 2020;20:101227.  
6 4 21. Villanti AC, Mowery PD, Delnevo CD, *et al.* Changes in the prevalence and correlates of  
7 5 menthol cigarette use in the USA, 2004–2014. Tobacco control 2016;25(Suppl 2):ii14-ii20.  
8 6 22. Wailoo K. *Pushing Cool: Big Tobacco, Racial Marketing, and the Untold Story of the*  
9 7 *Menthol Cigarette*: University of Chicago Press; 2021.  
10 8 23. Horn K, Dearfield CT, Johnson SB, *et al.* Smoking cessation intentions and attempts one  
11 9 year after the federally mandated smoke-free housing rule. Preventive Medicine Reports  
12 10 2021;24:101600.  
13 11 24. Horn K, Johnson SB, Patiño SR-G, *et al.* Implementation of the Department of Housing  
14 12 and Urban Development’s Smoke-Free Rule: A Socio-Ecological Qualitative Assessment of  
15 13 Administrator and Resident Perceptions. International Journal of Environmental Research and  
16 14 Public Health 2021;18(17):8908.  
17 15 25. National Adult Tobacco Survey. In: Prevention CfDCA, (ed); 2013-2014.  
18 16 26. Heatherton TF, Kozlowski LT, Frecker RC, *et al.* The Fagerström test for nicotine  
19 17 dependence: a revision of the Fagerstrom Tolerance Questionnaire. British journal of addiction  
20 18 1991;86(9):1119-1127.  
21 19 27. Kozlowski LT, Director J, Harford MA. Tobacco dependence, restraint and time to the  
22 20 first cigarette of the day. Addictive Behaviors 1981;6(4):307-312.  
23 21 28. Allison PD. *Multiple regression: A primer*: Pine Forge Press; 1999.  
24 22 29. Pearson JL, Abrams DB, Niaura RS, *et al.* A ban on menthol cigarettes: impact on public  
25 23 opinion and smokers' intention to quit. American Journal of Public Health 2012;102(11):e107-  
26 24 e114.  
27 25 30. Rose SW, Ganz O, Zhou Y, *et al.* Longitudinal response to restrictions on menthol  
28 26 cigarettes among young adult US menthol smokers, 2011–2016. American journal of public  
29 27 health 2019;109(10):1400-1403.  
30 28 31. Wackowski OA, Manderski MTB, Delnevo CD. Young adults’ behavioral intentions  
31 29 surrounding a potential menthol cigarette ban. nicotine & tobacco research 2014;16(6):876-880.  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60