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Product Substitution After A Real-World Menthol Ban: A Cohort Study

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Abstract

Objectives: The province of Ontario, Canada banned menthol in cigarettes and other tobacco products effective January 1st, 2017 adding to an existing flavour ban. However, all flavoured e-cigarettes, flavoured cigars larger than 6g, and alcohol flavoured cigars without filters over 1.4g were exempted. This paper examines the association between use of flavoured non-cigarette products and self-reported cigarette smoking cessation after the ban.

Methods: Current past-30 day cigarette smokers (N=913) who were 16 years or older, living in Ontario were recruited between September-December 2016 and re-contacted January-August 2018.

Results: Both daily and occasional pre-ban menthol cigarette smokers were more likely to use flavoured cigar products (adjusted relative rate, RR=1.53, 95% confidence interval, CI=1.01, 2.31; adjusted RR=1.57, 95% CI=1.06, 2.30) after the ban, while occasional pre-ban menthol cigarette smokers were more likely to use other tobacco products (adjusted RR=1.25, 95% CI=1.02, 1.53) or flavoured other tobacco products (adjusted RR=1.56, 95% CI=1.09, 2.24), conditional on prior use.

Conclusions: Menthol smokers prior to the ban were more likely to use other tobacco products, or flavoured tobacco products, after the ban. These results suggest that comprehensive menthol

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Human Subjects Statement

This study was approved by the research ethics board of the University of Toronto.

Conflicts of Interest

Dr. Eissenberg is a paid consultant in litigation against the tobacco industry and the electronic cigarette industry, and is named on a patent for a device that measures the puffing behavior of electronic cigarette users

bans could be more effective without the option of using flavoured tobacco or nicotine products as substitutes.

Keywords

menthol; flavors; cigars; cigarettes; policy

INTRODUCTION

Menthol produces cooling, desensitizing and proanalgesic effects and, when added to tobacco cigarettes, leads to increased escalation of cigarette smoking, increased nicotine dependence, and decreased success in smoking cessation[1]. The tobacco industry uses menthol to recruit and retain smokers [2–4]. In order to reduce the health burden of tobacco use, in May 2015, the Province of Ontario extended the Canadian national ban on flavored tobacco products (that excluded menthol flavor) with legislation banning the sale of certain tobacco products that contain any added flavors, including menthol. This menthol ban came into effect on January 1, 2017[5]. In Ontario, while menthol was restricted from all tobacco products, it would have been available as an electronic cigarette (e-cigarette) flavour after the ban as e-cigarettes were not classified as tobacco products in Canada. Exceptions were also made for other flavours and tobacco products: all flavours remained available in cigars over 6 g and alcohol flavours were allowed in little cigars between 1.4 g and 6 g. This ban is one of the first on menthol tobacco products worldwide and follows the Canadian provinces of Nova Scotia, Alberta, and Quebec that already have bans in place [6]. A Canada-wide menthol cigarette ban was implemented in October 2017, banning the use of menthol in cigarettes, blunt wraps and most cigars sold in Canada although the national law did not cover hookah tobacco, smokeless tobacco, or e-cigarettes [7].

In Canada, menthol cigarettes comprised 5% of cigarette sales in 2015[8–10], while menthol cigarette sales are estimated to be about 30% of the cigarette market in the US[1]. Among Canadians age 15 and older in 2015, more than one-third (35.3%) of all respondents said they had ever smoked a menthol cigarette; 1.6% of all respondents had smoked one in the past 30 days[11]. Unlike the US, where menthol cigarette smoking is more common among African Americans, the use of menthol cigarettes is not concentrated among Black Canadians[12].

One potential limitation to the public health impact of a menthol ban is the use of other flavoured tobacco products as a substitute for menthol tobacco. In the US in 2011, the Food and Drug Administration has announced intentions to regulate the sale of menthol but those intentions appear to exempt menthol in e-cigarettes[13,14] and its advisory committee concluded that “removal of menthol cigarettes from the marketplace would benefit public health”[1]. Existing local regulation vary widely: San Francisco has already banned the sale of all menthol cigarettes and other tobacco products with flavours [15] and while Oakland and Chicago have only limited sales of menthol cigarettes to tobacco-only retailers or retailers located away from high schools respectively[16,17].Other national jurisdictions, including Brazil, Ethiopia, Turkey, and the European Union, are in the process of phasing out menthol cigarettes with different exemptions for other flavoured tobacco products[13].

Other tobacco flavour substitution is a possibility in Ontario, where e-cigarettes and some cigars may contain menthol. In addition, other flavoured tobacco products may function similarly to menthol as flavoured tobacco products (such as cherry and candy-flavoured) are perceived as healthier, more appealing, less harsh than unflavoured products, with users being less likely to intend to quit[18].

An assessment of smoker actual behaviors, rather than behavioral intentions, including menthol substitution before and after a menthol flavour ban is important for understanding how current menthol smokers respond to a menthol ban and will help inform future policies in the same and other jurisdictions. This is the first study to our knowledge to examine the long-term changes in smoking behaviours, other tobacco product use, and flavoured tobacco use among menthol smokers and the potential for flavour substitution in a real world environment.

METHODS

Participants

For this pre-post evaluation study, eligible participants were residents of Ontario, who were 16+ years of age, current cigarette smokers (past 30-day users). A convenience sample of smokers was recruited through email (n=772) from an existing registry of Ontario recent smokers (http://smokerspanel.ca/) and by telephone through a commercial list of Ontario telephone numbers (n=1026). Participants were recruited between September and December 2016 and answered questions regarding their tobacco use behaviors ban before the menthol cigarette ban was implemented. For other details, see Chaiton et al. [19].

Participants were contacted for follow-up beginning one year (January 1st, 2018) after the implementation of the Ontario ban (January 1st, 2017) through an online survey. Follow-up recruitment continued until August 30th with up to three reminder emails and with telephone contact if necessary (n=216). From the 1738 approached, 913 participants completed the follow-up survey. Those who were lost to follow-up were more likely to be from the telephone sample but did not otherwise differ independently by the level of menthol smoking, age, sex, education, or smoking characteristics (data not shown).

Measures

At baseline, menthol use was categorized into “daily” menthol smokers (menthol cigarette smoking “every day”), “occasional” menthol smokers (menthol cigarette smoking “occasionally” and “on rare occasions”), and “non-menthol smokers” (menthol cigarette smoking “not at all”). At follow up, participants reported their use of menthol cigarettes (“every day,” “almost every day,” “occasionally,” “not at all”). Self-reported past year use (Yes/No) of each type of other flavoured or unflavoured tobacco products was measured at baseline, including cigars, pipes, smokeless (pinch, snuff, chew, snus), bidis, kreteks, hookah, e-cigarettes or electronic vaping devices. At follow-up, participants were asked about use of these products after the ban. Use of any other tobacco products (flavoured or unflavoured), use of any flavoured tobacco product, use of flavoured e-cigarettes, and use of flavoured cigars were treated as the outcomes at follow-up.

We also assessed cigarette smoking quit attempts and continued abstinence at follow-up, where a quit attempt was defined as reporting having made a serious attempt to quit smoking cigarettes since the beginning of the menthol cigarette ban in January 2017, and abstinence was defined as reporting having made a quit attempt since the ban and not smoking cigarettes “at all” at followup.

Menthol cigarette smokers at baseline were asked “How do you think the ban on menthol cigarettes will affect your smoking in the future”. Responses were “quit”, “smoke non-menthol cigarettes”, “buy contraband cigarettes”, “switch to flavoured cigars or hookah”, or “switch to e-cigarettes (flavoured or unflavoured)”.

Demographic characteristics assessed at baseline included age, sex (male, female, other), education (“some elementary or some high school,” “completed high school,” “some community or technical college,” “completed community or technical college,” “some university,” “completed university,” refused) ethnicity (White, Asian, Black, Latin American, Arab, Aboriginal, multiple cultural backgrounds, refused, other), pattern of tobacco use (daily vs. occasional) and number of cigarettes smoked per day.

Analysis

Adjusted logistic regression models were used to assess pre-ban menthol smoking status on likelihood of use of other tobacco products, use of any flavoured tobacco product, use of flavoured e-cigarettes, and use of flavoured cigars at follow-up after the ban, given previous use and demographic characteristics. The predictors of interest were daily and occasional menthol use and models were adjusted for baseline demographic characteristics (age, sex, education, ethnicity), baseline smoking characteristics (pattern of tobacco use, pre-ban use of the respective post-ban tobacco product of interest), sampling method (phone or online survey), and number of days between the baseline and follow-up survey. Sensitivity analyses were performed to account for those who did not complete the follow-up survey, using an “intent to treat” approach whereby missing data were coded as continued smokers.

The likelihood of making a quit attempt after the ban for users of any other tobacco products and flavoured other tobacco products was analyzed using adjusted logistic regression. Interaction terms between menthol cigarette use at baseline and quitting (quit attempt; abstinence at follow up) were included to assess if use of other tobacco or flavoured tobacco products was associated with a difference in quitting behaviour between non-menthol users and menthol smokers.

RESULTS

Sample Characteristics and Menthol Use

The majority of the participants were White, female, older than 30 years of age, highly educated, and daily tobacco users (Table 1). Overall, 21% of participants were daily menthol cigarette smokers, 46% were occasional menthol smokers, and 34% were non-menthol smokers at baseline. Respondents in the online sample were significantly more educated, smoked fewer cigarettes per day, and were more likely to have used e-cigarettes, cigars, and flavoured other tobacco products (data not shown). At follow-up, 27% of all participants

reported using menthol cigarettes since the beginning of the ban, with 0.3% among pre-ban non-menthol users at baseline, 5% among pre-ban occasional menthol users at baseline, and 22% among pre-ban daily menthol users at baseline (p<0.001). Five-hundred thirteen people (56%) reported a quit attempt and 171 (19%) reported smoking “not at all” at follow-up. Daily and occasional menthol users were more likely to report making a quit attempt (63% and 62% vs. 43%; p<0.001) or not smoking (24% and 20% vs. 14%; p=0.014) than those who did not use menthol at baseline.

Other Tobacco and Flavoured Tobacco Use

Pre-ban use of alternative products, flavoured products, e-cigarettes, or cigars was higher among occasional menthol smokers compared to daily and non-menthol smokers prior to the ban (other tobacco products: 71% vs. 57% and 29%; p<0.001; flavoured tobacco products: 66% vs. 49% and 22%; p<0.001; e-cigarettes: 44% vs. 41% and 18%; p<0.001; cigars: 36% vs. 30% and 14%; p<0.001; Table 1). The use of these products during the period after the ban was also higher among occasional menthol smokers compared to daily and non-menthol smokers before the ban (other tobacco products: 57% vs. 47% and 28%; p<0.001; flavoured tobacco products: 28% vs. 18% and 16%; p<0.001; e-cigarettes: 42% vs. 34% and 21%; p<0.001; cigars: 24% vs. 21% and 11%; p<0.001).

Of the 59 menthol smokers who predicted at baseline that they would switch to another flavoured tobacco product after the ban, 23 (39%) reported using flavoured alternative products at follow-up (occasional menthol smokers: 43%; daily menthol smokers: 29%).

Adjusted logistic regression models showed that relative to non-menthol cigarette smokers at baseline, both baseline daily and occasional menthol cigarette smokers were more likely to use flavoured cigar products (adjusted relative risk, RR=1.53, 95% confidence interval, CI=1.01, 2.31; adjusted RR=1.57, 95% CI=1.06, 2.30) after the ban, controlling for previous use of this product, other smoking characteristics, and demographic characteristics (Table 2). In addition, occasional menthol smokers were more likely to use other tobacco products (adjusted RR=1.25, 95% CI=1.02, 1.53) and flavoured other tobacco products (adjusted RR=1.56, 95% CI=1.09, 2.24) after the ban. The sensitivity analyses, in which all missing data at the one-year follow-up represented continued smokers (N=824), did not affect the results.

Use of Alternative and Flavoured Tobacco Products and Quitting

The likelihood of making a quit attempt and successfully quitting among baseline cigarette smokers was examined among 913 participants. Of the 513 who made a quit attempt, 82 (16%) out of 254 among those who used other tobacco products after the ban reported not smoking cigarettes since the beginning of the ban, compared to 89 (17%) of the 259 who did not use other tobacco products after the ban. Forty-nine (10%) of 124 who used flavoured other tobacco products after the ban reported abstinence after making a quit attempt, compared to 135 (26%) of the 389 who did not use flavoured products after the ban.

After controlling for demographics and tobacco use characteristics before and after the ban, no significant association was found between the post-ban use of any other tobacco products (adjusted RR=0.82, 95% CI=0.48, 1.41) or flavoured other tobacco products (adjusted

RR=1.13, 95% CI=0.59, 2.16) and making a cigarette smoking quit attempt. There were no interactions between menthol status and the post-ban use of either alternative or flavoured tobacco products on quitting attempt (data not shown).

DISCUSSION

This study is the first evaluation looking at alternate tobacco product use and flavour substitution after a real-world ban on menthol flavored cigarettes. This study showed that there was a substantial decrease in menthol cigarette use after the ban. However, an increase of the use of other tobacco products, flavoured tobacco products, and flavoured cigars after the ban was observed among baseline daily menthol smokers, while an increase in post-ban use of flavoured cigars was observed among occasional menthol smokers, even after controlling for past history of use of these products and other demographic and smoking characteristics. There was not a statistically significance increase in the use of e-cigarettes for either daily or occasional menthol smokers.

Pre-menthol ban daily menthol cigarette smokers were more likely to use flavoured cigar products after the ban and occasional menthol smokers were more likely to use other tobacco products (flavoured or unflavoured), flavoured tobacco products, and flavoured cigars compared to non-menthol smokers. This finding is consistent with previous analyses of bans on non-menthol flavoured tobacco in the US, which suggest that smokers do seek out substitutes, but only increase modestly the use of unflavoured products [16]. Flavour bans have also been associated with introduction of products that contain flavouring agents but are not labelled as such in the product descriptor [20]. Because the Ontario regulations for smokeless and shisha tobacco ban explicit flavour descriptors but not necessarily flavour additives—these products may still include flavours even if not identified as such. The use of flavoured tobacco products are associated with reduced odds of making a quit attempt [18, 21, 22]. Moreover, other research has shown associations between flavour descriptors and reduced harm perceptions [18]. Given these characteristics of flavoured tobacco products and users' perceptions, a concern is that menthol cigarette smokers may try flavoured tobacco products and be less interested in quitting these substitute products due to decreased harm perceptions [18]. However, many of these other flavored tobacco products carry the same risks as cigarette smoking (e.g., flavored cigars) and others have unknown long-term health effects (e.g., e-cigarettes). Furthermore, these individuals may continue to smoke cigarettes in addition to the other flavored tobacco products.

The lack of a statistically significant increase in the use of flavoured e-cigarettes suggests the ban was not associated with substantial numbers of menthol smokers using these products as a substitute for menthol tobacco. Similarly, few smokers identified interest in products such as menthol "flavour cards" (flavour cards are one of a series of products that can be used to add menthol and other flavours into into unflavored cigarettes). It appears that not all products with flavour or menthol will act a substitute for menthol tobacco in the same ways. However, there appeared to be minimal tobacco industry marketing effort that would inform smokers of these alternatives. Importantly, only 39% of menthol smokers who predicted they would use flavoured tobacco products as an adaptation to the ban at baseline in fact reported using flavoured products after the ban. This suggests that individuals may

not be accurately predicting what they expect to turn to as a substitute and may not be aware of the products that would feel like a true substitute. The difference between the occasional menthol smoker use of flavour products and daily menthol users suggests that there may be heterogeneity in reasons for use and that those who use menthol sporadically may be looking for a flavour or variety experience that could be substitutable, but those who only use menthol cigarette may not find other products suitable.

There is considerable debate regarding the potential benefits that may be realized by replacing cigarettes with a different tobacco product, such as cigars or e-cigarettes. While many would likely agree that switching from cigarettes to cigars would not represent a significant decrease in risk, there is less agreement about the change in risk associated with switching from cigarettes to e-cigarettes and future research is needed to determine the long-term effects of e-cigarette use. Therefore, the potential benefits that menthol smokers may gain from switching to a different tobacco product is likely dependent on the replacement product and future studies should continue to evaluate these individuals' tobacco use trajectories and long-term health outcomes.

This evaluation reflects the one-year impact of the ban on menthol flavoured cigarettes. Some menthol smokers were able to buy menthol cigarettes from regular retail stores [19], and enforcement agents may have allowed some stores to sell remaining stock of menthol cigarettes or menthol smokers may have been smoking their remaining supply of menthol cigarettes after the menthol ban. Longer-term evaluations should reflect less availability of menthol cigarettes at regular retail outlets. Untaxed tobacco from First Nations reserves is available readily in most areas in Ontario – among those who reported using a non-menthol tobacco brand at baseline in this sample, 18% reported smoking a First Nations or non-Canadian brand cigarette. Further research is necessary to investigate contraband use of menthol cigarettes after the ban. Furthermore, the study was conducted in Canada and speaks to the Canadian population, so these results may be informative to other jurisdictions but should be interpreted with caution given the differences in users and environments.

This study had several limitations. First, the study used a convenience sample recruited from two sources and there were differences in demographic characteristics and behaviours between the two groups (telephone and online samples). However, as a cohort design, the primary purpose of this study is to examine within-individual change. Another limitation is that all responses including quit attempts were self-reported and participants may not have been able to identify accurately the timing of activities that had occurred just before or after the implementation of the ban. Finally, the ban was implemented on New Year's Day, and many people attempt to quit at this time as part of New Year's resolutions and therefore some quit attempts may have been triggered in part by the time of year rather than because of the menthol ban implementation. The categorization of those who used menthol occasionally was a hetereogenous group and likely included those who were strongly attached to menthol and those who happened to smoke it occasionally, potentially biasing the results to the null. Furthermore, we cannot distinguish whether the use of the flavoured product after ban occurred prior to or after the quit attempt and cannot determine what flavoured products users would have used if had these products not been available.

IMPLICATIONS FOR TOBACCO REGULATION

Ontario's ban on the sale of menthol tobacco products was associated with an increase in flavoured other tobacco products and flavoured cigar products among those who were occasional menthol smokers prior to the ban. This paper suggests that a menthol ban is affected by the availability of other flavoured tobacco or nicotine products. Further research is necessary to examine the longer-term effects of the ban, and to more directly investigate the motives and motivations of menthol users who might have used other flavoured tobacco products as substitutions for menthol.

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Table 1.

Baseline characteristics of menthol cigarette smokers in Ontario, Canada, 2016 (N=913)

			No Menthol Use	Occasional Menthol Use	Daily Menthol Use
			n=306 (34%)	n=420 (46%)	n=187 (21%)
	Total N	%	%	%	%
Sex					
Female	527	58	50	60	65
Male	380	42	49	40	34
Other	6	1	1	1	1
Age					
16–29	143	16	4	24	16
30 and over	770	84	96	76	84
Education					
High school or less	267	29	41	22	27
More than high school	646	71	59	78	73
Ethnicity					
Non-white	153	17	11	20	18
White	760	83	89	80	82
Pattern of tobacco use					
Daily	824	90	95	82	100
Occasional	89	10	5	18	0
Cigarettes per day					
0 to 10	318	35	32	37	35
11 to 20	357	39	46	35	36
21 to 30	139	15	14	17	13
Over 30	99	11	7	11	16
Past year use of e-cigarettes					
No	536	43	82	56	59
Yes	377	57	18	44	41
Past year use of cigars					
No	661	72	86	64	70
Yes	252	28	14	36	30
Past year use of alternative tobacco products (e-cigarettes, cigars, smokeless, hookah, bidis, kreteks)					
No	420	46	71	29	43
Yes	493	54	29	71	57
Past year use of flavoured					
Other tobacco products					
No	478	52	78	34	51
Yes	435	48	22	66	49

Table 2.

Association of menthol cigarette smoking regularity prior to the ban with use of any other tobacco products, flavoured other tobacco products, flavoured e-cigarettes, and flavoured cigars, shortly after the implementation of a menthol ban in Ontario, Canada on January 1st, 2017, using multiple logistic regression. (n=913)

	Post-Ban Use of Other Tobacco Products		Post-Ban Use of Flavoured Other tobacco Products		Post-Ban Use of Flavoured E-Cigarettes		Post-Ban Use of Flavoured Cigars	
	Relative Rate (CI)	**P value**	**Relative Rate (CI)**	**P value**	**Relative Rate (CI)**	**P value**	**Relative Rate (CI)**	**P value**
Occasional Menthol Smoking before the Ban	1.25 (1.02, 1.53)	**0.028**	1.56 (1.09, 2.24)	**0.016**	1.36 (0.88, 2.11)	0.172	1.57 (1.06, 2.30)	**0.023**
Daily Menthol Smoking before the Ban	1.20 (0.97, 1.49)	0.096	1.17 (0.77, 1.78)	0.472	1.18 (0.72, 1.93)	0.519	1.53 (1.01, 2.31)	**0.042**

All analyses controlling for age, sex, education, ethnicity, pattern of tobacco use, pre-ban use of the respective post-ban tobacco product of interest, survey source, number of days between the baseline and follow-up survey