

ORIGINAL INVESTIGATION

Switching Between Menthol and Nonmenthol Cigarettes: Findings From the U.S. Cohort of the International Tobacco Control Four Country Survey

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ABSTRACT

Introduction: This article examines trends in switching between menthol and nonmenthol cigarettes, smoker characteristics associated with switching, and associations among switching, indicators of nicotine dependence, and quitting activity.

Methods: Participants were 5,932 U.S. adult smokers who were interviewed annually as part of the International Tobacco Control Four Country Survey between 2002 and 2011. Generalized estimating equations (GEEs) were used to examine the prevalence of menthol cigarette use and switching between menthol and nonmenthol cigarettes (among 3,118 smokers who participated in at least 2 consecutive surveys). We also evaluated characteristics associated with menthol cigarette use and associations among switching, indicators of nicotine dependence, and quitting activity using GEEs.

Results: Across the entire study period, 27% of smokers smoked menthol cigarettes; prevalence was highest among Blacks (79%), young adults (36%), and females (30%). Prevalence of switching between menthol and nonmenthol cigarettes was low (3% switched to menthol and 8% switched to nonmenthol), and switchers tended to revert back to their previous type. Switching types was not associated with indicators of nicotine dependence or quit attempts. However, those who switched cigarette brands within cigarette types were more likely to attempt to quit smoking.

Conclusions: While overall switching rates were low, the percentage who switched from menthol to nonmenthol was significantly higher than the percentage who switched from nonmenthol to menthol. An asymmetry was seen in patterns of switching such that reverting back to menthol was more common than reverting back to nonmenthol, particularly among Black smokers.

INTRODUCTION

The United States (U.S.) Food and Drug Administration (FDA), under the Family Smoking Prevention and Tobacco Control Act (FSPTCA, Public Law 111-31), now has the authority to regulate tobacco products, including the use of menthol in cigarettes. However, determining whether mentholated cigarettes pose a public health burden beyond that imposed by nonmenthol cigarettes is a multifaceted challenge, encompassing questions related to disproportionate use among subgroups of the population, smoking initiation among youth/young adults, and associations with nicotine dependence, smoking cessation, and various other health indicators (Gardiner & Clark, 2010; Lee & Glantz, 2011). Along with evaluating the impact of menthol

cigarette use per se, evaluating the extent to which smokers naturalistically switch between use of menthol and nonmenthol cigarettes may provide an indicator of their substitutability, which can inform FDA's activities addressing menthol.

Among smokers in the United States, menthol cigarette smoking is most prevalent among Blacks, females, and youth/young adults (Caraballo & Asman, 2011; Giovino et al., 2013; Lawrence et al., 2010), which is unsurprising given the tobacco industry's historical targeted marketing of menthol cigarettes to these groups (Cruz, Wright, & Crawford, 2010; Henriksen, Schleicher, Dauphinee, & Fortmann, 2012; Sutton & Robinson, 2004). Current data from the National Survey on Drug Use and Health (NSDUH) indicate that 88% of Black smokers, 40% of female smokers, and 57% of adolescent smokers smoke

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Switching between menthol and nonmenthol cigarettes

menthol cigarettes (Giovino et al., 2013). Regarding young smokers, rates of smoking nonmenthol cigarettes have recently declined among adolescents (i.e., 12–17 years old) and young adults (i.e., 18–25 years old), but rates of smoking menthol cigarettes have remained stagnant among adolescents and have increased among young adults during this time (i.e., 2004–2010, Giovino et al., 2013). Further, patterns of menthol/nonmenthol initiation and switching among young smokers have led to the suggestion that menthol cigarettes may serve as a starter product for smokers; Villanti, Giovino, Burns, and Abrams (2013) found that young adults are more likely to switch to nonmenthol cigarettes from menthol cigarettes, rather than the other way around, and Nonnemaker et al. (2013) showed that young adults who initiate smoking using menthol cigarettes are more likely to progress to becoming established smokers, and are more likely to have greater nicotine dependence, than young adults who initiate smoking using nonmenthol cigarettes.

Among adult smokers, however, the natural course and consequences of switching between menthol and nonmenthol cigarettes (hereafter referred to as cigarette type) have not yet been comprehensively evaluated, though some studies have modeled the hypothetical consequences of a ban on menthol cigarettes by considering the extent to which menthol and nonmenthol cigarettes may serve as substitutes for one another. Tauras et al. (2010) evaluated preference for menthol versus nonmenthol cigarettes among a large sample of adult smokers and found that smokers do not consider different cigarette types to be close substitutes, with nonmenthol cigarettes being less of a substitute for menthol cigarettes than menthol cigarettes are for nonmenthol cigarettes, and with Blacks and young adults being even less willing to substitute nonmenthol for menthol products. O'Connor, Bansal-Travers, Carter, and Cummings (2012) estimated demand elasticity for cigarette type and concluded that 35% of menthol smokers would try to quit smoking in response to such a ban, which is consistent with other hypothetical predictions of the consequences of a ban on menthol cigarettes (Hartman, 2011; Pearson, Abrams, Niaura, Richardson, & Vallone, 2012).

Importantly, patterns of cigarette type switching, and associations between switching and nicotine dependence/quitting behavior, may help to explain observed differences in dependence and cessation rates between menthol and nonmenthol smokers. That is, studies have consistently shown that menthol smokers are more likely to smoke their first cigarettes within 5 min of waking compared to nonmenthol smokers, indicating greater dependence; however, results tend to be mixed when comparing these groups on number of cigarettes smoked per day or scores on the Fagerström Test for Nicotine Dependence (Bover, Foulds, Steinberg, Richardson, & Marcella, 2008; Collins & Moolchan, 2006; Fagan et al., 2010; Okuyemi, Ebersole-Robinson, Nazir, & Ahluwalia, 2004; Okuyemi et al., 2003). Regarding smoking cessation rates, several longitudinal evaluations have found that menthol smokers have poorer cessation outcomes compared to nonmenthol smokers (Foulds et al., 2006; Harris et al., 2004; Okuyemi et al., 2003; Pletcher et al., 2006). Others have identified racial differences in quitting success, in which the inverse association between menthol smoking and cessation is only present among Blacks (Gandhi, Foulds, Steinberg, Lu, & Williams, 2009; Gundersen, Delnevo, & Wackowski, 2009; Stahre, Okuyemi, Joseph, & Fu, 2010). Taken together, the weight of all available evidence led the FDA to conclude that menthol in cigarettes is likely associated with

increased dependence and reduced smoking cessation success, with the latter being particularly likely among Blacks (Food and Drug Administration, 2013). Absent among all previous studies, however, is an evaluation of cigarette type switching as a predictor of nicotine dependence or quitting activity.

The purpose of this study was to evaluate the prevalence of cigarette type switching, and correlates and sequelae of switching, among a longitudinal sample of adult smokers in the United States. Specifically, the aims of this study were (a) to evaluate the prevalence and correlates of menthol cigarette use, (b) to evaluate the prevalence and correlates of switching between menthol and nonmenthol cigarettes, and (c) to evaluate associations between switching and various indicators of nicotine dependence and quitting activity using secondary data analyses.

METHODS

Participants

A sample of 5,932 adult smokers in the United States, who were interviewed as part of the International Tobacco Control Four Country Survey (ITC-4), participated in this study. The ITC-4 is a cohort survey, and eight survey waves have been conducted through 2011. Beginning in 2002, random digit dialing was used to recruit smokers (i.e., those who smoked at least 100 cigarettes in their lifetimes and reported smoking at least once in the past 30 days) from the United States, Canada, the United Kingdom, and Australia. Response rates in the United States ranged from 21% to 35%, which are comparable with other telephone surveys (ITC Wave 1 Technical Report, 2004; ITC Waves 2–8 Technical Report, 2011). Prior analyses have demonstrated that the demographic profiles of those who participated in this survey are similar to those who participated in national benchmark surveys (i.e., National Health Interview Survey, Current Population Survey, and Behavioural Risk Factor Surveillance Systems), suggesting that any nonresponse to this survey is comparable with that of benchmark surveys (ITC Wave 1 Technical Report, 2004). Data used in this study were collected from U.S. smokers between 2002 and 2011, and the sample consisted of 84% non-Hispanic White, 11% Black, and 4% Hispanic respondents. Roughly half of the sample was male (45%), and respondents ranged in age from 18 to 88 years.

Cohort members were recontacted approximately annually to complete follow-up surveys, and new participants were recruited each year, from the same sampling frame, to replace those lost to follow-up (~25% annually). Analyses used to evaluate cigarette type switching were necessarily limited to those who participated in two or more consecutive waves ($N = 3,118$), and analyses used to evaluate reverting back to previous cigarette type were necessarily limited to those who participated in three or more consecutive waves ($N = 1,896$). Previous analyses have shown that age, gender, and racial/ethnic groups vary with respect to retention (Thompson et al., 2006); therefore, multivariate models used in the present analyses were adjusted for these variables. Detailed descriptions of the ITC survey design, procedures, and limitations can be found elsewhere (Fong et al., 2006; ITC Wave 1 Technical Report, 2004; ITC Waves 2–8 Technical Report, 2011; Thompson et al., 2006).

The study protocol was approved by the institutional review boards/research ethics boards of the University of Waterloo (Canada), Roswell Park Cancer Institute (United States), University of Strathclyde (United Kingdom), University of Stirling (United Kingdom), The Open University (United Kingdom), and The Cancer Council Victoria (Australia).

Measures

Cigarette Type: Menthol/Nonmenthol

During each survey wave, smokers were asked, “Do you have a regular brand and variety of cigarettes?” Those who responded affirmatively were asked to provide the exact brand of cigarette usually smoked. During surveys conducted between 2007 and 2009 (i.e., Waves 5–7), interviewers were trained to probe for specific brand/variety information (including cigarette strength, length, and flavor), and each smoker’s response to this probing was used to classify his/her cigarette type as menthol or nonmenthol. Between 2002 and 2006 and in 2010 (i.e., Waves 1–4 and 8), smokers were directly asked if their usual brand is menthol or plain.

Cross-Type and Within-Type Switching

During each pair of waves, respondents were classified as having experienced a “cross-type” switch (i.e., switch from menthol to nonmenthol or from nonmenthol to menthol) if cigarette type (regardless of brand) differed between consecutive waves. Respondents were classified as having experienced a “within-type” switch if cigarette type remained the same but cigarette brand differed between consecutive waves.

Reasons for Switching

During each survey wave, respondents who reported that they have a regular brand of cigarettes were asked “About how long have you been smoking [regular brand]?” Those who indicated that they have been smoking their brand for less than 1 year were asked the following, “In choosing [regular brand], was part of your decision to smoke this brand based on any of the following...The tar and nicotine levels for the brand? It may not be as bad for your health? As a way to help you quit? The price? How they taste?” Respondents could endorse any number of reasons.

Smoking Behavior

During each survey wave, respondents reported the average number of cigarettes smoked each day, along with how soon after waking they usually smoke their first cigarettes. When assessed as outcomes, the cigarettes per day variable was square root transformed, and the time to first cigarette after waking variable was natural logarithm transformed, to more closely approximate normality. Nicotine dependence, measured with the heaviness of smoking index (HSI; [Heatherton, Kozlowski, Frecker, Rickert, & Robinson, 1989](#)), was assessed as a correlate of menthol cigarette use (assessed concurrent with use), a correlate of cigarette type switching (i.e., assessed at the wave prior to the wave when switching was detected), and as an outcome following switching (i.e., assessed at the wave when switching was detected).

During each follow-up interview, respondents who were smokers at previous interview were asked, “Have you made any attempts to stop smoking since we last talked with you?” Making a quit attempt between waves was assessed as an

outcome in two ways: (a) during the same interval when switching was assessed (“concurrent attempt to quit,” e.g., cigarette type assessed at Wave 1, cigarette type assessed at Wave 2 [switching between Wave 1 and Wave 2 detected at Wave 2], attempt to quit assessed at Wave 2 [recalled since Wave 1]) and (b) during the interval immediately following the assessment of switching (“subsequent attempt to quit,” e.g., cigarette type assessed at Wave 1, cigarette type assessed at Wave 2 [switching between Wave 1 and Wave 2 detected at Wave 2], attempt to quit assessed at Wave 3 [recalled since Wave 2]).

Covariates

The following demographic characteristics were included in analyses: gender, age group (i.e., 18–24, 25–39, 40–54, and 55+), race/ethnicity (i.e., non-Hispanic White, Black, and Hispanic), level of education (i.e., “low” if completed high school or less, “moderate” if completed community college/trade/technical school/some university [no degree], or “high” if completed university or postgraduate education), and annual household income (i.e., “low” if less than \$30,000, “moderate” if \$30,000–\$59,999, or “high” if \$60,000 or more; those who did not provide this information [~5%] were included in adjusted analyses as a valid unknown group). Intention to quit smoking was also evaluated as a correlate of menthol cigarette use and of switching, using a dichotomous variable created with the question, “Are you planning to quit smoking within the next month, within the next six months, sometime in the future—beyond six months, or are you not planning to quit?” All ITC questionnaires can be found at www.itcproject.org. Multivariate analyses were also adjusted for time in sample (i.e., the number of waves a respondent participated in the ITC survey) and instrument change (i.e., a dummy variable indicating whether participants provided cigarette type information as a result of being directly asked [i.e., Waves 1–4 and 8] or as a result of interviewer probing [i.e., Waves 5–7]).

Statistical Analyses

Menthol cigarette smoking (compared to nonmenthol cigarette smoking) was assessed as a function of demographic and smoking-related characteristics using generalized estimating equations (GEEs), in which an exchangeable within-person correlation matrix and a robust variance estimator were specified ([Hardin & Hilbe, 2002](#); [Liang & Zeger, 1986](#)). GEEs allowed data from the full study period to be used while accounting for repeated assessments of the same individuals across survey waves. Analyses were stratified by race/ethnicity and were adjusted for gender, age group, education level, income level, HSI index, intention to quit smoking cigarettes (all measured at the same time as the outcome), time in sample, and instrument change.

Among smokers who participated in at least two consecutive survey waves, the proportion who experienced a cross-type switch (i.e., switched from nonmenthol to menthol or from menthol to nonmenthol) was evaluated, separately by gender and by race/ethnicity (e.g., cigarette type assessed at Wave 1, cigarette type assessed at Wave 2, switching between Wave 1 and Wave 2 was detected at Wave 2). Among smokers who participated in at least three consecutive waves, the proportion who smoked menthol and the proportion who smoked nonmenthol at “third” wave was evaluated separately for each initial cross-type switch group (also stratified by gender and race/ethnicity,

Switching between menthol and nonmenthol cigarettes

e.g., cigarette type assessed at Wave 1, cigarette type assessed at Wave 2, cigarette type assessed at Wave 3, switching was detected between Wave 2 and Wave 3 and was stratified by the switching that was detected between Wave 1 and Wave 2).

Among menthol cigarette smokers at a given wave, switching to nonmenthol cigarettes at the following wave was assessed as a function of demographic and smoking-related characteristics (i.e., HSI index and intention to quit smoking), which were assessed at the wave prior to the wave when switching was detected, and among nonmenthol smokers at a given wave, switching to menthol cigarettes at the following wave was also assessed as a function of the same demographic and smoking-related characteristics (i.e., two separate models were used to evaluate cross-type switching). Among those who did not switch across cigarette types between waves, the likelihood of switching brands within cigarette type was also assessed as a function of the same characteristics (i.e., one model was used to evaluate within-type switching). Among respondents who switched across or within cigarette types between waves, the percentages of those who endorsed various reasons for switching were determined.

Respondents' number of cigarettes smoked per day (square root transformed), time to first cigarette after waking (natural logarithm transformed), HSI index, and intention to quit smoking were each evaluated as outcomes of cross-type switching (compared to no cross-type switching) and within-type switching (compared to no within-type switching) using GEE modeling. Each outcome was evaluated immediately following the interval in which switching was detected, and all analyses were adjusted for gender, race/ethnicity, age, education level, income level, time in sample, instrument change, and corresponding dependence measure (i.e., number of cigarettes smoked per day, time to first cigarette after waking, and HSI index; HSI index was also included as an adjustment variable in the intention to quit analysis) assessed at previous wave. Making an attempt to quit smoking was also evaluated as an outcome of cross-type and within-type switching using GEEs, assessed both concurrent with, and subsequent to, the interval in which switching was assessed. These analyses were adjusted for HSI index assessed prior to switching, along with the same covariates as above. All analyses were conducted using Stata Version 11 (StataCorp, 2009).

RESULTS

Characteristics of Menthol Smokers

When averaged across the entire study period, 27% of participants smoked menthol cigarettes. Table 1 shows the proportions of menthol smokers by demographic and smoking-related characteristics, stratified by race/ethnicity. Blacks, females, and those younger in age were more likely to smoke menthol cigarettes than were their counterparts who were smoking nonmenthol cigarettes.

Switching and Reverting Back Between Menthol and Nonmenthol Cigarettes

As shown in Table 2, switching between menthol and nonmenthol cigarette types was uncommon, with only 3% of nonmenthol smokers switching from nonmenthol to menthol

cigarettes and 8% of menthol smokers switching to nonmenthol cigarettes (results based on those who participated in two or more waves). The majority of respondents endorsed "price" (66%) and "taste" (68%) as reasons for switching (data not shown). Among those who switched from menthol to nonmenthol cigarettes, about two thirds (65%) reverted back to menthol cigarettes at the following survey wave (results based on those who participated in three or more waves). Among those who switched from nonmenthol to menthol cigarettes, about one third (31%) reverted back to nonmenthol cigarettes at the following survey wave. Patterns were similar for males and females. Among Blacks who switched from menthol to nonmenthol cigarettes, 85% reverted back to menthol cigarettes at the following survey wave (compared to 67% reversion back among whites). Among Blacks who switched from nonmenthol to menthol cigarettes, about one third (36%) reverted back to nonmenthol cigarettes at the following survey wave (compared to 24% reversion back among whites).

Correlates of Switching

Table 3 examines correlates of switching between different cigarette types (i.e., menthol and nonmenthol) and within cigarette types to different brands. Among those who initially reported smoking menthol cigarettes, Whites, those with lower incomes, and those with lower HSI scores were more likely to switch to nonmenthol cigarettes than were their counterparts. Among those who initially smoked nonmenthol cigarettes, Blacks and Hispanics, those younger in age, and those with lower HSI scores were more likely to switch to menthol cigarettes than were their counterparts.

Among those who did not switch across cigarette types, females, those younger in age, those with lower incomes, and those with stronger intentions to stop smoking were more likely to report switching brands within type than were their counterparts.

Associations Between Switching and Indicators of Nicotine Dependence and Quitting Activity

Those who switched between menthol and nonmenthol cigarettes were similar to those who did not switch across cigarette types in terms of their ensuing cigarettes smoked per day, time to first cigarette after waking, HSI index, intention to quit, and making an attempt to quit (both concurrent with, and subsequent to, the interval in which switching was assessed, Table 4).

However, among those who did not switch across cigarette types, those who switched brands within types were more likely to intend to quit, to make a concurrent or subsequent attempt to quit, and were more likely to have a lower HSI score (postswitch) than were those who did not switch brands or type of cigarette.

DISCUSSION

Menthol cigarettes make up slightly more than one quarter of the cigarette market in the United States today. Our data show that, when averaged across the entire study period (2002–2011), approximately 20% of non-Hispanic White smokers smoked menthol cigarettes, while nearly 80% of Black smokers and 34% of Hispanic smokers smoked menthol cigarettes.

Table 1. Correlates of Smoking Menthol Cigarettes Stratified by Race/Ethnicity

Correlates	All ^a , N = 5,932 (2.7% menthol)			Non-Hispanic White, N = 5,026 (2.1% menthol)			Black, N = 657 (7.9% menthol)			Hispanic, N = 249 (3.4% menthol)		
	N	% menthol	OR (95% CI)	N	% menthol	OR (95% CI)	N	% menthol	OR (95% CI)	N	% menthol	OR (95% CI)
Race/ethnicity												
Non-Hispanic White	5,026	21	Reference									
Black	657	79	16.82 (13.71, 20.62)									
Hispanic	249	34	1.77 (1.34, 2.33)									
Gender												
Female	3,271	30	Reference	2,783	24	Reference	359	81	Reference	139	39	Reference
Male	2,661	23	0.63 (0.55, 0.71)	2,243	17	0.64 (0.56, 0.74)	298	77	0.63 (0.42, 0.92)	120	28	0.62 (0.35, 1.10)
Age (years)												
18-24	635	36	Reference	515	28	Reference	68	93	Reference	52	45	Reference
25-39	1,490	24	0.50 (0.40, 0.61)	1,195	15	0.47 (0.36, 0.60)	193	85	0.58 (0.24, 1.37)	102	28	0.48 (0.22, 1.04)
40-54	2,211	31	0.72 (0.59, 0.88)	1,876	24	0.72 (0.57, 0.90)	264	83	0.66 (0.28, 1.54)	71	36	0.61 (0.28, 1.32)
55+	1,596	22	0.51 (0.40, 0.63)	1,440	19	0.56 (0.44, 0.71)	132	58	0.18 (0.08, 0.44)	24	34	0.49 (0.17, 1.45)
Education												
Low	2,710	27	Reference	2,241	20	Reference	333	81	Reference	136	38	Reference
Moderate	2,294	28	1.01 (0.90, 1.27)	1,954	22	1.10 (0.90, 1.34)	256	80	0.97 (0.64, 1.46)	84	32	0.74 (0.41, 1.34)
High	980	23	0.99 (0.82, 1.18)	875	21	1.07 (0.88, 1.30)	72	64	0.46 (0.24, 0.88)	33	24	0.52 (0.21, 1.27)
Income												
Low	2,289	27	Reference	1,841	18	Reference	346	79	Reference	102	34	Reference
Moderate	2,089	26	1.13 (1.01, 1.27)	1,814	22	1.08 (0.97, 1.20)	193	77	1.49 (0.90, 2.46)	82	37	1.15 (0.68, 1.94)
High	1,493	27	1.18 (1.04, 1.34)	1,336	23	1.16 (1.02, 1.32)	94	84	1.09 (0.65, 1.85)	63	32	1.37 (0.71, 2.65)
Not provided	412	28	1.00 (0.83, 1.19)	341	21	0.93 (0.76, 1.14)	52	75	0.97 (0.59, 1.59)	19	36	1.79 (0.72, 4.44)
HSI index												
0-1	1,620	30	Reference	1,222	21	Reference	266	79	Reference	132	25	Reference
2-3	3,307	27	1.01 (0.93, 1.10)	2,831	21	1.01 (0.92, 1.10)	367	79	0.82 (0.63, 1.08)	109	39	1.81 (1.25, 2.61)
4-6	2,183	24	1.09 (0.99, 1.21)	2,005	21	1.10 (0.98, 1.22)	135	79	0.82 (0.56, 1.21)	43	49	1.81 (0.98, 3.37)
Intend to quit												
No	2,023	26	Reference	1,792	23	Reference	155	75	Reference	76	35	Reference
Yes	4,698	27	0.96 (0.90, 1.02)	3,932	20	0.96 (0.91, 1.02)	565	80	1.20 (0.81, 1.76)	201	34	0.83 (0.57, 1.20)

Note. OR = odds ratio; CI = confidence interval; HSI = Heaviness of Smoking Index. Analyses were adjusted for gender, age group, education, income, HSI, intention to quit, time in sample, and instrument change. Generalized estimating equation modeling approach was used; N indicates number of unique individuals *within rows* (therefore, sum of N across rows within variables will not equal total N inasmuch as individuals are present in multiple levels of a variable at different timepoints); row percentages are based on corresponding row N. ^aAdditionally adjusted for race/ethnicity.

Table 2. Likelihood of Switching Between Menthol and Nonmenthol Cigarettes Stratified by Gender and Race/Ethnicity

	Gender						Race/ethnicity													
	All		Female		Male		Non-Hispanic White		Black		Hispanic									
	Overall $N_{ind} = 3,118$ (8% switch)		Overall $N_{ind} = 1,802$ (9% switch)		Overall $N_{ind} = 1,316$ (8% switch)		Overall $N_{ind} = 2,724$ (7% switch)		Overall $N_{ind} = 293$ (17% switch)		Overall $N_{ind} = 101$ (19% switch)									
Type at following wave		Type at following wave		Type at following wave		Type at following wave		Type at following wave		Type at following wave										
N_{obs}	%	Nonmenthol	Menthol	N_{obs}	%	Nonmenthol	Menthol	N_{obs}	%	Nonmenthol	Menthol	N_{obs}	%	Nonmenthol	Menthol					
Initial type																				
Nonmenthol	8,848 ^a	73 ^a	98%	3%	4,866 ^a	70 ^a	98%	3%	3,982 ^a	77 ^a	98%	2%	261 ^a	22 ^a	85%	15%	300 ^a	66 ^a	93%	6%
Menthol	3,274 ^a	27 ^a	8%	92%	2,059 ^a	30 ^a	8%	92%	1,215 ^a	23 ^a	8%	8%	906 ^a	78 ^a	8%	92%	155 ^a	34 ^a	16%	83%
Initial switch																				
Menthol → Menthol	1,602	24	7%	93%	1,051	27	7%	93%	551	20	7%	93%	376	70	6%	94%	64	32	9%	91%
Non → Non	4,812	72	99%	1%	2,730	69	98%	2%	2,082	76	99%	1%	111	21	96%	4%	117	58	93%	7%
Menthol → Non	142	2	35%	65%	92	2	35%	67%	50	2	33%	67%	31	6	15%	85%	12	6	75%	25%
Non → Menthol	126	2	31%	69%	74	2	32%	68%	52	2	28%	72%	22	4	36%	64%	8	4	75%	25%

Note. Overall N given for individuals who participated in two or more waves, and corresponding percentages indicate proportion of these individuals who ever switched; all other N are given for observations, and corresponding proportions are based on these numbers of observations.

^aStrictly cross-sectional.

Table 3. Correlates of Switching Across Cigarette Types (i.e., Menthol and Nonmenthol) and Within Cigarette Type

Correlates	Menthol to nonmenthol ^a			Nonmenthol to menthol ^b			Within-type switch ^c		
	N = 857 (8% switch)			N = 2,297 (3% switch)			N = 2,707 (12% switch)		
	N	% switch	OR (95% CI)	N	% switch	OR (95% CI)	N	% switch	OR (95% CI)
Race/ethnicity									
Non-Hispanic White	590	8	Reference	2,160	2	Reference	2,388	13	Reference
Black	226	7	0.57 (0.33, 0.99)	69	18	11.93 (6.30, 22.58)	233	8	0.62 (0.39, 1.00)
Hispanic	41	16	1.94 (0.90, 4.17)	68	6	3.16 (1.37, 7.29)	86	12	0.94 (0.53, 1.68)
Gender									
Female	554	8	Reference	1,284	3	Reference	1,584	14	Reference
Male	303	8	1.11 (0.74, 1.67)	1013	2	0.88 (0.59, 1.32)	1,123	11	0.72 (0.59, 0.87)
Age (years)									
18–24	81	8	Reference	150	5	Reference	197	20	Reference
25–39	153	11	1.19 (0.54, 2.60)	513	2	0.28 (0.13, 0.59)	654	15	0.69 (0.47, 1.01)
40–54	393	7	0.87 (0.41, 1.85)	867	3	0.47 (0.23, 0.97)	1,083	11	0.58 (0.40, 0.83)
55+	230	9	1.04 (0.47, 2.30)	767	2	0.26 (0.12, 0.55)	863	11	0.51 (0.35, 0.75)
Education									
Low	369	9	Reference	971	3	Reference	1,143	13	Reference
Moderate	355	7	0.86 (0.57, 1.30)	915	2	0.79 (0.52, 1.20)	1,082	14	1.12 (0.91, 1.37)
High	138	7	0.71 (0.38, 1.32)	432	2	0.73 (0.39, 1.38)	503	9	0.79 (0.60, 1.06)
Income									
Low	313	10	Reference	859	3	Reference	986	14	Reference
Moderate	313	8	0.72 (0.45, 1.14)	854	3	0.90 (0.58, 1.40)	1,006	12	0.82 (0.67, 1.01)
High	231	5	0.39 (0.22, 0.71)	589	1	0.50 (0.26, 0.96)	718	10	0.71 (0.55, 0.92)
Not provided	59	11	1.03 (0.48, 2.19)	141	3	0.92 (0.40, 2.12)	168	14	0.89 (0.56, 1.41)
HSI index									
0–1	245	13	Reference	572	4	Reference	674	12	Reference
2–3	482	7	0.44 (0.29, 0.68)	1292	3	0.86 (0.53, 1.37)	1,514	12	1.00 (0.78, 1.28)
4–6	288	7	0.44 (0.27, 0.73)	937	1	0.48 (0.27, 0.86)	1,058	13	1.08 (0.83, 1.40)
Intend to quit									
No	285	7	Reference	863	2	Reference	982	10	Reference
Yes	684	9	1.42 (0.94, 2.15)	1772	3	0.84 (0.55, 1.28)	2,083	13	1.31 (1.08, 1.60)

Note. OR = odds ratio; CI = confidence interval; HSI = heaviness of smoking index. Analyses were adjusted for race/ethnicity, gender, age group, education, income, HSI, intention to quit, time in sample, and instrument change. All correlates were measured prior to the assessment of the outcome. Generalized estimating equation modeling approach was used; *N* indicates number of unique individuals *within rows* (therefore, sum of *N* across rows within variables will not equal total *N* inasmuch as individuals are present in multiple levels of a variable at different timepoints); row percentages are based on corresponding row *N*.

^aAmong those who smoked menthol cigarettes at previous wave, 8% switched to nonmenthol.

^bAmong those who smoked nonmenthol cigarettes at previous wave, 3% switched to menthol.

^cAmong those who did not switch across cigarette types between waves, 12% switched within type; additionally adjusted for type.

Table 4. Associations Between Cross-Type (i.e., Menthol/Nonmenthol) and Within-Type Switching and Indicators of Nicotine Dependence and Quitting Activity

Switching	N	Cigarettes/day ^{ab} (M = 4.00 cigarettes)			Time to first cigarette ^{ac} (M = 3.00 min)			HSI index ^a (M = 2.74)			Attempt to quit ^d								
		M	β	(95% CI)	M	β	(95% CI)	M	β	(95% CI)	%	OR	(95% CI)	%	OR	(95% CI)			
Cross-type																			
No cross-type switch	3,031	4.02	Reference	Reference	3.00	Reference	2.76	Reference	68	Reference	32	Reference	39	Reference					
Switch to nonmenthol	139	3.31	-0.15	(-0.42, 0.12)	3.27	0.20	(-0.02, 0.41)	2.17	-0.19	(-0.45, 0.06)	77	1.35	(0.95, 1.92)	39	1.09	(0.78, 1.52)	42	1.03	(0.66, 1.60)
Switch to menthol	123	3.57	-0.01	(-0.29, 0.28)	2.97	0.07	(-0.15, 0.29)	2.51	-0.05	(-0.31, 0.22)	66	0.88	(0.61, 1.25)	40	1.12	(0.80, 1.57)	41	0.91	(0.57, 1.44)
Within type^e																			
No switch	2,574	4.02	Reference	Reference	2.99	Reference	2.76	Reference	68	Reference	31	Reference	38	Reference					
Within-type switch	575	3.94	-0.10	(-0.22, 0.03)	3.02	0.08	(-0.03, 0.19)	2.68	-0.20	(-0.32, -0.08)	75	1.22	(1.04, 1.44)	41	1.47	(1.25, 1.73)	46	1.31	(1.04, 1.64)

Note. HSI = heaviness of smoking index; OR = odds ratio; CI = confidence interval. All outcomes were assessed at the wave immediately following the interval in which switching was assessed, with the exception of concurrent attempt to quit; generalized estimating equation modeling approach was used; N indicates number of unique individuals within rows (therefore, sum of N across rows will not equal cohort N); row means and percentages are based on corresponding row N; analyses were adjusted for race/ethnicity, gender, age group, education, income, time in sample, and instrument change.

^aAdditionally adjusted for corresponding dependence measure assessed at previous wave.

^bSquare root transformed.

^cNatural logarithm transformed.

^dAdditionally adjusted for HSI index assessed prior to switch/no switch.

^eAdditionally adjusted for cigarette type.

Menthol cigarette smoking was more common among young adults and females than among older adults and males. The relatively high prevalence of menthol cigarette smoking among Blacks, women, and youth/young adults in our sample is consistent with findings from previous studies (Caraballo & Asman, 2011; Giovino et al., 2013; Lawrence et al., 2010), although our estimates are generally lower than those produced from the most recent waves of NSDUH data (Giovino et al., 2013). While many smokers in our study did report switching brands of cigarettes, few of those smoking menthol cigarettes switched to nonmenthol cigarettes and vice versa.

A key finding here is the asymmetry in the maintenance of switching. Menthol is a “stickier” product: When nonmenthol smokers switch to menthol, they tend to stay there (69% are still smoking menthol at next wave), but when menthol smokers switch to nonmenthol, only 35% of them are still smoking nonmenthol at next wave. This pattern was found despite the low absolute rates of cross-type switching and though a higher percentage of smokers switched to nonmenthol than to menthol (which could be an artifact of the fact that there are more nonmenthol varieties on the market to which to switch).

One can think of this asymmetry between menthol and nonmenthol as an equilibrium equation—the equilibrium favors switches to menthol at a ratio of 2:1 ($69\%/35\% = 1.97$). Among Blacks, the equilibrium is even more skewed toward menthol: $64\%/15\% = 4.27$. Further, while Whites and Blacks who switch from nonmenthol to menthol have similar rates of staying with menthol at the following survey wave (76% and 64%, respectively), Whites who switch from menthol to nonmenthol are twice as likely to stay with nonmenthol at the following survey wave (33%) than are Blacks who switch from menthol to nonmenthol (only 15% stay with nonmenthol at the following survey wave). These findings are consistent with Tauras et al.’s (2010) evaluation of menthol/nonmenthol substitutability, in which Blacks were found to be particularly unwilling to substitute their menthol products with nonmenthol products.

Our finding that menthol smokers are more likely to stick with menthol cigarettes than nonmenthol smokers are to stick with nonmenthol cigarettes could be due, in part, to the marketing of menthol cigarettes, particularly to Blacks. Several reviews of tobacco industry documents have shown that tobacco companies have conducted market research specifically among Blacks to better target their marketing strategies to this group (Cruz et al., 2010; Gardiner, 2004; Johnson et al., 2008). Regardless of whether menthol is associated with cessation rates or dependence, the observation that menthol smokers are more type-loyal than nonmenthol smokers is important when trying to understand the public health impact of menthol cigarettes.

In addition to our findings on cigarette type switching, we found that, although the majority of those who switched cigarette brands but did not switch cigarette type reported that they did so mainly because of the price and/or taste of their current brands, and fewer than 25% reported that they switched to help them quit, those who switched were more likely to have intentions to quit smoking (both prior to, and following, switching) and were more likely to actually make an attempt to quit smoking (assessed after switching) than were those who did not switch. This could suggest that the act of switching brands itself is an indicator of dissatisfaction with smoking, which might be an early indicator of cessation. More research is needed to examine this possibility.

The findings from this study should be interpreted with some caution for several reasons. First, our results are based only upon smokers who participated in our surveys. As noted previously, the survey response rates ranged from 21% to 35% at different years, with 25% of participants lost to follow-up in subsequent survey waves. We do not believe nonresponse to our survey adversely impacted our estimates of smoker characteristics, including use of menthol cigarettes, as our findings with regard to respondent characteristics are similar to national benchmark surveys (ITC Wave 1 Technical Report, 2004). Respondent attrition is a concern that we have attempted to address by adjusting for characteristics that varied with respect to retention in the cohort. A second concern is the relatively low rates of switching between menthol and nonmenthol cigarette types observed, which necessarily impacts the statistical power to evaluate correlates of switching. Third, all of our data are based on cigarette smoking assessed once each year, which necessarily excludes switching that may have occurred within a year. Thus, our estimates of switching are likely underestimates of the actual amount of switching occurring either between or within cigarette types. Also, since our data were self-reported, it is possible that there was some underreporting of menthol cigarette use in this study. Lastly, although the descriptor ban on cigarette packs occurred during the course of our study period, prior research in the United Kingdom and Australia has shown that the removal of descriptors had little impact on smokers’ perceptions of light/low-tar cigarettes (Borland et al., 2008). Since the descriptor ban did not have an impact on measures that would be more directly related to the elimination of descriptors, it is unlikely to have had an impact on the measures that are the focus of this article.

In sum, the current findings indicate little naturalistic switching (3%–8% per year) among menthol and nonmenthol cigarettes in a national cohort of smokers over 8 years. Among those who smoked menthol cigarettes, Whites, those with lower incomes, and those with lower HSI scores were more likely to switch to nonmenthol cigarettes than were their counterparts. There is also an asymmetry in switching such that movement toward menthol is more likely to be maintained than movement away from menthol, particularly among Black smokers.

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DECLARATION OF INTERESTS

RJO has served as a consultant to the Tobacco Constituents Subcommittee of the Tobacco Products Scientific Advisory Committee (TPSAC) of the U.S. Food and Drug Administration. RJO, via a subcontract from Research Triangle Institute, reviewed confidential and trade secret documents on menthol cigarettes submitted by tobacco manufacturers pursuant to an FDA request and presented this information in closed session to TPSAC (February 10, 2011); this information was not used in any way in the current study. KMC has received grant support from Pfizer Pharmaceutical to develop hospital-based tobacco cessation services and has served as a paid expert witness in litigation against the cigarette industry, which has on occasion included testimony about the role of menthol and other cigarette additives in cigarette design and smoking behavior. The views and opinions expressed in this manuscript are those of the authors only and do not necessarily represent the views, official policy, or position of the U.S. Department of Health and Human Services or any of its affiliated institutions or agencies.

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