Short Communication

Binge drinking and marijuana use among menthol and non-menthol adolescent smokers: Findings from the Youth Smoking Survey

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ABSTRACT

Introduction: Research has shown that smoking menthol cigarettes induces smoking initiation and hinders cessation efforts especially among youth. The objective of this paper is to examine the association between menthol cigarette smoking and substance use among adolescent students in Canada.

Methods: A nationally representative cross-sectional sample of 4466 Canadian students in grades 7 to 12 from the 2010–2011 Youth Smoking Survey is analyzed. A bivariate probit model is used jointly to examine the association of menthol smoking status with binge drinking and marijuana use.

Results: 32% of the current smokers in grades 7 to 12 smoke mentholated cigarettes, 73% are binge drinkers and 79% use marijuana. Results of the bivariate probit regression analysis, controlling for other covariates, show statistically significant differences in the likelihood of binge drinking and marijuana use between menthol and non-menthol smokers. Menthol cigarette smokers are 6% (ME = 0.06, 95% CI = 0.03–0.09) more likely to binge drink and 7% (ME = 0.07, 95% CI = 0.05–0.10) more likely to use marijuana.

Conclusion: Smoking menthol cigarettes is associated with a higher likelihood of binge drinking and marijuana use among Canadian adolescents. Banning menthol in cigarettes may be beneficial to public health.

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1. Introduction

Substantial evidence exists on the adverse health effects of substance use (Centers for Disease Control and Prevention, 2008; Hall & Degenhardt, 2009; Stickley, Koyanagi, Koposov, Razvodovsky, & Ruchkin, 2013; Yanbaeva, Dentener, Creutzberg, Wesseling, & Wouters, 2007). Smoking is the leading cause of premature and preventable mortality with more than six million deaths every year (WHO, 2011). Studies have shown that binge drinking is positively associated with several health-risk behaviors among adolescents such as engaging in violence, sexual risk behaviors, and illicit drug use (Stickley et al., 2013). In addition, binge drinking is positively associated with the three major causes of death among youth: suicide, homicide and unintentional injury (National Center for Injury Prevention and Control, 2007). Similarly, it is well documented that marijuana use is associated with several adverse outcomes such as cardiovascular disease, impaired respiratory function, development of a dependence syndrome, increased risk of motor vehicle accidents, and the negative effects of regular use on adolescent mental health (Hall & Degenhardt, 2009).

There is a growing concern that menthol smoking may stimulate other health risk behavior (Kong, Singh, Camenga, Cavallo, & Krishnan-Sarin, 2013; Winhusen et al., 2013). Tobacco companies have continually exploited the sensory characteristics of menthol cigarettes in order to reinforce smoking behavior and addiction among youth and beginning smokers (Anderson, 2011; Lee & Glantz, 2011). Studies have shown that menthol cigarettes may attract beginning smokers and young people because of a preference for lighter taste (Connolly, Behm, Osaki, & Wayne, 2010). There is also evidence that the association between menthol cigarette smoking and difficulty with quitting is stronger among younger smokers, and that smoking menthol cigarettes is significantly associated with indicators of nicotine dependence (Hersey et al., 2006; Wayne & Connolly, 2004).

While marijuana use and binge drinking are strongly related to smoking among youth (e.g., Choquet, Morin, Hassler, & Ledoux, 2004; Höhne et al., 2013; Weitzman & Chen, 2005), little is known as to whether menthol smokers are more likely to use marijuana and to binge drink compared to non-menthol smokers. A recent systematic review (Ramo, Liu, & Prochaska, 2012) on the co-use of tobacco and marijuana among adolescents and young adults finds a statistically significant association in 85% of the covered studies. Similar strong evidence exists on the co-occurrence of smoking and binge drinking in

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adolescence and young adults (Chung & Chun, 2010; Johnson, Boles, Vaughan, & Kleber, 2000; Weitzman & Chen, 2005).

Several studies have examined the clustering of smoking with other health-risk behaviors, but few studies have examined the association between smoking menthol cigarettes, marijuana use and binge drinking among youth. For example, in a recent study of 837 high school students from the U.S. State of Connecticut, Kong et al. (2013) find that smoking menthol cigarettes is associated with life-time marijuana use. Thus, the objective of this paper is to examine the association between menthol cigarette smoking and two public health risk factors; binge drinking and marijuana use among adolescent students in Canada. To the best of our knowledge, no previous study has examined the dual association of menthol smoking and binge drinking among adolescents. Using a nationally representative sample of adolescent students in Canada, this paper adds to the sparse literature on the use of menthol cigarette with either marijuana or binge drinking.

2. Materials and methods

2.1. Data

To achieve the objective of this paper, a nationally representative sample of adolescent Canadian students in grades 7 to 12 from the 2010–2011 Youth Smoking Survey (YSS) is used. Briefly, the YSS is a cross-sectional, biennial, classroom-based survey that focuses on the attitudes and behavior of Canadian youth in grades 6 to 12, with respect to tobacco use and substance abuse. The total response rate for the 2010–2011 YSS at the school-board level is 82%, 56% of schools and 73% of students. All ethical approvals related to the survey are granted from the University of Waterloo (the principal coordinator of the YSS) and Health Canada. A more detailed description of the YSS can be found elsewhere (University of Waterloo, 2011).

2.2. Outcome variables

The outcome variables of interest in this paper are binge drinking and marijuana use. Binge drinking is defined as having five or more drinks on one occasion at least once a month in the past year and marijuana use is defined by students who reported using marijuana in the last 12 months.

2.3. Independent variables

The primary predictor of interest, menthol cigarette smoking status, is determined by a student's response to the following question "In the last 30 days, did you use any of the following flavored tobacco products? Menthol cigarette". Students who reported smoking menthol cigarette in the last 30 days prior to the interview of the survey are classified as menthol cigarette smokers; otherwise they are classified as non-menthol smokers. The multivariate analysis also controls for other covariates such as school grade level (12, 11, 10, 9 and 8 with grade 7 as the reference category); gender (1 = male, 0 = female); peer effect, a dichotomous measure (1 = student has at least a friend that smokes, 0 = no friends that smoke); skipping class (1 = if the student skip classes, 0 otherwise) and province of residence (Alberta, Ontario, Quebec, British Columbia, Manitoba Saskatchewan, Prince Edward Island, Nova Scotia, with Newfoundland & Labrador as the reference category). Smoking status of friends is determined by response to the following question: "Your closest friends are the friends you like to spend the most time with. How many of your closest friends smoke cigarettes?" The response to this question is dichotomized to indicate either having at least one friend that smokes or no friends that smoke.

2.4. Statistical analysis

A bivariate probit model is used to examine whether a statistically significant difference in binge drinking and marijuana use exist between menthol and non-menthol adolescent smokers. A bivariate probit model of the following form is specified: $y_j = 1$ is binary indicator of whether an individual binge drinks ($j = 1$) or uses marijuana ($j = 2$), otherwise non-binge drinkers or no marijuana use is represented as $y_j = 0$. The bivariate model can be expressed in terms of latent variables that represent an unobserved tendency to binge drink or to use marijuana: $y_j^* = \alpha_j Menthol + \beta_j \mathbf{x} + \mu_j$, because y_j^* is latent, we only observe $y_j = 1$ if $y_j^* > 0$, zero otherwise. Menthol cigarette use is represented as, *Menthol* and other predictors or control variables included in the analysis are captured by, **x**.

The estimation methodology takes into account that there may be unobserved characteristics which jointly influence the decision to binge drink and to use marijuana and therefore may be correlated. The estimated coefficient of correlation (ρ) between the two error terms (μ_1, μ_2) captures the unobserved influences on the probability of having a binge drink and the probability of using marijuana. It is possible to expect a positive correlation between binge drinking and marijuana use due to clustering of health-risk behaviors among adolescents. All regression results and the descriptive analysis are population weighted using the survey weights to produce population estimates and adjust for unequal probabilities of selection. All analyses are carried out using Stata version 13.

3. Results

The weighted sample characteristics, reported in Table 1, show that 32% of the current smokers in grades 7 to 12 smoke mentholated cigarettes, 73% are binge drinkers and 79% use marijuana.

Table 1
Weighted sample characteristics (%).

	Binge drinking	Marijuana use
	Total	Total
	(n = 220,633[a])	(n = 248,039[a])
Menthol smoking status		
Menthol smoking	32	31
Non-menthol smoking	68	69
Binge drinking status		
Binge drink	73	
No binge drink	27	
Marijuana use status		
Marijuana use		79
No marijuana use		21
Gender		
Female	45	44
Male	55	56
Grade level		
12	30.1	30
11	26.4	24
10	19.3	19
9	15	15
8	7	9
7	2	3
School truancy		
Class skip	63	60
No class skip	37	40
Peer effect		
Friend smokes	92	92
No friend smokes	8	8

[a] Population estimates.