



## Short communication

# How are lifetime polytobacco users different than current cigarette-only users? Results from a Canadian young adult population

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## ABSTRACT

Current cigarette smoking combined with ever use of other tobacco products (lifetime polytobacco use) is important to examine as users may be at greater risk for illicit drug use, nicotine addiction, and adverse health outcomes. We determined estimates and patterns of lifetime polytobacco use and conducted multivariable analyses to determine demographic, family and friend, psychosocial, and lifestyle factors associated with use among a sample of Canadian young adults. Overall prevalence was 36.3% for current cigarette use; 10.1% for current cigarette use only and 26.2% for lifetime polytobacco use. Among polytobacco users, current cigarette use and ever cigar use was most frequent (67.2%). For males, the final model contained demographic, family and friends, and lifestyle factors. For females, the final model also included psychosocial factors. Illicit drug use was the strongest significant predictor for lifetime polytobacco use among males. We found gender specific differences when comparing lifetime polytobacco users to current cigarette-only users, in particular; male lifetime polytobacco users were more likely to use drugs and alcohol. Interventions focusing on individual substances should consider addressing combinations of use.

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## 1. Introduction

Current polytobacco use is the concurrent use of cigarettes and other tobacco products such as smokeless tobacco, cigars, pipes, bidis, and/or kreteks (Bombard, Rock, Pederson & Asman, 2008; Bombard, Pederson, Nelson & Malarcher, 2007). Multiple tobacco product use may be important to examine as it could increase levels of nicotine exposure, increase the risk for nicotine dependence, and increase the risk of tobacco-attributable death or disease relative to the sole use of individual tobacco products.

Some characteristics of polytobacco users have recently been reported. For example, polytobacco use is higher among younger adult populations, adolescents, and males (Backinger et al., 2008; Bombard et al., 2008, 2007; Everett, Malarcher, Sharp, Husten & Giovino, 2000; Gilpin & Pierce, 2003; Soldz, Huyser & Dorsey, 2003; Tercyak & Audrain, 2002). Among adolescents in middle school and high school, almost half of current cigarette smokers are current polytobacco users (Bombard et al., 2008; Gilpin & Pierce, 2003; Tercyak & Audrain, 2002). For U.S. college students, past-year use of cigarettes and cigars is the most prevalent form of polytobacco use (19.7%), followed by past-year use of cigarettes and pipes (12.0%) (Rigotti, Lee & Wechsler, 2000).

Differences between polytobacco users and cigarette-only smokers have also been noted. U.S. youth and young adults who are polytobacco users are more likely to use alcohol and illicit drugs than cigarette-only users (Coogan, Geller & Adams, 2000; Everett, Giovino, Warren, Crossett & Kann, 1998; Everett et al., 2000; Galanti & Gilljam, 2003; Lando, Haddock, Klesges, Talcott & Jensen, 1999; Simon, Sussman, Dent, Burton & Flay, 1993). U.S. adolescent polytobacco users are more likely than cigarette-only users to engage in other risky behaviors such as drunk driving, fighting, and skipping classes (Coogan et al., 2000; Gilpin & Pierce, 2003; Simon et al., 1993). Currently, there is little information on other factors related to polytobacco use, such as psychosocial characteristics, attitudes, and environmental influences, that could inform the development of interventions to address these factors and potentially reduce use. This study examines, among a sample of Canadian young adults, 1) prevalence and patterns of lifetime polytobacco use; 2) the associations between demographic, psychosocial, lifestyle, and familial and peer characteristics that discriminate between lifetime polytobacco and current cigarette-only use; and 3) similarity or differences in these associations among males and females.

## 2. Method

## 2.1. Data source and study population

We used the 2001–2003 data from a group of Canadian young adults (age range 20–24), collected as a part of a 10-year cohort study

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(Koval, Aubut, Pederson, O'Hegarty & Chan, 2005). The study's overall purpose was to explore the interrelationships between smoking behavior and a range of psychosocial and lifestyle factors (Pederson, Koval & O'Connor, 1997). Details of the study design and participant tracking can be found elsewhere (Koval, Pederson & Zhang, 2006; Mills, Pederson, Koval, Gushue & Aubut, 2000; Pederson, Koval, Chan & Zhang, 2007). Briefly, data were collected at baseline and in 1995–1996 (Grade 8); 1997–1999 (Grade 11); and 2001–2003 (young adults). There were 1270 eligible participants who participated in the young adult follow-up survey (78.7%  $n=1270/1614$ ). The final sample was 1048; 222 respondents were excluded because of incomplete data.

## 2.2. Outcome definitions and questionnaire content

Two questions were used to assess cigarette use status: "Have you ever smoked cigarettes?" and "In the past 30 days, did you smoke any cigarettes?" Respondents were classified as current cigarette smokers if they indicated yes to both questions (Tyas & Pederson, 1998). Non-current smokers included respondents who answered no to the first question and respondents who answered yes to the first question but indicated on the second question that they did not smoke in the past 30 days. Lifetime polytobacco users included current smokers who indicated ever use of pipes, cigars, chewing tobacco, and/or bidis; current cigarette-only users were those who only smoked cigarettes.

The questionnaire also included items on demographic variables, tobacco and other drug use among family and friends, psychosocial and attitudinal variables, and lifestyle factors. Four categories of variables were created for purposes of screening variables (Pederson et al., 2007) for their significance in predicting lifetime polytobacco use: *demographics* (category 1) included age, marital status, living arrangement, language spoken at home, racial/ethnic group, money spent on leisure activities per week, school level, and employment status; *family and friends* (category 2) included parental characteristics such as education, smoking status, and occupation; sibling smoking; and number of friends who smoke, use illicit drugs, or drink alcohol; and number of other people known who smoke; *psychosocial variables and attitudes* (category 3) consisted of continuously coded created scales (Koval et al., 2006; Pederson et al., 1997) on stress, attitude, mastery, anger, depressive symptoms, social support, coping, self-esteem, risk taking, and social conformity; *lifestyle and health attitudes* (category 4) included respondents' illicit drug use, alcohol use, bar attendance, exercise activities, volunteer work, importance of religion, attendance at a religious organization, BMI, perceived health compared to others, weight concerns, and plans to smoke one year from now.

## 3. Analysis

We calculated prevalence estimates for smoking status overall and by selected demographic and substance use characteristics. Chi-square analysis tests were calculated to explore initial associations between the selected characteristics and cigarette smoking status. The prevalence of different combinations of products ever used among current cigarette smokers was also determined. Initial analyses revealed male–female differences; therefore final multivariable analyses were conducted separately by gender. In order to reduce the number of variables in the final model, multivariable logistic regression was used 1) with each of the four categories separately, and 2) with the reduced categories taken together.

During step 1, backward elimination was used using a  $p$ -value of  $>0.10$  to eliminate variables (Wang, Koval, Mills & Lee, 2008). In step 2, the remaining variables were retained in each reduced category and regressions were run to determine which combinations of categories were most useful in accounting for the outcome, controlling for demographics (category 1). We considered four models: 1) all four

reduced categories (full model); 2) reduced categories 1, 2, and 3; 3) reduced categories 1, 2, and 4; and 4) reduced categories 1, 3, and 4. Likelihood ratio tests were computed to compare the full model with each reduced model in order to determine which model provided the best fit (using  $\alpha=0.10$ ) (Pederson et al., 2007). All analyses were performed using SAS Version 9.1.

## 4. Results

### 4.1. Prevalence of tobacco use and patterns of lifetime polytobacco use

The overall prevalence for current cigarette smoking was 36.3%; 10.1% were current cigarette-only users, and 26.2% were lifetime polytobacco users (Table 1). Lifetime polytobacco users had a higher percentage of males (61.1%) than current cigarette-only (21.7%) and non-current smokers (43.0%) and a higher percentage of drug users (93.8%), alcoholic binge drinkers (73.2%), and white respondents (72.5%). Non-current smokers had a higher percentage of university-level respondents (65.2%) than lifetime polytobacco users (31.7%) and current cigarette-only smokers (30.5%) (Table 1). Among current cigarette smokers, 27.8% were cigarette-only users, 31.2% had ever used one other tobacco product, and 41.0% had ever used two or more other tobacco products (data not shown<sup>1</sup>). Among current cigarette smokers who had ever used one tobacco product, cigarettes and cigars (67.2%) was the most frequent combination, followed by cigarettes with bidis (30.3%) and cigarettes with chew tobacco or pipes (2.5%) (data not shown<sup>1</sup>).

### 4.2. Multivariable analysis

Following backwards elimination within each category, variables that remained significant for males were language spoken at home (category 1); father's education, mother's smoking status, number of others who smoke, number of peers who use drugs (category 2); attitude, mastery, and risk taking (category 3); and drug use and alcohol use (category 4). For females, the remaining variables were language spoken at home and school level (category 1); number of peers who use drugs (category 2); stress (category 3); and drug use and alcohol use (category 4) (data not shown<sup>2</sup>).

For males, the best fit of the model for predicting lifetime polytobacco use included variables from demographic (category 1), family and friends (category 2), and lifestyle factors (category 4). For females, the best fit of the model included variables from all four categories (Table 2). Variables which were significant in the final model for males included mother's smoking status, peer use of drugs, and self-reported drug use and alcohol use. For females, school level was significant (Table 2).

## 5. Discussion

Slightly over a quarter of young adult participants in this study (26.2%) were lifetime polytobacco users, and most current cigarette smokers (72.2%) had used another tobacco product. These prevalence rates are higher than those from U.S. studies (Backinger et al., 2008; Bombard et al., 2008, 2007), resulting from ever use as compared to current use of other tobacco products. Furthermore, while our findings suggest polytobacco users are different from cigarette-only users among all, there are also differences between male and female lifetime polytobacco users, and the strongest predictor among males for polytobacco use is illicit drug use.

Several areas for additional research are suggested by the findings in this study. For example, how often and how much are young adults

<sup>1</sup> Data available upon request.

<sup>2</sup> Data available upon request.

**Table 1**Prevalence and characteristics associated with tobacco product use among a sample of Canadian young adults, 2002 ( $n = 1048$ ).

	Non-current smoker			Current cigarette-only			Lifetime Polytobacco Use			<i>p</i> -value
	<i>n</i>	%	95% CI	<i>n</i>	%	95% CI	<i>n</i>	%	95% CI	
All	667	63.7	(60.1–67.3)	106	10.1	(4.4–15.8)	275	26.2	(21.0–31.4)	
Drug use										<0.0001
Marijuana, ecstasy, and/or mushroom ever use	245	36.8	(30.8–42.8)	82	78.9	(70.1–86.7)	257	93.8	(90.9–96.7)	
Non-use	421	63.2	(58.6–67.8)	22	21.1	(4.0–38.2)	17	6.2	(0.0–17.7)	
Alcohol use										<0.0001
Currently drink and do not binge	196	29.7	(23.3–36.1)	34	32.1	(16.4–47.8)	51	18.7	(8.0–29.4)	
Currently binge drink	221	33.5	(27.3–39.7)	59	55.7	(43.0–68.4)	199	73.2	(67.0–79.4)	
Do not drink	243	36.8	(30.7–42.9)	13	12.2	(0.0–30.0)	22	8.1	(0.0–19.5)	
Gender										<0.0001
Male	287	43.0	(37.3–48.7)	23	21.7	(4.9–38.5)	168	61.1	(53.7–68.5)	
Female	380	57.0	(52.0–62.0)	83	78.3	(69.4–87.2)	107	38.9	(29.7–48.1)	
Racial/ethnic group										<0.0001
White	291	44.1	(38.4–49.8)	69	65.1	(53.9–76.3)	198	72.5	(66.3–78.7)	
Asian	294	44.5	(38.8–50.2)	30	28.3	(12.2–44.4)	55	20.2	(9.6–30.8)	
Other	75	11.4	(4.2–18.6)	7	6.6	(0.0–25.0)	20	7.3	(0.0–18.7)	
School level										<0.0001
University	432	65.2	(60.7–69.7)	32	30.5	(14.5–46.5)	86	31.7	(21.9–41.5)	
Non-university	231	34.8	(28.7–40.9)	73	69.5	(58.9–80.1)	185	68.3	(61.6–75.0)	

engaging in multiple use of tobacco products along with other substance use? Are young adults simply experimenting with these products or are they established users? Does polytobacco use and the concurrent use of alcohol and/or drugs hasten subsequent addiction and nicotine dependence? What is the sequence of tobacco product use initiation and use of illicit drugs? Finally, alcohol and/or drug use combined with use of individual tobacco products (e.g. cigarettes) has been found to increase the risk for certain cancers and other health conditions (U.S. Department of Health and Human Services, 2004). Do polytobacco users maintain this pattern of multiple use over a long period? What are the long-term health consequences associated with polytobacco use and alcohol and/or drug use?

The current findings are subject to some limitations. The prevalence data may not be representative of all young adults in the province of Ontario or in Canada as participants were originally recruited from one school board in Ontario, Canada (Koval, Pederson & Chan, 2004; Koval et al., 2006; Pederson et al., 2007). Compared to young adults in Ontario from the 2001 census, our young adult study participants had fewer males and higher rates of unemployment, current enrollment in school, and unmarried status, as well as slightly higher smoking prevalence (Koval et al., 2006). Second, despite a follow-up rate of almost 80%, losses to follow-up, withdrawals, and missing data may also have affected our prevalence estimates and the relationships we observed. Third, estimates from these data on illicit drug use may be low as users may underreport socially disapproved

behaviors (Griensven F.V. et al., 2006). Fourth, some important relationships may not have attained statistical significance because of small sample sizes.

We found a high level of lifetime polytobacco use among all of the study participants and subsequent strong significant associations for illicit drug and alcohol use among males from this sample of Canadian young adults. Tobacco control interventions aimed at youth typically focus on cigarette use only, through counter-marketing media campaigns, policy initiatives such as excise taxes and smoke free policies, and school- and community-based programs (Tercyak & Audrain, 2002; U.S. Department of Health and Human Services, 1994). Interventions may need to be modified to address the full array of products which young adults may be using or experimenting with and efforts may need to target young adult men and women differently. Finally, treatment outcomes may need to be designed and evaluated specifically for persons who are using multiple substances, as there appear to be different factors related to polytobacco and cigarette-only use.

#### CDC disclaimer

The findings and conclusions in this article are those of the authors and do not necessarily represent the views of the Centers for Disease Control and Prevention.

**Table 2**Final combined reduced category logistic regression model (lifetime polytobacco use vs. current cigarette-only) among a sample of Canadian young adults, 2002.<sup>a</sup>

Categories	Variable (referent group = 1.0 for categorical variables)	Males (categories 1 + 2 + 4)			Females (categories 1 + 2 + 3 + 4)		
		Polytobacco ( <i>n</i> = 135)	Cigarette-only ( <i>n</i> = 21)	<i>p</i> -value	Polytobacco ( <i>n</i> = 94)	Cigarette-only ( <i>n</i> = 72)	<i>p</i> -value
		Odds ratio	95% CI		Odds ratio	95% CI	
Category 1: demographic	Other language spoken at home (English)	0.3	(0.1–1.2)	0.0817	0.2	(0.02–1.7)	0.1352
	Non-university school level (university)				0.4	(0.2–0.9)	<b>0.0286</b>
Category 2: family and friends	Father education greater than high school (less than or equal to high school or do not know)	2.7	(0.9–8.2)	0.0698			
	Mother smokes (no)	0.2	(0.1–0.9)	<b>0.0278</b>			
	Number of others smoke	0.6	(0.3–1.4)	0.2650			
	Number of peers use drugs	1.9	(1.0–3.6)	<b>0.0456</b>	1.4	(1.0–2.0)	0.0856
Category 3: psychosocial	Stress				1.0	(1.0–1.1)	0.0602
Category 4: lifestyle and health attitude	Drug use (no)	6.2	(1.4–28.4)	<b>0.0189</b>	2.8	(0.8–10.0)	0.1254
	Do not binge (binge)	0.3	(0.1–0.8)	<b>0.0211</b>	0.6	(0.3–1.3)	0.2204

CI = confidence interval.

<sup>a</sup> Significant *p*-values ( $\leq 0.05$ ) are in bold.

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