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Research Article

Cigarette smoking in Canadian adolescents: A cross-sectional examination of psychosocial determinants

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Abstract

Introduction

Tobacco cigarette smoking is often initiated during adolescence. Although rates of cigarette smoking have declined in the past decades, some Canadian adolescents still engage in this behaviour despite its widely known health risks. It is important to understand the predictors of cigarette smoking in a contemporary context. Psychosocial factors associated with cigarette smoking behaviours among Canadian adolescents are examined.

Methods

This study used a population-based dataset of 23,732 Canadian adolescents in grades 6-10 who completed the 2022 cycle of the Health Behaviour in School-aged Children (HBSC) Survey. Bivariate analysis and sequential multiple logistic regression models were utilized to assess adolescents' odds of having ever smoked cigarettes in relation to a range of psychosocial predictor variables.

Results

Among the participants, 7.5% reported having ever smoked cigarettes. The fully specified models showed significant associations between cigarette smoking and other substance use (vaping: Odds Ratio=26.3, alcohol: Odds Ratio = 4.7) and higher friend support (Odds Ratio = 1.1), indicating that these were predictors of cigarette smoking, when holding other factors constant. Higher relative family affluence (Odds Ratio = 0.6), having higher family support (Odds Ratio=0.9), and higher teacher support (Odds Ratio = 0.8) were significantly associated with reduced odds of cigarette smoking.

Conclusion

Other substance use was a significant predictor for increased odds of smoking. Some factors that were associated with reduced odds were identified, including family and teacher support. These findings can inform future research that seeks to examine the mechanisms underlying these associations.

INTRODUCTION

Cigarette smoking is a modifiable risk factor that leads to disease and death, with more than 45,000 deaths in Canada caused by smoking cigarettes each year.[1] Smoking cigarettes is typically initiated during adolescence.[2] Despite overall decreases in the prevalence of smoking tobacco among adolescents in recent decades, thousands of Canadian youth still begin smoking every year.[3] Given this, the Canadian Paediatric Society highlights the need for continued attention and efforts towards understanding and preventing cigarette smoking in this population.[4]

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The Canadian smoking context has been evolving over the last several decades. Canada has adopted some of the most comprehensive regulations and mandates around reducing smoking in adolescents, including restricted marketing, strategic labelling, smoke-free spaces, and higher taxation rates. These measures have been found to reduce rates of adolescent smoking[4] in turn de-normalizing this behaviour. Further, new modes of nicotine delivery are on the market, which has further changed the landscape of adolescent smoking, in that youth have a wider array of products to choose from in terms of nicotine delivery. Despite these factors, there is still a population of young smokers in Canada. Population surveys have shown that the rate of ever-smoking for Canadian older adolescents (15–19-year-olds) was 10.5% in 2020[5] and 17% for students in Grades 7-12 in 2023/24.[6] Understanding the factors associated with cigarette smoking in a contemporary context is critical to developing targeted programs to continue to move the needle on adolescent cigarette smoking.

Given the known health implications of cigarettes, and that smoking often begins in adolescence,[2] it is important to identify potential predictors of cigarette use. As outlined by Dai et al.,[7] social cognitive theory can be used to explain susceptibility to changes in behaviour (such as initiating cigarette smoking). Predictor variables from each of various levels of influence (individual-, interpersonal- and context-level) have been well established in the literature. The aim of this study was to explore the potential psychosocial predictive factors associated with cigarette smoking behaviour amongst adolescents (grades 6-10) in Canada.

METHODS

This study utilized data from the 2022 Canadian Health Behaviour in School-aged Children (HBSC) survey, which was conducted over the 2022 and 2023 school years. The HBSC survey is part of an international, repeated cross-sectional study done every four years in more than 50 different countries, including Canada (in collaboration with the World Health Organization).[8] In Canada, the HBSC survey is representative of the Canadian population from grades 6-10. It is distributed in schools across multiple provinces and territories. Cluster sampling (students are clustered in classes within schools) is used to collect a sample of respondents.[9,10] The 2022 survey collected information from 9 provinces and 2 territories through either electronic or paper-based anonymous surveys. Data were not collected for New Brunswick or Nunavut in this survey cycle. A total of 26,571 students (ages 11-17 years) were included in the study. Participation was voluntary, and responses were anonymous. School jurisdictions agreed to take part in the study, followed by permission from school principals; parental consent was active or passive depending on local school jurisdiction requirements, and child assent was obtained.[11,12] Ethics approval for the HBSC survey was obtained through Queen's University and the Public Health Agency of Canada.[9]

DEPENDENT VARIABLE

CIGARETTE SMOKING

The outcome variable for this study was cigarette smoking in the adolescents' lifetime (i.e., ever smoked). The self-reported history of ever having smoked cigarettes was determined by the question "*On how many days (if any) have you smoked cigarettes in your lifetime*", with the response options being *Never, 1-2 days, 3-5 days, 6-9 days, 10-19 days, 20-29 days* or *30 days or more*. Responses were re-coded to *Never Smoked* or *Ever Smoked* (i.e., those who responded affirmatively to smoking on one or more days).

INDEPENDENT VARIABLES

INDIVIDUAL SOCIODEMOGRAPHIC VARIABLES

Grade at the time of the survey ranged from grades 6-10, which was treated as a continuous variable in the models. The participants' gender came from two survey questions asking participants' sex at birth and gender identity. These two variables were then combined to create a final gender variable. This classified the participants' gender as cis-boy, cis-girl, and trans/gender-diverse.

The question about ethnicity was categorized, as was done by Seo and Huang[13] into *White, Black, Asian, Other (or mixed race)* and *Indigenous*. Additionally, a *Missing* category for the race/ethnicity survey question was included because there were 2,533 respondents (>10%) who did not respond to this item. Due to requirements of the HBSC study ethics in terms of reporting findings for unaggregated data for Indigenous participants[14] the results of the ethnicity analyses are not reported in the Tables, although this variable was included as a covariate in the multiple logistic regressions.

Perceived relative family affluence was assessed by the question "*How well off do you think your family is?*" with response options: *Very well off, Quite well off, Average, Not very well off*, and *Not at all well off*. This was re-coded into *Below average, Average* and *Above average* and treated as categorical.

OTHER INDIVIDUAL VARIABLES

Other substance use measures examined were: (1) lifetime vaping and (2) lifetime alcohol use. Response categories were the same as for smoking. Respondents who selected *"Never"* were coded as non-users, and respondents who selected 1 or more days were coded as having ever used.

To assess physical activity, the participants were asked, "*Over the past 7 days, on how many days were you physically active for a total of at least 60 minutes per day?*" This variable was treated as a continuous variable.

For this study, mental wellbeing was measured using the Cantril's Ladder Analog Scale[15] as an indicator of life satisfaction (which is considered part of cognitive wellbeing, i.e., their assessment of their wellbeing). For this, respondents are asked to mark on a "ladder" (scale of 0-10) how satisfied they feel with their life currently; 0 indicates the *"worst possible life"* and 10 indicates the *"best possible life"*.

The responses for analysis were grouped with scores of 0-5 being labelled *Low*, scores of 6-7 as *Moderate*, scores of 8-10 as *High,* as was done by Gazendam et al.[16]

INTERPERSONAL-LEVEL VARIABLES

Two composite measures (i.e., scales) used to assess interpersonal relationships within the HBSC survey were included in the analysis: (1) The Family Support Scale (4 items, example question: *"My family really tries to help me."*) and (2) The Friend Support Scale (4 items, example question: "*I can count on my friends when things go wrong*").[17] The responses to each question ranged from 1 (Very Strongly Disagree*)* to 7 *(Very Strongly Agree).* The mean value across all scale items was used to compute the composite measures, and person mean imputation was applied when only 1 item in the scale was missing a response. This means that only responses from participants who had answered at least 3 of the 4 questions had scores (i.e., responses which had fewer than 3 of the items answered were excluded) and the mean of the available items was substituted for the missing item. These were treated as continuous variables.

CONTEXT-LEVEL VARIABLES

Two composite measures were used to examine the school environment (1) The Teacher Support Scale (3 items, example question: *"I feel that my teachers accept me as I am"*) and (2) The Classmate Support Scale (3 items, example question: "*The students in my class(es) enjoy being together*").[18] Response options ranged from 1 (Strongly Disagree) to 5 (Strongly Agree*).* The mean value of the questions was used, and person mean imputation, as described above, was applied to compute the scores where respondents had answered at least 2 of the 3 questions (i.e., responses with fewer than 2 questions answered were excluded). These were treated as continuous variables.

One measure of the neighbourhood environment was included. Perceived neighbourhood social cohesion was measured with a composite measure (5 items, example question: "*People say 'hello' and often stop to talk to each other on the street*").[17,19] The mean value across all questions was used, and person mean imputation was applied to compute the scores when at least 4 of the 5 questions were answered (i.e., responses with fewer than 4 questions answered were excluded).

One measure was included to explore the digital environment. A 9-item composite scale, called the Social Media Disorder Scale,[20] was used to explore the relationship with social media use that is compulsive and excessive with cigarette smoking*.* Respondents who answered "yes" to 5 or more of 9 questions about social media use and individuals' feelings about social media (example question: "*During the past year, have you regularly found that you can't think of anything else but the moment you will be able to use social media again?)* were classified as a "problematic social media user".[20] While a cut-off score of 6 is commonly used to indicate problematic social media use,[21] adopting a threshold of 5, as per van den Eijnden et al. captures individuals who may not meet the criteria for problematic use but who are at the high end in terms of levels of risk. This variable was treated as categorical, with respondents being categorized as indicating *High risk/Problematic* or *Non-problematic* social media use.

STATISTICAL ANALYSIS

First, bivariate logistic regression analysis was completed to explore simple associations.[22] Second, a series of nested multiple logistic models were conducted that included: (1) sociodemographic variables (i.e., demographics, relative family affluence), (2) sociodemographic + other individual variables (other substance use, physical activity, mental wellbeing), (3) sociodemographic + other individual + interpersonal (family support and friend support), and (4) sociodemographic + other individual + interpersonal + other contextual (i.e., classmate and teacher support, neighbourhood social cohesion, and social media use) to see which variables were related to adolescent cigarette smoking when accounting for other factors.[7] A p-value < 0.05 was considered statistically significant in all analyses. Only complete cases (e.g., when all variables of interest were not missing) were included in the multiple logistic regression models.[23]

To account for the clustered sample design (students were sampled in classes within schools) and allow for weighting to the general population, all analyses were done using IBM SPSS Statistics (Version 27) Complex Samples.[24] Weighting the data helps to ensure that, even though some populations are sampled at a higher rate, they do not carry more weight in the analysis than they would in the general population.

RESULTS

The 2022 HBSC survey included over 26,000 survey responses from Canadian adolescents,[9] and 23,732 adolescents responded to the question about having ever smoked a cigarette, with 7.5% weighted estimate (95% CI = 7.2% - 7.8%), reporting that they had ever smoked.

BIVARIATE ANALYSIS

Bivariate analysis (see **Table 1**) showed that all variables explored were significantly associated with having ever smoked when not accounting for other variables. Increasing grade (OR = 1.6; p < .001) and being gender-diverse (OR = 2.2; p < .001) compared to cis-boys, were both associated with higher odds of ever smoked tobacco, while being a cis-girl was not significantly associated with smoking, this was just above the significance threshold (p=.051). Having ever vaped (OR = 72.2; p < .001) and ever drank alcohol (OR=21.8; p < .001) were associated with increased odds of ever smoking, with both having the greatest effect size on having ever smoked compared to the other predictors. High risk/problematic social media use (OR = 2.6; p < .001) was also associated with a higher likelihood of ever smoked. Factors associated with significantly reduced odds of smok-

ing were also found in the bivariate models. Higher perceived relative family affluence was significantly associated with reduced odds of smoking. Also, higher levels of physical activity (OR = 0.9; $p < .001$), neighbourhood social cohesion, and support from family, friends, teachers, and classmates were all found to reduce the odds of having ever smoked.

SEQUENTIAL ADJUSTED MODELS

Based on Variance Inflation Factors (VIF), none of the independent variables were found to be collinear (highly related to each other) to a degree of concern; VIF ranged from 1.07 – 1.48, which does not meet the threshold of 5.00 indicating the potential of collinearity. The results of the multivariate models are shown in **Table 2**. Complete data on all variables were available from 19,636 participants, and so this constituted the analytic sample. In Model 1 (sociodemographic variables only model), higher grade was a significant predictor of cigarette smoking behaviours ($p < 0.001$). Being trans or gender-diverse (OR = 1.6; $p = 0.005$) compared to cis-boys, was also a significant predictor, while being a cis-girl was not significantly associated with cigarette smoking. Having higher relative family affluence (above average: OR = 0.3; $p < 0.001$, average: OR = 0.5; $p < 0.001$, compared to below average) was associated with significantly lower odds of cigarette smoking. Nagelkerke's R-squared was 0.128, meaning the model explained approximately 13% of the variability in students' likelihood of ever having smoked based on the set of sociodemographic predictors.

In Model 2, other individual factors were added into the model. Lifetime vaping (OR = 28.2; $p < 0.001$), lifetime alcohol use (OR = 4.9; $p < 0.001$) and *low* (OR = 1.9; $p < 0.001$) or *moderate* (OR = 1.4; $p = 0.019$) life satisfaction, were associated with significantly increased odds of having ever smoked. Physical activity (OR= 0.9*; p* = 0.024) was associated with reduced odds of cigarette smoking. Being a cis-girl compared to cis-boy was now significantly associated with reduced odds of cigarette smoking (OR = 0.6; $p < 0.001$) and being trans or gender-diverse was no longer significant. Nagelkerke's R-squared value for goodness of fit increased to 0.529 for this model.

In Model 3, interpersonal factors (family support and friend support) were added into the hierarchical model. Family support was a predictor of lower odds of ever smoked tobacco (OR = 0.9; $p < 0.001$), while friend support was associated with increased odds of having ever smoked (OR = 1.1; $p = 0.009$). Nagelkerke's R-squared value increased from 0.529 to 0.534, indicating that although the model improved this was not to the same magnitude of increase as between Models 1 and 2.

In the final fully specified model (Model 4), contextual factors (teacher support, classmate support, neighbourhood social cohesion, and high risk/problematic social media use) were added. When including all factors, of the contextual factors only teacher support was a significant predictor of lower odds of having ever smoked (OR = 0.8; $p < 0.001$). Additionally, mental wellbeing, classmate support, and physical activity were no longer significant in the fully specified model, although classmate support and physical activity approached significance. Nagelkerke's R-squared value had a small increase from 0.534 to 0.542.

DISCUSSION

The harmful health effects of cigarette smoking are well known.[25] It is promising that among Canadian adolescents, cigarette smoking has declined in the last several decades,[5, 6] yet it is important to understand the characteristics of those still engaging in cigarette smoking. Results of this study indicated that for adolescents in grades 6-10, the rate of having ever smoked tobacco is 7.5% and that several factors are related to having ever smoked.

Previously identified gender gaps in substance use (where boys tended to be at greater risk of substance use than girls) appear to be closing.[26] This has been found in multiple substances, such as alcohol use[27] and other studies of cigarette smoking.[26] However, in our study, being a girl was associated with reduced odds of starting cigarette smoking when other individual factors were adjusted for. This could mean that looking at gender in isolation is not necessarily capturing the bigger picture of cigarette smoking, and further intersectional analysis is warranted.

Vaping and alcohol use were found to be significant predictors of cigarette smoking in adolescents with strong effect sizes. In our study, vaping was the factor with the highest odds ratio of all the predictor variables. The link between having tried cigarette smoking and vaping has been well-documented among adolescents.[28-30] Although vaping rates are on the rise, a study involving repeated cross-sectional surveys in Canada, England, and the US of older adolescents aged 16-19 found that rates of both vaping and smoking had increased in Canada between 2017 and 2018, which suggests vaping is not replacing cigarette smoking for youth.[31] For health policy and prevention initiatives, rather than completely shifting the focus from cigarette smoking to vaping and alternative methods of nicotine delivery, there should be a combined effort to address both cigarette smoking and vaping in adolescents.[32] Our study also indicated that ever having consumed alcohol was significantly associated with cigarette smoking. Our findings are in line with past research that finds a link between cigarette smoking and other substance use, indicating that substance use behaviours in adolescents can cluster.[33] This could be due to common factors associated with multiple substance use types such as risk-taking profiles, coping mechanisms, peer pressure and stress.[33] This tendency for clustering puts adolescents who use cigarettes as well as other substances at an increased risk of multiple harms associated with various substances.

In both bivariate and adjusted analyses, physical activity, classmate and teacher support were associated with reduced odds of starting cigarette smoking, being either significant or just above the significance threshold. These findings are consistent with previous research. A longitudinal study that looked at cigarette smoking and physical activity in Canadian adolescents in grades 9-12 found that cigarette smoking was associated with low participation in

Table 1. Bivariate analyses between those who had ever-smoked or never-smoked

Variable	*Cigarette Smoking Status*				
	Sample	Ever Smoked	Never Smoked	Odds ratio (CI)	p-value
Unweighted N	23,732	2,023 (8.5)	21,709 (91.5)		
Weighted N (%)	23,506	1,760 (7.5)	21,746 (92.5)		
Grade, Mean (SD)	7.8 (1.4)	8.7 (1.3)	7.8 (1.4)	1.6 (1.6-1.7)	<0.001
Grade 6-10					
Gender, N (%)	10,724.1 (46.2)	701 (40.6)	10,023 (46.6)	Ref	<0.001
Cis-boys	1,331.0 (5.7)	178 (10.3)	1,153 (5.4)	2.2(1.7-2.9)	0.051
Gender-diverse	11,164.4 (48.1)	849 (49.1)	10,315 (48.0)	1.2 (1.0-1.4)	
Cis-girls					
Relative Family Affluence, N (%)	2,047.5 (9.3)	301 (18.0)	1,746 (8.5)	Ref	<0.001
Below Average	8,403.8 (38.0)	761 (45.6)	7,643 (37.4)	0.6 (0.5-0.7)	<0.001
Average	11,676.3 (52.8)	607 (36.4)	11,069 (54.1)	0.3 (0.3-0.4)	
Above Average					
Vaping Status, Mean (SD)	19,893.6 (85.2)	212 (12.3)	19,681 (91.0)	Ref	<0.001
Never Vaped	3,460.0 (14.8)	1,516 (87.7)	1,944 (9.0)	72.2 (56.5-92.3)	
Ever Vaped					
Alcohol Status, Mean (SD)	15,878.9 (68.6)	192 (11.2)	15,687 (73.3)	Ref	<0.001
Never drank alcohol	7,255.2 (31.4)	1,527 (88.8)	5,728 (26.7)	21.8 (17.0-27.9)	
Ever drank alcohol					
Physical Activity, Mean (SD)	4.7 (2.0)	4.3 (2.0)	4.7 (2.1)	0.9 (0.8-0.9)	<0.001
Mental Wellbeing (Life Satisfaction), N(%)	10,203.7 (44.6)	7,343 (84.2)	9,867 (46.6)	Ref	<0.001
	7,961.2 (34.8)	618 (7.1)	7,343 (34.7)	2.5 (2.0-3.1)	<0.001
High	4,738.1 (20.7)	763 (8.7)	3,975 (18.8)	5.6 (4.6-7.0)	
Moderate					
Low					
Family Support (1-7), Mean(SD)	4.8 (1.8)	3.9 (1.7)	4.9 (1.8)	0.7 (0.7-0.8)	<0.001
Friend Support (1-7), Mean(SD)	4.6 (1.8)	4.5 (1.8)	4.7 (1.8)	0.9 (0.9-1.0*)	<0.001
Teacher Support Scale (1-5), Mean(SD)	3.7 (0.9)	3.1 (1.0)	3.8 (0.9)	0.5 (0.47-0.52)	<0.001
Classmate Support Scale (1-5), Mean(SD)	3.4 (0.9)	3.0 (1.0)	3.5 (0.9)	0.6 (0.5-0.6)	<0.001
Neighbourhood Social Cohesion (1-5)	3.5 (0.7)	3.3 (0.7)	3.5 (0.6)	0.6 (0.6-0.7)	<0.001
Social Media Use, N(%)	20, 695.3 (88.0)	1,336 (75.9)	19,359 (89.0)	Ref	<0.001
Non-problematic	2,811.1 (12.0)	424 (24.1)	2,387 (11.0)	2.6 (2.1-3.1)	
Problematic					

*1.0 due to rounding

Table 2. Results from the nested hierarchical modeling using the different levels of predictors of adolescent cigarette smoking and the goodness of fit of each model (unweighted *n* =19,636)

Variable	*Hierarchical Model*							
	Model 1 (socio-demographics) OR (95%CI)	p-value	Model 2 (Model 1 + Other Individual Factors) OR (95%CI)	p-value	Model 3 (Model 2 + Interpersonal Factors OR (95%CI)	p-value	Model 4 (Model 3 + Other Contextual Factors) OR (95%CI)	p-value
Grade (6-10)	1.7 (1.6-1.8)	<0.001	1.1 (1.0-1.2)	0.210	1.1 (1.0-1.2)	0.195	1.1 (1.0-1.2)	0.155
Gender	Ref	0.005	Ref	0.781	Ref	0.753	Ref	0.528
Cis-boys	1.6 (1.2-2.3)	0.108	1.1 (0.7-1.7)	<0.001	0.9 (0.6-1.5)	<0.001	0.9 (0.5-1.4)	<0.001
Gender-diverse	1.2 (0.9-1.4)		0.6 (0.5-0.7)		0.5 (0.4-0.7)		0.5 (0.4-0.6)	
Cis-girls								
Relative Family Affluence	Ref	<0.001	Ref	0.011	Ref	0.011	Ref	0.012
Below Average	0.5 (0.4-0.7)	<0.001	0.6 (0.5-0.9)	<0.001	0.6 (0.5-0.9)	<0.001	0.6 (0.5-0.9)	0.001
Average	0.3 (0.2-0.4)		0.5 (0.4-0.7)		0.5 (0.4-0.8)		0.6 (0.4-0.8)	
Above Average								
Vaping Status	N/A	N/A	Ref	<0.001	Ref	<0.001	Ref	<0.001
Never Vaped			28.2 (21.1-37.7)		27.5 (20.6-36.8)		26.3 (19.7-35.1)	
Ever Vaped								
Alcohol Status	N/A	N/A	Ref	<0.001	Ref	<0.001	Ref	<0.001
Never drank alcohol			4.9 (3.5-6.7)		4.8 (3.5-6.7)		4.7 (3.4-6.5)	
Ever drank alcohol								
Physical Activity	N/A	N/A	0.9 (0.9-1.0)	0.024	0.9 (0.9-1.0)	0.020	0.9 (0.9-1.0)	0.053
Mental Wellbeing (Life Satisfaction)	N/A	N/A	Ref	0.019	Ref	0.042	Ref	0.210
High			1.4 (1.0-1.9)	<0.001	1.4 (1.0-1.8)	0.001	1.2 (0.9-1.6)	0.138
Moderate			1.9 (1.4-2.6)		1.7 (1.2-2.4)		1.3 (0.9-1.8)	
Low								
Family Support (1-7)	N/A	N/A	N/A	N/A	0.9 (0.8-0.9)	<0.001	0.9 (0.8-1.0)	0.002
Friend Support (1-7)	N/A	N/A	N/A	N/A	1.1 (1.0-1.2)	0.009	1.1 (1.0-1.2)	0.002
Teacher Support Scale (1-5)	N/A	N/A	N/A	N/A	N/A	N/A	0.8 (0.7-0.9)	<0.001
Classmate Support Scale (1-5)	N/A	N/A	N/A	N/A	N/A	N/A	0.9 (0.7-1.0)	0.056
Neighbourhood Social Cohesion (1-5)	N/A	N/A	N/A	N/A	N/A	N/A	0.9 (0.8-1.1)	0.216
Social Media Use	N/A	N/A	N/A	N/A	N/A	N/A	Ref	0.139
Non-problematic							1.2 (0.9-1.6)	
Problematic								
Nagelkerke (model goodness of fit)	0.128		0.529		0.534		0.542	

Note. OR=odds ratio, CI=confidence interval. All models are adjusted for race/ethnicity

sport, and that smoking cessation was associated with increased physical activity.[34] This could suggest that that culture of sport and activity may play a role in reducing cigarette smoking. It could be that smoking is seen as less acceptable for those engaged in physical activity, although this may vary across different sports/activities.[35] In terms of school environments, like our study, other studies have found that a positive school environment is associated with lower susceptibility to smoking[7] and a negative school climate, as measured by poor peer relationships, low school attachment and perceived emphasis on academic performance from the teacher were associated with a higher prevalence of adolescents trying cigarettes.[36] This indicates that supporting teachers in building positive and meaningful relationships with students may yield some benefits in terms of smoking behaviour. This is consistent with the Icelandic Prevention Model, which has been associated with reduced rates of adolescent substance use in Iceland. This model involves (in part) investing in and strengthening protective factors in schools and communities, including local-level school meetings.[37] This approach aims to build up positive aspects in the school and community, rather than specifically targeting risky behaviours.

Lower wellbeing was associated with increased odds of cigarette smoking, and was significant until the final, fully adjusted model that included the addition of contextual factors, although the effect size was small. This is consistent with findings from another study that utilized a similar sequential modelling approach when looking at cigarette smoking in 9- and 10-year-olds in the US.[7] The authors suggest that some complex interactions and pathways may exist between the emotional (mental wellness, friends, family support) and environmental (school, neighbourhood) factors, which could explain why this variable is not significant after the addition of environmental variables.[38] Considering this, these relationships warrant further in-depth investigations that consider the interplay of these factors.

Our study did reveal some findings that differed from those previously reported in the literature. Friend support was found to be a significant predictor of cigarette smoking in the multivariate models. This contrasts with a study from Greenland, which found that adolescents with higher levels of social support had lower rates of smoking.[39] One explanation could be that when including other factors, those who smoke may also have friends who have tried cigarette smoking, and so a closer relationship could increase the odds of cigarette smoking.[36] Additionally, while neighbourhood social cohesion and high risk/problematic social media use were significant in the bivariate models, neither was significant in adjusted models. It could be that the interpersonal and modifiable individual factors explain some of the association between social media and neighbourhood social cohesion; therefore, future studies that look at mechanisms underlying these relationships are warranted.

STRENGTHS AND LIMITATIONS

This study helps to strengthen the body of research specific to Canadian adolescents and cigarette smoking using a large population-based sample. This systematic and sequential approach revealed relationships between psychosocial variables and cigarette smoking.

There are limitations to consider when interpreting the results of this study. Cross-sectional data represents just one moment in time; therefore, it is not possible to make any causal inferences based on the results.[40] Thus, identified variables associated with smoking behaviour should be considered only as predictive. Additionally, the survey did not have representation from New Brunswick or Nunavut, limiting the ability to infer to those areas. Conducting multiple tests increases the risk of Type I error (false-positive findings). Finally, these types of surveys rely on self-reported behaviour data, which is susceptible to recall bias and social-desirability bias.[7] However, the anonymous nature of the survey should help to minimize social-desirability bias risk.

CONCLUSION

This study strengthens the body of research specific to Canadian adolescents and cigarette smoking. It also highlights the significant role of other substance use as a dominant predictor of smoking behaviours, even when controlling for a range of demographic and psychosocial variables. The findings further underscore the importance of examining gender as a predictive factor that may intersect with other contextual variables in complex ways. That lower relative family affluence was consistently associated with increased odds of cigarette smoking reveals persistent health inequities, pointing to the need for targeted policy and intervention strategies. The presence of supportive environments, particularly teacher support, emerged as a factor that reduced odds of cigarette smoking, offering valuable insights for future study in terms of potential prevention approaches.

It is important to continue to monitor adolescent cigarette smoking in Canada and explore additional predictive factors in contemporary contexts.

ARTICLE DISCLOSURES

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ETHICAL APPROVAL

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CONTRIBUTORS

CW: conceptualization, formal analysis, methodology, writing- original draft

JV and GM: conceptualization, methodology, supervision, writing – review and editing

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CONFLICT OF INTEREST

None of the authors have any conflicts of interest to declare.

AI STATEMENT

The authors confirm no generative AI or AI-assisted technology was used to generate content.

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