

The Prevalence of Tobacco Use Co-morbidities in Canada

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ABSTRACT

OBJECTIVES: Tobacco use co-morbidities, including co-occurring tobacco use, substance use and mental health problems, are a serious public health issue that has implications for treatment and policy. However, not enough is known about the prevalence of various types of tobacco use co-morbidities among the Canadian population. The purpose of this study was to increase understanding of the extent of this issue through an examination of prevalence and correlates of tobacco use co-morbidities in Canada.

METHODS: We undertook a series of comprehensive secondary analyses of population survey data from the Canadian Community Health Survey (CCHS) and the Canadian Alcohol and Drug Monitoring Survey (CADUMS). Data were analyzed for 123,846 individuals from the CCHS and 13,581 individuals from the CADUMS. Substance use and mental health variables were compared by smoking status, with chi-square tests. Multivariate logistic regression models were fit to quantify the association between smoking, substance use and mental health issues, adjusting for age, sex, and family income.

RESULTS: Prevalence of problematic alcohol and illicit drug use was significantly higher among current smokers than non-smokers. Co-morbid mental health problems were also elevated among current smokers, and co-morbidities varied by age and gender. While smokers of all ages and genders were more likely to report problematic substance use and poor mental health, the effect of smoking status was significantly larger among youth.

CONCLUSION: Smoking in Canada is associated with problematic use of alcohol and illicit drugs, as well as co-morbid mental health problems. Youth tobacco use co-morbidities are at a concerning level, especially among young female smokers. More research on this issue in the Canadian context is needed, as well as the development of integrated interventions tailored to treat smokers with co-morbidities, particularly youth.

KEY WORDS: Tobacco use; co-occurring substance use and mental health problems; population survey; Canada

La traduction du résumé se trouve à la fin de l'article.

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Tobacco use continues to be the leading preventable cause of death and disease in Canada.¹ Furthermore, at \$17 billion, the social costs of tobacco use comprise 43% of all costs related to substance abuse in Canada.¹ In the last two decades, increased investment in tobacco control strategies across Canada has led to extensive denormalization of tobacco use and decreased prevalence of use.² With these changes, a population of persistent smokers may be emerging³ who may also have high rates of co-use with other substances, particularly alcohol and cannabis,^{4,7} and may be experiencing co-occurring mental health issues.⁸

Tobacco use co-morbidities, including co-occurring tobacco use and substance use problems and/or mental health problems, are a serious public health issue that has implications for treatment and policy. Research among clinical populations has shown that high rates of tobacco use occur among individuals seeking treatment for addiction and mental health problems.⁹ A number of international population-level studies have examined the prevalence of tobacco use co-morbidities and have noted elevated rates among current smokers.¹⁰⁻¹³ Canadian population-level reports have focused primarily on youth populations and provincial trends.^{4,5,7,14} No studies have examined prevalence of a spectrum of tobacco use co-morbidities at the population level in Canada, and not enough is known about the correlates of various co-morbidities among the general population and population subgroups at the national level. While smokers may be engaging in multiple forms of substance use

and may be experiencing co-occurring mental health problems, it is likely that tobacco-related disease will be the leading cause of death among this population.¹⁵ Individuals with co-occurring tobacco use, other substance use and mental health problems may have greater difficulty achieving smoking cessation.¹²

In order to improve understanding of the extent of this issue, we undertook a series of secondary analyses of recent population-level survey data to isolate current prevalence and correlates of various co-morbid conditions with tobacco use among the general population in Canada, including past-year frequent drinking, harmful drinking, cannabis use, other illicit drug use and related problems, mood disorders and anxiety. Such analyses are important to inform and advance improvements in treatment and policy models for the prevention and treatment of a variety of complex tobacco use co-morbidities.

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METHODS

Study population and design

The data were obtained from two population-level databases – the Canadian Community Health Survey (CCHS) and the Canadian Alcohol and Drug Monitoring Survey (CADUMS). Two separate databases were analyzed due to the fact that a single database containing all variables of interest was not available. The CCHS is a cross-sectional telephone-based survey that collects information related to health status, health care utilization, and health determinants for the Canadian population. The CCHS includes data collected from persons over the age of 12 from all health regions across every province and territory in Canada. Our study uses data from the 2009-2010 iteration of the survey, which had a total of 124,189 respondents. The CADUMS is a random-digit dialed telephone-based general population survey dealing with issues relevant to alcohol and illicit drug use, and the harms associated with use of these substances. The CADUMS includes data collected from persons over the age of 15 from Canada's 10 provinces. Our study uses data from the 2010 data collection period, which included a total of 13,619 individual respondents.

Measures

Current smokers were defined as individuals who reported smoking either daily or occasionally. This variable was captured similarly in both surveys. In total, 11 other substance use and mental health variables were derived from the surveys. Variables taken from the CCHS include: drinking alcohol per week, binge drinking per week (5+ drinks in one sitting), lifetime cannabis use, past-year cannabis use, a distress scale, a depression scale, diagnosed mood disorder, and diagnosed anxiety disorder. The distress scale used was the Kessler 10-item index distress scale, which has been found to reliably detect psychological distress;¹⁶ scores of 12 to 40 were considered to reflect moderate to high distress. The depression scale used was a short form of the Composite International Diagnostic Interview (CIDI).¹⁷ The CIDI is a diagnostic tool for the assessment of mental disorders according to the Diagnostic and Statistical Manual for Mental Disorders;¹⁸ a cut-off score of 3 to 8 on the depression scale was considered to reflect moderate to high levels of depression. The mood and anxiety disorders captured by the survey refer to diagnosis by a medical professional and reflect self-reported diagnosis. Variables taken from the CADUMS include: problem drinking (AUDIT scale),¹⁹ lifetime illicit drug use, past-year illicit drug use, harm from illicit drug use, and cannabis use problems (WHO ASSIST score).¹⁹ The AUDIT scale involves a series of questions regarding hazardous and harmful drinking patterns in the past year, such as frequency of heavy drinking, impaired control over drinking, and experiences of guilt after drinking. The AUDIT is scored by summing all responses into a scale, and scale scores of 8 or higher are indicative of harmful drinking patterns.¹⁹ The AUDIT has been used widely in research with the general population, and has shown good reliability among this population (Cronbach's alpha = 0.75).²⁰ All illicit drug use variables exclude cannabis use. Harm from illicit drugs included any harm in the previous 12 months to friendships, family, health, work/studies, and finances, as well as legal and housing problems. The WHO ASSIST score for problem cannabis use is a six-item scale measuring frequency of use, desire to use, and problems associated with use

(ASSIST score ≥ 4).²¹ The scale has shown good reliability in the general population (Cronbach's alpha=0.85).²²

Data analysis

To be eligible for inclusion in our analysis, individuals were required to have data regarding their current smoking status. Data were analyzed for 123,846 individuals from the CCHS and 13,581 individuals from the CADUMS. The frequencies of all substance use and mental health variables were compared by smoking status, with chi-square tests of equality of proportions being used to assess the significance of the observed differences. Finally, multivariable logistic regression models were fit to quantify the association between smoking and both substance use and mental health issues, adjusting for age, sex, and family income. Significant interactions between both the age and sex variables were found in many of the models; as such, the models were subsequently stratified by age and sex. All analyses were performed in SAS version 9.3 (SAS Inc., Cary, NC), adjusting for the sampling weights and the complex survey design.

RESULTS

Prevalence of co-occurring tobacco and alcohol use

Table 1 presents the prevalence of various tobacco use co-morbidities among the general Canadian population. Among the 20% of current smokers in Canada, 50% drink alcohol weekly compared to 40% among non-smokers. Current smokers have higher rates of harmful drinking in the previous year than non-smokers, with 15% reporting weekly binge drinking (compared to 4% among non-smokers), and 24% scoring higher than 8 on the AUDIT scale (compared to 9% among non-smokers), reflective of harmful drinking experiences such as physical and social consequences of drinking.

Prevalence of co-occurring tobacco and illicit drug use

Cannabis use appears to be relatively high among current smokers in Canada compared to non-smokers; 67% of current smokers had used cannabis in their lifetime and 26% had used cannabis in the previous year, compared to 31% and 7% among non-smokers, respectively (see Table 1). Current smokers also had higher rates of cannabis problems, with 18.2% scoring moderate/high on the WHO ASSIST scale, versus only 3.2% of non-smokers. Concerning use of other drugs, 35% of current smokers had used illicit drugs (excluding cannabis) in their lifetime (vs. 12% of non-smokers) and 6% had used illicit drugs in the previous year (vs. 1% of non-smokers). Current smokers are also more likely to experience harm from illicit drug use, with 4.8% experiencing some form of physical or mental harm in the previous month, versus 1.6% of non-smokers.

Prevalence of co-morbid tobacco use and mental health problems

Co-morbid mental health problems appear to be elevated among current smokers compared to non-smokers (see Table 1). Fifteen percent of current smokers received a moderate/high score on the Kessler 10-item index distress scale (vs. 8% of non-smokers), while 12% received a moderate/high score on the short form CIDI depression scale (vs. 6% of non-smokers). Moreover, 11% of current smokers reported being diagnosed with a mood disorder (vs. 5% of non-smokers) and 9% indicated having an anxiety disorder diagnosis (vs. 4% of non-smokers).

Table 1. Prevalence of Tobacco Use Co-morbidities

	Total	Current Smokers		Chi-square p-value
	% (95% CI)	Yes % (95% CI)	No % (95% CI)	
Drink alcohol/week (n=122,652)*				
Yes	41.9 (41.4-42.4)	49.9 (48.8-51.1)	39.8 (39.2-40.4)	<0.0001
No	58.1 (57.6-58.6)	50.1 (48.9-51.2)	60.2 (59.6-60.8)	
Binge drink/week (n=122,423)*				
Yes	6.5 (6.2-6.7)	14.8 (14.0-15.6)	4.4 (4.1-4.6)	<0.0001
No	93.5 (93.3-93.8)	85.2 (84.4-86.0)	95.6 (95.4-95.9)	
Problem drinking (AUDIT) (n=13,191)†				
Score ≥8	11.2 (10.2-12.2)	23.9 (20.5-27.3)	8.5 (7.5-9.4)	<0.0001
Cannabis use – lifetime (n=52,652)*				
Yes	38.1 (37.4-38.9)	66.7 (64.9-68.4)	31.3 (30.5-32.1)	<0.0001
No	61.9 (61.1-62.6)	33.3 (31.6-35.1)	68.7 (67.9-69.5)	
Cannabis use – previous year (n=52,636)*				
Yes	10.4 (10.0-10.9)	25.9 (24.4-27.3)	6.7 (6.3-7.2)	<0.0001
No	89.6 (89.1-90.0)	74.1 (72.7-75.6)	93.3 (92.8-93.7)	
Cannabis use problems (ASSIST) (n=13,540)†				
Low	94.2 (93.4-94.9)	81.8 (78.5-85.0)	96.8 (96.2-97.4)	<0.0001
Moderate/High	5.8 (5.1-6.6)	18.2 (15.0-21.5)	3.2 (2.6-3.8)	
Illicit drug use‡ – lifetime (n=13,379)†				
Yes	16.0 (14.8-17.1)	35.0 (31.3-38.7)	11.9 (10.7-13.0)	<0.0001
No	84.0 (82.9-85.2)	65.0 (61.3-68.7)	88.1 (87.0-89.3)	
Illicit drug use‡ – previous year (n=13,337)†				
Yes	2.2 (1.8-2.6)	6.3 (4.9-7.7)	1.3 (1.0-1.7)	<0.0001
No	97.8 (97.4-98.2)	93.7 (92.3-95.1)	98.7 (98.3-99.0)	
Harm from illicit drug use‡ – previous month (n=12,962)†				
Yes	2.1 (1.7-2.8)	4.8 (3.3-6.4)	1.6 (1.2-2.0)	<0.0001
No	97.9 (97.4-98.3)	95.2 (93.6-96.7)	98.4 (98.0-98.8)	
Distress scale (k10) (n=39,270)*				
Low	90.7 (90.3-91.2)	85.1 (83.8-86.3)	92.4 (91.9-93.0)	<0.0001
Moderate/High	9.3 (8.8-9.7)	14.9 (13.7-16.2)	7.6 (7.0-8.1)	
Depression scale (CIDI) (n=68,433)*				
Low	92.6 (92.2-92.9)	87.5 (86.5-88.6)	93.9 (93.5-94.3)	<0.0001
Moderate/High	7.4 (7.1-7.8)	12.5 (11.4-13.5)	6.1 (5.7-6.5)	
Mood disorder diagnosis (n=123,689)*				
Yes	6.4 (6.2-6.7)	11.0 (10.3-11.6)	5.3 (5.0-5.5)	<0.0001
No	93.6 (93.3-93.8)	89.0 (88.4-89.7)	94.7 (94.5-95.0)	
Anxiety disorder diagnosis (n=123,667)*				
Yes	5.1 (4.9-5.3)	8.7 (8.1-9.2)	4.2 (4.0-4.4)	<0.0001
No	94.9 (94.7-95.1)	91.3 (90.8-91.9)	95.8 (95.6-96.0)	

* Data from CCHS (N=123,846) – 20.4% current smokers (n=26,092), 79.6% non-smokers (n=97,754); 23.4% of males and 17.6% of females were current smokers.

† Data from CADUMS (N=13,581) – 17.7% current smokers (n=2,449), 82.3% non-smokers (n=11,132); 20.1% of males and 15.4% of females were current smokers.

‡ Excluding cannabis use.

Gender and age differences in co-morbid tobacco, other drug use, and mental health problems

Co-morbidities associated with smoking varied by age and sex (see Figures 1 and 2). While smokers of all ages and genders were more likely to report risky alcohol consumption, illicit drug use, and poor mental health, the effect of smoking status was significantly larger among teenagers. In particular, younger (12-17 year-old) female smokers were 36.9 times more likely to binge drink weekly than their non-smoking female peers. Male smokers aged 15-17 were 7 times more likely to experience problems related to cannabis use than non-smoker males, and female smokers aged 18-29 were 14 times more likely to have cannabis use problems than their non-smoking counterparts. The magnitude of association between smoking and illicit drug use was also significantly larger among younger smokers. Gender also affects the relationship of smoking and mental health outcomes, as the association between smoking and both depression and anxiety is larger among female compared to male smokers.

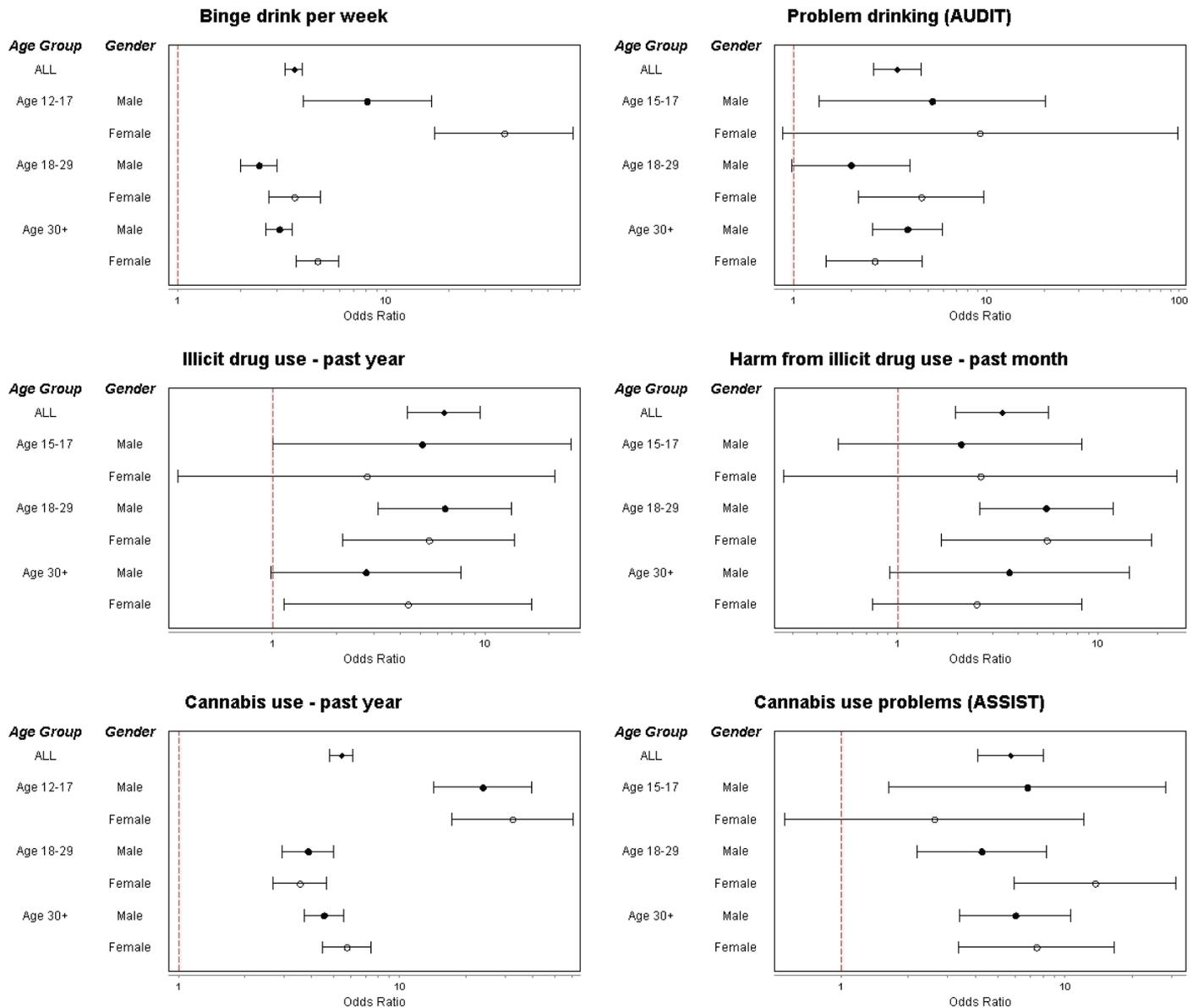
DISCUSSION

Our study found that smoking in Canada is associated with problematic use of alcohol and illicit drugs, as well as co-morbid mental health problems. Particularly, youth tobacco use co-morbidities are at an alarming level. Findings from this national study are consistent with results of a small body of, primarily provincial, research

in this area. Research among the general population in Canada has found a relatively high prevalence of major depression among current smokers aged 12 and over (11%), compared to ever-smokers (5%) and never-smokers (4%).⁸ A provincial study found that 74% of current smokers in Ontario consumed alcohol in excess of low-risk drinking guidelines compared to 57% of non-smokers.⁶ Among Canadian youth, 2% of those in Grades 7-12 had used alcohol, cigarettes, cannabis and other drugs in the previous year.⁴ In Ontario, the prevalence of such multi-substance use was found to be 5% among this age group.⁵ A recent study of adolescents in British Columbia found that male frequent cannabis users (those who had used cannabis 3-9 times in the previous 30 days) were more likely than females to frequently smoke cigarettes and drink alcohol.⁷ Similar to our findings, cigarette smoking was associated with elevated depressive symptoms among females in a sample of 12,000 students in grades 7-12 in four Atlantic Canadian provinces.¹⁴ In combination, these findings highlight that co-morbidities are prevalent among smokers in the general population in Canada and are deserving of greater public health attention.

Our findings are also consistent with international studies that have found higher prevalence of substance use and mental health problems among current smokers compared to non-smokers.^{10,12,13,23-25} For example, analyses of national population surveys in the United Kingdom, Australia, and the United States, have found prevalence rates of any mental disorder ranging from

Figure 1. Odds ratios and 95% confidence intervals from multivariate models comparing the odds of substance use among smokers (as compared to non-smokers)



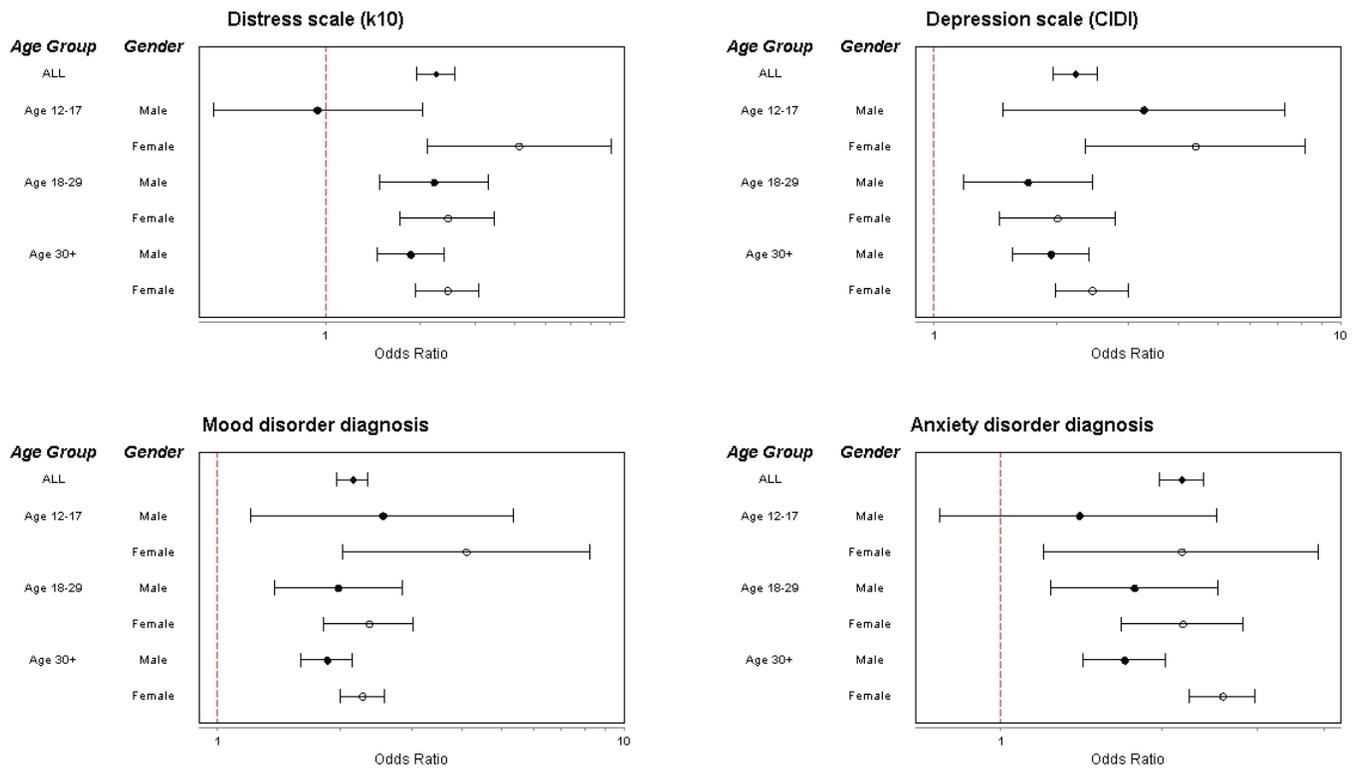
NOTE: Sample sizes for each of the above multivariate models are as follows: Binge drink (n=102,406), Problem drinking (n=8,814), Illicit drug use (n=8,876), Harm from illicit drug use (n=8,697), Cannabis use (n=43,982), Cannabis use problems (n=9,100). All models adjust for income level.

22% to 41% among current smokers.^{13,23-25} Approximately 7% of current smokers in a national sample in Australia and 6% in the US had harmful alcohol use, and 6% in Australia and 7% in the US had a depressive episode in the previous 12 months.¹³ A German study found that current daily smokers had higher odds of a substance use disorder, and affective, anxiety and somatoform disorders.¹²

A number of limitations should be considered when interpreting study findings. Our analyses examine co-occurring problematic alcohol use, illicit drug use and mental health problems among smokers; however, the cross-sectional nature of the data limits the ability to draw causal inferences. Confidence intervals are wide for estimates of co-morbidity for youth aged 12-17, which generally reflects lower prevalence of smoking among this age group (7.2% in CCHS; 7.6% in CADUMS). These analyses

reflect co-occurring tobacco and other substance use, but do not reflect concomitant use of substances. The CCHS contained missing data on cannabis use, depression and distress as some provinces opted out of those questions, resulting in lower sample sizes for these variables. Furthermore, co-morbid substance dependence is not examined because nine provinces (British Columbia, Alberta, Manitoba, Quebec, Nova Scotia, Prince Edward Island, Newfoundland & Labrador, Yukon, and Northwest Territories) opted out of the illicit drug use module in the CCHS, and data on dependence were not available in the CADUMS. Finally, two different population-level datasets were used in the analyses to assess national prevalence of tobacco use co-morbidities, with each data set being analyzed separately. However, both these datasets are representative of the Canadian population.

Figure 2. Odds ratios and 95% confidence intervals from multivariate models comparing the odds of mental health problems among smokers (as compared to non-smokers)



NOTE: Sample sizes for each of the above multivariate models are as follows: Distress scale (n=33,733), Depression scale (n=47,074), Mood disorder (n=102,689), Anxiety disorder (n=102,678). All models adjust for income level.

CONCLUSION

The issue of tobacco use co-morbidities is critical for the public health community, and this study has identified a young cohort that will experience tremendous health costs if current trends continue. In particular, this study has noted alarming rates of frequent binge drinking, cannabis problems and mental health issues among young female smokers. There is a need for further study of co-occurring tobacco use, the problematic use of other substances and mental health issues in the Canadian context, as well as more research and evaluation of prevention interventions and tailored approaches to treat smokers with co-morbidities, particularly youth. Furthermore, a more integrated response from tobacco control, substance use and mental health practitioners and services is necessary to address the treatment needs of individuals experiencing these co-morbidities.^{26,27}

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RÉSUMÉ

OBJECTIFS : Les comorbidités du tabagisme, dont la concomitance du tabagisme, de la consommation de substances et des troubles de santé mentale, posent un grave problème de santé publique qui a des conséquences sur le traitement et sur les politiques. On n'en sait pas suffisamment long, toutefois, sur la prévalence des diverses comorbidités du tabagisme dans la population canadienne. Le but de notre étude était de mieux comprendre l'envergure de cet enjeu en examinant la prévalence et les corrélats des comorbidités du tabagisme au Canada.

MÉTHODE : Nous avons mené une série d'analyses secondaires globales des données de deux enquêtes en population : l'Enquête sur la santé dans les collectivités canadiennes (ESCC) et l'Enquête de surveillance canadienne de la consommation d'alcool et de drogues (ESCCAD). Nous avons analysé les données de 123 846 répondants de l'ESCC et de 13 581 répondants de l'ESCCAD. Les variables de consommation de substances et de santé mentale ont été comparées selon l'usage du tabac à l'aide d'analyses du khi-carré. Des modèles multivariés de régression logistique ont servi à chiffrer l'association entre le tabagisme, la consommation de substances et les troubles de santé mentale en tenant compte de l'âge, du sexe et du revenu familial.

RÉSULTATS : La prévalence de la consommation abusive d'alcool et de drogues illicites était sensiblement plus élevée chez les fumeurs actuels que chez les non-fumeurs. Les troubles de santé mentale concomitants étaient également élevés chez les fumeurs actuels, et les comorbidités variaient selon l'âge et le sexe. Peu importe leur âge et leur sexe, les fumeurs étaient plus susceptibles de faire état d'une consommation abusive de substances et d'une mauvaise santé mentale, mais l'effet de l'usage du tabac était significativement plus grand chez les jeunes.

CONCLUSION : Le tabagisme au Canada est associé à la consommation abusive d'alcool et de drogues illicites, ainsi qu'à des troubles de santé mentale concomitants. Le niveau des comorbidités du tabagisme des jeunes est inquiétant, surtout chez les jeunes fumeuses. Il faudrait pousser la recherche sur cette question dans le contexte canadien et élaborer des interventions intégrées, adaptées au traitement des fumeurs présentant des comorbidités, tout particulièrement les jeunes.

MOTS CLÉS : tabagisme; concomitance de problèmes de toxicomanie et de troubles de santé mentale; enquête démographique; Canada