Cannabis use among middle and high school students in Ontario, Canada

Hugues Sampasa-Kanyinga, MD, MSc[1]

Hayley A. Hamilton, PhD[2,3]

Allana G. LeBlanc, PhD[4]

Jean-Philippe Chaput, PhD[5*]

Affiliations:

[1]School of Epidemiology and Public Health, University of Ottawa, Ottawa, Ontario, Canada
[2]Institute for Mental Health Policy Research, Centre for Addiction and Mental Health, Toronto, Ontario, Canada
[3]Dalla Lana School of Public Health, University of Toronto, Toronto, Ontario, Canada
[4]Division of Prevention and Rehabilitation, University of Ottawa Heart Institute, Ottawa, Canada
[5]Healthy Active Living and Obesity Research Group, Children's Hospital of Eastern Ontario Research Institute, Ottawa, Ontario, Canada.

***Corresponding Author:** Hugues Sampasa-Kanyinga, School of Epidemiology and Public Health, University of Ottawa, 451 Smyth Road, Ottawa, ON, K1H 8M5, Canada. E-mail: hsampasa@uottawa.ca. Phone: +1 613 562 5800. Fax: +1 613 562 5465.

Competing interests: None declared.

Funding: The Ontario Student Drug Use and Health Survey, a Centre for Addiction and Mental Health initiative, was funded in part through ongoing support from the Ontario Ministry of Health and Long-Term Care, as well as targeted funding from several provincial agencies. The funders had no involvement in study design; collection, analysis, and interpretation of data; writing the report; or the decision to submit the report for publication.

ABSTRACT

Background: Despite current legislation, cannabis is the most widely used illicit drug worldwide. This study assessed the prevalence of cannabis use among middle and high school students in Ontario (Canada), and examined its association with demographic and behavioural factors.

Methods: Data were obtained from the 2015 Ontario Student Drug Use and Health Survey, a province-wide, school-based survey of students in grades 7 through 12. Analyses included a representative sample of 9,920 middle and high school students.

Results: Overall, 21.5% and 13.8% of students reported using cannabis in the previous year, or month, respectively. The conditional probability that an adolescent who reported cannabis use in the past year would report daily use is 12.5%. There was a significant dose-response gradient with age, with older students more likely to use cannabis than younger students. In multivariate analyses, being in grades 10 through 12 (ORs ranged from 3.71 to 3.85), being of black ethnic background (OR=2.67; 95% CI: 1.76–4.05), using tobacco cigarette (OR=10.10; 95% CI: 8.68–13.92), and being occasional (OR=5.35; 95% CI: 4.01–7.13) or regular (OR=14.6; 95% CI: 10.8–19.89) alcohol users were associated with greater odds of cannabis use. Being an immigrant was associated with lower odds of cannabis use (OR=0.55; 95% CI: 0.39–0.78).

Interpretation: These findings suggest that cannabis use is prevalent among middle and high school students, and is strongly associated with tobacco cigarette smoking and alcohol consumption. Future research should document trends in cannabis use over time, including its risks, especially when the legalization of recreational cannabis becomes in effect.

Key words: marijuana, risk factors, adolescents, public health, Canada

INTRODUCTION

By July 2018, the Government of Canada has committed to legalizing the use, possession, purchase, and growth of recreation cannabis. However, little is known on the patterns and factors associated with cannabis use among adolescents (i.e., those aged 12-17 years). In particular, understanding sociodemographic characteristics and behavioural factors associated with cannabis use among adolescents on the eve of cannabis legalization and regulation in Canada is important because (i) cannabis is the most commonly used illegal drug among youth in Canada;[1] (ii) such knowledge could constitute baseline data necessary for surveillance and evaluation of the effects of legalization on cannabis use patterns and related factors; and (iii) adolescents are more vulnerable to the adverse effects of cannabis than adults.[2]

It is increasingly recognized that cannabis use impairs short-term memory and learning, the ability to focus, coordination, and is related to poorer academic achievement and suicidality.[3,4] Early cannabis use also increases the risk of psychosis related problems and schizophrenia.[5] Young brains are more susceptible to the effects of cannabis because they are still developing.[4,6,7] In June 2017, the Center for Addictions and Mental Health, in partnership with the Canadian Medical Association, the Canadian Public Health Association, the Canadian Society of Addiction Medicine, and the Canadian Centre on Substance Use and Addiction released lower-risk cannabis use guidelines to protect public health and safety.[8] Although the first recommendation is abstinence, they also recommend avoiding: smoking cannabis (i.e., versus edible forms), cannabis with high THC content, synthetic cannabis, frequent use, deep inhalation, using cannabis while driving, using cannabis with a history of psychosis, using cannabis during pregnancy, or for individuals <16 years old.[8]

Given the impending legalization of cannabis in Canada, it seems prudent to expect that cannabis use could increase dramatically, and it is necessary to establish the profile of cannabis use among adolescents, including its sociodemographic and behavioural correlates. Thus, the objective of this study was to assess the prevalence of cannabis use among middle and high school students in Ontario (Canada), and examine the association with demographic and behavioural factors.

METHODS

Data were obtained from the 2015 Ontario Student Drug Use and Health Survey (OSDUHS), a province-wide, school-based, cross-sectional survey of students in grades 7-12 within the public or Catholic school system.[1] Conducted every two years since 1977, the OSDUHS is the longest ongoing school survey in Canada. The survey employs a two-stage cluster design involving a random selection of classes from within a random selection of schools (probability proportional to size) stratified by region and school type. The survey is administered in classrooms through anonymous, student-completed questionnaires. A total of 10,426 students (representing nearly 900,000 students in grades 7–12 in Ontario) from 43 school boards, 220 schools, and 750 classes participated in the 2015 cycle of the survey. The response rate for students was 59%. Student non-response was due to absenteeism (11%), unreturned consent forms or parental refusal (29%), and other reasons such as comprehension issues, or withdrawals (1%). Further details regarding the study design are available elsewhere.[1] The study was approved by the Research Ethics Board of the Centre for Addiction and Mental Health and York University, as well as existing research review committees of participating school boards. All participants provided their own assent in addition to parental signed consent.

Measures

Cannabis use

Past year cannabis use was based on a survey question asking the frequency of cannabis use in the last 12 months. Cannabis was also referred to as marijuana, hashish, hash oil, "pot", "weed", "grass", and "hash". Respondents were provided with eight response choices. Responses were collapsed to create a binary (yes/no) measure of cannabis use. Respondents who indicated that they used cannabis at least once in the last 12 months were classified as having used cannabis ("yes"). Respondents who did not use cannabis in the 12 months prior to the survey, who have never used cannabis, or who reported that they did not know what cannabis is were classified as not having used cannabis in the last 12 months ("no"). A similar item was also used to assess *recent cannabis use*. Responses were collapsed 3 different ways to create 3 binary (yes/no) measures of cannabis use: (1) *Past month* users (yes/no) – respondents who indicated that they used cannabis at least once in the last 4 weeks; (2) *cannabis use on a weekly basis* (yes/no) – respondents who indicated that they used cannabis at least once each week; and (3) *cannabis use on a daily basis* (yes/no) – respondents who used cannabis at least once each day.

Synthetic cannabis use was based on a survey question asking the frequency of use in the last 12 months. Synthetic cannabis was referred to as "SPICE", also known as "K2", "K3", "Blaze", "Black Mamba", "legal weed", "fake pot", or "IZMS". For the *past 12-month measure,* responses were collapsed to create a binary (yes/no) measure of synthetic cannabis use. For the *lifetime measure,* responses were collapsed to create a binary (yes/no) measure of synthetic cannabis use.

Students were also asked about their history with cannabis use, and asked to indicate the grade in which they were when (if ever) they first tried cannabis. Respondents were provided with 10

response options. Respondents who indicated that they first tried cannabis in grade 4 or before, grade 5, and grade 6 were collapsed together for analysis.

Other substance use

The smoking of tobacco cigarettes was constructed as a dichotomous measure (yes/no) for previous year smoking history (excludes a few puffs). Alcohol use in the previous 12 months was constructed as a 3-category measure: “non-use”, “special occasion use”, or “regular use”. Students who had never drunk alcohol, had not drunk in the previous 12 months or had only had a sip of alcohol were classified as “non-drinkers”. Drinking on special occasions was classified as occasional drinking. Drinking outside of special occasions (i.e. from once a month or less to almost every day – 6 or 7 times a week) was classified as regular drinking.

Sociodemographic characteristics

Sociodemographic characteristics included sex (male/female), grade (7 to 12, with grades 7 and 8 collapsed to increase statistical power), racial background (White, Black, East/South East Asian, South Asian, or Other), subjective socio-economic status (low vs. high),[9] and immigration status (immigrant/non-immigrant).

Physical activity, screen time, and sleep duration

Physical activity, screen time, and sleep duration were categorized as meeting, and not meeting current guidelines.[10,11] Specifically, physical activity ≥60 minutes of moderate-to-vigorous physical activity per day; screen time ≤2 hours of recreational screen time per day; and sleep duration in the age-appropriate range (9–11 h per night for 11–13-year-olds; 8–10 h per night for 14–17-year-olds, or 7–9 h per night for those ≥18 years of age).[11,12] Physical activity, screen time, and sleep duration were self-reported as part of the questionnaire administered to students.

Data analysis

After removing missing data, we were left with an analytical sample of n=9,920 students, reducing our initial sample size by 4.9%. Taylor series linearization methods were used to account for the complex sample design of the survey. We generated descriptive statistics on the prevalence of cannabis use measured using different timeframes. We used cross-tabulations to examine bivariate associations of cannabis use (lifetime, past year, and past month) with sociodemographic and behavioural characteristics. Data were compared by Pearson Chi-Square adjusted for the survey design and transformed into an F-statistic for categorical data and by an adjusted Wald test for continuous data. Univariable (Model 1) and multivariable (Models 2 to 4) logistic regression analyses were performed to examine the relationships between cannabis use in the past year with demographic and behavioural factors, including sex, grade, ethnicity, socioeconomic status, immigration status, tobacco cigarette use, alcohol use, and adherence to the physical activity, screen time, and sleep duration recommendations. All data were analysed with STATA (version 13.0, Stata Corp., College Station, Texas, USA). Statistical significance was set at $p<0.05$.

RESULTS

Overall, 21.5% of students reported using cannabis at least once in the previous year (Table 1). Fewer students reported using cannabis on a monthly and daily basis (13.9% and 2.8%, respectively). The conditional probability that an adolescent who reported cannabis use in the past year would report daily use is 12.5%. About 1% of students reported using synthetic cannabis at least once during the past 12 months. Grades 9 and 10 were the most common grades in which students reported having tried cannabis for the first time.

Table 2 presents cannabis use among Ontario middle and high school students by demographic and behavioural factors. There was a dose-response gradient with age, with older students more likely to use cannabis than younger students. Cannabis use was more frequent among respondents who reported past-year tobacco cigarette use, occasional or regular alcohol use, and those with short sleep durations. The percentage of students reporting cannabis use in the past year was similar to reports of past-year tobacco cigarette use (21.5% and 18.1%, respectively). Students with an Asian ethnic background and immigrants were less likely to use cannabis. Socioeconomic status was not significantly associated with cannabis use.

Table 3 presents univariable and multivariable logistic regression analyses examining the relationships between cannabis use in the past year and demographic and behavioural factors. Analyses adjusted for demographic characteristics (Model 2) indicated that cannabis use in the past year was associated with grades in a dose-response fashion, with older students more likely to use cannabis. Being from an Asian ethnic background or being an immigrant was associated with lower odds of cannabis use (Model 2). Further adjusting for substance use in addition to sociodemographic characteristics changed the link between cannabis use and being of Black ethnic background to significance (Model 3). Using tobacco cigarette and drinking alcohol regularly or occasionally were also associated with greater odds of cannabis use (Model 3). In the fully adjusted model (Model 4), being in grades 10 through 12, being of Black ethnic background, using tobacco cigarette, and drinking alcohol regularly or occasionally were associated with greater odds of cannabis use. In contrast, being an immigrant was associated with lower odds of cannabis use.

INTERPRETATION

We used data from the 2015 cycle of the OSDUHS to investigate the prevalence and sociodemographic and behavioural correlates of cannabis use among middle and high school students in Ontario, Canada. Overall, 21.5% of students reported cannabis use in the previous year, representing about 204,000 students in grades 7–12 in Ontario. Some students (6.5%) reported having tried cannabis for the first time as early as elementary school, emphasizing the importance of early interventions. Being a regular alcohol user and using tobacco cigarettes were the strongest predictors of cannabis use. There was a significant dose-response gradient with age, with older students more likely to use cannabis than younger students. Being in grades 10 through 12, and of Black ethnic background were also associated with greater odds of cannabis use. Being an immigrant was associated with lower odds of cannabis use. These findings represent the most up-to-date data on cannabis use and are the first to establish a profile of adolescent cannabis users in Ontario. The results can inform medical practices, policy decisions and prevention efforts, especially as we move to the legalization of marijuana.

The prevalence of previous year cannabis use is somewhat consistent with data from students in grades 8, 10, and 12 in the United States who participated in the 2015 (23.7%) and 2016 (22.6%) Monitoring the Future survey,[13] and with data from youth aged 15 to 17 years from the Canadian Community Health Survey (20%).[14] It does appear that cannabis use is lower in Canada than the United States. For example, results from the 2015 cycle of the Youth Risk Behavior Surveillance System in the United States show a lifetime and past month prevalence of cannabis use of 38.6% and 21.7%, respectively.[15] Although a recent report indicated that cannabis use in Ontario has decreased over the past two decades from 28.0% in 1999 to 21.3% in 2015,[1] there have been increases in heavy use. For example, the prevalence of daily or near

daily users among adults in the United States went from 1.9% in 2002 to 3.5% in 2015. And since 2008, there has been consistent year-to-year increases in cannabis use among those >12 years, particularly in states that allow recreational marijuana.[16] With the impending legalization of marijuana in Canada, it is possible that access, quality, and content of marijuana will change significantly in the next few years. The tetrahydrocannabinol (THC) content of marijuana has already changed (increased) drastically in recent years.[17]

Consistent with other studies that have examined cannabis use in relation with other substances,[18-20] our results indicate that cannabis use is strongly associated with tobacco cigarette smoking and alcohol drinking. This suggests that cannabis use should be targeted as part of a multi-component prevention plan that also includes tobacco and alcohol. The observed dose-response gradient with age and students in more senior grades being more likely to use cannabis is consistent with findings of other studies.[21,22] Adolescents who reported being of Black ethnic background were more likely to report cannabis use, which is consistent with findings of other studies.[23] While Hamilton et al.[24] did not found such link, our results show that this association was mainly driven by other substance use, including alcohol use and tobacco cigarette smoking. The finding that being an immigrant was associated with lower odds of cannabis use also corroborates previous findings and provides further support for the immigrant paradox phenomenon.[25,26] These results support previous evidence suggesting that ethno-racial background should be an important consideration in investigations of cannabis use among foreign-born compared to native-born adolescents.[24]

Strengths and limitations

The results of this study should be considered in light of the following limitations. First, the study was cross-sectional, so causal inferences cannot be made. Second, the study relied on self-

reported data, which may raise potential issues related to social desirably bias since cannabis is still considered an illicit substance. Third, this study may actually underestimate the prevalence of cannabis use among adolescents, considering that those who have dropped out of school may have particularly high rates of frequent cannabis use.[27] Finally, although class response rate was very high (88%), student participation rate was relatively low (59%) and could have partly hampered the external validity of the results. However, the data did not show evidence of appreciable nonresponse bias.[1]

Conclusion

This study shows that cannabis use is prevalent among middle and high school students in Ontario, and is strongly associated with alcohol drinking and tobacco cigarette smoking. These findings can help to inform physicians and other health care professionals about protective and risk factors associated with cannabis use, and can help to identify target groups for future interventions. These findings can also help to inform public health organizations for heightened and tailored school-based prevention efforts. Future research should document trends in cannabis use over time, including its risks, especially with the impending legalization of recreational cannabis.

REFERENCES

1. Boak A, Hamilton HA, Adlaf EM, Mann RE. Drug use among Ontario students, 1977-2015: Detailed OSDUHS findings (CAMH Research Document Series No. 41). Toronto, ON: Centre for Addiction and Mental Health. 2015.

2. Mokrysz C, Freeman TP, Korkki S, Griffiths K, Curran HV. Are adolescents more vulnerable to the harmful effects of cannabis than adults? A placebo-controlled study in human males. *Transl Psychiatry.* 2016;6(11):e961.

3. Silins E, Horwood LJ, Patton GC, et al. Young adult sequelae of adolescent cannabis use: an integrative analysis. *Lancet Psychiatry.* 2014;1(4):286-293.

4. Volkow ND, Baler RD, Compton WM, Weiss SR. Adverse health effects of marijuana use. *N Engl J Med.* 2014;370(23):2219-2227.

5. Di Forti M, Morrison PD, Butt A, Murray RM. Cannabis use and psychiatric and cogitive disorders: the chicken or the egg? *Curr Opin Psychiatry.* 2007;20(3):228-234.

6. Shapiro GK, Buckley-Hunter L. What every adolescent needs to know: cannabis can cause psychosis. *J Psychosom Res.* 2010;69(6):533-539.

7. Lubman DI, Cheetham A, Yucel M. Cannabis and adolescent brain development. *Pharmacol Ther.* 2015;148:1-16.

8. Fischer B, Russell C, Sabioni P, et al. Lower-Risk Cannabis Use Guidelines: A Comprehensive Update of Evidence and Recommendations. *Am J Public Health.* 2017;107(8):e1-e12.

9. Sampasa-Kanyinga H, Chaput JP. Use of social networking sites and alcohol consumption among adolescents. *Public Health.* 2016;139:88-95.

10. Tremblay MS, Warburton DE, Janssen I, et al. New Canadian physical activity guidelines. *Appl Physiol Nutr Metab.* 2011;36(1):36-46; 47-58.

11. Tremblay MS, Carson V, Chaput JP, et al. Canadian 24-Hour Movement Guidelines for Children and Youth: An Integration of Physical Activity, Sedentary Behaviour, and Sleep. *Appl Physiol Nutr Metab.* 2016;41(6 Suppl 3):S311-327.

12. Hirshkowitz M, Whiton K, Albert SM, et al. National Sleep Foundation's sleep time duration recommendations: methodology and results summary. *Sleep Health.* 2015;1(1):40-43.

13. Miech RA, Johnston LD, O'Malley PM, Bachman JG, Schulenberg JE, Patrick ME. Monitoring the Future national survey results on drug use, 1975–2016: Volume I, Secondary school students. Ann Arbor: Institute for Social Research, The University of Michigan, 2017. Available at http://monitoringthefuture.org/pubs.html#monographs [last accessed August 11, 2017].

14. Rotermann M, Langlois K. Prevalence and correlates of marijuana use in Canada, 2012. *Health Reports.* 2015;26(4):10.

15. Kann L, McManus T, Harris WA, et al. Youth risk behavior surveillance—United States, 2015. *MMWR Surveill Summ* 2016;65(No. SS-6):1-174.

16. United Nations Office on Drugs and Crime. World Drug Report 2017 (ISBN: 978-92-1-148291-1, eISBN: 978-92-1-060623-3, United Nations publication, Sales No. E.17.XI.6).

17. Health Canada. A Framework for the Legalization and Regulation of Cannabis in Canada: The Final Report of the Task Force on Cannabis Legalization and Regulation, 2016 (ISBN: 978-0-660-07006-3). *Available at:* https://wwwcanadaca/en/services/health/marijuana-cannabis/task-force-marijuana-legalization-regulation/framework-legalization-regulation-cannabis-in-canadahtml#es [last accessed July 26, 2017].

18. Suris JC, Akre C, Berchtold A, Jeannin A, Michaud P. Some go without a cigarette: Characteristics of cannabis users who have never smoked tobacco. *Arch Pediatr Adolesc Med.* 2007;161(11):1042-1047.

19. Coffey C, Lynskey M, Wolfe R, Patton GC. Initiation and progression of cannabis use in a population-based Australian adolescent longitudinal study. *Addiction.* 2000;95(11):1679-1690.

20. Brook JS, Lee JY, Brook DW. Trajectories of marijuana use beginning in adolescence predict tobacco dependence in adulthood. *Substance Abuse.* 2015;36(4):470-477.

21. Johnston LD, O'Malley PM, Miech RA, Bachman JG, Schulenberg JE. Monitoring The Future National Results On Drug Use: 1975-2013: Overview, Key Findings On

Adolescent Drug Use. Institute For Social Research, The University Of Michigan; Ann Arbor: 2014. from http://www.monitoringthefuture.org/pubs/monographs/mtf-overview2014.pdf. [Last accessed August 9, 2017]

22. Palmer RHC, Young SE, Hopfer CJ, et al. Developmental epidemiology of drug use and abuse in adolescence and young adulthood: Evidence of generalized risk. *Drug Alcohol Depend.*102(1):78-87.

23. Johnson RM, Fairman B, Gilreath T, et al. Past 15-Year Trends in Adolescent Marijuana Use: Differences by Race/Ethnicity and Sex. *Drug Alcohol Depend.* 2015;155:8-15.

24. Hamilton HA, Owusu-Bempah A, Boak A, Mann RE. Ethnoracial differences in cannabis use among native-born and foreign-born high school students in Ontario. *J Ethn Subst Abuse.* 2017:1-12.

25. Chun H, Mobley M. The “Immigrant Paradox” Phenomenon: Assessing Problem Behaviors and Risk Factors Among Immigrant and Native Adolescents. *J Prim Prev.* 2014;35(5):339-356.

26. Cristini F, Scacchi L, Perkins DD, Bless KD, Vieno A. Drug Use Among Immigrant and Non-immigrant Adolescents: Immigrant Paradox, Family and Peer Influences. *J Community Appl Soc Psychol.* 2015;25(6):531-548.

27. Bray JW, Zarkin GA, Ringwalt C, Qi J. The relationship between marijuana initiation and dropping out of high school. *Health Econ.* 2000;9(1):9-18.

Table 1. Prevalence of cannabis use among Ontario middle and high school students, 2015 Ontario Student Drug Use and Health Survey.

	N	%	95% CI
Cannabis use			
Lifetime	2087	24.1	21.7 – 26.5
Past 12 months	1863	21.5	19.3 – 23.8
Past Month	1142	13.9	12.2 – 15.7
Weekly	396	4.9	4.0 – 5.8
Daily	207	2.8	2.1 – 3.5
Don't know what cannabis is	444	4.2	3.5 – 5.0
Never use cannabis in life	7833	75.9	73.4 – 78.2
Synthetic cannabis use			
Lifetime	147	1.6	1.1 – 2.1
Past 12 months	112	1.3	0.9 – 1.7
First time tried cannabis			
Never tried	7783	75.3	72.0 – 77.5
Grade 6 or before	105	1.0	0.7 – 1.3
Grade 7	205	1.8	1.4 – 2.4
Grade 8	350	3.7	3.1 – 4.4
Grade 9	627	7.0	6.1 – 8.1
Grade 10	491	6.2	5.4 – 7.2
Grade 11	269	3.7	3.2 – 4.2
Grade 12	90	1.3	0.9 – 1.7

CI: confidence interval.

Table 2. Cannabis use among Ontario middle and high school students by demographic and behavioural factors, 2015 Ontario Student Drug Use and Health Survey (N=9,920).

	Total sample	Lifetime use	Past 12 months use	Past month use	Never used in life
Age (years)					
Mean (SD)	15.1 (1.8)	16.4 (1.2)*	16.4 (1.2)*	16.4 (1.2)*	14.8 (1.9)
Sex (%)					
Male	51.3	25.5	22.4	15.0	74.5
Female	48.7	22.6	20.7	12.8	77.4
Grade (%)					
7/8	25.7	3.4*	3.0*	2.2*	96.6
9	16.1	11.9	10.1	6.6	88.1
10	16.7	26.8	24.7	14.7	73.2
11	17.3	38.8	34.7	23.5	61.2
12	24.1	42.0	37.3	24.0	58.0
Ethnicity (%)					
White	57.7	28.7*	25.4*	16.4*	71.3
Black	7.0	26.8	25.0	17.3	73.2
East/South East Asian	13.3	11.7	10.8	5.6	88.3
South Asian	8.8	10.9	9.0	6.2	89.1
Other	13.2	23.7	21.9	15.2	76.3
Subjective socioeconomic status (%)					
Low	67.3	26.3	20.6	13.1	77.0
High	32.7	23.0	23.5	15.6	73.7
Immigration status (%)					
Non-immigrant	81.7	26.5*	23.7*	15.4*	73.5
Immigrant	18.3	13.4	11.6	7.6	86.6
Tobacco cigarette use, past year (%)					
Not used	81.9	11.8*	10.0*	5.4*	88.2
Used	18.1	80.0	73.7	53.0	20.0
Alcohol use, past year (%)					
None/sip	53.7	3.6*	2.8*	1.8*	96.4
Occasional	19.8	27.5	23.9	13.6	72.5
Regular	26.5	63.2	57.8	39.0	36.8
Meeting the physical activity recommendation of ≥60 min/day (%)					
Do not meet	77.9	24.0	21.7	14.0	76.0
Meet	22.1	24.6	20.9	13.8	75.4
Meeting the screen time recommendation of ≤2 hours/day (%)					
Do not meet	64.3	24.6	21.9	14.7	75.4
Meet	35.7	23.3	20.8	12.7	76.7
Meeting the age-appropriate sleep					

duration recommendation (%)					
Do not meet	64.1	26.6*	23.9*	15.6*	73.4
Meet	35.9	19.6	17.3	10.9	80.4

Data are shown as column % in total column and row % are used elsewhere unless otherwise indicated.
Cannabis use measures are dichotomous; however, only yes responses are shown.
Cannabis use or not (for selected time frame) were compared with a chi-square test adjusted for the survey design and transformed into an F-statistic for categorical data and with an adjusted Wald test for continuous data. *P value <0.05.

Table 3. Logistic regression of past-year cannabis use among Ontario middle and high school students by demographic and behavioural factors, 2015 Ontario Student Drug Use and Health Survey (N=9,920).

	Model 1	Model 2	Model 3	Model 4
	OR (95% CI)	**OR (95% CI)**	**OR (95% CI)**	**OR (95% CI)**
Sex				
Male	1	1		1
Female	0.90 (0.73–1.13)	0.93 (0.75–1.14)	0.94 (0.73–1.19)	0.91 (0.71–1.16)
Grade				
7/8	1	1	1	1
9	**3.65 (1.68–7.94)**	**3.67 (1.67–8.05)**	1.63 (0.83–3.21)	1.64 (0.85–3.19)
10	**10.63 (4.9–22.81)**	**11.18 (5.17–24.16)**	**3.77 (1.98–7.18)**	**3.71 (1.96–7.04)**
11	**17.24 (8.07–36.81)**	**17.51 (8.13–37.69)**	**3.75 (1.97–7.12)**	**3.66 (1.94–6.92)**
12	**19.26 (8.97–41.36)**	**21.15 (9.83–45.51)**	**3.87 (2.06–7.26)**	**3.85 (2.07–7.16)**
Ethnicity				
White	1	1	1	1
Black	0.98 (0.68–1.41)	1.16 (0.81–1.66)	**2.70 (1.77–4.11)**	**2.67 (1.76–4.05)**
East/South East Asian	**0.35 (0.26–0.49)**	**0.43 (0.31–0.59)**	0.81 (0.58–1.14)	0.77 (0.54–1.10)
South Asian	**0.29 (0.21–0.41)**	**0.31 (0.22–0.44)**	0.94 (0.58–1.52)	0.92 (0.56–1.50)
Other	0.82 (0.67–1.01)	1.01 (0.78–1.31)	1.18 (0.81–1.72)	1.16 (0.79–1.71)
Subjective socioeconomic status				
High	1	1	1	1
Low	1.19 (0.98–1.43)	1.13 (0.94–1.34)	1.03 (0.85–1.26)	1.01 (0.83–1.22)
Immigration status				
Non-immigrant	1	1	1	1
Immigrant	**0.42 (0.32–0.56)**	**0.48 (0.37–0.64)**	**0.56 (0.39–0.79)**	**0.55 (0.39–0.78)**
Tobacco cigarette use, past year				
Not used	1		1	1
Used	**25.18 (20.58–30.81)**		**10.90 (8.60–13.83)**	**10.10 (8.68–13.92)**
Alcohol use, past year				
None/sip	1		1	1
Occasional	**10.94 (8.24–14.52)**		**5.42 (4.08–7.21)**	**5.35 (4.01–7.13)**

Regular	**47.53 (35.53–63.58)**		**14.84 (10.87–20.26)**	**14.6 (10.8–19.89)**
Meeting the physical activity recommendation				
Do not meet	1.05 (0.88–1.25)			1.10 (0.87–1.38)
Meet	1			1
Meeting the screen time recommendation				
Do not meet	1.07 (0.91–1.26)			1.09 (0.82–1.45)
Meet	1			1
Meeting the sleep duration recommendation				
Do not meet	**1.50 (1.25–1.81)**			1.21 (0.95–1.55)
Meet	1			1

OR: odds ratio; CI: confidence interval.
Models compare past-year cannabis use versus no use.
Model 1: univariable analysis.
Model 2: multivariable analysis including sociodemographic variables (i.e. sex, grade, ethnicity, subjective socioeconomic status, and immigration status).
Model 3: Model 2 + other substance use, including tobacco cigarette use and alcohol use.
Model 4: Model 3 + meeting the physical activity, screen time, and sleep duration recommendations (i.e. full model incorporating all the variables).
Bold values represent p values that are statistically significant at $p<0.05$.