This is the Post-Print version of an article accepted for publication in Journal of Studies on Alcohol and Drugs, after peer review but before any corrections were made during the publication process. The official version of record can be accessed online at https://doi.org/10.15288/jsad.2022.83.528

The following is the reference for the official version of record:

Wardell, J.D. (2022). Correlates of self-reported medicinal cannabis use for physical health, mental health, and sleep-related conditions in a population-based survey of Canadian youth. *Journal of Studies on Alcohol and Drugs, 83,* 528–536. doi:10.15288/jsad.2022.83.528.

Number of Tables: 4

Number of Figures: none

Correlates of self-reported medicinal cannabis use for physical health, mental health, and sleep-related conditions in a population-based survey of Canadian youth

Jeffrey D. Wardell, Ph.D.[1,2,3*]

[1]Department of Psychology, York University, 4700 Keele Street, Toronto, ON, Canada, M3J 1P3

[2]Institute for Mental Health Policy Research, Centre for Addiction and Mental Health, 33 Ursula Franklin St., Toronto, ON, Canada, M5S 2S1

[3]Department of Psychiatry, University of Toronto, 250 College St., Toronto, ON, Canada, M5T 1R8

*Correspondence: Jeffrey D. Wardell, 101 Behavioural Sciences Building, York University, 4700 Keele Street, Toronto, Ontario, Canada, M3J 1P3.

Email: jwardell@yorku.ca. Phone: 416-736-2100 ext. 44241. Fax: 416-736-5814

Funding Information: None

Abstract

Objective: Medicinal cannabis use (MCU) among youth is correlated with frequent cannabis use and several substance use and health-related indicators. This study examined whether correlates of self-reported MCU among youth varied as a function of the primary health condition for which cannabis is used. **Method:** Data came from the 2017 Canadian Tobacco, Alcohol, and Drugs Survey. Youth (ages 15-24) who reported past year cannabis use were included in analyses. Regression analyses (controlling for age and sex) compared youth reporting only non-medicinal cannabis use (NMCU-only, n=2082) to youth reporting MCU primarily for physical health conditions (n=227), mental health conditions (n=271), or insomnia (n=98). **Results:** Relative to youth reporting NMCU-only, youth reporting MCU for physical or mental health conditions had greater odds of reporting daily cannabis use, cannabis problems, vaporization and oral ingestion of cannabis, and tobacco use. Youth reporting MCU for physical health reasons also had greater odds of both illicit drug use and prescription pain medication use, whereas youth reporting MCU for mental health reasons had greater odds of prescription sedative use. Youth reporting MCU for insomnia only had greater odds of cannabis problems relative to youth in the NMCU-only group. Youth in both the physical health and mental health MCU groups reported poorer health and mental health compared with the NMCU-only group. Some, but not all, differences were accounted for by greater frequency of cannabis use among youth reporting MCU. **Conclusions:** Findings provide new insight into the correlates of MCU among youth in the general population, suggesting that these correlates vary as a function of the primary reason for MCU.

Keywords: medical marijuana; substance use; health; adolescents; young adults

Introduction

Youth (ages 15 to 24 years; United Nations, n.d.) have high rates of cannabis use in North America (Johnston et al., 2020; Rotermann, 2020; Schulenberg et al., 2020). In Canada, 49% of young adults (ages 20-24) and 37% of adolescents (ages 15-19) report past year cannabis use, compared with 22% of adults over age 24 (Health Canada, 2021). Youth are at greater risk for cannabis use disorder than older individuals (Substance Abuse and Mental Health Services Administration, 2020), and their developing brains may be especially sensitive to the deleterious neurocognitive effects of cannabis (Lisdahl et al., 2014). Accordingly, much research has been devoted to identifying correlates of cannabis use among youth to inform targeted interventions.

However, these studies rarely consider the unique experiences of youth who report using cannabis for medicinal reasons, even though this is not uncommon in this population. Indeed, a 2015 national survey in Canada, where medicinal cannabis use (MCU) has been legal since 2001, found that 3.4% of all youth aged 15-24 self-reported that they had used cannabis for "medicinal purposes" in the past year (Rotermann & Pagé, 2018). Also, 25.8% of high school students in Ontario, Canada who used cannabis in the past year reported that they had used cannabis to "manage pain, nausea, or another medical problem" (Wardell et al., 2021). Importantly, the vast majority of youth self-reporting MCU indicate that they do so without obtaining authorization through a healthcare provider and report that they also use cannabis for non-medicinal purposes (Health Canada, 2021; Wadsworth et al., 2020). Moreover, young adults reporting MCU have more problematic cannabis use and report different cannabis use motives relative to older MCU patients (Haug et. al, 2017). Thus, self-described MCU is an important factor to consider in research on cannabis use among youth.

Many studies have found that adults who report MCU differ from those who report only non-medical cannabis use (NMCU) on several cannabis use, substance use, and health-related correlates (e.g., Hamilton et al., 2017; Sznitman, 2017; for review, see Park & Wu, 2017). Studies of the correlates of MCU focussing specifically on youth have been less common until recently. These recent studies have consistently found that youth who report MCU engage in more frequent cannabis use and have greater risk for cannabis problems relative to their peers who report NMCU (Boyd et al., 2015; Choi et al., 2017; Hummer et al., 2021; Kim et al., 2018; Kossowsky et al., 2021; Lankenau et al., 2017; Mader et al., 2019; Pedersen et al., 2019; Tucker et al., 2019; Wadsworth et al., 2020; Wardell et al., 2021). Further, several of these studies have observed greater use of other substances and risk for alcohol or drug problems among youth reporting MCU (Boyd et al., 2015; Choi et al., 2017; Wardell et al., 2021). Some studies have also found that MCU among youth is associated with poorer physical and mental health relative to NMCU (Choi et al., 2017; Wadsworth et al., 2020; Wardell et al., 2021), although these findings have been mixed (Hummer et al., 2021; Kossowsky et al., 2021; Lankenau et al., 2017; Pedersen et al., 2019). Together, these studies suggest that youth reporting MCU have unique profiles of cannabis use, substance use, and health characteristics relative to their peers who engage in NMCU only.

However, an important limitation is that most of these studies involve samples of convenience or are otherwise not representative of the general population of youth who use cannabis. Only a few population-based studies examining correlates of MCU among youth have been published to date (Boyd et al., 2015; Choi et al., 2017; Wardell et al., 2021). Further, youth report using cannabis to manage a variety of medical conditions and symptoms including chronic pain, headaches, GI symptoms, depression, anxiety, and sleep problems, among others

(Lankenau et al., 2018; Rotermann & Pagé, 2018; Smith et al., 2019). Yet, prior studies tend to group all youth who report MCU into a single category and have rarely considered the heterogeneity among them. In one recent exception, Hummer et al. (2021) found that young adults in California who had medical cannabis authorization for physical health conditions showed greater elevations in cannabis consumption, cannabis problems, and risky behaviors than young adults with medical cannabis authorization exclusively for behavioral health conditions. However, this was not a population-based study involving a representative sample of youth, and this study did not examine the use of other substances or prescription medications, which are important correlates of medicinal cannabis use among youth (Wardell et al., 2021). Thus, additional epidemiological research is needed to further clarify how correlates of MCU among youth may differ depending on the specific medical reasons for MCU.

The goal of the present study was to extend research on the correlates of MCU among youth using data from a nationally representative survey of Canadians. The study aimed to examine the cannabis use, substance use, and health-related correlates specific to subgroups of youth reporting MCU for physical health, mental health, or sleep-related conditions. Moreover, as most previous studies have not controlled for frequency of cannabis use when examining substance use and health-related correlates of MCU, this study also aimed to determine whether these associations could be explained by frequency of cannabis use. Finally, given developmental differences between adolescents and young adults, including differences in patterns of substance use (Johnston et al., 2020; Statistics Canada, 2018a), the moderating role of age group (young adults vs. adolescents) was also explored in the analyses.

Method

Participants and Procedure

Data came from the Canadian Tobacco, Alcohol, and Drugs Survey (CTADS), a biennial, cross-sectional telephone survey of the Canadian population aged 15 and older (Statistics Canada, 2018a). The survey was administered between February and December 2017, the year prior to legalization of non-medicinal cannabis use in Canada. The CTADS involves a complex stratified random sampling approach to obtain a representative sample of the Canadian population (see Statistics Canada, 2018a, for methodological details). The sampling strategy involved stratification of households by province and by age group (15-19, 20-24, and 25+). To strategically oversample youth, households believed to have at least one individual in the 15-19 or 20-24 age group were targeted for recruitment. A random sample of these households was selected within each province to be contacted (using available landline and cellular phone numbers), and one person in each of the youth age strata (15-19 and 20-24 years old) was randomly selected for the interview if available. A smaller proportion of individuals over age 24 were also randomly selected for the interview, but this age group was subsampled to prioritize oversampling of youth. The 2017 CTADS had a household response rate of 50.7%, and among respondent households the person-level response rate was 70.4% (Statistics Canada, 2018a). The anonymized data are available for secondary analysis as a Public Use Microdata file (Statistics Canada, 2018b). Thus, ethics approval for this secondary analysis was not required. The full set of survey questions and response options is publicly available on the Statistics Canada website (Statisics Canada, 2018a).

As the present study aimed to compare youth who reported various reasons for MCU to those reporting only NMCU, only participants aged 15-24 who reported cannabis use in the past

year (N=2757) were included in analyses. Four participants had invalid data on the question assessing MCU and were excluded from the analyses, resulting in a final sample size of N=2753. The final sample had a mean age of 20.35 years (*SD*=2.49; n=1022 aged 15-19; n=1731 aged 20-24), 44.3% (n=1219) of the participants identified as female, 24.7% (n=668) lived in a rural area, and 4.1% (n=112) were married or living in a common-law relationship.

Measures

Cannabis use. Participants were informed that the term "marijuana" referred to "marijuana, hashish, hash oil or any other preparation of the cannabis plant". Participants endorsing past year cannabis use were asked to report the routes of cannabis administration they had used in the past year, including smoking, vaporizing, eating and drinking cannabis (the latter two were combined into a variable reflecting the oral route of administration). Participants were also asked where they typically obtained the cannabis they used in the past month, with 9 different response options (see Table 1). Participants then reported their frequency of cannabis use in the past 3 months.

Medicinal cannabis use. Participants who endorsed past year cannabis use were asked, "In the past 12 months, have you used or tried marijuana (hashish, hash oil, or other cannabis derivatives) for medical purposes?" Participants responding affirmatively were subsequently asked, "For what main medical condition did you use marijuana?" and were asked to select one of several response options (see Table 1).

Cannabis problems. Problems associated with cannabis use in the past 3 months were assessed using the World Health Organization Alcohol, Smoking and Substance Involvement Screening Test (ASSIST; Humeniuk et al., 2010). Based on conventions (Humeniuk et al., 2010), ASSIST scores < 4 indicate low risk, scores 4-25 indicate moderate risk, and scores > 25

indicate high risk for cannabis problems. As few participants (n=17) scored > 25, a binary variable was created to compare low risk (coded 0) vs. moderate or high risk (coded 1).

Other substance and medication use. Participants were asked if they used any tobacco products in the past 30 days, including cigarette, cigars, cigarillos, smokeless tobacco, and tobacco smoked in a pipe or water pipe. Participants were also asked to report the frequency of heavy episodic drinking in that past 12 months (defined as 4 or more drinks for females and 5 or more drinks for males), on an 8-point scale ranging from *Never* to *Daily or almost daily*.

Participants reported whether they had used prescription pain relievers, sedatives, or stimulants in the past year. If so, they were asked if each category of medication was prescribed to them. Response options included: *No, none were prescribed; Yes, they all were prescribed;* and *Some were prescribed, and others were not.* Binary variables were created for each medication type to indicate whether the participant had a prescription for all or some medications of that type (coded as 1) versus no prescription (coded as 0). Participants were also asked if they had used cocaine, speed/methamphetamines, ecstasy, hallucinogens, salvia, or heroin in the past year. A binary variable was created reflecting any illicit drug use (including using medications without a prescription) in the past year (yes vs. no).

Self-reported health and mental health. Participants responded to two items to assess their perceptions of their general health and mental health. The items read, “In general, would you say your [health/mental health] is…” with 5 response options ranging from *Poor* to *Excellent.*

Data Analysis

Data were analyzed using SAS v.9.4 (Cary, NC). First, descriptive analyses were performed on the MCU items to examine the prevalence of, and reasons for, MCU in the sample.

Given low endorsement of several of the medical reasons for MCU (see Table 1), participants were grouped into broader categories reflecting a) physical symptoms/conditions, including chronic pain, nausea/vomiting, lack of appetite/weight loss, multiple sclerosis/spinal cord injury, and epilepsy; b) mental health symptoms/conditions, including depression and anxiety/nerves; and c) insomnia. Next, descriptive analyses were conducted to examine demographic, cannabis use, substance use, and self-reported health variables separately for each group of participants reporting MCU as well as those reporting NMCU only. For all descriptive analyses, unweighted counts, percentages, and means are reported along with weighted estimates of percentages and means reflective of the population. To obtain weighted estimates and coefficients of variation, complex survey analyses were conducted in SAS using the balanced repeated replication (BRR) method, following analysis guidance provided by Statistics Canada (Gagné et al., 2014). These analyses incorporated the sampling weight variable along with 500 bootstrapped replicate weights available with the CTADS dataset. Weighted estimates with coefficients of variation > 16.5% were flagged with a warning to interpret the estimate with caution, and weighted estimates with coefficients of variation > 33.3% and/or those based on cell sizes of $n<30$ were deemed to be of insufficient quality and are not reported.

Next, to examine differences in cannabis use, substance use, and health correlates of MCU as a function of primary reason for MCU, a series of linear and logistic regressions were conducted with a set of 3 dummy coded predictor variables to compare each of the MCU groups to the NMCU-only group (reference category). Sex and age group (20-24 vs. 15-19 years old) were included as covariates in all models. Then, to determine whether differences between the MCU groups and NMCU-only group were accounted for by frequency of cannabis use, the models were rerun controlling for frequency of cannabis use in the past 3 months. Finally, to

examine whether the correlates of MCU were moderated by age, all models were rerun including the interactions between age group and each of the cannabis grouping variables.

Given that multiple tests were conducted, a conservative alpha level of .01 was set, and estimates were considered to be statistically significant if the 99% Confidence Interval (CI) did not contain zero (for linear regression coefficients) or one (for odds ratios). All linear and logistic regressions used the complex survey procedure in SAS with the sampling weight and replicate weights included in the estimation (Gagné et al., 2014).

Results

Descriptive Analyses

The distribution of cannabis use frequency was bimodal, with infrequent and daily cannabis use reported by more participants than weekly or monthly cannabis use (see Table 1).[1] The most common source of cannabis was a family member or friend; less than 3% of the sample reported obtaining cannabis from a licensed medical producer (Table 1). A substantial number of participants (n=671, 24.5%, weighted%=22.8) reported that they had used cannabis for medicinal purposes in the past year. The primary reasons for MCU are shown in Table 1.[2] Descriptive data for each of the cannabis use groups are shown in Table 2.

Differences among Cannabis Use Groups

Demographics. Neither mean age nor the proportion of participants in each age group differed significantly between the MCU groups and the NMCU-only group (all p>.100; see Table 3). Relative to the NMCU-only group, there was a significantly greater proportion of men in the Physical Health MCU group, OR=2.09, 99% CI [1.05, 4.14], a significantly smaller proportion of men in the Mental Health MCU group, OR=0.40, 99% CI [0.19, 0.87], and no difference in the proportion of men in the Insomnia MCU group, OR=1.99, 99% CI [0.56, 7.08].

Cannabis use variables. Participants in the physical and mental health MCU groups, but not the insomnia group, had greater odds of reporting daily cannabis use and both oral ingestion and vaporization of cannabis relative to participants in the NMCU-only group (see Table 3).[3] Furthermore, all three MCU groups were more likely to have at least moderate risk for cannabis problems relative to the NMCU-only group, although this difference was less pronounced for the insomnia MCU group (see Table 3).

Other substance use. Table 3 shows that rates of tobacco use were significantly greater in the physical and mental health MCU groups, but not in the insomnia MCU group, relative to the NMCU-only. In contrast, only participants in the physical health MCU group had greater odds of reporting past year illicit drug use and use of pain medications with a prescription relative to the NMCU-only group. Further, only the mental health NMCU group had greater odds of reporting sedative use with a prescription than the NMCU-only group. There were no significant differences between the MCU groups and the NMCU-only group on frequency of heavy episodic drinking or odds of prescription stimulant use (Table 3).

Self-reported health and mental health. Participants in both the physical and mental health MCU groups (but not the insomnia MCU group) reported poorer health and mental health relative to participants in the NMCU-only group (see Table 3).

Adjusting for Cannabis Use Frequency and Moderation by Age

As shown in Table 4, all differences between MCU groups and the NMCU-only group on cannabis vaping, cannabis problems, tobacco use, and illicit drug use were no longer statistically significant after controlling for cannabis use frequency. Conversely, cannabis use frequency did not account for differences between groups in the likelihood of having a prescription for pain medications or sedatives. Also, controlling for cannabis use frequency strengthened the negative

association between MCU for physical health and frequency of heavy episodic drinking, such that this association became statistically significant (Table 4). Finally, cannabis use frequency accounted for the poorer ratings of health observed among the mental health MCU group (but not among the physical health MCU group), as well as the poorer ratings of mental health observed among the physical health MCU group (but not among the mental health MCU group).

Finally, no interactions between age group and cannabis group were supported (all $p>.01$), suggesting that the correlates of medicinal cannabis use did not differ significantly between the adolescents and young adults in the sample.

Discussion

This study contributes to a growing literature on MCU among youth. Consistent with other recent population-based studies (Rotermann & Pagé, 2018; Wardell et al., 2021), the current study found that self-described MCU was relatively common among youth who use cannabis. Further, youth reported cannabis use to manage a variety of conditions – including chronic pain, anxiety, insomnia, and depression – consistent with previous research (Hummer et al., 2021; Lankenau et al., 2018; Rotermann & Pagé, 2018; Smith et al., 2019). The current study extends prior work by examining correlates of MCU separately for youth reporting MCU for physical health, mental health, or sleep-related conditions. Further age group was considered as a moderator, but observed associations were not found to differ significantly across adolescents and young adults.

This study found that youth reporting MCU generally reported greater frequency of cannabis use, higher rates of cannabis problems, and higher rates of vaping and orally ingesting cannabis relative to youth reporting only NMCU, which aligns with previous findings (e.g., Boyd et al., 2015; Kossowsky et al., 2021; Hummer et al., 2021; Pedersen et al., 2019; Tucker et

al., 2019; Wardell et al., 2021). However, the magnitude of these differences was much greater for the physical and mental health MCU groups than for the insomnia MCU group. The only prior study to examine differences between youth reporting MCU vs. NMCU-only as a function of specific reasons for MCU grouped mental health and sleep conditions together into a single category and did not examine sleep conditions separately (Hummer et al., 2021). Thus, the current study provides new insight, suggesting that youth reporting MCU primarily to manage insomnia may not be as likely to show elevations in daily cannabis use, cannabis problems, and other substance use as youth reporting MCU primarily to manage physical and mental health conditions. Importantly, this study also found that the elevated risk for cannabis problems for all of the MCU groups was explained entirely by differences in the frequency of cannabis use.

This is the first study to examine a variety of substance use correlates of MCU among youth as a function of different reasons for MCU. Relative to the NMCU-only group, rates of tobacco use were higher in both the physical health and mental health MCU groups, whereas rates of illicit drug use were higher only in the physical health MCU group. However, these differences were entirely explained by differences in the frequency of cannabis use, a confound that has rarely been examined in studies of the correlates of MCU (see also Wardell et al., 2021). Further, controlling for cannabis use frequency revealed a negative association between MCU for physical health and heavy episodic drinking frequency. Perhaps youth who use cannabis primarily to manage a physical health condition might be particularly conscious of the health risks of heavy drinking and may be more likely to avoid heavy drinking or to use cannabis as a substitute for alcohol. Studies including adults of all ages have often observed a cannabis-alcohol substitution effect among those reporting MCU (e.g., Lin et al., 2016; Roy-Byrne et al., 2015; Wardell et al., 2018). However, prior studies of youth have tended not to support the same

cannabis-alcohol substitution effect when comparing MCU to NMCU-only (Boyd et al., 2015; Wardell et al., 2021). The current findings suggest that lower rates of heavy drinking among youth reporting MCU (relative to NMCU) may be unique to the subgroup of youth reporting MCU for physical health conditions, and may only emerge after controlling for variance in heavy drinking explained by frequency of cannabis use.

Unsurprisingly, greater likelihood of using pain medications with a prescription was specific to youth reporting physical health reasons for MCU, and greater likelihood of using sedatives with a prescription was specific to youth reporting mental health reasons for MCU. These findings extend past research showing that MCU among youth are more likely to have prescriptions for psychoactive medications (Wardell et al., 2021), demonstrating that use of specific medications appears to align with the primary medical condition for which cannabis is used. Yet, somewhat surprisingly, youth reporting MCU primarily for insomnia were not more likely to report using sedatives with a prescription relative to youth reporting NMCU only. However, the small cell size for prescription sedative use in the Insomnia MCU group may have affected statistical power to detect effects for this group.

Results also provide new insight into the relationships between self-reported MCU and perceived health and mental health. When controlling for cannabis use frequency, only the physical health MCU group reported significantly poorer health, and only the mental health MCU group reported significantly poorer mental health, relative to the NMCU-only group. These findings are inconsistent with some previous studies showing that youth who obtain medical authorization for cannabis are no more likely to report worse physical and mental health than those without medical authorization (Hummer et al., 2021; Lankenau et al., 2017; Pedersen et al., 2019). However, the current study examined self-defined MCU, which includes both youth

with and without medical authorization. Thus, the present findings suggest that youth in the general population who self-report MCU (irrespective of medical authorization) tend to report a pattern of poorer health and mental health that maps onto their primary medical reason for MCU.

Some limitations of this study must be considered. First, it was not possible to distinguish between youth with versus without medical cannabis authorization, nor between youth using cannabis exclusively for medicinal reasons versus a combination of medicinal and non-medicinal reasons. Most Canadian youth reporting MCU do so without medical authorization, and rarely report using cannabis exclusively for medicinal reasons (Health Canada, 2021). Similar findings have also been reported in adult samples (Hamilton et al., 2017; Sznitman, 2017). Thus, it is likely that MCU captured in this study primarily reflects self-medication of symptoms among youth who also engage in NMCU. Also, data reported here were collected in the year prior to legalization of NMCU in Canada. It will be necessary to replicate and extend the findings with data collected after legalization of NMCU. Further, findings may have limited generalizability to youth outside of Canada, and the cross-sectional nature of the data prevent any causal inferences. Data on participants' race, ethnicity and socioeconomic status are not available in the CTADS dataset, limiting the ability to examine the role of these important factors in MCU. Additional limitations include the reliance on self-report data and the use of single-item measures for some variables.

In conclusion, this study provides new insight into the correlates of MCU among youth in the general population as a function of their primary medical reason for cannabis use. Together with previous findings that show greater risk for cannabis problems among younger vs. older medicinal cannabis patients (Haug et al., 2017), the results of this study suggest that MCU may be a unique marker of risk among youth. Thus, health care providers working with youth should

not only assess MCU, but also should assess specific reasons for MCU, as these may be associated with specific patterns of substance use and health-related correlates. Future research should examine the utility of harm reduction interventions for youth who report MCU that are tailored toward their specific reasons for MCU.

Footnotes

[1]Due to its bimodal distribution, frequency of cannabis use was dichotomized into *Daily* vs. *Less than daily* in the model in which it was examined as an outcome variable.

[2] Two participants were missing data on primary reason for MCU, and n=73 reported their primary reason as "other". These participants were excluded from subsequent analyses of differences as a function of primary reason for MCU (leaving N=2678 for these analyses).

[3]For the smoking route of cannabis administration, the confidence intervals for the Odds Ratios showed extreme uncertainty in the estimates (with an upper limit >999 for one estimate). This was likely due to the very small number of participants reporting that they did not use smoking as a method of cannabis administration in the past year (see Table 2). Thus, the results of the logistic regressions for the smoking route of administration are not reported.

References

Boyd, C. J., Veliz, P. T., & McCabe, S. E. (2015). Adolescents' use of medical marijuana: A secondary analysis of monitoring the future data. *Journal of Adolescent Health*, *57*(2), 241–244. https://doi.org/10.1016/j.jadohealth.2015.04.008

Choi, N. G., DiNitto, D. M., & Marti, C. N. (2017). Nonmedical versus medical marijuana use among three age groups of adults: Associations with mental and physical health status. *The American Journal on Addictions*, *26*(7), 697–706. https://doi.org/10.1111/ajad.12598

Gagné, C., Roberts, G., & Keown, L. (2014). Weighted estimation and bootstrap variance estimation for analyzing survey data: How to implement in selected software. *Information and Technical Bulletin*, *6*(1), 5–70. https://www150.statcan.gc.ca/n1/pub/12-002-x/2014001/article/11901-eng.pdf

Health Canada. (2021). *Canadian cannabis survey (CSS) detailed tables*. https://epe.lac-bac.gc.ca/100/200/301/pwgsc-tpsgc/por-ef/health/2021/102-20 e/CCS2021_DetailedTables_09DEC2021.pdf.

Humeniuk, R., Monteiro, M. G., Poznyak, V., Ali, R., & Henry-Edwards, S. (2010). *The alcohol, smoking and substance involvement screening test (ASSIST): Manual for use in primary care*. Geneva: World Health Organization.

Hamilton, H. A., Brands, B., Ialomiteanu, A. R., & Mann, R. E. (2017). Therapeutic use of cannabis: Prevalence and characteristics among adults in Ontario, Canada. *Canadian Journal of Public Health, 108,* e282-e287. https://doi.org/10.17269/CJPH.108.6130

Haug, N. A., Padula, C. B., Sottile, J. E., Vandrey, R., Heinz, A. J., & Bonn-Miller, M. O. (2017). Cannabis use patterns and motives: a comparison of younger, middle-aged, and older medical cannabis dispensary patients. *Addictive behaviors, 72,* 14-20. https://doi.org/10.1016/j.addbeh.2017.03.006

Hummer, J., Seelam, R., Pedersen, E., Tucker, J., Klein, D., & D'Amico, E. (2021). Why young adults obtain a medical marijuana card: Associations with health symptoms and heaviness of use. *Cannabis*, *4*(1), 27–39. https://doi.org/10.26828/cannabis/2021.01.001

Johnston, L. D., Miech, R. A., O'Malley, P. M., Bachman, J. G., Schulenberg, J. E., & Patrick, M. E. (2020). Monitoring the future national survey results on drug use, 1975-2019: Overview, key findings on adolescent drug use. *Ann Arbor: Institute for Social Research*, 1–131. https://doi.org/10.3998/2027.42/162579

Kim, J., Coors, M. E., Young, S. E., Raymond, K. M., Hopfer, C. J., Wall, T. L., Corley, R. P., Brown, S. A., & Sakai, J. T. (2018). Cannabis use disorder and male sex predict medical cannabis card status in a sample of high risk adolescents. *Drug and Alcohol Dependence*, *183*, 25–33. https://doi.org/10.1016/j.drugalcdep.2017.11.007

Kossowsky, J., Magane, K. M., Levy, S., & Weitzman, E. R. (2021). Marijuana Use to Address Symptoms and Side Effects by Youth With Chronic Medical Conditions. Pediatrics, 147, e2020021352. https://doi.org/10.1542/peds.2020-021352

Lankenau, S. E., Ataiants, J., Mohanty, S., Schrager, S., Iverson, E., & Wong, C. F. (2017). Health conditions and motivations for marijuana use among young adult medical

marijuana patients and non-patient marijuana users. *Drug and Alcohol Review*, *37*(2), 237–246. https://doi.org/10.1111/dar.12534

Lankenau, S. E., Fedorova, E. V., Reed, M., Schrager, S. M., Iverson, E., & Wong, C. F. (2017). Marijuana practices and patterns of use among young adult medical marijuana patients and non-patient marijuana users. *Drug and Alcohol Dependence*, *170*, 181–188. https://doi.org/10.1016/j.drugalcdep.2016.10.025

Lin, L. A., Ilgen, M. A., Jannausch, M., & Bohnert, K. M. (2016). Comparing adults who use cannabis medically with those who use recreationally: Results from a national sample. *Addictive Behaviors*, *61*, 99–103. https://doi.org/10.1016/j.addbeh.2016.05.015

Lisdahl, K. M., Wright, N. E., Medina-Kirchner, C., Maple, K. E., & Shollenbarger, S. (2014). Considering cannabis: The effects of regular cannabis use on neurocognition in adolescents and young adults. *Current Addiction Reports*, *1*(2), 144–156. https://doi.org/10.1007/s40429-014-0019-6

Mader, J., Smith, J. M., Afzal, A. R., Szeto, A. C. H., & Winters, K. C. (2019). Correlates of lifetime cannabis use and cannabis use severity in a Canadian university sample. *Addictive Behaviors*, *98*, 106015. https://doi.org/10.1016/j.addbeh.2019.06.004

Park, J.-Y., & Wu, L.-T. (2017). Prevalence, reasons, perceived effects, and correlates of medical marijuana use: A review. *Drug and Alcohol Dependence*, *177*, 1–13. https://doi.org/10.1016/j.drugalcdep.2017.03.009

Pedersen, E. R., Tucker, J. S., Seelam, R., Rodriguez, A., & D'Amico, E. J. (2019). Factors associated with acquiring a medical marijuana card: A longitudinal examination of young

adults in California. *Journal of Studies on Alcohol and Drugs*, *80*(6), 687–692. https://doi.org/10.15288/jsad.2019.80.687

Rotermann, M. (2020). What has changed since cannabis was legalized? *Health Reports*, *31*(2), 11–20. https://doi.org/10.25318/82-003-x202000200002-eng

Rotermann, M., & Pagé, M. M. (2018). Prevalence and correlates of non-medical only compared to self-defined medical and non-medical cannabis use, Canada, 2015. *Health Reports*, *29*(7), 3–13.

Roy-Byrne, P., Maynard, C., Bumgardner, K., Krupski, A., Dunn, C., West, I. I., Donovan, D., Atkins, D. C., & Ries, R. (2015). Are medical marijuana users different from recreational users? The view from primary care. *The American Journal on Addictions*, *24*(7), 599–606. https://doi.org/10.1111/ajad.12270

Schulenberg, J. E., Johnston, L. D., O'Malley, P. M., Bachman, J. G., Miech, R. A., & Patrick, M. E. (2020). Monitoring the future national survey results on drug use, 1975-2019: Volume II, college students and adults ages 19-60. *Ann Arbor: Institute for Social Research*. https://doi.org/10.3998/2027.42/162576

Smith, J. M., Mader, J., Szeto, A. C., Arria, A. M., Winters, K. C., & Wilkes, T. C. (2019). Cannabis use for medicinal purposes among Canadian university students. *The Canadian Journal of Psychiatry*, *64*(5), 351–355. https://doi.org/10.1177/0706743718818420

Statistics Canada. (2018a, October 29). *Canadian tobacco, alcohol and drugs survey (CTADS)*. https://www23.statcan.gc.ca/imdb/p2SV.pl?Function=getSurvey&Id=333871.

Statistics Canada. (2018b). *Canadian tobacco, alcohol and drugs survey microdata file, 2017*. [Data set]. Statistics Canada. https://www150.statcan.gc.ca/n1/en/catalogue/82M0020X.

Substance Abuse and Mental Health Services Administration. (2020). *Key substance use and mental health indicators in the United States: Results from the 2019 national survey on drug use and health*. Rockville, MD: Center for Behavioral Health Statistics and Quality, Substance Abuse and Mental Health Services Administration. https://www.samhsa.gov/data/sites/default/files/cbhsq-reports/NSDUHNationalFindingsReport2018/NSDUHNationalFindingsReport2018.pdf

Sznitman, S. R. (2017). Do recreational cannabis users, unlicensed and licensed medical cannabis users form distinct groups? *International Journal of Drug Policy, 42,* 15-21. https://doi.org/10.1016/j.drugpo.2016.11.010

Tucker, J. S., Rodriguez, A., Pedersen, E. R., Seelam, R., Shih, R. A., & D'Amico, E. J. (2019). Greater risk for frequent marijuana use and problems among young adult marijuana users with a medical marijuana card. *Drug and Alcohol Dependence*, *194*, 178–183. https://doi.org/10.1016/j.drugalcdep.2018.09.028

United Nations (n.d.). *Global Issues: Youth.* Retrieved November 1, 2021, from https://www.un.org/en/global-issues/youth.

Wadsworth, E., Leos-Toro, C., & Hammond, D. (2019). Mental health and medical cannabis use among youth and young adults in Canada. *Substance Use & Misuse*, *55*(4), 582–589. https://doi.org/10.1080/10826084.2019.1691594

Wardell, J. D., Rueda, S., Elton-Marshall, T., Mann, R. E., & Hamilton, H. A. (2021). Prevalence and correlates of medicinal cannabis use among adolescents. *Journal of Adolescent Health*, *68*(1), 103–109. https://doi.org/10.1016/j.jadohealth.2020.07.032

Wardell, J. D., Shuper, P. A., & Hendershot, C. S. (2018). A longitudinal investigation of the association between cannabis use and alcohol use among people living with HIV. *Drug and Alcohol Dependence*, *193*, 7–13. https://doi.org/10.1016/j.drugalcdep.2018.08.026

Table 1. Cannabis use frequency, sources of cannabis, and medicinal cannabis use among youth who reported cannabis use in the past year

	Unweighted		Weighted
	N	%	%
Frequency of cannabis use (past 3 months)			
No use in the past 3 months	880	32.18	31.68
Less than monthly use	612	22.38	18.71
Monthly use	324	11.84	13.55
Weekly use	357	13.05	12.29
Daily or near daily use	562	20.55	23.78
Total[a]	2735		
Typical source for cannabis (past year)			
Grow my own	9	0.34	[F]
Someone grows it for me	6	0.22	[F]
Shared around a group of friends	404	15.05	13.30
Family member or friend	1472	54.82	54.19
Someone else I know	96	3.58	4.21[E]
Dealer	357	13.30	12.50
Licensed dealer (medical)	64	2.38	2.75[E]
Compassion club/dispensary	202	7.52	9.80
Online	44	1.64	[F]
Other	31	1.15	0.91[E]
Total[a]	2685		
Primary medical reason for MCU among youth reporting MCU (past year)			
Chronic pain	209	31.24	35.68
Nausea/vomiting	4	0.60	[F]
Lack of appetite/weight loss	6	0.90	[F]
Multiple sclerosis/spinal cord injury	3	0.45	[F]
Epilepsy	5	0.75	[F]
Depression	68	10.16	9.60[E]
Anxiety/nerves	203	30.34	28.47
Insomnia	98	14.65	15.46[E]
Other	73	10.91	8.41[E]
Total[a]	669		

Notes. [a]Total number of participants with valid data for each variable. [E]Weighted estimate should be interpreted with caution due to elevated coefficient of variation (>16.5%); [F]Weighted estimate suppressed due to high coefficient of variation (>33.3%) and/or small cell size (n<30).
MCU=Medicinal cannabis use

Table 2. Demographic, cannabis use, substance use, and health variables by cannabis use group

	Total N[a]	NMCU-Only (n=2082, 77.7%, 79.0%$_{wt}$)			MCU – Physical Health (n=227, 8.5%, 8.7%$_{wt}$)			MCU – Mental Health (n=271, 10.1%, 8.7%$_{wt}$)			MCU – Insomnia (n=98, 3.7%, 3.5[E]%$_{wt}$)		
		M_{un-wt}	M_{wt}	SEM_{wt}	M_{un-wt}	M_{wt}	SEM_{wt}	M_{un-wt}	M_{wt}	SEM_{wt}	M_{un-wt}	M_{wt}	SEM_{wt}
Age	2678	20.21	20.54	0.11	21.30	21.07	0.29	20.47	20.94	0.30	20.47	20.25	0.36
HED[b] frequency	2678	2.30	2.37	0.07	2.20	2.10	0.20	2.07	2.46	0.32	2.45	2.23	0.29
Self-rated health	2678	3.87	3.99	0.04	3.51	3.52	0.12	3.56	3.55	0.13	3.84	3.67	0.14
Self-rated mental health	2678	3.67	3.74	0.04	3.50	3.46	0.13	2.83	2.68	0.17	3.42	3.40	0.18
		Unweighted		Weighted	Unweighted		Weighted	Unweighted		Weighted	Unweighted		Weighted
		N	%	%	N	%	%	N	%	%	N	%	%
Age 20-24 (vs. 15-19)	2678	1259	60.47	65.19	178	78.41	73.46	177	65.31	73.57	64	65.31	61.25
Male sex	2678	1142	54.85	58.54	147	64.76	74.66	131	48.34	36.21[E]	70	71.43	73.72
Daily cannabis use[c]	2662	225	10.82	15.01	120	54.55	58.68	146	54.68	63.42	33	34.38	25.64[E]
Cannabis route: smoke	2665	2004	96.39	96.47	210	94.59	92.22	259	96.64	97.90	94	97.92	99.34
Cannabis route: vaporize	2668	520	24.98	24.86	124	55.86	59.51	146	54.48	57.52	51	53.13	43.53[E]
Cannabis route: oral	2668	761	36.55	40.54	143	64.41	75.43	185	69.03	76.57	61	63.54	65.54
Cannabis problems[d]	2611	631	30.99	33.01	163	75.12	81.36	202	76.81	80.14	65	68.42	57.85
Used tobacco (past 30 days)	2669	670	32.30	33.56	119	52.65	59.16	137	50.55	60.08	43	43.88	40.05[E]
Any illicit drug (without Rx)[e]	2659	440	21.28	23.16	87	38.67	42.58	103	38.29	34.38[E]	40	41.24	44.19[E]
Used pain meds with Rx	2653	231	11.19	11.69	61	27.48	26.89[E]	35	13.01	10.44[E]	14	14.43	[F]
Used sedative meds with Rx	2673	185	8.90	6.52	27	11.95	[F]	73	26.94	21.17[E]	10	10.31	[F]
Used stimulant meds with Rx	2678	92	4.42	4.54	12	5.29	[F]	22	8.12	[F]	5	5.10	[F]

Notes. All timeframes are past 12 months unless otherwise noted. [a]Total number of participants with valid data for each variable. [b]Heavy episodic drinking defined as ≥ 4/5 drinks on a single occasion for women/men. [c]Past 3-month time frame; [d]Indicates moderate or high risk for cannabis problems in the past 3 months; [e]Used any illicit drug, including medication use without a prescription, but not including cannabis. [E]Weighted estimate should be interpreted with caution due to elevated coefficient of variation (>16.5%); [F]Weighted estimate suppressed due to high coefficient of variation (>33.3%) and/or small cell size (n<30). Un-wt = Unweighted. Wt= Weighted. SEM=Standard error of the mean. Rx = Prescription. NMCU-only = Non-medicinal cannabis use only. MCU=Medicinal cannabis use. HED=Heavy episodic drinking.

Table 3. Logistic regression models of differences between youth reporting non-medicinal cannabis use and those reporting medicinal cannabis use for physical health, mental health, or insomnia.

		99% CI				99% CI	
	OR/*B*	LL	UL		OR/*B*	LL	UL
Daily cannabis use (past 3 mo)				Any illicit drug (without Rx)[d]			
Age (20-24 vs. 15-19 y/o)	1.64	0.76	3.51	Age (20-24 vs. 15-19 y/o)	1.30	0.80	2.11
MCU – mental health	**13.18**	**5.33**	**32.57**	MCU – mental health	1.89	0.71	5.02
MCU – insomnia	1.82	0.65	5.10	MCU – insomnia	2.52	0.99	6.39
MCU – physical health	**7.35**	**3.18**	**16.99**	MCU – physical health	**2.27**	**1.15**	**4.46**
Cannabis route: vaporized				Used pain meds with Rx			
Age (20-24 vs. 15-19 y/o)	1.30	0.78	2.16	Age (20-24 vs. 15-19 y/o)	1.29	0.69	2.42
MCU – mental health	**5.11**	**2.13**	**12.28**	MCU – mental health	0.90	0.39	2.09
MCU – insomnia	2.15	0.84	5.53	MCU – insomnia	0.92	0.27	3.15
MCU – physical health	**4.03**	**2.04**	**7.94**	MCU – physical health	**2.65**	**1.18**	**5.96**
Cannabis route: oral				Used sedatives with Rx			
Age (20-24 vs. 15-19 y/o)	1.23	0.80	1.88	Age (20-24 vs. 15-19 y/o)	0.97	0.55	1.72
MCU – mental health	**4.91**	**2.39**	**10.07**	MCU – mental health	**3.33**	**1.31**	**8.49**
MCU – insomnia	2.75	0.79	9.55	MCU – insomnia	2.38	0.24	23.58
MCU – physical health	**4.34**	**2.28**	**8.25**	MCU – physical health	1.64	0.60	4.45
Cannabis problems[a]				Used stimulants with Rx			
Age (20-24 vs. 15-19 y/o)	1.09	0.66	1.79	Age (20-24 vs. 15-19 y/o)	0.96	0.46	2.00
MCU – mental health	**10.98**	**4.71**	**25.60**	MCU – mental health	1.53	0.46	5.09
MCU – insomnia	**2.56**	**1.01**	**6.47**	MCU – insomnia	0.67	0.04	10.53
MCU – physical health	**8.31**	**3.94**	**17.53**	MCU – physical health	1.04	0.28	3.92
Used tobacco (past 30 days)				Self-rated health[c]			
Age (20-24 vs. 15-19 y/o)	1.27	0.81	1.99	Age (20-24 vs. 15-19 y/o)	0.08	-0.09	0.26
MCU – mental health	**3.57**	**1.49**	**8.54**	MCU – mental health	**-0.43**	**-0.79**	**-0.07**
MCU – insomnia	1.21	0.46	3.18	MCU – insomnia	-0.33	-0.71	0.04
MCU – physical health	**2.58**	**1.35**	**4.95**	MCU – physical health	**-0.50**	**-0.81**	**-0.18**
HED[b] frequency[c]				Self-rated mental health[c]			
Age (20-24 vs. 15-19 y/o)	**0.50**	**0.19**	**0.81**	Age (20-24 vs. 15-19 y/o)	0.14	-0.06	0.34
MCU – mental health	0.11	-0.70	0.91	MCU – mental health	**-0.98**	**-1.39**	**-0.57**
MCU – insomnia	-0.17	-0.89	0.56	MCU – insomnia	-0.39	-0.89	0.11
MCU – physical health	-0.36	-0.88	0.16	MCU – physical health	**-0.35**	**-0.70**	**-0.005**

Notes. Reference category is non-medicinal cannabis use group in all models. All estimates are adjusted for sex. Bold type denotes estimates with a 99% CI that does not contain zero (for linear regression coefficients) or one (for odds ratios). All timeframes are past 12 months unless otherwise noted. [a]Indicates moderate or high risk for cannabis problems in the past 3 months. [b]Heavy episodic drinking defined as ≥ 4/5 drinks on a single occasion for females/males. [c]Outcome variable is continuous and thus estimates are regression coefficients (*B*) rather than odds ratios. [d]Used any illicit drug, including medication use without a prescription, but not including cannabis. OR=Odds ratio. B= Unstandardized regression coefficient. CI=Confidence interval. LL = Lower limit of CI. UL = Upper limit of CI. y/o = years old. HED=Heavy episodic drinking. Meds = Medications. Rx = Prescription. MCU=Medicinal cannabis use. HED=Heavy episodic drinking.

Table 4. Logistic regression models of differences between youth reporting non-medicinal cannabis use and those reporting medicinal cannabis use for physical health, mental health, or insomnia, adjusting for frequency of cannabis use

		99% CI				99% CI	
	OR/*B*	LL	UL		OR/*B*	LL	UL
Cannabis route: vaporized				Used pain meds with Rx			
Age (20-24 vs. 15-19 y/o)	1.13	0.69	1.84	Age (20-24 vs. 15-19 y/o)	1.31	0.71	2.41
Cannabis use frequency	**1.77**	**1.45**	**2.16**	Cannabis use frequency	0.95	0.74	1.22
MCU – mental health	2.11	0.85	5.26	MCU – mental health	1.00	0.39	2.57
MCU – insomnia	1.59	0.54	4.68	MCU – insomnia	0.96	0.28	3.32
MCU – physical health	1.96	0.87	4.41	MCU – physical health	**2.98**	**1.21**	**7.38**
Cannabis route: oral				Used sedatives with Rx			
Age (20-24 vs. 15-19 y/o)	1.14	0.75	1.75	Age (20-24 vs. 15-19 y/o)	0.94	0.52	1.68
Cannabis use frequency	**1.41**	**1.17**	**1.70**	Cannabis use frequency	1.08	0.84	1.38
MCU – mental health	**2.79**	**1.29**	**6.05**	MCU – mental health	2.90	1.01	8.35
MCU – insomnia	2.33	0.72	7.59	MCU – insomnia	2.29	0.23	22.44
MCU – physical health	**2.79**	**1.40**	**5.56**	MCU – physical health	**1.33**	**0.41**	**4.30**
Cannabis problems[a]				Used stimulants with Rx			
Age (20-24 vs. 15-19 y/o)	0.51	0.24	1.10	Age (20-24 vs. 15-19 y/o)	1.00	0.48	2.07
Cannabis use frequency	**10.24**	**6.94**	**15.13**	Cannabis use frequency	0.86	0.65	1.15
MCU – mental health	1.61	0.57	4.61	MCU – mental health	2.01	0.58	6.91
MCU – insomnia	1.42	0.14	14.44	MCU – insomnia	0.75	0.05	11.96
MCU – physical health	2.18	0.57	8.40	MCU – physical health	1.36	0.31	5.96
Used tobacco (30 days)				Self-rated health[c]			
Age (20-24 vs. 15-19 y/o)	1.13	0.73	1.75	Age (20-24 vs. 15-19 y/o)	0.10	-0.06	0.27
Cannabis use frequency	**1.64**	**1.35**	**2.00**	Cannabis use frequency	**-0.08**	**-0.15**	**-0.01**
MCU – mental health	1.58	0.67	3.74	MCU – mental health	-0.29	-0.66	0.09
MCU – insomnia	0.86	0.28	2.69	MCU – insomnia	-0.28	-0.68	0.11
MCU – physical health	1.35	0.64	2.86	MCU – physical health	**-0.37**	**-0.71**	**-0.03**
HED[b] frequency[c]				Self-rated mental health[c]			
Age (20-24 vs. 15-19 y/o)	**0.45**	**0.14**	**0.76**	Age (20-24 vs. 15-19 y/o)	0.17	-0.03	0.37
Cannabis use frequency	**0.20**	**0.07**	**0.34**	Cannabis use frequency	**-0.12**	**-0.20**	**-0.04**
MCU – mental health	-0.24	-1.00	0.52	MCU – mental health	**-0.77**	**-1.17**	**-0.38**
MCU – insomnia	-0.30	-1.00	0.40	MCU – insomnia	-0.31	-0.81	0.19
MCU – physical health	**-0.65**	**-1.24**	**-0.06**	MCU – physical health	-0.17	-0.54	0.21
Any illicit drug (without Rx)[d]							
Age (20-24 vs. 15-19 y/o)	1.14	0.66	1.99				
Cannabis use frequency	**1.79**	**1.45**	**2.22**				
MCU – mental health	0.70	0.26	1.89				
MCU – insomnia	1.95	0.76	5.01				
MCU – physical health	1.04	0.47	2.31				

Notes. Reference category is non-medicinal cannabis use group in all models. All estimates are adjusted for sex. Bold type denotes estimates with a 99% CI that does not contain zero (for linear regression coefficients) or one (for odds ratios). All timeframes are past 12 months unless otherwise noted.

[a]Indicates moderate or high risk for cannabis problems in the past 3 months [b]Heavy episodic drinking defined as ≥ 4/5 drinks on a single occasion for females/males. [c]Outcome variable is continuous and thus estimates are regression coefficients (*B*) rather than odds ratios. [d]Used any illicit drug, including medication use without a prescription, but not including cannabis. OR=Odds ratio. B = Unstandardized regression coefficient. CI=Confidence interval. LL = Lower limit of CI. UL = Upper limit of CI. y/o = years old. HED=Heavy episodic drinking. Meds = Medications. Rx = Prescription. MCU=Medicinal cannabis use. HED=Heavy episodic drinking.