

**Health warnings, cannabis marketing and perceptions
among youth and young adults in Canada.**

By

Cesar Leos Toro

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Examining Committee Membership

The following served on the Examining Committee for this thesis. The decision of the Examining Committee is by majority vote.

External Examiner

DR. MICHAEL CHAITON
Associate Professor
Dalla Lana School of Public Health
University of Toronto

Supervisor

DR. DAVID HAMMOND
Professor
School of Public Health & Health Systems
University of Waterloo

Internal Member

DR. SAMANTHA B. MEYER
Associate Professor
School of Public Health & Health Systems
University of Waterloo

Internal Member

DR. GEOFFREY T. FONG
Professor
Department of Psychology
University of Waterloo

Internal-external Member

DR. SHANNON DEA
Associate Professor
Department of Philosophy
University of Waterloo

Author's Declaration

This thesis consists of material all of which I authored or co-authored: see Statement of Contributions included in the thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners.

I understand that my thesis may be made electronically available to the public.

Statement of Contributions

This thesis consists in part of four manuscripts that have been submitted or are under review.

Exceptions to sole authorship:

CHAPTER 2: Leos-Toro C, Fong GT, Meyer SB, Hammond D. Cannabis health knowledge and risk perceptions among Canadian youth and young adults. Submitted to the *Preventive Medicine*.

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CHAPTER 5: Leos-Toro C, Fong GT, Hammond D. The efficacy of health warnings and package branding on perceptions of cannabis products among youth and young adults. Submitted to *Drug and Alcohol Review*.

As lead author of these four chapters I was responsible for conceptualizing study design, carrying out data collection and analysis, and drafting and submitting manuscripts. My co-authors provided guidance during each step of the research and provided feedback on draft manuscripts. Dr. David Hammond provided significant direction and editorial assistance throughout.

Under Dr. David Hammond's supervision, I also prepared the remaining chapters in this thesis, which were not written for publication.

Abstract

Background

An increasing number of jurisdictions are legalizing nonmedical cannabis, including Canada in October 2018. One of the primary goals under the *Cannabis Act* is to adequately inform Canadians about nonmedical cannabis and risks related to its use. There is a need for evidence to inform regulatory measures that are implemented as part of the legal market.

Purpose

The current study had four specific objectives: 1) to examine current health beliefs and perceptions among young Canadian nonmedical cannabis users and non-users, 2) to examine differences in perceived effectiveness of text and pictorial health warning labels, 3) to investigate effective approaches for labelling cannabis product constituents and dose, and 4) to examine the effect of different branding elements and descriptors on product perception among young Canadians.

Methods

An online cross-sectional survey was conducted from October 10th to October 24th, 2017. The sample (N=870) was restricted to individuals aged 16 to 30 years of age with a Canadian IP address, and included cannabis users and non-users. The survey assessed sociodemographic characteristics, cannabis use behaviours, health knowledge, as well as attitudes and beliefs around cannabis use. Study 1 examined young Canadians' awareness of negative health effects, as well as perceptions of risk and harm. The survey also contained three sets of between-group experiments. In Study 2, respondents were randomized to view health warnings according to one of two experimental conditions: text-only warnings, and pictorial warnings accompanied by text. Study 2 examined the effectiveness of health warnings for cannabis products and levels of support among youth. In Study 3, between-group experiments were conducted to assess comprehension of cannabis-related information, including communication of dose and strength of a particular product. Finally, Study 4 investigated perceptions of brand imagery on cannabis packaging. In this experimental set, respondents were randomized to view and evaluate cannabis product mock-ups in terms of appeal, and different perceptions of the intended target consumer.

Results

Study 1

Most respondents were aware of a cannabis-related physical health effect (78.0%). Approximately one-third reported having been exposed to public health messaging about cannabis; digital media was reported most frequently. Compared to never users, ever users were less likely to report that they perceive cannabis as addictive ($p<0.001$), and to perceive harm to mental health ($p<0.001$). Approximately one-quarter of past 3-month cannabis users reported they were at least ‘a little’ addicted. Respondents who reported using a particular form of cannabis self-administration (e.g., edibles, smokables, etc.) were less likely to perceive harm from that form compared to non-users ($p<0.001$).

Study 2

Pictorial health warnings for cannabis products were perceived as more effective and believable than text-only warnings ($p<0.001$). Pictorial warnings were rated as more effective than text-only warnings for THC dose ($p=0.039$), co-morbid drug use ($p=0.006$), and pregnancy ($p<0.001$). Pictorial warnings were also rated as more believable than text-only warnings ($p=0.048$). Overall, 87.7% respondents supported health warnings on cannabis products and 84.0% supported the inclusion of calls to action such as quit-lines on cannabis products.

Study 3

Labelling the number of doses per package was associated with the greatest proportion of correct responses (54.1%) when respondents had to determine a recommended serving compared with the no-label control condition (RR=7.28, 95%CI 4.81-11.04) and THC mg condition (RR=4.05, 95%CI 2.96-5.54). When product was labelled using a traffic light system, participants were more likely to identify THC level: low THC (RR=43.43 95%, CI 16.43-114.79) or high THC (RR=16.71, 95%CI 9.61-29.07) than the control condition.

Study 4

When cannabis product branding was present, respondents were more likely ($p=0.027$) to report greater appeal than when branding was absent. When a pictorial health warning was present, respondents were less likely ($p=0.010$) to report greater appeal than when absent. The presence of

a celebrity sponsor ($p<0.001$), music references ($p<0.001$), or party references ($p<0.001$) increased the likelihood that respondents would perceive the product to be targeted at someone younger and one that was likely to go out and party ($p<0.001$). Differences by cannabis use status were seen across experimental tasks; those that had ever used were more likely to find the presence of branding elements appealing.

Conclusions

Young Canadians report a wide range of beliefs about the health effects of cannabis use. Substantial proportions underestimated and overestimated cannabis' health effects. The findings also suggest that cannabis users may be demonstrating a form of 'optimism' bias: worry about health effects and perceptions of addiction appeared to be lower when they were personalized to users rather than asked in the general form. The current study provided the first empirical test of cannabis health warnings. Pictorial health warnings for cannabis products were perceived as more effective and believable than text-only warnings. Labelling cannabis package content in terms of doses per package and using symbols or other graphics to denote potency were considerably more effective than the use of THC percentages or milligrams in making decisions about cannabis products' recommended use amounts and potency. Finally, the findings demonstrate that brand imagery on cannabis packaging can promote lifestyle associations and influence the appeal of cannabis products among young people. There is an urgent need for additional research on regulatory approaches and strategizing public health communications campaigns to ensure that consumers have adequate information to make responsible decisions about their nonmedical cannabis use.

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I would be doing a bit of a disservice if didn't contextualize this feat with its starting point. My family emigrated from Mexico to Canada one very cold night on November 24, 1994 in search of a better life as refugees. The night we stepped out of Pearson Airport, my mother took my sister and I aside and told us that the road ahead was paved with hardship – *pero ibamos a chingar!* Chingar is a tough Mexicanism to translate, it can have transgressive power and it changes depending on the context in which it is used – here, it simply means that we were strong enough to overcome, and we did. (For more see: Octavio Paz, Chingar, in *El laberinto de la soledad*)

Dedication

Para las dos mujeres mas chingonas que conozco – Elsa Kouvousis y Maria Toro.

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List of Abbreviations

ACMPR	Access to Cannabis for Medical Purposes Regulations
Cannabis Act	An Act respecting cannabis and to amend the Controlled Drugs and Substances Act, the Criminal Code and other Acts
CB₁	Cannabinoid receptor, coupled G-protein - present in central nervous system (CNS) and peripheral tissues
CB₂	Cannabinoid receptor, coupled G-protein - present in peripheral tissues
CBD	Cannabidiol
CCHS-MH	Canadian Community Health Survey – Mental Health
CCS	Canadian Cannabis Survey
CHWL	Cannabis health warning label
CNS	Central nervous system
CNU	Census net undercoverage
CO	Carbon monoxide
CSTADS	Canadian Student Tobacco, Alcohol and Drugs Survey
CTADS	Canadian Tobacco, Alcohol and Drugs Survey
DALY	Disability-adjusted life year
DSM	Diagnostic and Statistical Manual of Mental Disorders
ELM	Elaboration-likelihood Model
FCTC	World Health Organization’s Framework Convention on Tobacco Control
Generation R	Generation R Study
GenIUSS	Gender Identity in U.S. Surveillance Group
HBM	Health Belief Model
HCCMDS	Health Canada Cannabis Measures Draft Survey
HSM	Heuristic-Systematic Model
HWL	Health warning label
IARC	International Agency for Research on Cancer
IEIR	Incompletely enumerated Indian reserves
IP address	Internet Protocol address
ITC Survey	International Tobacco Control Survey
LD₅₀	Lethal dose, 50% – dosage required for 50% of test subjects receiving a drug to die of drug-induced toxicity
MDMA	3,4-methylenedioxymethamphetamine
MHPCDS	Maternal Health Practices and Child Development Study
MMAR	Marihuana Medical Access Regulations
MMPR	Marihuana for Medical Purposes Regulations
NASEM	National Academies of Science, Engineering, and Medicine
OPPS	Ottawa Prenatal Prospective Study
PAHs	Polycyclic aromatic hydrocarbons

RSM	Reinforcing Spirals Model of Media Exposure
THC	Tetrahydrocannabinol (Δ^9 -THC)
TPB	Theory of Planned Behaviour
TRA	Theory of Reasoned Action
WHO	World Health Organization
YLD	Years lost due to disability
YLL	Years of life lost due to premature mortality
YSS	Youth Smoking Survey

Chapter 1: Introduction

Cannabis

Cannabis is a generic term used to describe the numerous psychoactive preparations of the *Cannabis sativa*, *Cannabis indica*, and to a lesser extent, the *Cannabis ruderalis* plants.^{1,2} More than 400 diverse bioactive molecules are derived from these plant species. Of these constituents, over 60 cannabinoids contribute to the overall physiological effects that act on neural pathways lined with cannabinoid receptors capable of modulating neurotransmitter activity in the endocannabinoid pathway.^{3,4,5,6} Tetrahydrocannabinol (Δ^9 -THC) is the cannabinoid that is primarily responsible for the euphoric sensation associated with the many forms and modes of consumption of the plant.⁷ Cannabidiol (CBD) is secondary to THC and the major non-psychoactive compound found in cannabis in terms of its concentration; it is often cited and investigated for its therapeutic qualities.^{8,9}

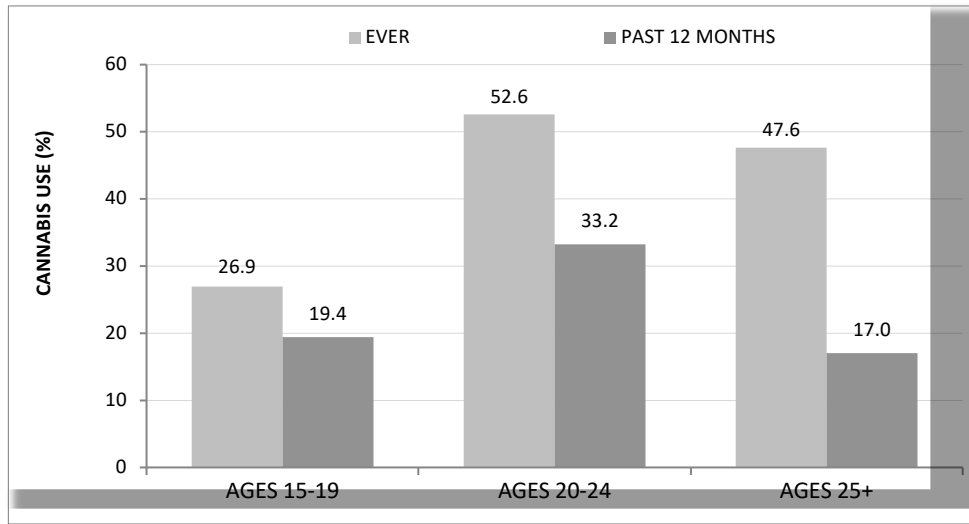
This thesis will use the term “cannabis” instead of the many other names used to denote the substance or its preparations colloquially (i.e., marijuana, chronic, pot, dope, kush, bud, etc.) or traditionally used in local indigenous cultures around the world (i.e., basuco, bhang, pasta base).¹⁰

Prevalence and patterns of use in Canada

Cannabis is the most widely used illicit substance around the world.^{1,11,12} In Canada, it is only second to alcohol in terms of use prevalence. According to the 2017 Canadian Tobacco, Alcohol and Drugs Survey, the most recent nationally representative survey of the general Canadian population’s drug use behaviours, more than 4 in 10 (46.6%) Canadians reported ever using cannabis in their lifetime.¹³ Among young adults aged 20-24 years, approximately half (52.6%) reported lifetime use.¹³ Cannabis use is most common among youth and young adults; see

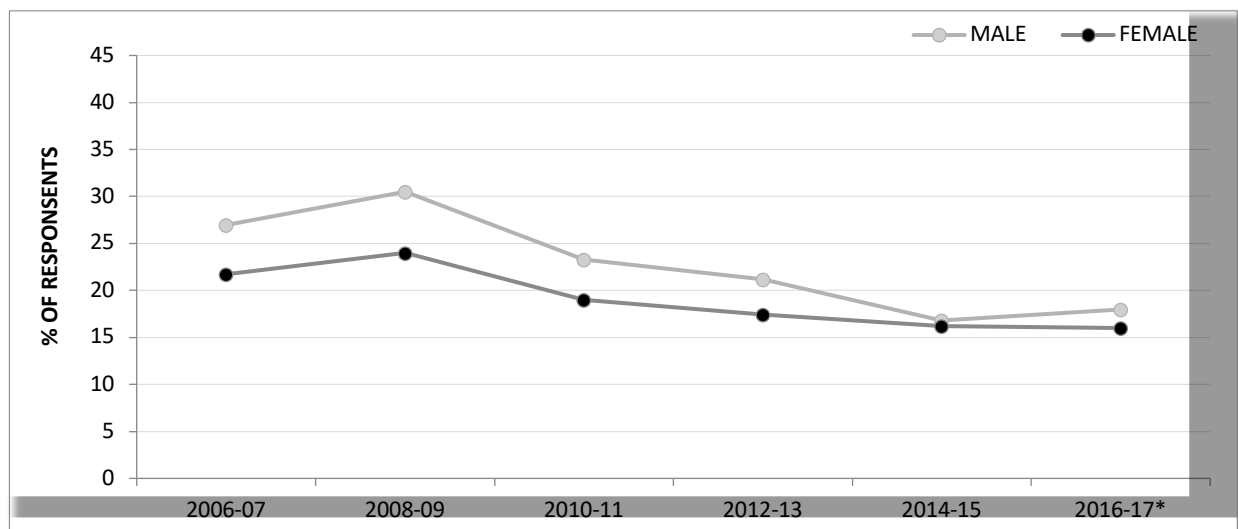
Figure 1 for further detail. The prevalence of use was reported with greater frequency among men than women when reporting ever use (52.4% vs. 40.9%), and past 12-month use (18.7% vs. 11.1%).

Figure 1 Cannabis use by age group, 2017 Canadian Tobacco, Alcohol and Drugs Survey¹³



Over the last decade, national surveys indicate modest decreases in the prevalence of cannabis among youth, along with delays in the average age of first use or initiation.¹⁴ The most recent nationally representative survey of Canadian youth from grades 7 to 12, the 2016-2017 Canadian Student Tobacco, Alcohol and Drugs Survey (CSTADS), reported figures that were consistent with the general population survey, CTADS wherein 16.7% of Canadian students reported past 12-month use.¹⁵ For the second time since CSTADS, formerly the Youth Smoking Survey, was administered in 2004, there existed no significant difference in reported cannabis use behaviours between male and female respondents.^{15,16}

Figure 2 Prevalence of cannabis use in the past 12 months, by sex, Grades 7-12, 2006-07 to 2014-15, Canadian Student Tobacco, Alcohol and Drugs Survey (Formerly Youth Smoking Survey)^{15,16}



Cannabis use is higher among certain population subgroups such as youth who report poor school performance, sensation-seeking personality traits, early use of tobacco, alcohol, and other drugs, those fraternizing with drug-using peers, experiencing a difficult family environment, and those that report cannabis accessibility and availability.^{17,18} Use is approximately twice as high among Indigenous Canadian youth when compared to youth in the general population.^{14,18} Indigenous Canadian youth are also more likely to initiate their use at a younger age than their non-Indigenous peers.¹⁹ According to the First Nations Regional Health Survey, a survey designed to be representative of First Nations individuals living on-reserve and in Northern communities, among the general Indigenous Canadian adult population, approximately one third (32.3%) of First Nations adults reported use of cannabis in the past year when the survey was last conducted in 2008/2010. Men reported use in greater numbers (40.5%) than the women (24.1%) in First Nations communities surveyed.²⁰ There exists a general void in the literature around Indigenous Canadians and their use of cannabis and related behaviours.

Forms and modes of use

The most common cannabis preparations include dried herbal forms, hashish, and hash oil; these are then available for further processing, such as in edibles, alcohol extractions, etc.¹ In Canada, the current cannabis regulatory system, the Access to Cannabis for Medical Purposes Regulations (ACMPR), allows for dried and fresh cannabis plant as well as cannabis oils.²¹ However, cannabis is a versatile substance and the diversity of consumer products includes edibles (e.g., cannabis-infused foods, cooking oils, drinks, etc.), oils, ointments, tinctures, creams, concentrates (e.g., butane hash, oil, resins, waxes, shatter, etc.).²² A list of common forms and modes of use are listed below in **Table 1**. According to the 2017 CTADS, 9 in 10 (91%) of past-year cannabis users report smoking it.¹³ Other methods of administration also reported by past-year users include mixing it with tobacco (22%), smoking tobacco immediately after inhaling, or *chasing* (34%), ingesting it in edibles (38%), or vaporizing (29%).¹³

Table 1 Common forms/modes of cannabis consumption.

Smoked dried herb/flower/leaf
Vaporized dried flower/leaf
Vaporized liquid form in an e-cigarette
Mixed with or rolled in tobacco (e.g., blunt)
Hashish
Hash oil
Concentrate (e.g., butane honey oil, shatter, budder, wax etc.)
Edibles (e.g. cookies)
Liquid (e.g., cola/tea)
Tinctures (e.g., concentrated amounts ingested orally or taken under the tongue)
Topical ointments (e.g., lotions, salves, balms applied directly to the skin)
Fresh flower/leaf (e.g., for juicing)

The various kinds of cannabis preparations carry different degrees of psychoactive potency. Different jurisdictions have operationalized potency to refer to a product's THC content.²³ THC is found on and around the flowering parts of the female cannabis plant in greatest concentrations – this section may be harvested and dried with its potency dependent on the plant's

genetic composition and growing conditions.²⁴ Potency may be manipulated, perhaps in the most extreme example as the “sinsemilla” varieties where female plants are grown together isolated from male phenotypes thus maximizing their THC generation.²⁴ The THC content of cannabis has increased significantly over the past three decades in North American markets, from approximately 2% to 9% in its dried herbal form and has reached up to 80% to 90% in high potency products such as oils or waxes.^{25,26,27,28}

Health effects of nonmedical cannabis use

The past 20 years have brought about a better understanding about the effects of cannabis and cannabinoids on human health.⁵⁹ Cannabis’ effects vary and are dependent on dose, form, mode of administration, past experience with the substance, simultaneous substance use, contextual factors where use is taking place, and personal expectations, mood, and attitudes regarding the effects that cannabis may produce.¹

Cannabis use has not been associated with direct mortality (e.g., fatal overdose), but, it has been observed to lead to fatalities from motor vehicle accidents, increased potential for brain and respiratory cancers, and has been associated with increased mortality when compared to never-users.^{29,59} Little is currently known about the cannabis-attributable disease burden stemming from the several known effects to health but numerous studies in Canada have observed it to be comparably small despite the large population-level exposure.^{30,31,32,33} Most of the health consequences related to cannabis use occur in individuals who are high frequency and high intensity users – these compose a very small proportion of Canadians.^{34,35,36,37} Other important behaviours that lead to an increased disease burden include: operating machinery under the influence of cannabis, using products with high THC concentrations, smoking cannabis – especially when mixed with tobacco, and using cannabis in early and mid-adolescence – critical developmental periods.³⁸

Acute Health Effects

The acute health effects of cannabis use are those that may occur shortly after a singular occasion of use or from relatively few occasions of use and occurring close together in time.¹ During an acute phase of cannabis intoxication, a subjective sensation often described as euphoric is experienced; this is the characteristic “high” sought by nonmedical and perhaps some medical cannabis users.^{1,59} THC is a very lipophilic molecule; it interacts with the brain’s dopamine pathway that is lined with cannabinoid receptors (CB₁ and CB₂) and affects regions modulated by dopamine. Thus, functions such as cognition and attention, emotionality, motivation, time perception, as well as a number of psychomotor functions are affected.^{1,59,39,40}

Chronic Health Effects

Chronic health effects of cannabis refer to those that arise from the greater frequency of its use, over periods of time that may span months, years, or decades. Regular and heavy exposure to cannabinoids may give rise to chronic neurological effects. Chronic and persistent exposure to cannabinoids downregulate, or reduce levels of CB₁ cannabinoid receptors, some of which function within brain regions responsible for memory and cognition.^{41,42} The particular effects of chronic cannabis use are of particular interest to current cannabis legalization decision-makers as domains of women’s health such as perinatal health of mother and child, neurological and psychosocial development, and general concerns remain hazy in the current literature.

Health effects of interest

Cannabis Use and Driving

The extent to which cannabis use leads to motor vehicle fatalities is a current research priority. Although there exist several studies supporting deficits to tasks related to driving that include reaction time, concentration, visual acuity, short-term memory, compromised ability to

handle unexpected events, among others, the scientific community is reluctant to attribute driving under the influence of cannabis to motor vehicle fatalities.^{43,44,45,46,47} What has been generally accepted is that driving under the influence of cannabis doubles drivers' risk of collision.⁷⁴ More young Canadians report driving after consuming cannabis than after consuming alcohol.⁴⁸ Between 2000 and 2010, 16.4% of drivers killed in motor vehicle collisions tested positive for cannabis – of those, drivers aged 16-24 were found to be more than twice as likely as their older counterparts aged 35 or older to test positively for cannabis and accounted for 4 in 10 of those fatally injured.⁴⁹ While data is somewhat scarce on young people's explicit attitudes, the existing evidence base suggests that Canadian youth are not sufficiently educated on the potentially dangerous effects that cannabis carries, particularly around cannabis-impaired driving.

Canada does not currently have a set limit for drug-impaired driving other than alcohol.⁵⁰ Drug-impaired driving is a criminal offence according to the Criminal Code (S. 253a), however, Canadian jurisdictions rely on safety enforcement officers to independently evaluate likely impairment of a driver using the Drug Evaluation and Classification system developed more than three decades ago in the United States and pair results with a toxicological analysis to proceed with charges of drug-impaired driving.^{51,52} A significant proportion of youth and young adults (**Figure 1**) use cannabis in Canada. This, coupled with young people's disproportionate risk for being involved in a collision-related mortality than older age groups and limited enforcement technologies creates an important policy domain for further research.⁵³

Health Canada's 2017 Canadian Cannabis Survey (CCS) indicated that approximately 4 in 10 (39%) past-year cannabis users reported driving within two hours of using cannabis; of these, 15% reported that they had combined cannabis and alcohol within two hours of operating a vehicle and a minority (2%) reported having an interaction with law enforcement related to driving while cannabis-impaired.⁵⁴ Furthermore, approximately 4 in 10 (39%) Canadian reported having been a

passenger in a vehicle operated by someone who had recently used cannabis – further analysis revealed that 8 in 10 (79%) cannabis users had been passengers of a vehicle driven by somebody under the influence of cannabis.⁵⁴ A gradient was observed in terms of perceived effects of cannabis on driving in the 2017 CCS. Overall, 3 in 4 (75%) Canadians reported that they thought cannabis affected driving, however, half of cannabis users (past-year users) reported the same, and 1 in 5 (19%) reported that it did not affect driving at all.⁵⁴

Co-morbid use with other substances

Different substances including cannabis are often discussed in isolation; however, cannabis and/or its derivatives are often used simultaneously with other substances during the same occasion.⁵⁵ A recent review found that up to approximately one-third (29%) of adolescents who use cannabis also use other drugs.⁵⁶ Many of the current findings and our understanding of cannabis-related outcomes may be confounded by effects of other substances or the combined effects of polysubstance use. There appears to be a strong and consistent association between the use of different substances, typically with earlier initiation of smoking followed by cannabis. While some suggest that this is evidence of a causal gateway between the substances, the current working consensus is that this phenomenon is due to a shared susceptibility or common factor. The order of initiation of different substances of interest is primarily related to accessibility and availability among youth.^{57, 58} Nevertheless, the co-morbid use of cannabis with other substances can have important implications for patterns of use and consequences.

Tobacco

There exists limited evidence that cannabis use is associated with the initiation of tobacco use.⁵⁹ However, there is a strong and consistent association between the uses of both substances. The most recent Canadian analyses of nationally representative data indicate that virtually all respondents who reported being current tobacco users also reported using cannabis; in contrast,

only a fraction of cannabis users reported using tobacco as well.^{60,61} The sociodemographic characteristics of Canadian co-users and extent of co-use use have been observed; past 12-month cannabis users who were also ‘current’ smokers were more likely to be young males (aOR=1.8, 99%CI=1.55-2.21) aged 15 to 19 years of age who were not attending school and indicated that they lived in an urban community.⁶² More recent studies indicate similar results, individuals that use tobacco and cannabis concurrently tend to be male, non-daily smokers who report greater alcohol and other drug use, not attending school; its relation to ethnicity seems to be variable by region.^{63,64,75}

Co-administration of tobacco and cannabis may occur in what are known in colloquial terms as “blunts”, “spliffs” or as “cigarette chasers” among other ways. Blunts refer to partially or completely hollowed out cigars that are re-filled with cannabis. Spliffs refer to cannabis cigarettes, or “joints”, containing loose tobacco and cannabis. A cigarette chaser refers to the practice of smoking a tobacco cigarette shortly after using cannabis.⁶⁵ The smoke from the simultaneous use of cannabis and tobacco contains a number of common toxic compounds including hydrocyanic acid, ammonia, carbon monoxide, naphthalene, as well as known carcinogens such as benzenanthracene, and benzopyrene.⁶⁶ The two substances in combination may have additive effects that may generate worse health outcomes than either substance on its own in terms of increased toxicant exposure from the two substances due to the mechanical aspects of ingestion (i.e., holding combusted smoke deeper in the lungs for a longer period of time).^{67,68,69} Endobronchial biopsies of regular co-users have shown that the combination of substance cause significant pathological changes to the bronchial mucosa.⁷⁰ The simultaneous use of tobacco and cannabis may be due to the distinct behaviour’s practical economic advantage – tobacco has been observed to increase the cannabinoid THC inhaled per gram by up to 45% thereby producing a greater psychoactive effect using less of the substance.⁷¹

Alcohol

The consumption of alcohol and cannabis often takes place for similar reasons in similar social contexts. Limited evidence is available regarding associations between cannabis use and patterns of alcohol use behaviours.⁵⁹ Alcohol tends to be implicated with cannabis use and characterized as a substitute, taking its place, or as a complement, its co-administration to complete or enhance its effect or experience.⁷² Alcohol is also the most widely used intoxicant among the general Canadian population (77%; past year use) as well as among Canadian youth (40%; past year use).^{15,11} Studies with animal models have found that cannabinoids enhance neural sensitivity to ethanol suggesting that simultaneous co-administration of cannabis and alcohol magnifies their respective individual effects.⁷³ Both alcohol and cannabis have been found to affect reaction time, concentration, visual acuity, short-term memory, compromised ability to handle unexpected events among other effects.^{74,75,76,77,78,79} It should be noted that the magnitude of the impact of cannabis use is dwarfed by the evidence of the available half a century of epidemiological research regarding the adverse effects of alcohol – alcohol found to lead to significantly greater rates of mortality and morbidity.⁸⁰

Other Substances

Individuals that use cannabis have been identified as having a greater likelihood of using other substances (e.g., sedatives, stimulants, and opiates) and to be problematic users of those substances.^{59,81} Piece-meal findings are available for the comorbid use of common drugs. For example, 3,4-methylenedioxymethamphetamine (MDMA) or *ecstasy* and cannabis, for which regular users of both substances were more likely to report mental health problems with paranoia being a commonly reported issue.⁸²

Second-Hand Smoke

In Canada, the most common form of administration of cannabis is through combustion.⁸³ Cannabis smoke shares many of the same properties and contains many of the same compounds as tobacco smoke including polycyclic aromatic hydrocarbons (PAHs) such as benzo[α]pyrene and phenols; in some cases, these carcinogens and tumor promoters are present at higher concentrations than in tobacco smoke (e.g., 20-fold greater concentrations of ammonia, 3-5 times more hydrogen cyanide).^{84,85,86,87,88} Cannabis smoke has been found to be carcinogenic in laboratory assays, however, there is mixed data in terms of establishing its precise carcinogenic potential.^{1,59} This is because while cannabis and tobacco smoke share similar chemical properties, their pharmacodynamics differ greatly and appear to be somewhat contradictory.⁸⁹

Compounds in cannabis have been demonstrated to kill a number of cancer types including lung⁹⁰, breast and prostate⁹¹, lymphoma⁹², glioma⁹³, melanoma⁹⁴ and pheochromocytoma (a rare tumor in the adrenal gland)⁹⁵, however, low doses of THC have also been observed to stimulate the development of lung cancer cells *in vitro*.⁹⁶ Some of these very different biological end points have been attributed to the enzymatic activity of cytochrome P4501A1 oxidase protein (CYP1A1 gene product). When PAHs are introduced into the respiratory system through tobacco smoke, they stimulate CYP1A1 gene transcription activity which leads to increased enzymatic activity of the gene product responsible for the carcinogenic effects of PAHs. In contrast, while cannabis also introduces PAHs and upregulates CYP1A1 gene transcription, there is also a direct inhibition of the enzymatic activity of the gene product that is stimulated that exerts a protective effect.^{97,98,99} Cannabis smoke may contain components that may minimize certain carcinogenic pathways, though, not necessarily eliminate them. The differential practices in smoking tobacco and cannabis should also be considered in terms of its potential harm. Cannabis cigarettes are generally smoked without filters, are inhaled and held much deeper in the lungs for a greater amount of time to

maximize exposure, effectively inhaling 5 times more CO than what would be inhaled in a tobacco cigarette.¹⁰⁰ Across the world cannabis is mixed with tobacco in what is the most common form of administration, perhaps accounting for the contradictory findings in this area.¹⁰⁰ The increasing popularity of vaporizing devices available to consumers may help to decrease some risks associated with cannabis smoke.

Aside from the concerns regarding carcinogenic potential, exposure to second-hand cannabis smoke may lead to positive results on testing of a variety of body fluids (oral fluid, blood, urine) and passive exposure may also produce psychoactive effects. Short term and extreme cannabis smoke exposure (e.g., room with no air ventilation, 11.3% THC-containing cannabis) has been shown to allow for sufficient absorption of THC to produce characteristic effects and be detectable in urine assays.¹⁰¹ To date, there are no studies that report on the long-term effects of passive exposure to cannabis or to third-hand smoke.¹⁰² The limited findings in the area should be used carefully. Passive exposure of cannabis smoke among individuals with a history of mental health issues that may be exacerbated by the use of cannabis may be at risk of unintended, negative health consequences. As jurisdictions develop regulations around use in public spaces, they should keep in mind harm-reduction strategies to avoid these potential consequences.

Cannabis Use and Pregnancy

The 2008 Canadian Perinatal Health Report found that 5% of pregnant women reported use of an illicit substance during pregnancy, though it did not report how much of the use was from cannabis.¹⁰³ This relatively small figure may be a underrepresentation, other studies that include prospective longitudinal methodologies have found prevalence rates of illicit drug use ranging from 10 to 16% in middle-class samples to 23 to 30% among inner-city populations.^{104,105} The relationship between smoking cannabis and pregnancy and related outcomes is unclear.^{1,59,106} However, available systematic reviews and meta-analyses indicate that it is possible that cannabis

use during pregnancy may increase the risks of stillbirth, preterm birth, fetal development issues, as well as having an adverse effect on child neurodevelopment.^{107,108} The relationship remains hazy due to the fact that existing studies rely on self-reporting cannabis exposure, varied/unknown cannabis potency used, as well as a inclusion of a minority of women who exclusively used cannabis. Animal models have found that the likelihood of a miscarriage increases when cannabis is used early in pregnancy, however, these findings have not been observed in humans.^{109,110,111} Three different case-control studies found associations between smoking cannabis during pregnancy and childhood cancers.^{112,113,114} To counter, the incidence of childhood cancers did not significantly increase during periods when cannabis use became more prevalent in the United States.¹

The neurological development of a fetus is greatly affected by the environmental conditions of the intrauterine environment and involves a cascade of events that may be interrupted, delayed, or, at the very least, generally affected by the introduction of foreign substances. Of particular interest is the endocannabinoid system, accessible to components of cannabis that are able to cross the placental barrier including lipophilic THC and other cannabinoids. The endocannabinoid system plays a significant role in a broad array of critical processes in the developing fetus including cell proliferation and differentiation.¹⁰⁶ The extent to which cannabinoid exposure *in utero* may affect development throughout the life course is not currently well understood. A summary of findings from three prospective longitudinal cohort studies (Ottawa Prenatal Prospective Study (OPPS)^{115,116}, Maternal Health Practices and Child Development Study (MHPCD)¹¹⁷, and the Generation R Study¹¹⁸) that describe the impact of cannabis use during pregnancy on child development are displayed in **Table 2**.

Table 2 Known potential neurocognitive and behavioural effects of maternal cannabis use during pregnancy.

Neurocognitive and Behavioural Effects	
18 months	Increased aggressive behaviour ^c Attention deficits (females) ^c
3 to 6 years	Deficits in: <ul style="list-style-type: none">• Verbal and perceptual skills^{ab}• Verbal reasoning^{ab}• Visual reasoning^{ab}• Verbal and quantitative reasoning^b• Short-term memory^{ab} Hyperactivity ^{ab} Attention deficits ^{ab} Impulsivity ^{ab} Impaired vigilance ^b
9 to 10 years	Deficits in: <ul style="list-style-type: none">• Abstract and visual reasoning^{ab}• Executive functioning^{ab}• Reading^{ab}• Spelling^{ab} Hyperactivity ^{ab} Attention deficits ^b Impulsivity ^b Depressive and anxious symptoms ^b
14 to 16 years	Deficits in: <ul style="list-style-type: none">• Visual-cognitive functioning^a• Academic achievement^b• Information processing speed^b• Visual motor coordination^b Delinquency ^b
17 to 22 years	Deficits in: <ul style="list-style-type: none">• Executive functioning^a• Response inhibition^a• Visuospatial working memory^a Smoking ^{ab} Substance use ^{ab} Early initiation of substance use ^{ab}

^aOPPS ^bMHPDC ^cGeneration R
*Adapted from Porath-Waller et al.*¹⁰⁶

Cannabis Use in Adolescence

Cannabis use initiation often occurs during adolescence while heaviest use tends to occur in the late teens and early twenties.¹¹⁹ In Canada, this is consistently evidenced by nationally representative youth and general population substance use surveys (e.g, **Figure 1**).¹⁴ Adolescence is a critical developmental period for all biopsychosocial domains and is also a time when different patterns of behaviours are established.¹²⁰ Dose, potency, and cumulative exposure contribute to

and determine the consequential effects of cannabis use.¹²¹ Cannabis use in adolescence may produce persistent impairments in memory, cognition, academic failure, school dropout, heightened risk for cannabis dependence, or further abuse of other drugs among other consequences.^{122,123} Several regions of the brain are affected through regular cannabis use and it is currently unclear whether the aberrant changes in the neural pathways of regular users are reversible.^{1,59} The most recent review from the National Academies of Sciences on cannabis indicates that the most frequent and heavy users are at highest risks of developing schizophrenia, psychoses and generally compromise their mental health as a result of consumption.⁵⁹

The public discourse around cannabis and its strict regulation has largely been centered on the protection of youth health (See: Taskforce Document²², Bill C-45¹⁹⁰). The commentariat, which includes the media and other sources of information, has historically presented the issue of cannabis regulation as a binary – either presenting the idea that cannabis is largely if not completely harmless and should be loosely regulated given its benign effects or prohibition-era messaging that concentrates on serious harms that have befallen some users as a reason to maintain the status quo.^{124,125} Historically, related policy has been restrictive given the neurobiological research of cannabinoids on the developing brain, however, it has also led to ineffective, discriminatory and harmful policies that arguably have had greater negative impacts on youth health and life trajectories than the substance itself.¹²⁶

Cannabis Use and Mental Health

The adverse psychological and emotional issues related with cannabis use have been observed among relatively higher intensity users (e.g., daily or near-daily users).¹ Canadians aged 15 to 24 have been found to have the highest rates of mood and anxiety disorders according to the 2012 Canadian Community Health Survey – Mental Health with 7% identified as experiencing depression in the past year compared to 2 to 5% of persons aged 25 years or older.¹²⁷ The evidence

relating cannabis use and depression is moderate, though, it has been found that high intensity users exhibit a small increased risk for the development of depressive disorder.⁵⁹

Severe depression is associated with suicidal behaviour, suicide being the 2nd leading cause of death among young Canadians – 1 in 4 deaths among Canadians aged 15 to 24.¹²⁸ Cannabis use has been associated with panic, depersonalization, at times accompanied with paranoid ideation, particularly among first time users – acute depressive reactions have also been documented.¹²⁹ To date, only one study exists that suggests that acute cannabis intoxication precipitates suicidal ideation based on the experience of a 32-year old man who presented with suicidal ideation on two different occasions after acute cannabis intoxication.¹³⁰ The most recent meta-analyses of the cannabis-suicidality link indicates that chronic cannabis use can predict suicidality, though this conclusion is tempered due to the small number of included studies along with many heterogeneous features including a lack of homogeneous measurement of cannabis exposure.¹³¹ According to the National Academies of Science, greater intensity of cannabis use is associated with suicidal ideation, attempt, and completion.⁵⁹

Cannabis use is associated with psychotic symptoms including an increased risk of developing psychoses including schizophrenia – greater frequency and intensity of use has been observed to increase this risk.^{59,124} A prospective study of 50,465 Swedish conscripts found that youth that had reported cannabis use prior to the age of 18 were more than twice as likely (2.4) to be diagnosed with schizophrenia than non-users; further studies confirm these findings along with a dose-response relationship.^{59,132,133,134} Reverse causation may also be a possibility in explaining these findings, it may be that sub-clinical or undetected schizophrenic patients self-medicate with the use of cannabis for disease-specific symptom relief. Another possibility that has been presented is the common cause hypothesis where the association between cannabis use and psychotic symptoms is explained by genetic or environmental factors and not cannabis. Findings in this are

mixed, however, the National Academies of Science concluded that the magnitude of association between cannabis use and the development of a psychotic disorder is moderate to large, appears to be dose-dependent and it is possible that it is moderated by genetic factors.^{1,59} Among individuals with psychotic disorders, moderate evidence supports an association between a history of cannabis use and better cognitive performance.⁵⁹

Overdose

A drug overdose refers to the consumption of a substance beyond a particular quantity where its effects elicit a negative outcome, toxic state, or death. Cannabis has an extremely high LD₅₀, the dosage required for 50% of test subjects receiving a drug to die of drug-induced toxicity. It is estimated that a cannabis user would have to consume 20,000 to 40,000 times as much cannabis as is contained in one cannabis cigarette to consume a lethal concentration to affect physiological process essential for life; practically speaking, cannabis cannot induce a lethal response as a result of drug-related toxicity.^{135,136} A substance's LD₅₀ is one of a range of potential responses and does not provide a complete depiction of its degree of hazard to human health. There do not yet exist reports of fatal cannabis overdoses in the epidemiological literature.¹³⁷ A recent case study by Nappe & Hoyte made national headlines in the United States as it associated a pediatric death with cannabis exposure.^{138,139} The authors determined that there may be an association between cannabis exposure and the myocarditis that led to the young patient's cardiac arrest and ultimate death. While this remains insufficient in terms of determining causality between cannabis exposure and overdose fatality, there exists moderate evidence of a statistical association between cannabis use and an increased risk of overdose injuries – among pediatric populations in American states where cannabis has been legalized, respiratory depression or failure, temporary coma, and cardiovascular symptoms have been detected.⁵⁹ All-cause mortality has not yet been associated with cannabis use or exposure.

At very high levels of THC absorption, an individual can experience panic or anxiety attacks, depersonalization, paranoia, and hallucinations among other less documented effects.^{59,140} The effects of acute intoxication due to cannabis are particularly important as they have regulatory implications in a legalized market which include accidental ingestion (with particular concern for ingestion by children), risks associated with methods of using cannabis among experienced and inexperienced users, impaired driving, combining substances in the same occasion, along with the effects to users' mental health among other concerns.¹⁴¹

Addictive Potential

Regular long-term cannabis use has been observed to produce tolerance, withdrawal symptoms, compulsive use, impaired ability to control use, and continued use despite problems.^{142,143,144} A 1964 World Health Organization Expert committee introduced the term 'dependence' to replace the terms 'addiction' and 'habituation'.¹⁴⁵ Dependence refers to a constellation of psychological, behavioural, and cognitive phenomena in which the use of a particular substance, such as cannabis, takes priority over previously valued behaviours or activities. The *Diagnostic and Statistical Manual of Mental Disorders* (DSM-V) combined DSM-IV categories of substance dependence and substance abuse into a single disorder measured on a gradient from mild to severe – substance use disorder.¹⁴⁶ Despite the changes in terminology, the term 'addiction' is still generally used and refers to the DSM-IV (dependence) or the DSM-V (cannabis use disorder, severe) categories.¹²¹ Cannabis use disorder becomes moderate/severe when the impulse to use interferes with a person's life in a significant way.¹⁴⁷ Daily or near-daily use substantially increases the risk of dependence – dependence occurs in approximately 10% of ever users, 15% of adolescent users, and one third of daily users.¹

Therapeutic Effects

Cannabis and its constituent cannabinoids have been used for medical purposes and otherwise for millennia; evidence of their use may be dated back to 2737BCE in ancient China.^{148,149} In Canada, evidence of their use is present since its recorded first harvest in 1609.¹⁵⁰ Over time, there have been fluctuations in acceptance of cannabis and cannabinoids as acceptable medical therapies. After its criminalization early in the last century, its use largely declined. Today, it is accepted that cannabis and cannabinoids appear to be effective therapies for a wide range of conditions. The strongest evidence indicates that cannabis or specific cannabinoids are effective as analgesics in chronic pain patients (especially among those with neuropathic pain), as antiemetics for chemotherapy induced nausea, and for improving patient-reported multiple sclerosis spasticity symptoms though limited evidence exists for improving clinician-measure multiple sclerosis spasticity.⁵⁹ Other therapeutic uses such as sleep quality improvement, appetite, applications for the treatment of Tourette syndrome, anxiety, and post-traumatic stress disorder have more limited evidence in terms of therapeutic efficacy.⁵⁹ Cannabis in its herbal form is not authorized as a drug in Canada (See Section: Legal and Regulatory Status below), however, three cannabinoid-based medicines are available for marketing in different countries: Nabiximols (Sativex®): oromucosal spray, *C. sativa* THC and CBD – common use: treatment of MS spasticity, neuropathic pain, Nabilone (Cesamet® or Canemes®): oral capsules, synthetic cannabinoid similar to THC, common use: chemotherapy nausea and vomiting, Dronabinol (Marinol® or Syndros®): oral capsule or solution containing synthetic THC, common use: anorexia in AIDS patients, chemotherapy nausea and vomiting.¹⁵¹ In Canada, Nabiximols and Nabilone are approved for use in MS spasticity complications and severe nausea respectively.^{152,153}

According to the most recently available estimates (September 2017), Health Canada reports that 235,621 Canadians are accessing cannabis for medical purposes from approved

licensed producers.¹⁵⁴ Ontario (96,390) and Alberta (91,150) report the majority of client registrations across Canada.¹⁵⁴ Findings from the 2013 and 2014 Centre for Addiction and Mental Health Monitor Survey of adults in Ontario indicate that more than 1 in 4 (28.8%) individuals who used cannabis in the past 12-months, self-reported using it for therapeutic purposes – 15.2% reported having medical approval.¹⁵⁵ These findings are similar to findings from the 2004 Canadian Addiction Survey that found that 29% of cannabis users reported use of cannabis use for medical purposes.¹⁵⁶

Social and economic costs associated with cannabis use

The current body of work assessing the social costs associated with cannabis use is limited. The most recent comprehensive analyses examined costs in terms of the burden placed on services such as health care, public safety, occupational indicators (i.e., loss of productivity), disability or premature death of substances including tobacco, alcohol, and illicit substances which included cannabis. Overall, in Canada, the economic cost was estimated to be \$38.4B CAD; intangible costs such as the costs of pain and suffering were not included in this comprehensive analysis.¹⁵⁷ The most recent figures of cannabis-attributable burden of disease in Canada come from a 2012 study which outlined 287 deaths, 10,500 YLLs, 55,800 YLDs and 66,300 DALYs with cannabis-attributable lung cancer being the largest contributor to mortality and YLLs, and cannabis use disorder accounting for most YLDs.¹⁵⁸ The current system of prohibition under which cannabis is situated disproportionately implicates marginalized communities through criminal records that affect employability, housing, and professional prospects.

Perceptions of health risks related to cannabis use

In 2015, after the Government of Canada announced its intention to legalize the nonmedical use of cannabis, the public discourse was anticipated to shift social norms affecting perceptions of health risks associated with cannabis.¹⁵⁹ Social norms influence substance use

behaviours, particularly among young people; they represent expectations about how others perceive and evaluate our behaviour. In November 2017, approximately two-thirds (65%) of Canadians reported support of cannabis legalization, an increase from one-fourth (26%) in 1975, indicating increasingly permissive attitudes toward the substance.¹⁶⁰ Once considered a deviant behaviour within criminal subcultures, cannabis use is increasingly perceived as a common feature of Canadians' leisure time.¹⁶¹ According to work from Parker and colleagues' Normalization Thesis, this increasingly normalized fixture of Canadian society may provide a sort of stability in terms of individuals' cannabis use behaviours as they bridge their substance use from adolescence into adulthood.¹⁶²

Cannabis use in this social climate has the potential to become an object of consumption and identity formation in parallel ways alongside other sociocultural artefacts such as music, fashion, media, and technology.^{163,164} The divergence between actual risks and perceived risks has been well documented among Canadians. Public perceptions of risk due to substance use such as cannabis is incongruous with actual risk and imposes cost to Canadian society as discussed in the previous section – this can be understood through the Social Amplification of Risk Framework, which describes how increased familiarity with a source of risk exerts an attenuating influence on perceptions of risk.¹⁶⁵

Canadian youth perceive that cannabis use is more prevalent and widespread than it actually is among their peers as well as the general population.¹⁶⁶ Young Canadians report that cannabis is generally benign and is a substance used by “everybody” referring to it as “natural” and “not really a drug at all”.^{121,166} Cannabis users tend to have unique perspectives on risks associated with use based partly on personal experiences with the product and their observations of others' use of cannabis that contributes to their perspectives. While temporality and directionality precludes concrete conclusions regarding risk perception and cannabis use, cross-

sectional surveys such as the US Monitoring the Future study reveals an inverse association between risk perception and youth use – young people who perceive a substance such as cannabis to be high risk, are less likely to use it and vice versa.^{167,168} Exploring more specific risk perceptions from a nationally representative survey of Canadians (N=2,088) conducted in 2016 reveals that approximately 7 in 10 (71%) respondents perceived that driving under the influence of cannabis was as bad as driving under the influence of alcohol.¹⁵⁹ Approximately 6 in 10 (58%) perceived cannabis to be addictive, and 1 in 2 (55%) indicate that use of cannabis does not lead to the use of other illicit substances.¹⁵⁹ Approximately 1 in 5 Canadians were unsure if cannabis caused physical (21%) or mental (23%) harm.¹⁵⁹ Young Canadians and the population at large have very little knowledge about the health risks associated with cannabis contributing to their perceptions of risk.

Risk perceptions refer to the subjective judgements that individuals make about the severity and characteristics of a risk.¹⁶⁹ Risk perception', as a construct, is embedded in a variety of behavioural theories used to predict substance use. For example, the Health Belief Model identifies perceived risk as a significant factor in an individual's decision to engage in a particular health-related behaviour which includes sociodemographic factors such as sex, age, gender, race-ethnicity, and knowledge in influencing beliefs which in turn influence behaviours.^{170,171,172,173} As a construct, risk perception plays a significant role in influencing an individual's intention to use cannabis.¹⁷⁴ An understanding of how individual level factors such as perceptions of risk and severity, and how these factors interact with broader environmental factors to culminate and manifest themselves in different substance use behaviours is essential.¹⁷⁵ Increasing perceptions of health risks may be insufficient in reducing a potentially destructive behaviours of interest. Greater health knowledge has been associated with behaviours of interest in tobacco control research including reductions in smoking initiation, increased engagement in cessation behaviours

and long-term abstinence from smoking that may be relevant to cannabis control measures.^{176,177,178,179}

The legal and regulatory status of cannabis in Canada

Although nonmedical cannabis use in Canada was illegal from 1923 until 2018, Canadians were granted legal access to cannabis for medical purposes in 2001.¹⁸⁰ In 2000, a legal decision based on Section 56 exemptions under the *Controlled Drugs and Substances Act* gave eligible individuals with serious medical needs access to the *dried herb* form of cannabis.¹⁸¹ The *Marihuana Medical Access Regulations* (MMAR), implemented in 2001, gave Canadians who were approved and received licences from Health Canada the right to possess a legal supply of dried cannabis for medical purposes through one of three options: Health Canada's supply, a personal cultivation licence, or a designated-person licence to produce cannabis for the approved individual.¹⁸² Several years into the program, few Canadians had obtained MMAR approval, and many reported obtaining their supply of medical cannabis through illegal sources.¹⁸³

In 2012, the MMAR framework was replaced with the *Marihuana for Medical Purposes Regulations* (MMPR), which addressed concerns related to: the practice of industrial cultivation and distribution, access restrictions, lack of plant and seed diversity (licenced producers were only legally permitted to produce a single strain), as well as concerns regarding the health and security of home cannabis producers (e.g., risk of violent home invasion, health concerns from mould, air quality issues, electricity installation).¹⁸⁴

The MMPR outlined the creation of a licensing scheme and development of standard conditions for commercial production and distribution.¹⁸⁴ Under the MMPR, health care providers also had greater flexibility over diagnoses for which they were permitted to prescribe cannabis.^{185,186} In 2015, the MMPR was further modified after the Supreme Court of Canada found that it would be unconstitutional to restrict access to cannabis solely to its dried herbal form (*R v.*

Smith); a broader scope of cannabis forms (i.e., bud, oil, fresh leaves, etc.) became legally available to approved cannabis users.¹⁸⁷

In 2016, the MMPR was replaced by the *Access to Cannabis for Medical Purposes Regulations* (ACMPR) in response to a Federal Court decision (*Allard v. Canada*), which found that individuals did not have “reasonable access” to medical cannabis under the MMPR (which required sole access from licenced producers) and thus it violated section 7 of the Canadian Charter of Rights and Freedoms.¹⁸⁸ The ACMPR retained aspects of MMAR and MMPR that established the framework for conditions for commercial production and distribution by licenced producers, as well as additional forms that were legally acceptable under the MMPR. The ACMPR limits the quantities of cannabis an individual can possess but allows for the personal production or production by a third party for the use of the approved user.¹⁸¹

In 2016, the Canadian government began the process of legalizing nonmedical cannabis use. The government appointed a Task Force on Cannabis Legalization and Regulation, which issued a series of recommendations in their final report, released in November 2016.²² The Task Force recommendations, intended to minimize the harms of cannabis use, included enforcing a minimum age of purchase (18 years), applying limits to cannabis promotion, requiring plain packaging and specific labelling requirements, creating limits on maximum THC content per unit, clarifying distribution systems, and enhancing efforts to detect and discourage impaired driving from cannabis use. A unique feature regarding the Taskforce document is its provision that recognizes the benefits that cannabis may have. Part of its guiding principles includes the protection of public health and safety as its primary goal, “which includes minimizing harms and *maximizing benefits*”.²² This stipulation and its mention throughout the remainder of the document stands in stark contrast to public health messaging in the United States, where the substance is not

recognized to have any medical value and is categorized as having a high potential for being abused.¹⁸⁹

Using the recommendations developed by the Taskforce's efforts, the Government of Canada introduced Bill C-45 on April 13, 2017, *An Act respecting cannabis and to amend the Controlled Drugs and Substances Act, the Criminal Code and other Acts*, better known by its short hand, the *Cannabis Act*. The proposed *Act* outlined the creation of a comprehensive national framework to legalize and provide restricted access to regulated cannabis. Further, it seeks to control cannabis production, distribution, sale, import, export, and possession.¹⁹⁰ These controls include the regulation of minutiae that include considerations related to production licencing, product standards, advertising and marketing restrictions, and shared taxation authority. Provinces and territories will be primarily responsible for deciding their respective retail sales regulations. The federal government legalized nonmedical cannabis in October 2018 making Canada the second country to legalize the nonmedical use of cannabis, after Uruguay.^{191,192}

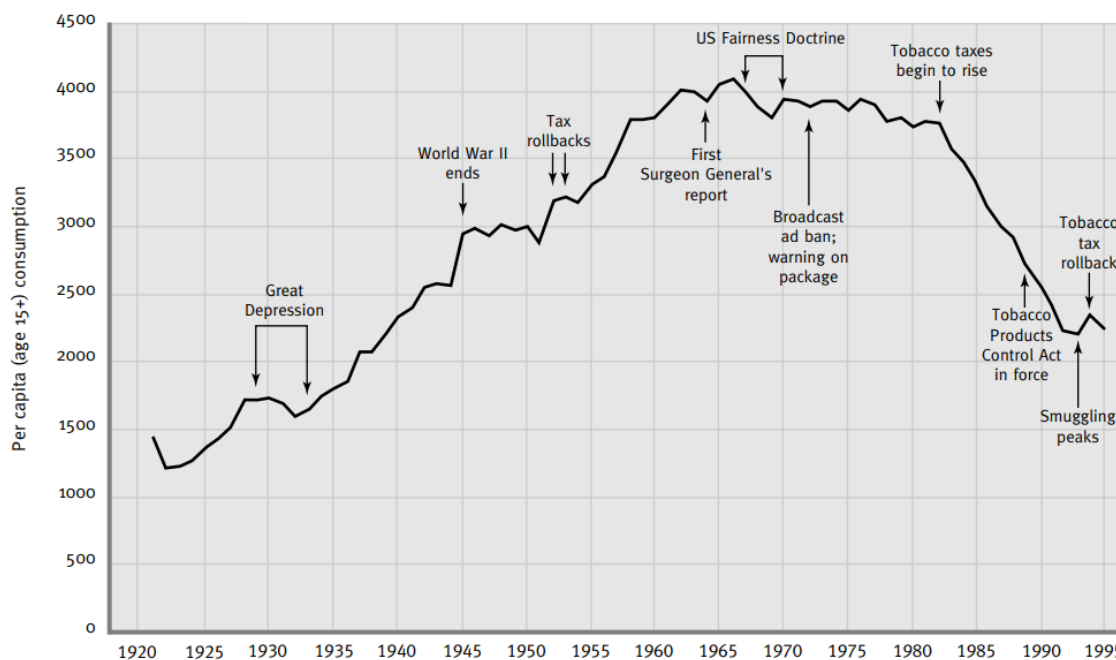
History of tobacco marketing and directions for cannabis

There are parallels between cannabis and tobacco use as has been discussed in terms of their similar modes of administration, their frequent co-administration, and their potential presentations in the market. In order to understand the importance of marketing strategies and health warning labels (HWLs) specific to cannabis products, it is useful to describe, in brief, how these came to be such powerful media tools by which Industry and Public Health have sought to find solutions to their respective problems, the former with an interest in creating and maintaining captive consumers, and the latter attempting to prevent disease and protect human health. Besides being a powerful health communications tool, media is able to shape and reflect social values around substance use.¹⁹³

In Canada, the period around World War I (1914-1918) resulted in a 28-fold increase in tobacco cigarettes consumed – from 87 million in 1896 to approximately 2.4 billion in the early 1920s.¹⁹⁴ Tobacco companies targeted military personnel and supplied troops with tobacco products.^{195,196} A *New York Times* article of the time stated that smoking cigarettes, “lighten the inevitable hardship of war” and were described as, “the last and only solace” of the wounded.¹⁹⁶ Use became widespread and the rapid expansion of cigarette smoking and new consumers entering the market was later attributed to the very effective advertising and promotional strategies that were employed.¹⁹⁷

Use of tobacco continued to surge until around the time the United Kingdom’s Royal College of Physicians and Canada’s Minister of National Health and Welfare Judy LaMarsh declared that there was, “scientific evidence that cigarette smoking is a contributory cause of lung cancer” in 1963 on separate instances. Six months after LaMarsh’s statements, the US Surgeon General, Dr. Luther L. Terry, declared that cigarette smoking was causally related to lung cancer in the pivotal work, *Smoking and Health: Report of the advisory Committee to the Surgeon General of the Public Health Service*.¹⁹⁸ **Figure 3** below depicts patterns of changes in consumption behaviours among Canadians before and after this information was communicated.

Figure 3 Canadian per capita (age 15+) cigarette consumption (including roll-your-own), 1921–95. Consumption during the 1990s includes contraband estimates, as a result there is some uncertainty. Imports, typically very low, not included¹⁹⁹



The following decades marked the emergent tobacco control effort and in parallel, tobacco companies' efforts to counter claims of their products' harm to health, disputing what they felt were false allegations. The market was flooded with new claims and product presentations that implied that the new 'low-tar', 'light' and filtered products were safer though no evidence existed then or now that supported those claims.²⁰⁰ In 1969, a report by the House of Commons Committee on Health, Welfare and Social Affairs, also known as the Isabelle Report) contained recommendations for a complete ban on advertising, for health warnings to be placed on packages and vending machines, listing tar and nicotine levels, restriction of places of distribution such as vending machines, among other recommendations.¹⁹⁹ Shortly thereafter, in 1971, Bill C-248, the *Cigarette Products Act*, was introduced – it would have eliminated advertising, required warnings on packages and in places products were sold and would have created an authority to set maximum nicotine and other constituent limits – however, it was never debated and instead, voluntary guidelines were developed by the tobacco industry and health warning labels were not

implemented until approximately 20 years later.¹⁹⁹ A legal battle that started in 1999 regarding the historical misrepresentation and deception of the general public about the harms caused by using tobacco products culminated in 2017 with the US Federal Court mandating marketing campaigns containing a number of statements regarding the health effects of smoking that were broadcast on primetime television, and in 50+ influential newspapers (e.g., New York Times, Wall Street Journal, USA Today) – a penalty of approximately \$30 million in total.²⁰¹ It is estimated that the tobacco industry spends approximately \$8 billion, or \$24 million per day on advertising, promotions and sponsorships in America and Europe alone.²⁰² The Department of Justice decided that increasing the public’s health knowledge specific to tobacco products would influence risk perceptions and subsequent health behaviours among those exposed to the messaging as discussed previously in this dissertation. Notably, unlike their product advertisements and marketing, the court-mandated advertisements were void of colour, vivid imagery, or emotion when the messages were presented on television, an attempt to dampen potential persuasive effects.

Advertising is “the use of media to create positive product imagery or positive product associations or to connect the product with desirable personality traits, activities or outcomes. Promotion, also called marketing, can be defined as the mix of all activities which are designed to increase sales”.²⁰³ Advertising may also be indirect which refers to practices that accomplish the same goals of increasing the appeal of a product’s brand, these activities often occur adjacent to traditional advertising media such as the provision of promotional items, contests, free samples, holidays, sponsorships, as well as “brand stretching” where the product’s brand is translated onto unrelated products such as clothing, cafes etc.²⁰⁴ Advertising and related activities manipulate perceptions and appeal of a particular product to increase an individual’s intention to consume. Product characteristics affect comparative perceptions of their potential benefits and/or harms.²⁰⁵ Few young people initiate substance use behaviours due to a substance’s inherent characteristics

(i.e., a tobacco cigarette's nicotine content, a cannabis cigarette's THC:CBD ratio), rather, they have been described as being attracted to the five S's: sophistication, slimness, social acceptability, sexual attractiveness, and status that advertisement of a product is able to manipulate.¹⁹⁹ Numerous studies have observed positive causal relationships between advertising and promotional activities and onset and continuation of smoking among youth and young adults.^{197,206,207,208}

Since at least 1970, despite continual denials, multinational tobacco companies including Philip Morris, British American Tobacco (including Brown & Williamson), and RJ Reynolds have considered manufacturing cannabis-containing cigarettes.^{209,210,211} The 80+ million pages of documents that were released during litigation against these industry giants also reveal a sense of urgency they felt to develop adequate potential products and paraphernalia to enter the market as the sociopolitical climate became increasingly favourable.²¹⁵ Currently, there are long standing interests in the cannabis market from the Tobacco Industry; one that has repeatedly been shown to modify its products to increase addictiveness, provide misleading information, and use advertising and marketing to increase demand and change and expand how consumers use cannabis.²⁰¹

Philip Morris registered the brand name Marley in France in 1993, along with a number of other colloquial terms for cannabis.^{212,213} Denver saw medical cannabis dispensaries outnumber Starbucks cafes in 2011 (300 vs 266).²¹⁴ In 2012, the cannabis industry in the US started advertising medical cannabis with a "menthol taste".²¹⁵ In March 2014, the first television advertisement for medical cannabis appeared on major networks including CNN, Fox, and ESPN.²¹⁶ Also in 2014, Altria (formerly Philip Morris) purchased Green Smoke, an e-cigarette company with branding and product offerings suggesting crossover use (**Figure 4**).²¹⁵ E-cigarettes are another nexus between cannabis and tobacco as these devices may be fitted to be used with derivatives of cannabis such as hash oil and are difficult to distinguish from nicotine-delivering e-

cigarettes. The tobacco industry should be expected to be ready and prepared to enter and be an aggressive player in the cannabis market providing incentives to increase cannabis use.

Figure 4 Flavoured product offerings from Altria (formerly Philip Morris). *Source:* <https://www.greensmoke.com>



Cannabis retailers have established a presence on the internet. Recently, there have been attempts to describe young people’s online environments such as social media’s presentation of cannabis and related activities, as these cyber spaces may represent credible sources of information for youth and young adults.^{217,218} For example, a recent study by Lamy and colleagues demonstrates how social media platforms like Twitter are able to disseminate information about cannabis that describes it as “pure”, “clean”, and a “natural medicine”.²¹⁹ Ouellette and colleagues describe how YouTube users are spreading information about cooking with cannabis, receiving collectively 15.6 million views though little is currently known regarding the basic effects these preparations may have or about users’ habits of ingesting edibles.²²⁰ Work by Ramo and colleagues identified more than 700 phone applications related to cannabis and characterized them as likely vehicles for cannabis related information and misinformation.²²¹ The online environment

is an important burgeoning area of work regarding cannabis-related messaging and a space where its normalization is currently taking place.²²²

To date, there exist few studies that have investigated the impact of cannabis-specific marketing and its influence on consumer behaviours. The experience from Oregon, which has a legalized cannabis market, has been documented and confirms that exposure to cannabis-related advertising will be prevalent and influential to surrounding communities as well as subgroups of particular interest that include youth and young adults.²²³ Similar studies have been conducted that confirm and quantify sources of cannabis advertisements and promotional materials.^{224,225} According to the Reinforcing Spirals Model of Media Exposure (RSM), which describes processes that lead to the formation and subsequent maintenance of attitudes such as ideologies or more transient and temporary behaviours, exposure to cannabis-related media increases the likelihood of cannabis-related behaviour which may be reinforcing processes that lead to increasing the likelihood of continuing to engage in that or similar behaviours.²²⁶ A recent study from California illustrates RSM; young people's exposure to medical cannabis advertisements was associated with a greater likelihood of cannabis use and stronger intentions to use 1 year later.²¹⁷ Furthermore, clinical work in the area confirms that public advertising of cannabis elicits activations in the brain's reward circuit (striatal activation) similar to those seen after primary rewards such as food or water.²²⁷ In summary, while there is currently very little work in this area that is specific to cannabis advertising. However, what is available seems to be analogous to the experiences with tobacco issues in this area in terms of a positive association between exposure to advertising and marketing and increased consumption.

Canada's proposed policy measures on cannabis products

The *Cannabis Act* came into force on October 17, 2018.²²⁸ The *Cannabis Act*'s provisions require general prohibitions on the promotion, packaging, labelling and display of cannabis

products and related accessories.¹⁴¹ Provinces and territories were given the responsibility to determine distribution and retail models and flexibility to determine different related regulations related to setting distinct minimum age, decreasing possession limits, restricting locations where cannabis may be used, and setting requirements for personal cultivation.²²⁹ Across Canada, personal public possession limits are consistent at 30g of dried herb or its equivalent, consistent with the recommendations of the *Cannabis Act* and with the exception of Alberta and Quebec that decided 18 as the minimum age of purchase, the minimum age of purchase across Canada is set at 19 in the rest of Canada.²²⁹ A summary of regulations is presented in the table below and current as of October 22, 2018.

Table 3 Summary of provincial and territorial nonmedical cannabis restrictions and retail distribution²²⁹

Province	Legal Age	Retail	Public Possession Limit
Alberta	18	PLS, Online	30 grams
British Columbia	19	GOS, Online	30 grams
Manitoba	19	PLS, Online	30 grams
New Brunswick	19	GOS, Online	30 grams
Newfoundland and Labrador	19	PLS, Online	30 grams
Northwest Territories	19	GOS, Online	30 grams
Nova Scotia	19	GOS, Online	30 grams
Nunavut	19	GOOS, Phone	30 grams
Ontario	19	GOOS	30 grams
Prince Edward Island	19	GOS, Online	30 grams
Quebec	18	GOS, Online	30 grams
Saskatchewan	19	PLS, Online	30 grams
Yukon	19	GOS, Online	30 grams

PLS=Private licensed stores, GOS= Government operated stores, GOOS=Government-operated online store

Packaging & Branding

Package, product design, and branding play key roles in determining the level of appeal that a particular product has to its consumer. There exists a great deal of evidence from the tobacco and alcohol domains that the appearance of a product is designed to encourage initiation of use, increase use, and promote brand loyalties.^{230,231,232,233,234}

Restrictions on traditional forms of tobacco advertising in Canada has left tobacco packaging as the primary channel for promotion, development, and maintenance of brand identity which create or sustain positive associations, expectations, and reductions of risk perceptions of products.²³⁵ According to Philip Morris' *International Social Acceptability Research*, "[t]he following key elements are of prime importance in the enhancement of the smoker's self-perceptions: the physical characteristics and appearance of a product, including length, diameter, tipping (materials forming the mouth piece), etc. – the package, including brand name, logo, design, crest, box, soft pack, etc. – the advertising, including role models, personality/lifestyle-identification, product support, etc."²³⁶ Indeed, independent studies and tobacco industry research documents regarding packaging characteristics and consumer perceptions have described the impact on subsequent consumer behaviour and the specific elicited perceptions of each packaging detail – refer to the table below.²³⁵

Brand imagery, which encompasses logos, colour, brand variants, etc. encourages consumers to draw inferences about the contents of a package and the likely experience they will have as a result of consuming the product. Brand imagery aims to satiate needs and social identities among existing and prospective consumers.^{237,238,239,240}

Table 4 Package characteristics and consumers' elicited product perceptions.

Package Characteristic	Consumers' Elicited Product Perceptions
Rounded, octagonal, or 'beveled' edges ²⁴¹	stylish, elegant, class
Novel openings and shapes ²⁴¹	contemporary, modern
Slim and thin ^{241,242,243}	increased attractiveness (particularly women), milder content, less harmful
Colour combinations ^{244,245}	higher quality, lower tar, lower nicotine
"Smooth" labels ^{246,247,248}	lower health risk than "regular" of the same brand
Lighter colour ^{249,246,250,251,252}	less harm, less perceived strength, improved quality, better brand name recognition
Hot colour ²⁵³	more taste, harsher, stronger
health oriented descriptors (e.g., 100% organic) ²⁵⁴	increased purchase intention, reduced perceived harm, increased favourable perceptions
Standardized packaging ^{248,255,256,257,258}	less appealing, less attractive, less projection of personality attributes (i.e., cool, popular etc.), lower quality of smoking experience, reduced perceptions of implied safety, less sophisticated
Brand descriptors (e.g., Red, Rich Red, Rich Classic Red) ²⁴⁸	increasing number of words associated with greater appeal
Contains slim diameter cigarettes ^{259,260,261}	weaker taste, less harmful

An important lesson learned from tobacco control was that, short of prohibiting the substance, coupling a sizeable and impactful health warning label with vivid imagery and standardized packaging including the restriction of brand variants, are proven ways of mitigating use and discouraging engagement and initiation of product use and market participation.^{230,262,263,264}

In March 2018, Health Canada released their final proposals for package-specific requirements.²⁶⁵ The recommendations include limitations of colours, graphics, and other special characteristics to reduce appeal of the product, particularly among youth.¹⁴¹ Packaging for cannabis products is required to be opaque, enable inner and outer packaging to accommodate new product forms, and be in line with ACMPR regulations (e.g., child-resistant, tamper evident, prevents contamination, maintains cannabis dry). The maximum amount of cannabis allowed in a single package will be 30 grams of dried herb – or the equivalent for other forms of cannabis and consistent with the amount that adults would be able to possess in public spaces under the *Cannabis Act*. A summary of the proposed regulations is outlined in the table on the following page.

Table 5 Comparison of proposed packaging and labelling rules for cannabis with current rules under the ACMPR and proposed rules for tobacco products and vaping rules under the proposed Tobacco and Vaping Products Act.²⁶⁵

	Current Rules for Medical Cannabis	Proposed Rules for Nonmedical Cannabis	Proposed/Current Rules for Tobacco	Proposed Rules for Vaping
Universal Symbol	REQUIRED (N for narcotic)	REQUIRED	Not required	REQUIRED
Health warning message	Not required	REQUIRED required text in yellow box; font must be largest on the label	REQUIRED graphic and text; must cover 75% of package	REQUIRED text; standard style and size font
Product Related Information Plain packaging	REQUIRED	REQUIRED	RESTRICTED	REQUIRED
Background colour	Not restricted	RESTRICTED single, uniform colour	RESTRICTED Pantone 448C brown	Not restricted
Font	Not restricted	RESTRICTED standard style; size limit; single, uniform colour	RESTRICTED standard size; size limit; Pantone 2C grey	Not restricted
Brand name	Allowed, no restrictions	RESTRICTED size limit; limit of 1 on principal display; single, uniform colour	RESTRICTED standard style; size limit; limited number displayed; specified placement, Pantone 2C grey	Allowed, no restrictions
Bland element (logo)	Allowed, no restrictions	RESTRICTED size limit; limit of one on principal display	PROHIBITED	Allowed, no restrictions
Other images or graphics	Allowed, no restrictions	PROHIBITED	PROHIBITED	Allowed, no restrictions
Coatings, embossing, cut-outs, and peel-away	Allowed, no restrictions	PROHIBITED	PROHIBITED	Allowed, no restrictions
Package-specific rules				
Standard shape, size, material	Not Required	Not Required	REQUIRED	Not Required
Child resistant	REQUIRED	REQUIRED	Not Required	REQUIRED
Opaque or translucent	REQUIRED	REQUIRED	Not Required	Not Required
Tamper-evident	REQUIRED	REQUIRED	Not Required	Not Required

The general list of product-related labelling requirements include: name and contact information of the product packager, product description, lot number, weight or volume – depending on the product class, packaging fat and expiry date, recommended storage conditions, THC/CBD content – expressed as a percentage the product could yield and by unit or dose, as well as the inclusion of the statements, “KEEP OUT OF REACH OF CHILDREN/ *TENIR HORS DE*

LA PORTÉE DES ENFANTS”, and “Important: Please read the Health Canada document provided with this package before using the product/ *Important: Veuillez lire le document de Santé Canada qui accompagne ce colis avant d’utiliser ce produit*”. Standardized cannabis symbol markings are required with a minimum size of 1.27 cm (w) x 1.27 cm (h) and be displayed in 25% of the principal display panel.

Figure 5 Standardized cannabis symbol²⁶⁵

THE COLOURS



RED (Primary Colour)
 CO M100 Y92 K0
 R235 G0 B41
 HTML EB0028
 PANTONE 185



BLACK
 CO M0 Y0 K100
 R0 G0 B0
 HTML 000000



WHITE
 CO M0 Y0 K0
 R255 G255 B255
 HTML FFFFFFFF



Dotted border not required/used to illustrate outset

Branding was also accounted for in Health Canada’s regulations which contain strict requirements related to the use of branding, logos, and colours. For example, in addition to a brand name, only one other brand element may be displayed, other images or colours would be restricted, metallic and fluorescent colours would be prohibited, and any colour used would have to contrast with required elements in the display of a products package (e.g., cannabis symbol, health warnings, etc.). Examples of the execution of these rules are displayed in **Figure 6**.

Figure 6 Product packaging that is adherent to Health Canada's regulations²⁶⁵



Example of **FRONT (principal display panel)** with white/plain background and brand/producer name

Example of **BACK (secondary display panel)** with white/plain background



Example of **FRONT (principal display panel)** with solid coloured background and brand/producer logo

Example of **BACK (secondary display panel)** with solid coloured background

Health warning labels

Accurate health warnings on tobacco products have changed social norms around its use and have been very effective in reducing use and consequent disease burden.²⁸⁴ A pack-a-day

smoker is potentially exposed to a cigarette pack 7,300 times per year (20 views/day x 365 days/year). This outweighs exposure to any other public health or other mass messaging campaign at minimal cost.²⁶⁶ Well-designed health warnings on cannabis products may have the potential to become an important strategy to increase health knowledge and risk awareness through the same mechanisms observed with tobacco products and may influence use levels potentially reducing harms caused by cannabis use.

The communication of health risks related to cannabis use will be a priority in cannabis control strategies in a legalized market. In tobacco control, health warning labels have proven to be the most cost-effective medium to communicate information related to a product's health risks.^{267,268} Warning labels that display graphic images have been associated with increased perceptions of health risks, improved health knowledge, as well as higher measures in motivations to quit and increases in cessation behaviours.²⁶⁸

Cannabis users may benefit from health warnings given that the most recently available evidence suggests that cannabis users are not aware of the variety of consequences associated with cannabis use and report acquiring health information from a number of uninformed sources.^{159,166,269,270} The U. S. Surgeon General's report on cannabis expressly stated that the public is likely unaware of accurate information about the substance in general but more specifically the dosage and potency of cannabis products, both in the licit and illicit markets.²⁷¹

While laws are changing, so too is the drug itself with average potency more than doubling over the past decade (1998 to 2008) ... products and methods [of using cannabis] are unregulated even in states that have legalized marijuana use, users may not have accurate information about dosage or potency, which can lead and has led to serious consequences such as hospitalizations for psychosis and other overdose-related symptoms. Marijuana use can also impair driving skills and, while estimates vary, is linked to a roughly two-fold increase in accident risk. The risk is compounded when marijuana is used with alcohol.²⁷¹

The earliest recorded mention in academic journals proposing the use of health warning labels for cannabis products came in 1979 in the United States with many of the same relevant conclusions of today. In the event that cannabis should become legalized, it was proposed that it should be “...possible for consenting adults to obtain the substance for recreational use. The consent element being that they must be aware of the impairment of driving ability, the danger of chronic consumption on mental functioning and the possibility of teratogenicity if consumed by a pregnant woman...”²⁷² More recent work in the area outlines topic areas where warnings may be useful which are not very different from what was outlined in 1979 including messaging around drugged driving, mental health and psychological functioning issues, addictive potential, responsible use, and perinatal use.^{273,274,275,276}

In the US, where certain states have legalized the use of cannabis for medical or nonmedical purposes, existing labelling policies vary widely. The State of Montana, for example, does not currently specify any language or labelling beyond constituent content require to be presented on cannabis products according to the most recent *Montana Medical Marijuana Act*.²⁷⁷ In Alaska, the following statement is the only language required on cannabis products, “There are health risks associated with consumption of marijuana”.²⁷⁸ Colorado has adopted specific symbols differentiating between medical cannabis and nonmedical cannabis, as well as a health warning label composed of a paragraph and displayed with the state symbol and the Department of Revenue seal.

Figure 7 Example warning labels from the United States – Colorado, Washington, and Oregon. THC stands for the psychoactive ingredient tetrahydrocannabinol. The ‘M’ in the Colorado warnings indicates that product is medical and may potentially indicate a higher concentration of THC

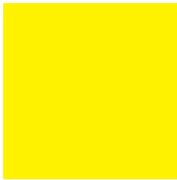


The scant literature on the subject of health warning labels for cannabis products suggests that Canada has the potential to have a pioneering role in labelling and implementation of this important health communication and education approach. To date, there does not exist any empirical evidence regarding the impact that health warnings on cannabis products and population health measures or consumer behaviours. Research from other consumer domains indicates that the effectiveness of health warnings depends upon their design. Key elements of effective health warnings include size, position, borders, and the general appearance of the warning (e.g., colour,

graphics and graphic content, and message content).²⁸² Health Canada’s specifications are shown in **Figure 8**. Interestingly, unlike rules for tobacco products, there is no mention of minimum size or percentage of main product display that cannabis health warnings must cover.

Figure 8 Health warning messages' layout²⁶⁵

THE COLOUR



YELLOW (Background Colour)
C0 M0 Y100 K0
R255 G242 B0
HTML FFF100

WARNING: Do not use if pregnant or breastfeeding. Using cannabis during pregnancy may harm your baby and result in low birth weight.

MISE EN GARDE : Ne consommez pas si vous êtes enceinte ou allaitez. Consommer du cannabis pendant la grossesse pourrait être dangereux pour le bébé et réduire son poids à la naissance.

Health Canada/Santé Canada

Vertical/bilingual example

WARNING: Do not use if pregnant or breastfeeding. Using cannabis during pregnancy may harm your baby and result in low birth weight.

MISE EN GARDE : Ne consommez pas si vous êtes enceinte ou allaitez. Consommer du cannabis pendant la grossesse pourrait être dangereux pour le bébé et réduire son poids à la naissance.

Horizontal/bilingual example

WARNING: Do not use if pregnant or breastfeeding. Using cannabis during pregnancy may harm your baby and result in low birth weight.

Vertical/English example

MISE EN GARDE : Ne consommez pas si vous êtes enceinte ou allaitez. Consommer du cannabis pendant la grossesse pourrait être dangereux pour le bébé et réduire son poids à la naissance.

Vertical/French example

Health warning message must appear in both official languages and be given equal prominence.

The content of the health warnings proposed by Health Canada included the following areas: prevention of accidental ingestion, risks associated with different methods of use, risks

associated with cannabis use during pregnancy, dangers of impaired driving, risks of combining cannabis with other substances, and impacts of cannabis use on mental health – a table of their specific messages are presented below, in **Table 6**.^{141,283} Health Canada requires mandatory health warnings composed of a primary and secondary message to be rotated on package levels.

Table 6 Health Canada's required health warning messages²⁸⁰

Primary Sentence	Secondary Sentence
WARNING: Cannabis smoke is harmful.	Harmful chemicals found in tobacco smoke are also found in cannabis smoke.
WARNING: Do not use if pregnant or breastfeeding.	Using cannabis during pregnancy may harm your baby and result in low birth weight. OR Substances found in cannabis are also found in the breast milk of mothers who use cannabis.
WARNING: Do not drive or operate machinery after using cannabis.	More than 4,000 Canadians were injured and 75 died from driving after using cannabis (in 2012). OR After cannabis use, coordination, reaction time and ability to judge distances are impaired.
WARNING: Cannabis can be addictive.	Up to half of people who use cannabis on a daily basis have work, social or health problems from using cannabis. OR 1 in 11 people who use cannabis will become addicted. OR Up to 1 in 2 people who use cannabis daily will become addicted.
WARNING: Regular use of cannabis can increase the risk of psychosis and schizophrenia.	Higher THC content can increase the risk of psychosis and schizophrenia. OR Higher THC content can lower the age of onset of schizophrenia. OR Young people are especially at risk.
WARNING: Adolescents are at greater risk of harms from cannabis.	Early and regular use increases the risk of psychosis and schizophrenia. OR Using cannabis as a teenager can increase your risk of becoming addicted. OR 1 in 6 people who start using cannabis in adolescence will become addicted.

Position and Size

Article 11 of the World Health Organization's Framework Convention on Tobacco Control (FCTC) recommended that graphic warning labels take up 50% or more, but no less than 30% of a cigarette pack's principal display areas – the 2008 guidelines recommended stronger language, and that labels cover more than 50% of the packs' principal display areas.²⁸⁴ Article 11 also specifies that Parties should ensure maximum visibility of health warning labels by displaying them prominently at the top of the principal display areas.²⁸⁵ Displaying graphic health warnings at top of product packs has been shown to increase salience and recall compared to text-only warnings appearing on the sides of packages such as those in the US.^{282,286} A recent simulation study in the US determined that the implementation of a prominent pictorial health warning label covering prominent cigarette display areas to replace existing text-only warnings on the side of cigarette packages has the potential to decrease prevalence of smoking by 5% (2.5%-9%) on the short term and up to approximately 20% (4%-19%) over the long term.²⁸⁷

Size matters when it comes to the impact that health warning labels have on consumer perceptions and ensuing behaviours. Empirical research has demonstrated that larger warnings increase cognitive reactions and processing of information, are perceived to be more important, are more attention grabbing, and are more likely to be remembered.^{288,289,290} Different countries around the world have started to experiment with increasing health warning labels from covering 50% to 80% of the products' display areas – this increase in size has been associated with increased salience, and greater overall rated effectiveness.²⁹⁰ These findings are consistent with ideas of decreasing brand livery to decrease measures of appeal simultaneously increasing warning size to heighten risk awareness.

Use of Pictures

Relative to text-only health warnings, pictorial health warnings are more likely to promote cognitive elaboration of risks, increased ability to attract and hold attention, and improve recall as they are more likely to remain salient over time and promote encoding to memory.^{291,292,293} Pictorial warnings have been shown to provoke more thought about the health risks associated with tobacco as well as motivations and intentions to cease using tobacco.²⁶⁶ Thus, the combination of increased attention, scrutiny, and warning credibility are associated with increased risk perceptions.²⁹⁴ A randomized clinical trial of over 2000 American smokers found that significantly more individuals in the trial reported quit attempts when they were provided with pictorial health warnings than those receiving the normal US packs with text-only warnings.²⁹⁵

Warnings that display and highlight stark or graphic images of the physical health effects of smoking may be particularly effective. Among youth, warnings that highlight negative aesthetic effects or those that portray an effect to their ability to participate in some kind of activity are rated as having a greater impact.^{296,297,298,299} Pictorial warning labels also have the potential to better inform low-literacy users and promote all of the intended benefits including reduced use, increase cessation behaviours, and reduction of overall appeal.³⁰⁰ Defensive avoidance behaviours have also been observed to be elicited from pictorial health warnings including health warning avoidance as well as reactance, the act of deliberately engaging in a prohibited behaviour in spite of the utility a piece of advice may confer to the individual; regardless of these behaviours, individuals are still more likely to make quit attempts after warning exposure.^{301,302,303,304,305}

Colour

Colour is an important aspect of health warning labels. Instructions regarding the health warning colours are outlined in Article 11 of the FCTC. Rather than present black and white warnings, it is recommended that participating states mandate full colour for pictorials included in health warnings, and contrasting colours for text elements.²⁸⁵ Evidence demonstrates that vivid colour affects overall noticeability and maximizes legibility of text which may lead to increased cognitive processing of content.^{285,306} Health warning labels presented in colour are perceived to be more hazardous and are even more effective when they are presented with signal words such as ‘DANGER’, ‘CAUTION’, and ‘WARNING’ – ‘DANGER’ outperforms the other two signal words in producing higher ratings of perceived hazard.³⁰⁷

Message content

It is important that health warning messages be credible, supported sufficiently by an established knowledge base, and be relevant to its target audience in order to be effective communication tools.²⁹⁸ Additionally, these messages should be presented in a graphic manner that produces emotional reactions that discourage use. Negative affect arousal elicited by tobacco warning labels has been studied largely in terms of the valence of the elicited emotional arousal, that is, whether they evoke positive or negative emotions.³⁰⁸ However, negative emotions such as fear, disgust, and anger have been observed to lead to differing resulting behaviours and attitudes. Messages that elicit fear or disgust are associated with protective and avoidant behaviours such as smoking cessation and increasingly negative attitudes toward tobacco.^{309,310,311} In contrast, health warning communications that provoke anger produce approach tendencies, retributive attitudes, and potentially also reactance as the warning represents a kind of threat to personal freedom.^{301,312} Among low socioeconomic populations, prompting negatively valenced conversations may

activate social networks to further discuss a negative health endpoint portrayed in a warning label and prompt further discussion and inquiry thereby supporting control efforts.³¹³

The messages that are displayed in warning labels should use clear and concise language and include a range of different issues that resonate with different users making them personally relevant such as the different themes discussed in the ‘Health effects of nonmedical cannabis use’ in this dissertation. Given the lack of work in this area specific to cannabis products, various message formats including testimonials, positive and supportive information that have been effective in tobacco control efforts should be considered.³¹⁴ Wear-out or overexposure refers to the loss of effectiveness of a particular health message due to desensitization of health impact due to diminished salience and noticeability; health warnings should be periodically rotated as per Article 11 of the FCTC Implementation Guidelines for this reason to reduce habituation.²⁸⁵

Information on resources such as telephone quit lines is another way to support control efforts as they have shown effectiveness in increasing long term smoking abstinence rates.³¹⁵ Generally, the goals of these services aim to increase motivation and self-efficacy among smokers. In Canada, the introduction of a toll-free number for a quit-smoking line led to an increase in call volumes to existing helpline centers, the number of new callers, as well as a broadening of the types of callers that accessed this service.³¹⁶ Call centre services that are specialized to cannabis issues may be perceived as more credible and promote engagement than existing strategies that refer individuals to general addiction helplines.³¹⁷

Study Rationale

Canada's decision to legalize nonmedical cannabis in 2018 provides a unique opportunity to inform a novel policy domain with important implications to public health. To date, the current state of knowledge regarding the health and social impacts of nonmedical cannabis use in the Canadian context has been the subject of much debate and speculation.^{1,59,271} There continues to exist many uncertainties regarding the broad implications that cannabis legalization will have within Canadian society.³¹⁸ Much of the empirical evidence that exists comes from U.S. states, which operate in much different setting given federal prohibitions on nonmedical cannabis. In Canada, the public remains generally unaware of accurate information about cannabis including important issues surrounding basic concepts such as potency and dosage in both the licit and illicit markets.²⁷¹ Equipping individuals with evidence-based information about the health and social consequences associated with the nonmedical use of cannabis should be a central priority in cannabis control efforts.

Health warning labels have proven to be the most cost-effective medium to communicate information related to a product's health risks and have been associated with use reduction due to their prominence and ubiquity. Similar efforts should be translated to cannabis control. The *Cannabis Act* contains language acknowledging the need for comprehensive packaging and labelling regulations as well as specific domains of interest with respect to the broad content of health warning labels; however there is no substantial empirical research specific to cannabis to guide this process.¹⁹⁰ The current study was the first to systematically test different text and pictorial health warning labels for cannabis products, how Canadian consumers may interact with different constituent labelling execution styles, as well as examine different branding elements and their impact on consumer behaviour among young Canadians.

Research Questions

This thesis investigated the following questions:

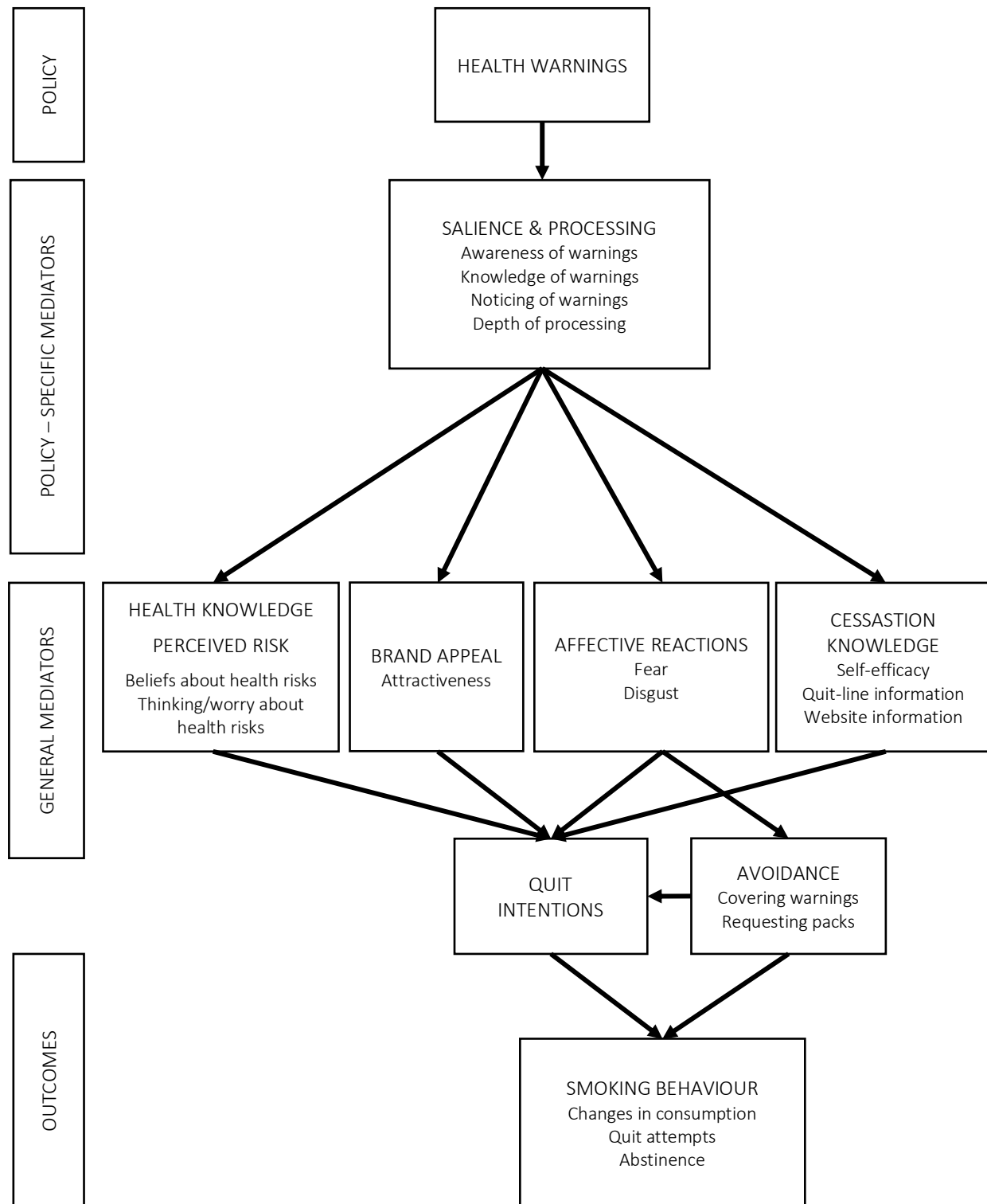
1. What are current health beliefs and perceptions of risk among young Canadians? To what extent do health beliefs and perceptions differ by cannabis use status?
2. What are the differences in perceived effectiveness of text and pictorial health warning labels? Are certain health warning themes more likely to be recalled than others?
3. What is the most effective approach for labelling cannabis product constituents and product dose?
4. What is the effect of different types of branding elements and descriptors on product perceptions among youth and young adults?

Conceptual Framework

There have been substantial efforts to understand the mechanisms underpinning the effectiveness of health warnings on tobacco products. Health warning labels represent a powerful health communications tools because the potential frequency of exposure can be very high, as much as 7,300 times per year for a pack-a-day smoker (20 views/day x 365 days/year) and viewing this health communications medium becomes part of the use behaviour – no other health promotion strategy has similar reach. To understand different pathways by which health warning labels achieve their effectiveness, the International Agency for Research on Cancer’s conceptual framework for evaluation of health warning policies will be used; it shares many similarities with other models of the hypothesized causal chain of how tobacco control policies exert influence on a broad array of resultant use behaviours (**Figure 9**).^{319,322}

Within this framework, the effects of health warnings occur through policy-specific and general mediators to describe how they influence a range of behaviours. Specifically, health knowledge, perceptions of risk, brand appeal, affective reactions and cessation knowledge are thought to mediate behavioural outcomes. Increasing risk perceptions and health knowledge have been associated with reductions in initiation, increased engagement in health protective behaviours, and long-term abstinence from smoking.^{177,178} Exposure to pro-use cues through marketing and branding practices promotes initiation, continuation, and increased use of products – restricting, or blunting this effect by making products less attractive to consumers is thought to have downstream effects of reducing product use.^{320,321} Finally, there is a sizeable evidence base that suggests that health warnings that elicit affective reactions such as fear or disgust are likely to dissuade individuals from using products and that increasing cessation knowledge is another pathway through which use reduction may be promoted.^{291,322}

Figure 9 Conceptual framework for evaluation of health warning policies (IARC, 2008)³²²



The primary objective of health warning labels on cannabis products is to communicate the health effects associated with use. Thus, the ways by which individuals notice, understand,

process, and interpret information are central concepts in understanding the connections between health warnings and their impact on use behaviours. One broad way to understand how individuals make decisions is by conceptualizing them as information processing units. Through this lens, people respond according to the inputs or data they are fed which they then process to make particular reasoned decisions.³²³ Under this view, units are limited-capacity information processors with physiological limits in their ability to recall, arrange, and rearrange information in response to particular stimuli. With regard to substance use, which often makes its debut in adolescence, the information-processing unit, the teenager, is limited by her neurophysiology to evaluate a risk in the same way as her adult counterpart – instead, she is more likely to be guided to seek maximization and optimization of immediate pleasure, deemed rational at this psychosocial life stage.³²⁴

The Heuristic-Systematic Model (HSM) is another way to understand how individuals formulate a judgement of perceived risk. The HSM posits that when individuals formulate risk perceptions, they use solely systematic, effortful scrutiny or solely heuristic processing – whereby a shorthand use of cues to arrive more easily at a judgement takes place, or a combination of both modes of processing information to make an evaluation of risk.^{325,326} The work of HSM is an extension of the elaboration-likelihood model (ELM), itself also a dual process theory which states that aspects of people’s primary motivational concerns are to attain accurate attitudes that are congruous with perceived relevant facts.³²⁶ In terms of cannabis use behaviours, the HSM-ELM suggests that increasing risk perceptions may lead to increasingly systematic thoughts regarding potential hazardous outcomes related to cannabis use. Graphic and pictorial health warning labels and supporting information may provide a vehicle to initiate thoughts about the potential consequences of engaging in cannabis use behaviours and have an impact on these. In contrast, individuals that engage in heuristic thought processing, the kind of ‘knee-jerk’ reaction wherein

individuals may not be concerned with health-protecting messages due to alarm fatigue (e.g., over-exposure to a warning³²⁷), or are avoidant of the message do not engage in deep thought about it and are thus less motivated by the advice. These theories present important principles in guiding the effectiveness of warning labels by promoting salience, noticeability, novelty, and credibility to influence greater systematic thinking about the health effects associated with cannabis.

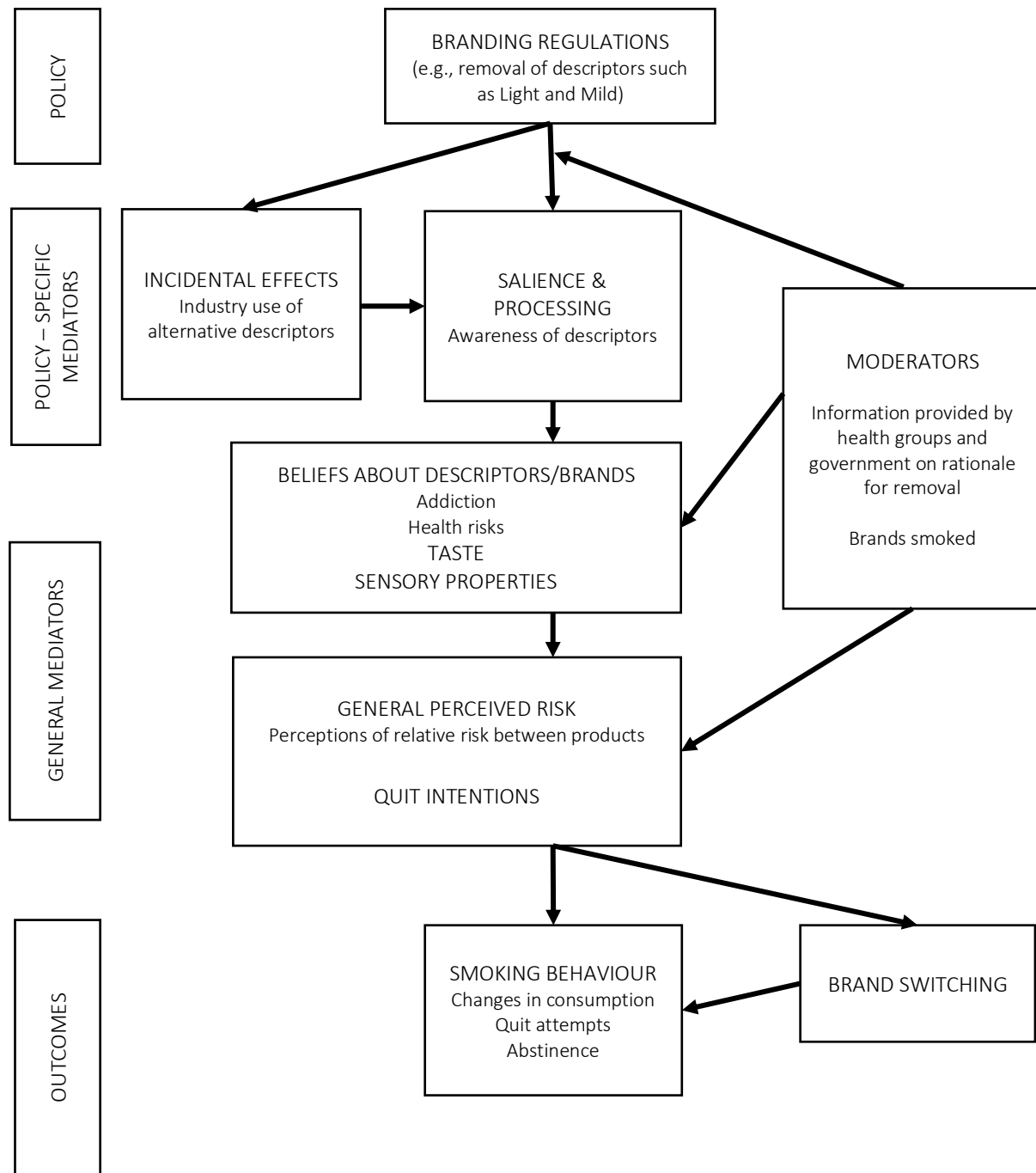
The prediction of engagement in health behaviours has been the focus of substantial attention in health psychology with a number of prominent social cognition models, such as the Theory of Planned Behaviour (TPB) or the Theory of Reasoned Action (TRA), historically applied to a broad range of health behaviours.^{324,328,329} The TRA describes a resultant human behaviour as being determined by intentions, attitudes, and subjective norms. An individual may choose to initiate or continue to engage in one or more substance use behaviours if they believe that others they hold in high esteem, such as a good friend, provide positive cues that enable the behaviour.^{328,329} Put simply, it describes a subjective evaluation of risks and/or benefits influencing behavioural intention.³³⁰ This framework for understanding behaviour has implications in terms of the ways by which individuals may make choices about the cannabis products they will use and how they use them based on the information presented in labelling, packaging, and marketing formulations.³³¹

The theories discussed so far work on the assumption that substance use behaviours are rational, conscious, and deliberative. It is difficult to account for irrational and unconscious decision-making that occurs in adolescence in terms of impulsivity due to immature pre-frontal cortex leading to reactive decision-making.³³² From an evolutionary perspective, conjuring up thoughts of death and increasing death awareness seems to be related to coalition psychology – arguably, the threat of death induces the activation of a social mechanism that involve coalescing in alliances as it was through numbers that primitive humans were able to defend against death

threats.³³³ Cannabis use culture involves a social context that includes rituals, symbols, and stories. An individual's participation and level of identification with the subculture induces a deep sense of belonging, ultimately identifying with the subculture's immortal values, norms and existence which may provide a sense of control, self-esteem and relief from persistent death awareness.³³⁴ An alternate possibility from work around alcohol consumption is that an alteration of consciousness provides temporary cognitive relief of intolerable existential insecurity, death anxiety, similar to self-medication for relatively less troubling anxieties (i.e., social anxiety).³³⁵ Either way, explicit mortality appeals are not necessary antecedents to arouse or conjure up cognitions related to death – serious health consequences may do so as well.³³² Increasing awareness of protective behaviours or presenting actionable strategies to mitigate risks (e.g., helplines) have the potential to promote health and reduce associated morbidity related to cannabis use.

Brand appeal is understood to mediate effectiveness of health warning labels and may be understood using the framework presented in **Figure 10**. Historically, tobacco companies have used packaging to display brand imagery and descriptors that convey false reassurance regarding the potential risks associated with their products (e.g., displaying 'Light' or 'Mild' descriptors to communicate reduced harm).³³⁶ Perceptions of risk associated with products are understood to be mediated by consumers' information processing strategies, health knowledge, beliefs about descriptors, and moderated by their perception of the brand as well as information that is provided by health authorities.³²² Given the existing evidence related to tobacco control, the implementation of graphic health warnings, standardized packaging and the removal or strict limitations of brand descriptors and imagery may be effective strategies in minimizing harms that may be associated with cannabis products.

Figure 10 Conceptual framework for the evaluation of branding policies (IARC, 2008)³²²



Methods

Study design

An online cross-sectional survey was conducted from October 10th to October 24th, 2017. The sample was restricted to individuals aged 16 to 30 years of age with a Canadian IP address, and included cannabis users and non-users. The study included a comprehensive background survey to determine sociodemographic characteristics, cannabis use behaviours, health knowledge, as well as attitudes and beliefs around cannabis use. The survey also contained three series of between-group experiments. First, respondents were randomized to view health warnings according to one of two experimental conditions: text-only warnings, and pictorial warnings accompanied by text. The second set of between-group experiments required respondents to complete a set of functional tasks related to cannabis product constituent labelling which they were randomized into. The final experimental section investigated perceptions of brand imagery on cannabis packaging. In this experimental set, respondents were randomized to view and evaluate cannabis product mock-ups in terms of appeal, and different perceptions of the intended target consumer.

Study Protocol

Participants and Recruitment

Survey respondents were recruited via e-mail through Leger's consumer panel for web surveys which consists of approximately 400,000 active members, half of them sampled using probability-based methods using the Canadian Census, along with other non-probability based methods, including commercial surveys.³³⁷ Respondents aged 16 to 30 were recruited across Canada directly with the exception of youth in Quebec where youth aged 16 and 17 were recruited through their parents; parental consent was obtained prior to Quebec youth accessing the survey.

Respondents received remuneration from Leger in accordance with their usual incentive structure (\$2.00 CAD for this study), which includes both points-based and monetary rewards, as well as chances to win monthly prizes. All of the data provided by respondents were anonymous and information was kept strictly confidential. The study was reviewed by and received ethics clearance from the Office of Research Ethics at the University of Waterloo (ORE# 22392). Overall, 1,045 respondents completed the study.

Screening and background survey

The survey was conducted in English and took approximately 30 minutes to complete, on average. The questionnaire contained a number of measures that were drawn from existing population surveys (e.g., the Canadian Community Health Survey, the Canadian Student Tobacco, Alcohol and Drugs Survey, the International Tobacco Control Surveys, among others) and others were developed for this study. Details regarding the source of particular measures can be found in the survey document (**Appendix 1**).

Potential survey participants were assessed for eligibility using their age; they must have reported being 16 to 30 years of age at the time of completion. Participants were then explicitly informed that they would, “be asked about marijuana or cannabis use behaviours, demographics, and beliefs about marijuana use. When we use the term marijuana or cannabis, this includes the dried herb, hashish, hash oil, wax or any preparations of the plant commonly known as weed, pot or ganja”—this statement was designed to clarify that we were interested in knowing about all cannabis forms and its derivatives in this survey. Additionally, respondents were informed that they would be able to refuse to answer any question they wanted.

In all cases, respondents were provided with information about the study and asked to provide consent before participating. If participants provided their informed consent to engage with our study, they were reassured their anonymity again and proceeded to complete a

background survey that included key sociodemographic measures as well as cannabis use and consumption measures including ever use, recent, and current use.

Measures

A copy of the survey can be found in **Appendix 1** which includes all of the measures that were used including their sources in the case of previously validated items.

Sociodemographic variable measures including sex and gender were drawn from the Gender Identity in U.S. Surveillance Group (GenIUSS), indigeneity and ethnicity measures came from the Health Canada Cannabis Measures Draft Survey (HCCMDS) and the 2016 International Tobacco Control Survey (ITC) respectively, and occupational variables came from the Canadian Community Health Survey (CCHS).

Patterns of cannabis use measures were drawn from the Canadian Student Tobacco, Alcohol and Drugs Survey (CSTADS) as indicated in the survey document to indicate ever use, recent use, and current use. In determining how many days per week respondents who responded affirmatively to ever using cannabis and different modes of cannabis use, items from the HCCMDS were used.

Cannabis forms and modes of use measures were adapted from the HCCMDS to allow respondents to specify past 12-month use, modes, and forms of use which included options: smoked dried herb/flower/leaf, vaporized dried herb/flower/leaf, vaporized liquid in an e-cigarette, mixed or rolled with tobacco (e.g., blunt), hashish, hash oil, concentrate (e.g., butane honey oil, shatter, budder, wax, etc.), edibles (e.g., cookies), liquid (e.g., cola/tea), tinctures (e.g., concentrated amount ingested orally or taken under the tongue), topical ointments (e.g., lotions, salves, balms applied directly to the skin), Fresh flower/leaf (e.g., for juicing), as well as including an open text field, ‘Other ____ (please specify without providing any identifiable information)’ in case we did not consider another form or mode of using cannabis.

Known risks or awareness of negative health effects was assessed with the question, “In your opinion, what are the most important negative health effects from marijuana use. Please list up to five.” Respondents were presented with open fields to determine a baseline knowledge of their known risks associated with cannabis use. These responses will be categorized and grouped by the type of domain of concern, (1) Physical health concern, (2) Psychological or emotional health concern, or (3) Social concern.

Perceptions of risk and harm were determined through the following four measures
Perceived likelihood of addiction: (1) “How likely is someone to become addicted to smoking marijuana?” with answer options, “Very unlikely”, “Somewhat unlikely”, “Neither likely nor unlikely”, “Somewhat likely”, “Very Likely”, “Don’t Know”. *Worry for future health:* (2) “Are you worried that using marijuana will damage your health in the future?” with answer options, “Not at all worried”, “Yes, a little worried”, “Moderately worried”, “Very worried”, and “Don’t know”. *Mental health harm:* (3) “In general, do people risk harming their mental health when they use marijuana on a regular basis, for non-medical reasons? with answer options, “No risk”, “Slight risk”, “Moderate risk”, “Great risk”, “I don’t know”. *Perceived addiction:* (4) “Do you consider yourself addicted to marijuana?” with answer options, “Not at all”, “Yes, a little addicted”, “Yes, very addicted”, “Don’t know”.

Perceptions of relative risk to other substances or forms of administration were adapted from the 2015 European School Survey Project on Alcohol and Other Drugs.³³⁸ With respect to tobacco and alcohol use, participants were asked, “How much do you think people risk harming themselves (physically or in other ways), if they... “ participate in a number substance use behaviours with varying degrees of frequency and intensity (e.g., smoke cigarettes occasionally, smoke cigarettes every day, drink alcohol (3-4 drinks) occasionally, drink alcohol (3-4 drinks) daily) with answer options, “No risk”, “Slight risk”, “Moderate risk”, “Great risk”, “I

don't know". Similarly, with respect to cannabis, respondents were asked the same question about smoking cannabis occasionally/daily, vaporizing cannabis occasionally/daily, eating or drinking cannabis occasionally/daily, using synthetic cannabis occasionally/daily, and using high potency cannabis extracts occasionally/daily. They were provided with the same answer options, "No risk", "Slight risk", "Moderate risk", "Great risk", "I don't know".

Exposure to education on risks and channels of exposure were assessed with the questions, "Have you seen any education campaigns or public health messages warning about the risks of marijuana use in the past 12 months?" followed up by, "Where have you seen education campaigns or public health messages about marijuana in the past 12 months?" with the following answer options to determine the channels of exposure if they indicated that they had seen public health messaging: "In school?", "At work?", "On websites or social media, like Facebook, Twitter, YouTube, Instagram or Snapchat?", "In email or text messages?", "In bars or pubs?", "In shops/stores that sell marijuana?", "Outside shops/stores that sell marijuana?", "At a pharmacy?", "At events like fairs, markets, festivals, sporting events, or music concerts?", "At kiosks or temporary sales locations (in shopping centres, parked in the street, other places, but not at specific events)", "On television or radio?", "On billboards or posters?", "In print newspapers or magazines?", "At the movies?", "Taxis or buses/public transit?", "In flyers?", and "Don't know".

Advertising and promotion exposure was assessed with the following question, "In the last 30 days, have you noticed marijuana products being advertised or promoted in any of the following places?" with the following answer options: "In regular postal mail?", "On websites or social media, like Facebook, Twitter, YouTube, Instagram or Snapchat?", "In email or text messages?", "In bars or pubs?", "In shops/stores that sell marijuana?", "Outside shops/stores that sell marijuana?", "At a pharmacy?", "At events like fairs, markets, festivals, sporting events, or music concerts?", "At kiosks or temporary sales locations (in shopping centres, parked in the street,

other places, but not at specific events)?”, “On television or radio?”, “On billboards or posters?”, “In print newspapers or magazines?”, “At the movies?”, “Taxis or buses/public transit?”, “In flyers?”, and “Don’t know”.

Support for health warning elements were assessed with the following yes or no questions, “In your opinion, if it were legal to sell marijuana, should health warnings be required on products?”, “Should health warnings include pictures?”, “Do you think this information (in the red rectangle) should be included on marijuana packages?”. The image referenced in the last question is reproduced below.

Figure 11 Health warning label with call to action



Health warning message recall was assessed using an unprompted recall task for four health warnings they were presented in the course of the study. Respondents were asked to list any details of the health warnings that they viewed.

Data quality was controlled for using a couple of questions to ensure participants were sufficiently engaged with the survey. They were asked, “What is the current month?” and, “One last question, did you feel you were able to provide honest answers about your marijuana use

during the survey?”. If respondents selected the wrong month or respondent that they felt unable to provide honest answers for ‘all questions’, they will not be included in the analytic sample.

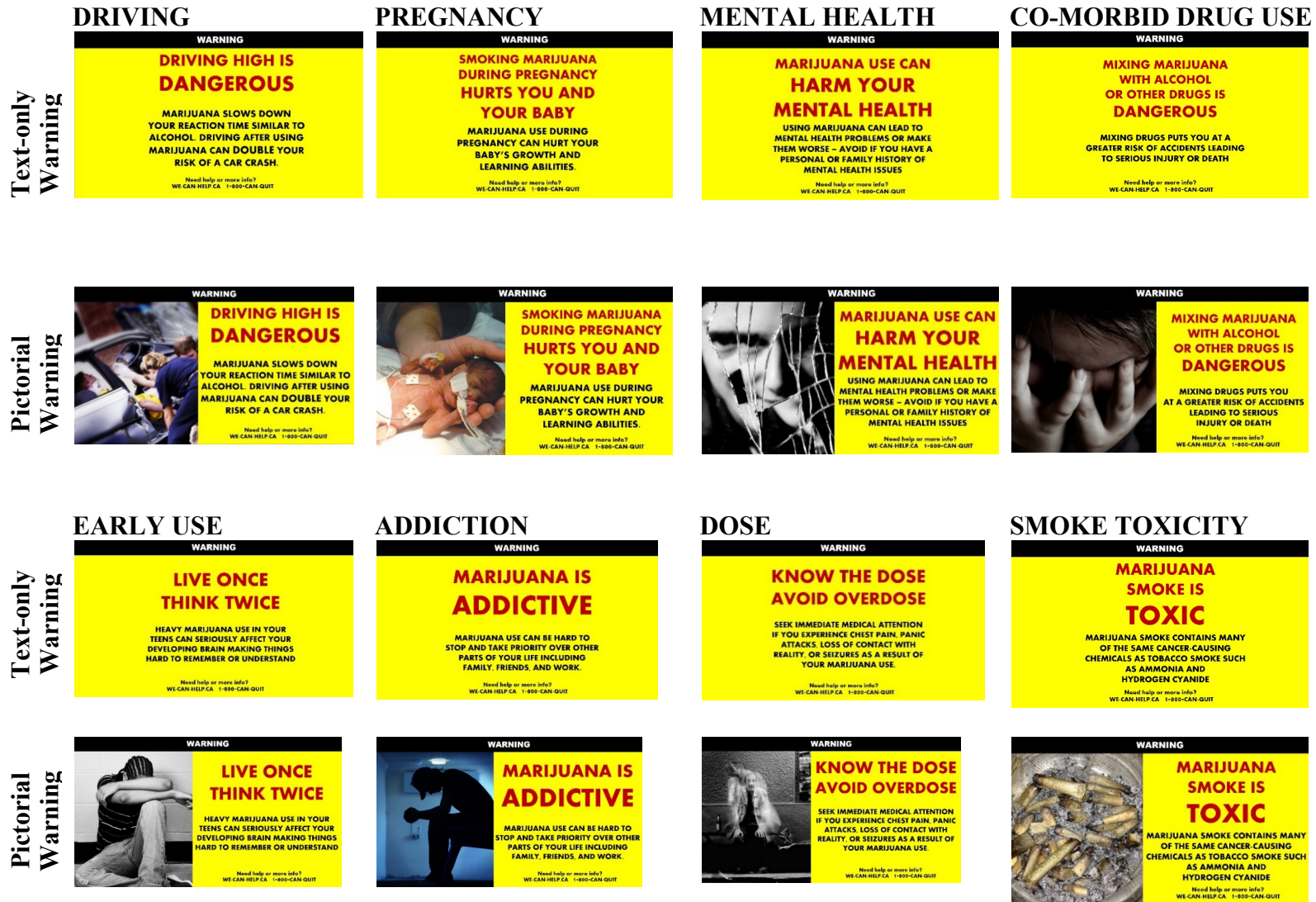
Experimental Conditions

Set I: Health Warning Labels

After completing the background survey, respondents were randomized to view four health warning labels of a potential pool of eight that were developed. This restriction was implemented to avoid respondent fatigue. The health warning themes, which are displayed in **Figure 12** on the following page, included: 1) driving while intoxicated, 2) use during pregnancy, 3) use and mental health, 4) co-morbid use, 5) youth use, 6) addictive potential, 7) dose, and 8) second-hand smoke. Randomization occurred in two steps: first, participants were randomized to view 4 of the 8 health warning label themes. Then, they were randomized once again to view one of two executions of the warning label related to the respective theme: a text-only warning, or a pictorial warning.

For each warning, respondents were presented with, respondents were asked to rank the overall effectiveness and believability along a 10-point scale from 1=‘Not at all effective/believable’ to 10=‘Extremely effective/believable’.

Figure 12 Health Warning Labels presented to survey respondents



Set II: Comprehension of constituent labelling and functional tasks

Respondents were asked to complete a number of tasks that required them to use different labels that were systematically manipulated to isolate characteristics of interest including communication of dose and strength of product.

Task 1: Labelling and dose

Respondents were randomized to view one of 3 product presentations that had been manipulated to isolate design elements related to dosing and serving size to determine respondents' ability to interpret this information. In **condition 1**, participants were presented with a cookie and packaging that did not display cannabinoid content or dosing instructions. **Condition 2** displayed the same cookie and package; however, cannabinoid content was displayed in terms of THC in milligrams. **Condition 3** displayed the same cookie and packaging and expressed the number of doses on its package.

Figure 13 Constituent labelling conditions – serving considerations



To assess respondents' comprehension of the product packaging, they were asked, "Based on the information provided, how much of the cookie should someone eat on one occasion if they wanted a recommended serving?" with the following answer options: "1/4 of a cookie", "1/2 of a cookie", "3/4 of a cookie", "1 cookie", "2 cookies", "3 cookies", "More than 3 cookies", and "Don't

know”. They were then asked, “How many servings are in this package?” with response options, “1”, “2”, “3”, “4”, “5”, “More than 5”, “Don’t know”.

Task 2: Product potency

In order to determine how different labelling strategies communicate a product’s level of THC, a proxy for its potency, respondents were randomized to view one of four conditions. In **condition 1**, only the product’s strain name was used, **condition 2**, used “%THC” to communicate strength of effects, **condition 3** used “mg THC”, and **condition 4** used a traffic light system to communicate product strength.

Figure 14 Constituent labelling conditions - THC level



Respondents were first randomized into conditions outlined in Task 2a that displayed products communicating relatively low THC content. They were asked, “Based on the available

information, what is the level of THC in this product?” with responses, “Low”, “Moderate”, “High”, “Don’t know”. Respondents were then once again randomized into one of the four outlined conditions in Task 2b, however, the products displayed communicated relatively high THC content. They were asked the same question once again and asked to evaluate the level of THC in the displayed product.

Set III: Perceptions of brand imagery on packaging

Participants responded to a series of eight ‘between-group’ experiments. Participants were randomized into experimental condition before each of the eight experiments to examine distinct package elements: 1) ‘plain’ package and health warnings, 2) a flavour descriptor, 3) an ‘energy’ descriptor, 4) a celebrity sponsorship, 5) music references, 6) party references, 7) health claims, and 8) fashion references in which they viewed different cannabis packages. Participants rated each pack on three outcomes: 1) product *appeal*, 2) the perceived *relative age* of the target consumer, and 3) a pack-specific question on the design element of interest, such as *perceived gender*, *party habits*, *health perceptions*, or *fashion*, as outlined in the specific experiment descriptions below.

Product *appeal* was rated using a ten-point scale from 0=“Not at all appealing” to 10=“Very appealing”.

Perceived *relative age* of target consumer was assessed with the question, “In your opinion, someone who chooses to use this product is more likely to be...” with answer options, “Younger than me”, “My age”, “Older than me”, “Don’t know”. A binary variable was created so that “Younger than me” was coded as 1 and the rest were coded as “Not younger than me”.

Perceived *gender* of the target consumer for products was assessed with the question, “In your opinion, someone who chooses to use this product is more likely to be...” with answer

options, “Male”, “Female”, “No difference”, and “Don’t know”. A binary variable was created so that “Likely female” was coded as 1 and the rest were coded as “Not likely female”.

Perceived *lifestyle* characteristics of target consumer was assessed with three additional questions. To assess perceptions of the *party habits* they associated with the target consumer of each product, respondents were asked, “In your opinion, someone who uses In your opinion, someone who chooses to use this product is more likely to...” with answer options, “Go out and party”, “Stay home”, “No difference”, and “Don’t know”. A binary variable was created so that “Go out and party” was coded as 1 and the rest were coded as “Not go out and party”.

The perceived level of target consumer’s *health consciousness* was determined with the question, “In your opinion, someone who chooses to use this product is more likely to be...”, with answers, “Someone who takes more care of their health”, “Someone who takes less care of their health”, “No difference”, and “Don’t know”. A binary variable was created so that “Someone who takes more care of their health” was coded as 1 and the rest were coded as “Not someone who takes more care of their health”.

To assess perceptions of *fashion sense* associated with target consumer, respondents were asked, “In your opinion, someone who chooses to use this product is more likely to be...”, with answers, “More fashionable”, “Less fashionable”, “No difference”, and “Don’t know”. A binary variable was created so that “More fashionable” was coded as 1 and the rest were coded as “Not more fashionable”.

This section was composed of a sequence of eight different experiments for which cannabis product packaging designs had been manipulated to examine the effects of brand imagery and brand descriptors on perceived appeal and target consumer characteristics.

Experiment 1: Examining perceptions of standard packs, branded packs, and packs displaying health warning labels.

Respondents were randomized into one of four experimental conditions where they saw either: a standardized cannabis pack with a health warning label, a standardized cannabis pack without a health warning label, a branded cannabis pack with a health warning label, or a branded cannabis pack without a health warning label (**Figure 15**) They were asked to rate the pack they were displayed on appeal, perceived relative age and gender of the target consumer.

Figure 15 Standard package vs Branded Package, Package displaying health warning label (HWL) vs package without HWL



Experiment 2: Examining perceptions of cannabis packs displaying flavour descriptors.

Respondents were randomized into one of two experimental conditions where they saw either a cannabis pack with a flavour descriptor or a cannabis pack without a flavour descriptor (Figure 16). They were asked to rate the pack they were displayed on appeal, perceived relative age and gender of the target consumer.

Figure 16 Packaging with and without flavour descriptors

Condition 1:
CANNABIS PRODUCT
DISPLAYING FLAVOUR
DESCRIPTOR



Condition 2:
CANNABIS PRODUCT NOT
DISPLAYING FLAVOUR
DESCRIPTOR

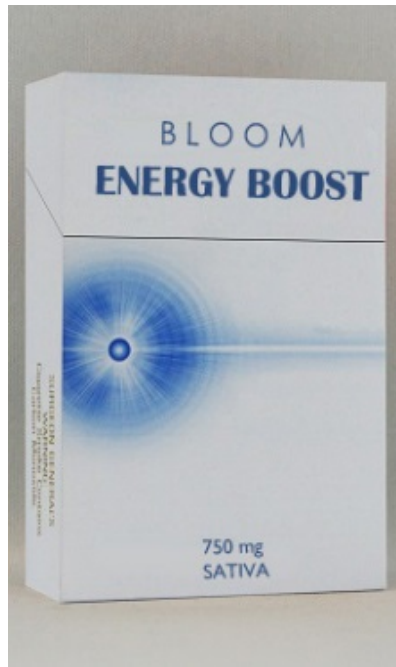


Experiment 3: Examining perceptions of cannabis packs displaying energy descriptors.

Respondents were randomized into one of two experimental conditions where they saw either a cannabis pack with an energy descriptor or a cannabis pack without an energy descriptor (Figure 17). They were asked to rate the pack they were displayed on appeal, perceived relative age and party habits of the target consumer.

Figure 17 Packaging with and without energy descriptors

Condition 1:
CANNABIS PRODUCT
DISPLAYING ENERGY
DESCRIPTOR



Condition 2:
CANNABIS PRODUCT NOT
DISPLAYING ENERGY
DESCRIPTOR



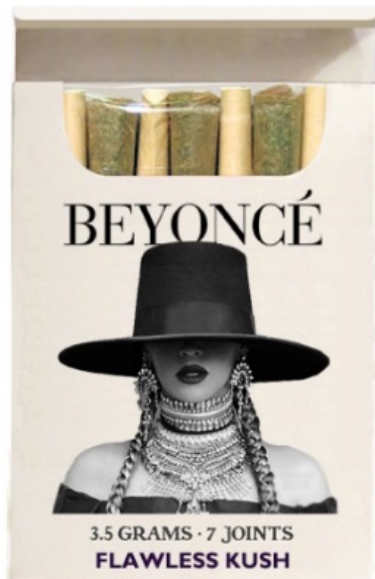
Experiment 4: Examining perceptions of cannabis packs displaying a celebrity sponsorship.

Respondents were randomized into one of two experimental conditions where they saw either a cannabis pack with a celebrity sponsor or a cannabis pack without a celebrity sponsor (Figure 18). They were asked to rate the pack they were displayed on appeal, perceived relative age and party habits of the target consumer.

Figure 18 Packaging with and without celebrity sponsorship

Condition 1:
CANNABIS PRODUCT
DISPLAYING CELEBRITY
SPONSOR

Condition 2:
CANNABIS PRODUCT NOT
DISPLAYING CELEBRITY
SPONSOR



Experiment 5: Examining perceptions of cannabis packs displaying music references.

Respondents were randomized into one of two experimental conditions where they saw either a cannabis pack displaying music references or a cannabis pack without music references (Figure 19). They were asked to rate the pack they were displayed on appeal, perceived relative age and party habits of the target consumer.

Figure 19 Packaging with and without music references

Condition 1:
CANNABIS PRODUCT
DISPLAYING MUSIC
REFERENCES

Condition 2:
CANNABIS PRODUCT NOT
DISPLAYING MUSIC
REFERENCES



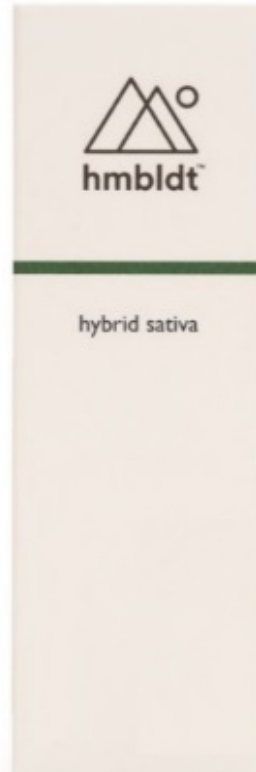
Experiment 6: Examining perceptions of cannabis packs displaying party references.

Respondents were randomized into one of two experimental conditions where they saw either a cannabis pack displaying ‘party’ references or a cannabis pack without ‘party’ references (Figure 20). They were asked to rate the pack they were displayed on appeal, perceived relative age and party habits of the target consumer.

Figure 20 Packaging with and without party references

Condition 1:
CANNABIS PRODUCT
DISPLAYING PARTY
REFERENCES

Condition 2:
CANNABIS PRODUCT NOT
DISPLAYING PARTY
REFERENCES



Experiment 7: Examining perceptions of cannabis packs displaying ‘organic’ and ‘natural’ descriptors.

Respondents were randomized into one of two experimental conditions where they saw either a cannabis pack with ‘100% Natural/Organic’ descriptors or a cannabis pack without organic or natural descriptors (**Figure 21**). They were asked to rate the pack they were displayed on appeal, perceived relative age and health consciousness of the target consumer.

Figure 21 Packaging with and without organic/natural descriptors

Condition 1:
CANNABIS PRODUCT
DISPLAYING
ORGANIC/NATURAL
DESCRIPTOR

Condition 2:
CANNABIS PRODUCT NOT
DISPLAYING ORGANIC/NATURAL
DESCRIPTOR

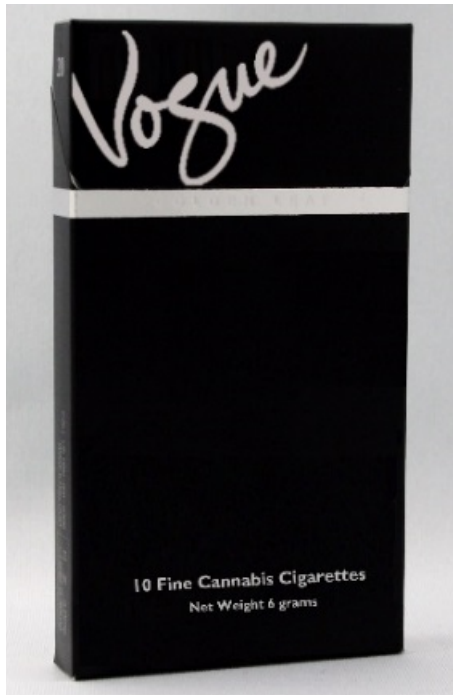


Experiment 8: Examining perceptions of cannabis packs displaying fashion reference.

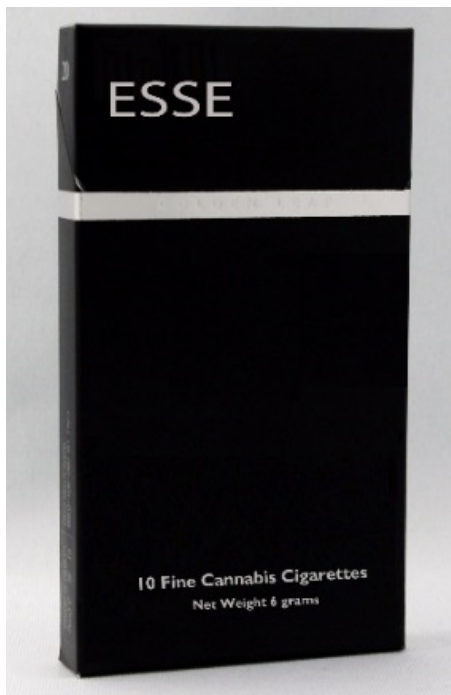
Respondents were randomized into one of two experimental conditions where they saw either a cannabis pack with a fashion reference or a cannabis pack without fashion references (Figure 22). They were asked to rate the pack they were displayed on appeal, perceived relative age and fashion sense of the target consumer.

Figure 22 Packaging with and without fashion references

Condition 1:
CANNABIS PRODUCT DISPLAYING
FASHION REFERENCE



Condition 2:
CANNABIS PRODUCT NOT
DISPLAYING FASHION REFERENCE



Chapter 2: Cannabis health knowledge and risk perceptions among Canadian youth and young adults.

Cesar Leos-Toro BSc¹, Geoffrey T. Fong PhD^{2,3}, Samantha B. Meyer PhD¹, David Hammond PhD¹

¹ School of Public Health & Health Systems, University of Waterloo, 200 University Ave. W., Waterloo, ON, Canada, N2L 3G1

² Department of Psychology, University of Waterloo, 200 University Ave. W., Waterloo, ON, Canada, N2L 3G1

³ Ontario Institute for Cancer Research, MaRS Centre, 661 University Avenue, Suite 510, Toronto, ON, Canada, M5G 0A3

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Corresponding Author

David Hammond
University of Waterloo
School of Public Health & Health Systems
200 University Ave W.
Waterloo, ON N2L 3G1
Tel. (519) 888-4567 ext. 36462
dhammond@uwaterloo.ca

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Overview

Background: Although recreational cannabis is now legal in Canada, little empirical evidence exists regarding young Canadians' cannabis literacy, cannabis-related risk perceptions, and risk of different forms of cannabis or the effect that public health education may have on these perceptions. The present study sought to address these knowledge gaps to examine health knowledge and risk perceptions associated with cannabis use.

Methods: An online survey was conducted with a national sample (N=870) of Canadians aged 16 to 30 years in October 2017 using a commercial panel. The study examined young Canadians' awareness of negative health effects related to cannabis, evaluation of known risks, and risk perceptions of different forms of administration.

Results: Most respondents were aware of a cannabis-related physical health effect (78.0%). Approximately one-third reported having been exposed to public health messaging about cannabis; digital media was reported most frequently. Compared to never users, ever users were less likely to report general likelihood of addiction ($p<0.001$), and harm to mental health ($p<0.001$). Approximately one-quarter of past 3-month cannabis users reported they were at least 'a little' addicted. Respondents who reported using a particular form of cannabis self-administration (e.g., edibles, smokables, etc.) were less likely to perceive harm than those who did not use each form ($p<0.001$).

Conclusions: The current study is among the first to measure the knowledge and perceptions of risks of Canadian youth about cannabis. The study, conducted in the time immediately preceding legalization, may serve as a reference point for future studies examining changes in cannabis knowledge and risk perceptions. This will be important in addressing the need for monitoring and enhancing public awareness of the impact and potential harms of this newly legalized substance.

KEYWORDS: cannabis literacy, cannabis health knowledge, cannabis risk perceptions, synthetic cannabis, ESPAD, public health education

Background

The *Cannabis Act*, which came into force in October 2018, outlines a legal framework for controlling the production, distribution and possession of cannabis in Canada.¹ Two of its primary goals are to prevent youth from accessing cannabis and to protect public health and safety by allowing safe and legal access of nonmedical cannabis to adults. In Canada, the typical age of initiation of cannabis use is 14 years, with prevalence peaking among young adults aged 20 to 24 years.^{2,3,4,5} According to the 2017 Canadian Cannabis Survey, past-year use of cannabis among Canadians aged 16 to 24 years was double that of Canadians older than 24.⁶ Cannabis use is higher among certain population subgroups such as young people who report poor school performance, early use of tobacco, alcohol, and other drugs, those fraternizing with drug-using peers, those experiencing a difficult family environment, those who report higher cannabis accessibility and availability of cannabis, and those who are high on sensation-seeking.^{7,8}

Youth who initiate cannabis at an earlier age may be at greater risk of negative health and social outcomes than those that delay initiation.⁹ Young Canadians report a variety of reasons for using cannabis, including identity formation, as a tool for social cohesion, boredom, relief of social anxiety, perceived acceptability, and lower perceived risk of harm than other substances.^{10,11,12,13,14} However, early cannabis use has been associated with greater impairments in memory, cognition, academic performance, heightened risk for cannabis dependence, and other negative health endpoints than those delay or refrain from use.^{15,16,17} Other general health effects include the exacerbation of mental health disorders, respiratory symptoms, increased risk of motor vehicle accidents, and lower birthweight of infants whose mothers smoked cannabis.¹⁷ The majority of health consequences related to first-hand cannabis use occur among individuals who are high frequency and high intensity users.^{9,18,19}

Most young Canadians report that regular cannabis use has health risks. For example, the 2016-17 Canadian Student Tobacco, Alcohol and Drugs Survey found that while 9% of youth reported that there was “no risk” of harm associated with smoking cannabis on a regular basis, approximately half (54%) thought that smoking cannabis on a regular basis posed “great risk”.² Data suggest that most young Canadians are aware of specific potential consequences associated with use, however, they do not appear to have an understanding of practical issues such as how long impairment might persist.¹² Among the general population, three-quarters of young Canadians (75%) believe that cannabis affects driving, and approximately 1 in 5 (19%) report that it does not affect driving at all.⁶ Young Canadians report taking solace in the fact that cannabis affects everyone differently. Focus groups have found that young people are indifferent to the consequences associated with use and selectively decide the harms that use may elicit based on personal experience or anecdotes from their peers.¹² Indeed, many young people perceive cannabis as “natural”, a “soft drug” or “not really a drug at all”.^{11,12} Approximately 6 in 10 Canadians report that cannabis is more helpful than harmful to their mental and physical health.¹³

To date, most studies have assessed risk perceptions for cannabis use in general, simply probing about whether individuals believe that cannabis carries a level of risk. Few studies have examined risk perceptions for different types of cannabis products (e.g. edibles, concentrates) or modes of administration. Understanding risk perceptions, as they vary across product and modes of administration is critical as they have differential impacts on the body. The pharmacological effects of cannabis vary depending on the concentrations of its primary active ingredient, THC (tetrahydrocannabinol, Δ^9 -THC), as well as whether products are smoked, vaped, or ingested orally or otherwise.²⁰ The THC content of cannabis has increased significantly over the past three decades in North American markets in its dried herbal form, and has reached up to 80% to 90% in high potency products such as oils or waxes.^{21,22,23} In general, frequent use of products containing

higher THC concentrations significantly increases the risk of psychotic disorders, paranoia, marked effects on memory and dependence.^{24,25,26,27,28} Synthetic cannabis is the term given to mixtures of synthetic compounds marketed as “herbal” mixtures (e.g., Spice, K2m Mamba, Afghan Incense) that activate cannabinoid receptors. They are the largest, fastest-growing, and most diversified new psychoactive substances which have been observed to precipitate acute psychotic symptoms, fatal poisonings, acute myocardial infarction, delusions, renal dysfunction, among other effects.^{29,30,31}

According to decades of substance use research, increased perceived riskiness and health knowledge influences rates of substance use and are generally associated with reductions in use initiation, increased engagement in health protective behaviours, and long-term abstinence.^{32,33,34,35,36,37} Individuals who perceive a substance such as cannabis to be high risk are generally less likely to use it, and vice versa.³² When young people are made aware that use behaviours are not normative and their misperceptions about how many of their peers actually use substances are corrected, substance use behaviours tend to decrease.^{38,39} However, existing work from US contexts that have legalized medical and/or nonmedical cannabis are less clear the relationship between perceived risk, health knowledge, and use behaviours remains poorly understood with respect to cannabis.^{40,41}

Young people access health information from a variety of channels. Of these, online spaces represent credible sources of information for youth and young adults.^{42,43} A recent study by Lamy and colleagues demonstrates how social media platforms like Twitter are able to disseminate information about cannabis that describes it as “pure”, “clean”, and a “natural medicine”.⁴⁴ Ouellette and colleagues describe how YouTube users are spreading information about cooking with cannabis, receiving collectively 15.6 million views though little is currently known regarding the basic effects these preparations may have or about users’ habits of ingesting edibles.⁴⁵ Work

by Ramo and colleagues identified more than 700 smartphone apps related to cannabis and characterized them as likely vehicles for cannabis related information and misinformation.⁴⁶ Overall, however, there is little population-level data on sources of health information on cannabis among young people. This is important given that Health Canada is reportedly spending \$100M on cannabis education over six years and should consider competing sources of information known to be available that may dampen education efforts.⁴⁷

The present study examined young Canadians' awareness of negative health effects, a proxy for knowledge, associated with cannabis use, perceptions of risk and harm associated with cannabis use, perceptions of relative risk to other substances or forms of administration (e.g., smoking, vaping, edibles), how these vary by use intensity (e.g., occasional vs. daily use), and how those perceptions were influenced by reported exposure to public health education around cannabis use.

Methods

Design

An online cross-sectional survey was conducted from October 10th to October 24th, 2017. The inclusion criteria were individuals aged 16 to 30 years of age with a Canadian IP address, and included cannabis users and non-users. Recruitment occurred by e-mail through Léger's consumer panel for web surveys consisting of approximately 400,000 active members, half of them sampled using probability-based methods using the Canadian Census, along with other non-probability based methods, including commercial surveys.⁴⁸ Respondents aged 16 to 30 were recruited across Canada directly with the exception of youth in Quebec where youth aged 16 and 17 were recruited through their parents; parental consent was obtained prior to Quebec youth accessing the survey. Respondents received remuneration from Léger in accordance with their usual incentive structure.

All of the data provided by respondents were anonymous and information was kept confidential. In all cases, respondents were provided with information about the study and asked to provide consent before participating. They were reassured their anonymity again after providing consent and proceeded to the survey. The study was reviewed by and received ethics clearance from the Office of Research Ethics at the University of Waterloo (ORE# 22392).

Measures

Sociodemographic variables: sex (male, female), age, ethnicity (white, non-white), cannabis use status (never use, recent use – use in the past 12-months, current use – use in the past 30-days) were recorded in the survey. Cannabis use status measures were used and adapted from the Canadian Student Tobacco, Alcohol and Drugs Survey (CSTADS), “Have you ever tried marijuana?” and a new item, “When was the last time you used marijuana” with options “More than 12 months ago”, “More than 3 months to 12 months ago”, “Within the last month”. Cannabis forms were asked about with the item, “In the past 12 months, did you use marijuana in any of the following ways: 1)Smoked dried herb/flower/leaf, 2)Vaporized dried flower/leaf 3)Vaporized liquid in an e-cigarette, 4)Mixed with or rolled in tobacco (e.g., blunt), 5)Hashish, 6)Hash oil, 7)Concentrate, 8)Edibles (e.g., cookies), 9)Liquid (e.g., cola/tea), 10)Tinctures (e.g., concentrated amounts ingested orally or taken under the tongue), 11)Topical Ointments, 12) Fresh flower/leaf” with answer options “No, I have never done this”, “Yes, but not in the past 12 months”, “Yes, in the past 12 months”, “Don’t know”, “Refuse to answer”.⁴⁹

Exposure to education on risks related to cannabis and channels of exposure were assessed with the questions, “Have you seen any education campaigns or public health messages warning about the risks of marijuana use in the past 12 months?” followed up by, “Where have you seen education campaigns or public health messages about marijuana in the past 12 months?” with answer options outlined in Table 2. A binary variable was created to determine exposure to

education on risks where 0 referred to ‘No exposure’, and 1 to ‘Exposed’ where respondents had indicated that they had been exposed to any of the different channels asked about.

Awareness of negative health effects was assessed with the question, “In your opinion, what are the most important negative health effects from marijuana use? Please list up to five.” These open-ended responses were coded and classified into three categories: *Physiological effects*, *psychological effects*, and *social effects*.

Perceptions of risk and harm were assessed using four measures. General perceptions of harmfulness: (1) *Perceived likelihood of addiction*: “How likely is someone to become addicted to smoking marijuana?” with answer options, “0=Very unlikely”, “0=Somewhat unlikely”, “0=Neither likely nor unlikely”, “1=Somewhat likely”, “1=Very Likely”, “0=Don’t Know” and (2) *Mental health harm*: “In general, do people risk harming their mental health when they use marijuana on a regular basis, for non-medical reasons?”, with answer options, “0=No risk”, “1=Slight risk”, “1=Moderate risk”, “1=Great risk”, “0=I don’t know”. Perceptions of harm to self, only asked of past 3-month users: (3) *Worry for future health*: “Are you worried that using marijuana will damage your health in the future?” with answer options, “0=Not at all worried”, “1=Yes, a little worried”, “1=Yes, moderately worried”, “1=Yes, very worried”, and “0=Don’t know”. (4) *Perceived addiction*: “Do you consider yourself addicted to marijuana?” with answer options, “0=Not at all”, “1=Yes, a little addicted”, “1=Yes, very addicted”, “0=Don’t know”. Binary variables were created based on respondents’ answers for each measure (1) 0=Not likely, 1=Likely, (2) 0= Not Worried, 1=Worried, (3) 0=No risk, 1=Risk, and (4) 0=Not addicted, 1=Addicted.

Perceptions of risk depending on form of use were adapted from the 2015 European School Survey Project on Alcohol and Other Drugs (ESPAD).⁵⁰ Participants were asked how much they risked harming themselves by the occasional or daily use of the following: smoking cannabis,

vaporizing cannabis, eating or drinking cannabis, using high potency cannabis extracts, and using synthetic cannabis with answer options, “0=No risk”, “1=Slight risk”, “1=Moderate risk”, “1=Great risk”, “0=I don’t know”. Binary variables were created based on respondents’ answers (0=No risk, 1=Risk) for each cannabis form and frequency of use asked about. Responses were filtered by whether participants used cannabis in those ways.

Data integrity was assessed using two of questions: “What is the current month?” and, “One last question, did you feel you were able to provide honest answers about your marijuana use during the survey?”. If respondents selected the wrong month or respondent felt unable to provide honest answers for ‘all questions’, they were excluded from the analytic sample.

Analysis

All analyses were conducted using SPSS (Version 25.0, Armonk, NY: IBM Corp.). Survey weights were generated based preliminary postcensal population estimates from Statistics Canada.^{51,52} Logistic regression models tested whether cannabis use was associated with perceived likelihood of addiction, worry for future health, mental health harm, and perceived addiction. Logistic regressions also examined whether different forms and modes of administration or use of different forms of cannabis and synthetic cannabis were associated with risk (physical or in other ways). All of the logistic regressions were adjusted for age, sex, ethnicity, cannabis use status, and exposure to cannabis risk education. Unless otherwise noted, all analyses are based on weighted data.

Results

Table 1 displays the sample characteristics. Overall, 1,045 respondents completed the survey. However, due to missing data on core measures of cannabis use and/or failed data integrity questions, a final sample of 870 youth and young adults was analyzed. A total of 1,045 respondents

completed the survey; however, the final analytic sample was 870 as the rest were excluded from analysis due to completing survey from a mobile device instead of a desktop computer (28), missing data on key measures including cannabis use status (8) and/or failed data integrity questions; 62 records deleted due to incorrectly identifying the current month and 77 respondents reported being unable to provide honest answers to all of the survey questions.

EXPOSURE TO EDUCATION OR PUBLIC HEALTH MESSAGING ABOUT CANNABIS USE

Less than one-third of respondents (31.8%) reported encountering public health messages about cannabis in the past year. Table 2 displays the different locations where reported encounters took place. The most common locations reported were online (16.7%), on television or radio (15.2%), and in school (12.5%).

AWARENESS OF NEGATIVE HEALTH EFFECTS

Table 3 summarizes the ‘most important’ negative health effects associated with cannabis use reported by respondents. Overall, 78.0% % of all respondents cited at least one physical concern, 43.0% cited at least one psychological concern, while 4.5% cited at least one social concern.

Among physical concerns, effects on the brain and respiratory function were the most common responses. *Never* and *Ever* users were more likely to report physical concerns related to cannabis use than *Current* users (AOR=1.89, 95%CI 1.26-2.85, $p=0.002$, AOR=1.57, 95%CI 1.07-2.31, $p=0.002$ respectively). Furthermore, respondents that reported having encountered public health messaging were more likely to report physical concerns than those that had not (AOR=2.31, 95%CI 1.60-3.34, $p<0.001$).

Deficits in reaction time in relation to driving among other activities, general mental health issues, and memory loss were the most frequently cited psychological concerns. Older respondents aged 19-24 years and those aged 25-30 were at a greater likelihood of reporting psychological concerns than youth aged 16-18 years (AOR=1.58, 95%CI 1.09-2.30, $p=0.015$, AOR=1.49, 95%CI 1.04-2.14, $p=0.032$ respectively). Encountering public health messaging was also associated with a greater likelihood of reporting a psychological concern (AOR=2.26, 95%CI 1.72-2.97, $p<0.001$).

Respondents cited that cannabis may be a gateway drug and were concerned about behavioural changes as social concerns.

PERCEPTIONS OF RISK AND HARM

Table 4 presents respondents' perceptions of health harms associated with cannabis use and Table 5 displays related logistic regression analyses examining each risk.

Perceived likelihood of addiction—As indicated in Table 4, perceptions of cannabis addiction varied widely across the sample. Logistic regression analyses shown in Table 5 indicated that young people aged 19-24 and 25-30 years were less likely to report that someone may become addicted to cannabis than youth aged 16-18 years (AOR=0.51, 95%CI 0.35-0.76, $p=0.001$ and AOR=0.49, 95%CI 0.34-0.70, $p<0.001$ respectively). Compared to female respondents, males perceived cannabis as less addictive (AOR=0.69, 95%CI 0.28-0.55, $p=0.012$). Compared to *Never* cannabis users, *Ever* and *Current* cannabis users were also less likely to report that cannabis users

would become addicted (AOR=0.39 95%CI 0.28-0.55, $p<0.001$; AOR=0.35 95%CI 0.24-0.52, $p<0.001$ respectively). No other significant differences were observed.

Mental health harm—One in ten (10.9%) respondents reported that they perceived ‘no risk’ of harming mental health as a result of using cannabis. *Ever* and *current* cannabis users had lower odds of reporting that individuals that use cannabis risk harming their mental health than those who reported that they had *never* used cannabis (AOR=0.48, 95%CI 0.30-0.76, $p=0.002$; AOR=0.35, 95%CI 0.21-0.58, $p<0.001$ respectively). Furthermore, those who reported having been exposed to some form of public health messaging regarding risks associated with cannabis were more likely to report that users risk harming their mental health (AOR=2.28 95%CI 1.46-3.57, $p<0.001$).

Worry for future health — Among those who reported using cannabis in the past 3 months, about half reported being worried about potential damage to future health (51.3%). There were no significant differences between ‘daily’, ‘weekly’, ‘monthly’, or ‘less than monthly’ cannabis users in responding affirmatively to worrying about damaging future health as a result of their use. However, those that reported seeing public health messaging were more likely to report this type of worry (AOR=1.99, 95%CI 1.18-3.37, $p=0.010$).

Self-Perceived addiction — More than 1 in 5 (22.8%) of respondents who reported using cannabis within the past 3 months reported being ‘a little’ or ‘very’ addicted. Those that reported using in the past 30 days were more likely to consider themselves addicted than those that reported not having used cannabis in the past 30 days (AOR=3.96, 95%CI 1.49-10.54, $p=0.006$). Among past 3-month users, respondents that reported ‘weekly’, ‘monthly’, or ‘less than monthly’ use were

significantly less likely to report perceiving themselves as addicted to cannabis than ‘daily’ users (AOR=0.10, 95%CI 0.04-0.24, $p<0.001$; AOR=0.09, 95%CI 0.03-0.25, $p<0.001$; AOR=0.04, 95%CI 0.01-0.11, $p<0.001$, respectively).

PERCEPTIONS OF RISK OF HARM (PHYSICAL OR IN OTHER WAYS) TO OTHER FORMS OF ADMINISTRATION

Figure 1 displays respondents’ perceptions of health risk associated by different forms of cannabis use. Overall, daily use of any form of cannabis was perceived to carry greater risk than occasional use. Half (50.9%) of all respondents reported that using high potency cannabis carried ‘great risk’ of harm, physically or in other ways, and approximately 4 in 10 reported the same for smoking (44.1%), synthetic cannabis use (43.4%), eating or drinking cannabis (38.2%), and vaping cannabis (37.2%). In contrast, less than 1 in 4 thought the same regarding the occasional use of any form of cannabis use.

Table 6 displays the results of logistic regression analyses examining correlates of perceived harm associated with daily cannabis use in its different forms. Similar patterns emerged across forms; cannabis users consistently display lower odds of perceiving harm from the daily use of different forms of cannabis than respondents that report never having used cannabis. However, a gradient among cannabis users is evident; those that reported having used, but not in the past 30 days, are more likely to report risks of harm from daily cannabis use than those that report having used in the past 30 days. Finally, reporting exposure to cannabis risk public health messaging was associated with increased likelihood of perceiving harm from daily use of different forms of cannabis with the exception of edible or drinkable forms of administration. Similar patterns emerge when respondents were asked about occasional use of the different cannabis forms. Table S3 in the Supplementary File also displays logistic regression analyses examining correlates of perceived harm associated with different intensities of use and different forms of

cannabis, however, it is filtered further by whether participants used cannabis in each way. Across the different modes of cannabis self-administration, participants that indicated using each particular form were less likely to perceive risk of harm than those that did not use the particular form ($p < 0.001$).

Discussion

Canadian youth and young adults reported being aware of a number of important health effects associated with cannabis use, as well as a number of channels where they have been receptive to public health messaging or educational information. Approximately a third of young Canadians reported being exposed to public health messages on cannabis, with digital media, television and radio being the most reported channels of exposure in our study. The findings reinforce the importance of digital media in reach young people. Virtually all (95%) Canadians aged 18 to 24 years use Facebook and nearly all (90%) use YouTube, with a majority being active monthly users of these platforms.⁵³ Exposure to education campaigns may have increased immediately following the current study, given the range of campaigns implemented in the lead up to cannabis legalization, in October 2018. For example, Public Safety Canada launched a “Don’t Drive High” campaign the following month and reported that 62% of Canadians aged 16 to 24 years recalled the message post-campaign.⁵⁴ The Government of Canada has also engaged a number of partner organizations such as Drug Free Kids Canada, Mothers Against Drunk Driving, the Canadian Hockey League, and the Centre of Addictions and Mental Health, and made funding available for research and outreach in the area to target dissemination efforts of cannabis and health information.⁵⁴ Future studies should examine the population-level reach of these campaigns.

Overall, young people reported a wide range of beliefs about the health effects of cannabis use. Indeed, responses were equally distributed across the scale of likelihood of addiction and risks

of mental health. For example, similar proportions reported that cannabis addiction was “very unlikely” and “very likely”. This pattern of results reflects the wide diversity of opinions about addiction to cannabis: as the Canadian Task Force on Cannabis Legalization and Regulation noted, cannabis is one of the few substances for which substantial proportions of the public both underestimate and overestimate the health effects.⁵⁵ Interestingly, approximately one-quarter of past 3-month cannabis users reported they were at least ‘a little’ addicted to cannabis, and this proportion increased with more frequent use. While perceptions of addiction among users are lower than for other substances, such as tobacco smoking, the findings are consistent with studies suggesting problematic use in a certain minority of users.^{18,56}

Future studies should prioritize perceptions of cannabis and mental health. The current study indicates a wide range of beliefs about the effects of cannabis on mental health. Indeed, many young perceive cannabis to have a net overall benefit on public health.¹² Future work should discriminate between different aspects of mental health, such as depression and anxiety versus psychosis, for which there is a strong evidence base on negative impact.¹⁷

The findings also suggest that cannabis users may be demonstrating a form of ‘optimism’ bias: worry about health effects and perceptions of addiction appeared to be lower when they were personalized to users rather than asked in the general form. This is similar to optimism bias exhibited by smokers, who often underestimate their own risks relative to others.⁵⁷

The current study is among the first to examine whether perceptions of risk differ across product types and modes of administration. Daily use in all of its forms was consistently perceived to be more risky than occasional cannabis use, as expected. In terms of modes of administration, smoked, vaped, and edible cannabis products were perceived to have similar risk, whereas high potency products and synthetic cannabis products were perceived as somewhat riskier. However, similar proportions of young people perceived daily use of synthetic cannabis and daily cannabis

smoking to be ‘high risk’. This is a concern given the serious acute health effects of synthetic cannabis use, particularly given their ‘legal’ status in many jurisdictions and widespread consumer confusion about these products.^{29,30,31,58,59} Focused attention should be given to highlighting and detailing the risks associated with synthetic cannabinoid that dwarf existing known risks associated with combusted cannabis. The findings suggest that public education campaigns implemented as part of cannabis legalization in Canada should help consumers to identify and understand the unique health effects of synthetic cannabis products.

STRENGTHS AND LIMITATIONS

The sample was recruited from a commercial sample that used probability and non-probability-based recruitment methods, thus, our findings may not be fully generalizable to Canadian young people. Nevertheless, a broad and diverse sample with similar patterns of cannabis use and sociodemographic characteristics as the 2017 Canadian Cannabis Survey was recruited.⁶⁰ The current sample surveyed aged 16 to 30 years exclusively. While this age group has the highest rates of use in Canada, it is unclear to what extent the current findings are representative of older adults. It should be noted that directionality regarding beliefs and exposure or noticing public health messaging is unclear and an opportunity for future research. Considerable strengths of the study include the use of existing international tools that allow for comparability to countries participating in the European School Survey Project on Alcohol and Other Drugs (ESPAD), open-ended fields that allowed respondents to freely communicate the extent of their cannabis health knowledge, and this study expands the limited literature on young Canadians’ cannabis health knowledge and risk perceptions.

Conclusion

The current study is among the first to measure cannabis health knowledge and perceptions of risks among Canadian youth in the time immediately preceding legalization; it may serve as a reference point for future studies examining changes in cannabis literacy. The findings complement and add to the very limited literature specific to young Canadians' cannabis health knowledge and ability to evaluate associated risks.^{11,12,13} The findings indicate that a minority of young people recall seeing or hearing public education on cannabis products over the past year, although those that do report greater perceptions of risk. More generally, the study highlights the wide discrepancy of views about the potential health effects and addictive potential of cannabis. Legalization of non-medical cannabis provides an opportunity—and indeed a mandate—to enhance public education on the health effects of cannabis. Helping consumers to understanding different modes of administration and the distinct risk profile of synthetic cannabis should be an important component of public education campaigns.

Table 1 – Sample Characteristics

		Unweighted % (N) N=870	Weighted % (N) N=867
Sex	Female	52.1 (453)	49.2 (427)
	Male	47.9 (417)	50.8 (441)
Age (yrs.)	16–18	25.2 (219)	17.0 (148)
	19–24	30.7 (267)	40.3 (350)
	25–30	44.1 (384)	42.7 (370)
Ethnicity	White	64.5 (561)	64.6 (560)
	Non-white	35.5 (309)	35.4 (307)
Cannabis use status	Never use	41.5 (361)	37.4 (325)
	Ever use, not in past 30 days	36.0 (313)	38.7 (336)
	Current use, within past 30 days	22.5 (196)	23.8 (207)
Exposed to education on risks associated with cannabis		31.8 (277)	32.8 (284)

Table 2 – Location where education campaigns or public health messages about cannabis were encountered by participants in the past year (n=870).

Location	% (n)
On websites or social media like Facebook, Twitter, YouTube, Instagram or Snapchat	16.7 (145)
On television or radio	15.2 (132)
In school	12.5 (109)
On billboards and posters	6.8 (59)
In print newspapers or magazines	5.4 (47)
At a pharmacy	4.1 (36)
At work	3.9 (34)
In e-mail or text messages	2.1 (18)
In bars or pubs	2.1 (18)
Taxis or buses/public transit	2.1 (18)
At events like fairs, markets, festivals, sporting events, or music concerts	2.0 (17)
In flyers	1.6 (14)
In shops/stores that sell marijuana	1.5 (13)
At the movies	1.4 (12)
At kiosks or temporary sales locations (in shopping centres, parked in the street, other places, but not at specific events)	1.1 (10)
Outside shops/stores that sell marijuana	1.0 (9)
Don't know	0.8 (7)

Table 3 – Frequencies of ‘most important’ negative health effects associated with cannabis use reported by Canadian youth and young adults (N=870).

Physical Concerns	%	(N)
Decreased brain function, cognitive abilities	24.7	(215)
Respiratory function	23.8	(207)
Addiction	16.4	(143)
Carcinogenic	9.7	(84)
Harmful effects from smoking	7.2	(63)
Hunger/"munchies"	6.7	(58)
Drowsiness	6.1	(53)
General detriment to health	5.4	(47)
Issues with circulation, heart palpitations	5.3	(46)
Dry mouth	3.6	(31)
Youth health, developmental concerns	3.0	(26)
Bad/"gross" smell	2.6	(23)
Drug interactions, concerns about tainted product	2.1	(18)
Obesity	2.0	(17)
Dizziness	1.8	(16)
Being high	1.6	(14)
Nausea	1.6	(14)
Red eyes	1.5	(13)
Vision problems	1.4	(12)
Sexual health	1.4	(12)
Death	1.1	(10)
Psychological Concerns		
Reaction time related to driving or other activities	9.3	(81)
Mental health issues	9.3	(81)
Judgement/Inhibition issues	8.5	(74)
Memory loss	8.4	(73)
Loss of motivation	7.5	(65)
Anxiety/Panic	5.5	(48)
Depression	3.7	(32)
Hallucinations	3.7	(32)
Loss of concentration	3.7	(32)
Paranoia	3.4	(30)
Schizophrenia	1.1	(10)
Psychosis	1.1	(10)
Social Concerns		
Gateway drug	1.7	(15)
Behavioural changes	1.5	(13)
Money problems	1.0	(9)
Don't Know/Refused		
Don't know	10.0	(87)
Refused	1.7	(15)

**Concerns accounting for <1% of overall responses are omitted here.*

Table 4 – Perceptions of health effects associated with cannabis use (N=870)

		Very unlikely	Somewhat unlikely	Neither likely nor unlikely	Somewhat likely	Very likely	Don't know
Beliefs, others	Likely someone may become addicted	14.7 (128)	16.0 (139)	17.0 (148)	27.6 (240)	16.6 (144)	7.9 (69)
		No risk	Slight risk	Moderate risk	Great risk	Don't know	
	Risk of harming mental health	10.9 (95)	32.2 (280)	27.2 (237)	21.8 (190)	7.8 (68)	
		Not at all worried	A little worried	Moderately worried	Very worried	Don't know	
Beliefs, self	Worry about damage to future health*	51.3 (137)	34.1 (91)	9.0 (24)	2.6 (7)	3.0 (8)	
		Not at all	Yes, a little addicted	Yes, very addicted	Don't know		
	Perceived addiction*	76.0 (203)	20.2 (54)	2.6 (7)	1.1 (3)		

*Among past 3-month users (n=267)

Table 5 - Logistic regression analyses examining potential risks associated with cannabis use among Canadian youth and young adult cannabis users and non-users.

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Characteristics		Ref. Category	Agreement %	Likely someone may become addicted, general (N=870)		
				<i>p</i>	AOR	95%CI
Age	19-24	16-18	41.2% v. 62.1%	0.001	0.51	0.35-0.76
	25-30	16-18	35.9% v. 62.1%	<0.001	0.49	0.34-0.70
	19-24	25-30	41.2% v. 35.9%	0.738	1.06	0.76=1.48
Sex	Male	Female	40.5% v. 47.5%	0.013	0.69	0.52-0.93
Ethnicity	White	Non-white	42.1% v. 47.9%	0.169	0.81	0.60-1.90
Cannabis use status	Ever use, not in past 30 days	Never Use	33.2% v. 60.4%	<0.001	0.39	0.28-0.55
	Current use, within past 30 days	Never Use	31.6% v. 60.4%	<0.001	0.35	0.24-0.52
Exposure to education	Ever use, not in past 30 days	Current Use, within past 30 days	33.2% v. 31.2%	0.597	1.11	0.75-1.64
	Exposed	Not Exposed	46.9% v. 42.8%	0.097	1.29	0.96-1.76
Risk of harming mental health, general (N=870)						
Age	19-24	16-18	80.1% v. 85.4%	0.533	0.85	0.51-1.42
	25-30	16-18	79.7% v. 85.4%	0.829	0.95	0.59-1.54
	19-24	25-30	80.1% v. 79.7%	0.599	0.90	0.60-1.35
Sex	Male	Female	81.1% v. 81.5%	0.807	0.96	0.67-1.36
Ethnicity	White	Non-white	80.9% v. 81.9%	0.945	1.01	0.70-1.48
Cannabis use status	Ever use, not in past 30 days	Never Use	78.3% v. 88.1%	0.001	0.48	0.31-0.74
	Current use, within past 30 days	Never Use	73.5% v. 88.1%	<0.001	0.35	0.22-0.56
Exposure to education	Ever use, not in past 30 days	Current Use, within past 30 days	78.3% v. 73.5%	0.155	1.36	0.89-2.08
	Exposed	Not Exposed	88.1% v. 78.1%	<0.001	2.28	1.50-3.48
Worry about damage to future health, self (n=267)*						
Age	19-24	16-18	41.3% v. 60.0%	0.080	0.51	0.24-1.08
	25-30	16-18	49.7% v. 60.0%	0.492	0.78	0.38-1.59
	19-24	25-30	41.3% v. 49.7%	0.140	0.66	0.38-1.15
Sex	Male	Female	50.9% v. 45.8%	0.572	1.16	0.70-1.91
Ethnicity	White	Non-white	47.0% v. 51.5%	0.349	0.78	0.45-1.32
Cannabis use status	Current use, within past 30 days	Ever use, not in past 30 days	46.9% v. 50.4%	0.721	1.11	0.63-1.95
Exposure to education	Exposed	Not Exposed	58.9% v. 43.0%	0.010	1.99	1.18-3.37
Perceived addiction, self (n=267)*						
Age	19-24	16-18	17.7% v. 33.3%	0.048	0.41	0.17-0.99
	25-30	16-18	23.3% v. 33.3%	0.220	0.61	0.27-1.35
	19-24	25-30	17.7% v. 23.3%	0.287	0.68	0.34-1.38
Sex	Male	Female	28.8% v. 17.0%	0.068	1.78	0.96-3.30
Ethnicity	White	Non-white	22.1% v. 24.4%	0.770	0.91	0.47-1.74
Cannabis use status	Current use, within past 30 days	Ever use, not in past 30 days	28.1% v. 8.5%	0.003	3.96	1.60-9.78
Exposure to education	Exposed	Not Exposed	29.3% v. 19.4%	0.125	1.62	0.88-2.99

*Among past 3-month users

Figure 1 – Perceptions of level of health risks associated with occasional cannabis use by cannabis form/mode of administration (N=870).

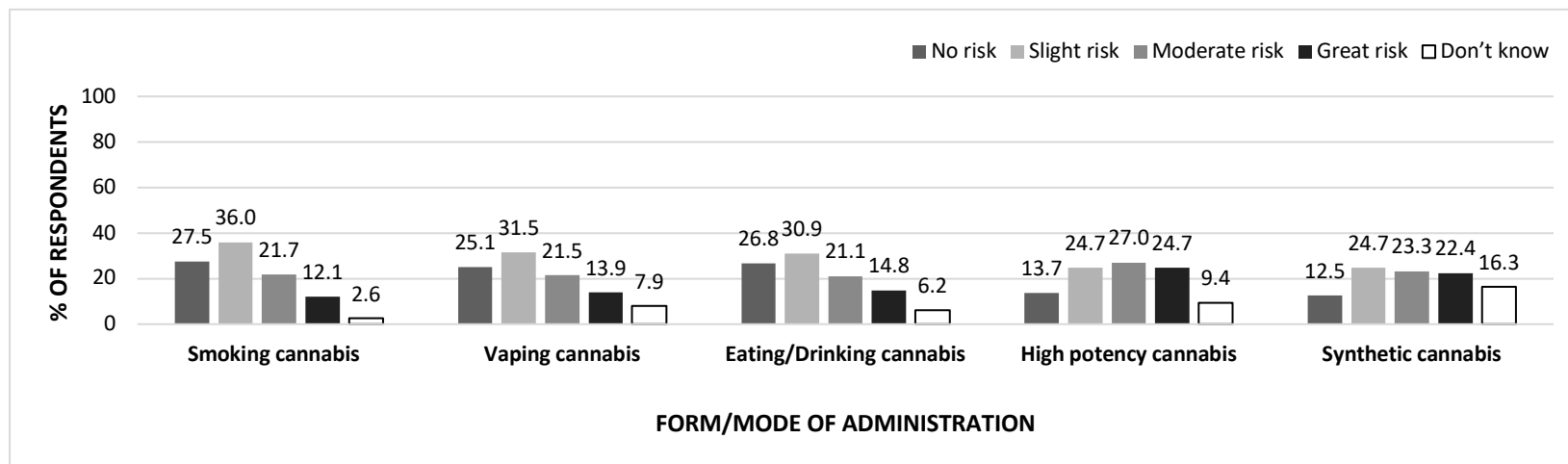


Figure 2 – Perceptions of level of health risks associated with daily cannabis use by cannabis form/mode of administration (N=870).

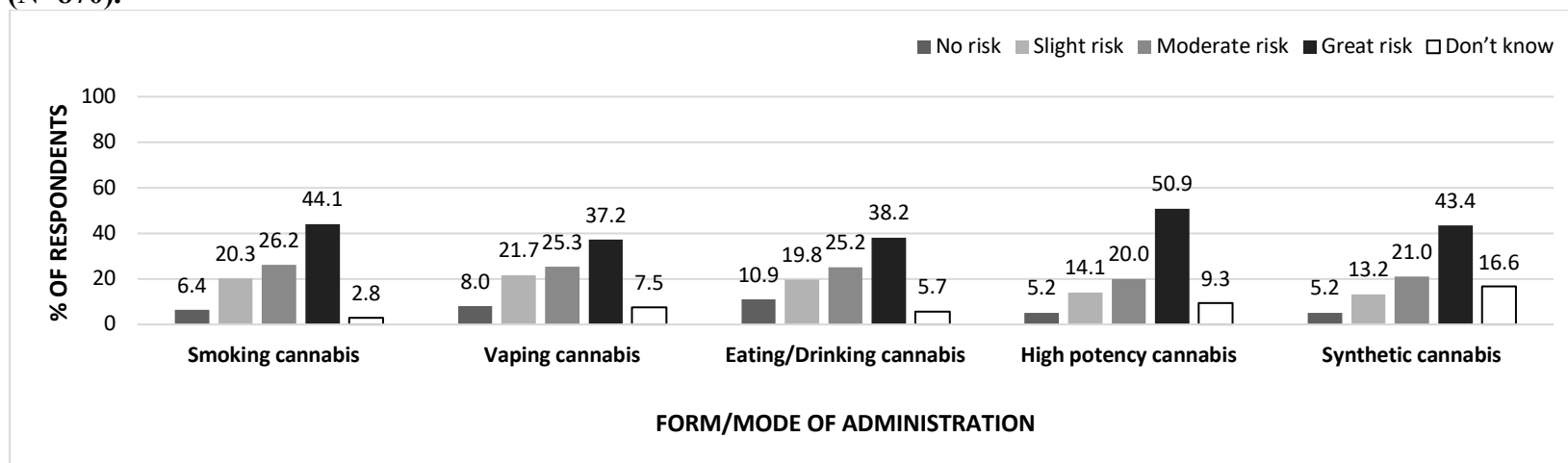


Table 6 – Logistic regression analyses examining risks of harm (physical or in other ways) perceived by cannabis forms and frequency of use among Canadian youth and young adult cannabis users and non-users (N=867).

Characteristics		Ref. Category	Smoke Cannabis Daily			Vape Cannabis Daily			Eat/Drink Cannabis Daily		
			<i>p</i>	AOR	95%CI	<i>p</i>	AOR	95%CI	<i>p</i>	AOR	95%CI
Cannabis Use Status	Current use, use in past 30 days	Never Use	<0.001	0.21	0.11-0.40	<0.001	0.40	0.25-0.64	<0.001	0.24	0.15-0.39
	Ever use, not in the past 30 days		0.013	0.45	0.23-0.84	0.343	0.80	0.51-1.27	0.002	0.48	0.30-0.77
	Ever use, not in past 30 days	Current use, use in past 30 days	0.003	2.12	1.30-3.47	0.001	2.01	1.31-3.08	0.001	2.01	1.34-2.99
Exposure to education	Exposed	Not Exposed	0.007	2.09	1.22-3.57	<0.001	2.27	1.48-3.50	0.054	1.47	0.99-2.16

Characteristics		Ref. Category	Use High Potency Extracts Daily			Use Synthetic Cannabis Daily		
			<i>p</i>	AOR	95%CI	<i>p</i>	AOR	95%CI
Cannabis Use Status	Current use, use in past 30 days	Never Use	<0.001	0.32	0.20-0.52	0.008	0.58	0.39-0.87
	Ever use, not in the past 30 days		0.056	0.63	0.39-1.01	0.446	0.86	0.59-1.26
	Ever use, not in past 30 days	Current use, use in past 30 days	0.002	1.96	1.28 -3.01	0.041	1.49	1.02-2.18
Exposure to education	Exposed	Not Exposed	0.006	1.80	1.18-2.73	0.028	1.46	1.04-2.05

SUPPLEMENTARY FILE

Table S1 - Risk perceptions of OCCASIONAL USE reported by high intensity cannabis users by cannabis form in the past 12 months

RISK		0=No Risk			1= Risk			Total % (n)
		No risk % (n)	Slight risk	Moderate risk	Great risk	Don't know		
Smoking	Smoked (n=165)	12.3 (107)	45	12	0	1	6.7 (58)	
	Edibles (n=110)	8.0 (70)	25	10	3	2	4.6 (40)	
Edibles	Liquid (e.g. cola/tea) (n=25)	0.9 (8)	9	4	3	1	2.0 (17)	
	Tinctures (n=26)	1.6 (14)	7	3	1	1	1.4 (12)	
	Fresh flower (n=14)	0.8 (7)	5	1	1	0	0.8 (7)	
Vaping	Vaporized (dried herb) (n=91)	6.4 (56)	25	8	0	2	4.0 (35)	
	Vaporized (liquid) (n=62)	4.3 (37)	11	12	61	2	9.9 (86)	
High Potency Product	Hashish (n=69)	4.3 (37)	17	9	3	2	3.6 (31)	
	Hash Oil (n=43)	2.4 (21)	12	5	3	2	2.5 (22)	
	Concentrate (e.g., BHO, shatter, budder, wax etc.) (n=61)	2.4 (21)	21	10	4	5	4.6 (40)	

Table S2 - Risk perceptions of DAILY USE reported by high intensity cannabis users by cannabis form in the past 12 months

RISK		0=No Risk			1= Risk			Total
		No risk	Slight risk	Moderate risk	Great risk	Don't know		
Smoking	Smoked (n=165)	3.3 (29)	69	47	20	1	15.7 (137)	
	Edibles (n=110)	4.4 (38)	36	24	9	3	8.3 (72)	
Edibles	Liquid (e.g. cola/tea) (n=25)	0.6 (5)	7	5	7	0	2.2 (19)	
	Tinctures (n=26)	1.3 (11)	10	3	1	0	1.6 (14)	
	Fresh flower (n=14)	0.2 (2)	9	2	1	0	1.4 (12)	
Vaping	Vaporized (dried herb) (n=91)	2.5 (22)	39	19	10	2	8.0 (70)	
	Vaporized (liquid) (n=62)	1.5 (13)	19	16	12	1	5.5 (48)	
High Potency Product	Hashish (n=69)	1.6 (14)	24	16	13	2	6.3 (55)	
	Hash Oil (n=43)	1.3 (11)	17	5	7	2	3.6 (31)	
	Concentrate (e.g., BHO, shatter, budder, wax etc.) (n=61)	1.4 (12)	16	12	16	6	5.7 (50)	

Table S3 - Logistic regression analyses examining risks of harm (physical or in other ways) perceived by cannabis forms and frequency of use among Canadian youth and young adult cannabis users and non-users (N=867).

Characteristics		Ref. Category	Affirmative Response%	Smoking Cannabis Occasionally			Affirmative Response%	Smoking Cannabis Daily		
				p	AOR	95%CI		p	AOR	95%CI
Age	19-24	16-18	65.2% v. 79.9%	<0.001	0.45	0.30-0.70	91.4% v. 93.6%	0.509	0.80	0.40-1.57
	25-30	16-18	67.2% v. 79.9%	0.003	0.54	0.36-0.81	88.5% v. 93.6%	0.122	0.61	0.33-1.14
	19-24	25-30	65.2% v. 67.2%	0.300	0.84	0.61-1.17	91.4% v. 88.5%	0.298	1.31	0.79-2.15
Sex	Male	Female	69.1% v. 70.4%	0.677	0.94	0.70-1.26	91.4% v. 90.1%	0.262	1.29	0.83-2.02
Cannabis use	Smokes	Does not smoke	35.4% v. 77.4%	<0.001	0.156	0.11-0.22	79.1% v. 93.3%	<0.001	0.30	0.19-0.48
Ethnicity	White	Non-white	66.8% v. 75.1%	<0.001	0.51	0.37-0.70	89.7% v. 92.6%	0.080	0.64	0.381-0.06
Exposure to education	Exposed	Not Exposed	71.5% v. 69.0%	0.010	1.53	1.11-2.12	93.9% v. 89.2%	0.006	2.13	1.25-3.65
				Vaping Cannabis Occasionally						
				p	AOR	95%CI				
Age	19-24	16-18	64.8% v. 75.8%	0.002	0.54	0.37-0.80	84.3% v. 89.0%	0.139	0.67	0.40-1.14
	25-30	16-18	63.3% v. 75.8%	0.002	0.56	0.38-0.81	81.5% v. 89.0%	0.082	0.64	0.39-1.06
	19-24	25-30	64.8% v. 63.3%	0.858	0.97	0.72-1.32	84.3% v. 81.5%	0.828	1.05	0.70-1.6
Sex	Male	Female	66.4% v. 67.3%	0.448	0.90	0.68-1.18	84.9% v. 83.7%	0.347	1.19	0.83-1.70
Cannabis use	Vapes	Does not vape	41.3% v. 70.6%	<0.001	0.28	0.19-0.219	71.6% v. 86.1%	<0.001	0.42	0.26-0.67
Ethnicity	White	Non-white	64.2% v. 71.8%	0.001	0.60	0.44-0.80	83.2% v. 86.1%	0.208	0.78	0.53-1.14
Exposure to education	Exposed	Not Exposed	70.0% v. 65.4%	0.002	1.62	1.20-2.20	89.5% v. 81.8%	<0.001	2.28	1.48-3.52
				Eating/Drinking Cannabis Occasionally						
				p	AOR	95%CI				
Age	19-24	16-18	64.0% v. 76.3%	0.003	0.54	0.36-0.81	84.3% v. 88.1%	0.515	0.84	0.50-1.42
	25-30	16-18	63.5% v. 76.3%	0.002	0.55	0.38-0.80	79.4% v. 88.1%	0.044	0.61	0.38-0.99
	19-24	25-30	64.0% v. 63.5%	0.929	0.99	0.72-1.35	84.3% v. 79.4%	0.115	1.38	0.93-2.06
Sex	Male	Female	66.4% v. 67.3%	0.479	0.90	0.68-1.20	82.3% v. 83.9%	0.891	0.98	0.69-1.39
Cannabis use	Consumes edibles	Does not consume edibles	34.7% v. 72.1%	<0.001	0.22	0.15-0.33	61.2% v. 86.6%	<0.001	0.26	0.17-0.39
Ethnicity	White	Non-white	63.5% v. 73.1%	<0.001	0.55	0.41-0.74	81.6% v. 85.8%	0.158	0.76	0.52-1.11
Exposure to education	Exposed	Not Exposed	68.2% v. 66.3%	0.066	1.33	0.98-1.80	85.9% v. 81.8%	0.062	0.26	0.17-0.39
				Use High Potency Extracts Occasionally						
				p	AOR	95%CI				
Age	19-24	16-18	76.8% v. 79.9%	0.231	0.77	0.50-1.18	85.4% v. 87.7%	0.392	0.80	0.48-1.33
	25-30	16-18	74.2% v. 79.9%	0.343	0.82	0.55-1.23	83.3% v. 87.7%	0.612	0.88	0.54-1.43
	19-24	25-30	76.8% v. 74.2%	0.710	0.94	0.67-1.32	85.4% v. 83.3%	0.641	0.91	0.61-1.36
Sex	Male	Female	77.2% v. 75.7%	0.689	1.06	0.79-1.44	85.6% v. 84.5%	0.953	0.99	0.69-1.42
Cannabis use	Uses high potency extracts	Does not use high potency extracts	52.6% v. 79.4%	<0.001	0.24	0.16-0.37	72.6% v. 86.6%	0.002	0.45	0.28-0.74
Ethnicity	White	Non-white	74.2% v. 80.6%	0.053	0.72	0.52-1.00	84.3% v. 86.0%	0.944	0.99	0.67-1.44
Exposure to education	Exposed	Not Exposed	79.8% v. 74.9%	0.003	1.68	1.20-2.36	88.8% v. 83.3%	0.009	1.74	1.15-2.64

Chapter 3: Perceptions of effectiveness and believability of pictorial and text-only health warning labels for cannabis products among Canadian youth.

Cesar Leos-Toro BSc¹, Geoffrey T. Fong PhD^{2,3}, Samantha B. Meyer PhD¹, David Hammond PhD¹

¹ School of Public Health & Health Systems, University of Waterloo, 200 University Ave. W., Waterloo, ON, Canada, N2L 3G1

² Department of Psychology, University of Waterloo, 200 University Ave. W., Waterloo, ON, Canada, N2L 3G1

³ Ontario Institute for Cancer Research, MaRS Centre, 661 University Avenue, Suite 510, Toronto, ON, Canada, M5G 0A3

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Corresponding Author

David Hammond
University of Waterloo
School of Public Health & Health Systems
200 University Ave W.
Waterloo, ON N2L 3G1
Tel. (519) 888-4567 ext. 36462
dhammond@uwaterloo.ca

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Overview

Background: Health warnings have been shown to increase knowledge and awareness of health risks, influence social norms, and reduce consumption of tobacco products. With the legalization of non-medical cannabis in Canada and other subnational jurisdictions, there is a need for empirical studies to examine the impact of cannabis health warnings on consumer perceptions and behaviour relevant to cannabis.

Methods: In October 2017, a between-group experiment was conducted as part of an online survey of Canadians aged 16 to 30 years (N=870) recruited from a national consumer panel. Participants rated the perceived effectiveness and believability of either text-only or pictorial cannabis health warnings and then completed a message recall task. Participants also reported their level of support for cannabis warnings, and support for including cessation information and a quitline on the warnings.

Results: Pictorial health warnings for cannabis products were perceived as more effective and believable than text-only warnings ($p<0.001$), and the superiority of pictorial warnings was found across different warnings: dose ($p=0.039$), co-morbid drug use ($p=0.006$), and pregnancy ($p<0.001$). Pictorial warnings were also rated as more believable ($p=0.048$). Overall, 87.7% respondents supported having health warnings on cannabis products, and 84.0% supported the inclusion of a quitline number on cannabis health warnings.

Conclusion: The current study provides the first empirical test of cannabis health warnings, consistent with the considerable body of evidence on the effectiveness of pictorial warnings on tobacco products. There was strong support for the inclusion of picture warnings and the inclusion of resources and quitlines on cannabis packaging.

KEY WORDS: Cannabis labeling, cannabis health communication, cannabis product packaging, cannabis use, cannabis consumer behaviour

Background

In October 2018, non-medical cannabis was legalized in Canada.^{1,2} One of the primary objectives of the *Cannabis Act* is to protect the health of young persons and enhance public awareness of associated health risks.² Cannabis is the most prevalent substance used among Canadian youth after alcohol; approximately 17% of students in grades 7 to 12 reported used cannabis in the past year according to the nationally representative 2016/17 Canadian Student Tobacco, Alcohol and Drugs Survey.^{3,4} The most recent general population survey on cannabis, the 2017 Canadian Cannabis Survey, found that 41% of youth aged 16 to 19 years and 45% of those aged 20 to 24 years reported past-year use.⁵

Like most other substances, the risks of cannabis depend upon the setting, dose, form, mode of administration, and co-morbid substance use.^{4,6,7,8,9} Overall, two-thirds (62.4%) of Canadian current and past 3-month cannabis users have been found to be at a moderate risk of developing health or other problems due to their use.¹⁰ Early and frequent use of cannabis is among the best predictors of subsequent problematic use, lower academic performance, heightened risk for cannabis dependence, and problematic use of other drugs.^{6,7,11,12,13} Frequent and heavy cannabis use is also associated with an increased risk of psychosis and other mental health disturbances.^{6,14,15,16,17} Cannabis use during pregnancy may increase the risks of stillbirth, preterm birth, fetal development issues, as well as having an adverse effect on child neurodevelopment.^{6,18,19} Acute impairment from cannabis increases the risk of motor vehicle accidents and evidence indicates that chronic exposure to cannabis smoke may increase risk of respiratory disease; high potency THC products may also increase adverse health risks.^{6,20,21} Finally, concurrent use of cannabis with other drugs may also give rise to negative health and social outcomes.^{22,23}

Research has identified youth in Canada as having low cannabis literacy. Focus groups conducted in 2013 found that many Canadian youth did not recognize the word *marijuana* in study pre-screening forms.²⁴ A more recent focus group study conducted in 2017 found that, while young people perceive that they have accurate understanding of the potential adverse health effects of cannabis, they just “don’t care” about the health effects and would use cannabis regardless.²⁵ Young Canadians report that cannabis is generally benign and is a substance used by “everybody” referring to it as “natural” and “not really a drug at all”.^{24,26,27} Young users report taking comfort in the opinion that cannabis “affects everyone differently” to selectively determine the degree of harm that use might produce.²⁵ As with most other health behaviours, perceptions of risk are inversely related to behaviour: youth who perceive cannabis as more harmful are less likely to use it.^{28,29,30}

Health warning labels (HWLs) are a prominent policy measure to communicate the health effects of consumer products. Research in the domain of tobacco control demonstrates that HWLs have high reach and frequency of exposure with more consumers reporting noticing information from product warnings than any other source.³¹ Comprehensive HWLs have been shown to influence social norms, increase health knowledge, and reduce consumption.^{32,33,34,35}

The effectiveness of HWLs depends upon their design. Key elements of effective health warnings include size, position, borders, and the general appearance of the warning (e.g., colour, graphics and graphic content, and message content).³⁶ Vivid colour affect overall noticeability and maximizes legibility of text which may lead to increased cognitive processing of content.^{37,38} Relative to text-only HWLs, pictorial HWLs are more likely to promote cognitive elaboration of risks, increased ability to attract and hold attention, and improve recall as they are more likely to remain salient over time and promote encoding to memory.^{35,39,40} Among youth, HWLs that highlight negative aesthetic effects or those that portray messages that suggest an inability to

participate in a valued activity are rated as having a greater impact.^{41,42,43,44} Integrating information on resources such as telephone quitlines also increases the impact of health warnings on behaviour change.^{45,46}

Canada's *Cannabis Act* requires that products feature rotating health warnings, including general warnings about potential hazards from use, precautions of use during pregnancy or while breastfeeding, driving or operating heavy machinery while intoxicated, addiction, mental health implications, and impact from use in adolescence.^{47,48} Currently, however, there is a lack of evidence on the impact of health warnings for cannabis products. Despite increased calls and recommendations for health warnings on cannabis, there are no empirical studies examining the design or content of messages on consumption perceptions or behaviour.^{49,50,51,52}

The current study examined the effectiveness of health warnings for cannabis products. The study had three primary objectives: 1) to test differences in perceived effectiveness and believability of text and pictorial cannabis product health warning labels; 2) examine whether certain label themes were more likely to be recalled than others; and 3) to examine levels of support from Canadian youth, including general support for health warnings, support for pictorial warnings, and whether a call to action such as a quitline should be present.

Methods

Design

Between-group experimental tasks were conducted as part of a 30-minute online survey examining a range of areas related to cannabis use behaviours, beliefs, and attitudes.⁵³ Approximately 15 minutes into the survey, respondents were randomized to view either text-only or pictorial health warnings. Respondents rated the perceived effectiveness and believability of the warnings and completed a message recall task approximately 10 minutes after viewing the warnings. Participants also reported their level of support for cannabis warnings, pictorial vs. text

warnings, and the inclusion of cessation information and a quitline as part of the warnings. A description of the tasks and measures is presented below.

Respondents

Respondents were individuals aged 16 to 30 (N=870) years of age with a Canadian IP address, and included cannabis users and non-users. Recruitment for participation in an online survey occurred by e-mail through Léger's consumer panel for web surveys consisting of approximately 400,000 active members, with half of respondents sampled using probability-based methods using the Canadian Census, along with other non-probability based methods, including commercial surveys.⁵⁴ Respondents aged 16 to 30 were recruited across Canada directly with the exception of youth in Quebec where youth aged 16 and 17 were recruited through their parents; parental consent was obtained prior to Quebec youth accessing the survey. Respondents received remuneration from Léger in accordance with their usual incentive structure. All of the data provided by respondents were anonymous and information was kept strictly confidential. The study was reviewed by and received ethics clearance from the Office of Research Ethics at the University of Waterloo (ORE# 22392). Data collection was conducted from October 10th to October 24th, 2017.

Development of health warnings

The health warning messages tested in the study were created in a multi-step process. First, a literature review was conducted to identify known health effects associated with cannabis use and was used to create an initial set of warnings. Second, this initial set of warnings was incorporated into an anonymous online survey, hosted by SurveyGizmo (Widgix, LLC, Colorado, USA), and was sent to 51 experts on August 26, 2016 (See **Appendix 2**). These experts included members of the Expert Advisory Committee on Information for Physicians on Marijuana for Medical Purposes, the Canadian Centre on Substance Abuse Scientific Advisory Council, and

other prominent cannabis researchers.⁵⁵ Of the 51 experts, 25 completed the survey, and the warning messages were refined based on their responses. Third, four focus groups were conducted in February 11-12, 2017 among 35 Canadian cannabis users (those who had used cannabis in the past 12 months) and non-users (those who had either never used or had abstained in the past 12 months), aged 16 to 24 years. Focus group participants were asked about their perceptions of cannabis, and for their opinions of the refined warnings; the focus group results led to a final set of warnings, which were then constructed to be consistent with the graphic design of Canadian tobacco health warnings.

Protocol and Measures

Randomization for the between-group health warning experiment occurred in two steps. First, participants were randomized to receive 4 of any of the 8 prepared health warning messages: 1) driving while intoxicated, 2) use during pregnancy, 3) use and mental health, 4) co-morbid use, 5) youth use, 6) addictive potential, 7) dose, and 8) second-hand smoke (see Figure 1).

Second, participants were randomized to view either a text-only or text and pictorial warnings (henceforth simply ‘pictorial’) for each of the 4 messages they viewed. Participants rated each health warning of perceived effectiveness and believability using a 10-point scale from 1=‘Not at all effective/believable’ to 10=‘Extremely effective/believable’. Ratings were made while the message appeared on the screen.

Following the experimental tasks, three measures of support were assessed. Respondents could respond yes/no/don’t to the following questions: 1) “In your opinion, if it were legal to sell marijuana, should health warnings be required on products?”; 2) “Should health warnings include pictures?”; 3) “Do you think this information (in the red rectangle) should be included on marijuana packages?”. The information referenced in the last question is reproduced in Figure 2.

At the end of the survey, approximately 10 minutes after viewing the warnings, participants were asked to recall as many of the four health warnings they viewed as possible. ‘Unprompted recall’ was assessed using open-ended fields. Responses were coded by two coders, both of whom were blind to the experimental condition and one who was unaware of the study hypotheses. A correct recall was operationally defined as one that contained references and phrases contained in the health warning that had been presented. For example, mentions of “mixing”, “combining”, or “using both weed and alcohol” were coded as having recalled the warning about co-morbid drug use; mentioning “car accident”, “crashing”, or “too high to drive” were coded as having recalled the warning about driving while intoxicated. The percentage of agreement by the two coders of correct vs. incorrect recall for 75 of the responses was very high: 97.3%.

Sociodemographic characteristics included sex (male or female), age, ethnicity (white, non-white), and cannabis use status. Cannabis use status measures (‘never’, ‘recent – in the past 12-months’, and ‘current use – in the past 30 days’) were drawn from a modified Canadian Student Tobacco, Alcohol and Drugs Survey, “Have you ever tried marijuana?” and a new item, “When was the last time you used marijuana” with options “More than 12 months ago”, “More than 3 months to 12 months ago”, “Within the last month”.^{53,56}

Analysis

All analyses were conducted using SPSS 25.0 (Armonk, NY: IBM Corp.). Generalized linear models were fitted to examine perceived effectiveness and perceived believability, while accounting for correlated responses across the 8 warnings. The models were adjusted for age, sex, ethnicity, cannabis use status, and indicator variables were included for experimental condition (0=text-only, 1=pictorial warning), the order by which warnings were shown, and warning label theme (1=Driving, 2=Pregnancy, 3=Mental Health, 4=Co-morbid Drug Use, 5=Early use, 6=Addiction, 7=Overdose, 8=Toxic smoke). Logistic regression models were fitted to examine

correlates of support for requiring cannabis product health warning labels, inclusion of pictures on labels, and the inclusion of a call to action (0=Not supportive/Don't Know, 1=Supportive).

Results

Table 1 displays the sample characteristics. A total of 1,045 respondents completed the survey; however, the final analytic sample was 870 as the rest were excluded from analysis due to completing survey from a mobile device instead of a desktop computer (28), missing data on key measures including cannabis use status (8) and/or failed data integrity questions; 62 records deleted due to incorrectly identifying the current month and 77 respondents reported being unable to provide honest answers to all of the survey questions.

PERCEPTIONS OF HEALTH WARNING EFFECTIVENESS AND BELIEVABILITY

Overall, pictorial warnings were rated as significantly more effective than text-only warnings (AOR=1.59, 95%CI 1.33-1.89, $p<0.001$). Figure 3 displays the mean ratings of perceived effectiveness of text-only and pictorial health warnings among participants by message theme. Pictorial warnings were rated as more effective than text-only warnings overall, although of the eight health message themes, on three the greater effectiveness of pictorial warnings was statistically significant: dose, co-morbid drug use, and pregnancy (AOR=1.79, 95%CI 1.03-2.79, $p=0.039$; AOR=1.91, 95%CI 1.20-3.04, $p=0.006$; and AOR=3.20 95%CI 2.06-4.97, $p<0.001$ respectively).

Table 2 displays the results of linear regression models for perceived effectiveness and believability across the eight themes. Pregnancy-related warnings were consistently more likely to receive greater mean scores of effectiveness than any of the other health warning themes. For example, the pregnancy health warning labels were approximately twice as likely to receive greater

mean scores of perceived effectiveness than the drugged driving warnings (AOR=2.09 95%CI 1.45-3.02, $p<0.001$).

Figure 4 displays the mean ratings of believability of the text-only and pictorial health warnings by message theme. Pictorial warnings were rated as slightly more believable than text-only warnings, although the effect size was small (AOR=1.19 95%CI 1.002-1.41, $p=0.048$), and for none of the 8 individual themes did pictorial and text-only warnings differ significantly. Table 2 displays the results of the linear regression model examining believability across the eight themes. The pattern of differences across themes for believability were quite similar to the pattern of differences found for ratings of effectiveness.

SUPPORT FOR HEALTH WARNINGS AND HEALTH WARNING ELEMENTS

Table 3 displays respondents' support of health warning labels on cannabis products, pictorial labels, and calls to action displayed on labels such as quitlines. A very high percentage of respondents supported putting health warnings on cannabis products (88%). Logistic regression analyses revealed that respondents who had used cannabis in the past 30 days (*current* users) were less likely to be supportive of health warnings than those who had *never* used cannabis (75.5% vs. 93.6%; AOR=0.23 95%CI 0.13-0.40, $p<0.001$). In contrast, those who reported that they had ever used cannabis, but not in the past 30 days (*former* users), were associated with greater odds of support for health warnings on cannabis products than *current* users (88.5% vs. 75.5%; AOR=2.51 95%CI 1.55-4.06, $p<0.001$).

Nearly 7 in 10 respondents (69%) supported having pictorial warnings on cannabis products. White respondents had lower odds of supporting pictures on health warning labels than non-White respondents (72.9% vs. 81.8%; AOR=0.57 95%CI=0.39-0.84, $p=0.004$). Significant differences were reported by cannabis use characteristics; 86.1% of *never* users, 77.4% of *former* users and 53% of *current* users reported support for pictorial warnings. *Former* and *current*

cannabis users were less likely to support pictorial warnings than respondents who had *never* used cannabis (AOR=0.61, 95%CI=0.39-0.94, $p=0.025$ and AOR=0.20, 95%CI=0.13-0.31, $p<0.001$ respectively). However, *former* users had a greater likelihood of supporting pictorial warning labels than *current* users (AOR=3.09 95%CI=2.03-4.70, $p<0.001$).

The inclusion of calls to action such as quitlines were also well-supported (84.0%). Males were less likely than females to support the inclusion of these resources (79.1% vs. 88.5%, AOR=0.49 95%CI=0.33-0.73, $p<0.001$). Similar to questions of support for warnings and pictures, *former* users were more likely to support resources such as quitlines than *current* users (86.9% vs. 69.4%, AOR=2.89 95%CI=1.83-4.55, $p<0.002$), and *current* users had significantly lower odds of supporting the same than *never* users (69.4% vs. 89.5%, AOR=0.28 95%CI=0.17-0.44, $p<0.001$ respectively).

HEALTH WARNING RECALL

Table 4 displays the number of times each message theme was accurately recalled as well as the number of respondents that were shown each warning (n). For the majority of health warning themes, pictorial warnings were recalled with the same or greater frequency as text warnings, with the exception of the driving and pregnancy themes that were recalled most frequently.

Discussion

The current study found that pictorial health warnings for cannabis products were perceived as more effective and believable than text-only warnings. These findings are consistent with the extensive tobacco control literature and recommendations from the WHO Framework Convention on Tobacco Control that specify that pictorial health warnings on tobacco product are more effective and believable than text-only warnings.^{35,38,57,58} Notably, however, the greater effectiveness of pictorial warnings was not as strong for cannabis as for cigarettes in this study.

The current study was also able to identify thematic areas for further public health information campaigns, such as cannabis dependence which was consistently rated as relatively less effective or believable than the other cannabis health warning themes, and which has been a challenging area in cannabis health communications identified by previous researchers.²⁵ Recent work from tobacco control research suggests that the use of graphic imagery, enhanced by testimonial content may be perceived as more effective and should be considered in the further development of cannabis product health warnings.⁵⁹ These principles may be useful in resonating more abstract health effects such as those related to mental health and cannabis use.

No significant differences were observed between text and pictorial warning in the recall task. The current findings contrast with other studies showing greater recall for pictorial warnings.⁶⁰ Typically, warnings that display and highlight stark or graphic images of physical health effects have been observed to enhance effects on memory; inducing an emotional reaction has been observed to increase memory for associated information.^{61,62,63} In the current study, there was a general trend towards greater recall of pictorial health warnings across most health effects, with the notable exception of the pregnancy warning. This was particularly surprising given that previous studies have identified pictorial health warnings of babies as among the most salient images tested.^{60,64} Other than the pregnancy warning, many of the images were abstract in nature, which may have contributed to lower levels of recall compared to more concrete images with more direct or congruent links to the specific health effect.⁶⁵ Indeed, most of the images were symbolic which are consistent rated as least effective among themes for pictorial health warnings.⁵⁹

There was near universal support for health warning labels on cannabis products and the inclusion of calls to action such as quitlines. Most youth and young adults also supported the use of pictorial health warning labels. The health warnings that are required by Health Canada under the Cannabis Act incorporate some the elements tested in the current study, including contrasting

colour and a set of rotating health warnings that depict different health effects.⁶⁶ Although the ‘main’ health warnings are text-only, packages are required to display a ‘universal symbol’ to indicate that the product contains cannabis. In the regulation and consultation reports, Health Canada contrasted the regulations for cannabis warnings against the pictorial warnings required on cigarette packages in Canada; the decision to opt for text-only cannabis warnings may be an effort to communicate the lesser health effects from cannabis use versus smoking.⁶⁶ Future research should examine the impact of the cannabis health warnings on consumer knowledge and perceptions of risk.

STRENGTHS AND LIMITATIONS

This study has a number of important strengths and limitations. While a commercial sample was used that employed probability and non-probability-based recruitment methods, we were able to include a broad and diverse sample with similar patterns of cannabis use and sociodemographic characteristics as the 2017 Canadian Cannabis Survey.⁵ The study surveyed Canadian young people aged 16 to 30, who use cannabis at the highest rates and are a priority population in Canada’s legalization efforts.² However, findings may not necessarily be generalizable among older age groups. Furthermore, it could be argued that the health warning labels presented in this study were ill-designed, however, an attempt to control for this involved a careful multistage process which included expert opinions and focus groups among youth and young adults. The between-group experimental design was a considerable strength as was the use of tools previously used to develop and evaluate health warnings and messages for tobacco products.⁶⁷

Conclusion

The current study provides the first empirical test of cannabis health warnings. As with warning messages on tobacco products, pictorial warnings were perceived as more effective and

believable than text-only warnings. This study also provides evidence of strong support for the inclusion of picture warnings on cannabis products and the inclusion of resources and quitlines on cannabis packaging to strengthen Canadian cannabis product packaging regulations and inform the Government's continued responsibility to protect population health.

Figure 1 Health Warning Labels presented to survey respondents

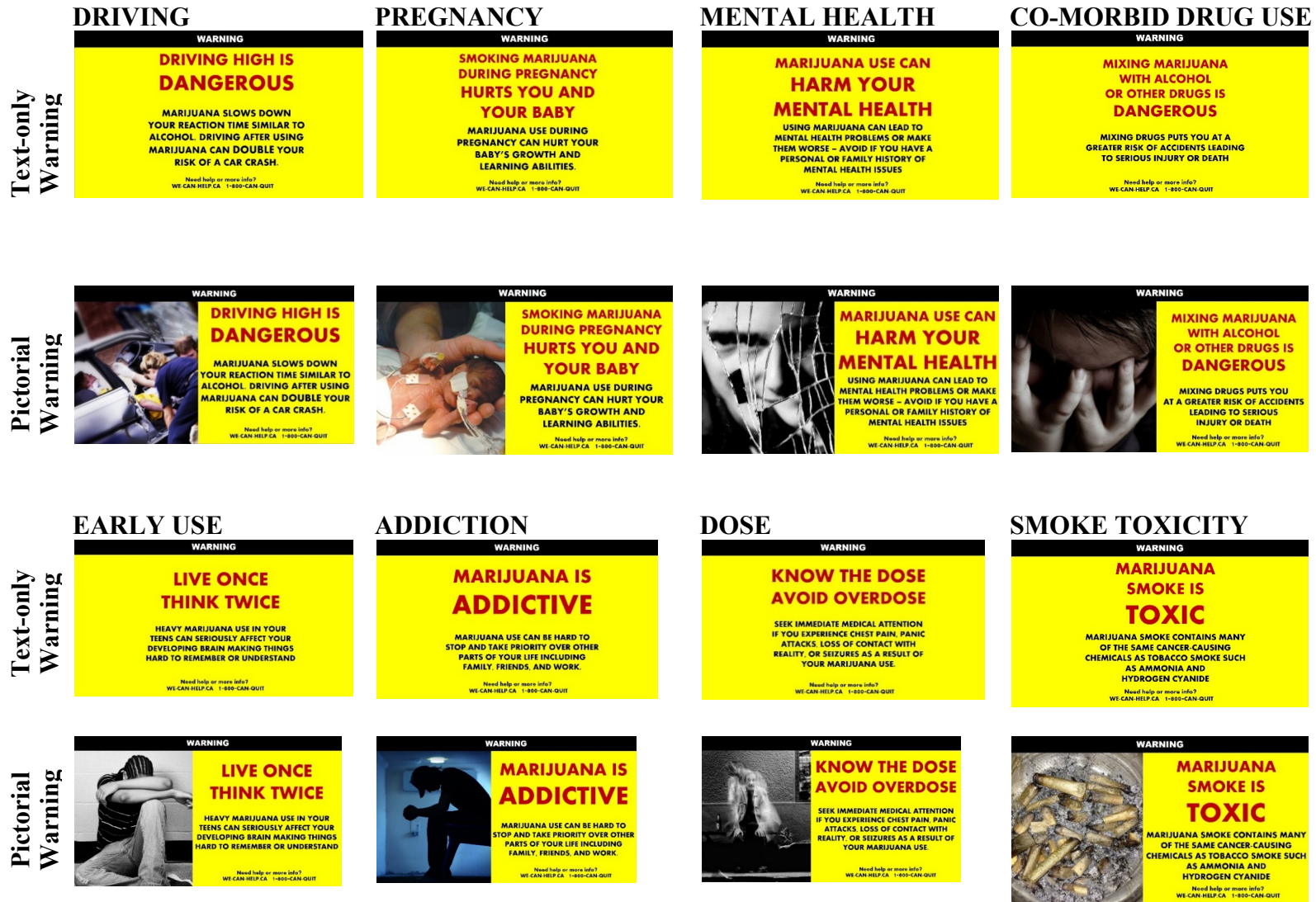


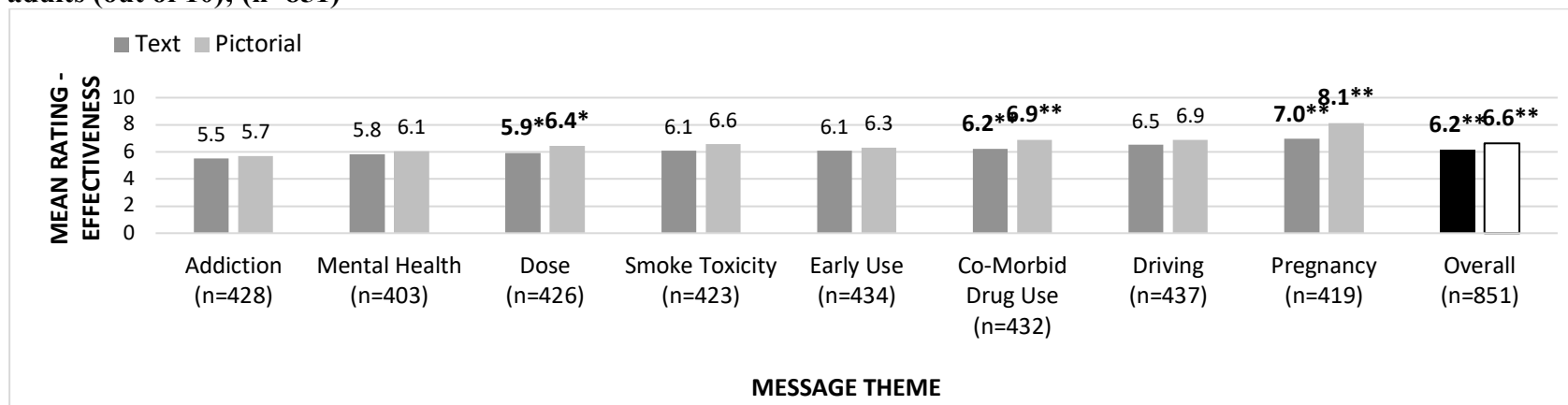
Figure 2 Health warning label with call to action.



Table 1 – Sample characteristics (N=870).

		% (N)
Sex	Female	52.1 (453)
	Male	47.9 (417)
Age (yrs.)	16–18	25.2 (219)
	19–24	30.7 (267)
	25–30	44.1 (384)
Ethnicity	White	64.5 (561)
	Non-white	35.5 (309)
Cannabis use status	Never use	41.5 (361)
	Former use, not in past 30 days	36.0 (313)
	Current use, within past 30 days	22.5 (196)

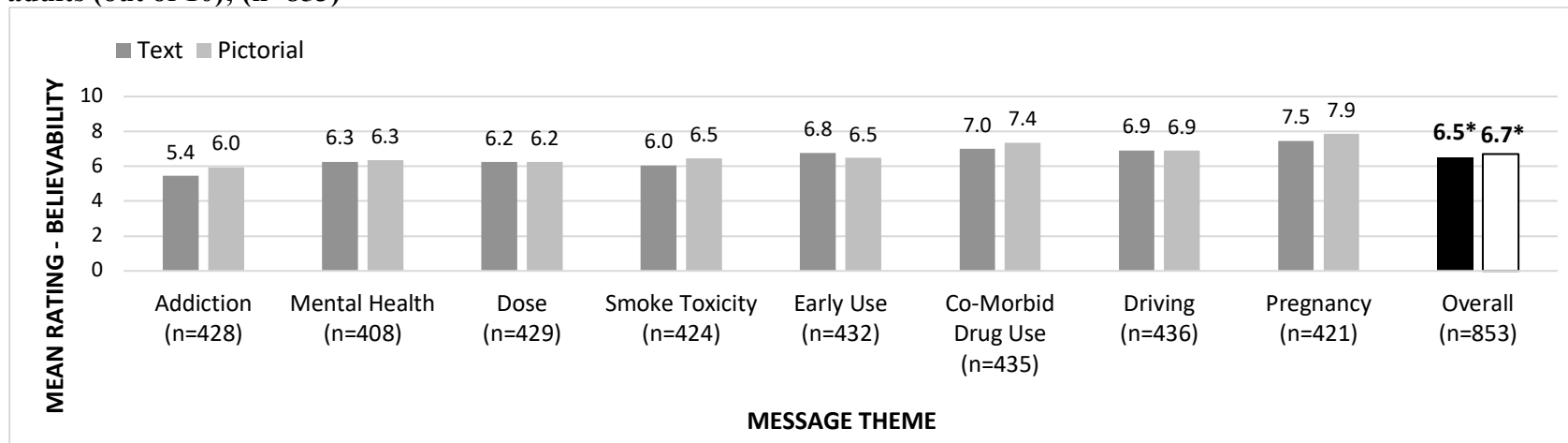
Figure 3 – Mean ratings of effectiveness of text-only and pictorial health warning label among Canadian youth and young adults (out of 10); (n=851)



Values adjusted for age, sex, ethnicity, and cannabis use status. * $p < .05$, ** $p < 0.001$

“Overall” columns adjusted for age, sex, ethnicity, cannabis use status, order by which warning was shown, and warning message theme.

Figure 4 – Mean ratings of believability of text-only and pictorial health warning label among Canadian youth and young adults (out of 10); (n=853)



Values adjusted for age, sex, ethnicity, and cannabis use status, * $p < 0.05$

“Overall” columns adjusted for age, sex, ethnicity, cannabis use status, order by which warning was shown, and warning message theme.

Table 2 – Linear regression analyses examining ratings of effectiveness and believability between cannabis health warning labels (n=851).

Health Warning Label Theme	Ref.	Effectiveness			Believability		
		<i>p</i>	OR	95%CI	<i>p</i>	OR	95%CI
Pregnancy	Driving	<0.001	2.09	1.45-3.02	<0.001	1.96	1.35-2.82
Mental Health		<0.001	0.44	0.29-0.67	0.004	0.54	0.36-0.82
Co-morbid drug use		0.441	0.84	0.54-1.31	0.189	1.35	0.86-2.10
Early Use		0.109	0.68	0.42-10.09	0.494	0.85	0.53-1.36
Addiction		<0.001	0.40	0.24-0.67	<0.001	0.35	0.21-0.58
Overdose		0.144	0.66	0.38-1.15	0.037	0.56	0.32-0.97
Smoke toxicity		0.119	0.62	0.34-1.13	0.010	0.46	0.25-0.83
Mental Health	Pregnancy	<0.001	0.21	0.15-0.31	<0.001	0.28	0.19-0.40
Co-morbid drug use		<0.001	0.40	0.27-0.59	0.055	0.69	0.47-1.01
Early Use		<0.001	0.32	0.22-0.49	<0.001	0.43	0.29-0.65
Addiction		<0.001	0.19	0.12-0.30	<0.001	0.18	0.11-0.47
Overdose		<0.001	0.32	0.19-0.52	<0.001	0.29	0.18-0.47
Smoke toxicity		<0.001	0.30	0.17-0.52	<0.001	0.23	0.13-0.40
Co-morbid drug use	Mental Health	<0.001	1.89	1.33-2.70	<0.001	2.48	1.75-3.54
Early Use		0.027	1.53	1.05-2.22	0.020	1.56	1.07-2.27
Addiction		0.610	0.90	0.59-1.36	0.036	0.64	0.43-0.97
Overdose		0.085	1.50	0.95-2.37	0.897	1.03	0.65-1.63
Smoke toxicity		0.208	1.40	0.83-2.36	0.505	0.84	0.50-1.41
Early Use	Co-morbid drug use	0.223	0.81	0.57-1.14	0.008	0.63	0.45-0.89
Addiction		<0.001	0.47	0.33-0.69	<0.001	0.26	0.18-0.38
Overdose		0.271	0.79	0.52-1.20	<0.001	0.42	0.27-0.63
Smoke toxicity		0.221	0.74	0.45-1.20	<0.001	0.34	0.21-0.55
Addiction	Early Use	0.003	0.59	0.41-0.84	<0.001	0.41	0.29-0.59
Overdose		0.919	0.98	0.66-1.45	0.036	0.66	0.45-0.97
Smoke toxicity		0.704	0.92	0.58-1.45	0.008	0.54	0.34-0.85
Overdose	Addiction	0.005	1.67	1.17-2.38	0.009	1.61	1.13-2.29
Smoke toxicity		0.035	1.56	1.03-2.35	0.205	1.31	0.86-1.97
Smoke toxicity	Overdose	0.714	0.93	0.65-1.35	0.268	0.81	0.56-1.17

Values adjusted for age, sex, ethnicity, cannabis use status, order by which warning was shown, and warning message theme.

Table 3 – Support for health warnings and health warning elements (N=870).

Support for	% (N)
Health warning labels on cannabis products	87.7 (763)
Pictures on health warning labels*	69.8 (607)
Calls to action/quitlines on cannabis products	84.0 (731)

*Only those that answered in support for health warning labels on cannabis products were asked about support for pictures on said products.

Table 4 – Health Warning Recall

Health Warning Theme	Experimental Condition	Recalled warning % (n)
Pregnancy (n=430)		49.5 (213)
	Pictorial (n=221)	45.2 (102)
	Text-Only (n=209)	53.1 (111)
Mental Health (n=414)		43.2 (179)
	Pictorial (n=216)	43.5 (94)
	Text-Only (n=198)	42.9 (85)
Smoke Toxicity (n=435)		33.1(144)
	Pictorial (n=204)	36.8 (75)
	Text-Only (n=231)	29.9 (69)
Youth/Early Use (n=440)		29.5 (130)
	Pictorial (n=217)	31.8 (69)
	Text-Only (n=223)	27.4 (61)
Addiction (n=436)		29.8 (130)
	Pictorial (n=209)	31.1 (65)
	Text-Only (n=227)	28.6 (65)
Overdose (n=440)		18.4 (80)
	Pictorial (n=221)	19.0 (42)
	Text-Only (n=219)	17.8 (38)
Co-Morbid Drug Use (n=441)		17.2 (76)
	Pictorial (n=223)	17.5 (39)
	Text-Only (n=218)	17.0 (37)

*Driving theme recall not reported as **Figure 2**, a driving warning, was shown to all respondents.

Chapter 4: Cannabis labelling and consumer understanding of THC levels and serving sizes.

Cesar Leos-Toro BSc¹, Geoffrey T. Fong PhD^{1,2,3}, Samantha B. Meyer PhD¹, David Hammond PhD¹

¹ School of Public Health & Health Systems, University of Waterloo, Canada

² Department of Psychology, University of Waterloo, Canada

³ Ontario Institute for Cancer Research, Canada

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Corresponding Author

David Hammond
University of Waterloo
School of Public Health & Health Systems
200 University Ave W.
Waterloo, ON N2L 3G1
Tel. (519) 888-4567 ext. 36462
dhammond@uwaterloo.ca

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Overview

Background: Cannabis products exist in a wide array of forms and concentrations, with a consistent trend towards higher THC concentrations in North American markets. As part of cannabis legalization in Canada and several US states, regulations specify how THC levels should be labelled on products; however, there is little evidence regarding the extent to which consumers understand and use THC labelling to inform consumption amounts.

Methods: Two experiments were conducted in October 2017 among Canadian youth and young adults as part of an online cross-sectional survey (N=870). Experiment 1: respondents were randomized to one of three labelling conditions (1=No Label, 2=mgTHC, 3=Doses). Respondents interpreted a recommended serving and number of servings contained in the package. Experiment 2: randomized respondents to one of four labelling conditions communicating THC level (1=No Label, 2=%THC, 3=mgTHC, 4=Traffic Light System). Respondents determined level of THC in the product.

Results: Labelling the number of doses per package was associated with the greatest proportion of correct responses (54.1%) when respondents had to determine a recommended serving compared with the no-label control condition (RR=7.28 95%CI 4.81-11.04) and THC mg condition (RR=4.05 95%CI 2.96-5.54). When product was labelled using a traffic light system, participants were more likely to identify THC level: low THC (RR=43.43 95%CI 16.43-114.79) or high THC (RR=16.71 95%CI 9.61-29.07) than the control condition.

Conclusion: Few consumers can understand and apply quantitative THC labelling; in contrast, THC labels that provide 'interpretive' information, such as descriptors, symbols, or references to servings have greater efficacy.

KEY WORDS: Cannabis constituent labeling, cannabis product packaging, cannabis use, cannabis consumer behaviour

Background

Cannabis comes in a wide array of product types (e.g., dried herb, edibles, hashish or kief, cannabis oils, concentrates), which lead to a diversity of modes of administration. The various product types and preparations (e.g., its combination with tobacco by certain users) deliver different levels of the primary psychoactive component Tetrahydrocannabinol, Δ^9 -THC (THC) – a proxy for potency. THC concentrations of street-level dried herb have increased considerably over the past 30 years in North American markets.¹ Currently, dried herb on both the licit and illicit market typically includes 15% to 17% THC, whereas high extract products such as oils or solid concentrates like waxes may contain up to 80-90% active THC.^{2,3,4,5} These increases are of public health concern because higher potency products have been associated with increased risk of health effects including psychoses, dependence, marked effects on memory and cognition, and increased use of emergency hospital services.^{6,7,8,9,10,11} After alcohol, cannabis is the most widely used substance in Canada among youth and young adults.¹² According to the 2017 Canadian Cannabis Survey, 41% of youth aged 16 to 19 years and 45% of those aged 20 to 24 years reported using cannabis in the past year.¹³

The most common forms of cannabis consumed among Canadians are dried herb (86%), followed by edibles (32%).¹⁴ Hashish (20%), cannabis oils (19%) and liquid concentrates (20%), which represent relatively higher potency products, were used by 1 in 5 past 3-month cannabis consumers in the second quarter of 2018.¹⁴ Gender differences in cannabis product use have been detected where males used dried herb more than females (90% vs 81%) and females consumed more edibles than males (41% vs 26%).¹⁴

The diversity of cannabis products represents challenges to effective regulation such as creating clear, effective labelling standards to guide consumer decisions. Given the increasing number of jurisdictions that have legalized medical and non-medical cannabis in North America,

there is surprisingly little literature on consumer understanding of THC content on other aspects of product labelling.^{15,16} Labelling frameworks for manufactured (e.g., edibles, concentrates, etc.) and non-manufactured (e.g., dried herb, leaf) cannabis products are highly variable from state to state, and evaluations of the effectiveness of warnings, such as whether they increase consumer knowledge about product potency, are limited to a few studies examining edibles.^{17,18}

Colorado and Washington require edible cannabis products to display information regarding potency and serving size such as, “the standard serving size for this product includes no more than 10 milligrams of active THC”; however, focus groups suggest that many consumers are unsure about how to interpret THC information.¹⁹ Colorado consumers also reported feeling overwhelmed by the amount of information on the product label, the small font size, and being confused about some kinds of information, such as information on the variability of testing standards.¹⁹ Despite Colorado’s requirement for a Universal Symbol indicating that a product contains cannabis, it was not clear to nonusers that certain Colorado cannabis products, such as edibles, contained cannabis.¹⁹ These and other studies suggest that cannabis labelling may not be satisfying a principal objective of providing clear and easy-to-understand messages about cannabis products that consumers can use to understand key characteristics of these products— both within product class (e.g., distinguishing potency within edibles) and between product classes (e.g., distinguishing potency between edibles and combustibles).

Accurate labelling is important in order to avoid or minimize adverse consequences that tend to occur when information is incomplete, unreliable, does not promote engagement or lacks practical knowledge such as information for first time users including excessive consumption, failure to dose properly, and increases in acute adverse events.²⁰ The diversity of cannabis product types and their routes of use constitutes a major challenge to labelling of these products, which have not been encountered to such a great extent as with other products, such as tobacco products.

Due to the lack of scientific consensus in many areas of cannabis-related health information, it is far more challenging to develop cannabis health warning messages, and thus more important to conduct research on cannabis warnings to fill knowledge gaps and develop an evidence base for cannabis health warnings.

Canada became the second country in the world, after Uruguay, to legalize nonmedical cannabis in October 2018. The *Cannabis Act* created a legal framework for the control of production, distribution, sale, and possession of cannabis in Canada.²¹ As part of labelling regulations in the *Cannabis Act*, Health Canada requires cannabis packages to display its constituents, product type, potency and other essential information, including THC and CBD numbers.^{22,23} The extent to which consumers can interpret THC numbers is unclear, particularly given that some consumers are unfamiliar with terminology used for cannabis products, let alone what ‘THC’, ‘CBD’ numbers may communicate.^{24,25,26,27} Adults also indicate confusion when presented with unfamiliar numerical information.¹⁹ Evidence in the areas of nutrition and tobacco labelling consistently demonstrate that consumers struggle to understand and apply quantitative constituent information. For example, although many consumers report using the calorie and nutrient numbers that appear in the ‘nutrition facts tables’ displayed on pre-packaged foods, most consumers struggle to correctly apply serving size information.^{28,29,30} Comprehension of food labels has been highly associated with literacy and numeracy skill, however even individuals with strong literacy skills appear to have trouble reading food labels.³¹ There are substantial and persistent disparities in consumer understanding and use of quantitative health information: consumers with lower education, income, and literacy skills are less likely to use and apply the nutrient amounts displayed on product labels.²⁸ Similarly, findings in cigarette labels indicate widespread misperceptions of the tar and nicotine numbers that were routinely displayed on

packaging and marketing, to the extent that these numbers have been removed or prohibited in many jurisdictions.^{32,33}

To date there exists no empirical evidence examining cannabis literacy in terms of specific constituents such as THC and/or CBD, perceptions of potency, or practical aspects related to consumption of cannabis products such as dosing or serving size. Given this considerable gap in the literature concerning cannabis consumer behaviour and Canada's legislative changes around practical aspects of cannabis regulation, the current study was designed to assess comprehension of cannabis-related information including communication of dose and strength of product on different labelling designs among youth and young adults by cannabis use status and sociodemographic factors.

Methods

Design

Two experiments, each composed of two tasks, were conducted as part of an online cross-sectional survey conducted among youth and young adults in Canada to assess respondents' comprehension and practical application of information presented on cannabis product labels. The survey took place in October 2017. Recruitment occurred by e-mail through Léger's consumer panel for web surveys consisting of approximately 400,000 active members, half of them sampled using probability-based methods using the Canadian Census, along with other non-probability based methods, including commercial surveys.³⁴ Inclusion criteria included individuals aged 16 to 30 years of age with a Canadian IP address, cannabis users and non-users. Respondents aged 16 to 30 were recruited across Canada directly with the exception of youth aged 16 to 18 which were recruited through their parents; parental consent was obtained prior to this younger demographic accessing the survey. Respondents received remuneration from Léger in accordance with their usual incentive structure. All of the data provided by respondents were anonymous and

information was kept strictly confidential. In all cases, respondents were provided with information about the study and asked to provide consent before participating. They were reassured their anonymity again after providing consent and proceeded to the survey. The study was reviewed by and received ethics clearance from the Office of Research Ethics at the University of Waterloo (ORE# 22392).

Measures

Respondents were asked to complete a set of tasks that required them to use different labelling executions such as presentations of THC in milligrams, percentages, or more intuitive presentations of THC level (e.g., as a ‘dose’, a pictorial ‘traffic light’ system) to determine serving sizes, and strength of cannabis products.³⁵

Experiment 1 – Comprehension of cannabis serving size information

Experiment 1 was designed to examine how three different ways of conveying information about serving size affected consumer understanding. As shown in the figures presented in Table 2, participants were randomized to view cannabis edibles with one of three THC labels: 1) no THC label (control), 2) THC in milligrams, and 3) number of ‘doses’. While viewing the labels, participants were asked two questions: 1) “Based on the information provided, how much of the cookie should someone eat on one occasion if they wanted a recommended serving?” with the following answer options: “1/4 of a cookie”, “1/2 of a cookie”, “3/4 of a cookie”, “1 cookie”, “2 cookies”, “3 cookies”, “More than 3 cookies”, and “Don’t know”; and 2) “How many servings are in this package?” with response options, “1”, “2”, “3”, “4”, “5”, “More than 5”, and “Don’t know”. The responses for each question were recoded into a binary variable where 1 = correct answer, and 0 = incorrect answer: for the first question, “1/4 of a cookie” was the correct answer; for the second question, “4 servings” was the correct answer.

Experiment 2 – Comprehension of THC potency information

Experiment 2 was designed to examine how four different ways of presenting information about potency affected potency perceptions. Participants were randomized to view containers of dried marijuana leaf where information about potency was expressed in one of four ways, displayed in Table 3: 1) no THC Label (control), 2) THC as a percent, 3) THC in milligrams, and 4) traffic-light graphic (green for ‘low’ potency, and red for ‘high’ potency). Participants first viewed the ‘low’ potency container, and then the ‘high’ potency container. While viewing each image, participants were asked the following question: “Based on the available information, what is the level of THC in this product?” with responses, “Low”, “Moderate”, “High”, “Don’t know”. Binary variables were created where 1=Correctly identified THC potency of displayed product, and 0=Did not correctly identify THC potency of displayed product.

Data Integrity

Data quality was controlled for using two questions to ensure participants were sufficiently engaged with the survey. Near the end of the survey, they were asked, “What is the current month?” and, “One last question, did you feel you were able to provide honest answers about your marijuana use during the survey?”. If respondents selected the wrong month or respondent that they felt unable to provide honest answers for ‘all questions’, they were not included in the analytic sample.

Analysis

All analyses were conducted using SPSS Statistical Software (Version 25.0, Armonk, NY: IBM Corp.). Bivariate tests were conducted to detect differences between sex, age, race and cannabis use status across experimental conditions with no differences detected. Logistic regression models were fitted to examine correct responses to interpreting a single serving size,

identifying number of servings contained in a cannabis package, identifying the ‘low’ THC product, and identifying the ‘high’ THC product. Relative risk estimates are presented. For the first experiment, an indicator variable representing experimental condition was entered into the model (1= “No THC Label”, 2= “mg THC Label”, 3= “THC as ‘dose’ label”) along with sex, age, race, and cannabis use status. For the second experiment an indicator variable was also constructed representing experimental condition (1= “No THC Label”, 2= “% THC”, 3= “mg THC”, 4= “green/red traffic-light”) along with sex, age, race and cannabis use status. A two-way interaction term was tested between cannabis use status and experimental condition for each of the tasks, but significant interactions were not found.

Results

Table 1 displays the current study’s sample characteristics. A total of 1,045 respondents completed the survey, however, the final analytic sample was 870 as the rest were excluded from analysis due to completing survey from a mobile device instead of a desktop computer (28), missing data on key measures including cannabis use status (8) and/or failed data integrity questions; 62 records deleted due to incorrectly identifying the current month and 77 respondents reported being unable to provide honest answers to all of the survey questions.

Experiment 1 – Comprehension of serving size information

Recommended serving size—As Table 2 indicates, less than 1 in 10 (7.4%) respondents in the control condition were able to correctly interpret a recommended serving size as $\frac{1}{4}$ of the cookie, or 10mg of THC. When products included constituent information such as “mg THC”, only 13.4% of respondents correctly identified the recommended survey amount; although this represented a significant increase from the no label control condition (RR=1.80 95%CI 1.09-2.97) as detailed in Table 3. More than one-quarter of respondents who viewed the THC mg label incorrectly reported the recommended serving was the entire cookie, while almost half selected

‘don’t know’. Labelling the number of doses per packages was associated with the greatest proportion of correct responses (54.1%) compared with the no-label control condition (RR=7.28 95%CI 4.81-11.039) and THC mg condition (RR=4.05 95%CI 2.96-5.54). Respondents who reported using within the past 30 days (current users) were 1.5 times more likely to correctly identify the commended serving size than never users (RR=1.47 95%CI 1.12-1.92).

Number of servings per package—No differences were observed between the ‘no label control condition’ and the THC mg condition in the proportion of participants who correctly identified the number of servings in the package (5.1% vs. 6.0%). In contrast, 77.9% of participants were able to correctly identify the number of servings as four when the THC information was displayed as ‘doses’, a significant increase from the no label control and the THC mg conditions (RR=15.38 95%CI 9.36-25.28; RR=13.02 95%CI 8.18-20.73, respectively). Current users were more likely to correctly identify the number of servings contained in the package than never users (RR=1.32 95%CI 1.03-1.70).

Experiment 2 – Comprehension of THC potency information

Table 4 displays the results of the second experiment examining ‘low’ and ‘high’ level THC products. In the control condition of the set communicating ‘low’ THC levels, where there was no THC information, virtually no respondents (2.0%) identified the displayed product as having a ‘low’ THC level. In contrast, approximately one-third (35.3%) of respondents correctly identified THC level as ‘low’ in the condition that displayed THC as a percentage, a significantly higher proportion compared to the control condition (RR=18.10 95%CI 6.76-48.52). Table 5 shows relative risk estimate analyses for Experiment 2. Respondents who viewed the cannabis product displaying a green traffic light which read “Low THC” had a much greater likelihood in correctly identifying it as a low THC product than when no THC information was present (85.1%

vs. 2.0; RR=43.43 95%CI 16.43- 114.79). Current users had greater odds of correctly identifying the ‘low’ THC level products they were displayed than never users using the product labels (RR=1.41 95%CI 1.14-1.75). Similar patterns emerged in the conditions where high THC level products were displayed to respondents.

Discussion

The current study found that intuitive cannabis constituent labelling strategies that include symbols or simple, common units of measurement such as “dose” were better understood by Canadian youth and young adults compared to THC numbers. These findings are consistent with existing literature regarding the ways in which consumers interact with product information including pre-packaged food and beverage or tobacco products.^{28,29,30,32,33} The inclusion of easily understandable THC and serving size considerations on product packaging is an important approach to educate the public on the consumption of cannabis products, particularly among first time and low-literacy populations. These findings are consistent with consumer studies of nutrition labelling, in which the use of simple, interpretive information increases consumer understanding.³⁶ Although there may be a tendency for regulators to present information in precise and accurate technical terms (e.g., mg, mL), doing so is likely to be less effective in conveying the necessary understanding for consumers to make accurate choices about dosing and potency of cannabis products. The current study demonstrated that only a third of consumers accurately identified a high potency product for what it was when technical information was presented compared to the traffic light system. It should also be noted that even for the most effective labelling condition, in which the number of doses was displayed on packages, almost half of participants continued to select an incorrect consumption amount or indicated that they did not know how much of the cannabis edible to consume. This highlights the importance of other packaging standards, such as unit-dose packaging, in which each THC serving or dose is packaged separately, rather than multi-

serving units, such as the cannabis cookie tested in the current study which are common to both the legal and illegal cannabis markets. For example, Canada has recently proposed new regulations for edibles, in which each 10mg unit of THC must be packaged separately.³⁷ This represents a more prescriptive approach than US states such as Colorado, which require 10mg servings to carry individual cannabis symbols, but not to be packaged separately.

The findings also suggest that interpretative symbols may be effective in providing context for THC levels with respect to whether they are ‘high’ or ‘low’. This is particularly important given the diversification of the cannabis market and the wide range of THC levels in products, ranging from very low THC products, to concentrates that can exceed 90% THC levels. The findings are consistent with the use of traffic light symbols to communicate nutrient amounts and research on the efficacy of graphic formats in enhancing consumer comprehension^{38,39,40} However, one potential limitation of traffic light symbols is that a ‘green’ or ‘low’ symbol can be misinterpreted by consumers as an indicator of permissiveness or decreased risk.^{41,42,43} In the case of cannabis products, consumption amounts are ultimately determined by consumers, and ‘lower’ or ‘moderate’ THC products can still be consumed in excessive amounts. For example, in the current study, a green traffic light was equated to 5% THC or 5mg THC, which to a regular cannabis consumer may be ‘low’ potency; however, a first-time or novice user may not consider it ‘low’. Perhaps for this reason, the Quebec government in Canada has avoided any symbol or descriptor associated with ‘low’ when labelling cannabis products on its government-run online cannabis store; instead, products are labelled ‘moderate’, ‘medium’, or ‘high’ depending on the THC level.⁴⁴

Existing online retail practices from the Ontario Cannabis Store use percentages, allow ambiguous language such as “mid-range THC Content” to describe product potency, product experience as having a “woody and earthy aroma”, with expected effects to include “relaxation,

happiness and/or euphoria”.⁴⁵ The limited objective information to make decisions about product use may be outweighed by a wide range of pleasant product descriptors that may promote initiation and continued consumption of cannabis among the Canadian population. Additional research should examine the efficacy of symbols and other graphical formats for communicating THC levels and potency through product labelling.

STRENGTHS AND LIMITATIONS

The commercial sample in the current study used probability and non-probability-based recruitment methods. As a result, the findings may not be representative of Canadian youth and young adults. However, a broad and diverse sample was surveyed with similar sociodemographic characteristics and patterns of cannabis use as the 2017 Canadian Cannabis Survey.⁵ The sample consisted of young people aged 16 to 30 exclusively. This subgroup has the highest rates of cannabis use in Canada and a key population of interest in legalization efforts. Another limitation may be in the alignment of the mocked-up product potencies; for example, in the second experimental task, the quantity of dried herb was not labelled on the container; therefore, 100mg THC may not neatly align with a 25% THC product, further the quantities of each product were not displayed which would help inform consumers gauge level of THC. Study strengths include the use of between-group experimental design as well as the use of existing products within our experimental conditions and demonstration of parallel findings between tobacco control and nutrition literature.

Conclusion

THC numbers used to express potency have little or no meaning to most youth and young adults in Canada. Expressing THC in terms of the number of ‘doses’ or servings may provide consumers with better guidance on consumption amounts for cannabis edibles; however, additional measures, such as unit-dose packaging, may be required to provide consumers with

clear, unequivocal guidance on THC levels. Future research should consider whether other labelling, such as symbols or descriptors provide additional benefit.

Table 1 – Sample characteristics (N=870)

		% (N)
Sex	Female	52.1 (453)
	Male	47.9 (417)
Age (years)	16–18	25.2 (219)
	19–24	30.7 (267)
	25–30	44.1 (384)
Race	White	64.5 (561)
	Non-white	35.5 (309)
Cannabis use status	Never use	41.5 (361)
	Ever use, not in past 30 days	36.0 (313)
	Current use, within past 30 days	22.5 (196)

Table 2 –Interpreting recommended serving size contained in a cannabis package without THC indicators, “mg THC” label, or “Doses” label (N=870).

Experimental conditions



No THC Label Control
n=296

“mg THC” Label
n=284

“Doses” Label
n=290









	No THC Label Control n=296	“mg THC” Label n=284	“Doses” Label n=290
How much should someone eat on one occasion if they wanted a recommended serving?			
¼ of a cookie*	7.4 (22)	13.4 (38)	54.1 (157)
½ of a cookie	8.1 (24)	11.3 (32)	5.9 (17)
¾ of a cookie	1.7 (5)	1.1 (3)	1.0 (3)
1 cookie	37.8 (112)	27.8 (79)	16.9 (49)
2 cookies	3.4 (10)	2.1 (6)	1.0 (3)
3 cookies	0.3 (1)	0.0 (0)	0.3 (1)
More than 3 cookies	0.3 (1)	0.4 (1)	2.8 (8)
I don’t know	49.9 (121)	44.0 (125)	17.9 (52)
How many servings are in this package?			
1 serving	33.8 (100)	29.9 (85)	9.7 (28)
2 servings	7.1 (21)	7.4 (21)	1.0 (3)
3 servings	3.4 (10)	2.8 (8)	0.7 (2)
4 servings*	5.1 (15)	6.0 (17)	77.9 (226)
5 servings	1.0 (3)	2.5 (7)	0.0 (0)
More than 5 servings	2.0 (6)	1.8 (5)	0.7 (2)
I don’t know	47.6 (141)	49.6 (141)	10.0 (29)

*‘Correct’ answer.

Table 3 – Relative risk estimates examining correct responses to questions regarding recommended serving size and number of servings in cannabis product packages

Characteristics	Comparison	Correct Response %	Correctly identified recommended serving size		Correct Response %	Correctly identified servings in package		
			RR	95%CI		RR	95%CI	
Age (years)	19-24	16-18	25.1% v. 20.1%	1.25	0.89-1.75	29.6% v. 29.7%	0.98	0.76-1.31
	25-30	16-18	27.6% v. 20.1%	1.37	1.01-1.87	29.7% v. 29.7%	1.00	0.78-1.29
	19-24	25-30	25.1% v. 27.6%	0.91	0.70-1.18	29.6% v. 29.7%	1.00	0.78-1.27
Sex	Female	Male	24.9% v. 24.9%	1.00	0.79-1.26	31.4% v. 28.0%	0.89	0.73-1.10
Race	Non-White	White	26.2% v. 22.7%	0.87	0.67-1.11	31.2% v. 26.9%	0.86	0.69-1.07
Cannabis use status	Ever use, not in past 30 days	Never Use	23.3% v. 22.2%	1.05	0.80-1.39	28.1% v. 27.4%	1.03	0.80-1.31
	Current use, within past 30 days	Never Use	32.7% v. 22.2%	1.47	1.12-1.95	36.2% v. 27.4%	1.32	1.03-1.70
	Ever use, not in past 30 days	Current Use, within past 30 days	23.3% v. 32.7%	0.71	0.54-0.95	28.1% v. 36.2%	0.78	0.60-1.00
Labelling Condition	“mg THC” Label	No THC Label Control	13.4 % v. 7.4%	1.80	1.09-2.97	6.0% v. 5.1%	1.18	0.60-2.32
	“Doses” Label	No THC Label Control	54.1% v. 7.4%	7.28	4.81-11.04	77.9% v. 5.1%	15.38	9.36-25.28
	“Doses” Label	“mg THC” Label	54.1% v. 13.4%	4.05	2.96-5.54	77.9% v. 6.0%	13.02	8.18-20.73

Table 4 –Determining cannabis product potency through four labelling strategies, no THC label control, THC presented as a percentage, in milligrams, and a traffic light system; (N=870)

What is the level of THC in this marijuana product? %(n)					
					
LOW POTENCY	No THC Label Control	“5% THC” Label	“5mg THC” Label	Traffic Lights “Green”	
n=	204	232	232	202	
Low*	2.0 (4)	35.3 (82)	27.6 (64)	85.1 (172)	
Moderate	9.3 (19)	13.8 (32)	15.5 (36)	4.5 (9)	
High	6.4 (13)	4.3 (10)	3.9 (9)	1.5 (3)	
I don’t know	82.4 (168)	45.7 (106)	53.0 (123)	8.9 (18)	
					
HIGH POTENCY	No THC Label control	“25% THC” Label	“100mg THC” Label	Traffic Lights “Red”	
n=	231	220	221	198	
Low	3.5 (8)	15.9 (35)	7.2 (16)	2.5 (5)	
Moderate	8.7 (20)	30.9 (68)	18.1 (40)	1.5 (3)	
High*	5.2 (12)	22.7 (50)	29.0 (64)	86.4 (171)	
I don’t know	82.7 (191)	30.0 (66)	45.7 (101)	9.1 (18)	

*‘Correct’ answer.

Table 5 – Relative risk estimates examining correct responses to questions regarding cannabis product potency

Characteristics	Comparison	Correct Response %	Correctly identified cannabis with <u>low</u> potency		Correct Response %	Correctly identified cannabis with <u>high</u> potency		
			RR	95%CI		RR	95%CI	
Age (years)	19-24	16-18	38.3% v. 34.7%	1.11	0.87-1.40	31.3% v. 33.3%	0.94	0.73-1.22
	25-30	16-18	37.5% v. 34.7%	1.08	0.87-1.35	36.7% v. 33.3%	1.10	0.88-1.39
	19-24	25-30	38.3% v. 37.5%	1.02	0.84-1.25	31.3% v. 36.7%	0.85	0.68-1.06
Sex	Female	Male	34.9% v. 39.1%	1.12	0.94-1.34	35.6% v. 33.0%	0.93	0.77-1.11
Race	Non-White	White	38.4% v. 34.6%	0.90	0.75-1.09	34.7% v. 33.3%	0.96	0.79-1.17
Cannabis use status	Ever use, not in past 30 days	Never Use	37.5% v. 32.1%	1.17	0.95-1.44	34.0% v. 31.7%	1.07	0.86-1.33
	Current use, within past 30 days	Never Use	45.4% v. 32.1%	1.41	1.14-1.75	39.3% v. 31.7%	1.24	0.99-1.56
	Ever use, not in past 30 days	Current Use, within past 30 days	37.2% v. 45.4%	0.83	0.67-1.01	34.0% v. 39.3%	0.87	0.69-1.09
Labelling Condition	% THC	Trade name	35.3% v. 2.0%	18.10	6.76-48.52	22.7% v. 5.2%	4.40	2.41-8.03
	mg THC	Trade name	27.6% v. 2.0%	14.07	5.22-37.96	29.0% v. 5.2%	5.57	3.09-10.04
	Traffic Light System	Trade name	85.1% v. 2.0%	43.43	16.43-114.79	86.4% v. 5.2%	16.71	9.61-29.07
	%THC	Traffic Light System	35.3% v. 85.1%	0.42	0.35-0.50	22.7% v. 86.4%	0.26	0.21-0.34
	mg THC	Traffic Light System	27.6% v. 85.1%	0.32	0.26-0.40	29.0% v. 86.4%	0.33	0.27-0.41
	mg THC	%THC	27.6% v. 35.3%	0.97	0.76-1.23	29.0% v. 22.7%	1.27	0.92-1.75

Chapter 5: The efficacy of health warnings and package branding on perceptions of cannabis products among youth and young adults.

Cesar Leos-Toro BSc¹, Geoffrey T Fong PhD^{2,3}, David Hammond PhD¹

¹ School of Public Health & Health Systems, University of Waterloo, 200 University Ave. W., Waterloo, ON, Canada, N2L 3G1

² Department of Psychology, University of Waterloo, 200 University Ave. W., Waterloo, ON, Canada, N2L 3G1

³ Ontario Institute for Cancer Research, MaRS Centre, 661 University Avenue, Suite 510, Toronto, ON, Canada, M5G 0A3

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Corresponding Author

David Hammond
University of Waterloo
School of Public Health & Health Systems
200 University Ave W.
Waterloo, ON N2L 3G1
Tel. (519) 888-4567 ext. 36462
dhammond@uwaterloo.ca

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Overview

Background

Canada requires mandatory health warnings and restrictions on advertising and promotion as part of nonmedical cannabis legalization. Similar regulations have proven effective in shaping product perceptions and consumer behaviour in other domains; however, little empirical evidence exists about the efficacy of labeling and marketing restrictions in a regulated cannabis market. This study examined perceptions of cannabis product packaging designs, health warning labels (HWLs), and perceptions of packs displaying brand imagery and leading descriptors on measures of appeal, and perceived consumer attributes.

Design, Setting, Participants

An online experimental survey of Canadian cannabis users and non-users (N=870) aged 16 to 30 years containing 8 between-group experimental tasks.

Measurements

The primary outcomes were appeal and perceptions of consumer attributes of cannabis product packaging and HWLs including: greater likelihood of being younger, female, fashionable, health conscious, and likely to go out and party.

Findings

When cannabis product branding was present, respondents were more likely (AOR=1.76 95%CI 1.07-2.91 $p=0.027$) to report greater appeal than when branding was absent. When a HWL was present, respondents were less likely (AOR=0.52 95%CI 0.32-0.86 $p=0.010$) to report greater appeal than when absent. The presence of a celebrity sponsor (AOR=3.06 95%CI 2.16-4.36 $p<0.001$), music references (AOR=3.64 95%CI 2.37-5.60 $p<0.001$), or party references (AOR=12.29 95%CI 8.08-18.69 $p<0.001$) increased the likelihood that respondents perceived the product as targeted at someone younger, and a party lifestyle. Differences by cannabis use status were observed across experimental tasks; those that had ever used were more likely to find the presence of branding elements appealing.

Conclusions

Plain/standardized cannabis packs with a HWL were perceived as less appealing than those with branding or without a HWL. A variety of lifestyle associations can be communicated through brand imagery on cannabis packaging.

KEYWORDS: health warning labels, HWLs, packaging design, cannabis warning labels

Background

Advertising and promotion have a strong influence on consumer health behaviours, such as tobacco use.^{1,2,3,4} Advertising can influence perceptions of risks, as well as positive associations between smoking and desirable outcomes, such as independence, social approval, sexual attraction and thinness. Packaging represents an important component of product marketing and serves as the cornerstone of brand imagery, which encompasses logos, colours and other brand identities. Brand imagery encourages consumers to draw inferences about the contents of a package and the likely experience they will have as a result of consuming the product, including social identities.^{5,6,7,8}

Evidence from the tobacco and alcohol research domains indicates that the appearance of a product influences initiation of use, increased consumption, and brand loyalties.^{9,10,11,12,13} Indeed, independent studies and tobacco industry research documents regarding packaging characteristics and consumer perceptions have described the impact on subsequent consumer behaviour and the specific elicited perceptions of each packaging detail. For example, lighter colours communicate cues that elicit perceptions of reduced harm and strength, superior quality, and better brand recognition.^{14,15,16,17,18} Health-oriented descriptors (e.g., 100% organic) have been shown to increase intentions to purchase, increase general favourable perceptions, and reduce perceived harm associated with the product's use.¹⁹ Products presented in relatively slim and thin designs increase attractiveness (particularly among women), communicate milder content, and are perceived as less harmful.^{20,21,22} In contrast, plain/standardized packaging has been observed to elicit less perceived appeal, be perceived as less attractive, promote less projections of personality attributes (i.e., cool, popular), reduce perceptions of implied safety, and is perceived as less sophisticated than packs that display branding elements.

To date, few studies have investigated the impact of cannabis-specific marketing and its influence on consumer behaviour. Research conducted in the US suggests widespread

exposure to cannabis advertising, particularly through digital media.^{23,24} A study conducted in Oregon following legalization of non-medical cannabis in 2015 indicated higher levels of exposure to cannabis marketing than general US samples, primarily via storefronts, street signs, and billboards.²⁵ In California, exposure to medical cannabis advertisements among 6th and 8th graders was associated with a greater likelihood of cannabis use and stronger intentions to use one year later.²⁶ Furthermore, brain imaging studies suggest that cannabis marketing produces similar brain reactivity and reward cues as marketing for alcohol and tobacco products.²⁷

Packaging also serves as an important channel for communicating health risks through product labels and health warnings. In tobacco control, health warning labels (HWLs) have proven to be the most cost-effective medium to communicate information related to a product's health risks.²⁸ Large pictorial health warnings on tobacco products have been effective in changing social norms and reducing consumption, including among youth.²⁹ In Canada, dried cannabis products are required to display one of six different warnings communicating risks related to pregnancy, addiction, adolescent use, impaired driving, and psychosis/schizophrenia. Cannabis users may benefit from health warnings given that the most recently available evidence suggests that many cannabis users have low awareness of health effects and obtain their limited health information about cannabis from unreliable sources.^{30,31,32,33} To date, however, there is no empirical evidence on the impact of health warnings on cannabis products.

In October 2018, nonmedical cannabis was legalized in Canada. The federal *Cannabis Act* establishes several international precedents for restrictions on advertising and promotion, packaging, and labelling of cannabis products.³⁴ In particular, the Act prohibits any form of lifestyle advertising or promotion that appeals to young people, including restrictions on brand imagery of cannabis packaging.³⁵ Packaging restrictions on brand imagery are often referred to as 'plain' or 'standardized' packaging; however, unlike restrictions on tobacco packages, the cannabis regulations in Canada allow manufacturers to choose one colour (as opposed to mandating the same colour across all packages) and a certain amount of brand imagery

equivalent in size to the mandated ‘cannabis symbol’. Cannabis products will also be required to feature one of six large text-only health warnings. The cannabis industry is widely expected to issue a legal challenge to the package regulations in Canada. Similar challenges issues in response to tobacco packaging standards have required the independent effectiveness of health warnings and restrictions on pack branding. In this context, it is important to test the efficacy of standardized packaging with and without health warnings. The current study examined perceptions of standardized and branded packaging designs, perceptions of packs with and without HWLs, and perceptions of packs displaying brand imagery and leading descriptors on measures of appeal, perceived target age of consumer, and other characteristics and lifestyle associations including gender, party habits, health consciousness, and fashion sensibility.

Methods

Design

PARTICIPANTS

An online cross-sectional survey was conducted from October 10th to October 24th, 2017. The inclusion criteria were individuals aged 16 to 30 years of age with a Canadian IP address, included cannabis users and non-users, it required users to complete the survey from a desktop computer. Recruitment occurred by e-mail through Léger’s consumer panel for web surveys consisting of approximately 400,000 active members, half of them sampled using probability-based methods using the Canadian Census, along with other non-probability based methods, including commercial surveys.³⁶ Respondents aged 16 to 30 were recruited across Canada directly with the exception of youth in Quebec where youth aged 16 to 18 were recruited through their parents; parental consent was required prior to Quebec youth accessing the survey. Respondents received remuneration from Léger in accordance with their usual incentive structure. All of the data provided by respondents were anonymous and information was kept strictly confidential. In all cases, respondents were provided with information about the study and asked to provide consent before participating. They were reassured their

anonymity again after providing consent and proceeded to the survey. The study was reviewed by and received ethics clearance from the Office of Research Ethics at the University of Waterloo (ORE# 22392).

PROCEDURE

The current study consisted of a series of eight between-group experimental tasks. Participants were randomized before each of the eight experimental tasks to examine eight distinct package elements. Task 1 examined perceptions of brand imagery and health warnings where participants were randomized to one of the following four conditions: i) a plain/standardized pack that displayed a health warning label (HWL), ii) a plain pack without a HWL, iii) a branded pack that displayed a health warning label, and iv) a branded pack. For the remaining experimental tasks, respondents were repeatedly randomized into one of two conditions where the following branding characteristics were present or absent: Task 2) a flavour descriptor, Task 3) an ‘energy’ descriptor, Task 4) a celebrity sponsorship, Task 5) music references, Task 6) party references, Task 7) health claims, and Task 8) fashion references. Participants rated each pack on three dimensions: 1) *appeal*, 2) the *perceived target age* of the consumer, and 3) a pack-specific question on the design element of interest, such as *perceived gender*, *party habits*, *health perceptions*, or *fashion*, as shown in Tables 2, 4, 6, 8, and 10.

Measures

Sociodemographic characteristics included sex (male or female), age, ethnicity (white, non-white), and cannabis use status. Cannabis use status measures (‘never’ vs. ‘ever use’) were drawn from the Canadian Student Tobacco, Alcohol and Drugs Survey (CSTADS) – “During your lifetime have you ever used or tried marijuana?” (Yes=‘Ever Use’).³⁷

Product *Appeal* was rated using a ten-point scale from 0=“Not at all appealing” to 10=“Very appealing”. *Perceived target age* of consumer for each brand was assessed with the question, “In your opinion, someone who chooses to use this product is more likely to be...”

with answer options, “Younger than me”, “My age”, “Older than me”, “Don’t know”. A binary variable was created so that “Younger than me” was coded as 1 and the rest were coded as 0, “Not younger than me”. *Perceived gender* of the target consumer for products was assessed with the question, “In your opinion, someone who chooses to use this product is more likely to be...” with answer options, “Male”, “Female”, “No difference”, and “Don’t know”. A binary variable was created so that “Likely female” was coded as 1 and the rest were coded as 0, “Not likely female”. Perceived consumer characteristics were assessed with the following questions. To assess perceptions of the *party habits* they associated with the target consumer of each product, respondents were asked, “In your opinion, someone who chooses to use this product is more likely to...” with answer options, “Go out and party”, “Stay home”, “No difference”, and “Don’t know”. A binary variable was created so that “Go out and party” was coded as 1 and the rest were coded as 0, “Not go out and party”. The perceived level of target consumer’s *health consciousness* was determined with the question, “In your opinion, someone who chooses to use this product is more likely to be...”, with answers, “Someone who takes more care of their health”, “Someone who takes less care of their health”, “No difference”, and “Don’t know”. A binary variable was created so that “Someone who takes more care of their health” was coded as 1 and the rest were coded as “Not someone who takes more care of their health”. To assess perceptions of *fashion sense* associated with target consumer, respondents were asked, “In your opinion, someone who chooses to use this product is more likely to be...”, with answers, “More fashionable”, “Less fashionable”, “No difference”, and “Don’t know”. A binary variable was created so that “More fashionable” was coded as 1 and the rest were coded as 0, “Not more fashionable”.

Two data integrity questions were included in the survey, “What is the current month?” as well as, “One last question, did you feel you were able to provide ‘honest’ answers about your marijuana use during the survey?” with options, “No”, “Some questions, but not all”, “All questions”. Respondents that did not provide accurate answers for ‘current month’ or did not

feel that they were able to provide honest answers to ‘all questions’ were excluded from the analytic sample. The full survey document is available at: <http://davidhammond.ca/wp-content/uploads/2018/07/2017-Cannabis-Purchasing-Consumption-Tool-Survey-Document.pdf>.³⁸

Analysis

All analyses were conducted using SPSS Statistical Software (Version 25.0, Armonk, NY: IBM Corp.). The study sample was characterized using descriptive statistics with respect to: age, sex, ethnicity, and cannabis use status. Chi square tests were used to test the effectiveness of randomization and potential differences in age, sex, ethnicity, and cannabis use status between experimental conditions. Chi square tests and ANOVA models were used to examine differences in the experimental outcomes for categorical and continuous measures, respectively. Two-way interactions were tested and are presented in the text as appropriate. Linear regression models were fitted to examine correlates of continuous measures adjusting for age, sex, race, and cannabis use status. Logistic regression models examined correlates of target consumer attributes including perceived target age, likely gender, party habits, relative health consciousness, and fashion sense.

Results

SAMPLE CHARACTERISTICS

Table 1 displays the sample characteristics. A total of 1,045 respondents completed the survey; however, the final analytic sample was 870 as the rest were excluded from analysis due to completing survey from a mobile device instead of a desktop computer (28), missing data on key measures including cannabis use status (8) and/or failed data integrity questions; 62 records deleted due to incorrectly identifying the current month and 77 respondents reported being unable to provide honest answers to all of the survey questions. Due to inaccuracies in

Canadian internet provider geolocation, 172 respondents aged 16 to 18 years were asked for parental consent across Canada. Experimental Task 1 that examined plain packaging, branding, and health warning labels, was completed by 526 respondents; this discrepancy is due to a programming error wherein respondents were randomized into three conditions instead of four. Léger re-contacted all of the original survey respondents and 526 respondents completed the experimental task as intended; 22 cases were not part of the analytic sample due to responses “Don’t know” (19) or refusals to answer (3).

BRAND IMAGERY, PLAIN PACKAGING, & HEALTH WARNINGS

Table 2 displays respondents’ mean appeal scores and perceived consumer attributes for the packs displayed in the first experimental task. Table 3 displays the results for the 2 x 2 test of brand imagery and health warning labels (HWLs) that examined the influence of product branding (present or absent) and HWLs (present or absent) on ratings of appeal of cannabis products. Main effects of health warning labels ($F(1,493)=6.694, p=0.010$) and branding ($F(1,493)=4.542, p=0.034$) were detected on ratings of appeal of cannabis products. Packs that did not display a HWL ($M=5.03, SD=3.09$) received greater appeal scores on average, than packs that displayed a HWL ($M=4.44, SD=2.95$), ($MD=0.593, t(502)=2.21, 95\%CI 0.07-1.12, p=0.028$). Differences in means were not detected between branded ($M=4.98, SD=3.06$) and unbranded packs ($M=4.48, SD=2.99$) ($MD=-0.497, t(502)=-1.845, 95\%CI -1.21-0.03, p=0.066$). No interaction between the presence or absence of HWLs and branding was observed ($F(1,493)=0.659, p=0.417$).

Table 3 displays the full analyses of appeal, and perceptions of consumer attributes including target age and gender for the first experimental task. Respondents were more likely to rate the plain/standardized pack *without* a HWL as significantly more appealing ($AOR=2.38, 95\%CI 1.18-4.82, p=0.016$) than the plain pack bearing a HWL. Similarly, the branded packs with and without HWLs were rated as significantly more appealing than the plain pack

displaying a HWL (AOR=2.17, 95%CI 1.08-4.36, $p=0.029$; AOR=3.40, 95%CI 1.68-6.88, $p=0.001$, respectively).

A main effect of experimental condition on the perceived age of the target consumer was found ($X^2(3, 523)=16.970, p=0.002$). Differences were detected between conditions where branding and HWLs were present and absent ($X^2(1,523)=10.311, p=0.001$ and $X^2(1,523)=5.449, p=0.003$) and between plain packs with and without HWLs ($X^2(1,259)=8.368, p=0.004$). The plain pack that did not display a HWL was rated as being intended for a relatively younger target consumer less frequently than the other three conditions. When branding was present, respondents had twice the odds of perceiving the target consumer to be younger than when the product did not have the pink branding (AOR=1.76, 95%CI 1.07-2.91, $p=0.027$). Respondents were more likely (AOR=1.62, 95%CI 1.08-2.43, $p=0.020$) to report that the likely consumer was relatively younger than when HWLs or branding were displayed on product packs.

When the pink, stylized branding was present on a product's package, respondents were significantly more likely to report that the consumer was likely female (AOR=66.99, 95%CI 29.78-150.66, $p<0.001$). When HWLs were displayed, respondents were and less likely (AOR=0.61, 95%CI 0.42-0.90, $p=0.011$) to report that the consumer was likely female than when there were no HWLs on the package.

LIFESTYLE BRAND IMAGERY

Table 4 shows pack ratings for the experimental tasks examining the presence of flavour descriptors. A main effect was detected between the presence of a flavour descriptor and ratings of appeal ($F(1,824)=7.138, p=0.001$), ratings were higher when one was present ($M=6.39 SD=2.71$) than when one was not ($M=6.00 SD=3.00$). As displayed in Table 5, respondents were more likely to indicate greater appeal when a flavour was present on the product package (AOR=1.60, 95%CI 1.11-2.31 $p=0.012$) and that the target consumer was

likely female than when one was not present (AOR=4.47, 95%CI 3.22-6.21 $p<0.001$). Respondents that had ever used cannabis were more likely to report greater appeal scores when a flavour descriptor was displayed on the pack ($p<0.001$).

Table 6 shows pack ratings for the four experimental tasks examining energy descriptors, celebrity references, music references, and party references. Table 7 shows that, as expected, packs that displayed music or party references were more likely to be rated higher on appeal (AOR=1.86, 95%CI 1.28-2.69 $p=0.001$; AOR=2.55, 95%CI 1.77-3.68 $p<0.001$, respectively). This was not the case for packs that displayed celebrity references. The cannabis pack that was manipulated to include an energy descriptor produced a contrary finding as it received a significantly lower mean appeal rating than when an energy claim was absent (AOR=0.56 95%CI 0.39-0.80 $p=0.002$). Males reported greater ratings of mean appeal than females for packs that included music or party references. In fact, the highest mean ratings of appeal (5.95) in this set were for the cannabis pack that displayed music references, ‘Reggae Chill’ and an image of Bob Marley with traditional Rastafarian colours. Across experimental tasks displayed in Table 6, respondents that reported past or current cannabis use were more likely to report greater appeal scores than never users ($p<0.001$).

When celebrity sponsorships (AOR=3.06, 95%CI 2.16-4.36, $p<0.001$), music references (AOR=3.64, 95%CI 2.37-5.60, $p<0.001$), or party references (AOR=12.29, 95%CI 8.08-18.69, $p<0.001$) were displayed on packs, respondents were more likely to rate them as being intended for a relatively younger consumer. The cannabis packs that included energy descriptors (AOR=3.17, 95%CI 2.30-4.38, $p<0.001$), celebrity sponsorships (AOR=3.60, 95%CI 2.70-4.80, $p<0.001$), music references (AOR=3.99, 95%CI 2.80-5.70, $p<0.001$), or party references (AOR=30.82, 95%CI 20.42-46.50, $p<0.001$), were more likely to be rated as being targeted at consumers that were perceived to “like to party”.

Table 8 shows ratings of appeal, perceived target gender of consumer, as well as the likelihood that someone who uses the pack that bears the fashion descriptor ‘Vogue’ is

perceived as more fashionable. Table 9 shows that past or current cannabis users were more likely to report greater appeal scores than those that reported never having used ($p < 0.001$). The target consumer of the pack that displayed a fashion descriptor was perceived as someone who was more likely to be female (AOR=8.22, 95%CI 5.63-12.01, $p < 0.001$).

'ORGANIC / NATURAL' BRAND IMAGERY

Table 10 displays ratings for a cannabis pack that has a '100% natural/organic' descriptor on its pack, and one that does not have such descriptors. As shown in Table 11, past and current cannabis users were more likely to report greater appeal score when 'natural/organic' descriptors were present ($p < 0.001$). However, these descriptors did not affect ratings of appeal or perceptions of the target consumer's perceived age. As expected, the intended consumer of the pack that displayed a natural/organic descriptor was perceived as someone who was more likely to be health conscious (AOR=2.63, 95%CI 1.94-3.56, $p < 0.001$).

Discussion

The findings demonstrate that brand imagery on cannabis packaging can promote lifestyle associations and influence the appeal of cannabis products among young people. Consistent with previous research on tobacco products, plain/standardized cannabis packs with a health warning were perceived as the least appealing.^{39,40,41,42} As expected, differences in appeal were greater among female participants for those experiments that examined marketing strategies more likely to appeal to females: the branding tested in the experimental task featured female-oriented brand imagery in the form of pink packages with a floral design. Accordingly, females perceived the branded packs as significantly more appealing than the plain packages, relative to males. This is consistent with the finding that both males and females overwhelmingly perceived the target consumer to be males when the brand imagery was displayed; whereas only 3% of participants identified the plain packaging as overtly male. These findings are consistent with studies on tobacco products, in which plain packaging

reduces the effectiveness of influencing product perceptions of specific subgroups through branding. The findings also suggest that health warnings and plain packaging may have independent effects and work in a complementary fashion: in other words, plain packaging may reduce the appeal of products beyond the effect of health warnings alone as observed among tobacco products although further study is required to conclusively determine this for cannabis products.⁴³ The presence of health warning labels decreased the likelihood of young Canadians finding a cannabis product appealing. Health warnings can reduce the appeal of consumer products both by highlighting negative health effects and by displacing promotional branding that can enhance appeal.

The addition of fruit or candy flavours has previously been shown to increase the appeal of tobacco and alcohol products among young people, and among females in particular.^{44,45,46,47} In the current study, females perceived a peach-flavoured product as significantly more appealing than male respondents did. This is notable given the proliferation of cannabis edibles with similar fruit and candy flavours in legal markets.

The findings also demonstrate the variety of lifestyle associations that can be communicated through brand imagery on cannabis packaging. Robust associations were observed for female-oriented brand imagery, such as packs that displayed names such as ‘Vogue’. Previous work has demonstrated that products with typically feminine brand imagery have greater appeal to female consumers.^{48,49} Manipulations of lifestyle associations were detected with each pack except that which displayed an energy boosting claim; the reverse effect was seen: the pack without the ‘energy’ descriptor was rated as more appealing.

Previous research has shown that exposure to images of celebrities promotes associations between the product and the positive traits and lifestyle associated with the celebrity, which helps to normalize the product or behaviour.⁵⁰ The current study did not find significant differences in mean appeal ratings for cannabis packs that featured celebrity sponsorship, although the products were perceived to be targeting younger consumer who likes

to party, particularly among young female participants. In addition, the product displaying an image of Bob Marley was perceived as significantly more appealing and intended for younger consumers who “like to party”.

References such as ‘natural’ and ‘organic’ are among the most common health-oriented descriptors for consumable tobacco products, and have been shown to increase the appeal of food and tobacco products.^{19,51,52,53} In the current study, products labelled as “100% Natural Organic” were perceived as ‘less harmful’, with no effect on the perceived target age of products.

STRENGTHS AND LIMITATIONS

The sample was recruited from a commercial sample that used probability and non-probability-based recruitment methods; thus, the sample may not be fully representative of Canadian youth. Nevertheless, a broad and diverse sample with similar patterns of cannabis use and sociodemographic characteristics was recruited.⁵⁴ The current sample included 16 to 30 years old individuals; while this age group has the highest rates of cannabis use in Canada, it is unclear to what extent the current findings generalize to older adults, particularly given that marketing can have a greater impact among young people.⁴ It should be noted that a majority of youth required parental consent to opt into the survey, however, the prevalence of use among this age group in the current study (31%) is consistent with existing prevalence measures (28%) from the most recent nationally representative 2016/17 Canadian Students Tobacco, Alcohol and Drugs Survey.⁵⁵ It may also be possible that responses to later experimental tasks may have been influenced by the previous tasks – for example being shown what respondents may have considered appealing in the first task may have influenced their ratings of appeal in subsequent tasks. However, participants were randomized to each task separately; therefore, any effect of previous experimental tasks could not account for the difference observed between experimental conditions for subsequent tasks. A considerable

strength of the study was the between-group experimental design for testing packaging and brand imagery. The use of actual product images is also a strength, although the effects of brand imagery may be underestimated in an online environment compared to the experience of seeing or handling ‘real’ packages.

Conclusion

The study provides experimental evidence that branding on cannabis packaging can promote lifestyle associations and appeal to youth. The findings are consistent with evidence from tobacco and alcohol research on the importance of packaging and brand imagery to consumer behaviour and suggests the same principles may apply to cannabis products.^{56,57,58} The findings support the efficacy of marketing restrictions included in Canada’s *Cannabis Act*, which limit branding on packaging and marketing that appeals to young people.⁵⁹

Table 1 – Sample Characteristics (N=870)

		% (N)
Sex	Female	52.1 (453)
	Male	47.9 (417)
Age (years)	16–18	25.2 (219)
	19–24	30.7 (267)
	25–30	44.1 (384)
Ethnicity	White	64.5 (561)
	Non-white	35.5 (309)
Cannabis use status	Never use	41.5 (361)
	Ever use, not in past 30 days	36.0 (313)
	Current use, within past 30 days	22.5 (196)

Table 2 – Perceptions of brand imagery and health warnings among Canadian youth and young adults aged 16-30 years; Experimental Task 1 (n=526).




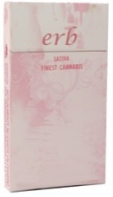
				
	Condition 1: PLAIN PACK DISPLAYING HWL	Condition 2: PLAIN PACK, NO HWL	Condition 3: BRANDED PACK DISPLAYING HWL	Condition 4: BRANDED PACK, NO HWL
$n_{\text{males}}=$	60	68	58	48
$n_{\text{females}}=$	69	63	76	84
Mean appeal (SD)	4.04 (2.94)	4.93 (2.98)	4.82 (2.92)	5.13 (3.20)
Mean appeal score among males (SD)	4.85 (3.05)	5.84 (3.07)	5.13 (2.87)	4.30 (2.78)
Mean appeal score among females (SD)	3.32 (2.66)	4.03 (2.63)	4.59 (2.95)	5.61 (3.35)
Consumer is ‘relatively younger’ %(n)	27.9 (36)	13.0 (17)	33.6 (45)	29.5 (39)
Among males %(n_{males})	31.7 (19)	10.3 (7)	37.9 (22)	27.1 (13)
Among females %(n_{females})	24.6 (17)	15.9 (10)	30.3 (23)	31.0 (26)
More likely to be female %(n)	2.3 (3)	3.1 (4)	50.7 (68)	72.7 (96)
Among males %(n_{males})	1.7 (1)	2.9 (2)	46.6 (27)	62.5 (30)
Among females %(n_{females})	2.9 (2)	3.2 (2)	53.9 (41)	78.6 (66)

Table 3 – Linear and logistic regressions examining appeal and perceptions of consumer attributes of plain and branded cannabis pack variations and health warning labels among Canadian youth and young adults aged 16-30 years (n=504).

Characteristics	Ref. Category		Appeal				Perceived consumer attributes							
			Mean Scores	p	AOR	95%CI	“relatively younger”				“more likely to be female”			
							Affirmative Response %	p	AOR	95%CI	Affirmative Response %	p	AOR	95%CI
Age	19-24	16-18	4.62 v. 4.49	0.214	0.64	0.32-1.30	14.9% v. 39.3%	<0.001	0.26	0.14-0.49	40.3% v. 21.4%	0.004	2.81	1.38-5.69
	25-30	16-18	4.92 v. 4.49	0.295	0.71	0.38-1.35	24.3% v. 39.3%	0.008	0.51	0.32-0.84	34.8% v. 21.4%	0.001	3.14	1.60-6.15
	19-24	25-30	4.62 v. 4.92	0.734	0.90	0.48-1.67	14.9% v. 24.3%	0.023	0.51	0.29-0.91	40.3% v. 34.8%	0.723	0.89	0.48-1.67
Sex	Male	Female	5.08 v. 4.46	0.020	1.82	1.10-3.03	26.1% v. 26.0%	0.838	1.04	0.69-1.58	25.6% v. 38.0%	0.024	0.55	0.33-0.92
Race	White	Non-White	4.77 v. 4.65	0.527	0.84	0.50-1.43	28.0% v. 22.2%	0.166	1.37	0.88-2.14	34.7% v. 28.3%	0.052	1.71	0.99-2.93
Cannabis Use	Past use, not past 30 days	Never Use	5.21 v. 3.74	<0.001	4.86	2.68-8.82	23.2% v. 29.5%	0.724	0.91	0.55-1.50	34.3% v. 29.5%	0.961	0.99	0.54-1.81
	Current use, within past 30 days	Never Use	6.00 v. 3.74	<0.001	10.79	5.42-21.46	23.8% v. 29.5%	0.594	0.86	0.48-1.52	36.2% v. 29.5%	0.392	1.36	0.67-2.74
	Past use, not in past 30 days	Current use, within past 30 days	5.21 v. 6.00	0.020	0.55	0.33-0.91	23.2% v. 23.8%	0.825	1.07	0.59-1.93	34.3% v. 36.2%	0.376	0.73	0.37-1.49
Experimental Condition	Plain pack, no HWL	Plain pack, HWL	4.93 v. 4.04	0.016	2.38	1.18-4.82	13.0% v. 27.9%	0.004	0.38	0.20-0.73	3.1% v. 2.3%	0.731	1.31	0.28-6.00
	Branded pack, HWL	Plain pack, HWL	4.82 v. 4.04	0.029	2.17	1.08-4.36	33.6% v. 27.9%	0.237	1.39	0.81-2.39	50.7% v. 2.3%	<0.001	49.68	14.79-166.84
	Branded pack, no HWL	Plain pack, HWL	5.13 v. 4.04	0.001	3.40	1.68-6.88	29.5% v. 27.9%	0.517	1.20	0.69-2.10	72.7% v. 2.3%	<0.001	130.31	38.04-446.44
	Branded pack, HWL	Plain pack, no HWL	4.82 v. 4.93	0.798	0.91	0.45-1.84	33.6% v. 13.0%	<0.001	3.64	1.92-6.90	50.7% v. 3.1%	<0.001	38.03	13.05-110.82
	Branded pack, no HWL	Plain pack, no HWL	5.13 v. 4.93	0.324	1.43	0.70-2.90	33.6% v. 13.0%	0.001	3.15	1.64-6.05	72.7% v. 3.1%	<0.001	99.77	33.45-297.52
Branded pack, no HWL	Branded pack, HWL	5.13 v. 4.82	0.207	0.64	0.32-1.28	29.5% v. 33.6%	0.601	1.154	0.68-1.97	72.7% v. 50.7%	<0.001	0.01	0.00-0.03	
	Packs with HWL	Packs without HWL	4.44 v. 5.03	0.010	0.52	0.32-0.86	30.8% v. 21.3%	0.020	1.62	1.08-2.43	27.0% v. 38.0%	0.011	0.61	0.42-0.90
	Branded Packs	Plain Packs	4.98 v. 4.48	0.027	1.76	1.07-2.91	31.6% v. 20.4%	0.001	1.96	1.30-2.96	61.7% v. 2.7%	<0.001	66.99	29.78-150.66

Table 4 – Perceptions of flavoured products among Canadian youth and young adults aged 16-30 years; Experimental Task 2 (N=870).



	 Condition 1: FLAVOUR DESCRIPTOR	 Condition 2: NO FLAVOUR DESCRIPTOR
n _{males} =	203	214
n _{females} =	218	235
Mean appeal (SD)	6.39 (2.71)	6.00 (3.00)
Mean appeal - males (SD)	6.07 (2.72)	6.26 (2.94)
Mean appeal - females (SD)	6.66 (2.67)	5.77 (3.06)
Consumer is 'relatively younger' %(n)	26.4 (111)	26.1 (117)
Among males %(n _{males})	26.1 (53)	26.6 (57)
Among females %(n _{females})	26.6 (58)	25.5 (60)
More likely to be female (%n)	43.5 (183)	15.1 (68)
Among males %(n _{males})	33.0 (67)	13.1 (28)
Among females %(n _{females})	53.2 (116)	17.0 (40)

Table 5 – Linear and logistic regressions examining appeal and perceptions of consumer attributes of packs with flavour descriptors among Canadian youth and young adults aged 16-30 years (n=830).

Characteristics	Ref. Category		Perceived consumer attributes												
			Appeal				"relatively younger"						"more likely to be female"		
			Mean Scores	<i>p</i>	AOR	95%CI	Affirmative Response %	<i>p</i>	AOR	95%CI	Affirmative Response %	<i>p</i>	AOR	95%CI	
Age	19-24	16-18	6.44 v. 5.95	0.468	0.83	0.50-1.38	21.0% v. 9.1%	0.001	2.63	1.50-4.61	26.6% v. 30.6%	0.196	0.75	0.48-1.16	
	25-30	16-18	6.15 v. 5.95	0.017	0.56	0.34-0.90	39.8% v. 9.1%	<0.001	6.42	3.80-10.83	29.6% v. 30.6%	0.990	1.00	0.66-1.52	
	19-24	25-30	6.44 v. 6.15	0.073	1.49	0.96-2.30	21.0% v. 39.8%	<0.001	0.41	0.29-0.59	26.6% v. 29.6%	0.130	0.75	0.51-1.09	
Sex	Male	Female	6.17 v. 6.21	0.630	0.91	0.63-1.32	26.4%v. 26.1v%	0.952	0.99	0.72-1.37	22.8% v. 34.5%	<0.001	0.50	0.36-0.69	
Race	White	Non-White	6.04 v. 6.47	<0.001	0.49	0.33-0.73	27.7% v. 23.7%	0.241	1.23	0.87-1.73	29.1% v. 28.6%	0.413	0.87	0.62-1.22	
Cannabis Use	Past use, not past 30 days	Never Use	6.75 v. 5.13	<0.001	6.54	4.20-10.19	31.4% v. 20.6%	0.650	1.09	0.70-1.65	31.1% v. 29.4%	0.832	1.04	0.72-1.52	
	Current use, within past 30 days	Never Use	7.20 v. 5.13	<0.001	10.01	6.10-16.41	28.6% v. 20.6%	0.742	1.08	0.74-1.60	24.5% v. 29.4%	0.610	0.89	0.58-1.38	
	Past use, not in past 30 days	Current use, within past 30 days	6.75 c. 7.20	0.090	0.65	0.40-1.07	31.4% v. 28.6%	0.938	1.02	0.68-1.53	31.1% v. 24.5%	0.484	1.17	0.76-1.80	
Experimental Condition	Flavour descriptor	No descriptor	6.39 v. 6.00	0.012	1.60	1.11-2.31	26.4% v. 26.1%	0.805	1.04	0.76-1.43	43.5% v. 15.1%^s	<0.001	4.47	3.22-6.21	

Table 6 – Perceptions of lifestyle brand references among Canadian youth aged 16-30 years; Experimental Tasks 3 to 6 (N=870).

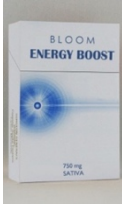






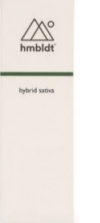
	EXPERIMENTAL TASK 3: ENERGY REFERENCE		EXPERIMENTAL TASK 4: CELEBRITY REFERENCE		EXPERIMENTAL TASK 5: MUSIC REFERENCE		EXPERIMENTAL TASK 6: PARTY REFERENCE	
								
	Condition 1: ENERGY DESCRIPTOR	Condition 2: NO ENERGY DESCRIPTOR	Condition 1: CELEBRITY SPONSOR	Condition 2: NO CELEBRITY SPONSOR	Condition 1: MUSIC REFERENCES	Condition 2: NO MUSIC REFERENCES	Condition 1: PARTY REFERENCES	Condition 2: NO PARTY REFERENCES
$n_{\text{males}}=$	220	197	208	209	217	236	192	225
$n_{\text{females}}=$	233	220	230	223	208	209	221	232
Mean appeal (SD)	5.08 (2.75)	5.62 (2.78)	5.99 (3.13)	5.73 (2.81)	5.95 (3.06)	5.36 (2.76)	5.63 (2.85)	4.72 (2.75)
Mean appeal - males (SD)	5.01 (2.84)	5.94 (2.81)	5.92 (3.24)	5.79 (2.82)	6.54 (3.05)	5.10 (2.76)	5.86 (2.96)	4.80 (2.87)
Mean appeal - females (SD)	5.14 (2.67)	5.34 (2.73)	6.06 (3.03)	5.67 (2.81)	5.39 (2.98)	5.59 (2.74)	5.43 (2.74)	4.65 (2.63)
Consumer is ‘relatively younger’ %(n)	9.5 (43)	11.0 (46)	31.3 (137)	14.8 (64)	22.1 (94)	7.6 (34)	45.0 (186)	8.1 (37)
Among males %(n_{males})	10.9 (24)	12.2 (24)	32.7 (68)	12.0 (25)	20.2 (42)	10.5 (22)	39.6 (76)	8.4 (19)
Among females %(n_{females})	8.2 (19)	10.0 (22)	30.0 (69)	17.5 (39)	24.0 (52)	5.1 (12)	49.8 (110)	7.8 (18)
More likely to ‘go out and party’ %(n)	38.6 (175)	16.8 (70)	56.4 (247)	26.6 (115)	34.4 (146)	11.9 (53)	70.9 (293)	7.4 (34)
Among males %(n_{males})	39.5 (87)	16.8 (33)	52.9 (110)	24.4 (51)	34.1 (71)	11.5 (24)	65.6 (126)	10.7 (24)
Among females %(n_{females})	37.8 (88)	16.8 (37)	59.6 (137)	28.7 (64)	34.6 (79)	12.3 (29)	75.6 (167)	4.3 (10)

Table 7 – Linear and logistic regressions examining appeal and perceptions of consumer attributes of packs bearing lifestyle brand references among Canadian youth and young adults aged 16-30 years.

Characteristics	Ref. Category	Appeal						Perceived consumer attributes								
		Mean Scores			p	AOR		"relatively younger"			"more likely to be go out and party"					
		Mean	95%CI	p		AOR	95%CI	Affirmative Response %	p	AOR	95%CI	Affirmative Response %	p	AOR	95%CI	
Task 3	Age	19-24	16-18	5.24 v. 5.44	0.004	0.47	0.28-0.78	8.0% v. 4.1%	0.106	1.97	0.87-4.49	28.7% v. 27.4%	0.289	1.26	0.82-1.93	
Energy Reference (n=828)	Age	25-30	16-18	5.35 v. 5.44	0.003	0.48	0.29-0.77	15.5% v. 4.1%	<0.001	4.12	1.94-8.74	28.6% v. 27.4%	0.229	1.28	0.85-1.93	
		19-24	25-30	5.24 v. 5.35	0.960	0.99	0.64-1.53	8.0% v. 15.5%	0.007	0.48	0.28-0.82	28.7% v. 28.6%	0.919	0.98	0.68-1.41	
	Sex	Male	Female	5.45 v. 5.24	0.440	1.16	0.80-1.67	11.6% v. 9.1%	0.359	1.24	0.79-1.94	28.9% v. 27.8%	0.665	1.07	0.79-1.46	
		White	Non-White	5.18 v. 5.63	0.001	0.51	0.35-0.76	9.5% v. 11.8%	0.324	0.79	0.50-1.26	29.1% v. 26.9%	0.369	1.16	0.84-1.62	
	Cannabis Use	Past use, not in past 30 days	Never Use	5.70 v. 4.65	<0.001	3.86	2.48-6.01	12.3% v. 8.6%	0.767	1.08	0.63-1.85	27.7% v. 30.1%	0.390	0.85	0.59-1.23	
		Current use, past 30 days	Never Use	6.01 v. 4.65	<0.001	5.15	3.15-8.43	10.3% v. 8.6%	0.896	0.96	0.52-1.78	26.0% v. 30.1%	0.139	0.73	0.48-1.11	
	Condition	Past use, not in past 30 days	Current use, past 30 days	5.70 v. 6.01	0.246	0.75	0.46-1.22	12.3% v. 10.3%	0.682	1.13	0.63-2.02	27.7% v. 26.0%	0.476	1.17	0.77-1.77	
		Energy descriptor	No descriptor	5.08 v. 5.62	0.002	0.56	0.39-0.80	9.5% v. 11.0%	0.624	0.89	0.57-1.40	38.6% v. 16.8%	<0.001	3.17	2.30-4.38	
Task 4	Age	19-24	16-18	5.96 v. 5.78	0.113	0.65	0.38-1.11	20.4% v. 5.9%	<0.001	3.89	2.02-7.49	46.2% v. 42.7%	0.570	1.12	0.76-1.66	
Celebrity Sponsor (n=840)	Age	25-30	16-18	5.84 v. 5.78	0.011	0.52	0.31-0.86	35.1% v. 5.9%	<0.001	9.01	4.82-16.85	38.2% v. 42.7%	0.294	0.82	0.56-1.19	
		19-24	25-30	5.96 v. 5.84	0.332	1.26	0.79-1.99	20.4% v. 35.1%	<0.001	0.43	0.29-0.64	46.2% v. 38.2%	0.066	1.37	0.98-1.93	
	Sex	Male	Female	5.85 v. 5.87	0.741	0.94	0.63-1.38	22.4% v. 23.9%	0.361	0.85	0.60-1.20	38.9% v. 44.5%	0.142	0.81	0.60-1.08	
		White	Non-White	5.71 v. 6.13	0.001	0.51	0.34-0.76	23.0% v. 23.5%	0.557	0.90	0.62-1.29	42.4% v. 40.7%	0.964	1.01	0.74-1.37	
	Cannabis Use	Past use, not in past 30 days	Never Use	6.33 v. 4.96	<0.001	5.38	3.37-8.61	28.1% v. 17.2%	0.336	1.22	0.81-1.84	42.8% v. 40.9%	0.318	1.19	0.84-1.69	
		Current use, past 30 days	Never Use	6.76 v. 4.96	<0.001	7.74	4.60-13.00	26.5% v. 17.2%	0.263	1.30	0.82-2.05	41.8% v. 40.9%	0.540	1.13	0.77-1.66	
	Condition	Past use, not in past 30 days	Current use, past 30 days	6.33 v. 6.76	0.169	0.70	0.42-1.17	28.1% v. 26.5%	0.790	0.94	0.61-1.45	42.8% v. 41.8%	0.773	1.06	0.72-1.55	
		Celebrity reference	No celebrity reference	5.08 v. 5.62	0.078	1.42	0.96-2.08	9.5% v. 11.0%	<0.001	3.06	2.16-4.36	38.6% v. 16.8%	<0.001	3.60	2.70-4.80	
Task 5	Age	19-24	16-18	5.68 v. 5.43	0.052	0.60	0.36-1.01	13.6% v. 3.2%	<0.001	4.61	1.96-10.81	24.2% v. 28.1%	0.321	0.80	0.51-1.25	
Music Reference (n=827)	Age	25-30	16-18	5.75 v. 5.43	0.025	0.57	0.35-0.93	22.4% v. 3.2%	<0.001	9.00	3.98-20.39	19.5% v. 28.1%	0.066	0.67	0.43-1.03	
		19-24	25-30	5.68 v. 5.75	0.830	1.05	0.68-1.63	13.6% v. 22.4%	0.003	0.51	0.33-0.80	24.2% v. 19.5%	0.380	1.20	0.80-1.79	
	Sex	Male	Female	5.81 v. 5.50	0.257	1.24	0.85-1.80	15.5% v. 14.3%	0.645	1.10	0.74-1.64	23.0% v. 23.2%	0.760	0.95	0.68-1.33	
		White	Non-White	5.48 v. 5.96	<0.001	0.47	0.32-0.70	15.5% v. 13.7%	0.542	1.14	0.74-1.76	21.6% v. 25.8%	0.203	0.80	0.56-1.13	
	Cannabis Use	Past use, not in past 30 days	Never Use	6.12 v. 4.52	<0.001	6.67	4.25-10.48	17.7% v. 11.8%	0.736	1.09	0.67-1.75	21.0% v. 28.6%	0.230	0.78	0.53-1.17	
		Current use, past 30 days	Never Use	6.87 v. 4.52	<0.001	12.86	7.83-21.13	15.9% v. 11.8%	0.961	0.99	0.58-1.69	16.4% v. 28.6%	0.006	0.52	0.32-0.83	
	Condition	Past use, not in past 30 days	Current use, past 30 days	6.12 v. 6.87	0.009	0.52	0.32-0.85	17.7% v. 15.9%	0.714	1.10	0.66-1.83	21.0% v. 16.4%	0.093	1.52	0.93-2.47	
		Music reference	No music reference	5.95 v. 5.36	0.001	1.86	1.28-2.69	22.1% v. 7.6%	<0.001	3.64	2.37-5.60	33.4% v. 11.9%	<0.001	3.99	2.80-5.70	
Task 6	Age	19-24	16-18	5.17 v. 4.85	0.536	0.85	0.51-1.42	24.2% v. 5.9%	<0.001	5.57	2.85-10.90	37.6% v. 36.2%	0.985	1.01	0.61-1.67	
Party Reference (n=829)	Age	25-30	16-18	5.32 v. 4.85	0.662	0.90	0.55-1.46	38.5% v. 5.9%	<0.001	14.52	7.50-28.10	39.1% v. 36.2%	0.687	1.11	0.68-1.80	
		19-24	25-30	5.17 v. 5.32	0.812	0.95	0.61-1.47	24.2% v. 38.5%	<0.001	0.38	0.25-0.58	37.6% v. 39.1%	0.667	0.91	0.59-1.41	
	Sex	Male	Female	5.29 v. 5.03	0.291	1.22	0.84-1.77	23.0% v. 28.4%	0.025	0.65	0.44-0.95	36.3% v. 39.3%	0.580	0.90	0.62-1.31	
		White	Non-White	4.97 v. 5.49	<0.001	0.50	0.34-0.74	26.9% v. 23.9%	0.728	1.07	0.72-1.59	38.4% v. 37.0%	0.710	0.93	0.63-1.37	
	Cannabis Use	Past use, not in past 30 days	Never Use	5.49 v. 4.39	<0.001	3.42	2.18-5.36	29.8% v. 19.0%	0.895	1.03	0.66-1.61	40.6% v. 36.4%	0.268	1.29	0.82-2.01	
		Current use, past 30 days	Never Use	5.95 v. 4.39	<0.001	5.37	3.28-8.80	32.1% v. 19.0%	0.090	1.53	0.94-2.52	36.2% v. 36.4%	0.718	1.10	0.67-1.81	
	Condition	Past use, not in past 30 days	Current use, past 30 days	5.49 v. 5.95	0.071	0.64	0.39-1.04	29.8% v. 32.1%	0.099	0.67	0.42-1.08	40.6% v. 36.2%	0.526	1.17	0.72-1.93	
		Party reference	No party reference	5.63 v. 4.72	<0.001	2.55	1.77-3.68	45.0% v. 8.1%	<0.001	12.29	8.08-18.69	70.9% v. 7.4%	<0.001	30.82	20.42-46.50	

Table 8 – Perceptions of fashion related references among Canadian youth and young adults aged 16-30 years; Experimental Task 7 (N=870).



EXPERIMENTAL TASK 7: FASHION REFERENCE		
	 Condition 1: FASHION REFERENCE	 Condition 2: NO FASHION REFERENCE
$n_{\text{males}}=$	226	191
$n_{\text{females}}=$	228	225
Mean appeal (SD)	5.42 (2.96)	5.48 (2.82)
Mean appeal - males (SD)	5.21 (2.92)	5.51 (2.94)
Mean appeal - females (SD)	5.62 (2.99)	5.47 (2.72)
More likely to be female %(n)	45.6 (207)	10.1 (42)
Among males %(n_{males})	43.8 (99)	7.3 (14)
Among females %(n_{females})	47.4 (108)	12.4 (28)
More likely to be 'more fashionable' %(n)	51.3 (233)	48.1 (200)
Among males %(n_{males})	52.2 (118)	46.1 (88)
Among females %(n_{females})	50.4 (115)	49.8 (112)

Table 9 – Linear and logistic regressions examining appeal and perceptions of consumer attributes of packs bearing fashion references among Canadian youth and young adults aged 16-30 years (n=829).

Characteristics	Ref. Category		Appeal					Perceived consumer attributes								
			Mean Scores	p	AOR	95%CI	"more likely female"			"likely more fashionable"						
							Affirmative Response %	p	AOR	95%CI	Affirmative Response %	p	AOR	95%CI		
Age	19-24	16-18	5.62 v. 5.07	0.738	0.91	0.54-1.55	25.9% v. 23.3%	0.237	1.33	0.83-2.12	52.3% v. 48.2%	0.603	1.10	0.76-1.61		
	25-30	16-18	5.55 v. 5.07	0.289	0.76	0.46-1.26	33.9% v. 23.3%	0.006	1.84	1.19-2.86	49.7% v. 48.2%	0.928	0.98	0.69-1.40		
	19-24	25-30	5.62 v. 5.55	0.428	1.20	0.77-1.87	25.9% v. 33.9%	0.096	0.72	0.49-1.06	52.3% v. 49.7%	0.477	1.12	0.82-1.54		
Sex	Male	Female	5.34 v. 5.55	0.235	0.79	0.54-1.16	27.3% v. 30.2%	0.160	0.79	0.57-1.10	49.9% v. 50.3%	0.865	0.98	0.75-1.28		
Race	White	Non-White	5.31 v. 5.70	0.002	0.52	0.35-0.78	31.0% v. 24.5%	0.026	1.49	1.05-2.12	49.6% v. 51.0%	0.628	0.93	0.70-1.24		
Cannabis Use	Past use, not in past 30 days	Never Use	6.04 v. 4.48	<0.001	5.60	3.54-8.88	31.0% v. 25.1%	0.935	0.98	0.66-1.46	51.3% v. 47.2%	0.316	1.18	0.85-1.63		
		Current use, within past 30 days	Never Use	6.23 v. 4.48	<0.001	6.50	3.92-10.78	32.1% v. 25.1%	0.109	1.44	0.92-2.24	53.6% v. 47.2%	0.148	1.31	0.91-1.88	
	Past use, not in past 30 days	Current use, within past 30 days	6.04 v. 6.23	0.563	0.86	0.52-1.43	31.0% v. 32.1%	0.088	0.69	0.44=1.06	51.3% v. 53.6%	0.587	0.91	0.63-1.30		
Experimental Condition	Fashion reference	No fashion reference	5.42 v. 5.48	0.655	0.92	0.63-1.34	45.6% v. 10.1%	<0.001	8.22	5.63-12.01	51.3% v. 48.1%	0.254	1.17	0.89-1.53		

Table 10 – Perceptions of organic and natural brand references among Canadian youth and young adults aged 16-30 years; Experimental Task 8 (N=870).



8. ORGANIC / NATURAL DESCRIPTOR		
		
	Condition 1: ORGANIC/NATURAL DESCRIPTOR	Condition 2: NO ORGANIC/ NATURAL DESCRIPTOR
n _{males} =	226	191
n _{females} =	221	232
Mean appeal (SD)	5.97 (2.79)	6.18 (2.97)
Mean appeal - males (SD)	6.06 (2.81)	6.22 (2.98)
Mean appeal - females (SD)	5.88 (2.76)	6.15 (2.96)
Consumer is 'relatively younger' %(n)	6.5 (29)	7.6 (32)
Among males %(n _{males})	8.0 (18)	6.3 (12)
Among females %(n _{females})	5.0 (11)	8.7 (20)
More likely to be health conscious %(n)	42.3 (189)	21.7 (92)
Among males %(n _{males})	38.9 (88)	18.3 (35)
Among females %(n _{females})	45.7 (101)	24.7 (57)

Table 11 – Linear and logistic regressions examining appeal and perceptions of consumer attributes of packs bearing organic/natural references among Canadian youth and young adults aged 16-30 years (n=833).

Characteristics	Ref. Category		Appeal				Perceived consumer attributes								
			Mean Scores	p	AOR	95%CI	“relatively younger”				“likely more to be health conscious”				
							Affirmative Response %	p	AOR	95%CI	Affirmative Response %	p	AOR	95%CI	
Age	19-24	16-18	6.26 v. 5.70	0.489	0.84	0.51-1.39	5.3% v. 2.3%	0.135	2.24	0.78-6.47	38.9% v. 26.6%	0.054	1.50	0.99-2.27	
	25-30	16-18	6.16 v. 5.70	0.099	0.67	0.41-1.08	11.0% v. 2.3%	0.001	4.92	1.86-13.03	31.5% v. 26.6%	0.785	1.06	0.71-1.59	
	19-24	25-30	6.26 v. 6.16	0.303	1.26	0.81-1.93	5.3% v. 11.0%	0.015	0.46	0.24-0.86	38.9% v. 31.5%	0.045	1.42	1.01-2.00	
Sex	Male	Female	6.13 v. 6.02	0.733	1.07	0.74-1.54	7.2% v. 6.9%	0.983	1.01	0.59-1.72	29.9% v. 35.1%	0.062	0.75	0.56-1.01	
Race	White	Non-White	5.87 v. 6.45	<0.001	0.43	0.29-0.63	6.8% v. 7.5%	0.614	0.87	0.50-1.52	32.7% v. 32.1%	0.849	0.97	0.71-1.33	
Cannabis Use	Past use, not past 30 days	Never Use	6.53 v. 4.94	<0.001	6.37	4.08-9.93	8.6% v. 5.3%	0.531	1.23	0.65-2.34	36.1% v. 26.9%	0.054	1.43	0.99-2.05	
	Current use, within past 30 days	Never Use	7.33 v. 4.94	<0.001	13.43	8.25-21.86	7.7% v. 5.3%	0.681	1.17	0.56-2.41	36.2% v. 26.9%	0.089	0.97	0.71-1.33	
	Past use, not in past 30 days	Current use, within past 30 days	6.53 vs. 7.33	0.002	0.47	0.29-0.77	8.6% v. 7.7%	0.875	1.06	0.54-2.06	36.1% v. 36.2%	0.962	1.01	0.69-1.48	
Experimental Condition	Organic/Natural reference	No Organic/Natural reference	5.97 v. 6.18	0.095	0.73	0.51-1.06	6.5% v. 7.6%	0.422	0.81	0.47-1.37	42.3% v. 21.7%	<0.001	2.63	1.94-3.56	

Chapter 6

Discussion

The studies contained in this thesis provide important information and contribute to the very limited evidence on Canadian youth and young adults' perceptions of different aspects related to nonmedical cannabis in the year immediately preceding its legalization in Canada.

Health Knowledge and Perceptions of Risk

Chapter 2 addressed the first research question by providing an overview of young Canadians' health knowledge and perceptions of risk resulting from cannabis use in terms of its health effects and across product types and modes of administration. This is important as the literature in the area of young Canadian cannabis literacy is at a very early stage. Digital media and traditional media, including television and radio, were important sources of cannabis health information for our respondents, consistent with prior work in this area.^{1,2} Respondents reported seeing educational campaigns online, on television or radio, or at school most frequently. Additionally, approximately two-thirds of respondents were able to cite at least one important health effect associated with cannabis use, and one-fourth reported that they were most concerned about decreased brain and respiratory function. The findings indicate that young Canadians have a wide range perceptions regarding the potential health effects of cannabis which manifest themselves as underestimating or overestimating potential risks that may arise from using cannabis for nonmedical purposes.³ Younger Canadians aged 15 to 18 years and those that reported greater frequency of cannabis use were consistently less likely to perceive harm from cannabis use making them important targets for future educational campaigns. The findings suggest that exposure to educational campaigns may be beneficial, or it may reflect a bias in which those that believe that cannabis is harmful may more readily engage with educational campaigns. Increased risk perception of substance use behaviours is associated with reductions in use initiation, increased engagement in health protective

behaviours and long-term abstinence in the substance use literature.^{4,5,6,7,8,9} Another important outcome of the study was the identification of a false equivalency in perceived risk profiles between synthetic cannabis and dried herbal cannabis among youth and young people. This is a concern given the serious acute health effects of synthetic cannabis use, particularly given their characterization as a ‘legal high’ in many jurisdictions and widespread consumer confusion about these products.^{10,11,12,13,14}

Since the current work took place, the Government of Canada announced a \$9.6M investment public education and surveillance activities related to cannabis which will be important to examine changes in beliefs of cannabis-related health effects and perhaps due to exposure to public health education efforts.¹⁵ Recently, Constellation Brands, owners of Corona beer, announced an investment of \$4B into Canada’s top cannabis producer Canopy Growth; Altria, owners of cigarette brands like Marlboro, have made a \$1.86B investment into the Cronos Group, another Canadian cannabis producer; and Coca-Cola has also been in talks with Aurora to invest a still undisclosed amount in the Canadian cannabis industry.^{16,17} Public health communication efforts have the potential to be drowned out by industries that have been waiting to enter the market since at least 1970.^{18,19,20,21}

Cannabis health warning labels – perceptions of effectiveness and believability

Chapter 3 addressed the second research question by examining perceptions of effectiveness and believability of pictorial and text-only cannabis health warning labels, whether certain label themes were more likely to be recalled, evaluated levels of support for cannabis health warning labels, support for pictorial warnings, and whether calls to action such as quit lines and websites/further information should also be displayed. Pictorial cannabis health warning labels were found to be perceived as more effective and believable than text-only warnings, consistent with literature in tobacco control.^{22,23,24,25} There were no statistically

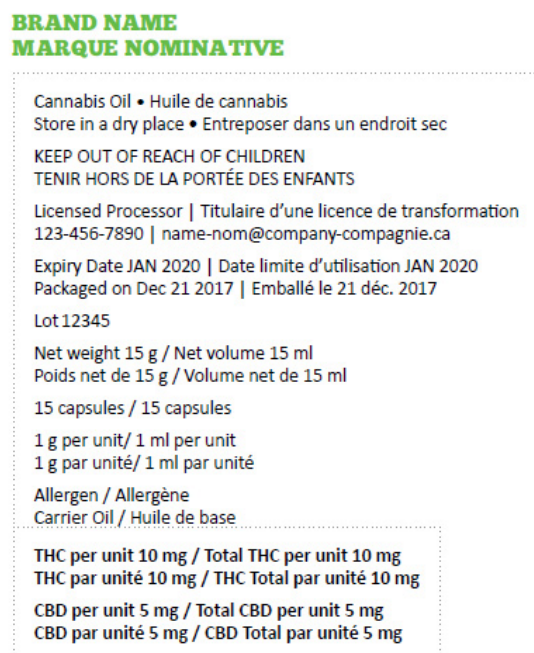
significant differences in recall detected between pictorial and text-only cannabis health warning labels which was unexpected given the graphic nature of the images that were used for the warning about pregnancy, for example. According to existing literature in tobacco control, warning labels that display and highlight stark and graphic images of physical health effects promote cognitive elaboration from its elicited emotional reaction and increase memory for the associated information.^{26,27,28} Nearly all respondents supported cannabis health warning labels and a majority supported the use of accompanying pictures and calls to action to be displayed on cannabis product packaging.

Although exposure to cannabis packaging may be somewhat lower than for tobacco products, health warnings provide broad reach among public education initiatives, are self-sustaining over time, and have minimal costs. Canadian cannabis regulations require text-only health warning labels, which may be a conscious effort to communicate higher relative risk for cigarettes, for which there are pictorial warnings in Canada. The only exception is the requirement for products to display a ‘universal’ symbol, which is intended to alert consumers that a package includes cannabis, particularly with respect to children and youth. It remains to be seen whether regulatory agencies in other jurisdictions opt for pictorial imagery as part on the ‘main’ health warnings on cannabis products.

Cannabis product constituent labelling

Chapter 4 addressed the third research question by exploring different approaches for labelling cannabis product potency and dosing information. The findings indicate that intuitive cannabis constituent labelling strategies that make use of simple interpretative or descriptive labels, such as “dose” or “low/high”, were better understood by Canadian youth and young adults. On the other hand, numbers, percentages, milligrams, and other quantitative information that may require math calculations were less successful effective in communicating THC levels and serving amounts.

Figure 1 – Health Canada’s example cannabis constituent label²⁹



Currently, the *Cannabis Act* requires the communication of THC/CBD content for dried cannabis and cannabis oil retail products. As pictured in Health Canada’s example label formatting requirements (**Figure 21**), existing regulations require a number of different units of measurement of contents.²⁹ This mode of presenting product constituents is at odds with our study’s findings of providing important information related to a product’s potency in an intuitive way to maximize understanding of the effects that a cannabis product may produce. These principles are particularly relevant for the legal sale of cannabis edibles and concentrates in October 2019.³⁰ Health Canada is proposing to label edibles and concentrates using THC numbers in a similar way as dried herb, although it has proposed ‘unit dose’ packaging, in which each edible can have a maximum of 10mg of THC.³¹ The current findings suggest that these packaging requirements will help inform consumers regarding ‘standard servings’ beyond the THC numbers printed on packages and are consistent with research in food labelling and tobacco constituent labelling.^{32,33,34,35,36}

Impact of packaging, branding, and health warning labels on cannabis product perceptions

Chapter 5 addressed the fourth research question which investigated the efficacy of health warnings and package branding (e.g., plain/standardized packaging), on perceptions of cannabis products among youth and young adults. Plain/standardized cannabis packages displaying health warnings were perceived as least appealing compared to branded packs with and without health warnings and the branded pack without a health warning, consistent with research in tobacco control.^{37,38,39,40} Our findings demonstrate that brand imagery on cannabis packaging can promote lifestyle associations and influence appeal among Canadian youth and young adults.

Health Canada released their final packaging requirements in March 2018.⁴¹ The requirements included restrictions on colours, graphics, and other special characteristics to reduce appeal of the product, particularly among youth.²⁹ Packaging for cannabis products should be opaque, enable inner and outer packaging to accommodate new product forms, and be child-resistant, tamper evident, prevent contamination, and maintain cannabis dry. The maximum amount of cannabis allowed in a single package will be 30 grams of dried herb – or the equivalent for other forms of cannabis and consistent with the amount that adults would be able to possess in public spaces under the *Cannabis Act*. An important lesson learned from tobacco control was that, short of prohibiting the substance, mandating comprehensive health warnings with vivid imagery and standardized packaging are effective measures for discouraging product use.^{42,43,44,45} Moving forward, it will be important to monitor industry practices and brand associations among consumers to address gaps in existing regulations. As noted previously in this section, multinational tobacco and beverage companies have entered the Canadian cannabis market and cross-branding with an existing products, like Coca-Cola, may increase the appeal of cannabis products particularly among young people.

Conclusion

In 2018, Canada became the second country in the world, after Uruguay, to legalize the nonmedical use of cannabis.⁴⁶ This regulatory shift represents a major health policy experiment that will set precedents for other countries that liberalize nonmedical cannabis policies. The current studies provide the first evidence to inform specific regulatory measures that may influence the impact of cannabis legalization on Canadian youth and young adults – populations of interest to the Canadian government. While current cannabis control regulations have adopted many of the lessons learned from tobacco control, they will require revision over time as we learn more.

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Chapter 1

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Chapter 2

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<http://ris.pmc.gov.au/sites/default/files/posts/2016/02/Tobacco-Plain-Packaging-PIR.pdf>

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Appendix 1 – Canadian Cannabis Study: Survey Document

Study Information & Informed Consent

WELCOME
[WELCOME]

Welcome!

STOP HERE IF YOU ARE USING A SMARTPHONE! The survey will only work on a laptop, desktop computer or tablet.

Do NOT click 'next' if you are using a smartphone: you will be locked out of the survey.

Close your browser and reopen the link on a laptop, desktop computer or tablet.

AGE
[AGE]

How old are you today? _____ [numeric]

PROGRAMMER NOTE: Numeric entry [Value [00] = 16 to 30]; IF [AGE<16 OR >30 ; “Sorry, you are not eligible to participate in this study, thank you for your time.”

INFO SCREEN
[INFO1]

Before you start the survey, please read the following information to let us know if you agree to participate. The purpose of this study is:

- (1) to examine patterns of marijuana or cannabis (a joint, pot, weed, hash, or hash oil etc.) use,
- (2) gather your thoughts and opinions about different aspects of health warning labels and symbols that may be present on marijuana products in the future,
- (3) examine knowledge, perceptions and behaviours related to the use of marijuana among Canadian youth and young adults, and
- (4) increase our general understanding of marijuana in Canadian society.

You will be asked about marijuana or cannabis use behaviours, demographics, and beliefs about marijuana use.

When we use the term marijuana or cannabis, this includes the dried herb, hashish, hash oil, wax or any other preparations of the plant commonly known as weed, pot, or ganja.

This study is being led by Dr David Hammond at the University of Waterloo, Canada.

To thank you for your time, you will receive the usual compensation from Léger.

This survey will take about 30 minutes to complete.

You must be between 16 and 30 years of age to participate in this study

Participation is voluntary. You can click, 'refuse to answer' to any question you do not wish to answer and will still receive your remuneration. You can withdraw your participation at any time by not submitting your response (e.g., by closing your browser); however, you will not receive remuneration.

All of the information you provide will be considered confidential and grouped with responses from other participants which means that there will be no way to identify participants individually.

The data will be stored for a minimum of 7 years in a secure University of Waterloo server. Researchers will not collect or use internet protocol (IP) addresses or other information which could link your participation to your computer or electronic device. When information is transmitted over the internet, privacy cannot be guaranteed. There is always a risk your responses may be intercepted by a third party (e.g., government agencies, hackers).

This study has been reviewed and received ethics clearance through a University of Waterloo Research Ethics Committee (ORE#22392).

If you have questions for the University of Waterloo Research Committee, contact the Chief Ethics Officer, Office of Research Ethics at 1-519-888-4567, ext. 36005 or ore-ceo@uwaterloo.ca.

For all other questions about the study, please contact Dr. David Hammond of the University of Waterloo at 1-519-888-4567 ext. 36462 or dhammond@uwaterloo.ca.



CONSENT
[CONSENT]

Based on the information you received, do you agree to take part in this research study being conducted by Dr. David Hammond of the University of Waterloo?

1=Yes
2=No

SECTION 1: Background Questionnaire

Initial Sociodemographic Questions

DEMOGRAPHICS
INTRO

The first few questions help us learn a little more about you.

To ensure confidentiality, we will group your responses with those of other respondents, which means **there will be no way to identify participants individually.**

UNIVERSE: ALL

SEX
[SEX.BIRTH]

What sex were you assigned at birth, on your original birth certificate?

Source: [GENIUSS](#)

1=Female

2=Male

UNIVERSE: ALL

GENDER
[SEX.GENDER]

How would you describe your gender identity today? (Select one)

Source: [GENIUSS](#)

1= Female

2= Male

3= Transgender

4= Do not identify as female, male, or transgender

5= Other _____

-77 Don't know

-88 Refuse to answer

UNIVERSE: ALL

**INDIGENOUS
[INDIGENOUS]**

*Source: Health Canada
Draft Survey*

Are you an Aboriginal person, that is, First Nations (North American Indian), Metis or Inuk (Inuit)?

Note: First Nations (North American Indian) includes Status and Non Status Indians.

- 1= No, not an Aboriginal person
- 2= Yes, First Nations (North American Indian)
- 3= Yes, Métis
- 4= Yes, Inuk (Inuit)

UNIVERSE: ALL; **IF** [INDIGENOUS=1] then continue to [ETHNICITY]; **IF** [INDIGENOUS>1], Skip to [PROVINCE]

**ETHNICITY
[ETHNICITY]**

Source: ITC 2016

People in Canada come from many racial and cultural groups. Select the group(s) that best apply to you.

Select all that apply.

- 1= White
- 2= South Asian (e.g., East Indian, Pakistani, Sri Lankan, etc.)
- 3= Chinese
- 4= Black
- 5= Filipino
- 6= Latin American
- 7= Arab
- 8= Southeast Asian (e.g., Vietnamese, Cambodian, Laotian, Thai, etc.)
- 9= West Asian (e.g., Iranian, Afghan, etc.)
- 10= Korean
- 11= Japanese
- 12= Other _____ (please specify without providing any identifiable information)
- 77 Don't know
- 88 Refuse to answer

UNIVERSE: RESPONDENTS WHO ANSWERED [INDIGENOUS=1]

**PROVINCE
[PROVINCE]**

Which province or territory do you currently reside (live) in?

- 1=British Columbia
- 2=Alberta
- 3=Saskatchewan
- 4=Manitoba
- 5=Ontario
- 6=Quebec
- 7=New Brunswick
- 8=Nova Scotia
- 9=Prince Edward Island
- 10=Newfoundland & Labrador
- 11=Yukon
- 12=Northwest Territories
- 13=Nunavut
- 77 Don't know
- 88 Refuse to answer

UNIVERSE: ALL

OCCUPATION
[OCCUPATION.MAIN]

Source: CCHS

Last week, was your main activity working at a paid job or business, looking for paid work, going to school, caring for children, household work, retired or something else?

- 1= Working at a paid job or business
- 2= Vacation (from paid work)
- 3= Looking for paid work
- 4= Going to school (including vacation from school)
- 5= Caring for children
- 6= Household work
- 7= Retired
- 8= Maternity/paternity leave
- 9= Long term illness
- 10= Volunteering
- 11= Care-giving other than for children
- 12= Other
- 77 Don't know

-88 Refuse to answer

UNIVERSE: ALL

**OCCUPATION
[WORK.12MON]**

Source: CCHS

Have you worked at a job or business at any time in the past 12 months?

1= Yes

2= No

-77 Don't know

-88 Refuse to answer

UNIVERSE: ALL

**OCCUPATION
[WORK.RISK]**

Source: NEW

Did your work in the past 12 months pose any risk to you or others, including driving or use of heavy equipment?

1= No risk

2= Minimal risk

3= Moderate risk

4= Substantial risk

-77 Don't know

-88 Refuse to answer

UNIVERSE: RESPONDENTS WHO ANSWERED [WORK.12MON=1]

Use & Consumption

CANNABIS USE INTRO

PROGRAMMER NOTE: MAKE FONT SIZE 1.5 TIMES THE SIZE OF THE TEXT IN THE SURVEY QUESTIONS.

The following questions ask about **cannabis or marijuana**. Marijuana can be used with medical approval, recreationally, or for other non-medical purposes.

We will use the term **marijuana** (also known as *pot, weed, hash, kush*) to refer to **all** of the different forms the plant and its preparations such as dried herb/flower, hash/hash oil, edible, concentrate (wax, shatter, etc.), liquid (tea, cola) etc.

Please include all of these forms and types of preparations when we ask you about '**marijuana**'.

NEXT

CANNABIS USE INTRO

PROGRAMMER NOTE: MAKE FONT SIZE 1.5 TIMES THE SIZE OF THE TEXT IN THE SURVEY QUESTIONS.

We understand this is a sensitive issue and some people aren't comfortable sharing this information.

Your answers to this survey will be anonymous and will never be stored with any personal information.

To protect your privacy, we don't collect your name, address, or any other contact information.

Thanks for being as honest as you can when answering.

NEXT

Have you ever tried marijuana?

1= Yes

2= No

-77 Don't know

-88 Refuse to answer

UNIVERSE: ALL

CANNABIS USE [EVER.TRY]

Source: CSTADS 2016/2017

**CANNABIS USE
[USE.RECENT]**

Source: CSTADS 2016/2017.

When was the last time you used marijuana?

- 1= More than 12 months ago
- 2= More than 3 months to 12 months ago
- 3= Between 1 to 3 months ago
- 4= Within the last month
- 77 Don't know
- 88 Refuse to answer

UNIVERSE: EVER.TRY=1

**CANNABIS USE
[CURRENT.USE]**

Source: CSTADS 2016/2017.

Do you currently use marijuana?

- 1= Less than once per month
- 2= Monthly
- 3= Weekly
- 4= Daily
- 77 Don't know
- 88 Refuse to answer

UNIVERSE: USE.RECENT=2-4

**CANNABIS USE
[USE.DAY]**

*Source: Health Canada Draft
Survey.*

How many days a week do you usually use marijuana?

- 1= Less than 1 day
- 2= 1 day
- 3=2 days
- 4=3 days
- 5=4 days
- 6=5 days
- 7=6 days
- 8=7 days
- 77 Don't know
- 88 Refuse to answer

UNIVERSE: CURRENT.USE=1-4

**CANNABIS USE
[USE.MODES]**

Source: Health Canada Draft Survey

In the past 12 months, did you use marijuana in any of the following ways?

	No, I have never done this	Yes, but not in past 12 months	Yes, in past 12 months
1= Smoked Dried herb/flower/leaf	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2= Vaporized Dried flower/flower/leaf	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3= Vaporized liquid form in an e-cigarette	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4= Mixed with or rolled in tobacco (e.g., blunt)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5= Hashish	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6= Hash oil	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7= Concentrate (e.g., butane honey oil, shatter, budder, wax etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8= Edibles (e.g. cookies)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9= Liquid (e.g., cola/tea)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
10= Tinctures (e.g., concentrated amounts ingested orally or taken under the tongue)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
11= Topical Ointments (e.g., lotions, salves, balms applied directly to the skin)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
12= Fresh flower/leaf (e.g., for juicing)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
13= Other _____ (please specify without providing any identifiable information)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

UNIVERSE: USE.RECENT=2,3,4

Note: In live survey, included columns, "Don't Know" and "Refuse to answer".

**CANNABIS USE
[MODE.FREQUENCY]**

In the past 12 months, how often did you use marijuana in the following ways?

PROGRAMMER NOTE: INSERT LIST OF OPTIONS SELECTED IN THE PAST 12 MONTHS FROM USE.MODES VARIABLE; SHOW IN TABLE FORMAT WITH OPTIONS LISTED BELOW.

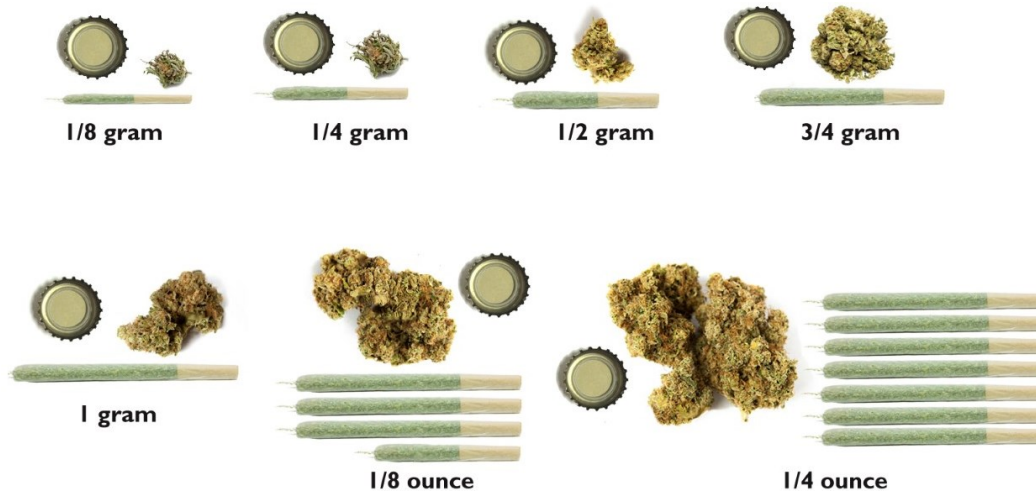
- 1=Less than once a month
- 2= Monthly
- 3=Weekly
- 4= Daily
- 77 Don't know
- 88 Refuse to answer

UNIVERSE: PAST 12 MONTH USERS OF EACH METHOD

CANNABIS USE
[SMOKETOB.AMOUNT1]

PROGRAMMER NOTE: DERIVE TIME FRAME (I.E., DAY/WEEK/MONTH/PAST-12MONTHS) BASED ON RESPONSE TO MODE.FREQUENCY

[In a usual day/In a usual week/ In a usual month/In the past 12-months], up to **HOW MUCH dried herb/flower/leaf** did you use? (Include smoking and vaping dried herb)



- 1= Less than 1/8 (one eighth) gram
- 2= 1/8 (one eighth) Gram
- 3= 1/4 (one quarter) Gram
- 4= 1/2 (half) Gram
- 5= 3/4 (three quarters) Gram
- 6= 1 gram
- 7= 2 grams
- 8= 3 grams
- 9= 1/8 (one eighth) Ounce
- 10= 1/4 (one quarter) Ounce
- 11= More than 1/4 (one quarter) Ounce
- 77 Don't know
- 88 Refuse to answer

UNIVERSE: MODE.FREQUENCY INCLUDES USE.MODES=1,2,4=PAST 12-MONTH USE

CANNABIS USE
[SMOKETOB.AMOUNT2]

PROGRAMMER NOTE: SHOW IMAGE: [H.DriedFlowerQtys.jpeg] ON THE RIGHT HAND SIDE OF THE SCREEN WITH ANSWER OPTIONS ON THE LEFT.

[In a usual day/In a usual week/ In a usual month/In the past 12-months], up to **HOW MUCH dried herb/flower/leaf** did you use? (Include smoking and vaping dried herb)]

Did you use...

- 1= Half of one ounce
- 2= One ounce
- 3= More than one ounce
- 77 Don't know
- 88 Refuse to answer

IF [SMOKETOB.AMOUNT2=3] ASK AND ALLOW TWO DECIMAL SPACES [000.00]:

[In a usual day/In a usual week/ In a usual month/In the past 12-months], up to **HOW MUCH dried herb/flower/leaf** did you use? (Include smoking and vaping dried herb)]

Please indicate the usual amount using ONE of the following:

[Numeric field] Number of **OUNCES** OR

[Numeric field] Number of **POUNDS** OR

[Numeric field] Number of **KILOGRAMS**

- 77 Don't know
- 88 Refuse to answer

UNIVERSE: SMOKETOB.AMOUNT1= 9

In the **past 12 months**, when you used **dried herb/flower/leaf**, about how much of time did you...



CANNABIS USE
[MIX]

Source: Health Canada Draft Survey.

	Never	Less than 1 in 10 times	Less than one quarter of the time	About half of the time	Three- quarters of the time	Almost all of the time	All the time
Vape without tobacco	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Vape with tobacco	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Smoke without tobacco	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Smoke with tobacco	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Smoke tobacco immediately after	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

UNIVERSE: USE.MODES=1,2,4=PAST 12-MONTH USE

Note: In live survey, included columns, “Don’t Know” and “Refuse to answer”.

CANNABIS SOURCE
[HERB.SOURCE1]

Source: Modified Health Canada
Survey Draft

In the **past 12 months**, how did you get the **DRIED HERB/FLOWER/LEAF** YOU USED?

Select all that apply.

- 1=I grew my own
- 2=It was grown for me
- 3=It was shared around a group of friends
- 4=From a family member or friend
- 5=From someone else I know
- 6=From a dealer (in person)
- 7=From a dealer (mail delivery)
- 8=medical marijuana through the mail from a licensed producer
- 9=medical marijuana from a store (e.g., a dispensary or compassion club)
- 10=non-medical marijuana from a store
- 11=Ordered it online (from someone other than a licensed producer)
- 12=Other _____ (please specify without providing any identifiable information)
- 77 Don’t know

-88 Refuse to answer

UNIVERSE: USE.RECENT=2-4 AND USE.MODES=1,2,4=PAST 12-MONTH USE

**CANNABIS SOURCE
[HERB.SOURCE2]**

*Source: Modified Health Canada
Survey Draft*

PROGRAMMER NOTE: IF HERB.SOURCE>1 OPTION SELECTED ASK:

What per cent (%) of **DRIED HERB/FLOWER/LEAF** did you get from each source:

[INSERT Sources selected from HERB.SOURCE1 with open fields for entry of % numbers that sum to 100%]

-77 Don't know

-88 Refuse to answer

**CANNABIS SOURCE
[SEED.PURCHASE]**

*Source: Modified Health Canada
Survey Draft*

PROGRAMMER NOTE: IF HERB.SOURCE=6-12 go to HERB.TIMEFRAME

PROGRAMMER NOTE: IF HERB.SOURCE=1 ASK:

Did you buy or pay for the **SEEDS** for plant you grew?

1= Yes

2= No

-77 Don't know

-88 Refuse to answer

**CANNABIS RESPONSE
[SEED.TIMEFRAME]**

We would like to know how many **SEEDS** you bought or paid for.

Which time-frame is easiest for you to report the amount of **SEEDS** you purchased; in a usual day, a usual week, a usual month, or a 12-month period?

1=Day

2=Week

3=Month

4=12-months (entire year)

5=I did not buy any of the marijuana I used over the past year

-77 Don't know

-88 Refuse to answer

UNIVERSE: SEED.PURCHASE=1

**PURCHASE AMOUNT
[PURCH.SEEDS]**

Source: New

In total, how many **SEEDS** did you **BUY** [**In a typical [day/week/month/ or In the past 12-months]**]....



ENTER NUMBER OF SEEDS: _____

- 77 Don't know
- 88 Refuse to answer

UNIVERSE: SEED.PURCHASE =1, POPULATE TIME FRAME WITH [TIMEFRAME.PURCH] VARIABLE

**MONEY SPENT
[MONEY.SEEDS]**

Source: New

In total, how much money did you spend on all of the **SEEDS** you bought [**In a typical [day/week/month/ or In the past 12-months]**]....

ENTER DOLLAR AMOUNT: _____

- 77 Don't know
- 88 Refuse to answer

UNIVERSE: PURCH.SEEDS, POPULATE TIME FRAME WITH [TIMEFRAME.PURCH] VARIABLE

**CANNABIS SOURCE
[HERB.PURCHASE]**

*Source: Modified Health Canada
Survey Draft*

PROGRAMMER NOTE: IF HERB.SOURCE=2-5 ASK:

Did you buy or pay for the **DRIED HERB/FLOWER/LEAF** you used?

- 1= Yes
- 2= No
- 77 Don't know
- 88 Refuse to answer

If yes: got to HERB.TIMEFRAME

CANNABIS RESPONSE
[HERB.TIMEFRAME]

We would like to know how much **DRIED FLOWER/HERB/LEAF** you bought or paid for.

Which time-frame is easiest for you to report the amount of **DRIED FLOWER/HERB/LEAF** you purchased; in a usual day, a usual week, a usual month, or a 12-month period?

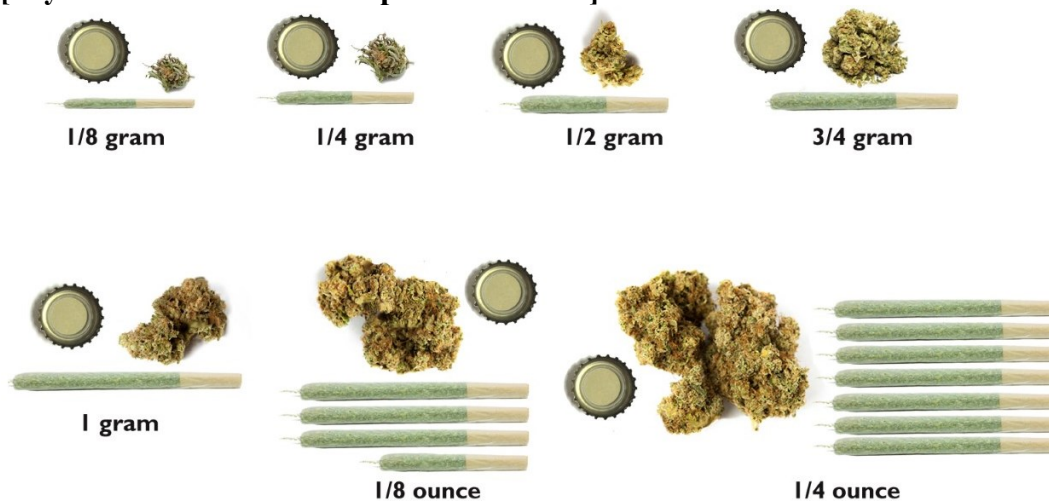
- 1=Day
- 2=Week
- 3=Month
- 4=12-months (entire year)
- 5=I did not buy any of the marijuana I used over the past year
- 77 Don't know
- 88 Refuse to answer

UNIVERSE: HERB.PURCHASE=1

PURCHASE AMOUNT
[PURCH.HERB1]

Source: New

In total, how much **DRIED FLOWER/HERB/LEAF** did you BUY [In a typical [day/week/month/ or In the past 12-months]....



- 1= Less than 1/8 (one eighth) gram
- 2= 1/8 (one eighth) Gram

- 3= ¼ (one quarter) Gram
- 4= ½ (half) Gram
- 5= ¾ (three quarters) Gram
- 6= 1 gram
- 7= 2 grams
- 8= 3 grams
- 9= 1/8 (one eighth) Ounce
- 10= ¼ (one quarter) Ounce
- 11= More than ¼ (one quarter) Ounce
- 77 Don't know
- 88 Refuse to answer

UNIVERSE: HERB.SOURCE=6-12 OR HERB.PURCHASE=1, POPULATE TIME FRAME WITH [HERB.TIMEFRAME] VARIABLE

PURCHASE AMOUNT
[PURCH.HERB2]

PROGRAMMER NOTE: SHOW IMAGE: [H.DriedFlowerQtys.jpeg] ON THE RIGHT HAND SIDE OF THE SCREEN WITH ANSWER OPTIONS ON THE LEFT.

Source: New

In total, how much **DRIED FLOWER/HERB/LEAF** did you BUY [**In a typical [day/week/month/ or In the past 12-months]....**]

Did you buy...

1= Half of one ounce

- 2= One ounce
- 3= More than one ounce
- 77 Don't know
- 88 Refuse to answer

IF [PURCH.HERB2=3] ASK AND ALLOW TWO DECIMAL SPACES [000.00]:

In total, how much **DRIED FLOWER/HERB/LEAF** did you BUY [In a typical [day/week/month/ or In the past 12-months]....

Please indicate the usual amount using ONE of the following:

[Numeric field] Number of **OUNCES** OR

[Numeric field] Number of **POUNDS** OR

[Numeric field] Number of **KILOGRAMS**

- 77 Don't know
- 88 Refuse to answer

UNIVERSE: PURCH.HERB1= 9



MONEY SPENT
[MONEY.HERB]

Source: New

In total, how much money did you spend on all of the **DRIED FLOWER/HERB/LEAF** you bought [In a typical [day/week/month/ or In the past 12-months]....

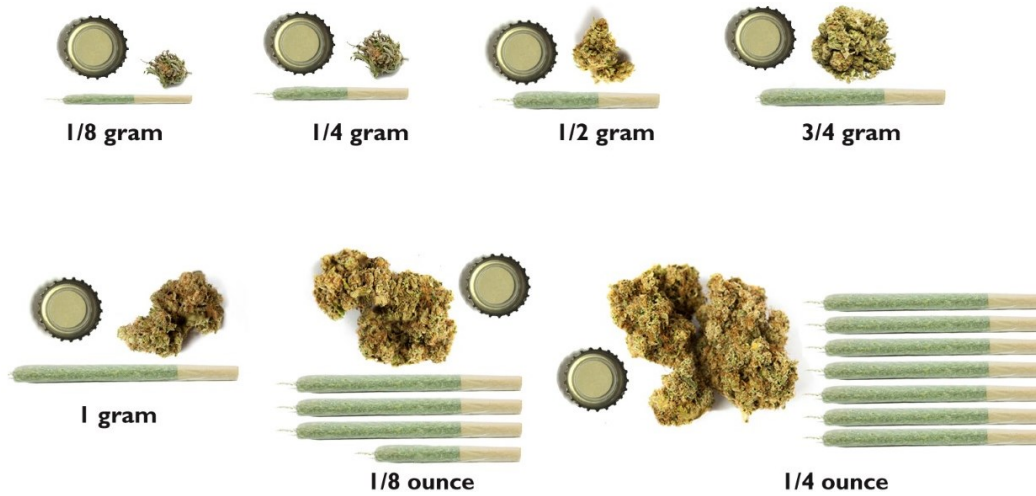
ENTER DOLLAR AMOUNT:

- 77 Don't know
- 88 Refuse to answer

UNIVERSE: PURCH.HERB, POPULATE TIME FRAME WITH [HERB.TIMEFRAME] VARIABLE

LAST PURCHASE
[LASTPURCH1]

THE LAST TIME you purchased **DRIED FLOWER/HERB/LEAF**, how much did you buy...



- 1= Less than 1/8 (one eighth) gram
- 2= 1/8 (one eighth) Gram
- 3= 1/4 (one quarter) Gram
- 4= 1/2 (half) Gram
- 5= 3/4 (three quarters) Gram
- 6= 1 gram
- 7= 2 grams
- 8= 3 grams
- 9= 1/8 (one eighth) Ounce
- 10= 1/4 (one quarter) Ounce
- 11= More than 1/4 (one quarter) Ounce
- 77 Don't know
- 88 Refuse to answer

LAST PURCHASE
[LASTPURCH1A]

UNIVERSE: PURCH.HERB=1
THE LAST TIME you purchased **DRIED FLOWER/HERB/LEAF**, how much did you buy...

Did you buy...

- 1= Half of one ounce
- 2= One ounce
- 3= More than one ounce
- 77 Don't know
- 88 Refuse to answer

IF [LASTPURCH1A=3] ASK AND ALLOW TWO DECIMAL SPACES [000.00]:

Thinking of the **LAST TIME** you purchased **DRIED FLOWER/HERB/LEAF**, please indicate the amount using one of the following:

[Numeric field] Number of **OUNCES** OR

[Numeric field] Number of **POUNDS** OR

[Numeric field] Number of **KILOGRAMS**

- 77 Don't know
- 88 Refuse to answer



LAST PURCHASE
[LASTPURCH2]

UNIVERSE: PURCH.HERB=1

THE LAST TIME you purchased **DRIED FLOWER/HERB/LEAF**, how much did you pay for the amount you bought?

ENTER DOLLAR AMOUNT: _____

- 77 Don't know
- 88 Refuse to answer

CANNABIS SOURCE
[HERB.MEDICAL]

UNIVERSE: PURCH.HERB=1

Do you use the **DRIED FLOWER/HERB/LEAF** for medical or non-medical reasons?

- 1= Medical
- 2= Non-medical
- 3= Both medical and non-medical
- 77 Don't know

Source: Modified Health Canada
Survey Draft

-88 Refuse to answer

UNIVERSE: USE.MODES=1,2,4

**CANNABIS SOURCE
[HERB.THCC1]**

*Source: Modified Health Canada
Survey Draft*

Do you know the **THC** level in the **DRIED FLOWER/HERB/LEAF** you usually used?

1= Yes

2= No

-88 Refuse to answer

UNIVERSE: USE.MODES=1,2,4

**CANNABIS SOURCE
[HERB.THCC2]**

*Source: Modified Health Canada
Survey Draft*

What is the usual **THC** level in the **DRIED HERB/FLOWER/LEAF** you used?

Enter number: _____ dropdown menu: mg THC, %THC

-88 Refuse to answer

UNIVERSE: USE.MODES=1,2,4 AND HERB.THCC1=1

**CANNABIS SOURCE
[HERB.CBD1]**

*Source: Modified Health Canada
Survey Draft*

Do you know the **CBD** level in the **DRIED HERB/FLOWER/LEAF** you usually used?

1= Yes

2= No

-88 Refuse to answer

UNIVERSE: USE.MODES=1,2,4

**CANNABIS SOURCE
[HERB.CBD2]**

*Source: Modified Health Canada
Survey Draft*

What is the usual level of CBD in the **DRIED HERB/FLOWER/LEAF** you used?

1= Insert CBD mg [] OR Insert CBD level % []

-88 Refuse to answer

UNIVERSE: USE.MODES=1,2,4 AND HERB.CBD1=1

**CANNABIS USE
[VAPELIQUID.AMOUNT]**

PROGRAMMER NOTE: SHOW IF MODE.FREQUENCY INCLUDES USE.MODES=3=PAST 12-MONTH USE
PROGRAMMER NOTE: ONLY IF MODE.FREQUENCY=1-4 FOR USE.MODE=3. DERIVE TIME FRAME BASED ON RESPONSE TO MODE.FREQUENCY

[In a usual day/In a usual week/ In a usual month/In the past 12-months], **HOW MUCH** marijuana liquid did you **VAPE?**



Enter number: _____ Dropdown menu: mL/Vape hits/fl oz

-77 Don't know

-88 Refuse to answer

CANNABIS SOURCE
[LIQUID.SOURCE1]

Source: Modified Health Canada
Survey Draft

In the **past 12 months**, how did you get the **MARIJUANA LIQUID** you vaped? Select all that apply.

1=I made my own

2=It was made for me

3=It was shared around a group of friends

4=From a family member or friend

5=From someone else I know

6=From a dealer (in person)

7=From a dealer (mail delivery)

8=medical marijuana through the mail from a licensed producer

9=medical marijuana from a store (e.g., a dispensary or compassion club)

10=non-medical marijuana from a store

11=Ordered it online (from someone other than a licensed producer)
12=Other _____ (please specify without providing any identifiable information)

-77 Don't know
-88 Refuse to answer

UNIVERSE: USE.MODES=3=PAST 12-MONTH USE

**CANNABIS SOURCE
[LIQUID.SOURCE2]**

*Source: Modified Health Canada
Survey Draft*

PROGRAMMER NOTE: IF LIQUID.SOURCE>1 OPTION SELECTED ASK:

What per cent (%) of **MARIJUANA LIQUID FOR VAPING** did you get from each source:

[INSERT Sources selected from LIQUID.SOURCE1 with open fields for entry of % numbers that sum to 100%]

-77 Don't know
-88 Refuse to answer

**CANNABIS SOURCE
[LIQUID.PURCHASE]**

*Source: Modified Health Canada
Survey Draft*

PROGRAMMER NOTE: IF LIQUID.SOURCE=6-12 go to LIQUID.TIMEFRAME

PROGRAMMER NOTE: IF LIQUID.SOURCE=1 ASK:

Did you buy or pay for the materials to make the **MARIJUANA LIQUID** you vaped?

1= Yes
2= No
-77 Don't know
-88 Refuse to answer

PROGRAMMER NOTE: IF LIQUID.SOURCE=2-5 ASK:

Did you buy or pay for the **MARIJUANA LIQUID** you vaped?

1= Yes
2= No
-77 Don't know
-88 Refuse to answer

If yes: got to LIQUID.TIMEFRAME

**CANNABIS RESPONSE
[LIQUID.TIMEFRAME]**

We'd like to know how much marijuana liquid you bought or paid for.

Which time-frame is easiest for you to report the amount of **MARIJUANA LIQUID FOR VAPING** you purchased; in a usual day, a usual week, a usual month, or a 12-month period?

- 1= Day
- 2=Week
- 3=Month
- 4=12-months (entire year)
- 5=I did not buy any of the marijuana I used over the past year
- 77 Don't know
- 88 Refuse to answer

UNIVERSE: CURRENT.USE =2-4, LIQUID.PURCHASE=1

PURCHASE AMOUNT
[PURCH.LIQUID]

Source: New

In total, how much **MARIJUANA LIQUID FOR VAPING** did you BUY [In a typical [day/week/month/ or In the past 12-months]....



Enter number: _____ mL

- 77 Don't know
- 88 Refuse to answer

MONEY SPENT
[MONEY.LIQUID]

Source: New

UNIVERSE: LIQUID.SOURCE=6-12 OR LIQUID.PURCHASE=1, POPULATE TIME FRAME WITH [LIQUID.TIMEFRAME] VARIABLE

In total, how much money did you spend on all of the **MARIJUANA LIQUID FOR VAPING** you bought **[In a typical [day/week/month/ or In the past 12-months]....**

ENTER DOLLAR AMOUNT:

-77 Don't know

-88 Refuse to answer

CANNABIS SOURCE
[LIQUID.MEDICAL]

Source: Modified Health Canada
Survey Draft

UNIVERSE: PURCH.LIQUID, POPULATE TIME FRAME WITH [LIQUID.TIMEFRAME] VARIABLE

Do you use the **MARIJUANA LIQUID** you vaped for medical or non-medical reasons?

1= Medical

2= Non-medical

3= Both medical and non-medical

-77 Don't know

-88 Refuse to answer

CANNABIS SOURCE
[LIQUID.THC1]

Source: Modified Health Canada
Survey Draft

UNIVERSE: USE.MODES=3

Do you know the **THC** level in the **MARIJUANA LIQUID** you usually vaped?

1= Yes

2= No

-88 Refuse to answer

CANNABIS SOURCE
[LIQUID.THC2]

Source: Modified Health Canada
Survey Draft

UNIVERSE: USE.MODES=3

What is the usual **THC** level in the **MARIJUANA LIQUID** you vaped?

Enter number: ____ Dropdown menu: mg THC, %THC

-88 Refuse to answer

UNIVERSE: USE.MODES=3 LIQUID.THC1=1

CANNABIS SOURCE
[LIQUID.CBD1]

Do you know the **CBD** level in the **MARIJUANA LIQUID** you usually vaped?

Source: Modified Health Canada
Survey Draft

- 1= Yes
- 2= No
- 88 Refuse to answer

UNIVERSE: USE.MODES=3

CANNABIS SOURCE
[LIQUID.CBD2]

What is the usual level of **CBD** in the **MARIJUANA LIQUID** you vaped?

Source: Modified Health Canada
Survey Draft

Enter number: _____ Dropdown menu: mg CBD, % CBD
-88 Refuse to answer

UNIVERSE: USE.MODES=3 LIQUID.CBD1=1

CANNABIS USE
[HASH.AMOUNT]

PROGRAMMER NOTE: SHOW IF MODE.FREQUENCY INCLUDES USE.MODES=5=PAST 12-MONTH USE
PROGRAMMER NOTE: ONLY IF MODE.FREQUENCY=1-4 FOR USE.MODE=5. DERIVE TIME FRAME BASED ON RESPONSE TO MODE.FREQUENCY

[In a usual day/In a usual week/ In a usual month/In the past 12-months], **HOW MUCH** hash or hashish did you **USE**?



Note: Each piece is about half a gram

Enter number: _____ Dropdown menu: Gram(s)/Hits/Tokes

- 77 Don't know
- 88 Refuse to answer

CANNABIS SOURCE
[HASH.SOURCE1]

In the **past 12 months**, how did you get the hash or hashish YOU USED? Select all that apply.

Source: Modified Health Canada
Survey Draft

- 1=I made my own
- 2=It was made for me
- 3=It was shared around a group of friends
- 4=From a family member or friend
- 5=From someone else I know
- 6=From a dealer (in person)
- 7=From a dealer (mail delivery)
- 8=medical marijuana through the mail from a licensed producer
- 9=medical marijuana from a store (e.g., a dispensary or compassion club)
- 10=non-medical marijuana from a store
- 11=Ordered it online (from someone other than a licensed producer)
- 12=Other _____ (please specify without providing any identifiable information)
- 77 Don't know
- 88 Refuse to answer

UNIVERSE: USE.MODES=5

CANNABIS SOURCE
[HASH.SOURCE2]

PROGRAMMER NOTE: IF HASH.SOURCE>1 OPTION SELECTED ASK:

Source: Modified Health Canada
Survey Draft

What per cent (%) of **HASH OR HASHISH** did you get from each source:

[INSERT Sources selected from HASH.SOURCE1 with open fields for entry of % numbers that sum to 100%]

- 77 Don't know
- 88 Refuse to answer

CANNABIS SOURCE
[HASH.PURCHASE]

PROGRAMMER NOTE: IF HASH.SOURCE=6-12 go to HASH.TIMEFRAME

Source: Modified Health Canada
Survey Draft

PROGRAMMER NOTE: IF HASH.SOURCE=1 ASK:

Did you buy or pay for the materials to make the **HASH OR HASHISH** you used?

- 1= Yes
- 2= No
- 77 Don't know
- 88 Refuse to answer

PROGRAMMER NOTE: IF HASH.SOURCE=2-5 ASK:

Did you buy or pay for the **HASH OR HASHISH** you used?

1= Yes

2= No

-77 Don't know

-88 Refuse to answer

If yes: got to HASH.TIMEFRAME

CANNABIS RESPONSE
[HASH.TIMEFRAME]

We would like to know how much hash or hashish you bought or paid for.

Which time-frame is easiest for you to report the amount of **HASH OR HASHISH** you purchased; in a usual day, a usual week, a usual month, or a 12-month period?

1= Day

2= Week

3= Month

4= 12-months (entire year)

5= I did not buy any of the marijuana I used over the past year

-77 Don't know

-88 Refuse to answer

UNIVERSE: HASH.PURCHASE=1

PURCHASE AMOUNT
[PURCH.HASH]

In total, how much **HASHISH OR HASHISH** did you **BUY** [In a typical [day/week/month/ or In the past 12-months]....

Source: New



Note: Each piece is about half a gram

Enter number: _____ Gram(s)

-77 Don't know

-88 Refuse to answer

UNIVERSE: HASH.SOURCE=6-12 OR HASH.PURCHASE=1, POPULATE TIME FRAME WITH [HASH.TIMEFRAME] VARIABLE

MONEY SPENT
[MONEY.HASH]

Source: New

In total, how much money did you spend on all of the **HASH OR HASHISH** you bought [**In a typical [day/week/month/ or In the past 12-months]....**]

ENTER DOLLAR AMOUNT:

-77 Don't know

-88 Refuse to answer

UNIVERSE: PURCH.HASH, POPULATE TIME FRAME WITH [HASH.TIMEFRAME] VARIABLE

CANNABIS SOURCE
[HASH.MEDICAL]

*Source: Modified Health Canada
Survey Draft*

Do you use the **HASH OR HASHISH** for medical or non-medical reasons?

1= Medical

2= Non-medical

3= Both medical and non-medical

-77 Don't know

-88 Refuse to answer

UNIVERSE: USE.MODES=5

**CANNABIS SOURCE
[HASH.THC1]**

*Source: Modified Health Canada
Survey Draft*

Do you know the **THC** level in the **HASH OR HASHISH** you usually used?

- 1= Yes
- 2= No
- 88 Refuse to answer

UNIVERSE: USE.MODES=5

**CANNABIS SOURCE
[HASH.THC2]**

*Source: Modified Health Canada
Survey Draft*

What is the usual **THC** level in the **HASH OR HASHISH** you used?

Enter number: ____ Dropdown menu: mg THC, %THC
-88 Refuse to answer

UNIVERSE: USE.MODES=5 HASH.THC1=1

**CANNABIS SOURCE
[HASH.CBD1]**

*Source: Modified Health Canada
Survey Draft*

Do you know the **CBD** level in the **HASH OR HASHISH** you usually used?

- 1= Yes
- 2= No
- 88 Refuse to answer

UNIVERSE: USE.MODES=5

**CANNABIS SOURCE
[HASH.CBD2]**

*Source: Modified Health Canada
Survey Draft*

What is the usual level of **CBD** in the dried **HASH OR HASHISH** you used?

Enter number: ____ Dropdown menu: mg CBD, %CBD
-88 Refuse to answer

UNIVERSE: USE.MODES=5 HASH.CBD1=1

**CANNABIS USE
[HASHOIL.AMOUNT]**

PROGRAMMER NOTE: SHOW IF **MODE.FREQUENCY** INCLUDES **USE.MODES=6=PAST 12-MONTH USE**
PROGRAMMER NOTE: ONLY IF **MODE.FREQUENCY=1-4** FOR **USE.MODE=6**. DERIVE TIME FRAME BASED ON RESPONSE TO **MODE.FREQUENCY**

[In a usual day/In a usual week/ In a usual month/In the past 12-months], **HOW MUCH** hash oil did you **USE**?



Enter number: _____ Dropdown menu: Gram(s), Hits/Tokes

CANNABIS SOURCE
[HASHOIL.SOURCE1]

Source: Modified Health Canada Survey Draft

In the **past 12 months**, how did you get the hash oil YOU USED? Select all that apply.

- 1=I made my own
- 2=It was made for me
- 3=It was shared around a group of friends
- 4=From a family member or friend
- 5=From someone else I know
- 6=From a dealer (in person)
- 7=From a dealer (mail delivery)
- 8=medical marijuana through the mail from a licensed producer
- 9=medical marijuana from a store (e.g., a dispensary or compassion club)
- 10=non-medical marijuana from a store
- 11=Ordered it online (from someone other than a licensed producer)
- 12=Other _____ (please specify without providing any identifiable information) -77 Don't know
- 88 Refuse to answer

UNIVERSE: USE.MODES=6

CANNABIS SOURCE
[HASHOIL.SOURCE2]

Source: Modified Health Canada Survey Draft

PROGRAMMER NOTE: IF HASHOIL.SOURCE>1 OPTION SELECTED ASK:

What per cent (%) of **HASH OIL** did you get from each source:

[INSERT Sources selected from HASHOIL.SOURCE1 with open fields for entry of % numbers that sum to 100%]

- 77 Don't know
- 88 Refuse to answer

**CANNABIS SOURCE
[HASHOIL.PURCHASE]**

*Source: Modified Health Canada
Survey Draft*

PROGRAMMER NOTE: IF HASHOIL.SOURCE=6-12 go to HASH.TIMEFRAME

PROGRAMMER NOTE: IF HASHOIL.SOURCE=1 ASK:

Did you buy or pay for the materials to make the **HASH OIL** you used?

1= Yes

2= No

-77 Don't know

-88 Refuse to answer

PROGRAMMER NOTE: IF HASHOIL.SOURCE=2-5 ASK:

Did you buy or pay for the **HASH OIL** you used?

1= Yes

2= No

-77 Don't know

-88 Refuse to answer

If yes: got to HASHOIL.TIMEFRAME

**CANNABIS RESPONSE
[HASHOIL.TIMEFRAME]**

We would like to know how much hash oil you bought or paid for.

Which time-frame is easiest for you to report the amount of **HASH OIL** you purchased; in a usual day, a usual week, a usual month, or a 12-month period?

1=Day

2=Week

3=Month

4=12-months (entire year)

5=I did not buy any of the marijuana I used over the past year

-77 Don't know

-88 Refuse to answer

UNIVERSE: HASHOIL.PURCHASE=1

**PURCHASE AMOUNT
[PURCH.HASHOIL]**

In total, how much **HASHISH OIL** did you **BUY** [In a typical [day/week/month/ or In the past **12-months**]....

Source: New



Enter number: _____ Gram(s)

- 77 Don't know
- 88 Refuse to answer

UNIVERSE: HASHOIL.SOURCE=6-12 OR HASHOIL.PURCHASE=1, POPULATE TIME FRAME WITH [HASHOIL.TIMEFRAME] VARIABLE

MONEY SPENT
[MONEY.HASHOIL]

In total, how much money did you spend on all of the **HASH OIL** you bought [**In a typical [day/week/month/ or In the past 12-months]....**

Source: New

ENTER DOLLAR AMOUNT:

- 77 Don't know
- 88 Refuse to answer

UNIVERSE: PURCH.HASHOIL, POPULATE TIME FRAME WITH [HASHOIL.TIMEFRAME] VARIABLE

CANNABIS SOURCE
[HASHOIL.MEDICAL]

Do you use the **HASH OIL** for medical or non-medical reasons?

Source: Modified Health Canada
Survey Draft

- 1= Medical
- 2= Non-medical
- 3= Both medical and non-medical
- 77 Don't know
- 88 Refuse to answer

UNIVERSE: USE.MODES=6

CANNABIS SOURCE
[HASHOIL.THC1]

Do you know the **THC** level in the **HASH OIL** you usually used?

Source: Modified Health Canada
Survey Draft

1= Yes
2= No
-88 Refuse to answer

UNIVERSE: USE.MODES=6

CANNABIS SOURCE
[HASHOIL.THC2]

What is the usual **THC** level in the **HASH OIL** you used?

Source: Modified Health Canada
Survey Draft

Enter number: ____ Dropdown menu: mg THC, %THC
-88 Refuse to answer

UNIVERSE: USE.MODES=6 HASHOIL.THC1=1

CANNABIS SOURCE
[HASHOIL.CBD1]

Do you know the **CBD** level in the **HASH OIL** you usually used?

Source: Modified Health Canada
Survey Draft

1= Yes
2= No
-88 Refuse to answer

UNIVERSE: USE.MODES=6

CANNABIS SOURCE
[HASHOIL.CBD2]

What is the usual level of **CBD** in the dried **HASH OIL** you used?

Source: Modified Health Canada
Survey Draft

Enter number: ____ Dropdown menu: mg CBD, %CBD
-88 Refuse to answer

UNIVERSE: USE.MODES=6 HASHOIL.CBD1=1

CANNABIS USE
[CONCEN.AMOUNT]

PROGRAMMER NOTE: SHOW IF MODE.FREQUENCY INCLUDES USE.MODES=7=PAST 12-MONTH USE
PROGRAMMER NOTE: ONLY IF MODE.FREQUENCY=1-4 FOR USE.MODE=7. DERIVE TIME FRAME BASED ON RESPONSE TO MODE.FREQUENCY

[In a usual day/In a usual week/ In a usual month/In the past 12-months], **HOW MUCH** concentrate (e.g., Butane honey, shatter, budder, etc.), did you **use**?



Enter number: _____ Dropdown menu: Gram(s)/HITS/TOKES/DABS

-77 Don't know

-88 Refuse to answer

CANNABIS SOURCE
[CONCEN.SOURCE1]

Source: Modified Health Canada
Survey Draft

In the **past 12 months**, how did you get the concentrate (e.g., Butane honey oil/shatter/budder/etc.) **YOU USED?** Select all that apply.

1=I made my own

2=It was made for me

3=It was shared around a group of friends

4=From a family member or friend

5=From someone else I know

6=From a dealer (in person)

7=From a dealer (mail delivery)

8=medical marijuana through the mail from a licensed producer

9=medical marijuana from a store (e.g., a dispensary or compassion club)

10=non-medical marijuana from a store

11=Ordered it online (from someone other than a licensed producer)

12=Other _____ (please specify without providing any identifiable information)

-77 Don't know

-88 Refuse to answer

UNIVERSE: USE.MODES=7

CANNABIS SOURCE
[CONCEN.SOURCE2]

Source: Modified Health Canada
Survey Draft

PROGRAMMER NOTE: IF CONCEN.SOURCE>1 OPTION SELECTED ASK:

What per cent (%) of **CONCENTRATE (E.G., BUTANE HONEY OIL/SHATTER/BUDDER/ETC.)** did you get from each source:

[INSERT Sources selected from CONCEN.SOURCE1 with open fields for entry of % numbers that sum to 100%]

-77 Don't know

-88 Refuse to answer

**CANNABIS SOURCE
[CONCEN.PURCHASE]**

*Source: Modified Health Canada
Survey Draft*

PROGRAMMER NOTE: IF CONCEN.SOURCE=6-12 go to CONCEN.TIMEFRAME

PROGRAMMER NOTE: IF CONCEN.SOURCE=1 ASK:

Did you buy or pay for the materials to make the **CONCENTRATE (E.G., BUTANE HONEY OIL/SHATTER/BUDDER/ETC.)** you used?

1= Yes

2= No

-77 Don't know

-88 Refuse to answer

PROGRAMMER NOTE: IF CONCEN.SOURCE=2-5 ASK:

Did you buy or pay for the **CONCENTRATE (E.G., BUTANE HONEY OIL/SHATTER/BUDDER/ETC.)** you used?

1= Yes

2= No

-77 Don't know

-88 Refuse to answer

If yes: got to CONCEN.TIMEFRAME

**CANNABIS RESPONSE
[CONCEN.TIMEFRAME]**

We would like to know how much concentrate (e.g., butane honey oil/shatter/budder/etc.) you bought or paid for.

Which time-frame is easiest for you to report the amount of **CONCENTRATE (E.G., BUTANE HONEY OIL/SHATTER/BUDDER/ETC.)** you purchased; in a usual day, a usual week, a usual month, or a 12-month period?

1=Day

2=Week

- 3=Month
- 4=12-months (entire year)
- 5=I did not buy any of the marijuana I used over the past year
- 77 Don't know
- 88 Refuse to answer

UNIVERSE: CURRENT.USE =2-4, CONCEN.PURCHASE=1

PURCHASE AMOUNT
[PURCH.CONCEN]

Source: New

In total, how much **CONCENTRATE (E.G., BUTANE HONEY OIL/SHATTER/BUDDER/ETC.)** did you **BUY** [In a typical [day/week/month/ or In the past 12-months]....



Enter number: _____ Gram(s)

- 77 Don't know
- 88 Refuse to answer

UNIVERSE: CONCEN.SOURCE=6-12 OR CONCEN.PURCHASE=1, POPULATE TIME FRAME WITH [CONCEN.TIMEFRAME] VARIABLE

MONEY SPENT
[MONEY.CONCEN]

Source: New

In total, how much money did you spend on all of the **CONCENTRATE (E.G., BUTANE HONEY OIL/SHATTER/BUDDER/ETC.)** you bought [In a typical [day/week/month/ or In the past 12-months]....

ENTER DOLLAR AMOUNT:

- 77 Don't know
- 88 Refuse to answer

UNIVERSE: PURCH.CONCEN, POPULATE TIME FRAME WITH [CONCEN.TIMEFRAME] VARIABLE

CANNABIS SOURCE
[CONCEN.MEDICAL]

Source: Modified Health Canada
Survey Draft

Do you use the **CONCENTRATE (E.G., BUTANE HONEY OIL/SHATTER/BUDDER/ETC.)**
for medical or non-medical reasons?

- 1= Medical
- 2= Non-medical
- 3= Both medical and non-medical
- 77 Don't know
- 88 Refuse to answer

UNIVERSE: USE.MODES=7

CANNABIS SOURCE
[CONCEN.THC1]

Source: Modified Health Canada
Survey Draft

Do you know the **THC** level in the **CONCENTRATE (E.G., BUTANE HONEY OIL/SHATTER/BUDDER/ETC.)** you usually used?

- 1= Yes
- 2= No
- 88 Refuse to answer

UNIVERSE: USE.MODES=7

CANNABIS SOURCE
[CONCEN.THC2]

Source: Modified Health Canada
Survey Draft

What is the usual **THC** level in the **CONCENTRATE (E.G., BUTANE HONEY OIL/SHATTER/BUDDER/ETC.)** you used?

Enter number: _____ Dropdown menu: mg THC, %THC
-88 Refuse to answer

UNIVERSE: USE.MODES=7 CONCEN.THC1=1

CANNABIS SOURCE
[CONCEN.CBD1]

Source: Modified Health Canada
Survey Draft

Do you know the **CBD** level in the **CONCENTRATE (E.G., BUTANE HONEY OIL/SHATTER/BUDDER/ETC.)** you usually used?

- 1= Yes
- 2= No
- 88 Refuse to answer

UNIVERSE: USE.MODES=7

CANNABIS SOURCE
[CONCEN.CBD2]

Source: Modified Health Canada
Survey Draft

What is the usual level of **CBD** in the dried **CONCENTRATE (E.G., BUTANE HONEY OIL/SHATTER/BUDDER/ETC.)** you used?

Enter number: _____ Dropdown menu: mg CBD, %CBD
-88 Refuse to answer

UNIVERSE: USE.MODES=7 CONCEN.CBD1=1

CANNABIS USE
[TINCT.AMOUNT]

PROGRAMMER NOTE: SHOW IF **MODE.FREQUENCY** INCLUDES **USE.MODES=10=PAST 12-MONTH USE**
PROGRAMMER NOTE: ONLY IF **MODE.FREQUENCY=1-4** FOR **USE.MODE=10**. DERIVE TIME FRAME BASED ON RESPONSE TO **MODE.FREQUENCY**

[In a usual day/In a usual week/ In a usual month/In the past 12-months], **HOW MUCH** liquid concentrate in the form of Tinctures (e.g., concentrated amounts ingested orally or taken under the tongue), did you **USE?**



Enter number: _____ Dropdown menu: mL/fl oz/Drops/Capsules/Ounces/Grams
-77 Don't know
-88 Refuse to answer

CANNABIS SOURCE
[TINCT.SOURCE1]

Source: Modified Health Canada
Survey Draft

In the **past 12 months**, how did you get the liquid concentrate in the form of Tinctures (e.g., concentrated amounts ingested orally or taken under the tongue) **YOU USED?** Select all that apply.

1=I made my own
2=It was made for me

- 3=It was shared around a group of friends
- 4=From a family member or friend
- 5=From someone else I know
- 6=From a dealer (in person)
- 7=From a dealer (mail delivery)
- 8=medical marijuana through the mail from a licensed producer
- 9=medical marijuana from a store (e.g., a dispensary or compassion club)
- 10=non-medical marijuana from a store
- 11=Ordered it online (from someone other than a licensed producer)
- 12=Other _____ (please specify without providing any identifiable information)
- 77 Don't know
- 88 Refuse to answer

UNIVERSE: USE.MODES=10

**CANNABIS SOURCE
[TINCT.SOURCE2]**

*Source: Modified Health Canada
Survey Draft*

PROGRAMMER NOTE: IF TINCT.SOURCE>1 OPTION SELECTED ASK:

What per cent (%) of **liquid concentrate in the form of TINCTURES (e.g., concentrated amounts ingested orally or taken under the tongue)** did you get from each source:

[INSERT Sources selected from TINCT.SOURCE1 with open fields for entry of % numbers that sum to 100%]

- 77 Don't know
- 88 Refuse to answer

**CANNABIS SOURCE
[TINCT.PURCHASE]**

*Source: Modified Health Canada
Survey Draft*

PROGRAMMER NOTE: IF TINCT.SOURCE=6-12 go to TINCT.TIMEFRAME

PROGRAMMER NOTE: IF TINCT.SOURCE=1 ASK:

Did you buy or pay for the materials to make the **liquid concentrate in the form of TINCTURES (e.g., concentrated amounts ingested orally or taken under the tongue)** you used?

- 1= Yes
- 2= No
- 77 Don't know
- 88 Refuse to answer

PROGRAMMER NOTE: IF TINCT.SOURCE=2-5 ASK:

Did you buy or pay for the **liquid concentrate in the form of TINCTURES** (e.g., concentrated amounts ingested orally or taken under the tongue) you used?

1= Yes

2= No

-77 Don't know

-88 Refuse to answer

If yes: got to TINCT.TIMEFRAME

CANNABIS RESPONSE
[TINCT.TIMEFRAME]

We would like to know how much liquid concentrate in the form of TINCTURES (e.g., concentrated amounts ingested orally or taken under the tongue) you bought or paid for.

Which time-frame is easiest for you to report the amount of **liquid concentrate in the form of TINCTURES** (e.g., concentrated amounts ingested orally or taken under the tongue) you purchased; in a usual day, a usual week, a usual month, or a 12-month period?

1=Day

2=Week

3=Month

4=12-months (entire year)

5=I did not buy any of the marijuana I used over the past year

-77 Don't know

-88 Refuse to answer

UNIVERSE: TINCT.PURCHASE=1

PURCHASE AMOUNT
[PURCH.TINCT]

In total, how much **liquid concentrate in the form of TINCTURES** (e.g., concentrated amounts ingested orally or taken under the tongue) did you **BUY** [In a typical [day/week/month/ or In the past 12-months]....

Source: New



Enter number: _____ mL/fl oz/Drops/Capsules/Ounces/Grams

-77 Don't know

-88 Refuse to answer

UNIVERSE: TINCT.SOURCE=6-12 OR TINCT.PURCHASE=1, POPULATE TIME FRAME WITH [TINCT.TIMEFRAME] VARIABLE

MONEY SPENT
[MONEY.TINCT]

Source: New

In total, how much money did you spend on all of the **liquid concentrate in the form of TINCTURES** (e.g., concentrated amounts ingested orally or taken under the tongue) you bought [In a typical [day/week/month/ or In the past 12-months]....

ENTER DOLLAR AMOUNT:

-77 Don't know

-88 Refuse to answer

UNIVERSE: PURCH.TINCT, POPULATE TIME FRAME WITH [TINCT.TIMEFRAME] VARIABLE

CANNABIS SOURCE
[TINCT.MEDICAL]

Source: Modified Health Canada
Survey Draft

Do you use the **liquid concentrate in the form of TINCTURES** (e.g., concentrated amounts ingested orally or taken under the tongue) for medical or non-medical reasons?

1= Medical

2= Non-medical

3= Both medical and non-medical

-77 Don't know

-88 Refuse to answer

**CANNABIS SOURCE
[TINCT.THC1]**

*Source: Modified Health Canada
Survey Draft*

UNIVERSE: USE.MODES=10

Do you know the **THC** level in the liquid concentrate in the form of **TINCTURES** (e.g., concentrated amounts ingested orally or taken under the tongue) you usually used?

- 1= Yes
- 2= No
- 88 Refuse to answer

UNIVERSE: USE.MODES=10

**CANNABIS SOURCE
[TINCT.THC2]**

*Source: Modified Health Canada
Survey Draft*

What is the usual **THC** level in the liquid concentrate in the form of **TINCTURES** (e.g., concentrated amounts ingested orally or taken under the tongue) you used?

Enter number: _____ Dropdown menu: mg THC, %THC
-88 Refuse to answer

UNIVERSE: USE.MODES=10 TINCT.THC1=1

**CANNABIS SOURCE
[TINCT.CBD1]**

*Source: Modified Health Canada
Survey Draft*

Do you know the **CBD** level in the liquid concentrate in the form of **TINCTURES** (e.g., concentrated amounts ingested orally or taken under the tongue) you usually used?

- 1= Yes
- 2= No
- 88 Refuse to answer

UNIVERSE: USE.MODES=10

**CANNABIS SOURCE
[TINCT.CBD2]**

*Source: Modified Health Canada
Survey Draft*

What is the usual level of **CBD** in the dried liquid concentrate in the form of **TINCTURES** (e.g., concentrated amounts ingested orally or taken under the tongue) you used?

Enter number: _____ Dropdown menu: mg CBD, %CBD
-88 Refuse to answer

UNIVERSE: USE.MODES=10 TINCT.CBD1=1

**CANNABIS USE
[EDIBLE.AMOUNT]**

PROGRAMMER NOTE: SHOW IF MODE.FREQUENCY INCLUDES USE.MODES=8
PROGRAMMER NOTE: ONLY IF MODE.FREQUENCY=1-4 FOR USE.MODE=8. DERIVE TIME FRAME BASED ON RESPONSE TO MODE.FREQUENCY

[In a usual day/In a usual week/ In a usual month/In the past 12-months], **HOW MANY** edible marijuana products did you **eat**?

ENTER NUMBER OF EDIBLE PRODUCTS:

- 77 Don't know
- 88 Refuse to answer

CANNABIS SOURCE
[EDIBLE.SOURCE1]

*Source: Modified Health Canada
Survey Draft*

In the **past 12 months**, how did you get the edible marijuana products YOU ATE? Select all that apply.

- 1=I made my own
- 2=It was made for me
- 3=It was shared around a group of friends
- 4=From a family member or friend
- 5=From someone else I know
- 6=From a dealer (in person)
- 7=From a dealer (mail delivery)
- 8=medical marijuana through the mail from a licensed producer
- 9=medical marijuana from a store (e.g., a dispensary or compassion club)
- 10=non-medical marijuana from a store
- 11=Ordered it online (from someone other than a licensed producer)
- 12=Other _____ (please specify without providing any identifiable information)
- 77 Don't know
- 88 Refuse to answer

UNIVERSE: USE.MODES=8

CANNABIS SOURCE
[EDIBLE.SOURCE2]

*Source: Modified Health Canada
Survey Draft*

PROGRAMMER NOTE: IF EDIBLE.SOURCE>1 OPTION SELECTED ASK:

What per cent (%) of **EDIBLE MARIJUANA PRODUCTS** did you get from each source:

[INSERT Sources selected from EDIBLE.SOURCE1 with open fields for entry of % numbers that sum to 100%]

- 77 Don't know
- 88 Refuse to answer

**CANNABIS SOURCE
[EDIBLE.PURCHASE]**

*Source: Modified Health Canada
Survey Draft*

PROGRAMMER NOTE: IF EDIBLE.SOURCE=6-12 go to EDIBLE.TIMEFRAME

PROGRAMMER NOTE: IF EDIBLE.SOURCE=1 ASK:

Did you buy or pay for the materials to make the **EDIBLE MARIJUANA PRODUCTS** you ate?

1= Yes

2= No

-77 Don't know

-88 Refuse to answer

PROGRAMMER NOTE: IF EDIBLE.SOURCE=2-5 ASK:

Did you buy or pay for the **EDIBLE MARIJUANA PRODUCTS** you ate?

1= Yes

2= No

-77 Don't know

-88 Refuse to answer

If yes: got to EDIBLE.TIMEFRAME

**CANNABIS RESPONSE
[EDIBLE.TIMEFRAME]**

We would like to know how many edible marijuana products you bought or paid for.

Which time-frame is easiest for you to report the amount of **EDIBLE MARIJUANA PRODUCTS** you purchased; in a usual day, a usual week, a usual month, or a 12-month period?

1=Day

2=Week

3=Month

4=12-months (entire year)

5=I did not buy any of the marijuana I used over the past year

-77 Don't know

-88 Refuse to answer

UNIVERSE: EDIBLE.PURCHASE=1

**PURCHASE AMOUNT
[PURCH.EDIBLE]**

Source: New

In total, how many **EDIBLE MARIJUANA PRODUCTS** did you **BUY [In a typical [day/week/month/ or In the past 12-months]....**

ENTER NUMBER: ____ UNITS (e.g., muffins, cookies, brownies,...etc)

-77 Don't know

-88 Refuse to answer

UNIVERSE: EDIBLE.SOURCE=6-12 OR EDIBLE.PURCHASE=1, POPULATE TIME FRAME WITH [EDIBLE.TIMEFRAME] VARIABLE

MONEY SPENT
[MONEY. EDIBLE]

In total, how much money did you spend on all of the **EDIBLE MARIJUANA PRODUCTS** you bought **[In a typical [day/week/month/ or In the past 12-months]....**

Source: New

ENTER DOLLAR AMOUNT:

-77 Don't know

-88 Refuse to answer

UNIVERSE: PURCH.EDIBLE, POPULATE TIME FRAME WITH [EDIBLE.TIMEFRAME] VARIABLE

CANNABIS SOURCE
[EDIBLE.MEDICAL]

Do you use the **EDIBLE MARIJUANA PRODUCTS** for medical or non-medical reasons?

*Source: Modified Health Canada
Survey Draft*

1= Medical

2= Non-medical

3= Both medical and non-medical

-77 Don't know

-88 Refuse to answer

UNIVERSE: USE.MODES=8

CANNABIS SOURCE
[EDIBLE.THC1]

Do you know the **THC** level in the **EDIBLE MARIJUANA PRODUCTS** you usually used?

*Source: Modified Health Canada
Survey Draft*

1= Yes

2= No

-88 Refuse to answer

UNIVERSE: USE.MODES=8

CANNABIS SOURCE
[EDIBLE.THC2]

What is the usual **THC** level in the **EDIBLE MARIJUANA PRODUCTS** you used?

*Source: Modified Health Canada
Survey Draft*

Enter number: ____ Dropdown menu: mg THC, %THC

-88 Refuse to answer

UNIVERSE: USE.MODES=8 EDIBLE.THC1=1

**CANNABIS SOURCE
[EDIBLE.CBD1]**

*Source: Modified Health Canada
Survey Draft*

Do you know the **CBD** level in the **EDIBLE MARIJUANA PRODUCTS** you usually used?

- 1= Yes
- 2= No
- 88 Refuse to answer

UNIVERSE: USE.MODES=8

**CANNABIS SOURCE
[EDIBLE.CBD2]**

*Source: Modified Health Canada
Survey Draft*

What is the usual level of **CBD** in the dried **EDIBLE MARIJUANA PRODUCTS** you used?

Enter number: _____ Dropdown menu: mg CBD, %CBD
-88 Refuse to answer

UNIVERSE: USE.MODES=8 EDIBLE.CBD1=1

**CANNABIS USE
[DRINKS.AMOUNT]**

PROGRAMMER NOTE: SHOW IF MODE.FREQUENCY INCLUDES USE.MODES=9=PAST 12-MONTH USE
PROGRAMMER NOTE: ONLY IF MODE.FREQUENCY=1-4 FOR USE.MODE=9. DERIVE TIME FRAME BASED ON RESPONSE TO MODE.FREQUENCY

[In a usual day/In a usual week/ In a usual month/In the past 12-months], **HOW MANY** beverages containing marijuana extracts did you **DRINK?**

Enter number of beverages:
-77 Don't know
-88 Refuse to answer

**CANNABIS SOURCE
[DRINKS.SOURCE1]**

*Source: Modified Health Canada
Survey Draft*

In the **past 12 months**, how did you get the marijuana liquid (e.g. cola/tea) products **YOU DRANK?** Select all that apply.

- 1=I made my own
- 2=It was made for me
- 3=It was shared around a group of friends
- 4=From a family member or friend
- 5=From someone else I know
- 6=From a dealer (in person)
- 7=From a dealer (mail delivery)
- 8=medical marijuana through the mail from a licensed producer

- 9=medical marijuana from a store (e.g., a dispensary or compassion club)
- 10=non-medical marijuana from a store
- 11=Ordered it online (from someone other than a licensed producer)
- 12=Other_____ (please specify without providing any identifiable information)
- 77 Don't know
- 88 Refuse to answer

UNIVERSE: USE.RECENT=3,4 AND USE.MODES=9

**CANNABIS SOURCE
[DRINKS.SOURCE2]**

*Source: Modified Health Canada
Survey Draft*

PROGRAMMER NOTE: IF DRINKS.SOURCE>1 OPTION SELECTED ASK:

What per cent (%) of **MARIJUANA LIQUID (E.G. COLA/TEA) PRODUCTS** did you get from each source:

[INSERT Sources selected from DRINKS.SOURCE1 with open fields for entry of % numbers that sum to 100%]

- 77 Don't know
- 88 Refuse to answer

**CANNABIS SOURCE
[DRINKS.PURCHASE]**

*Source: Modified Health Canada
Survey Draft*

PROGRAMMER NOTE: IF DRINKS.SOURCE=6-12 go to DRINKS.TIMEFRAME

PROGRAMMER NOTE: IF DRINKS.SOURCE=1 ASK:

Did you buy or pay for the materials to make the **MARIJUANA LIQUID (E.G. COLA/TEA) PRODUCTS** you drank?

- 1= Yes
- 2= No
- 77 Don't know
- 88 Refuse to answer

PROGRAMMER NOTE: IF DRINKS.SOURCE=2-5 ASK:

Did you buy or pay for the **MARIJUANA LIQUID (E.G. COLA/TEA) PRODUCTS** you drank?

- 1= Yes
- 2= No
- 77 Don't know
- 88 Refuse to answer

CANNABIS RESPONSE
[DRINKS.TIMEFRAME]

If yes: got to DRINKS.TIMEFRAME

We would like to know how many marijuana liquid (e.g., cola/tea) products you bought or paid for.

Which time-frame is easiest for you to report the amount of **MARIJUANA LIQUID (E.G. COLA/TEA) PRODUCTS** you purchased; in a usual week, a usual month, or a 12-month period?

1=Day

2=Week

3=Month

4=12-months (entire year)

5=I did not buy any of the marijuana I used over the past year

-77 Don't know

-88 Refuse to answer

UNIVERSE: DRINKS.PURCHASE=1

PURCHASE AMOUNT
[PURCH.DRINKS]

In total, how many **MARIJUANA LIQUID (E.G. COLA/TEA) PRODUCTS** did you BUY [In a typical [day/week/month/ or In the past 12-months]....

Source: New

Enter number of products (e.g., cola/tea) : _____

-77 Don't know

-88 Refuse to answer

UNIVERSE: DRINKS.SOURCE=6-12 OR DRINKS.PURCHASE=1, POPULATE TIME FRAME WITH [DRINKS.TIMEFRAME] VARIABLE

MONEY SPENT
[MONEY.DRINKS]

In total, how much money did you spend on all of the **MARIJUANA LIQUID (E.G. COLA/TEA) PRODUCTS** you bought [In a typical [day/week/month/ or In the past 12-months]....

Source: New

ENTER DOLLAR AMOUNT:

-77 Don't know

-88 Refuse to answer

UNIVERSE: PURCH. DRINKS, POPULATE TIME FRAME WITH [DRINKS.TIMEFRAME] VARIABLE

**CANNABIS SOURCE
[DRINKS.MEDICAL]**

*Source: Modified Health Canada
Survey Draft*

Do you use the **MARIJUANA LIQUID (E.G. COLA/TEA) PRODUCTS** for medical or non-medical reasons?

- 1= Medical
- 2= Non-medical
- 3= Both medical and non-medical
- 77 Don't know
- 88 Refuse to answer

UNIVERSE: USE.MODES=9

**CANNABIS SOURCE
[DRINKS.THC1]**

*Source: Modified Health Canada
Survey Draft*

Do you know the **THC** level in the **MARIJUANA LIQUID (E.G. COLA/TEA) PRODUCTS** you usually used?

- 1= Yes
- 2= No
- 88 Refuse to answer

UNIVERSE: USE.MODES=9

**CANNABIS SOURCE
[DRINKS.THC2]**

*Source: Modified Health Canada
Survey Draft*

What is the usual **THC** level in the **MARIJUANA LIQUID (E.G. COLA/TEA) PRODUCTS** you used?

Enter number: _____ Dropdown menu: mg THC, %THC
-88 Refuse to answer

UNIVERSE: USE.MODES=9 DRINKS.THC1=1

**CANNABIS SOURCE
[DRINKS.CBD1]**

*Source: Modified Health Canada
Survey Draft*

Do you know the **CBD** level in the **MARIJUANA LIQUID (E.G. COLA/TEA) PRODUCTS** you usually used?

- 1= Yes
- 2= No
- 88 Refuse to answer

UNIVERSE: USE.MODES=9

CANNABIS SOURCE
[DRINKS.CBD2]

Source: Modified Health Canada
Survey Draft

What is the usual level of **CBD** in the dried **MARIJUANA LIQUID (E.G. COLA/TEA)**
PRODUCTS you used?

Enter number: _____ Dropdown menu: mg CBD, %CBD
-88 Refuse to answer

UNIVERSE: USE.MODES=9 DRINKS.CBD1=1

CANNABIS USE
[TOPICAL.AMOUNT]

PROGRAMMER NOTE: SHOW IF **MODE.FREQUENCY** INCLUDES **USE.MODES=11**
PROGRAMMER NOTE: ONLY IF **MODE.FREQUENCY=1-4** FOR **USE.MODE=11**. DERIVE TIME FRAME BASED ON RESPONSE TO **MODE.FREQUENCY**

[In a usual day/In a usual week/ In a usual month/In the past 12-months], **HOW MUCH** of the topical products (e.g., creams, lotions, balms, salves, etc.), did you **USE**?

Enter number: _____ Dropdown menu: Ounces, grams, palmfuls
-77 Don't know
-88 Refuse to answer

CANNABIS SOURCE
[TOPICAL.SOURCE1]

Source: Modified Health Canada
Survey Draft

In the **past 12 months**, how did you get the marijuana topical products (e.g., creams, lotions, balms, salves, etc.) **YOU USED**? Select all that apply.

- 1=I made my own
- 2=It was made for me
- 3=It was shared around a group of friends
- 4=From a family member or friend
- 5=From someone else I know
- 6=From a dealer (in person)
- 7=From a dealer (mail delivery)
- 8=medical marijuana through the mail from a licensed producer
- 9=medical marijuana from a store (e.g., a dispensary or compassion club)
- 10=non-medical marijuana from a store
- 11=Ordered it online (from someone other than a licensed producer)
- 12=Other _____ (please specify without providing any identifiable information)
- 77 Don't know
- 88 Refuse to answer

UNIVERSE: USE.MODES=11

**CANNABIS SOURCE
[TOPICAL.SOURCE2]**

*Source: Modified Health Canada
Survey Draft*

PROGRAMMER NOTE: IF TOPICAL.SOURCE>1 OPTION SELECTED ASK:

What per cent (%) of **MARIJUANA TOPICAL PRODUCTS (E.G., CREAMS, LOTIONS, BALMS, SALVES, ETC.)** did you get from each source:

[INSERT Sources selected from TOPICAL.SOURCE1 with open fields for entry of % numbers that sum to 100%]

-77 Don't know

-88 Refuse to answer

**CANNABIS SOURCE
[TOPICAL.PURCHASE]**

*Source: Modified Health Canada
Survey Draft*

PROGRAMMER NOTE: IF TOPICAL.SOURCE=6-12 go to TOPICAL.TIMEFRAME

PROGRAMMER NOTE: IF TOPICAL.SOURCE=1 ASK:

Did you buy or pay for the materials to make the **MARIJUANA TOPICAL PRODUCTS (E.G., CREAMS, LOTIONS, BALMS, SALVES, ETC.)** you used?

1= Yes

2= No

-77 Don't know

-88 Refuse to answer

PROGRAMMER NOTE: IF TOPICAL.SOURCE=2-5 ASK:

Did you buy or pay for the **MARIJUANA TOPICAL PRODUCTS (E.G., CREAMS, LOTIONS, BALMS, SALVES, ETC.)** you used?

1= Yes

2= No

-77 Don't know

-88 Refuse to answer

If yes: got to TOPICAL.TIMEFRAME

CANNABIS RESPONSE
[TOPICAL.TIMEFRAME]

We would like to know how many marijuana topical products (e.g., creams, lotions, balms, salves, etc.) products you bought or paid for.

Which time-frame is easiest for you to report the amount of **MARIJUANA TOPICAL PRODUCTS (E.G., CREAMS, LOTIONS, BALMS, SALVES, ETC.)** you purchased; in a usual week, a usual month, or a 12-month period?

- 1=Day
- 2=Week
- 3=Month
- 4=12-months (entire year)
- 5=I did not buy any of the marijuana I used over the past year
- 77 Don't know
- 88 Refuse to answer

UNIVERSE: TOPICAL.PURCHASE=1

PURCHASE AMOUNT
[PURCH.TOPICAL]

Source: New

In total, how many **MARIJUANA TOPICAL PRODUCTS (E.G., CREAMS, LOTIONS, BALMS, SALVES, ETC.)** did you BUY [In a typical [day/week/month/ or In the past 12-months]....

ENTER NUMBER: ____ Dropdown menu: OUNCES/GRAMS/PALMFULS

- 77 Don't know
- 88 Refuse to answer

UNIVERSE: TOPICAL.SOURCE=6-12 OR TOPICAL.PURCHASE=1, POPULATE TIME FRAME WITH [TOPICAL.TIMEFRAME] VARIABLE

MONEY SPENT
[MONEY.TOPICAL]

Source: New

In total, how much money did you spend on all of the **MARIJUANA TOPICAL PRODUCTS (E.G., CREAMS, LOTIONS, BALMS, SALVES, ETC.)** you bought [In a typical [day/week/month/ or In the past 12-months]....

ENTER DOLLAR AMOUNT:

- 77 Don't know
- 88 Refuse to answer

UNIVERSE: PURCH.TOPICAL, POPULATE TIME FRAME WITH [TOPICAL.TIMEFRAME] VARIABLE

CANNABIS SOURCE
[TOPICAL.MEDICAL]

Source: Modified Health Canada
Survey Draft

Do you use the **MARIJUANA TOPICAL PRODUCTS (E.G., CREAMS, LOTIONS, BALMS, SALVES, ETC.)** for medical or non-medical reasons?

- 1= Medical
- 2= Non-medical
- 3= Both medical and non-medical
- 77 Don't know
- 88 Refuse to answer

UNIVERSE: USE.MODES=11

CANNABIS SOURCE
[TOPICAL.THC1]

Source: Modified Health Canada
Survey Draft

Do you know the **THC** level in the **MARIJUANA TOPICAL PRODUCTS (E.G., CREAMS, LOTIONS, BALMS, SALVES, ETC.)** you usually used?

- 1= Yes
- 2= No
- 88 Refuse to answer

UNIVERSE: USE.MODES=11

CANNABIS SOURCE
[TOPICAL.THC2]

Source: Modified Health Canada
Survey Draft

What is the usual **THC** level in the **MARIJUANA TOPICAL PRODUCTS (E.G., CREAMS, LOTIONS, BALMS, SALVES, ETC.)** you used?

Enter number: _____ Dropdown menu: mg THC, %THC
-88 Refuse to answer

UNIVERSE: USE.MODES=11 TOPICAL.THC1=1

CANNABIS SOURCE
[TOPICAL.CBD1]

Source: Modified Health Canada
Survey Draft

Do you know the **CBD** level in the **MARIJUANA TOPICAL PRODUCTS (E.G., CREAMS, LOTIONS, BALMS, SALVES, ETC.)** you usually used?

- 1= Yes
- 2= No
- 88 Refuse to answer

UNIVERSE: USE.MODES=11

CANNABIS SOURCE
[TOPICAL.CBD2]

Source: Modified Health Canada
Survey Draft

What is the usual level of **CBD** in the dried **MARIJUANA TOPICAL PRODUCTS (E.G., CREAMS, LOTIONS, BALMS, SALVES, ETC.)** you used?

Enter number: _____ Dropdown menu: mg CBD, %CBD

-88 Refuse to answer

UNIVERSE: USE.MODES=11 TOPICAL.CBD1=1

CANNABIS USE
[FRESHFLOWER.AMOUNT]

PROGRAMMER NOTE: SHOW IF **MODE.FREQUENCY** INCLUDES **USE.MODES=12**
PROGRAMMER NOTE: ONLY IF **MODE.FREQUENCY=1-4** FOR **USE.MODE=12**. DERIVE TIME FRAME BASED ON RESPONSE TO **MODE.FREQUENCY**

[In a usual day/In a usual week/ In a usual month/In the past 12-months], **HOW MUCH** fresh flower/leaf did you **USE**?

Enter number: _____ Dropdown menu: ounces, grams, leaves

-77 Don't know

-88 Refuse to answer

CANNABIS SOURCE
[FRESHFLOWER.SOURCE1]

Source: Modified Health Canada
Survey Draft

In the **past 12 months**, how did you get the marijuana fresh flowers/leaves (e.g., for juicing) **YOU USED**? Select all that apply.

1=I grew my own

2=It was grown for me

3=It was shared around a group of friends

4=From a family member or friend

5=From someone else I know

6=From a dealer (in person)

7=From a dealer (mail delivery)

8=medical marijuana through the mail from a licensed producer

9=medical marijuana from a store (e.g., a dispensary or compassion club)

10=non-medical marijuana from a store

11=Ordered it online (from someone other than a licensed producer)

12=Other _____ (please specify without providing any identifiable information)

-77 Don't know

-88 Refuse to answer

UNIVERSE: USE.MODES=12

**CANNABIS SOURCE
[FRESHFLOWER.SOURCE2]**

*Source: Modified Health Canada
Survey Draft*

PROGRAMMER NOTE: IF FRESHFLOWER.SOURCE >1 OPTION SELECTED ASK:

What per cent (%) of **FRESH FLOWERS/LEAVES (E.G., FOR JUICING)** did you get from each source:

[INSERT Sources selected from FRESHFLOWER.SOURCE1 with open fields for entry of % numbers that sum to 100%]

-77 Don't know

-88 Refuse to answer

**CANNABIS SOURCE
[SEEDSFF.PURCHASE]**

*Source: Modified Health Canada
Survey Draft*

PROGRAMMER NOTE: IF FRESHFLOWER.SOURCE=6-12 go to FRESHFLOWER.TIMEFRAME

PROGRAMMER NOTE: IF FRESHFLOWER.SOURCE=1 ASK:

Did you buy or pay for the **SEEDS** for plant you grew?

1= Yes

2= No

-77 Don't know

-88 Refuse to answer

**CANNABIS RESPONSE
[SEEDSFF.TIMEFRAME]**

We would like to know how many **SEEDS** you bought or paid for.

Which time-frame is easiest for you to report the amount of **SEEDS** you purchased; in a usual day, a usual week, a usual month, or a 12-month period?

1=Day

2=Week

3=Month

4=12-months (entire year)

5=I did not buy any of the marijuana I used over the past year

-77 Don't know

-88 Refuse to answer

UNIVERSE: SEEDSFF.PURCHASE=1

PURCHASE AMOUNT
[PURCH.SEEDSFF]

Source: New

In total, how many **SEEDS** did you **BUY** [In a typical [day/week/month/ or In the past 12-months]....



[NUMBER OF SEEDS]

-77 Don't know

-88 Refuse to answer

UNIVERSE: SEEDSFF.PURCHASE =1, POPULATE TIME FRAME WITH [SEEDFF.TIMEFRAME] VARIABLE

MONEY SPENT
[MONEY.SEEDSFF]

Source: New

In total, how much money did you spend on all of the **SEEDS** you bought [In a typical [day/week/month/ or In the past 12-months]....

ENTER DOLLAR AMOUNT:

-77 Don't know

-88 Refuse to answer

UNIVERSE: PURCH.SEEDSFF, POPULATE TIME FRAME WITH [SEEDFF.TIMEFRAME] VARIABLE

CANNABIS RESPONSE
[FRESHFLOWER.TIMEFRAME]

We would like to know how many **FRESH FLOWERS/LEAVES (E.G., FOR JUICING)** you bought or paid for.

Which time-frame is easiest for you to report the amount of **FRESH FLOWERS/LEAVES (E.G., FOR JUICING)** you purchased; in a usual day, a usual week, a usual month, or a 12-month period?

- 1=Day
- 2=Week
- 3=Month
- 4=12-months (entire year)
- 5=I did not buy any of the marijuana I used over the past year
- 77 Don't know
- 88 Refuse to answer

UNIVERSE: CURRENT.USE =2-4, FRESHFLOWER.SOURCE=6-12

**CANNABIS SOURCE
[FRESHFLOWER.PURCHASE]**

*Source: Modified Health Canada
Survey Draft*

PROGRAMMER NOTE: IF FRESHFLOWER.SOURCE=2-5 ASK:

Did you buy or pay for the **FRESH FLOWERS/LEAVES (E.G., FOR JUICING)** you used?

- 1= Yes
- 2= No
- 77 Don't know
- 88 Refuse to answer

If yes: got to FRESHFLOWER.TIMEFRAME

**CANNABIS RESPONSE
[FRESHFLOWER.TIMEFRAME]**

We would like to know how much fresh flowers/leaves (e.g., for juicing) you bought or paid for.

Which time-frame is easiest for you to report the amount of **FRESH FLOWERS/LEAVES (E.G., FOR JUICING)** you purchased; in a usual day, a usual week, a usual month, or a 12-month period?

- 1=Day
- 1=Week
- 2=Month
- 3=12-months (entire year)
- 4=I did not buy any of the marijuana I used over the past year
- 77 Don't know
- 88 Refuse to answer

UNIVERSE: CURRENT.USE =2-4, FRESHFLOWER.PURCHASE=1

PURCHASE AMOUNT
[PURCH. FRESHFLOWER]

Source: New

In total, how many **FRESH FLOWERS/LEAVES (E.G., FOR JUICING)** did you BUY [In a typical [day/week/month/ or In the past 12-months]....

Enter number: _____ Dropdown menu: OUNCES/GRAMS/LEAVES

-77 Don't know

-88 Refuse to answer

UNIVERSE: FRESHFLOWER.SOURCE=6-12 OR FRESHFLOWER.PURCHASE=1, POPULATE TIME FRAME WITH [FRESHFLOWER.TIMEFRAME] VARIABLE

MONEY SPENT
[MONEY. FRESHFLOWER]

Source: New

In total, how much money did you spend on all of the **FRESH FLOWERS/LEAVES (E.G., FOR JUICING)** you bought [In a typical [day/week/month/ or In the past 12-months]....

ENTER DOLLAR AMOUNT:

-77 Don't know

-88 Refuse to answer

UNIVERSE: PURCH. FRESHFLOWER, POPULATE TIME FRAME WITH [FRESHFLOWER.TIMEFRAME] VARIABLE

CANNABIS SOURCE
[FRESHFLOWER.MEDICAL]

Source: Modified Health Canada
Survey Draft

Do you use the **FRESH FLOWERS/LEAVES (E.G., FOR JUICING)** for medical or non-medical reasons?

1= Medical

2= Non-medical

3= Both medical and non-medical

-77 Don't know

-88 Refuse to answer

UNIVERSE: USE.MODES=12

CANNABIS SOURCE
[FRESHFLOWER.THCC1]

Source: Modified Health Canada
Survey Draft

Do you know the **THC** level in the **FRESH FLOWERS/LEAVES (E.G., FOR JUICING)** you usually used?

1= Yes

2= No

-88 Refuse to answer

UNIVERSE: USE.MODES=12

**CANNABIS SOURCE
[FRESHFLOWER.THCC2]**

*Source: Modified Health Canada
Survey Draft*

What is the usual **THC** level in the **FRESH FLOWERS/LEAVES (E.G., FOR JUICING)** you used?

Enter number: _____ Dropdown menu: mg THC, %THC

-88 Refuse to answer

UNIVERSE: USE.MODES=12 FRESHFLOWER.THCC1=1

**CANNABIS SOURCE
[FRESHFLOWER.CBD1]**

*Source: Modified Health Canada
Survey Draft*

Do you know the **CBD** level in the **FRESH FLOWERS/LEAVES (E.G., FOR JUICING)** you usually used?

1= Yes

2= No

-88 Refuse to answer

UNIVERSE: USE.MODES=12

**CANNABIS SOURCE
[FRESHFLOWER.CBD2]**

*Source: Modified Health Canada
Survey Draft*

What is the usual level of **CBD** in the dried **FRESH FLOWERS/LEAVES (E.G., FOR JUICING)** you used?

Enter number: _____ Dropdown menu: mg CBD, %CBD

-88 Refuse to answer

UNIVERSE: USE.MODES=11 FRESHFLOWER.CBD1=1

**CANNABIS USE
[OTHER.AMOUNT]**

PROGRAMMER NOTE: SHOW IF MODE.FREQUENCY INCLUDES USE.MODES=13

PROGRAMMER NOTE: ONLY IF MODE.FREQUENCY=1-4 FOR USE.MODE=13. DERIVE TIME FRAME BASED ON RESPONSE TO MODE.FREQUENCY

[In a usual day/In a usual week/ In a usual month/In the past 12-months], **HOW MUCH** of the other forms of marijuana not mentioned in this survey did you **USE?**

_____ GRAMS

-77 Don't know

-88 Refuse to answer

CANNABIS SOURCE
[OTHER.SOURCE1]

Source: Modified Health Canada
Survey Draft

In the **past 12 months**, how did you get the other forms of marijuana not mentioned in this survey
YOU USED? Select all that apply.

- 1=I made/grew my own
- 2=It was made/grown for me
- 3=It was shared around a group of friends
- 4=From a family member or friend
- 5=From someone else I know
- 6=From a dealer (in person)
- 7=From a dealer (mail delivery)
- 8=medical marijuana through the mail from a licensed producer
- 9=medical marijuana from a store (e.g., a dispensary or compassion club)
- 10=non-medical marijuana from a store
- 11=Ordered it online (from someone other than a licensed producer)
- 12=Other _____ (please specify without providing any identifiable information)
- 77 Don't know
- 88 Refuse to answer

UNIVERSE: USE.MODES=11

CANNABIS SOURCE
[OTHER.SOURCE2]

Source: Modified Health Canada
Survey Draft

PROGRAMMER NOTE: IF OTHER.SOURCE>1 OPTION SELECTED ASK:

What per cent (%) of **OTHER FORMS OF MARIJUANA NOT MENTIONED IN THIS SURVEY** did you get from each source:

[INSERT Sources selected from OTHER.SOURCE1 with open fields for entry of % numbers that sum to 100%]

- 77 Don't know
- 88 Refuse to answer

CANNABIS SOURCE
[OTHER.PURCHASE]

Source: Modified Health Canada
Survey Draft

PROGRAMMER NOTE: IF OTHER.SOURCE=6-12 go to OTHER.TIMEFRAME

PROGRAMMER NOTE: IF OTHER.SOURCE=1 ASK:

Did you buy or pay for the materials to make the **OTHER FORMS OF MARIJUANA NOT MENTIONED IN THIS SURVEY** you used?

1= Yes
2= No
-77 Don't know
-88 Refuse to answer

PROGRAMMER NOTE: IF OTHER.SOURCE=2-5 ASK:

Did you buy or pay for the **OTHER FORMS OF MARIJUANA NOT MENTIONED IN THIS SURVEY** you used?

1= Yes
2= No
-77 Don't know
-88 Refuse to answer

If yes: got to OTHER.TIMEFRAME

CANNABIS RESPONSE
[OTHER.TIMEFRAME]

We would like to know how many **OTHER FORMS OF MARIJUANA NOT MENTIONED IN THIS SURVEY** you bought or paid for.

Which time-frame is easiest for you to report the amount of **OTHER FORMS OF MARIJUANA NOT MENTIONED IN THIS SURVEY** you purchased; in a usual week, a usual month, or a 12-month period?

1=Day
2=Week
3=Month
4=12-months (entire year)
5=I did not buy any of the marijuana I used over the past year
-77 Don't know
-88 Refuse to answer

UNIVERSE: CURRENT.USE =2-4, OTHER.PURCHASE=1

PURCHASE AMOUNT
[PURCH. OTHER]

In total, how many **OTHER FORMS OF MARIJUANA NOT MENTIONED IN THIS SURVEY** did you **BUY** [In a typical [day/week/month/ or In the past 12-months]....

Source: New

Enter number: ____ Dropdown menu:OUNCES/GRAMS

-77 Don't know

-88 Refuse to answer

UNIVERSE: OTHER.SOURCE=6-12 OR OTHER.PURCHASE=1, POPULATE TIME FRAME WITH [OTHER.TIMEFRAME] VARIABLE

MONEY SPENT
[MONEY.OTHER]

Source: New

In total, how much money did you spend on all of the **OTHER FORMS OF MARIJUANA NOT MENTIONED IN THIS SURVEY** you bought [**In a typical [day/week/month/ or In the past 12-months]**]....

ENTER DOLLAR AMOUNT:

-77 Don't know

-88 Refuse to answer

UNIVERSE: PURCH. OTHER, POPULATE TIME FRAME WITH [OTHER.TIMEFRAME] VARIABLE

CANNABIS SOURCE
[OTHER.MEDICAL]

Source: Modified Health Canada
Survey Draft

Do you use the **OTHER FORMS OF MARIJUANA NOT MENTIONED IN THIS SURVEY** for medical or non-medical reasons?

1= Medical

2= Non-medical

3= Both medical and non-medical

-77 Don't know

-88 Refuse to answer

UNIVERSE: USE.MODES=13

CANNABIS SOURCE
[OTHER.THC1]

Source: Modified Health Canada
Survey Draft

Do you know the **THC** level in the **OTHER FORMS OF MARIJUANA NOT MENTIONED IN THIS SURVEY** you usually used?

1= Yes

2= No

-88 Refuse to answer

UNIVERSE: USE.MODES=13

CANNABIS SOURCE
[OTHER.THC2]

What is the usual **THC** level in the **OTHER FORMS OF MARIJUANA NOT MENTIONED IN THIS SURVEY** you used?

Source: Modified Health Canada
Survey Draft

Enter number: ____ Dropdown menu: mg THC, %THC
-88 Refuse to answer

UNIVERSE: USE.MODES=13 OTHER.THC1=1

CANNABIS SOURCE
[OTHER.CBD1]

Do you know the **CBD** level in the **OTHER FORMS OF MARIJUANA NOT MENTIONED IN THIS SURVEY** you usually used?

Source: Modified Health Canada
Survey Draft

1= Yes
2= No
-77 Don't know
-88 Refuse to answer

UNIVERSE: USE.MODES=13

CANNABIS SOURCE
[OTHER.CBD2]

What is the usual level of **CBD** in the dried **OTHER FORMS OF MARIJUANA NOT MENTIONED IN THIS SURVEY** you used?

Source: Modified Health Canada
Survey Draft

Enter number: ____ Dropdown menu: mg CBD, %CBD
-88 Refuse to answer

UNIVERSE: USE.MODES=13 OTHER.CBD1=1

Retail Access

CANNABIS
[ACCESS.EASE]

PROGRAMMER NOTE
IF EVER.TRIED=2 OR IF USE.RECENT=1,2

Source: Modified from CSTADS
2014/15

Overall, how easy or difficult would it be for you to get marijuana?

IF USE.RECENT=3,4
Overall, how easy or difficult is it for you to get marijuana?

1=Very easy
2=Fairly easy
3=Neither easy nor difficult
4=Fairly difficult

5=Very difficult
-77 Don't know
-88 Refuse to answer

UNIVERSE: ALL

RETAIL
[RETAIL.ONLINE]

How easy or difficult would it be for you buy marijuana **online from a website?**

Source: NEW

1=Very easy
2=Fairly easy
3=Neither easy nor difficult
4=Fairly difficult
5=Very difficult
-77 Don't know
-88 Refuse to answer

UNIVERSE: ALL

RETAIL
[RETAIL.EASE]

How easy or difficult would it be for you to buy marijuana from a store **in the town or city where you live or in the city or nearest town to where you live?**

Source: NEW

1=Very easy
2=Fairly easy
3=Neither easy nor difficult
4=Fairly difficult
5=Very difficult
-77 Don't know
-88 Refuse to answer

UNIVERSE: RETAIL.ACCESS=1-3

RETAIL
[RETAIL.ACCESS]

How close do you live to a store that sells marijuana?

Source: NEW

1=Within walking distance
2=Within a short drive
3=Within a long drive
4=I don't know of any stores that sell marijuana where I live

-77 Don't know
-88 Refuse to answer

UNIVERSE: ALL

RETAIL
[RETAIL.VISIT]

Have you ever been inside a store that sells marijuana **in the city or nearest town where you live?**

Source: NEW

1=Never
2=Once
3=3 More than once
-77 Don't know
-88 Refuse to answer

UNIVERSE: RETAIL.ACCESS=1-3

CANNABIS SOURCE
[SOURCE3]

In the **past 12 months**, have you sold/resold marijuana to others?

Source: Health Canada Survey
Draft

1=Yes
2=No
-77 Don't know
-88 Refuse to answer

UNIVERSE: ALL

CANNABIS EXTRACTS
[EXTRACT.HEARD]

Have you ever heard of people using butane or CO₂ for making marijuana extracts or concentrates such as shatter, wax, honeycomb, oil, crumble, sap, budder, pull-and-snap?

1= Yes
2= No
-77 Don't know
-88 Refuse to answer

UNIVERSE: EVER.TRIED=ASK ALL

CANNABIS EXTRACTS
[EXTRACT.TRY]

Have you ever tried to make marijuana extracts or concentrates yourself?

1=No
2=Yes – using butane

- 3=Yes – using CO₂
- 4=Yes – some other way [_____] ← *Open text field*
- 77 Don't know
- 88 Refuse to answer

IF participant selects, “Yes – using butane” in EXTRACTTRY > BUTANESAFE

BUTANESAFE
[BUTANE.SAFE]

How safe or dangerous is it to make marijuana extracts or concentrates using **BUTANE**?

- 1=Very Safe
- 2=Safe
- 3=Neither safe nor dangerous
- 4=Dangerous
- 5=Very dangerous
- 77 Don't know
- 88 Refuse to answer

IF participant selected, “Yes – using CO₂” in EXTRACTTRY > CO2SAFE

CO2 SAFE
[CO2SAFE]

How safe or dangerous is it to make marijuana extracts or concentrates using **CO₂**?

- 1=Very Safe
- 2=Safe
- 3=Neither safe nor dangerous
- 4=Dangerous
- 5= Very dangerous
- 77 Don't know
- 88 Refuse to answer

IF participant selected, “Yes – some other way [_____]” in EXTRACTTRY take them to a new variable var OTHERSAFE and populate what they put into the open field in the blank after the colon.

OTHERSAFE
[OTHER.SAFE]

“How safe or dangerous is it to make marijuana extracts or concentrates in the other way you mentioned:
_____?”

- 1=Very Safe
- 2=Safe
- 3=Neither safe nor dangerous

4=Dangerous
5= Very dangerous
-77 Don't know
-88 Refuse to answer

Cannabis Use for Medical Purposes

**MED CANNABIS USE
[EVER.MED]**

*Source: Health Canada Survey
Draft*

Have you ever used or tried marijuana for **MEDICAL PURPOSES** (e.g., used to treat disease or improve symptoms?)

1=Yes
2=No
-77 Don't know
-88 Refuse to answer

UNIVERSE: EVER.USE=1

**MED CANNABIS USE
[DOC.AUTH.EVER]**

*Source: Health Canada Draft
Survey*

Was your use of marijuana for medical purposes authorized by a **LICENSED PHYSICIAN?**

1=Yes
2=No
-77 Don't know
-88 Refuse to answer

UNIVERSE: EVER.MED=1

**MED CANNABIS USE
[PAST12MOS.MED]**

*Source: Health Canada Survey
Draft*

In the **past 12 months**, have you used or tried marijuana for medical purposes?

1=Yes
2=No
-77 Don't know
-88 Refuse to answer

UNIVERSE: EVER.MED=1

**MED CANNABIS USE
[DOC.AUTH.12MON]**

*Source: Health Canada Draft
Survey*

Was your use of marijuana for medical purposes **in the past 12 months AUTHORIZED BY A
LICENSED PHYSICIAN?**

- 1=Yes
- 2=No
- 77 Don't know
- 88 Refuse to answer

UNIVERSE: PAST12MOS.MED=1

**MED CANNABIS USE
[MED.COND]**

*Source: Health Canada Draft
Survey.Modified*

For what general condition(s) did your physician authorize the use of marijuana?

- Acute pain
- Chronic pain
- Nausea/vomiting
- Lack of appetite
- Seizures
- Headaches/migraines
- Muscle spasms
- Anxiety
- Problems sleeping
- Depression

Other _____

UNIVERSE: RESPONDENTS THAT ANSWERED [PAST12MOS.MED=1]

**SIDE EFFECTS
[NEG.SIDEXI]**

*Source: ADAPATED FROM Health
Canada Draft Survey*

Have you ever experienced any of the following unintended adverse effects/reactions from using
marijuana? (Select all that apply.)

- 1=Dry mouth
- 2=Nausea
- 3=Vomiting
- 4=Dry or red eyes
- 5=Heart and blood pressure problems
- 6=Feeling faint or dizzy

- 7=Numbness
- 8=Panic reactions
- 9=Hallucinations
- 10=Flashbacks
- 11=Depression
- 12=Sexual problems
- 13=Other _____
- 14=I have never experience any unintended adverse effects/reactions from using marijuana.
- 77 Don't know
- 88 Refuse to answer

UNIVERSE: EVER.USE=1

**SIDE EFFECTS
[NEG.SIDEX2]**

Did you seek medical help or talk to a health professional about any of these adverse effects?

- 1=Yes
- 2=No
- 77 Don't know
- 88 Refuse to answer

UNIVERSE: NEG.SIDEX1=1-13

**SIDE EFFECTS
[NEG.SIDEX3]**

Did you consider seeking medical help?

- 1=Yes
- 2=No
- 77 Don't know
- 88 Refuse to answer

UNIVERSE: NEG.SIDEX2=2

**SIDE EFFECTS
[NEG.SIDEX4]**

When you experienced side effects from marijuana, were you also... (Select all that apply)

- 1=Drinking alcohol
- 2=Taking recreational drugs other than marijuana
- 3=Taking prescription medication(s)
- 4=Other _____

5=None of these [**PROGRAMMER:** ONLY ALLOW IF NEITHER OPTION CHOSEN ABOVE]

-77 Don't know

-88 Refuse to answer

UNIVERSE: NEG.SIDEX1=1-13

SIDE EFFECTS
[NEG.SIDEX5]

When you experienced side effects from marijuana, what type or form were you using? (Select all that apply)

1=Smoked Dried flower/leaf

2=Vaporized Dried flower/leaf

3=Vaporized liquid form in an e-cigarette

4=Mixed with tobacco (blunt)

5=Hashish

6=Hash oil

7=Concentrate (e.g., Butane honey oil/shatter/budder/etc.)

8=Edibles (e.g. cookies)

9=Liquid (e.g., cola/tea)

10=Tinctures (e.g., concentrated amounts ingested orally or taken under the tongue)

11=Topical Ointments (e.g., lotions, salves, balms applied directly to the skin)

12=Fresh flower/leaf (e.g., for juicing)

13=Other _____ (please specify without providing any identifiable information)

-77 Don't know

-88 Refuse to answer

UNIVERSE: NEG.SIDEX1=1-13

Initiation & Susceptibility

AGE OF INITIATION
[AOI]

How old were you when you tried or started using marijuana?

Source: Draft Survey

Enter age in years:

UNIVERSE: EVER.TRIED=1

**CANNABIS USE INTENTIONS
OF NEVER USERS
[FUTURE.TRY1]**

*Source: CSTADS 2016/2017 Edited
from "smoking cigarettes" to
"using marijuana or cannabis (a
joint, pot, weed, hash, or hash oil)".*

PROGRAMMER NOTE

IF EVER.TRIED=2:

Do you think in the future you might try using marijuana?

IF USE.RECENT: =1-3

Do you think in the future you will use marijuana?

1=Definitely yes

2=Probably yes

3=Probably not

4=Definitely not

-77 Don't know

-88 Refuse to answer

UNIVERSE: ALL

**CANNABIS USE INTENTIONS
OF NEVER USERS
[FUTURE.TRY2]**

*Source: CSTADS 2016/2017 Edited
from "smoking cigarettes" to
"using marijuana or cannabis (a
joint, pot, weed, hash, or hash oil)".*

If one of your best friends were to offer you marijuana, would you try it?

1=Definitely yes

2=Probably yes

3=Probably not

4=Definitely not

-77 Don't know

-88 Refuse to answer

UNIVERSE: EVER.TRIED=2 OR USE.RECENT=1-3

**CANNABIS USE INTENTIONS
OF NEVER USERS
[FUTURE.TRY3]**

*Source: CSTADS 2016/2017 Edited
from "smoking cigarettes" to
"using marijuana or cannabis (a
joint, pot, weed, hash, or hash oil)".*

At any time during the next year do you think you will use marijuana?

1=Definitely yes

2=Probably yes

3=Probably not

4=Definitely not

-77 Don't know

-88 Refuse to answer

UNIVERSE: EVER.TRIED=2 OR USE.RECENT=1-3

**CANNABIS USE
[LEGAL.EVERUSE]**

*Source: Modified Health Canada
Draft Survey*

If marijuana were **LEGAL** to use, how would it affect whether you would use marijuana?

- 1=Definitely more likely to use
- 2=Probably more likely to use
- 3=No effect
- 4=Probably less likely to use
- 5=Definitely less likely to use
- 77 Don't know
- 88 Refuse to answer

UNIVERSE: ALL

Perceptions of Risk and Harm

**PERCEPTIONS OF HEALTH
RISKS
[HEALTH.AWARE]**

Source: Focus Group Work

PROGRAMMER NOTE: PLEASE INCLUDE 5 SEPARATE OPEN-ENDED ENTRY FIELDS. If they click next before writing in each one, prompt with question:
"Are there any others?"

In your opinion, what are the **MOST IMPORTANT NEGATIVE HEALTH EFFECTS** from marijuana use. Please list up to five.

UNIVERSE=ALL

**PERCEPTIONS OF HEALTH
RISKS
[HEALTH.RISKS4]**

Source: Focus Group Work

How likely is someone to become addicted to smoking marijuana?

- 1 Very unlikely
- 2 Somewhat unlikely
- 3 Neither likely nor unlikely
- 4 Somewhat likely
- 5 Very likely
- 77 Don't know
- 88 Refused

UNIVERSE=ALL

**MARIJUANA ADDICTIVE
[SELF.ADDICTED]**

Source: ITC Adapted

Do you consider yourself addicted to marijuana?

- 1= Not at all

- 2= Yes, a little addicted
- 3= Yes, very addicted
- 77 Don't know
- 88 Refused

UNIVERSE: RESPONDENTS WHO USED MARIJUANA IN PAST 30 DAYS (USE.RECENT=3,4)

PERCEPTIONS OF HEALTH RISKS
[HEALTH.RISKS7]

Source: ITC Adapted

Are you worried that using marijuana will damage your health in the future?

- 1= Not at all worried
- 2= A little worried
- 3= Moderately worried
- 4= Very worried
- 77 Don't know
- 88 Refuse to answer

UNIVERSE: USE.RECENT=2-4

MENTAL HEALTH
[HEALTH.RISKS2]

Source: New

In general, do people risk harming their mental health when they use marijuana on a regular basis, for non-medical reasons?

- 1=No risk
- 2=Slight Risk
- 3=Moderate Risk
- 4=Great Risk
- 5=I don't know
- 88=Refused

Self-Reported Impact of Use

**CANNABIS USE
[USE.EFFECTS]**

*Modified from Health Canada
Survey Draft*

PROGRAMMER NOTE
DISPLAY IN TABLE FORMAT WITH RESPONSE OPTIONS FOR EACH LINE

During the **past 12 months**, how did your marijuana use affect the following areas of life:

- 1= friendships or social life?
- 2= physical health?
- 3= mental health?
- 4= home or family life?
- 5= work, studies or employment opportunities?
- 6= financial position?

RESPONSE OPTIONS:

- 1 Positive effect
- 2 Negative effect
- 3 No effect
- 4 I don't know
- 5 Refuse to answer

UNIVERSE: USE.RECENT=2-4

Overall, during the **past 12 months**, how has your marijuana affected your QUALITY OF LIFE?

**CANNABIS USE
[USE.LIFEQUALITY]**

*Modified from Health Canada
Survey Draft*

- 1= Improved my quality of life
- 2= Worsened my quality of life
- 3= No effect on my quality of life
- 77 Don't know
- 88 Refuse to answer

UNIVERSE: USE.RECENT=2-4

Cannabis Use Practice

**CANNABIS WORK
[USE.WORK]**

Source: New

Have you ever used marijuana **BEFORE OR DURING WORK?**

- 1= Never
- 2= Once
- 3= 2 to 5 times
- 4= 6 to 10 times
- 5= More than 10 times
- 77 Don't know
- 88 Refuse to answer

UNIVERSE: EVER.TRIED=1

**CANNABIS WORK
[USE.CURRENTWORK]**

Source: New

Have you used marijuana before or during work **in the past 12 months?**

- 1= Never
- 2= Once
- 3= 2 to 5 times
- 4= 6 to 10 times
- 5= More than 10 times
- 77 Don't know
- 88 Refuse to answer

UNIVERSE: USE.WORK=2-5

**CANNABIS LOCATION
[PRACTICES3]**

*Source: Health Canada Draft
Survey.Modified*

In the **past 12 months**, have you noticed someone using marijuana near you in a public space (e.g., street, park, alley, mall, etc.)?

- 1=Not in the past 12 months
- 2=Less than monthly
- 3=Weekly
- 4=Every day
- 5=More than once a day
- 77 Don't know
- 88 Refuse to answer

UNIVERSE: ALL

Problematic Use (ASSIST Instrument)

Note: FIRST ASSIST MEASURE CAN BE DERIVED FROM VAR [USE.RECENT]

CANNABIS USE
[PAST3MOS.A2]

Source: ASSIST Tool

During the **past 3 months**, how often have you had a strong desire or urge to use marijuana?

- 1=Never
- 2=Once or twice
- 3=Monthly
- 4=Weekly
- 5=Daily or almost daily
- 77 Don't know
- 88 Refuse to answer

UNIVERSE: USE.RECENT=3-4

CANNABIS USE
[PAST3MOS.A3]

Source: ASSIST Tool

During the **past 3 months**, how often has your use of marijuana led to health, social, legal, or financial problems?

- 1=Never
- 2=Once or twice
- 3=Monthly
- 4=Weekly
- 5=Daily or almost daily
- 77 Don't know
- 88 Refuse to answer

UNIVERSE: USE.RECENT=3-4

CANNABIS USE
[PAST3MOS.A4]

Source: ASSIST Tool

During the **past 3 months**, how often have you failed to do what was normally expected of you because of your use of marijuana?

- 1=Never
- 2=Once or twice
- 3=Monthly
- 4=Weekly
- 5=Daily or almost daily
- 77 Don't know

-88 Refuse to answer

UNIVERSE: USE.RECENT=3-4

**CANNABIS USE
[PAST3MOS.A5]**

Has a friend or relative or anyone else expressed concern about your use of marijuana?

Source: ASSIST Tool

- 1=No, never
- 2=Yes, in the past 3 months
- 3=Yes, but not in the past 3 months
- 77 Don't know
- 88 Refuse to answer

UNIVERSE: USE.RECENT=3-4

**CANNABIS USE
[PAST3MOS.A6]**

Have you ever tried and failed to control, cut down or stop using marijuana?

Source: ASSIST Tool

- 1=No, never
- 2=Yes, in the past 3 months
- 3=Yes, but not in the past 3 months
- 77 Don't know
- 88 Refuse to answer

UNIVERSE: USE.RECENT=3-4

Treatment and Health Seeking Behaviour

**TREATMENT
[HELP1]**

In the last 12 months, have you ever tried to get help to manage problems with your marijuana use?

Source: Global Drug Survey

- 1=Yes
- 2=No
- 77 Don't know
- 88 Refuse to answer

UNIVERSE: USE.RECENT=2-4

**TREATMENT
[HELP2]**

In the last 12 months, have you ever thought about getting help to manage problems with your marijuana use?

Source: Global Drug Survey

- 1=Yes
- 2=No
- 77 Don't know
- 88 Refuse to answer

UNIVERSE: HELP1=2

Mental Health

PERCEIVED RISK – OTHER SUBSTANCES [RISK.1]

Source: Modified ESPAD 2015

How much do you think PEOPLE RISK harming themselves (physically or in other ways), if they ...

	No risk	Slight risk	Moderate risk	Great risk	Don't know
a) smoke cigarettes occasionally	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b) smoke cigarettes every day.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d) drink alcohol (3 – 4 drinks) occasionally	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e) drink alcohol (3- 4 drinks) daily	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

UNIVERSE: ALL

Note: live version also included a Refuse to answer column.

PROGRAMMER NOTE: PLEASE LEAVE A SMALL SPACE BETWEEN EACH SUBSTANCE

PERCEIVED RISK – MARIJUANA [RISK.2]

Source: Modified ESPAD 2015

How much do you think PEOPLE RISK harming themselves (physically or in other ways), if they ...

Mark one box for each line.

	No risk	Slight risk	Moderate risk	Great risk	Don't know
a) smoke marijuana occasionally	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b) smoke marijuana daily.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
i) vape marijuana occasionally	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
i) vape marijuana daily	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
j) eat or drink marijuana edibles occasionally	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
j) eat or drink marijuana edibles daily	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
k) use synthetic marijuana occasionally	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
l) use synthetic marijuana daily	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
l) use high potency marijuana extracts occasionally	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

l) use high potency marijuana extracts daily

UNIVERSE: ALL

Note: live version also included a Refuse to answer column.

MENTAL HEALTH
[MENTAL.EVER]

Source: CCHS modified

Do you have a family history of significant emotional or mental health problems related to any of the following? (Select all that apply.)

1=Anxiety (including phobia, obsessive-compulsive disorder or a panic disorder)

2=Depression (including bipolar disorder, mania or dysthymia)

3=PTSD or traumatic event (post-traumatic stress disorder)

4=Psychosis (including schizophrenia)

5=Drug or alcohol use

6 =Other significant emotional or mental health problem

7=Nobody in my family has experienced significant emotional or mental health problems.

UNIVERSE: ALL

MENTAL HEALTH
[MENTAL.SELF]

Source: CCHS modified

Have you ever experienced significant emotional or mental health problems related to any of the following? (Select all that apply.)

1=Anxiety (including phobia, obsessive-compulsive disorder or a panic disorder)

2=Depression (including bipolar disorder, mania or dysthymia)

3=PTSD or traumatic event (post-traumatic stress disorder)

4=Psychosis (including schizophrenia)

5= Drug or alcohol use

6 =Other significant emotional or mental health problem

7=I have never experienced significant emotional or mental health problems.

UNIVERSE: ALL

MENTAL HEALTH
[MENTAL.HEALTHPRO]

Source: CCHS modified

PROGRAMMER NOTE: ONLY SHOW RESPONSES SELECTED IN MENTAL.SELF

Have you ever, seen or talked to a health professional about your emotional or mental health for any of the following? (Select all that apply.)

1=Anxiety (including phobia, obsessive-compulsive disorder or a panic disorder)

- 2=Depression (including bipolar disorder, mania or dysthymia)
- 3=PTSD or traumatic event (post-traumatic stress disorder)
- 4=Psychosis (including schizophrenia)
- 5=Substance dependence disorder
- 6=Other [Specify]
- 7=I have never experienced significant emotional or mental health problems.

UNIVERSE: MENTAL.SELF= AT LEAST ONE SELECTED

MENTAL HEALTH
[MENTAL.12MON]

PROGRAMMER NOTE: ONLY SHOW RESPONSES SELECTED IN MENTAL.SELF

How you experienced significant emotional or mental health problems in the **last 12 months?** (Select all that apply.)

- 1=Anxiety (including phobia, obsessive-compulsive disorder or a panic disorder)
- 2=Depression (including bipolar disorder, mania or dysthymia)
- 3=PTSD or traumatic event (post-traumatic stress disorder)
- 4=Psychosis (including schizophrenia)
- 5=Substance dependence disorder
- 6=Other [Specify]
- 7=None of the above

UNIVERSE: UNIVERSE: EVER.TRIED=1 AND MENTAL.SELF= AT LEAST ONE SELECTED, BUT NOT 7

MENTAL HEALTH
[MENTAL.COPE]

Have you ever used marijuana to manage or improve emotional or mental health problems?
SELECT ALL THAT APPLY

- 1 Yes
- 2 No
- 77 Don't know
- 88 Refuse to answer

UNIVERSE: EVER.TRIED=1 AND MENTAL.SELF= AT LEAST ONE SELECTED, BUT NOT 7

MENTAL HEALTH
[MENTAL.EFFECT]

Overall, how has marijuana use affected your mental health?

- 1= Improved my mental health
- 2= Worsened my mental health
- 3= No effect on my mental health
- 77 Don't know
- 88 Refuse to answer

UNIVERSE: EVER.TRIED=1

Social Norms

**SOCIAL NORMS
[NORMS.FRIENDS]**

*Source: Health Canada Draft
Survey*

How many of your 5 closest friends use marijuana?

- 1=None
- 2=One
- 3=Two
- 4=Three
- 5=Four
- 6=Five
- 77 Don't know
- 88 Refused

UNIVERSE: ALL

**SOCIAL NORMS -
FRIENDS
[NORMS.APPROVE]**

Source: P01 MEASURE

Do people your age approve or disapprove of using marijuana?

- 1= Strongly approve
- 2= Somewhat approve
- 3= Neither approve nor disapprove
- 4= Somewhat disapprove
- 5= Strongly disapprove
- 77 Don't know
- 88 Refused

UNIVERSE: ALL

**SOCIAL NORMS -
FRIENDS
[NORMS.COOL]**

Source: P01 MEASURE

Do people your age think it's cool to use marijuana?

- 1= Not at all cool
- 2= A little
- 3= Somewhat
- 4= Very cool
- 77 Don't know
- 88 Refused

UNIVERSE: ALL

Advertising & Promotion

**ADVERTISING &
PROMOTION
[ADPROMO]**

*Source: Adapted from
tobacco/ecig*

In the last 30 days, have you noticed marijuana products being advertised or promoted in any of the following places?

- 1= In regular postal mail?
- 2= On websites or social media, like Facebook, Twitter, YouTube, Instagram or Snapchat?
- 3= In email or text messages?
- 4= In bars or pubs?
- 5= In shops/stores that sell marijuana?
- 6= Outside shops/stores that sell marijuana?
- 7= At a pharmacy?
- 8= At events like fairs, markets, festivals, sporting events, or music concerts?
- 9= At kiosks or temporary sales locations (in shopping centres, parked in the street, other places, but not at specific events)?
- 10= On television or radio?
- 11= On billboards or posters?
- 12= In print newspapers or magazines?
- 13= At the movies?
- 14= Taxis or buses/public transit?
- 15= In flyers?
- 77 Don't know
- 88 Refused

UNIVERSE: ALL
PROGRAMMER NOTE: RANDOMIZE ORDER OF RESPONSE OPTIONS IN A [YES/NO] CHECKLIST

**PUBLIC EDUCATION
[EDUCATION.AWARE]**

Source: NEW

Have you seen any education campaigns or public health messages warning about the risks of marijuana in the past 12 months?

- 1 Yes
- 2 No
- 77 Don't know
- 88 Refuse to answer

UNIVERSE: ALL

**PUBLIC EDUCATION
[EDUCATION.AWARE]**

Source: NEW

Where have you seen education campaigns or public health messages about marijuana in the past 12 months?

- 1=In school?
- 2=At work?
- 3=On websites or social media, like Facebook, Twitter, YouTube, Instagram or Snapchat?
- 4=In email or text messages?
- 5=In bars or pubs?
- 6=In shops/stores that sell marijuana?
- 7=Outside shops/stores that sell marijuana?
- 8=At a pharmacy?
- 9=At events like fairs, markets, festivals, sporting events, or music concerts?
- 10=At kiosks or temporary sales locations (in shopping centres, parked in the street, other places, but not at specific events)?
- 11=On television or radio?
- 12=On billboards or posters?
- 13=In print newspapers or magazines?
- 14=At the movies?
- 15=Taxis or buses/public transit?
- 16=In flyers?
- 77 Don't know
- 88 Refused

UNIVERSE: EDUCATION.AWARE=1

**PUBLIC EDUCATION
[WARNING.AWARE]**

Source: NEW

Have you ever seen a health warning on marijuana products or packages?

1=Yes

2=No

-77 Don't know

-88 Refused

UNIVERSE: EDUCATION.AWARE=1

Driving

**DRIVING BEHAVIOURS
[DRIVER]**

*Source: CSTADS 2014,
modified*

Have you driven a vehicle (e.g., car, snowmobile, motor boat, or an off-road vehicle (ATV) within 2 hours of using **marijuana**?

1=No, never

2=Yes, in the last 30 days

3=Yes, in the last 12 months

4=Yes, more than 12 months ago

-77 Don't know

-88 Refused

UNIVERSE: ALL

**DRIVING BEHAVIOURS
[PASSENGER]**

Source: CSTADS 2014

Have you ever been a passenger in a vehicle (e.g., car, snowmobile, motor boat, or an off-road vehicle (ATV) driven by someone who had been using **marijuana** in the last 2 hours?

1=No, never

2=Yes, in the last 30 days

3=Yes, in the last 12 months

4=Yes, more than 12 months ago

-77 Don't know

-88 Refused

UNIVERSE: ALL

DRIVING
SOCIAL NORMS
[DRIVING.SOC1]

Source: Modified [BC Roadside Survey](#)

How likely do you think it is, that if a person drives after **drinking too much alcohol**, they will be **stopped** by the police?

- 1= Extremely unlikely
- 2= Unlikely
- 3= In the middle
- 4= Likely
- 5= Extremely likely
- 77 Don't know
- 88 Refused

UNIVERSE: ALL

DRIVING
SOCIAL NORMS
[DRIVING.SOC2]

Source: Modified [BC Roadside Survey](#)

How likely do you think it is, that if a person drives after **using marijuana**, they will be **stopped** by the police?

- 1= Extremely unlikely
- 2= Unlikely
- 3= In the middle
- 4= Likely
- 5= Extremely likely
- 77 Don't know
- 88 Refused

UNIVERSE: ALL

DRIVING
SOCIAL NORMS
[DRIVING.SOC3]

Source: Modified [BC Roadside Survey](#)

If a person is stopped by the police after **drinking too much alcohol**, how likely are they to be **charged**?

- 1= Extremely unlikely
- 2= Unlikely
- 3= In the middle
- 4= Likely
- 5= Extremely likely
- 77 Don't know

-88 Refused

UNIVERSE: ALL

**DRIVING
SOCIAL NORMS
[DRIVING.SOC3]**

Source: Modified [BC Roadside Survey](#)

If a person is stopped by the police after **using marijuana**, how likely are they to be **charged**?

1= Extremely unlikely

2= Unlikely

3= In the middle

4= Likely

5= Extremely likely

-77 Don't know

-88 Refused

UNIVERSE: ALL

**DRIVING
SOCIAL NORMS
[DRIVING.SOC4]**

New

If a friend had **used marijuana** and was going to drive, would you try to stop them?

1= I wouldn't do anything

2= I would tell them not to drive, but I wouldn't try to stop them

3= I would try a little bit to stop them from driving

4= I would try very hard to stop them from driving

-77 Don't know

-88 Refused

UNIVERSE: ALL

**DRIVING
SOCIAL NORMS
[DRIVING.SOC4]**

New

If a friend had **drank too much alcohol** and was going to drive, would you try to stop them?

1= I wouldn't do anything

2= I would tell them not to drive, but I wouldn't try to stop them

3= I would try a little bit to stop them from driving

4= I would try very hard to stop them from driving

-77 Don't know

-88 Refused

UNIVERSE: ALL

**DRIVING SOCIAL NORMS
[DRIVING.SOC6]**

How easy or difficult is it to tell if someone has had too much alcohol before driving?

- 1=Very easy
- 2=Easy
- 3=In the middle
- 4=Difficult
- 5=Very difficult
- 77 Don't know
- 88 Refused

UNIVERSE: ALL

**DRIVING BEHAVIOURS
[IMPAIR]**

Do you think driving after using marijuana increases the risk of getting into an accident?

Source: NEW

- 1=Not at all
- 2=A little
- 3=Somewhat
- 4=A lot
- 77 Don't know
- 88 Refused

UNIVERSE: ALL

**DRIVING BEHAVIOURS
[IMPAIR2]**

Is driving after using marijuana more or less dangerous than driving after drinking too much alcohol?

Source: NEW

- 1=Marijuana a lot more dangerous
- 2=Marijuana a little more dangerous
- 3=The same
- 4=Alcohol a little more dangerous
- 5=Alcohol a lot more dangerous
- 77 Don't know
- 88 Refused

UNIVERSE: ALL

DRIVING SOCIAL NORMS
[DRIVING.SOC6]

How easy is it to tell if someone has used marijuana before driving?

- 1=Very easy
- 2=Easy
- 3=In the middle
- 4=Difficult
- 5=Very difficult
- 77 Don't know
- 88 Refused

UNIVERSE: ALL

Polysubstance Use

OTHER DRUGS
[DRUGS.TRY]

Have you ever used or tried any of the following drugs. (Select all that apply.)

- 1=Smoked cigarettes
- 2=E-cigarettes / vaping nicotine
- 3=Amphetamines (speed, crystal meth or ice, meth,...)
- 4=MDMA (ecstasy, E, X,...)
- 5=Hallucinogens (LSD, acid, PCP, magic mushrooms or 'shrooms', mesc..)
- 6=Heroin (smack, junk, crank,...)
- 7=Cocaine (crack, blow, snow,...)
- 8=Synthetic marijuana (spice, synthetic marijuana, K2, K3, scene, herbal mixtures, herbal incense)
- 9=Prescribed pain relievers used TO GET HIGH (E.G. Oxycodone, Fentanyl, Other prescribed pain relievers)
- 11=I have never used any of the drugs listed here.

UNIVERSE: ALL

OTHER DRUGS
[DRUGS.LAST]

PROGRAMMER NOTE

POPULATE A TABLE WITH THE SELECTED SUBSTANCES IN [DRUGS.TRY] IN THE LEFT_HAND COLUMN WITH THE RESPONSE CATEGORIES LISTED BELOW. IF [DRUGS.TRY]=11, SKIP TO [BINGE.DRINKING]

When was the last time you used [INSERT DRUG CATEGORY FROM DRUGS.TRY]...

- 1= More than 12 months ago
- 2= Between 3 to 12 months ago
- 3= Between 1 to 3 months
- 4= Within the last month
- 77 Don't know
- 88 Refuse to answer

UNIVERSE: DRUGS.TRY=1-10

**OTHER DRUGS
[DRUGS.CURRENT]**

PROGRAMMER NOTE
POPULATE A TABLE WITH THE SELECTED SUBSTANCES IN [DRUGS.TRY] WITH THE RESPONSE CATEGORIES LISTED BELOW.

Do you currently use [INSERT DRUG CATEGORY FROM DRUGS.TRY]...

- 1= Less than once per month
- 2= Monthly
- 3= Weekly
- 4= Daily
- 77 Don't know
- 88 Refuse to answer

UNIVERSE: DRUGS.TRY=1-10

**ALCOHOL USE
[BINGE.DRINKING]**

In the **past 12 months**, how often did you have ["5" if male / "4" if female] drinks of alcohol or more on one occasion?

Source: [CSTADS](#)
(revised to add "(4 drinks for females)" as per Erin's request)

A DRINK means: 1 regular sized bottle, can, or draft of beer; 1 glass of wine; 1 bottle or can of cooler; 1 shot of liquor (rum, whiskey, etc.); or 1 mixed drink (1 shot of liquor with pop, juice, energy drink, etc.).

- 1= I have never done this
- 2= I did not have [5/4] or more drinks on one occasion in the last 12 months
- 3= Less than once a month
- 4= Once a month
- 5= 2 to 3 times a month
- 6= Once a week

- 7= 2 to 5 times a week
- 8= Daily or almost daily
- 9= I do not know *[valid answer]*
- 88 Refuse to answer

OTHER DRUGS
[DRUGS.MARIJUANA]

PROGRAMMER NOTE
POPULATE A TABLE WITH THE SELECTED SUBSTANCES IN [DRUGS.TRY] IN THE LEFT_HAND COLUMN WITH THE RESPONSE CATEGORIES LISTED BELOW. INCLUDE [BINGE.DRINKING] IF >2 and <8 as "Alcohol".

Which substances have you used ON THE SAME OCCASION WITH MARIJUANA in the past 12 months?

[INSERT CHECKLIST]

UNIVERSE: DRUGS.TRY=1-10, BINGE.DRINKING=2-8

PACK INFO
[PACK.INFO]

In your opinion, what information should appear on marijuana packaging, if any? (Select all that apply.)

- 1=THC level
- 2=Strength or potency
- 3=Pesticide use
- 4=Grown indoor/outdoor
- 5=Nutrition labels
- 6=Time to onset and duration
- 7=Nothing
- 77 Don't know
- 88 Refused

UNIVERSE: ALL

SECTION 2: Perceptions of Health Warnings

Text vs. Pictures

PROGRAMMER NOTE: RANDOMIZE PARTICIPANTS TO VIEW 4 TEXT AND 4 PICTURE WARNINGS FOR THE FOLLOWING 8 QUESTIONS

We are now going to show you some health warnings. Please look at each warning before answering.

DRIVING
[DRIVING.SET]

PROGRAMMER NOTE: FIND PICTURES IN FOLDER TITLED 'SURVEY PICTURES'. COND1=DRIVINGPIC.jpeg, COND2=DRIVINGTEXT.jpeg



DRIVING HIGH IS DANGEROUS

DRIVING AFTER USING MARIJUANA SLOWS DOWN YOUR REACTION TIME SIMILAR TO ALCOHOL. DRIVING AFTER USING MARIJUANA CAN DOUBLE YOUR RISK OF A CAR CRASH.

- a. Overall, how EFFECTIVE is this health warning?
[INSERT SCALE 1-10, 1= NOT AT ALL EFFECTIVE, 10=EXTREMELY EFFECTIVE]

- b. How BELIEVABLE is this health warning?
[INSERT SCALE 1-10, 1= NOT AT ALL BELIEVABLE, 10=EXTREMELY BELIEVABLE]

UNIVERSE: ALL

PREGNANCY
[PREG.SET]

PROGRAMMER NOTE: FIND PICTURES IN FOLDER TITLED 'SURVEY PICTURES'. COND1=PREGPIC.jpeg, COND2=PREGTEXT.jpeg



SMOKING MARIJUANA DURING PREGNANCY HURTS YOU AND YOUR BABY
MARIJUANA USE DURING YOUR PREGNANCY CAN HURT YOUR BABY'S GROWTH AND LEARNING ABILITIES

- a. Overall, how EFFECTIVE is this health warning?
[INSERT SCALE 1-10, 1= NOT AT ALL EFFECTIVE, 10=EXTREMELY EFFECTIVE]

- b. How BELIEVABLE is this health warning?
[INSERT SCALE 1-10, 1= NOT AT ALL BELIEVABLE, 10=EXTREMELY BELIEVABLE]

UNIVERSE: ALL

PROGRAMMER NOTE: FIND PICTURES IN FOLDER TITLED 'SURVEY PICTURES'. COND1=MHPIC.jpeg, COND2=MHTEXT.jpeg



MARIJUANA USE CAN HARM YOUR MENTAL HEALTH
USING MARIJUANA CAN LEAD TO MENTAL HEALTH PROBLEMS OR MAKE THEM WORSE –
AVOID IF YOU HAVE A PERSONAL OR FAMILY HISTORY OF MENTAL HEALTH ISSUES

- a. Overall, how EFFECTIVE is this health warning?
[INSERT SCALE 1-10, 1= NOT AT ALL EFFECTIVE, 10=EXTREMELY EFFECTIVE]

- b. How BELIEVABLE is this health warning?
[INSERT SCALE 1-10, 1= NOT AT ALL BELIEVABLE, 10=EXTREMELY BELIEVABLE]

UNIVERSE: ALL

MIXING OTHER
DRUGS & ALCOHOL
[DURGSALC.SET]

PROGRAMMER NOTE: FIND PICTURES IN FOLDER TITLED 'SURVEY PICTURES'. COND1=MIXPIC.jpeg, COND2=MIXTEXT.jpeg



MIXING MARIJUANA WITH ALCOHOL OR OTHER DRUGS IS DANGEROUS
MIXING DRUGS PUTS YOU AT A GREATER RISK OF ACCIDENTS LEADING TO SERIOUS
INJURY OR DEATH

- a. Overall, how EFFECTIVE is this health warning?
[INSERT SCALE 1-10, 1= NOT AT ALL EFFECTIVE, 10=EXTREMELY EFFECTIVE]

- b. How BELIEVABLE is this health warning?
[INSERT SCALE 1-10, 1= NOT AT ALL BELIEVABLE, 10=EXTREMELY BELIEVABLE]

UNIVERSE: ALL

YOUTH USE
[YOUTH.SET]

PROGRAMMER NOTE: FIND PICTURES IN FOLDER TITLED 'SURVEY PICTURES'. COND1=YOUTH PIC.jpeg, COND2=YOUTHTEXT.jpeg



LIVE ONCE THINK TWICE

HEAVY MARIJUANA USE IN YOUR TEENS CAN SERIOUSLY AFFECT YOUR DEVELOPING BRAIN MAKING THINGS HARD TO REMEMBER OR UNDERSTAND

- a. Overall, how EFFECTIVE is this health warning?
[INSERT SCALE 1-10, 1= NOT AT ALL EFFECTIVE, 10=EXTREMELY EFFECTIVE]

- b. How BELIEVABLE is this health warning?
[INSERT SCALE 1-10, 1= NOT AT ALL BELIEVABLE, 10=EXTREMELY BELIEVABLE]

UNIVERSE: ALL

ADDICTION
[ADDICT.SET]

PROGRAMMER NOTE: FIND PICTURES IN FOLDER TITLED 'SURVEY PICTURES'. COND1=ADDPIC.jpeg, COND2=ADDTEXT.jpeg



MARIJUANA IS ADDICTIVE

MARIJUANA USE CAN BECOME HARD TO STOP AND TAKE PRIORITY OVER OTHER PARTS OF YOUR LIFE INCLUDING FAMILY, FRIENDS, AND WORK.

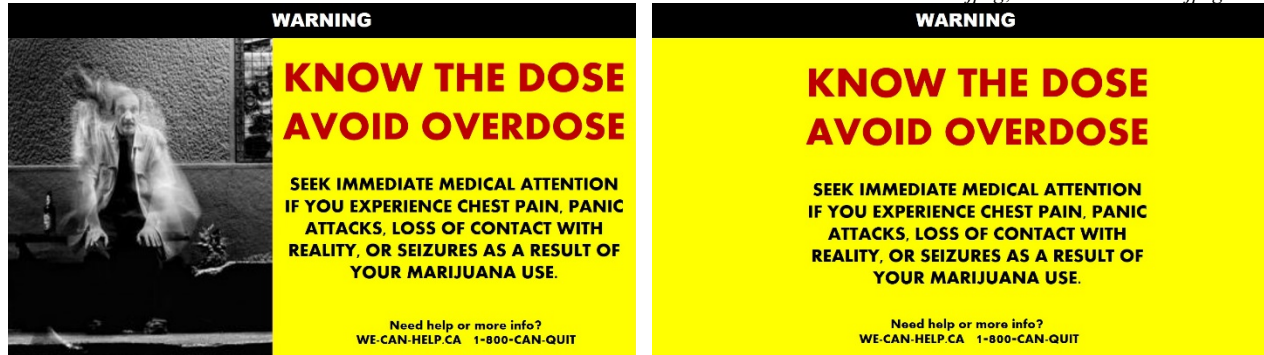
- a. Overall, how EFFECTIVE is this health warning?
[INSERT SCALE 1-10, 1= NOT AT ALL EFFECTIVE, 10=EXTREMELY EFFECTIVE]

- b. How BELIEVABLE is this health warning?
[INSERT SCALE 1-10, 1= NOT AT ALL BELIEVABLE, 10=EXTREMELY BELIEVABLE]

UNIVERSE: ALL

OVERDOSE
[OD.SET]

PROGRAMMER NOTE: FIND PICTURES IN FOLDER TITLED 'SURVEY PICTURES'. COND1=ODPIC.jpeg, COND2=ODTEXT.jpeg



KNOW THE DOSE AVOID OVERDOSE

PRODUCTS HAVE DIFFERENT THC LEVELS AND EFFECTS. SEEK IMMEDIATE MEDICAL ATTENTION IF YOU EXPERIENCE CHEST PAIN, PANIC ATTACKS, LOSS OF CONTACT WITH REALITY, OR SEIZURES AS A RESULT OF YOUR MARIJUANA USE.

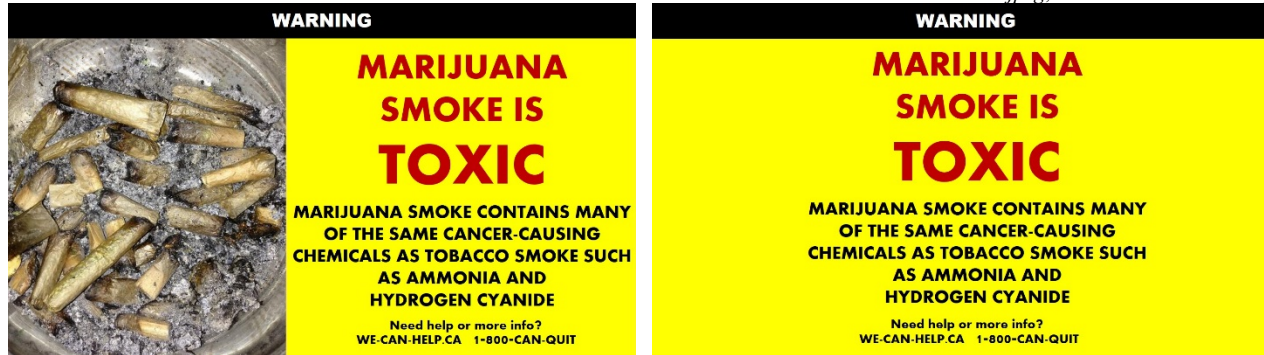
- a. Overall, how EFFECTIVE is this health warning?
[INSERT SCALE 1-10, 1= NOT AT ALL EFFECTIVE, 10=EXTREMELY EFFECTIVE]

- b. How BELIEVABLE is this health warning?
[INSERT SCALE 1-10, 1= NOT AT ALL BELIEVABLE, 10=EXTREMELY BELIEVABLE]

UNIVERSE: ALL

SMOKE
[MJSMOKE.SET]

PROGRAMMER NOTE: FIND PICTURES IN FOLDER TITLED 'SURVEY PICTURES'. COND1=SMOKEPIC.jpeg, COND2=SMOKETEXT.jpeg



MARIJUANA SMOKE IS TOXIC

MARIJUANA SMOKE CONTAINS MANY OF THE SAME CANCER-CAUSING CHEMICALS AS TOBACCO SMOKE SUCH AS AMMONIA AND HYDROGEN CYANIDE.

- a. Overall, how EFFECTIVE is this health warning?
[INSERT SCALE 1-10, 1= NOT AT ALL EFFECTIVE, 10=EXTREMELY EFFECTIVE]

- b. How BELIEVABLE is this health warning?
[INSERT SCALE 1-10, 1= NOT AT ALL BELIEVABLE, 10=EXTREMELY BELIEVABLE]

UNIVERSE: ALL

PRODUCT.WARNING
[WARNING.SUPPORT1]

In your opinion, if it were legal to sell marijuana, should health warnings be required on products?

- 1=Yes
- 2=No
- 3= Don't know

UNIVERSE: ALL

PRODUCT.WARNING
[WARNING.SUPPORT2]

Should health warnings include pictures?

- 1=Yes
- 2=No

3= Don't know

UNIVERSE: if WARNING.SUPPORT = 1 OR 3

HELPLINE.C1

PROGRAMMER NOTE: FIND PICTURES IN FOLDER TITLED 'SURVEY PICTURES' *CALLTOACTION.jpeg*



Do you think this information (in red rectangle) should be included on marijuana packages?

1=Yes

2=No

3= Don't know

UNIVERSE: ALL

SECTION 3: Perceptions of Constituent Labelling

Labelling Dose

DOSE
DOSE.AMOUNT

PROGRAMMER NOTE: RANDOMLY ASSIGN TO 1 OF 3 IMAGES. FIND PICTURES IN FOLDER TITLED 'SURVEY PICTURES'
CONTROLCOOKIE.jpeg, COOKIE_THC_MG.jpeg, COOKIE_THC_SERVINGSIZE.jpeg



Based on the information provided, how much of the cookie should someone eat on one occasion if they wanted a recommended serving?

- 1= 1/4 of a cookie
- 2= 1/2 of a cookie
- 3= 3/4 of a cookie
- 4= 1 cookie
- 5= 2 cookies
- 6= 3 cookies
- 7=More than 3 cookies
- 77 Don't know
- 88 Refused

UNIVERSE: ALL

DOSE
DOSE.SERVINGS

How many servings are in this package?

- 1=1
- 2=2
- 3=3
- 4=4

5=5
6=More than 5
-77 Don't know
-88 Refused

UNIVERSE: ALL

THC 'Amount' Label

THC.AMOUNTLOW

PROGRAMMER NOTE: RANDOMLY ASSIGN TO 1 OF 4 IMAGES. FIND PICTURES IN FOLDER TITLED 'SURVEY PICTURES' *LOWTHC*
TRADENAME.jpeg, *LOWTHC PERCENT.jpeg*, *LOWTHC MG.jpeg*, *LOWTHC TRAFFCLIGHT.jpeg*



Based on the available information, what is the level of THC in this product?

1=Low
2=Moderate
3=High
4=Don't Know

UNIVERSE: COND=3

THC.AMOUNTHIGH

PROGRAMMER NOTE: RANDOMLY ASSIGN TO 1 OF 4 IMAGES. FIND PICTURES IN FOLDER TITLED 'SURVEY PICTURES' HIGHTHC
TRADENAME.jpeg,HIGHTHC PERCENT.jpeg, HIGHTHC MG.jpeg,, HIGHTHC TRAFFCLIGHT.jpeg



Based on the available information, what is the level of THC in this marijuana product?

1=Low

2=Moderate

3=High

4=Don't Know

UNIVERSE: COND=3

Time to Onset & Product Type

TIME.Q1

PROGRAMMER NOTE: RANDOMLY ASSIGN TO 1 OF 3 IMAGES. FIND PICTURES IN FOLDER TITLED 'SURVEY PICTURES'
TIME_JOINT.jpeg, TIME_COOKIE.jpeg, TIME_BEV.png.



How soon would you feel the effects from using this marijuana product?

- 1=Less than 5 minutes
- 2=Within 30 minutes
- 3=Within 60 minutes (1hr)
- 4=1 to 2 hours
- 5=More than 2 hours
- 6=Don't know

UNIVERSE: ALL

Recognition of THC Symbol

SYMBOLS.Q1

PROGRAMMER NOTE: SHOW ALL 4 WARNINGS ON THE SCREEN. FIND PICTURES IN FOLDER TITLED 'SURVEY PICTURES'
SYMBOL_CO.png, SYMBOL_BPA.jpeg, SYMBOL_KIDS.png., SYMBOL_OR.jpeg

Which of these symbols would be MOST effective in warning children about marijuana products?



UNIVERSE: ALL

Driving & product type

DRIVINGSET.Q1

PROGRAMMER NOTE: RANDOMLY ASSIGN TO 1 OF 3 IMAGES. FIND PICTURES IN FOLDER TITLED 'SURVEY PICTURES'

SAFE_JOINT.jpeg, SAFE_COOKIE.png

PROGRAMMER NOTE: FOR ALCOHOL IMAGE, FEMALE=*SAFE_ALC_WOMEN.jpeg*, MALE=*SAFE_ALC_MEN*

How soon after consuming this would it be safe to drive?



- 1= Less than 1 hour
 - 2= 1 hour
 - 3= 2 hours
 - 4= 3 hours
 - 5= 4 hours
 - 6= More than 4 hours
 - 77= Don't Know
- UNIVERSE:ALL

SECTION 4: Perceptions of Brand Imagery on Packaging Branding

Standard pack, branded pack, health warning label

PACK.GENDER.APEAL

PROGRAMMER NOTE: RANDOMLY ASSIGN TO 1 OF 4 IMAGES: *Gender 1.jpeg, Gender 2.jpeg, Gender 3.jpeg, or Gender 4.jpeg*

How APPEALING would this marijuana product be to try?



0 1 2 3 4 5 6 7 8 9 10
Not at all appealing Very appealing

-77 Don't know
-88 Refused

UNIVERSE: ALL

PACK.GENDER.AGE

In your opinion, someone who chooses to use this product is more likely to be...

1= Younger than me

2= My age

3= Older than me

-77 Don't know

-88 Refused

UNIVERSE: ALL

PACK.GENDER.SEX

In your opinion, someone who chooses to use this product is more likely to be...

1= Male

2= Female

3= No difference

-77 Don't know

-88 Refused

UNIVERSE: ALL

Flavoured pack vs pack without flavour description

PACK.FLAV.APPEAL

PROGRAMMER NOTE: RANDOMLY ASSIGN TO 1 OF 2 IMAGES: *Flavour1.jpeg* or *Flavour2.jpeg*

How **APPEALING** would this marijuana product be to try?



0 1 2 3 4 5 6 7 8 9 10
Not at all appealing Very appealing

-77 Don't know

-88 Refused

UNIVERSE: ALL

PACK.FLAV.AGE

In your opinion, someone who chooses to use this product is more likely to be...

1= Younger than me

2= My age

3= Older than me

-77 Don't know

-88 Refused

UNIVERSE: ALL

PACK.FLAV.SEX

In your opinion, someone who chooses to use this product is more likely to be...

1= Male

2= Female

3= No difference

-77 Don't know

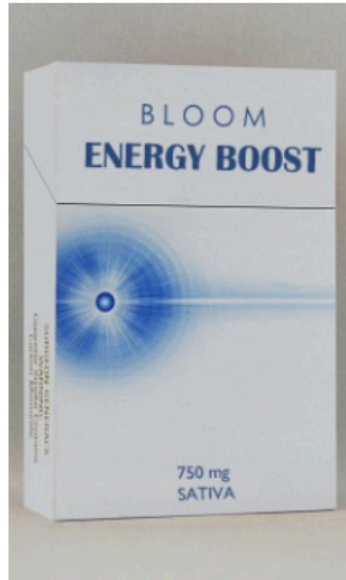
-88 Refused

UNIVERSE: ALL

Pack displaying energy boost claims vs pack without energy claims

PACK.ENERGY.APPEAL PROGRAMMER NOTE: RANDOMLY ASSIGN TO 1 OF 2 IMAGES: *Energy1.jpeg* or *Energy 2.jpeg*

How **APPEALING** would this marijuana product be to try?



0 1 2 3 4 5 6 7 8 9 10
Not at all appealing Very appealing

-77 Don't know
-88 Refused

UNIVERSE: ALL

PACK.ENERGY.AGE

In your opinion, someone who chooses to use this product is more likely to be...

1= Younger than me

2= My age

3= Older than me

-77 Don't know

-88 Refused

UNIVERSE: ALL

PACK.ENERGY.PARTY

In your opinion, someone who chooses to use this product is more likely to...

1= Go out and party

2= Stay home

3= No difference

-77 Don't know

-88 Refused

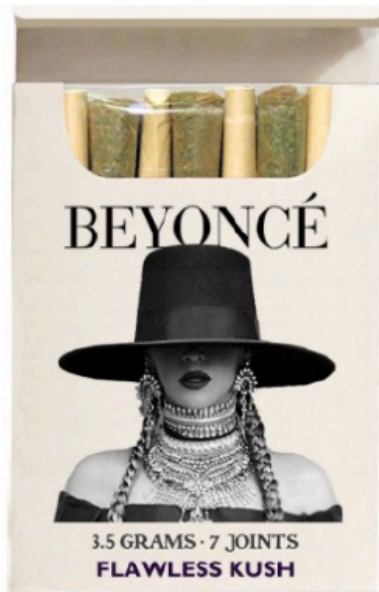
UNIVERSE: ALL

Pack displaying celebrity sponsor vs unsponsored pack

PACK.SPON.APPEAL

PROGRAMMER NOTE: RANDOMLY ASSIGN TO 1 OF 2 IMAGES: *Sponsored1.jpeg* or *Sponsored2.jpeg*

How **APPEALING** would this marijuana product be to try?



0 1 2 3 4 5 6 7 8 9 10
Not at all Very appealing
appealing

-77 Don't know

-88 Refused

UNIVERSE: ALL

PACK.SPON.AGE

In your opinion, someone who chooses to use this product is more likely to be...

1= Younger than me

2= My age

3= Older than me

-77 Don't know

-88 Refused

UNIVERSE: ALL

PACK.SPON.PARTY

In your opinion, someone who chooses to use this product is more likely to...

1= Go out and party

2= Stay home

3= No difference

-77 Don't know

-88 Refused

UNIVERSE: ALL

Pack displaying organic/natural descriptors vs pack without such descriptors

PACK.NATURAL.APPEAL PROGRAMMER NOTE: RANDOMLY ASSIGN TO 1 OF 2 IMAGES: *Organix1.jpeg* or *Organic2.jpeg*

How **APPEALING** would this marijuana product be to try?



0 1 2 3 4 5 6 7 8 9 10
Not at all appealing Very appealing

-77 Don't know
-88 Refused

UNIVERSE: ALL

PACK.NATURAL.AGE In your opinion, someone who chooses to use this product is more likely to be...

1= Younger than me

2= My age

3= Older than me

-77 Don't know

-88 Refused

UNIVERSE: ALL

PACK.NATURAL.HEALTH In your opinion, someone who chooses to use this product is more likely to be...

1= Someone who takes more care of their health

2= Someone who takes less care of their health

3= No difference

-77 Don't know

-88 Refused

UNIVERSE: ALL

Pack with music references vs pack without such references

PACK.MUSIC.APPEAL

PROGRAMMER NOTE: RANDOMLY ASSIGN TO 1 OF 2 IMAGES: *Music1.jpeg* or *Music2.jpeg*

How **APPEALING** would this marijuana product be to try?



0 1 2 3 4 5 6 7 8 9 10
 Not at all appealing Very appealing

-77 Don't know

-88 Refused

UNIVERSE: ALL

PACK.MUSIC.AGE

In your opinion, someone who chooses to use this product is more likely to be...

1= Younger than me

2= My age

3= Older than me

-77 Don't know

-88 Refused

UNIVERSE: ALL

PACK.MUSIC.PARTY

In your opinion, someone who chooses to use this product is more likely to...

1= Go out and party

2= Stay home

3= No difference

-77 Don't know

-88 Refused

UNIVERSE: ALL

Pack with fashion references vs pack without such references

PACK.FASH.APPEAL

PROGRAMMER NOTE: RANDOMLY ASSIGN TO 1 OF 2 IMAGES: *Fashion1.jpeg* or *Fashion2.jpeg*

How APPEALING would this marijuana product be to try?



0 1 2 3 4 5 6 7 8 9 10
Not at all appealing Very appealing

-77 Don't know

-88 Refused

UNIVERSE: ALL

PACK.FASH.SEX

In your opinion, someone who chooses to use this product is more likely to be...

1= Male

2= Female

3= No difference

-77 Don't know

-88 Refused

UNIVERSE: ALL

PACK.FASH.FASHION

In your opinion, someone who chooses to use this product is more likely to be....

1= More fashionable

2= Less fashionable

3= No difference

-77 Don't know

-88 Refused

UNIVERSE: ALL

Pack with party references vs pack without such references

PACK.FESTIVAL.APPEAL PROGRAMMER NOTE: RANDOMLY ASSIGN TO 1 OF 2 IMAGES : Party1.jpeg or Party2.jpeg

How **APPEALING** would this marijuana product be to try?



0 1 2 3 4 5 6 7 8 9 10
Not at all appealing Very appealing

-77 Don't know
-88 Refused

UNIVERSE: ALL

PACK.FESTIVAL.AGE

In your opinion, someone who chooses to use this product is more likely to be...

1= Younger than me

2= My age

3= Older than me

-77 Don't know

-88 Refused

UNIVERSE: ALL

PACK.FESTIVAL.PARTY

In your opinion, someone who chooses to use this product is more likely to...

1= Go out and party

2= Stay home

3= No difference

-77 Don't know

-88 Refused

UNIVERSE: ALL

Recall Exercise

WARNING.RECALL

PROGRAMMER NOTE: Please display 5 separate 'fill in the blank' fields

Earlier, we showed you 4 different health warnings. We'd like you to try to list as many of the 4 warnings as possible.

UNIVERSE: ALL

Additional Sociodemographic Questions

INFO SCREEN

We would like to ask you a few final questions about yourself before we finish.

DATA QUALITY CHECK
-MONTH

What is the current month?

[DQ_MONTH]

- 1= January
- 2= February
- 3= March
- 4= April
- 5= May
- 6= June
- 7= July
- 8= August
- 9= September
- 10= October
- 11= November
- 12= December
- 77 Don't know
- 88 Refused

UNIVERSE: ALL

**STUDENT
[CURR.ED]**

Are you currently a student?

1=Yes

2=No

UNIVERSE: ALL

**STUDENT
[CURR.ED2]**

Are you in...

1=High School – Grades 7-9

2=High School – Grades 10-12

3=CEGEP, college, or trade school

4=University

5=Post-graduate/Professional

6=I am not a student

-77 Don't know

-88 Refused

UNIVERSE: CURR.ED=1

**EDUCATION
[EDUCATION]**

What is the highest level of formal education that you have completed?

Source: ITC 2016

1= Grade school/ some high school

2= Completed high school

3= Technical/ trade school or community college

4= Some university, no degree

5= Completed university degree

6= Post-graduate degree

-77 Don't know

-88 Refused

UNIVERSE: ALL

**SEXUALITY
[SEXUALITY]**

How would you describe your sexual orientation?

*Source: [Saewyc et al. 2004](#),
[Evaluation of Adolescent
Health Surveys](#)*

1=Heterosexual (sexually attracted to the opposite sex)

2=Mostly heterosexual

- 3=Bisexual (attracted to both men and women)
- 4=Gay or lesbian (attracted to the same sex)
- 5=Other: _____
- 6=I am not sure yet
- 7=I don't understand this question
- 77 Don't know
- 88 Refused

UNIVERSE: ALL

**INCOME
[SES]**

Source: ITC 2016

Which of the following categories best describes your ANNUAL household income, that is the total income before taxes, or gross income, of all persons in your household combined, for one year?

- 1= Under \$10,000
- 2= \$10,000-29,999
- 3= \$30,000-44,999
- 4= \$45,000-59,999
- 5= \$60,000-74,999
- 6= \$75,000-99,999
- 7= \$100,000-149,999
- 8= \$150,000 and over
- 77 Don't know
- 88 Refused

UNIVERSE: ALL

**POSTAL CODE
[POSTAL.CODE]**

What are the first 3 characters of your postal code

- Fields: [Letter] [Number (0-9)] [Letter]
- 77 Don't know
- 88 Refused

UNIVERSE: ALL

POSTAL CODE
[LOCATION]

Source: [BRFSS](#)

To help us learn more about environmental factors in your area, we'd like to know what the nearest intersection to your home is. This information will never be released or analyzed individually and will be used to group your responses with others from your neighborhood. Please name the 2 cross-streets of this intersection.

Record first street _____

Record second street _____

-77 Don't know
-88 Refused

HONESTY
[HONESTY]

UNIVERSE: POSTAL.CODE=77, 88

One last question, did you feel you were able to provide 'honest' answers about your marijuana use during the survey?

1= No
2= Some questions, but not all
3= All questions

UNIVERSE: ALL

End Screen/Feedback Note

END

Thank you!

Source: ORE
Sample Online
Survey Response
Template

Your feedback is extremely valuable.

This study has been reviewed and received ethics clearance through a University of Waterloo Research Ethics Committee (ORE#22392). If you have questions for the

Committee contact the Chief Ethics Officer, Office of Research Ethics, at 1-519-888-4567 ext. 36005 or ore-ceo@uwaterloo.ca.

For all other questions or if you have general comments or questions related to this study, or if you would be interested in receiving a copy of the results please contact the principal investigator Dr. David Hammond, School of Public Health and Health Systems, dhammond@uwaterloo.ca.

Appendix 2 – List of Experts

(Members for Expert Advisory Committee on Information for Physicians on Marijuana for Medical Purposes [EAC-IPMM](#))

1. [Harold Kalant, MD, PhD](#)
Biological and Behavioural Researcher
Prof of Pharmacology and Toxicology
University of Toronto
Research Director, CAMH
harold.kalant@utoronto.ca
([Link to PubMed hits](#))
2. [Paul Daeninck, MD, MSc](#)
Medical Oncologist, Palliative Care Consultant
Department of Hematology/Medical Oncology
St. Boniface Hospital
University of Manitoba
paul.daeninck@cancercare.mb.ca
([Link to PubMed hits](#))
3. [Boris Gorzalka, PhD](#)
Behavioural Neuroscience and Clinical Psych
Prof of Psychology
University of British Columbia
bgorzalka@psych.ubc.ca
([Link to PubMed hits](#))
4. [Jason J. McDougall, PhD](#)
Physiologist
Prof Dept of Pharmacology and Anaesthesia
Dalhousie University
jason.mcdougall@dal.ca
([Link to PubMed hits](#))
5. [Keith Sharkey, PhD](#)
Biological Researcher
Prof Dept Physiology and Pharmacology
Director of the Hotchkiss Brain Institute
University of Calgary
ksharkey@ucalgary.ca
([Link to PubMed hits](#))
6. [Tony George, MD](#)
Addictions Researcher – Schizophrenia
Addiction of Psychiatry
University of Toronto

Clinical Director of Schizophrenia – CAMH
tony.george@camh.ca
([Link to PubMed hits](#))

7. [Mark Ware, MBBS, MRCP, MSc](#) ///Vice Chair on the [Taskforce](#) on Marijuana
Legalization and Regulation
Biological Researcher – Safety and Efficacy of Cannabinoids
Prof Family Medicine and Anaesthesia
McGill University
mark.ware@muhc.mcgill.ca
([Link to PubMed hits](#))
8. [Mary Lynch, MD, LMCC](#)
Biological Researcher – Pain Management
Prof Anaesthesia, Pain Management, Perioperative Medicine
Dalhousie University
mary.lynch@dal.ca
([Link to PubMed hits](#))
9. [Pierre Beaulieu, MD, PhD](#)
Biological Researcher – Cannabinoids and Pain
Prof Pharmacology and Anaesthesiology
University of Montreal
pierre.beaulieu@umontreal.ca
([Link to PubMed hits](#))

Most of the people recruited by Health Canada are also part of the Canadian Consortium for the Investigation of Cannabinoids.

(Board of Directors of Consortium for Investigation of Cannabinoids – excluding those listed above)

10. [Alexander \(John\) Clark, MD](#)
Biological Researcher – opioids and cannabinoids
Prof Anaesthesia, Pain Management, Perioperative Medicine
Dalhousie University
ajclark@dal.ca
([Link to PubMed hits](#))
11. [Matthew Hill, PhD](#)
Biological Researcher – endocannabinoid system and stress response
Prof Hotchkiss Brain Institute
University of Calgary
mnhill@ucalgary.ca
([Link to PubMed hits](#))
12. [Linda Parker, PhD](#)
Behavioural Neuroscience, Psychopharmacology
Prof Neuroscience & Applied Cognitive Science

University of Guelph
parkerl@uoguelph.ca
([Link to PubMed hits](#))

13. Jonathan Page, PhD
Botanist, Biochemistry and Genomics
Prof Botany – Cannabinoid Biosynthesis
University of British Columbia
jon.page@botany.ubc.ca
([Link to PubMed hits](#))
14. [Melanie Kelly, PhD](#)
Biological Researcher – molecular and functional pharmacology
Optic Nerve Research Laboratory – Faculty of Medicine
Dalhousie University
melanie.kelly@dal.ca
([Link to PubMed hits](#))
15. [Colleen O’Connell, MD](#) – Could not find more about her beyond general contact info.

([38th WHO Expert Committee on Drug Dependence](#) – November 2016th)

16. Prof Bruna Brands, PhD
Biobehavioural Scientist – Clinical Pharmacology, Addiction, Neuropharmacology
Prof Dept of Pharmacology and Toxicology
University of Toronto
bruna.brands@camh.ca
([Link to Pub Med hits](#))

(Canadian Centre on Substance Abuse - Scientific Advisory Council)

17. [Franco Vaccarino, PhD, 2nd Link](#)
Bioscience – Neuropsychopharmacology
President – University of Guelph
Collaborative Program in Neuroscience-University of Toronto
president@uoguelph.ca
vaccar@psych.utoronto.ca
([Link to PubMed hits](#))
18. [Rita Notarandrea, MHSc, CHE](#)
CEO Canadian Centre on Substance Abuse
613-235-4048 ext 227
19. [Michael Krausz, PhD](#)
Scientist – Addictions
Centre for Health Evaluations and Outcome Sciences
University of British Columbia
m.krausz@mac.com, michael.krausz@ubc.ca
([Link to PubMed hits](#))

(Not part of Advisory Council but involved in the CCSA Cannabis Portfolio)

20. Dr. Amy Porath-Waller
Director, Research and Policy for Canadian Centre on Substance Abuse
aporath-waller@ccsa.ca
21. [Jurgen Rehm](#)
Health Economist
Director, Institute for Mental Health Policy Research
([Link to PubMed hits](#))

22. [Prof. Louisa Degenhardt, PhD*](#)
Epidemiology - Substance Use
University of New South Wales - Sydney
l.degenhardt@unsw.edu.au
([Link to PubMed hits](#))

23. [Prof. Wayne Hall, PhD*](#)
Epidemiologist
University of Queensland Centre for Clinical Research
National Health and Medical Research Council
w.hall@uq.edu.au
([Link to PubMed hits](#))

24. [Wendy Swift, PhD](#)
Epidemiologist
National Drug and Alcohol Research Centre
University of New South Wales
w.swift@unsw.edu.au
([Link to PubMed hits](#))

25. [Courtney L. Bagge, PhD](#)
Epidemiology - Suicide
University of Mississippi Medical Centre
cbagge@umc.edu
([Link to PubMed hits](#))

26. [Ruben Baler, PhD](#)
Bioscience – neurobiology of drug abuse
National Institute on Drug Abuse
baler@nida.nih.gov
([Link to PubMed hits](#))

27. [Prof. Donald P. Tashkin](#)
Biosciences – Effects of Cannabis on Pulmonary Tissue
UCLA – Dept. of Medicine – Division of Pulmonary and Critical Care
National Institute of Drug Abuse

dtashkin@mednet.ucla.edu

([Link to PubMed hits](#))

28. [Nora Volkow, MD](#)

Director, National Institute on Drug Abuse – NIH

nvolkow@nida.nih.gov

([Link to PubMed hits](#))

29. [David M. Fergusson, PhD](#)

Epidemiologist – founder of the 35yr study of birth cohort born in mid-1977

University of Otago – Christchurch

dm.fergusson@otago.ac.nz

([Link to PubMed hits](#))

30. [Arpana Agrawal, PhD](#)

Bioscientist – genetic and environmental underpinnings of substance use behaviours, cannabis

Prof Psychiatry

Washington University in St Louis

arpana@wustl.edu

([Link to PubMed hits](#))

31. [Michael T Lynskey, PhD](#)

Epidemiology and etiology of cannabis use and cannabis use disorders

King's College London

michael.lynskey@kcl.ac.uk

([Link to PubMed hits](#))

32. [Benedikt Fischer, PhD](#)

Epidemiology of illicit drug use

Prof Dept of Psychiatry

University of Toronto

benedict.fischer@camh.ca

([Link to PubMed hits](#))

33. [Mark Asbridge, PhD](#)

Community Health Epidemiology – cannabis and driving harms

Centre for Clinical Research

Dalhousie University

mark.asbridge@dal.ca

([Link to PubMed hits](#))

34. [Paul Morrison, PhD](#)

Bioscientists – Cannabis and psychosis

King's College London

paul.morrison@kcl.ac.uk

([Link to PubMed hits](#))

35. [Nadia Solowij, PhD](#)

Epi – Long term cannabis use

Prof School of Psychology
University of Wollongong
nadia@uow.edu.au
([Link to PubMed hits](#))

(Other experts approached by Health Canada who were contributors to what is available on the Health Canada website)

36. Donald I. Abrams, M.D.
Donald.Abrams@ucsf.edu
Chief, Hematology-Oncology
San Francisco General Hospital
Integrative Oncology
UCSF Osher Center for Integrative Medicine
Professor of Clinical Medicine
University of California San Francisco
San Francisco, CA 94143-0874
USA

37. Vincenzo di Marzo, Ph.D.
vdimarzo@icmib.na.cnr.it
Research Director
Endocannabinoid Research Group
Institute of Biomolecular Chemistry
Consiglio Nazionale delle Ricerche
Via Campi Flegrei 34
Comprensorio Olivetti
80078 Pozzuoli (NA)
Italy

38. Mahmoud A. ElSohly, Ph.D.
melsohly@olemiss.edu
Research Professor and Professor of Pharmaceutics
National Center for Natural Products Research and Department of Pharmaceutics
School of Pharmacy
University of Mississippi
University, MS 38677
USA

39. Javier Fernandez-Ruiz, Ph.D.
jjfr@med.ucm.es
Full Professor of Biochemistry and Molecular Biology
Department of Biochemistry and Molecular Biology
Faculty of Medicine
Complutense University
Madrid, 28040
Spain

40. Margaret Haney, Ph.D.
mh235@columbia.edu
Professor of Clinical Neurobiology
Columbia University
Department of Psychiatry
1051 Riverside Drive, Unit 120
New York, NY 10032
USA
41. Aron Lichtman, Ph.D. (his name really only has one 'a')
aron.lichtman@vcuhealth.org
Professor
Department of Pharmacology & Toxicology
Molecular Medicine Research Building, Room 3042
1220 East Broad St.
P.O. Box 980613
Richmond, Virginia 23298-0613
USA
42. Raphael Mechoulam, Ph.D.
mechou@cc.huji.ac.il
Professor
Institute for Drug Research, Medical Faculty
Hebrew University
Jerusalem
91120
Israel
43. Roger G. Pertwee, MA, D.Phil. D.Sc.
rgp@abdn.ac.uk
Professor of Neuropharmacology
Institute of Medical Sciences
University of Aberdeen
Aberdeen
AB25 2ZD
Scotland, United Kingdom

(The following are the experts consulted for the Malouff & Rooke paper re: expert-recommended warnings for medical marijuana)

44. [Alan Budney](#)
Alan.J.Budney@Dartmouth.edu
ADHERE: Addiction and Health Research
Geisel School of Medicine at Dartmouth
Addiction and Health Research

46 Centerra, Third Floor
Lebanon, NH 03766

45. [Jan Copeland](#)
j.copeland@unsw.edu.au
University of New South Wales
National Drug and Alcohol Research Centre, Australia
Director of the National Cannabis Prevention and Information Center

46. [Nancy Day](#)
Prof p[psychiatry and epidemiology
nday@pitt.edu
University of Pittsburgh Psychiatry
3811 O'Hara St.
Pittsburgh PA
15213
Phone: 412-681-3482
Fax: 412-246-6875

47. [Kevin Gray, MD](#)
Biobehavioural scientist
graykm@musc.edu
Medical University of South Carolina Psychiatry and Behavioral Sciences
Department of Psychiatry and Behavioral Sciences
125 Doughty Street
Charleston, SC 29403

48. [Kerry Green](#)
Behavioural scientist
greenkm@umd.edu
University of Maryland Behavioral and Community Health

49. [Deborah Hasin](#)
Epidemiologist
dsh2@columbia.edu
Columbia University Psychiatry
College of Physicians and Surgeons
Department of Psychiatry
Mailman School of Public Health
Department of Epidemiology

50. [Mark Litt](#)
Clinical psych
litt@uchc.edu
University of Connecticut Health Center
Division of Behavioral Sciences
and Community Health
UConn Health
263 Farmington Avenue
Farmington, CT 06030

51. [Ryan Vandrey](#)
Human behavioural pharmacology of cannabis; nicotine/tobacco
rvandrey@jhmi.edu
Johns Hopkins University Psychiatry and Behavioral Sciences
Johns Hopkins Bayview Medical Center
Behavioral Biology Research Center
5510 Nathan Shock Drive
Baltimore, MD 21224 map
Phone: 410-550-4036
Fax: 410-550-0030