

# **Older Adults & Cannabis Use: A Narrative Review of Age-specific Issues**



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# Summary

**The use of cannabis by older adults is increasing faster than any other age-group. In Canada,** 7% of older adults report using cannabis, up from 1% in 2012. This increase is similar to observations of older populations in other countries. This trend has been attributed to the Baby Boomer generation entering into older age, changes in cannabis legislation, and the growing promotion of cannabis for its therapeutic potential. While a majority of older adults are new users, there are older adults who have been life-long users and those who were early users and have again begun to use. Older adults use cannabis for both therapeutic and recreational reasons, although newer users tend to be using for medicinal purposes. Surveys of the modality of use of cannabis among older adults demonstrate a use of a wide range of cannabis products. While research is limited, surveys of older adult users (largely for medicinal purposes) show a fair degree of satisfaction in targeting specific symptoms and overall quality of life. This represents a curious contrast to existing research which suggests that there currently is limited high-quality evidence for the efficacy of cannabis on many of the chronic conditions for which users may be seeking treatment. However, as the health care community will likely see a continued growth in the interest and use of cannabis by their older patients, a pragmatic approach is to be able to have an open and balanced discussion; and this applies for both medicinal and recreational use.

With regards to safe use of cannabis by older adults, there is limited research that has focused on this new emerging user group. However, as physiological changes with aging have the potential to impact the effects of cannabis (both recreational and medicinal), data on efficacy and safety from younger users cannot be extrapolated without consideration. For example, cannabis impacts parts of the brain that are known to change with age. Also, age-related changes in liver and kidney function and body fat can impact the way cannabis is metabolized in older adults. Another potential issue for older adults, is the interaction of cannabis with existing chronic conditions and medication being used for those conditions. Drug interactions include cannabinoid levels being increased by other medications and can have additive effects on and affect levels of other drugs. More research is needed in all of these areas of potential vulnerabilities, including adverse events, in order to provide direction for older adults on safe use of cannabis. To that end, both older adults and health care providers should also be aware that the issue of cannabis use disorder is not one limited to younger populations. Substance abuse, in general, by older adults is rising and so it cannot be assumed that this is not an issue in this age-group. Education on harms reduction, including behaviours such as driving under the influence of cannabis, is just as prudent in older populations.

Substantial empirically driven, representative research related to both physiological, attitudinal, and behavioral issues are still needed to advance the discourse on cannabis and aging. As is equipping older adults and their health care providers with education resources.

# Introduction

**Older adults make up the fastest growing age group in Canada.** This has demanded increased attention in supporting the health and well-being of our older adult population, and specifically highlighting the role of health information for those over the age of 65 years. With the goal of achieving healthy aging, there is increasing curiosity of the benefits of cannabis among older adults and an increase in its usage by older adults. This is being driven by the increased promotion of its medicinal use for conditions such as pain, insomnia, and anxiety (often experienced by older adults). Therefore, the purpose of this narrative review is to provide relevant and current evidence-based information in the area of cannabis use and its effect on the older adult with an emphasis on cannabis public education, awareness, health benefits, harm reduction and prevention; which will inform Active Aging Canada's initiatives in effectively disseminating health promotion information on cannabis use for older adults across Canada.

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## Why is Aging a Distinct Topic in the Discussion of Cannabis?

The answer is two-fold. The large baby-boomer cohort who were a part of the recreational-use generation are now entering 'older age' and there are questions as to whether the aging process influences the affects of cannabis use. In addition, [fueled by media coverage, promotion by cannabis companies, and anecdotal testimonials] the medicinal use of cannabis in the management of clinical conditions that are common in older adults is receiving attention. Both recreational and medicinal use of cannabis have the potential to contribute to healthy aging. Recreational use is often associated with relief from a variety of ailments including stress, sleep difficulties, trouble concentrating, physical pain, depression, and anxiety; which are issues still experienced as we get older. Also, cannabis is being promoted as a natural remedy or alternative therapy and this is appealing not only in the management of age-related clinical conditions, but also because these conditions are often poorly controlled by current drug treatments that may also incur medication-induced side effects. With both medicinal and recreational cannabis use now legal in Canada, with the quickly expanding business of cannabis and with the promotion of potential health benefits, information on this topic is needed for those who advocate for and promote healthy aging.

# Age-related Physiological Changes and Cannabis Use

**With respect to physiological aging, different physiological systems age at different rates and there is great variability in the aging process within an older adult population.** However, generally speaking ‘aging’ and ‘older adult’ often refer to the age range of 65 years and older. However, it should be noted that in the cannabis and aging literature, an older adult is often classified as 50 years of age and older.

The distinction of considering the aging process and cannabis use is because the aging process affects parts of the body that are known to be affected by cannabis. Cannabis and aging effects are concurrently present across several neurotransmitter systems, but especially in the hippocampus and prefrontal cortex (whose functions include learning, memory, decision making), which are critical in the interaction between aging and cannabis use. (Yoo et al,

2019). Specifically, animal studies have shown endocannabinoid signalling control changes in normal ageing and in neuroinflammatory and neurodegenerative disorders (often age-related) (DiMarzo et al., 2015). Therefore, aging presents unique considerations, and it could be theorized that cannabis use will impact an older person differently (positively or negatively). For example, adolescence represents a critical period of neurodevelopment and early-life users may demonstrate decrements across various cognitive domains (e.g., memory, executive function, and processing speed) (Burggren et al, 2019). As opposed to a developing brain in early life, the brain in late-life goes through neurodegeneration processes including

decreases in global and regional volumes as well as alterations in patterns of neural activity and consequently their cognitive function may decline, and their risk for neurodegenerative diseases including dementia and Alzheimer’s disease increases substantially (Weinstein 2020). The main effects of both aging and cannabis use seem to compromise the structure and function of the hippocampus, thus cannabis use may accelerate age-related degenerations in the hippocampus (Yoo et al, 2019). However, preclinical studies indicate that if used in a healthy population and with a restricted low dose, cannabis may actually be neuroprotective and aid in maintaining neurogenesis in older adults. (Yoo 2019). These changes along with parallel trends of increasing cannabis use among older adults need further investigation.

In addition to physiological and functional changes, aging can be associated with multiple comorbidities and cannabis use may resemble these changes. For example, smoking cannabis can lead to respiratory dysfunction, increased stroke, and cardiovascular risk. Again, there exists the potential of cannabis to compound on the aging the process itself but to also exacerbate age-related chronic conditions (CCSMH 2019).

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# Pharmacokinetics and Pharmacodynamics in Aging

**While research exists on acute and chronic use of cannabis in young populations, data on efficacy and safety established in studies with adults cannot simply be extrapolated to the older patient group**, due to changes in pharmacokinetic and pharmacodynamic factors associated with increasing age, leading to differences in effect and risk of developing adverse drug reaction (van den Elsen et al, 2014). Drug pharmacokinetics and pharmacodynamics in older people may be altered by age-related physiological changes, multiple comorbidities, or use of other medication. As well renal elimination is decreased in older adults (Corsonello et al, 2010). A decrease in hepatic blood flow and the slower metabolism of older individuals can slow the elimination of lipophilic

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drugs, thereby potentially increasing exposure and side effects (Linnebur et al, 2005). Although there are no studies specifically in this area, it is hypothesized that an impairment in liver or kidney function would raise potential for drug-drug interaction. Other age-related factors, such as delayed gastric emptying time, decreased splanchnic blood flow, decreased gastrointestinal motility, and decreased absorption surface, could also affect the absorption and bioavailability of THC in older individuals (Ahmed 2014). Furthermore, aging is associated with increased body fat and decreased lean body

mass, which increase the volume of distribution for lipophilic drugs, such as cannabis (Abuhasira, 2018). THC and cannabis are lipophilic and could lead to half-life prolongation and accumulation in adipose tissue with chronic use prolonging elimination half life up to 2-5 days (Lucas 2018).

Data specific to older adults are limited, but two small studies demonstrated that oral doses of Namisol® (THC in tablet form) pharmacokinetics showed rapid absorption, maximum plasma concentrations reached between 1-2 hours after dosing, and had wide interindividual variability in both healthy older adults (Ahmed et al., 2014) and adults with dementia (Ahmed et al., 2015). These studies also demonstrated the pharmacodynamics or effects were smaller than effects previously reported in young adults. Specifically, no statistically significant changes in participants' feeling high, external perception, body sway with the eyes open and diastolic blood pressure after THC. In light of the fact that there is variability in the absorption, distribution, metabolism, and elimination of cannabis – more investigation is needed to characterize this variable in older adults.

# Polypharmacy

**Drug interactions with cannabinoids include cannabinoid levels being increased by other medications and can have additive effects on and affect levels of other drugs.** Also, smoking marijuana, specifically, can increase clearance of some drugs (Antonio, 2020). This is a relevant concern as 89% of older Canadians have at least one chronic condition and after age 80 years it is not uncommon to have 3-4 chronic conditions and be taking multiple medications for these conditions (CIHI, 2011).

A lack of large formal pharmacokinetic studies of cannabinoids means that information related to relevant drug interactions is scarce. Additionally, the inconsistent bioavailability of the various products also makes predicting potential drug interactions difficult (Mahvan et al., 2017). Though lack of standardization and variety of marijuana strains make it difficult to predict the common side effects and drug-drug interactions of marijuana, it is also essential to consider method of dose delivery, such as inhalation versus oral, as therapeutic effects largely depend on the THC concentration in a given formulation, and dosage form (Mahvan et al., 2017). The risk of marijuana-drug interactions precipitated by cannabinoids remains challenging to study due to the current/past legal classification of marijuana and marijuana products, the diversity of marijuana strains and derivative products on the commercial market, and the variety of (Cox et al., 2019). In light of lack of direction with respect to prescription, the general guideline for dosing is to “start low and go slow” and marijuana products should be screened on older adult’s medication profiles in a fashion similar to the way of tobacco, alcohol, and other substances (Mahvan et al., 2017).

Similar to the influence of cannabis on other medications, there is growing investigation into the impact of cannabis on sedative medications, specifically. Cannabis may affect pharmacokinetic or pharmacodynamic tolerance to procedural sedatives, such as ones used in surgical procedures. As advanced age is often associated with the onset of chronic conditions (often requiring surgery), assessment of cannabis use is becoming common in pre-operative care. Research in this area is emerging and there may be a risk that regular cannabis use has an effect on the amount of sedation required. A recent review (Alexander et al., 2019) suggests anesthesiologist ask patients about marijuana use, ask about the duration, frequency, and the route of use. In addition, it is necessary to ask about the most recent intake.

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# Risks and Adverse Events Specific to the Older Adult Population

## Risks of Cannabis Use

**As summarized earlier, the ageing process itself, presence of a chronic condition, and medication use can hypothetically put older adults at unique risk when engaging in cannabis use;** either recreationally or medicinally. In addition, as observed in younger populations, cannabis use is similarly associated with vulnerability toward comorbid neuropsychiatric and substance use disorders in older adults as well (CCSMH 2019, Kuerbis 2019, Yoo 2019). The primary psychoactive ingredient in cannabis is THC. Of the cannabinoids, THC is most widely associated with the psychoactive effects of cannabis (Bhattacharyya et al., 2010).

Early research has identified evidence for marijuana as a trigger of adverse cardiovascular events (including tachyarrhythmias, acute coronary syndrome, vascular complications, stroke) in the general population (Aryana and Williams, 2007). Recent work in this area also highlights potentially harmful effects of unregulated use of cannabis in children, young adults and those with underlying cardiovascular risk factors or established heart disease (Singh et al., 2018). An investigation of chronic middle-aged Australian users indicated that smoking cannabis is a cardiovascular risk factor demonstrating an acceleration of the cardiovascular age (arterial stiffness); a surrogate for biological age (Reece et al., 2016). As the magnitude of the risk is not well studied in the older adult population, unstable cardiac disease, common with advancing age, is a relative contraindication for use (CCSMH 2019, Minerba 2019). Further, in terms of overall health or injury risk, a study of older trauma patients' (aged 55+) emergency department outcomes found that those who screened positive for marijuana had significantly higher odds of intensive care admission and surgery (Lank and Crandall, 2014).

Because THC, in particular, is thought to connect with receptors in the body that affect coordination and balance, there is a potential for altered balance and/or gait in users. While not widely studied, results from a small study of young chronic users suggest that history of cannabis use is associated with long-lasting changes in walking gait, but the magnitude of change is not clinically detectable (Todd et al., 2017). The authors note that further research is required to investigate if the subtle gait changes observed in this population become more apparent with aging and increased cannabis use.

Erectile dysfunction is the most common male sexual disorder, its prevalence is age-related, and there are plausible mechanisms linking cannabis use to this dysfunction; both centrally in control of penile erection and peripherally cannabinoid receptors in the corpus cavernosum. A large review of case-control studies in young users suggest that erectile dysfunction may be twice as high in cannabis users compared to controls (Pizzol et al, 2019).

One type of risk assessment that is emerging is the type of user; that is life-long user or novice user. Evidence of an association between early-life cannabis use and later morphology changes in the brain (hippocampus, temporal lobe) several decades after cessation of usage (Burggren 2018). Because hippocampal mass loss underlies and exacerbates age-related cognitive decline, these findings have profound implications for aging adults with a history of early-life usage (Burggren 2018). In addition, cumulative effect of more than 30 years of regular cannabis use may occur in older adults, compared to that of older adults who report a relatively recent onset of use. This indicates the need for determining the effects of long-term cannabis use on aging (Yoo 2019). A recent small pilot study (Thayer et al, 2019) compared current users (once a week for last year, on average 24 years use) versus non-user older adults (average age 86 years). Users and nonusers did not differ in terms of brain matter volumes and no differences were observed in performance on a brief cognitive test,

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suggesting that cannabis use may not have a widespread impact. As more research is needed, screening this population for past history of cannabis use may be prudent to identify older users who may be at greater health risk (Arora 2019).

Older adults who begin to use cannabis in later life have also been identified to be potentially at risk as they may be employing means of ingestion that are particularly challenging to dose safely (e.g., salve, oils, and edibles). Edibles also are challenging to monitor by new users, due to variation in the speed of effect that may lead users

to ingest more to achieve the desired effect faster, risking an overdose (Arora 2019). Additionally, for all types of users, cannabis is often perceived to be a 'soft' drug (Kostadinov 2017, Choi et al., 2018) with decreased perceived harm (Carliner et al, 2017). Of a large survey of U.S. older adults, the majority of cannabis users reported perceiving either no risk or slight risk of using cannabis monthly (85.3%) or once or twice a week (79.0%) (Han 2017). Further, a large survey from Washington State in the U.S., over 70% of older adults (50y+) did not think that cannabis is addictive (Sexton et al, 2019). All of the above issues are a concern in light of cannabis potency increasing over the years (ElSohly et al, 2018) and therefore past-users may not be aware of current potencies.

One final risk identified is not with older adult use specifically, but elder abuse in the form of diversion of medical cannabis. That is, family or caregivers may pressure older adults to acquire cannabis for their own self-use (Minerbi 2019).



# Adverse Events Associated with Cannabis Use

**Just as studies focusing on cannabis use in the older adult age-range are limited, so too are identifications of adverse events in this population.**

An adverse event is any undesirable experience associated with the use of a medical product. In one of the largest older adult studies, patients at Israeli medical clinics reported dizziness (9.7%) and dry mouth (7.1%) as the most frequent adverse events (Abuhasira et al. 2018). These same adverse events were reported by a small study from the Netherlands with the most frequently reported adverse events being drowsiness (27%) and dry mouth (11%) (Ahmed 2014). A sample of older adults in the state of Colorado reported “some problems” related to memory loss due marijuana use (22%) and 5% said a lot. Nine percent said they had some problems with falls and driving (Lum 2019). Increased rates of falls (21.9%) were also reported after treatment initiation in the above mentioned Israeli medical clinic (Abuhasira 2018). Sixteen percent of respondents at a geriatric primary care clinic in Colorado felt that they had experienced an adverse side effect attributable to marijuana; 66% reported no adverse effects. Five respondents described the adverse effect they had experienced, which included “loss of balance,” “dizzy, strange feelings,” “blurred vision and dry mouth from cookies,” “anxiety and racing thoughts,” and “I couldn’t even read the newspaper” (Reynolds 2018).

## Driving and Cannabis Use

**The Criminal Code of Canada prohibits driving while impaired to any degree by drugs, alcohol, or a combination of both.** Driving after cannabis consumption is illegal in Canada and for two prohibited levels of THC within two hours of driving: the less serious offence of between 2 nanograms (ng) and 5 ng of THC per ml of blood; It is a more serious offence to have 5 ng of THC or more per ml of blood (Department of Justice, Impaired Driving Laws).

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*Emerging data indicate this issue persists into older populations.*

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The negative association (independent association of increase fatal and nonfatal motor vehicle collision/injuries) between cannabis use and driving has been documented in young users (Bondalleg et al., 2016) and middle-aged users (Asbridge et al., 2015). Emerging data indicate this issue persists into older populations. Self-reported past-year substance users in the 50–64 and the 65+ age ranges indicated marijuana use was a significant predictor of driving under the influence (DIU) reports (Choi et al., 2016). Further, a large national survey in the U.S. show that one third of past-year marijuana users aged 50+ years reported past-year DUI, two thirds of which involved drugs. Those with marijuana abuse/dependence were 2.6 times more likely than those without the disorder to report DUI, controlling for alcohol abuse/dependence, other illicit drug use, and sociodemographic and health/mental health statuses (Choi et al., 2019). In Canada, among fatally injured 50-64-year-old drivers the percentage testing positive for marijuana was 13.7% in 2016 (Brown et al., 2019). The percentage of fatally injured Canadian drivers aged 65 and

older that tested positive for marijuana was 2.3% (Brown et al., 2019). As safe driving is key to prolonging independence in late life, clinicians need to educate older adults about the risk of marijuana use, alone and with other substances, on their driving capacity (Choi et al., 2019). Also, as described earlier if the pharmacokinetics of cannabis in older people is elongated, that could influence time frames for safe driving and needs further investigation.

## Withdrawal

**Substance withdrawal are symptoms experienced by individuals who discontinue use of medical or recreational drugs.** Research on this topic as it relates to older adults is very limited. However, one study describing survey data from adults in Washington state in the U.S. suggests older people appear to experience fewer withdrawal effects of cannabis than younger users, perhaps because these groups benefit more from the medicinal properties of cannabis and smaller cannabis concentrations in medicinal modalities (Sexton et al., 2019). Older users acknowledging withdrawal effects were less likely to report irritability, insomnia/interrupted sleep, anxiety, and loss of appetite. Trouble stopping cannabis use was 16.7% in this sample but did not vary as a function of (Sexton et al., 2019).

## Harms Reduction

**Cannabis use disorder (CUD) is a problematic pattern of cannabis use leading to clinically significant impairment or distress.** The Royal College of Psychiatrists in the United Kingdom describes that country's older adults with substance abuse as "Our Hidden Addicts"; with the topic of substance misuse in older people being unrecognized or ignored (Royal College of Psychiatrists,

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*... cannabis should be avoided by older adults who have a history or current experience of mental health disorder or problematic substance abuse disorder.*

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2018). The number of Americans aged 50+ years with a substance use disorder (and subsequent need for substance abuse care) was projected to double by 2020 from the previous decade (Wu and Blazer, 2011). A large national US survey of adults aged 50 years and older estimates that 21.2% of past-year and 13.7% of ex-marijuana users with lifetime marijuana use disorder sought help for marijuana problems and those with marijuana use disorder often have other substance use and mental disorders (Choi et al., 2017). An epidemiological study of older adults found that marijuana use (medicinal or otherwise) and cannabis use disorder were associated with more life stressors and lower perceived social support compared to those who did not use marijuana (Choi et al., 2016).

The Canadian Coalition for Senior's Mental Health (CCMA) produced a guidance document on the development of cannabis use disorder (CUD) or optimally assessing and treating older adults who have developed such a disorder (CCMA 2019). The CCMA put forth 22 recommendations covering prevention of, screening and assessment for, and treatment of CUD. With respect to prevention, the recommendation is that cannabis should be avoided by older adults who have a history or current experience of mental health disorder or problematic substance abuse disorder. In addition, cannabis use should also

be avoided by older adults who have cognitive impairment, cardiovascular disease, cardiac arrhythmias, coronary artery disease, unstable blood pressure, or impaired balance. The CCMA recommends thorough discussion with one's clinician regarding risks and close observation for signs of CUD.

## Benefits of Cannabis in Older Adults

**In contrast to the wide-ranging sentiment in the medical/public health/research communities that there is considerable mounting evidence for harms of cannabis use applicable to older individuals** (Minerbi et al., 2019), the literature indicates that cannabis use is generally well-tolerated in this population. In a small study from the Netherlands, the use of pharmaceutical THC, Namisol, was well-tolerated by a sample of adults with a mean age of 72 years; with few reporting many of the pharmacodynamics, such as feeling 'high' or feeling 'unsteady' (Ahmed et al., 2014). In one of the largest prospective studies (Israel) on cannabis use and older adults (mainly for medical reasons), older adults report their quality of life was improved, the cannabis treatment as effective for their condition, and they perceived a reduction in the intensity of the reported pain (Abushasira et al 2018). From a survey of older adults in the state of Colorado, past-year marijuana users frequently reported better overall health and well-being, quality of life, day-to-day functioning, and improved pain (Lum 2019). Another sample of older adults in Colorado reported on varying 'degrees of helpfulness' for targeted symptoms. Specifically, respondents reported that marijuana was most helpful when used for anxiety (100%), depression (92%), sleep (86%), pain (83%), and appetite stimulation (70%). Marijuana was felt to be less helpful when used for memory (44%), gastrointestinal symptoms (43%), seizures (25%), Parkinson's disease (20%), glaucoma (20%), and headaches (14%) (Reynolds 2018). The conflicting realities of perceived risks and personal experience in the older adult population needs further study. Specifically, teasing out the details of type of use, type of user, dosage etc.

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## Cannabis Use by Older Adults

**An increase in cannabis use in older populations is being reported by many countries**, including Canada, the USA, Australia, and the Netherlands. This increase in use is being attributed to both an increase in the size of aging cohorts and in new users (often using for age-related medical issues). This growth is also being observed to outpace the growth observed across all other age groups.

According to national survey data in the USA data, between 2006 and 2013, past year cannabis use among older adults increased from 2.8 to 4.8% (Han et al., 2017) and then again increased to 5.7% by 2017 [SAMHSA, 2017]. A similar report showed the prevalence of past-year marijuana use among late middle-aged US adults increased significantly from a low of 2.95% in 2003 to a high of 9.08% in 2014. Similarly, the prevalence of marijuana use increased significantly among older US adults from a low of 0.15% in 2003 to a high of 2.04% in 2014 (Salas-Wright et al., 2017). Cannabis use among Australians aged 50 years and over increased significantly from 1.5% to 3.6% between

2004 and 2013 (Kostadinov and Roche, 2017). These increases in cannabis use is not unanticipated, given the high rates of substance use among the Baby Boomer generation and given that the majority of Baby Boomers have still not yet reached the age 65, we will probably continue to see the trends continue into the next decade (Han et al., 2017). Growth has also been attributed to the entry of a more tolerant baby boom cohort into older age, recent evidence suggests the pathways to cannabis are more complex. Some older persons have responded to changing social and legal environments and are increasingly likely to take cannabis recreationally. Other older persons are experiencing age-related health care needs, and some take cannabis for symptom management, as recommended by a medical doctor (Kaskie 2017).

## Therapeutic vs. Recreational Use

**Although some studies have shown that many older persons use cannabis for recreational purposes** (Black & Joseph, 2014; Lum et al., 2019; Wu & Blazer, 2011), others have determined that older adult cannabis users are more likely to report its use for medical reasons (Choi et al., 2018). Epidemiological data show that the older population constitutes a growing segment of medical cannabis users, ranging from approximately 7% to more than one third, depending on the country (Abuhasira 2018). Among older adults in the state of Colorado, (54%) reported both medical and recreational purposes. The percent of medical only users (14%) was higher than those who reported use of recreational marijuana only 7% recreational only (Lum 2019).

## Pattern of Use

**Patterns of use among older adults often includes use of more than one preparation of marijuana** (smoking, topical and edibles). Lum 2019 reported that the majority of past-year marijuana users reported smoking/inhaling as their preferred method or preparation of marijuana use—whether alone or with other methods. In addition to smoking, other common methods of use included edible and topical formulations (creams and ointments). Topical formulations were used by 52% of past-year marijuana users, and this method was for medical rather than recreational use. In general, older persons in this sample from Colorado preferred multiple methods or preparations of marijuana (Lum 2019). Another sample from Colorado reported use by older adults attending geriatric primary care clinics reported that edibles followed by smoking cannabis and lotion were the top modalities of use (Reynolds 2018). This study also reported that the majority of this sample of older adults obtained their cannabis recreationally (almost half) and then one-quarter obtained a prescription.

# Who Are Older Cannabis Users?

**The older adult population is known to be a heterogeneous one, and this applies to the topic of cannabis and aging as well.** In discussing cannabis with this age-group, three pathways to use across the lifespan were identified: there will be individuals who are lifetime users, individuals who were early-life users only, individuals who were early-life users and now again using, and new users in later life (Arora 2019). Much of the descriptions available of older cannabis users are from epidemiological studies from States in the U.S. where cannabis has been legalized; with the majority of descriptions being from the state of Colorado. From these descriptions, current typical older cannabis users were more likely to be male and less likely to be married or partnered (Choi et al., 2016; Han & Palamar, 2018; Salas-Wright et al., 2017). However, newer users or those who use for medical reasons may have different characteristics, majority women and married (Reynolds et al., 2018).

# Why are Older Adults Using Cannabis?

**The increasing marijuana use rate among older adults has been attributed to the aging baby boomers** who have had greater exposure to marijuana; more permissive attitudes toward its recreational use than preceding generations; and marijuana's increased availability of and accessibility to marijuana owing to legalization of its medicinal and/or recreational use (Choi 2018).

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*... older adult cannabis users are more likely to report its use for medical reasons*

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The potential use of cannabis to cope with aging and chronic disease side effects (Han 2017) and the perception of cannabis being an alternative therapy (Arora 2019) are sentiments being reported. While one-third to more than one-half of registered medical marijuana participants in eight US states were 50+ years old (Fairman, 2015), a sample of baby boomers from the city of San Francisco who use marijuana claim they do so for relaxation/stress reduction, social/recreational reasons, and enhancement/expansion (e.g., heightened awareness, concentration, creativity) (Lau et al., 2015).

# Influences on Cannabis Use in Older Adults

**An age–period–cohort paradigm is being used to explain the various pathways of cannabis use among the older adult population** and demonstrate how attitudes, laws, and individual health needs may be shaping these paths. (Kaskie 2017). Individual outcomes (e.g., taking cannabis) are assumed to be shaped by cohort effects (e.g., more favorable attitudes held by one generation but not another) as well as period effects (e.g., historical events such as cannabis legalization) and age effects that occur over the life course (e.g., health problems). The increasing marijuana use rate among older adults has been attributed to the aging baby boomers who have had greater exposure to marijuana; more permissive attitudes toward its recreational use than preceding generations; and marijuana’s increased availability of and

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*... older Canadians are the fastest growing segment of users in Canada.*

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accessibility to marijuana owing to legalization of its medicinal and/or recreational use (Choi 2018). Also, many older adults may feel a certain familiarity with cannabis, having used it recreationally since the movement of the 1970s (Minerbi 2019). Findings also suggest that older adult cannabis users follow cultural norms, which are characterized by “normal” or “acceptable” cannabis use (Lau 2015). Among a sample of older adults living in Colorado, lack of education and research about cannabis, lack of provider communication, access

to medical cannabis, outcomes of cannabis use, and apprehension about public disclosure were emerging themes influencing cannabis use (Bobbitt et al 2019). With shifting attitudes and legalization of recreational cannabis and its use for medicinal purposes, further research is needed to determine whether these changes in attitudes and/or policies affect prevalence of use among older adults (Han 2017).

## Canadian Older Adults & Cannabis Use

The most recent data from Statistics Canada’s National Cannabis Survey (third quarter 2019) show 7% of community-dwelling Canadians aged 65 years and older consumed cannabis. While less older Canadians use cannabis than younger Canadians, for example, those 15- to 24- years old (26%) – older Canadians are the fastest growing segment of users in Canada (Statistics Canada, 2019). In 2012, less than 1% of older adults in Canada (about 40,000) reported using compared to estimates from 2019 indicating that more than 400,000 have used cannabis (in the past three months). Twenty-seven percent of those older Canadians reported that they used cannabis for the first time in the last three months at the time the survey was conducted (third quarter 2019); compared with 10% in younger users. Fifty-two percent of older Canadian’s use was primarily for medical reasons, 24% for both medical and non-medical, and 24% used for recreational purposes. Among users, roughly half are using daily, almost daily, or weekly. 41% of older Canadians reported purchasing their cannabis exclusively from a legal source.

# Evidence for Medical Cannabis

**As a majority of older Canadian cannabis users do so for medicinal reasons, a summary of the conditions for which cannabis is most frequently used by older adults is warranted.** However, it should be noted that while Health Canada granted access to cannabis for medical purposes with the support of their physicians under the original Marihuana Medical Access Regulations in 2001 and recreational marijuana was legalized in 2018, cannabis has not been approved for use as a medicine for any indication by Health Canada. Aside from a few synthetic cannabinoid products that have been approved for clinical use for specific conditions, cannabis has not yet gone through the regulatory processes required to be approved as a pharmaceutical product as a result of limited evidence supporting its safety and effectiveness.

## Recommended Prescribing Guidelines of the Canadian Medical Community

**The Canadian Medical Association's policy on cannabis for medical purposes (last reviewed and approved in March 2019) is very reserved** in nature owing to the lack of evidence on the risks and benefits associated with the use of cannabis, therefore making it difficult for physicians to advise their patients appropriately and manage doses or potential side effects in conjunction with concerns on the medico-legal liability of its prescription (Canadian Medical

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*The Canadian Medical Association calls for further research on efficacy and safety ...*

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Association, 2009). The Canadian Medical Association calls for further research on efficacy and safety and increased support for physicians on the use of cannabis for medical purposes. However, in light of the reality of the increased interest in medicinal cannabis, a Canadian prescribing guideline committee (Allen et al., 2018) put forth general recommendations on medical cannabis use in order to provide a simplified approach to medical cannabinoid use in primary care. The group issued a strong recommendation against the use of medical cannabinoids for most medical conditions, again, owing to lack of evidence of benefit and known harms. Based on reviews of the evidence in neuropathic pain, palliative cancer pain, chemotherapy-induced nausea and vomiting, and multiple sclerosis- or spinal cord injury-related spasticity, they should only be considered for patients whose conditions are refractory to standard medical therapies. When considered, there should be a discussion between the individual and health care provider regarding the limited benefits and more common harms (over medical marijuana). This assessment and recommendation is echoed by the National Academies of Sciences, Engineering, and Medicine in the US (a non-profit organization of national academics providing independent, objective advice to inform policy with evidence); evidence synopses suggest that only three conditions have an adequate volume of evidence for prescription: chronic pain; cancer related nausea and vomiting; and spasticity (NASEM, 2017).

# Chronic Pain

**The literature relating to the efficacy of cannabis on chronic pain in older adults is difficult to navigate.** Many summaries of research studies on this topic group together the underlying conditions that cause the chronic pain and often group together the type of cannabis used; resulting in mixed results on its efficacy (Aviram et al., 2017; Nugent et al., 2017; Häuser et al., 2018; Stockings et al., 2018, CADTH 2019; Johal et al., 2020). While chronic pain increases in prevalence with age, reviews of the literature do not specifically focus on older populations and rarely present results of subgroups by age. Lastly, as with many uses of cannabis for various medicinal indications, more high-quality studies are needed (Montero-Oleas et al., 2020).

The most recent systematic review on the topic (Johal et al. 2020, of only randomized control studies and included up to December 2018) found small, but significant effects (up to six months) of cannabinoids in pain reduction in patients with neuropathic pain related to multiple sclerosis and those with other chronic neuropathic pain conditions, including HIV sensory neuropathy, postsurgical or posttraumatic pain, diabetes, and fibromyalgia. While these results are promising, the review does note that non-serious treatment related adverse events (dizziness, throat discomfort, asthenia, fatigue, drowsiness, dry mouth, increased appetite, hallucinations, nausea, and refractory spasticity) reported for cannabinoids were greater versus a placebo. The documentation of adverse events has been highlighted in other reviews and therefore recommendations regarding use of cannabis for treatment of pain have been consistently tempered with caution to weigh the benefits and risks.

# Osteoarthritis

**Osteoarthritis is a common chronic condition affecting many older Canadians.** The symptom of osteoarthritis is pain, which may be persistent or intermittent. The source of osteoarthritic pain is thought to be driven by acute inflammatory flares, abnormal mechanical loading of damaged joint tissues, and/or nerve damage. The endocannabinoid system, specifically receptors in joints related to pain pathways are thought to be a potential target where cannabinoids can exert an analgesic effect. Studies using animal models have demonstrated promising results. Studies in humans are lacking but clinical trials have begun (O'Brien and McDougall, 2018). Future studies also need to identify which population (source of pain, inflammation, mechanical load, neuropathic) will benefit the most from the various cannabis products available.

Similar to research in the area of osteoarthritis, there is a paucity of research on the effect of cannabis specifically on rheumatoid arthritis. An early study has shown Sativex (an oromucosal spray of a formulated extract of the cannabis sativa plant) has a significant reduction in pain (Blake et al, 2006). The Canadian Rheumatology Association, while acknowledging a need for research in the area, recognizes the work done in the other areas of pain research and the growing interest and so recommends rheumatologists provide pragmatic advice to their patients (Fitzcharles et al, 2019).



# Neuropathic Pain

**The symptoms of neuropathic pain include shooting and/or burning pain or tingling and numbness.** It can be severe and can present in waves. It is commonly associated with peripheral nerve damage, for example with diabetes, but has many other causes such as nerve or spinal cord compression or chemotherapy. Reviews of research in this type of pain suggest some benefit with cannabis-based medicines (Avriam 2017, Hauser 2018, CADTH 2019). In one of the few Cochrane systematic reviews on the topic, it was found that cannabis-based medicines may increase the number of people achieving 30% or greater neuropathic pain relief (moderate evidence) compared with

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*...cannabis-based medicines may increase the number of people achieving 30% or greater neuropathic pain relief*

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placebo (Mücke et al, 2018); although the authors note that none of the studies included were considered “high-quality” evidence and conclude the use of cannabis-based medicines should be at the discretion of the pain specialist. In Canada, the Canadian Pain Society, in line with most professional bodies, currently recommends cannabinoids as third-line agents (Mu 2017). However, the Cochrane review did indicate that all cannabis-based medicines [at any dose; herbal cannabis, plant-derived THC (dronabinol), synthetic THC (nabilone), plant-derived THC/CBD combination] pooled together were superior to placebo. But again, in keeping with the weighing the benefits with the risks, there was also moderate-quality evidence that more people dropped out due to adverse events with cannabis-based medicines compared to placebo (Mücke et al, 2018).

In the most recent review on the topic (Johal et al, 2020), small effects of cannabinoids in pain reduction were summarized for patients with neuropathic pain related to multiple sclerosis and those with other chronic neuropathic pain conditions, including HIV sensory neuropathy, postsurgical or posttraumatic pain, and diabetes. The effectiveness varied by the source of pain, duration of treatment, and type of cannabis used but there was a trend for the efficacy of cannabinoids administered orally to have the largest effect size, followed by oromucosal sprays and inhaled (smoked) cannabis. However, an earlier review (Avriam 2017) reported that the inhalation of cannabinoids showed relatively better pain reduction effects.

In summary, there may be differences in effect of different types and doses of cannabis-based medicines in different types of neuropathic pain. The optimal ratio of THC/CBD still needs to be determined as well as potential adverse events for each.

# Palliative Care

**Pain and symptom control are common issues in palliative care.**

**Increasingly, cannabis as a therapeutic strategy in this context is being explored.** Treatment in palliative care often focuses on the treatment of cancer pain, but many patients may want to address other common symptoms at end of life, such as anxiety, depression, nausea, anorexia, or insomnia. Some of the desired effects in using cannabis for palliative care may be related to the therapeutic role for dealing with the despair of a terminal illness. Also, at much higher doses, cannabis can induce temporary dissociative-like states, which can create a “distancing” from pain experience. Though many patients may not be receptive to these types of effects, some may consider them as a safer and more desirable option than opioids. As evidence is largely inconclusive for some of the symptoms, this should be a factor taken into account in a terminal patient’s expectations (Cyr et al, 2018).

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*... some may consider them as a safer and more desirable option than opioids.*

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Specifically, for pain, cannabis (Nabilone or Nabiximols) use has traditionally been recommended by the medical community in palliative care; only after other analgesic therapies have been unsuccessful (Cyr et al, 2018). However, there is evidence that cannabinoids (combined THC/CBD) are modestly effective in clinically reducing pain in patients with malignant diseases (Darkovska-Serafimovska et al, 2018). Its use was largely well-tolerated; however, the recognition of potential side effects should be factored into the treatment discussion. Also, as delirium can be common in terminal stages of cancer, it may be exacerbated by the use of cannabinoids (Cyr et al, 2018).

# Disability

**An estimated one in five Canadians aged 15 years and over have one or more disabilities that limit them in their daily activities.** The percentage increases with age, where an estimated one-quarter of all older Canadians live with a disability (Statistics Canada, 2017). As the cause of disability varies, it is not suitable to describe the effect of cannabis on ‘disability’ as a whole. However, by examining the causes of disability, one can then assess if cannabis can assist in the management of the disability. The most common disability types among Canadian older adults, specifically, are pain, mobility, and flexibility (often in combination). The role of cannabis in pain management has been summarized earlier. With respect to mobility and flexibility, it is difficult to discern the main causes of those disabilities, and the literature does not describe any investigations specifically on those topics. However, one condition that is characterized by mobility issues and reduced flexibility is Parkinson’s. There is promising research in animal models, where synthetic cannabis was shown to prevent these outcomes and protect parts of the brain associated with Parkinson’s (Cassano et al, 2020). There is insufficient evidence in humans (Montero-Oleas et al, 2020, NASEM 2017). Similarly, in another neurodegenerative disease (causing cognitive disability), animal studies have indicated success in targeting factors associated with Alzheimer’s; but again, there is insufficient

evidence in humans with respect to slowing down the progression of the condition (Kim et al, 2019, Cassano et al, 2020). Another common disability among older adults is visual impairment. One of the major causes is the condition of glaucoma. The ability of cannabis to reduce intraocular pressure associated with glaucoma is inconclusive. While it does have the ability to reduce eye pressure, the dose required could produce other physiological responses which would offset it (Novack 2016). As such, the Canadian Ophthalmological Society does not support its use for treatment of glaucoma (Rafuse and Buys, 2019).

With respect to self-therapeutic use of cannabis, it has been shown that smoking and alcohol consumption have been used as coping strategies to deal with the negative impact of disability. As such, the use of cannabis in a harms reduction context requires attention as well.

## Sleep

**According to Statistics Canada, 26% of older Canadians report nighttime insomnia symptoms** (Chaput et al., 2018). One benefit that is commonly reported by cannabis users is that it aids with sleep (Walsh et al., 2013) and perhaps because of the reputation of cannabis to make one drowsy, individuals seek it out to assist with sleep issues. However, research in this area is limited (Babson et al., 2017) with the majority of reports related to sleep are secondary outcomes to treatment for other conditions; that is, sleep was not the primary outcome of the study and not objectively measured (Walsh et al., 2013).

Despite these limitations, certain strains of smoked THC and THC-derivatives, alone or in combination with cannabidiol, may improve self-reported sleep quality, sleep disturbances, and decrease sleep onset latency in specific subgroups (Kuhathasan et al., 2019). Cannabidiol may hold promise for REM sleep behavior disorder and excessive daytime sleepiness, while nabilone may reduce nightmares associated with PTSD and may improve sleep among patients with chronic pain. Similarly, the National Academies of Sciences, Engineering, and Medicine concluded that there is moderate evidence that cannabis or cannabinoids are effective for improving short-term sleep outcomes in individuals with sleep disturbance associated with obstructive sleep apnea syndrome, fibromyalgia, chronic pain, and multiple sclerosis (cannabinoids, primarily nabiximols) (NASEM, 2017).

The most recent critical review on clinical trials in this area similarly indicates that although sleep remains one of the main reasons people seek medicinal marijuana, to date there is a lack of high-quality placebo-controlled trials examining the use of cannabinoids specifically for treatment of sleep disorders. In addition, many available studies used nonstandardized, nonvalidated questionnaires and the use of validated objective and subjective sleep measures is strongly encouraged in future research. Lastly, there remains a large gap in the literature regarding the extent of potential side effects associated with the use of cannabinoids for sleep disorders (Kuhathasan et al., 2019).

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*... certain strains of smoked THC and THC-derivatives, alone or in combination with cannabidiol, may improve self-reported sleep quality, in specific subgroups.*

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# Recommendations for Medical Cannabis Use by Older Adults

**All reviews caution that there is a paucity of evidence for efficacy but an increased risk of harm** (Minerbi et al 2019). Any use of medical cannabis in older adults should be individualized and account for the unique characteristics of each person, including the symptoms requiring treatment, symptom severity, comorbid conditions and possible adverse effects through open and informative dialogue with health care professionals (Minerbi et al 2019). A pragmatic approach to treating older persons with medical cannabis is presented in Appendix I.

## Limitations in the Literature

**Clinical trials have mostly been short, often with heterogeneous patient populations**, especially for chronic pain, and with variable outcome measures. Cannabinoid preparations are diverse and cannot be regarded as a single drug. The molecular concentrations of THC and cannabidiol of pharmaceutical and plant-based preparations differ, with the plant product containing a myriad of other molecules. The shortcomings of studies partially explain the lack of convincing conclusions lacking the rigorous design of clinical trials (Minerbi et al 2019). Adequately powered trials are needed to assess the efficacy and safety of cannabinoids in older subjects, including a critical evaluation of the risk-benefit ratio.

This review is to provide information for general educational purposes only. It is not a substitute for professional medical, policy or legal advice.

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**Appendix 1: A pragmatic approach to treating older persons with medical cannabis (adapted from Minerbi et al 2009).**

<b>Why am I considering using Cannabis?</b>	E.g. Pain, agitation, anorexia, insomnia, anxiety
<b>What are all treatment options?</b>	Have other treatments been explored. Example psychological, physical therapy, other medications.
<b>Establish your expectations</b>	Depending on the indication for use, what does the science say compared to anecdotal information from other people who have tried it.
<b>Consider possible side effects</b>	Cardiovascular risk Risk of falling Existing mental health issues Interaction with other medications Cognitive impairment Driving
<b>Assess Risk Benefit</b>	Is potential improvement in symptoms and quality of life greater than potential risk for you.
<b>Begin Use</b>	Start with lowest available dosing Log your intake and experiences Involve family or friends to monitor side effects and assure safety – new users can consider having someone with them on their first try and in a safe comfortable location.
<b>Re-evaluate</b>	Was there a benefit with use? Were there any side effects? Did the benefits outweigh the side effects? Change dose? Either higher or lower? Try a different method of ingestion?