Cannabis Legalization and Youth: Developing Clear Messages in an Evolving Policy Climate

Boulder Colorado, Institute of Behavioral Science
November 15 and 16, 2018

Conference Report
# Table of Contents

Rationale for the Conference ........................................... page 1

Section 1. Research on the impact of cannabis use in adolescence and young adulthood ........ page 3

Section 2. Health policy and state health department experiences following legalization of recreational cannabis ........................................ page 6

Section 3. Evidence-based Cannabis Abuse Prevention and Treatment Interventions .......... page 10

Section 4: Cannabis and Youth: Community Responses ................................................ page 13

Section 5: Establishing national and cross-national research collaborations & funding opportunities ................................................ page 16

Appendix: Recent relevant publications by speakers ..................................................... page 18
Rationale for the Conference

An estimated 357 million people live in Canada or the United States (US) where either medical or retail cannabis is legal. For many years the complexities of commercialization and regulation have preoccupied legislators and this continues to absorb their considerable attention. As with all psychotropic drugs, limiting their use by children and adolescents is a serious concern when these are made publically available. Current restrictions mainly target age of legal use, driving while intoxicated, and criminalization of sales to youth. However, changes in access, patterns of use, or harms related to cannabis by youth that result from legalization and commercialization of Cannabis as well as the impacts of cannabis use legislation on adolescents and youth remain poorly studied and largely unknown. However, opportunities for discussion by youth servicing agencies, policy makers, parents and researcher are raised in times of changing legislation. A window of opportunity currently exists to identify, prevent, and mitigate cannabis related harms to vulnerable youth.

The collaborative Canada US conference that we report on here took advantage of ongoing policy development, research and public health experiences in Canada, Colorado, and Washington State to discuss cannabis legalization and youth. Organized by Drs. Bonnie Leadbeater, (University of Victoria, Canada) Karl Hill (University of Colorado Boulder, USA) and Kara Thompson (University of St Francis Xavier, Canada), this conference brought together more than experts in research policy and practice to join a conversation on youth and cannabis. Funding for the conference and for this report comes from the Canadian Institutes for Health Research and the Institute of Behavioral Science and The Research & Innovation Office at the University of Colorado Boulder.

As is argued cogently by Dr. Christian Hopfer of the Division of Substance Dependence, Department of Psychiatry, University of Colorado School of Medicine, “Legalization implies that law enforcement efforts to control or reduce cannabis will be limited, leaving public health, medical and scientific organizations to reduce harm and educate the public. These stakeholders face major challenges in developing clear messages, particularly in an evolving policy climate (2014, p.333).” Comprehensive, evidence-informed strategies are needed to mitigate cannabis use patterns that may be harmful for some youth (including early onset and chronically high frequencies and amounts of use) as well as interventions for abuse and dependency. Presenters at this conference had expertise in 1) Research on the impact of cannabis use in adolescence and young adulthood, 2) Health policy and state health department experiences following legalization, 3) Evidence-based cannabis use prevention and treatment, and 4) Community-based approaches to positive youth development and harm reduction. This report summarizes the conference’s main learnings and promising practices, and identifies gaps in research and interventions that inform societal obligations to protect adolescents and young adults from harms related to cannabis legalization and commercialization.

Societal obligations to protect adolescents and young adults

As has been illustrated by the long history of legislative changes and challenges related to the history of tobacco and alcohol retail use; societal obligations to protect youth are increased by legalizing, producing and distributing psychotropic substances. However, evidence-based approaches to policy and preventive interventions for cannabis use are not well established for youth and these may be difficult to evaluate and scale up to a level that can have large scale public health effects. Legislators aspire to reduce harms to children and youth by, for example, setting a minimum age for purchasing cannabis and providing criminal penalties for people who sell or give cannabis to minors. There are also restrictions to cannabis packaging and products that appeal to children and warning labels on commercial products, including edibles. However, past research shows that most youth begin use before the age of 18 and use peaks around age 22 in most samples and then declines for many youth. Hence, minimum age restrictions may not be effective in preventing harmful use. Addictions rates are highest for youth who start use before age 16, ranging from 9 to 17% (Leos-Roro, Rynard, & Hammond, 2017).
Why focus on adolescents and young adults?

Adolescents and young adults are largely indiscernible in the current public discussion on the impacts of legalization. The young adult age group (approximately 18 to 29) is typically combined with older adults and the specific risks and consequences of the retail use of cannabis have not been anticipated for this age group. This is a period of life when the educational, economic and social foundations of well-being are accrued and compromises in the ability of young people to achieve these critical milestones can create long term costs for labour, health and welfare. Most Canadian youth and adults believe that cannabis use is a low risk activity with few serious consequences, particularly when compared to alcohol (McKiernan & Fleming, 2017). Yet myths also bound about cannabis use. While one extreme makes claims for the safety of cannabis use (often comparing it to the greater harms of alcohol use), the other extreme forecasts dramatic increases in youth car crashes, school dropout, psychosis, addictions, and irreversible damage to adolescents’ developing brains. As the cannabis industry is quick to point out, “direct causality” is not established in most cannabis research. However, ample longitudinal research on cannabis use consequences in adolescents and young adults draws attention to youths’ greater risk for negative neurodevelopmental behaviours (cognitive, memory impairment, verbal errors, lack of motivation, risky decision making) and poor psycho-social outcomes (mental illness, work, academic, relationships) compared to adult-onset users (Bryant, 2012; Bryant et al., 2015; Claus et al., 2018; Levine et al., 2017).

Although the consequences of cannabis use in youth after legalization and commercialization is hard to predict (Schinke et al., 2017), both Canada and the US benefit from open discussions about variability in the use and outcomes of cannabis use by youth. Lessons learned in Colorado and Washington State following retail legalization (in 2012) could help Canada to minimize the impact of retail cannabis on Canadian youth.

The conference and collaborative follow-up activities offer unique opportunities to rapidly respond to the need for evidence-based knowledge to inform discussions among stakeholders of how adolescents and young adults may be impacted by the upcoming legalization and regulation of cannabis and about effective approaches to preventing harms. Several states in the US (Alaska, California, Colorado, Maine, Massachusetts, Nevada, Oregon, Vermont, and Washington) have legalized retail cannabis use in the period from and educators and legislators have collaborated with prevention researchers inform preventive approaches for youth. The conference participants included legislators, educators, and prevention scientists from two western states who legalized retail use in 2012 (Colorado and Washington State) from Canada where legislation occurred in October 2018 and where commercialization planning is ongoing.
Section 1. Research on the impact of cannabis use in adolescence and young adulthood

What do we know?
Most of the adverse effects of cannabis use in adolescence and young adulthood are associated with long term, frequent, heavy use. Hence, it is clear that (as with alcohol use), not all youth will experience negative consequences (Leos-Toro et al., 2017). However, considerable research with data from samples of youth who were interviewed before legislative changes showed that youth who start using cannabis before age 15 and those who become chronic heavy users of cannabis showed both vulnerability in adolescence and also suffer the most negative neurocognitive and psychosocial consequences in young adulthood. Adolescent risks for problematic use include co-occurring externalizing, mental health, deviant peers, low parent monitoring, and academic problems (Thompson et al., 2018). We also know that cannabis use, alcohol use and binge drinking frequently co-occur (Keith et al., 2015; Subbaraman & Kerr, 2015). Early onset and chronic polysubstance use in adolescence also predicts substance use problems during young adulthood (Merrin et al. 2018; Nelson, et al., 2014) and is associated with greater risk for cannabis dependency (Ellickson et al., 2004). Risks for addiction are also higher for youth who begin as adolescents with a wide range (17% to as many as 50%) depending on frequency of use (Leos-Toro et al., 2017).

Multiple studies have identified differences in the patterns of use from adolescence to young adulthood. These include youth who are occasional users as well as those who decrease in use, increase in use to high levels, or who start early and use chronically at high levels. High risk patterns of use (i.e., chronic or increasing use) are also associated with poorer academic and economic outcomes (Bryant et al., 2003; Epstein et al., 2015; Rioux et al. 2018; Terry-McElrath et al., 2017; Thompson et al., 2018a). Much of this research was conducted in the US with patterns of risk affecting 14% to 20% of youth. However, youth with chronic or increasing heavy use patterns made up 31% of a representative community
sample of British Columbia youth (N=662), followed biannually for a decade from 2003-2013 (Leadbeater et al., 2017). These two risky patterns of use were associated with behavioral and mental health concerns (Thompson, et al., 2018b), driving risk behaviors (Leadbeater et al., 2017) and contextual risk (deviant peer affiliations, low parent monitoring, disengagement from school, etc. Leadbeater et al., 2018). Youth in the Victoria sample who use cannabis are also more likely to co-use alcohol and other illicit substances and the patterns of co-use identified in adolescence are stable over time (Merrin et al., 2018).

Better use could be made of knowledge of protective factors (parent influences and monitoring in preventing adolescents’ early uptake of cannabis (Epstein et al., 2017). Legalization may make cannabis use more normative in some families and increase appearance of acceptance of youth use. The effect of parent use on youth attitudes to using cannabis is established. As more parents engage in legal use of cannabis, they may be unprepared to talk to their children about possible untoward effects. Preventing early onset use will require parents’ participation.
Research-based conclusions

- Heterogeneous patterns of use span adolescence and young adulthood (chronic, increasing, decreasing or adolescent limited, abstainers and occasional users). Acknowledging that not all youth will have problematic outcomes may be important for targeting messaging and education appropriately to low and high risk user groups.

- Negative outcomes are associated with high-risk patterns of use (early onset chronic and heavy increasing use)

- Cannabis and alcohol co-use are common in adolescence and cannabis is rarely used alone in adolescence or young adulthood.

- Cannabis is habit forming. Youth who start heavy frequent use in adolescence are more likely to experience symptoms of cannabis disorders in young adulthood.

- Clear mechanisms for delaying onset of use as prevention strategy need to reach beyond the idea that this is an individual choice. Given already vulnerable youth usually start well before the legal age of use; preventive interventions and public health messaging needs to start early and also include parents, peers and communities.

- Consequences of legalization and commercialization may not be seen in change in numbers of overall adolescent users of cannabis, but may be evident in changes in the frequency of heavier users or in those who rapidly increases in amounts used across the transition from adolescence to young adulthood. Assessing the changing frequency of heavy use may be more informative that overall use patterns.

Gaps in research needed to inform the impact of cannabis on youth

- Despite popular opinion, cannabis risks for brain development and changes in brain structure are not established and more research on long-term changes is needed. This research is complicated by high co-use of alcohol as well as difficult conceptualizing and measuring units of cannabis used at any given time. One of the few studies of brain structure (Welland et al., 2015) used high-resolution MRI scans, to investigate group differences in gray matter using voxel-based morphometry, surface-based morphometry, and shape analysis in structures suggested to be associated with marijuana use, (i.e. the nucleus accumbens, amygdala, hippocampus, and cerebellum). Even after carefully controlling for alcohol use, gender, age, no statistically significant differences were found between daily users and nonusers on volume or shape in the regions of interest.

- The content of THC and other substances in most packaged cannabis and cannabis concentrates are not well known (Bidwell et al., 2018. This research lags behind in the US impart due to federal restrictions on research on cannabis not grown in government run sites. More precise identification and measurements of the contents of products sold is needed.

- Measuring marijuana intoxication (either as perceived or subjective highs or as saliva or blood levels) is difficult to assess. The range of consequences related to acute intoxication or long term use for individual capacities are poorly understood.

- Monitoring changes related to differences in policies across states and provinces could help to better understand what policies or messaging is effective under what circumstance.
Section 2. Health policy and state health department experiences following legalization of recreational cannabis.

Where are we now?

Legislators aspire to reduce harms to children and youth by, for example, setting a minimum age for purchasing cannabis and providing criminal penalties for people who sell or give cannabis to minors. Common approaches are restrictions to cannabis packaging and products that appeal to children and warning labels on commercial products, including edibles. Interest has also developed in implementing surveillance surveys to monitor the impact of legalization on the percentages of youth using cannabis and how much they are using. Changes in use following legalization of retail cannabis remain hard to predict and may differ for males and females (Johnson et al., 2015; Schepis et al., 2012). However, recent surveys show that in Colorado, cannabis use by youth has remained stable from 2005 to post-legalization (Healthy Kids Colorado Survey, 2017). Also in Colorado, youth perception of harm increased between 2014 and 2016, but decreased to pre-legalization levels in 2018 (Healthy Kids Colorado Survey, 2018). In Washington State, cannabis use which was also on the rise prior to legalization stabilized at the 2012 level and may be decreasing (Diley et al., 2019). However, youth perceptions of ease of availability and safety of cannabis use increased over this period in Washington State. The Washington Traffic Safety Commission also released an analysis of drinking-under-the influence (DUI). By 2016, fatalities involving drivers with alcohol plus THC were two times more frequent than fatalities of drivers using alcohol-only. Roadside tests in Washington also suggest that nearly 1 in 5 daytime drivers may be under the influence of cannabis, up from less than 1 in 10 prior to 2012.

However, research comparing provincial or state policies and outcomes for children and youth are lacking. The complexities of monitoring and developing public health interventions targeting youth in the context of the current rapidly evolving environment of legalization and commercialization reveal enormous gaps in preparation for these changes. Many areas of concern remain to be considered: youth have varying patterns of use, and more problematic use patterns can be hidden in frequency counts of numbers of users that do not take into account onset, duration, frequency, and amount of use. New delivery mechanisms (e.g. vaping) have been embraced by youth, although data across states and provinces is lacking. For example, in Colorado, youth who use cannabis predominantly prefer smoking over other methods and in 2017, vaping did not increase in use, remaining at 4% of usual method of use.

Co-use of cannabis with alcohol is high. Although the availability of legal cannabis is intended to decreased demand for and exposure to illegal cannabis in adults (e.g. Amlung & MacKellop, 2018, https://doi.org/10.17269/s41997-018-0160-4), all cannabis use by individuals under the legal age remains illegal. However, the status of this offence is unclear or rarely or unevenly prosecuted. Exposure to marijuana marketing in Oregon after legalization suggested that youth are as expose to advertising as are adults (Fiala, Dilye, Firth, & Maher, 2018 https://doi.org/10.2105/AJPH.2017.304136). However, educational messages for youth may be hard to reach through traditional means (e.g. product or TV warnings or advertisements). Youth behaviors and norms are often highly influenced by their immediate social networks of peers and adults. Evidence based school-, peer-, and parent-focused preventive interventions in a legal environment for cannabis use and cannabis use disorders are largely unavailable, though many exist already. Restrictions against smoking cannabis may be hard to enforce on college campuses (especially in residences). While research suggests that 9% to 17% of youth using cannabis will develop substance use disorders, access to treatment is already difficult. Moreover, much of past research on cannabis and youth was conducted on lower potency products that no longer are used. Given cannabis crosses the boundaries between public health concern related to cigarettes use (as a carcinogen that is correlated with second hand smoke) and alcohol (as a psychotropic and addictive drug), past policies for cigarettes or alcohol are not necessarily a perfect fit for reducing harms related to cannabis use. As in the early days of cigarette and legalized alcohol use, the history of prohibition has undermined scientific research, masked harms, and created resistance to the distribution of public health warnings.
Speakers in this section of the conference had much to offer in terms of both elaborations of what is being done and what issues of concern and solutions related to protecting children and youth remain to be addressed. As argued by Kilmer, it is clear that the conceptualization of “cannabis legalization” as binary (legal versus illegal) in a province or state barely scratches the surface of the complexity of the processes of both legalization and commercialization of cannabis (Caulkins, Kilmer, & Kleiman, 2016). The context of legalization and, more importantly the way cannabis is commercialized, create unstudied impacts that may affect youth use (Caulkins et al., 2018). Summarized by Dr. Kilmer as 14 “Ps”, there are many choice points or aspects of commercializing that should be considered including 1) Production, 2) Profit motive, 3) Power to regulate, 4) Promotion, 5) Prevention and treatment, 6) Policing and enforcement, 7) Penalties, 8) Prior criminal records, 9) Product types, 10) Potency, 11) Purity, 12) Price, 13) Preferences for licenses, and 14) Permanency. Each of these elements of regulation and commercialization may affect youth attitudes towards and use of cannabis, but research, policy, and surveillance strategies have not begun to identify or monitor state or provincial differences or investigate how they might relate to adolescents and young adults.

On January 1, 2014, Colorado became the first state in the United States to sell legal recreational marijuana for adult use. As a result, Colorado has had to carefully examine potential population health and safety impacts as well as the role of public health in response to legalization. As outlined by Jessica Neuwirth (Colorado Department of Public Health and Environment), Colorado has made many strides in the direction of establishing a comprehensive public health framework (see Ghosh, Vandyke, et al. 2016 doi:10.2105/AJPH.2015.302875), to coordinate assurance (e.g. labor force safety and enforcement), assessment (evaluation and ongoing monitoring), and policy development and to enact the legislation while mitigating the negative effects on public health and safety. Practical outcomes have widespread effects on restricting industry signage and mass marketing, restricting products that appeal to youth, and smoking in public places. Coordinated efforts among state agencies and concerned stakeholders review and promote educational materials for adult consumers, prevention strategies for youth and pregnant and breastfeeding individuals (e.g. Colorado Retail Marijuana Education and Prevention Resource Guide at https://drive.google.com/file/d/1-2DUfwNoi3uszAOq2MOoQu6w_OJhUboR/view.

The Colorado Department of Public Health and Environment also established an interdisciplinary, cross-sectorial Retail Cannabis Public Health Advisory Committee per state law (https://www.colorado.gov/pacific/cdphe/retail-marijuana-public-health-advisory-committee). The committee meets regularly, and meetings are open for public attendance and comment. They work to review current scientific literature on the health effects of cannabis use; judge and openly discuss the science using expert medical and scientific opinion; come to consensus on population health effects of cannabis use based on current science, come to consensus on translation of the science into public health messages, recommend public-health-related policies based on the current science and expert opinion, identify and prioritize gaps in the science important to public health and recommend public health surveillance activities to monitor population health effects.
As outlined by Sarah Mariani (Washington State Health Care Authority), Washington State which legalized retail marijuana in 2012 has also had time to monitor change and create responses. The legislation originally included dedicated funding for the creation, implementation, operation, and management of a comprehensive cannabis education and public health program (including such strategies as a public health hotline to provide referrals for abuse treatment; grants that support development and implementation of coordinated intervention strategies for the prevention and reduction of cannabis use by youth; media-based education campaigns separately targeting youth and adults; prevention activities that target youth and populations with a high incidence of tobacco use; and monitoring changes in frequency of use by adolescents (but not young adults) see https://www.doh.wa.gov/YouandYourFamily/Marijuana. While funding for these concerns has declined, it has imbedded youth concerns as a priority in legislation. The existence of long-term, university community partnerships has enabled the development and distribution of adaptable resources for parents (A parent guide for underage marijuana use http://learnaboutmarijuanawa.org/parentpreventionbooklet2014.pdf) and the review and distribution of evidence based practices for prevention (see searchable website Programs and Practices for youth marijuana use prevention https://www.theathenaforum.org/EBP).

As outlined by Melissa Ramphal (Health Canada) and Dr. Pamela Ponic (Public Health Agency of Canada), Canada has also created a Framework for the Legalization and Regulation of Cannabis in Canada that focuses priorities and demonstrates the wide and likely costly scope of cannabis related concerns. The framework identifies the need for education and raising awareness, prevention of problematic use and health promotion, protection of public health and safety and restricting access to youth, and monitoring use patterns and industry compliance (https://www.canada.ca/en/health-canada/services/drugs-medication/cannabis/laws-regulations/task-force-cannabis-legalization-regulation/framework-legalization-regulation-cannabis-in-canada.html). The restriction of access to youth and efforts to reduce profits related to criminal distribution are also identified as central to the original motivation to legalize cannabis in Canada, suggesting that follow up monitoring of youth should be a priority.

City and community challenges and solutions to concerns created by legalization and commercialization also expand the demands for local public health policies to address local concerns relate to the evolution from the distribution of medical marijuana to recreational marijuana. As outlined by Richard Stanwick (Island Health, Victoria BC) these concerns range from name of establishing local laws protecting the public from second hand smoke has also licensing and naming distributors, reducing second hand smoke in public and campus environments. Many BC jurisdictions are also dealing with crises of opioid deaths; however, the regulation of cannabis use has begun to receive attention (McKee, McClure, Fyfe, & Stanwick, 2018). Dr. Stanwick also points to the many unexamined health claims related to all manner of illnesses and conditions that create an attitude that medicinal use is safe and acceptable for use that may affect youth attitudes (see National Academies of Sciences, Engineering, and Medicine resource at https://www.nap.edu/catalog/24625/the-health-effects-of-cannabis-and-cannabinoids-the-current-state). The Vancouver Island health authority has also participated in the development of a framework for monitoring cannabis use and harms that will require cross-sectoral collaboration and funding to assess not only the prevalence of use a variety of subpopulations, but also of impacts and costs of prevention, treatment harm reduction (education) and enforcement. Linkages of administrative data would facilitate this work. Key need for and categories for surveillance of health also need discussion and key public health indicators need to go beyond binary tracking of use or non-use to include age at first daily or regular use, patterns of use: quantity, frequency etc, anxiety and depression, cannabis harms, co-use with other substances, driving, operating machinery following use, use during pregnancy, and medical consultations for cannabis use or abuse.
What is working?

• Ongoing collection and analysis of administrative, population level data affords monitoring of the changes in the frequency of cannabis use and some related health concerns including hospitalization and poison control center data.

• Restricting public advertising (billboards, store front signs, television, health claims, and packaging) could impact youth attitudes towards use, as with tobacco. This is challenged by advertising on the internet and social media.

• Smoke-free environments limit exposure to secondary marijuana smoke.

• Clear and consistent messages can be created for evidence-based health risks (memory loss, attention and learning problems, addictions, testicular cancer and psychotic symptoms). Overreaching messages with little evidence should be avoided.

• Established evidence of impacts of cannabis use on driving and the advantages of designated drivers (as in alcohol education) needs to be disseminated. Messaging about infrequently occurring events that can be attributed to alcohol (car crashes resulting in death) are likely to be ignored.

• Educational materials for youth and families and prevention programs exist in some justifications like Colorado and many of these can be adapted and tested in new contexts.

Recommendations

• The way forward for public health policy is clearly complex and demanding. Responding to population needs will require shared approaches and co-ordinated and long-term surveillance of cannabis use and cannabis related consequences for health.

• Robust data collection and monitoring that supports ongoing evidence and cross time evaluation of the effects of state and local policies would inform best practices.

• Cross-national, evidence-based approaches for the education, prevention and treatment of youth who use cannabis need to be evaluated in newly legal environments.

• Monitoring changes in problematic use by youth is needed – change may not be visible at the overall frequency of use but increases in problematic use (early onset, duration, frequency and amounts).

• Support for biopsychological research on dosage impact and impairment associations is urgent.

• There is a need for testing the impact of variations in policy and regulations on cannabis use
Section 3. Evidence-based Cannabis Abuse Prevention and Treatment Interventions

Where are we now?

Cannabis has been used recreationally by young people at higher levels than adults across the last two decades and acceptance (but not always use) has increased in locations where cannabis is legalized. Efforts to prevent drug and alcohol use are long standing and there are many evidence-based approaches that show impacts on the prevention and treatment of substances by use. (See a searchable list of strong programs at Blueprints https://www.blueprintsprograms.org/search-results). Unfortunately, few programs distributed used at a scale that could make a wide-spread difference provincially or across states that have legalized use of cannabis. The need for prioritizing, accessing, funding, and disseminating evidence-based programs and continuing to evaluate their effects is increased by the legalization of marijuana. Conversations and educational messages have also been stimulated by legalization and commercialization increasing opportunities to enhance the knowledge youth need to make safe choices about starting or avoiding use and avoid harms related to cannabis use if they decide to use it. The most effect programs take and ecological, life span approach engage parents and peers of youth and even their communities to help to set norms about the delay in use, acceptability of cannabis use. There is growing evidence that heavy chronic use is that pattern of use that is most strongly associated with negative effects in adolescents and young adults. While considerable public warnings focus on the potential for damage to adolescents “developing brains” the evidence for permanent changes brain structure and function associated cannabis use in youth is inconsistent (deShazo et al., 2018, Marijuana's Effects on Brain Structure and Function: What Do We Know and What Should We Do? A Brief Review and Commentary, American Journal of Medicine). The most significant effects of heavy use in this time of life are likely highly associated with the impact of cannabis on academic success, mental health, and relationships. The pattern of chronic heavy use is associated with the development of potentially preventable substance use disorders.

Speakers in this section pointed to recently developed resources and highly innovative programs that are being developed or adapted and evaluated specifically in relation to preventing early onset and heavy cannabis use. Rather than distributing long lists of information potential risks or heavy handed messages or feedback to youth, these programs engage college or university teams seeking to promote health and safety on campuses, young people in interactive brief motivational exchanges that allow them to examine their own use of cannabis, they offer parents materials that engage their youth in conversations that clarify family values, and they engage peers networks in counseling.

Nate Riggs (Colorado State University) described in the new Higher Education Cannabis Prevention toolkit developed by the Coalition of Colorado Campus Alcohol and Drug Educators (CADE) https://www.naspa.org/images/uploads/events/Higher_Education_Cannabis_Toolkit.pdf in response to the 2012 legalization of commercial cannabis in Colorado. This resource offers a comprehensive, online approach, providing accurate, health promotion and prevention theory, evidence based practices and access to other resources. It was created for campus teams seeking to provide a healthy and safe campus environment in the context of changes in cannabis legislation. Riggs and his team are also evaluating a self-administered online program designed to help heavier Cannabis users reflect on and reduce use. A recently published study tested program effects of an adapted version of the Marijuana CHECKUPTO GO. This web-based marijuana use intervention provides university-specific personalized feedback (PF) with normative information and protective behavioral strategies (PBS) to students attending a university in a state with legalized adult recreational marijuana. The university specific norms and data are often collected by institutions enabling both the personalization of norms and the possibility of tracking changes over time. Results of an initial study gave some support for the adapted Marijuana eCHECKUPTO GO in reducing marijuana use for heavy college-aged users. Protective behavior strategies to reduce harms related to cannabis were not impacted by the program.
Laura Griner Hill (Washington State University) discussed the needs of parents for assistance in talking with their adolescents about marijuana—especially as youth face the challenges of increasingly autonomous decision making and self-regulation in the context of multiple peer influences in college. Hill and her team developed and are testing “Letting Go and Staying Connected,” a theoretically guided, developmentally targeted, and empirically-supported handbook intervention for parents of students transitioning to college. The program uniquely uses interactive games and conversation guides to help families to understand challenges youth may face at college and also to discuss their family values and expectations about substance use, sexual risks, and academic behaviors. Findings with a small sample size showed that most parents found the intervention useful and engaging, but completion of the full program was low. Parents increased their knowledge of university policies, relative to the control group, but few other changes were significant. Future analyses will illuminate underage students’ use of cannabis and the relation of parent-student relationship quality with student use.

Hanie Edalati (Université de Montréal) focused on how personality factors create risk factors for substance use disorders. Research suggests these can mediate genetic predispositions to substance misuse and predict specific patterns of substance misuse and psychiatric comorbidity (Conrod and Nikolaou, 2016). Edalati described the Preventure Programme (i.e., Personality-Targeted Interventions), which is designed to target four personality-specific motivational pathways to substance misuse: hopelessness, anxiety sensitivity, impulsivity, and sensation seeking. Previous evaluations indicated that Preventure helped to reduce rates of alcohol and illicit drug use and substance-related harms by 50% in high-risk adolescents with the effects last for up to 3 years. The intervention was also associated with a 25% reduction in likelihood of transitioning to mental health problems, such as anxiety, depression, suicidal ideation, and conduct problems. Receiving Preventure was also associated with delayed onset of use by high-risk youth as well as significant reduction in rates of cannabis use at the 6-month follow-up and reductions in frequency of cannabis use at 12- and 18-month follow-up. The program was particularly beneficial for youth with higher risk profiles, such as youth transitioning to substance use disorders, those with clinically significant levels of externalizing problems, and victimized adolescents. A key strength of Preventure is that it is embedded in the community and provides substance use intervention at school level to the general samples of high-risk adolescents who might not otherwise have access to interventions.

Addressing the particular intervention needs of heavy and persistent cannabis users, Michael Mason, (University of Tennessee) has developed Peer Network Counseling (PNC). PNC is a brief, motivational interviewing, guided substance use intervention that uniquely focuses on peer relations as the primary active ingredient for behavioral change. PNC activates reflection on peers and accompanying locations that provide risk for and protection against substance use. A randomized clinical trial of PNC with urban adolescents found increases in the probability of abstinence and reduction of heavy cannabis use. PNC-txt is the text message-delivered version that delivers 112 personalized, automated, and interactive text messages. Two randomized clinical trials with PNC-txt have shown efficacy in reducing cannabis use, cravings for cannabis, relationship problems, memory problems, and increasing peer support among young adults. Approximately 85% of participants reported that thinking about their peer network helped them meet their treatment goals.
Lessons learned

• Adolescents and young adults are the highest users of cannabis of any age groups in Canada and the US.

• Some youth may be more vulnerable to substance misuse due to impulsivity, low parent monitoring and associations with substance using peers. However, cannabis use is not only the result of an individual decision making in adolescents. There are many populations who can be targets for prevention and intervention of cannabis use in adolescents and young adults who are important (e.g. parents, peers, advertisers, producers).

• Government and industry regulations related to the commercialization of cannabis can affect youth access and harms. There some agreement that there is a need for strong regulation from the start and push back can be expected.

• Motivational interviewing a good starting place for youth self-evaluating their substance use and planning changes – but follow up services are needed for to support and sustain gains and effect behavioral changes in youth.

• Messages that marijuana is safe for medicating pain, sleep, depression and a host of other medical problems needed to be countered.

• Interventions that help them to self-identify problem use and to engage their parents and peers are being tested and developed (e.g. E-CheckUpTOGO, Riggs, Letting Go and Staying Connected, Hill, and Peer Network Counselling, Mason, 2015).

Gaps in intervention research

• Assessing the effectiveness of interventions in the multiple and varying contexts of legalization in Canada and the United States requires cross national collaborations and funding.

• Research on policy effects on the amounts of THC in cannabis used by youth is needed.

• Interventions to address misuse of cannabis in adolescents and young adults are needed.
Section 4: Cannabis and Youth: Community Responses

Where are we now?

As has been illustrated by the long history of legislative changes related to tobacco and alcohol legalization and recreational use, societal obligations to protect youth are increased by legalizing, producing and distributing psychotropic substances. Community level efforts to assume this social obligation vary greatly. The effectiveness of many approaches and local policies have not been evaluated; however, efforts to delineate and evaluate evidence-based community responses are growing. Moreover approaches to reducing youth substance use (particularly alcohol) undertaken through processes that engage communities in defining their concerns and implementing evidence-based solutions that they chose show considerable success (see https://www.blueprintsprograms.org/search-results).

As speaker, Kevin Haggerty (University of Washington) notes, decades of research has clearly identified the risk and protective factors related to substance use and misuse in adolescents (see Catalano et al. 2018 in Contemporary Heath Issues on marijuana DOI:10.1093/med-psych/9780190263072.003.0009). These extend beyond individual decision making to include the positive and negative influences of peers, parents, schools, and communities. However, comprehensive intervention efforts that simultaneously target several of these risk factors at the same time are very rare and these require community level capacity and support. Co-ordinated community efforts, in particular, may have an effect in addressing and reducing the combined influences of risk factors. At the state level, Washington State in collaboration with university based researchers has taken a multi-tiered approach. This has involved creating resources for parents (e.g. A parent’s guide to underage marijuana use at: https://www.dshs.wa.gov/sites/default/files/BHSIA/dbh/documents/Parent%20guide%20to%20MJ%20prevention%20final.pdf), using social media to promote self-directed coping, sports, and community engagement (e.g. see the “You can but marijuana can’t campaign” at https://www.youcanwa.org/). Haggerty and his team have also tested “Communities that Care” a systematic approach to community action that works to build a coalition of community members, survey youth concerns and prioritize goals, implement evidence based approaches that are tailored to these goals, and monitor results. A study of 12 communities using this approach showed declines in youth substance use relative to 12 control communities showed significant decrease in the initiation of substance use and delinquency from grade 5 to grade 8 and this was sustained through age 21.
Researcher Beverly Kingston, PhD (Center for the Study and Prevention of Violence, University of Colorado Boulder) described the evaluation of a Communities that Care approach to reducing youth substance use in Colorado in 43 communities. Funded by the Colorado Department of Public Health and the Environment, the wide scale initiatives were led by both a CTC Facilitator and a key community leader and community board. Community chose approaches included campaigns to communicate positive views of community strengths and social norms and promote attachments to and pride in local communities. Communities also implemented the LifeSkills Training Program in all middle schools and community wide parenting education (with Triple P Parenting). Facilitating a combined school, policing, parenting, and community collaboration was possible with collaboration time and funding investments. Recommendations stemming from Kingston and colleagues experiences with this large scale action indicate that forming trust and relationships must come first (ensuring transparency, listening, flexibility, commitment), time invested on the front end is needed to ensure fit for prevention strategies, aligning initiatives and leveraging resources that ease already taxed systems (like schools) is important, and fostering community ownership is critical for successful implementation and sustainability.

Julie Bull, PhD (Centre for Addiction and Mental Health, Toronto, Canada) focused on shifting demands of Indigenous communities to be acknowledged as having unique rights to their self-determination. Reconciliation of decades of colonialism requires both awareness of the consequences of trauma for Indigenous communities and also an acknowledgment of and respect for the rights of communities to “freely determine their political status and freely pursue their economic, social and cultural development” (UN rights of Indigenous people, Article 3). This includes jurisdiction over local regulation of production, commercialization and distribution and tax revenue as well as the right to ban distribution within their communities, despite federal legalization. Resources providing factual information to Indigenous peoples and communities so that they can plan how to reduce harms are beginning to be available (e.g. Legalized Cannabis, Pros and Cons for Indigenous Communities prepared by the Thunderbird Partnership Foundation at https://manitobachiefs.com/wp-content/uploads/Legalizing-Cannabis_FINAL.pdf). While respect for community self-determination may be the essential foundation for change – many communities cannot act without infrastructure support and funding. Evidence-based programs may be adapted by communities to enhance local success but ongoing monitoring of the effects of planned or enacted changes as expressed by community and youth voices are important.
What have we learned?

• Partnerships among key youth servicing agencies (educators, justice, not for profits, community leaders) are possible and needed! Strong collaborative groups that can debate and address youth and cannabis concerns on an ongoing basis have emerged in Colorado and Washington State.

• Success may be enhanced by local efforts; however, these need clear infrastructure support, links and funding.

• Infrastructure and capacity building funding may be first steps to enable prevention – ad hoc or one size fits all not likely to be adopted.

• Communities need a voice in setting their priorities.

• Community action cannot just be staffed by volunteers who are expected to work for free.

• Sustainable funding is needed for sustainable prevention. Every year a new generation is born and one time funding will not address the next wave of users.

• Youth voices are needed to ensure solutions are practical, relevant, and age and gender sensitive.

• Indigenous voices need to be supported to make changes for their urban and rural youth.

What are the gaps in community responses?

• The scale up of community engagement efforts for change takes time and sources of support and funding beyond research evaluations are not clear.

• Supports needed in Indigenous communities may vary widely and ways of balancing local self-determination and funding needs may need consideration.

• Interventions and messaging that avoids losing sight of the damaging effects of alcohol is needed.

• Health and behavior consequences of incredibly high doses of THC.

• The impact of cannabis use on parenting behaviors.

• The costs and consequences of moderate cannabis use.

• How effective are evidence based programs in a legalized cannabis context (across a variety of local approaches to commercialization and regulation)?

• The synergistic effects of community supported evidence based program, policies and practices to prevent youth cannabis use.

• How industry may advocate to reduce regulation and how communities can advocate for strong regulation.
Section 5: Establishing national and cross-national research collaborations & funding opportunities

Where are we now?

The status of cannabis as an illicit substance has limited and in some places continues to restrict research on its use and consequence. As a result, there remains considerable demand for high-quality evidence-based research to address the significant gaps in our knowledge about the risks and benefits of cannabis and the effectiveness of policy, prevention initiatives and treatments. The participants in the Cannabis and Youth conference discussed the availability of current funding opportunities exist; what the current funding priorities are for cannabis research; and what synergies could be achieved by cross-national collaborations.

Speakers from the National Institutes of Health were Dr. Mike Hilton from the National Institute on Alcohol Abuse and Alcoholism, and Dr. Heather Kimmel from the National Institute of Drug Abuse. In 2017, NIH awarded 572 grants valued at over $254 million for cannabinoid research. This research is investigating a wide range of concerns including cannabis use and dependence, attitudes and perceptions, availability and accessibility, health and social outcomes, co-use of alcohol and other drugs, therapeutic benefits, and biomedical research on the endocannabinoid system. Invited speaker Dr. Samuel Weiss, Director of the Canadian Institutes of Health Research (CIHR) - Institute of Neurosciences, Mental Health and Addiction, was unable to attend. However, the CIHR Institute of Neuroscience, Mental Health and Addiction is leading CIHR’s strategic efforts to develop cannabis research capacity in Canada and provides funding for cross national work. Speakers Pamela Ponic (Public Health Agency of Canada), Melissa Ramphel who is leading the Cannabis research team at Health Canada also identified youth and prevention as among the priorities for research funding available immediately. Dr. Amy Porath, the Director of Research at the Centre for Substance Use and Abuse (CCSA) and coordinator of CCSA’s work on knowledge generation and resource development also cited monitoring and reducing the risks of youth cannabis as a key concern.

Research challenges

Our speakers highlighted several barriers to conducting cannabis research which pose challenges for researchers. A consistent theme was the challenge of developing definitions and measures to appropriately capture cannabis use patterns among users in both surveillance and research studies. Cannabis poses unique challenges for measurement due to the complexity of the plant itself, which contains over 100 cannabinoids and other components, the various routes by which it can be consumed (e.g., smoked, vaped, eaten) and different product types (e.g. dried leaf/flower, oils). Moreover, there is currently no standard measure of cannabis quantity as there is for alcohol and tobacco. Thus, to date, researchers have largely had to rely on measures of cannabis frequency and have failed to take into account variability in quantity, route of administration and product type across users. These measurement issues significantly limit the knowledge that can be gained from cannabis research and are a priority for research.

Research priorities

Eight research priorities were identified by our funding and agency representatives.

- **Cannabis policy:** The impact of cannabis policies and different regulatory models on cannabis use and outcomes, as well as on other substance-related behaviors and outcomes. Regulatory models of cannabis are varying widely across provincial and state jurisdictions that have legalized retail cannabis. Understanding the impact of particular policies is a key research priority and requires systematizing information about how policies vary. Several resources are currently available that indicate cannabis policies across the US and Canada and can facilitate research in this area. In the US, state specific cannabis policies can be accessed at the Alcohol Policy Information System (APIS), LawAtlas Policy Surveillance Program (www.lawatlas.org), the Prescription Drug Abuse Policy System (PDAPS), and the National Cannabis Industry Association interactive map. Jurisdiction specific Canadian cannabis policies can be found on CCSA’s interactive cannabis map.
• **Neurodevelopment effects:** Research into the effects of cannabis on brain development in adolescence and on the fetus or child during pregnancy and breastfeeding.

• **Cannabis and other drugs:** Research into the health effects of cannabis use and co-use with alcohol and other substances (i.e., polysubstance use or substitution effects)

• **Cannabis and mental health:** Research on the relations between cannabis use and mental health (e.g., post-traumatic stress, psychosis, anxiety, depression, addiction, co-morbid conditions, etc.) including both potential harms and benefits.

• **Thresholds for impairment and harm:** Determine an appropriate THC concentration for a legal limit for driving impairment, as well as thresholds for experiencing harm. What can we consider to be “low-risk” cannabis use?

• **Product potency and composition:** How do differences in potency and composition (%THC/%CBD), dose, type of preparation (e.g., different cannabis strains, natural phytocannabinoids, synthetically modified cannabinoid derivatives, etc.), route of administration (e.g., vaping, edibles, concentrates, second-hand smoke, etc.), frequency and duration of use, impact behavior, health outcomes, and treatment needs?

• **Prevention and harm reduction:** Research into effective interventions to prevent problematic use and to reduce the harms of use. Has greater access and exposure to more potent cannabis changed the need for prevention? How can we effectively reach youth.

• **Key populations:** Research into the impact of cannabis use and policies on youth, seniors, LGBTQI2-S, and Indigenous populations, as well as sex and gender differences.

**Funding sources**

In the US, the primary funding body for cannabis-related research is the National Institutes of Health Research (NIH). NIH has 27 distinct research institutes, many of which fund cannabis research. However, the National Institute of Drug Abuse (NIDA) and National Institute on Alcohol Abuse and Alcoholism (NIAAA) are core funding bodies for cannabis research. Many of these NIH funding opportunities are also open to Canadian researchers.

In Canada, the majority of research funding is distributed by three federal research funding agencies—the Canadian Institutes of Health Research (CIHR), the Natural Sciences and Engineering Research Council of Canada (NSERC), and the Social Sciences and Humanities Research Council of Canada (SSHRC). Depending on the type of research being conducted, cannabis research may be funded by any of these agencies. However, the Canadian Institutes of Health Research, specifically the Institute of Neurosciences, Mental Health and Addiction has been tasked with leading strategic efforts to develop cannabis research capacity in Canada. Funds have also been committed to CIHR by other Canadian agencies including Mental Health Commission of Canada (MHCC) and the Canadian Centre on Substance Use and Addiction (CCSA), to directly support cannabis research. In the past five years, CIHR has invested nearly $20 million into cannabis research, including. In 2017 and 2018, they had two separate calls for research grants specific to cannabis research valued at $1.4 million and $3.0 million respectively to catalyze research related to the health impacts of cannabis legalization. It’s expected that these types of cannabis-specific calls for funding applications will continue as legalization is implemented across Canada.

Another Canadian funding opportunity for cannabis research is Health Canada’s Substance Use and Addiction Program (SUAP). Health Canada leads the Canadian Drugs and Substances Strategy and SUAP provides financial support to evidence-informed and innovative health promotion, prevention, harm reduction and treatment initiatives to address substance use issues in Canada. They are currently prioritizing applications related to cannabis use.

In both the US and Canada, speakers encouraged researchers to take advantage of what is already being collected by government agencies and in health care settings. These include administrative data sets, surveillance survey data and patient registries.
APPENDIX: Relevant recent publications by speakers:

**Kara Thompson** (St. Francis Xavier University) and **Bonnie Leadbeater** (University of Victoria)

Email: kdthomps@stfx.ca,bleadbea@uvic.ca


**Angela Bryan (with Kent Hutchison and Cinnamon Bidwell**, University of Colorado Boulder)

Email: angela.bryan@colorado.edu, kent.hutchison@colorado.edu, lcb@colorado.edu


Marina Epstein (University of Washington)
Email: marinaep@uw.edu


Beau Kilmer (RAND Drug Policy Research Center, San Francisco)
Email: beau_kilmer@rand.org


Richard Stanwick (Island Health, Victoria BC)


Julie Bull (Centre for Addiction and Mental Health, Toronto)


Heather Kimmel (National Institute on Drug Abuse)
Email: heather.kimmel@nih.gov


Michael Hilton (National Institute on Alcohol Abuse and Alcoholism)
Email: mhilton@wilco.niaaa.nih.gov


Nathaniel Riggs (Colorado State University)
Email: nathaniel.riggs@colostate.edu


Hanie Edalati & Patricia Conrod (Université de Montréal)

*Email: patricia.conrod@umontreal.ca*


Michael Mason (The University of Tennessee Knoxville)

*Email: mmsason29@utk.edu*


Kevin Haggerty (University of Washington)

*Email: haggerty@uw.edu*


**Beverly Kingston** *(University of Colorado Boulder)*

*Email: beverly.kingston@colorado.edu*

