Abstracts from the 2024 Scientific Meeting of the Research Society on Marijuana July 19th-21st, 2024

Cannabis
2024, Volume 7 (2)

researchmj.org
DOI: 10.26828/cannabis/2024.02.001

Special Section Editor
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KEYNOTE ADDRESSES

Trauma Cue Reactivity Paradigms as a Tool for Studying Affective and Cognitive Mechanisms Contributing to PTSD – Cannabis Use Disorder Comorbidity

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Cannabis for Medical Purposes and Chronic Pain: A Clinical Practice Guideline

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All abstracts were peer-reviewed by (in alphabetical order): Sophie G. Coelho (York University), Bradley T. Conner (Colorado State University), Kyra N. Farrelly (York University), Lauren Micalizzi (Brown University), Jamie E. Parnes (Brown University; Bradley Hospital), Stephanie Penta (Toronto Metropolitan University), Kristina T. Phillips (Kaiser Permanente Hawaii, Center for Integrated Health Care Research; Kaiser Permanente Bernard J. Tyson School of Medicine, Department of Health Systems Science), Jeffrey D. Wardell (York University; University of Toronto; Centre for Addiction and Mental Health, Toronto). All abstracts below were approved and voluntarily submitted for publication in Cannabis by the presenting or contact author.

PAPERS, POSTERS, & PANELS

Cannabis Treatment Outcomes Across Health Conditions: A Systematic Review of Sex Differences in Clinical Trials

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Background: Sex-based differences in response to cannabis treatment for various conditions have not received attention, despite knowing that sex- and gender-related factors are involved in health effects and biological mechanisms. A systematic review will identify, evaluate, and summarize the findings of all relevant individual studies on sex-based differences in treatment response. Methodology: A search of the databases, Embase (1974-26 October 2023), Medline (1946-26 October 2023), and EBM-Reviews Cochrane central register of controlled trials (up to September 2023) resulted in 1052 studies on sex and gender analysis in a therapeutic context. Out-of-scope literature was excluded to include only randomized clinical trials (RCTs), published between 1973 and 2023, for data extraction. Results: Screening of published literature examining the influence of patients' sex on the therapeutic efficacy of cannabis and cannabinoids resulted in diverse study types such as retrospective, prospective observational, clinical survey, case series, archival datasets, observational/quasi-field experimental research, and cross-sectional assessments. Because the quality of evidence in these non-randomized studies is generally poor, only evidence from RCTs were included in this systematic review; 10 RCTs consisting of 813 patients met the inclusion criteria for this review. Except for three RCTs investigating pain, and two RCTs on cannabis use disorder (CUD), the remaining five RCTs examined five different conditions. There were no sex differences in the three RCTs that examined pain. Similarly, one RCT on CUD showed sex differences whereas the other did not. Males with autism spectrum disorder, chronic tic disorder, and heroin use disorder showed improvement in disease symptoms. Females, on the other hand, showed improvement only among those with cancer-related anorexia-cachexia syndrome relative to placebo. Conclusion: Analysis of data relevant to sex differences, regardless of whether the primary outcome of the study was met, showed improvement in disease symptoms among males and females. However, these findings were inconclusive because of the unequal number of males and females in the treatment arms. The apparent sex differences seen in this systematic review need to be interpreted with caution. Statistically significant sex differences identified in the 10 RCTs may be due to chance or bias, instead of true heterogeneity of treatment-disease associations or of treatment effects.

Systematically Testing the Evidence on Marijuana (STEM)

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Background: With continuing legalization in the U.S. and internationally, more patients are using or interested in using cannabis for health conditions. Meanwhile, many clinicians are not counseling patients on the health effects of cannabis and most patients source this information from elsewhere (e.g., internet, cannabis dispensaries). Limited evidence regarding cannabis health effects (e.g., relatively few randomized controlled trials, lack of standard measures), and a rapidly changing research and policy landscape, leave healthcare professionals without definitive guidance on how to counsel patients. Yet clinicians need to be prepared to have evidence-informed discussions about cannabis use. Additionally, high-quality research is needed to improve knowledge regarding cannabis health effects. Methods: The Systematically Testing the Evidence on Marijuana (STEM) project is an independent, methodologically rigorous, and up-to-date resource (CannabisEvidence.org) that synthesizes what is known from research and what is left to learn about the health effects of cannabis. Using best-practice approaches to living systematic reviews and guided by a technical expert panel comprised of individuals with cannabis-related clinical and research expertise, STEM aims to: 1. Empower clinicians to have evidence-based discussions about cannabis use with patients 2. Identify research gaps and highlight ongoing research to help researchers design high-yield studies that advance the field of clinical cannabis research Results: Since the launch of the website in January 2022 STEM has: • Completed and maintained 6 living systematic reviews, including cannabis use in pregnancy and cannabis for posttraumatic stress disorder. Each review features a full report, a high-level summary, and a visual abstract so that readers can find the level of detail that fits their needs • Developed 13 clinical briefs, on topics ranging from "patient experiences when visiting dispensaries" to "cannabis and sleep" • Garnered 44,082 page views by 12,555 unique users • Provided a variety of other resources related to cannabis and health pertinent to researchers and clinicians, including: a summary of basic cannabis information (e.g., terminology, pharmacology), a searchable database of ongoing studies of cannabis-related research, guidance on the conduct of cannabis-related research in the US, an interactive map of cannabis legal status and key cannabis use statistics by US state, an updated collection of curated high-quality news articles relevant to our audience, an opportunity for clinicians to earn continuing medical education credits after reviewing the website. Conclusions: STEM is an innovative approach to help address gaps in knowledge and resources on the health effects of cannabis for clinicians and researchers. The STEM team is continuing to seek ways to further engage with researchers and clinicians through ongoing studies and collaborations with the ultimate goal of

supporting clinicians to have evidence-based discussions about cannabis use with patients that support shared decision-making and improve patient outcomes.

Cannabis and ADHD Symptoms in Emerging Adulthood: A Within-Person Analysis

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Background: Emerging adults (ages 18-25) have higher rates of cannabis use and cannabis consequences relative to other age groups. Attention deficit hyperactivity disorder (ADHD) has been identified as an important correlate of increased cannabis use and cannabis consequences among emerging adults (Bidwell et al., 2014; Mochrie et al., 2020). Prior studies have primarily explored the link between cannabis use and history of ADHD symptoms, leaving a gap in our understanding of associations between cannabis use and ADHD symptoms in daily life. This study aims to bridge this gap by investigating the real-time relationship between ADHD symptoms and cannabis-related outcomes using ecological momentary assessment (EMA). Objective: This research utilized EMA to explore whether immediate challenges with attention and other ADHD symptoms are linked to heightened cannabis use and its negative outcomes among emerging adults. Methods: The study involved 81 emerging adults aged 19-25 (mean age = 22.01, SD = 2.08; 46% identified as female) who reported using cannabis on average 15.74 days (SD = 9.51) in the month prior to the study. Participants first completed a baseline survey on their cannabis use and ADHD symptoms. They then completed short surveys three times daily over two weeks, reporting on their cannabis use (yes/no), any negative outcomes from use (e.g., difficulty starting tasks), and attention-related difficulties (e.g., focusing issues). Hierarchical linear modeling was employed to examine the within-person link between ADHD symptoms and cannabis outcomes. Results: On average, participants reported using cannabis 10.18 times (SD = 8.77) and experiencing 2.64 (SD = 2.02) negative outcomes per use. The most frequently reported ADHD symptoms were attention-related issues, focusing difficulties, and restlessness. Although ADHD symptoms were not associated with cannabis use directly, a positive within-person association was found between ADHD symptoms and cannabis consequences. Specifically, when ADHD symptoms were more pronounced than usual, participants reported more negative consequences from cannabis use. This association was even stronger among individuals with higher overall ADHD symptoms. Conclusions: These findings underscore a nuanced relationship between ADHD symptoms and the adverse effects of cannabis use. While previous research has shown that individuals with ADHD are more prone to cannabis use and its related negative outcomes, our study reveals that these associations manifest more acutely at the moment,

with negative consequences intensifying during periods of increased attentional difficulties. Notably, many negative outcomes associated with cannabis use, such as diminished motivation, mirror ADHD symptoms, suggesting that cannabis may worsen existing attentional challenges. Further research is needed to elucidate the dynamics of this relationship fully and to develop targeted strategies for mitigating the adverse effects linked to the concurrent presence of ADHD and cannabis use.

Bud Talks: Knowledge Translation Materials to Reduce Cannabis Harms in Older Adults

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Older adults are now the fastest growing age group of cannabis users. With cannabis' legalization in many areas, there is a growing interest in older adult populations to understand the effects of this drug. People often use cannabis for pain, sleep, or mood and anxiety problems. These problems tend to increase with age and are the main reasons why older adults try cannabis. The popular media is filled with unscientific and inaccurate information about cannabis. Recent Canadian research shows a large increase in the number of older adults presenting in the Emergency Room for cannabis poisonings. The current presentation describes a Knowledge Translation (KT) project, through the Centre for Medicinal Cannabis Research (CMCR) at McMaster University for developing materials to target misinformation and reduce cannabis harms in older adults. This project aims to provide evidence-based, clear and accessible information about cannabis. This presentation will describe the knowledge mobilization program and the development of 'Bud Talks': person-friendly, clear and evidence-based materials for older adults. As part of the KT process, the Team engaged with older audiences, pharmacists and other specialists to understand their knowledge needs around cannabis. The content development focused on issues specific to older adults, including health risks and polypharmacy. There is also information on cannabinoids, drug-interactions and dosing guidelines. The materials emphasize the importance of having an open 'Bud Talk' with a doctor and provide questions to ask that can help guide the discussion. There is a disconnect between the developments in the scientific evidence and the perceptions of risk with cannabis. Knowledge mobilization products, developed through collaborations between researchers and those at the front lines of healthcare, are crucial for bringing accurate and useful information to the public. This Bud Talk for older adults enhances understanding about cannabis and speaks to their unique needs, questions and concerns.

An Innovative Model? Exploring How Uruguay Designed its Cannabis Supply System Through Hybridisation

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As far as domestic presentation and wider international perspective,

Uruguay is often portrayed as a trailblazer for its distinctive approach to cannabis regulation, which avoids the mistakes and failures of other cannabis supply precedents. The dominant explanation for the model's distinctiveness is Uruguay's long-standing state interventionist culture, which served to constrain the transfer of more libertarian features of cannabis policies found in other jurisdictions. Yet, since the direct transfer or imitation of one international model to another context is rarely feasible or desirable, some form of adaptation is likely to occur, as policymakers attempt to make international precedents compatible with global pressures, domestic institutions, or a combination of the two. To fully understand the extent of international distinctiveness of Uruguay's cannabis regulation, it is critical to investigate not only the content of the new policies but also how the transfer process came about or was constrained. In this regard, to what extent can international pressures explain Uruguay's distinctive model of state-regulated cannabis supply? Drawing on analysis of documents, fieldwork observations, and 43 semi-structured interviews with policymakers, advocates, health professionals, and the commercial sector, this paper explores the complex interplay between global influences and domestic factors in shaping the development of Uruguay's cannabis regulation through the lens of hybridisation. Hybridisation is understood in a variety of ways, but for the purposes of this study, it refers to the combination of elements from policies found in two or more political contexts to develop an approach best suited to local conditions. Transfer processes and outcomes were evaluated in terms of Dolowitz and Marsh's typology, which lists a range of degrees: copying, emulation, hybridisation, and inspiration. The primary foci of analysis were the processes by which contextual factors shaped the decision (or not) to transfer certain aspects of policy approaches to cannabis in other countries to Uruguay based on the perceptions and strategic actions of policymakers involved in these processes. The analysis demonstrates that Uruguay's distinctive approach to state-regulated cannabis supply can be understood as a form of 'hybridisation' in which aspects of policy models in other countries were selected, blended, and adapted to the unique political and legal features of Uruguayan society. This led to the development of an innovative approach that nevertheless reflects elements found in existing cannabis supply systems. This blending of cannabis policy innovations with the domestic context was carried out in very specific ways, based on concerns to reconcile the specific contents of the legislation with the policies of Argentina and Brazil and the preferences of the US government as the regional hegemon. While there was greater latitude over aspects of regulation involving domestic considerations, Uruguayan officials were very cautious and conservative in the more constrained space of high politics or where cannabis regulation intersects with broader security dimensions of drug policy. The Uruguayan case suggests that national policy space to develop cannabis

regulation in other contexts is likely to be constrained in areas where such regulation interacts with those of other powerful states.

Cannabis Use Frequency Impacts Youth Use of Alternative Tobacco Products in an Experimental Tobacco Marketplace

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SIGNIFICANCE: Co-use of cannabis and tobacco products is more prevalent than single use of these substances among U.S. adolescents. Population-based studies demonstrate that cannabis use is associated with cigarette smoking initiation, progression, and lower cessation among youth who smoke. Laboratory evidence also suggests that cannabis use increases cigarette reward and reinforcement in young people; however, no studies have examined cannabis use frequency as a potential driver of demand for alternative tobacco products among youth who use multiple tobacco products. This study used a well-validated experimental tobacco marketplace (ETM) to explore whether demand for alternative tobacco products differed by past 30-day cannabis use frequency among adolescent smokers who also used other tobacco products. METHODS: After baseline exposure to study-provided research cigarettes varying in nicotine content, 49 adolescents aged 15-20 (M age=18.9) who smoked cigarettes daily and also used at least ≥1 tobacco product completed a timeline follow-back interview assessing past 30-day cannabis use and an ETM assessing the demand for tobacco products. Effects of exposure to cigarettes varying in nicotine content did not differ at baseline; thus, we focused on whether patterns of alternative tobacco product use differed by cannabis use frequency, given high rates of cannabis use in this sample. 8 participants were never cannabis users (0 days), 11 were non-daily users (1-29 days), and 30 had used cannabis daily (30 days). In the ETM, participants were asked to make hypothetical purchases of nicotine products as though they were making real tobacco purchases for the week. The ETM consisted of 8 trials, across which the price per study cigarette increased ($0.12, $0.25, $0.50, $1, $2, $4, $8, and $16), while the price of alternative products remained the same. Alternative tobacco products included combustible (i.e., little cigars, cigarillos) and non-combustible (i.e., JUUL, smokeless tobacco, disposable e-cigarettes, e-liquids, and nicotine replacement therapy) products to simulate real-world availability. RESULTS: As the price of study cigarettes increased, cigarette purchasing decreased in the overall sample. Demand for alternative tobacco products differed by cannabis use frequency, such that daily cannabis users purchased a higher overall

number of milligrams of nicotine relative to other cannabis use groups. Rates of purchase for combustible products were consistently highest among daily cannabis users, followed by participants who never used cannabis, and lowest among participants who used cannabis non-daily. Rates of purchase for non-combustible products were highest among daily cannabis users compared to non-daily and never users. CONCLUSIONS: Higher rates of purchasing of alternative tobacco products among daily cannabis users relative to non-daily or never users are consistent with data suggesting that cannabis use may be associated with greater tobacco exposure among young people. Findings showing no differences in sources of nicotine (i.e., combustible or non-combustible) across cannabis use frequency suggest that heavy cannabis-using adolescents who smoke may be as amenable to shifting their tobacco use behaviors towards primarily non-combustible sources of nicotine as non-cannabis using adolescents. Future studies assessing co-use patterns of tobacco and cannabis among youth may inform efforts that shift use behaviors towards non-combustible sources and quitting.

Anxiety Symptoms and Coping-with-Anxiety Motives Serially Mediate the Link Between Psychotic-Like Experiences and Cannabis-Related Problems in Emerging Adult Cannabis Users

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Many Canadian emerging adults between the ages of 18-25 years use cannabis, with 60% of past-three-month users reporting having experienced at least one cannabis-related problem (i.e., adverse social/legal/psychological/health consequences of use). While psychotic-like experiences (PLEs) and cannabis problems overlap, little is known about the mechanisms explaining this link. One hypothesis is that PLEs are distressing and give rise to anxiety, which emerging adults then attempt to cope with via an increase in cannabis use, which, in turn, increases their risk for developing cannabis-related problems. We tested a chained-mediational model to determine if anxiety symptoms and coping-with-anxiety motives for cannabis use sequentially mediated the association between PLEs and cannabis-related problems in a sample of emerging adult undergraduates who currently/recently use(d) cannabis (i.e., within the past three months). Furthermore, we tested a conditional process model which evaluated for moderation of the serial

mediation model by biological sex assigned at birth (e.g., male/female). Emerging adults who had recently used cannabis (N= 413; mean [SD] age = 19.1 [1.5] years; 71.9 % female) were recruited from five universities across Canada to provide cross-sectional, self-report survey data in the fall semester of 2021. Demographics were collected, along with data obtained from validated measures of PLEs, anxiety, coping-with-anxiety motives for cannabis use, and cannabis-related problems. Path analyses were conducted using Mplus, the results of which provided support for the hypothesized chained mediational indirect effect observed from PLEs to anxiety symptoms to coping-with-anxiety motives for cannabis use to cannabis-related problems (b = 0.027, 95 % bootstrap CI = [0.012, 0.050]). No direct effect was found (p = .698), suggesting that the PLEs-to-cannabis-related problems association is fully explained by anxiety and coping-with-anxiety motives for cannabis use. Inconsistent with hypotheses, the conditional process analysis revealed that the observed mediation did not depend on biological sex (95 % CIs crossed zero); therefore, anxiety and cannabis coping-with-anxiety motives explain the link between PLEs and cannabis problems in emerging adults regardless of the sex that they were assigned at birth. Results highlight that anxiety and coping-with-anxiety motives for cannabis use may potentially be important targets for intervention among current/recent cannabis-using emerging adults with PLEs, which, in turn, could possibly prevent the development or worsening of cannabis-related problems.

An Examination of Alcohol and Cannabis Protective Behavioral Strategies Among Simultaneous, Concurrent, Alcohol-Only, and Cannabis-Only Users

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Both simultaneous alcohol and cannabis (i.e., marijuana; SAM) and concurrent alcohol and cannabis (i.e., marijuana; CAM) use are prevalent among college students and associated with an increased risk of negative substance-related consequences. Prior work has found that students who report higher use of alcohol and cannabis protective behavioral strategies (PBS) report lower consumption and negative consequences. However, research has not yet examined if alcohol and cannabis PBS use differs among SAM and CAM users. Thus, the purpose of the current study was to examine how SAM, CAM, and single-drug users differ on alcohol and cannabis PBS use. Participants were 3471 college students (Mage = 19.43; 69.5% female; 57.2%; White non-Hispanic) from twelve United States universities who reported past-month alcohol and/or cannabis use (39.2% SAM, 11.5% CAM, 44.5% alcohol-only, 4.9% cannabis-only). Participants completed measures of alcohol and cannabis PBS and demographics via an online survey. Two analysis of covariance (ANCOVA) models were conducted to examine

differences on alcohol and cannabis PBS separately by past-month user status, controlling for sex assigned at birth. The overall cannabis model was significant ($F(2, 1753) = 4.706$, $p = .009$, h2r = .01). Examination of parameter estimates indicated that CAM users reported significantly greater cannabis PBS use than SAM users ($b = -3.80$, 95% CI = [-6.26, -1.33], $t(2) = -3.02$, $p = .003$). Cannabis-only users did not differ from CAM nor SAM users on cannabis PBS use. The overall alcohol model was also significant ($F(2, 3079) = 38.49$, $p = <.001$, h2r = .04). Parameter estimates indicated that alcohol-only users reported significantly greater alcohol PBS use than CAM ($b = -2.63$, 95% CI = [-4.82, -0.45], $t(2) = -2.36$, $p = .018$) and SAM (b = -6.49, 95% CI = [-7.94, -5.04], $t(2) = -8.77$, $p < .001$) users. In addition, CAM users reported significantly greater alcohol PBS use than SAM users (b = -3.86, 95% CI = [-6.09, -1.63], $t(2) = -3.39$, $p < .001$). Results indicated that SAM and CAM users can be importantly differentiated by alcohol and cannabis PBS use. Given that SAM users reported engaging in both alcohol and cannabis PBS use less frequently than CAM users, intervention efforts designed to reduce SAM-related consequences may benefit from promoting both alcohol and cannabis PBS use. Specifically, it may be advantageous to provide SAM users with psychoeducation about the utility of implementing both cannabis and alcohol PBS to mitigate the additive harms associated with both cannabis and alcohol use when they are consumed during the same occasion. Considering that cannabis-only users did not differ from SAM and CAM users on cannabis PBS use, additional efforts may be needed to increase cannabis PBS use among SAM, CAM, and cannabis-only users.

Examining the Potential Impact of Recreational Cannabis Legalization on Individuals Receiving Treatment for Substance Use Disorder: An Interrupted Time Series Study

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Objective: The present research evaluated the impact of legalizing recreational cannabis among individuals with substance use disorders (SUD) who may already use cannabis at high rates. Methods: Using an interrupted time series study design, we evaluated the potential impact of legalization among individuals seeking treatment for SUD within a hospital-based treatment setting in Guelph, Ontario. We examined 2,925 individuals who entered the treatment program between April 2017 and December 2021. We performed segmented regression analyses using both the date of cannabis legalization and the date of edibles legalization as the interruption

time point. We also performed stratified analyses to examine potential sex differences. Results: We found no significant changes in the prevalence of cannabis use or readiness to quit using cannabis following legalization with either of the interruption time points. However, there was evidence of increasing CUD severity post-edibles legalization. Stratified analyses also suggested possible sex differences in readiness to quit over time. Conclusions: Results point to some small but potentially important impacts of recreational cannabis legalization among individuals with SUD that may only continue with time. Nevertheless, there is a need to continue to monitor cannabis use trends to understand any potential lagged effects.

Cannabis Protective Behavioral Strategies and Eating Disorder Symptoms: A Closer Look at Muscular Dysmorphia and Cannabis Use Disorder Among Male and Female College Students

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Symptoms of Eating Disorders (ED) (e.g., making oneself sick, loss of control when eating, significant weight loss in a short period, feelings that food dominates one's life) have been identified as risk factors for problematic cannabis use across males and females. Past studies show mixed results regarding sex differences in cannabis use among ED samples, but many studies focused on samples of those with EDs do not include muscular dysmorphia (MD) – a risk factor for ED across sex, and especially for males. Greater use of cannabis protective behavioral strategies (CPBS) has been established as a protective factor against Cannabis Use Disorder (CUD) in college student samples. Few studies have examined ED symptoms and CPBS; available studies did not find a relationship between the two constructs. Sex differences in CPBS use among those who endorse ED symptoms have yet to be explored in detail. The present study investigated the moderating effect of ED symptoms, including MD, on the relationship between CPBS and CUD among male and female college students. The sample consisted of college students who used cannabis in the past year (N= 578; 76% female). All participants completed measures of CPBS (the Protective Behavioral Strategies for Marijuana scale), the CUDIT (CUD-Identification Test), and the SCOFF questionnaire (a 5-item screener to detect ED symptoms). An additional item was added to evaluate MD, which was examined individually. Separate regression analyses were conducted with the sample overall and then for males and females separately. With CUDIT as the outcome, the models included either total SCOFF scores or MD separately as moderators.

Depression and generalized anxiety (i.e., correlates of EDs) were included as covariates in all models (as assessed by the 8-item Patient Health Questionnaire and the 7-item Generalized Anxiety Disorder scale). Greater use of CPBS was significantly associated with lower CUDIT scores among the whole sample. The SCOFF significantly moderated the relationship between CPBS and CUD among the whole sample, such that participants with higher reported ED symptoms demonstrated significantly lower CUDIT scores when they used more CPBS, compared to participants who reported fewer ED symptoms. When examining sex separately, greater scores on the SCOFF functioned as a significant moderator for males only. When the MD item was included in the models instead of the SCOFF, the MD item moderated the relationship between CPBS and CUD among the whole sample, such that participants who endorsed MD symptoms demonstrated significantly lower CUDIT scores when they used more CPBS, compared to participants who did not endorse the MD item. When examining sex separately, the MD item was a significant moderator for both males and females. This study highlights the importance of CPBS as a harm reduction method in college students who use cannabis and report symptoms of EDs. Specifically, analyses highlight CPBS as a protective factor for males who present with a high amount of ED symptoms and for both males and females who endorse MD symptoms.

Personality Traits as Mediators in the Association Between Adverse Childhood Experiences and Cannabis Consequences: A Cross-National Examination Among College Students from Six Countries

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Impulsivity and childhood trauma exposure have been previously associated with increased cannabis use and negative consequences. Studies have also found that impulsivity traits (i.e., positive urgency, negative urgency, sensation seeking, lack of perseverance, and lack of premeditation) mediate the association of adverse childhood experiences (ACE) with later cannabis use. Whether these results can be generalized across countries is unknown. Moreover, past research has not considered the Big Five personality traits (i.e., emotional stability, extraversion, conscientiousness, agreeableness, and openness) in the relationship between ACEs and cannabis consequences. Thus, the present study aimed to explore whether different impulsivity traits and Big Five personality traits mediate the relationship between a wide variety of ACE's and negative cannabis consequences among college students from six countries (United States,

Spain, Argentina, Canada, United Kingdom, and South Africa) as well as whether the mediational model was invariant across countries. A sample of 2,481 college student cannabis users (mean age = 20.12; 67.9% female) completed an online survey. They completed a measure of cannabis use frequency, the Brief Marijuana Consequences Questionnaire, the Adverse Childhood Experiences International Questionnaire, and personality measures including the UPPS-P and the Big Five personality test. Mediation and moderation analyses were performed, controlling for cannabis frequency and sex. Analyses revealed that negative urgency and emotional stability mediated the association between the frequency of ACE's and cannabis consequences, such that higher ACE scores were associated with higher negative urgency and lower emotional stability (i.e., higher neuroticism) which were in turn associated with more cannabis consequences. Moderation analyses revealed that results were invariant across countries. This study replicates extant research linking ACEs with later cannabis use problems through negative emotionality-related impulsivity traits and suggests that these results could be generalized across college students from different countries. Interventions for those who experience ACE's might focus on impulsive, neurotic behaviors to lessen or even prevent negative cannabis consequences.

Cannabis Use, Consequences, and Protective Behavioral Strategies among Sexual and Gender Minority College Students

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Sexual and gender minority (SGM) individuals report increased levels of cannabis use when compared to their non-SGM counterparts. Some studies have pointed to this trend in young adult/college student SGM populations as well, and this is of particular importance given the already-elevated risk for cannabis use among the general young adult population. Cannabis use has been associated with several negative consequences, especially for college students; consequences may range from academic-related problems to more potentially severe consequences such as driving while high. Although little research has investigated the prevalence of cannabis-related consequences among SGM college students, related literature has indicated SGM students' increased risk for alcohol-related consequences. Thus, it is reasonable to consider the rate at which SGM students may experience cannabis-related consequences. Similarly, protective behavioral strategies for marijuana use (PBSM) have been shown to be negatively

associated with cannabis use and consequences among young adults, and very few studies have explored their use among the SGM college student population. If SGM college students are indeed at increased risk of cannabis use and consequences when compared to non-SGM college students, it is important to investigate their endorsement of PBSM usage and how this may relate to their cannabis use and related problems. In this exploratory cross-sectional study, using a convenience sample of 1,014 (25.9% SGM) college students, we examined SGM students' endorsement of past year and past 30-day cannabis use, days of cannabis use in the past 30 days, cannabis use disorder (CUD) symptoms, cannabis-related consequences, and PBSM usage. Participants completed an online survey assessing past year and past 30-day cannabis use, past 6-month CUD symptoms on the Cannabis Use Disorder Identification Test (CUDIT), past 30-day cannabis-related consequences on the Brief Marijuana Consequences Questionnaire (BMAC-Q), and PBSM usage. Chi-square tests revealed that SGM participants were significantly more likely than non-SGM participants to endorse any past year ($p < .001$) and any past 30-day ($p = .008$) cannabis use. Independent samples t-tests revealed that SGM participants had significantly higher sum scores on the CUDIT ($p < .001$) as well as significantly higher amounts of cannabis-related consequences ($p = .005$) but did not differ from non-SGM participants in their PBSM usage. Using two separate linear regression models with cannabis consequences and CUDIT scores as outcomes, we found that SGM status and PBSM usage associated with consequences and CUDIT scores, such that SGM participants had significantly greater consequences and higher CUDIT scores, and higher PBSM use significantly associated with lower consequences and CUDIT scores. There were significant interaction effects for SGM status and PBSM usage, such that SGM participants with low PBSM usage reported the highest consequences and CUDIT scores, whereas high PBSM usage protected against consequences and higher CUDIT scores regardless of SGM status. These findings provide novel insights into the cannabis use behaviors, consequences, and PBSM usage of SGM college students. Future work is needed to further investigate the relationship between PBSM use and cannabis behaviors among SGM college students and explore other potential correlates of hazardous cannabis use in this population.

Cannabis Use Timing and Motives: When You Get High Depends on Why You Get High

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INTRODUCTION: Previous studies demonstrate the prevalent nature of cannabis use and its typical association with adverse physical health, mental

health, and daily-functioning outcomes. Contrastingly, cannabis is often endorsed, and in some states prescribed, as an option for supplementing primary health concern treatment and coping with pain. Considering the potential intersection between utilization of cannabis for varied motives and the timing-specific nature of influence in day-to-day functioning, it is imperative that we investigate the connection between motivations and consumption timing to elicit greater insight into areas of intervention and support. Particularly, this study looks at how the endorsed motivation for cannabis use predicts the time patterns of cannabis consumption during the day. METHODS: - This study is a secondary data analysis conducted on a community sample collected through Prolific, comprised of 410 adults regarding cannabis and alcohol use. Analyses consist of a series of multiple regressions testing the Marijuana Motives Questionnaire (MMQ) as a predictor of time-block consumption. Time blocks were comprised of four-hour periods beginning at midnight and spanning each day of the week, resulting in a range from 0-7 modelled continuously for each time block. RESULTS: Our study results supported our theory that different endorsed motives for cannabis consumption would predict different patterns of consumption timing during the day. During the time periods of 12am-4am, 8am-12pm, and 12pm-4pm, the coping motive demonstrated a significant positive relationship ($p < 0.005$). The 4am-8am period showed no significant association with any motive ($p > 0.05$). The 4pm-8pm period was associated with a significant increase in consumption among those endorsing coping and enhancement motives ($p < 0.001$) and a significant negative relationship with those endorsing a conformity motive ($p < 0.001$). The 8pm-12am period showed a significant positive association with the coping, enhancement, and expansion motives ($p < 0.05$). DISCUSSION: The results of our study suggest that an individual's cannabis consumption across a typical 24-hour period can be predicted based on differences in motivation for cannabis use. As anticipated, individuals who endorse using cannabis to cope demonstrated a significant increase in cannabis use across all time blocks except the 4am-8am period, with elevated betas during typical working hours in the United States.

Impact of Cannabis Use During Adolescence and Young Adulthood on Academic Achievement: A Systematic Review and Meta-analysis of Observational Studies

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Background: Cannabis, also referred to as marijuana, is one of the most commonly used psychoactive drugs around the world with an increasing trend in its use among adolescents and young adults. Cannabis use during adolescence and young adulthood may affect academic achievement; however, the findings varied across studies and the magnitude of association remains uncertain. Objectives: To evaluate the impact of cannabis use on academic achievement using systematic review and meta-analysis. Methods: We searched CINAHL, EMBASE, MEDLINE, PsycINFO, PubMed, Scopus, and Web of Science up to November 2023 for observational studies examining the association of cannabis use with academic outcomes. Paired reviewers independently screened the titles/abstracts and full texts, assessed the risk of bias, and extracted data using standardized and pilot-tested data collection forms. We used random-effects model for meta-analyses of three or more studies, and fixed effects models for meta-analyses of two studies. We tested the a priori hypotheses for subgroup analyses and sensitivity analysis. Results: Sixty-three studies that included 438,329 individuals proved eligible for review. Moderate-certainty evidence showed cannabis use during adolescence and young adulthood probably results in increased school dropout rate (Odds ratio [OR] 1.72 [1.45-2.04]), higher school absenteeism (OR 2.31 [1.76-3.03]), less likelihood of completing high school (OR 0.50 [0.33-0.76]), and decreased university enrollment (OR 0.72 [0.60-0.87]) with an absolute risk reduction (ARR) or increase (ARI) ranging from 8% to 14%. Low-certainty evidence showed significant association with lower school grades (OR for grade B and above 0.61, 95% CI = [0.52-0.71]), lower postsecondary degree attainment (OR 0.69 [0.62-0.77]), and unemployment (OR 1.50 [1.15-1.96]) with ARR/ARI ranging from 6% to 8%. Very low certainty evidence showed no significant association with grade retention (OR 1.41, 95% CI = [0.97 to 2.03]). Subgroup analyses with moderate credibility showed worse academic outcomes for frequent users than infrequent users. Conclusions: Cannabis use during adolescence and young adulthood, particularly more frequent use, is associated with worse academic outcomes, including decreased high school graduation and university enrollment, and increased school dropout and absenteeism.

Associations Between E-Cigarette Marketing Exposure and Vaping Nicotine and Cannabis Among U.S. Adults, 2021

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Introduction: Vaping has become an increasingly common method for consuming nicotine and cannabis, a trend potentially influenced by e-cigarette marketing. However, little is known about the influence of e-cigarette marketing on cannabis vaping behaviors. This study examined the associations between e-cigarette marketing exposure and nicotine and cannabis vaping behaviors among adults. Methods: This cross-sectional study included a U.S. nationally representative sample of adults (≥18 years) from the Wave 6 survey of the Population Assessment of Tobacco and Health (PATH) Study, conducted from March to November 2021. We used multinomial logistic regressions to examine the associations between past 30-day e-cigarette marketing exposure (overall and by ten marketing channels) and past 30-day vaping behavior (sole- and dual-vaping of nicotine and cannabis) overall and stratified by age. The models controlled for socio-demographics, physical and mental health statuses, and substance use factors. Results: The study included 30,516 respondents (48.0% male and 63.9% non-Hispanic White). Overall, 52.0% of respondents reported past 30-day e-cigarette marketing exposure, and 89.8%, 5.6%, 3.2%, and 1.4% reported no vaping, sole-nicotine vaping, sole-cannabis vaping, and dual-vaping, respectively. Multinominal logistic regression results show exposure to e-cigarette marketing was associated with increased odds of reporting sole-cannabis vaping versus no vaping (adjusted risk ratio [aRR], 1.31; 95% confidence interval [CI], 1.09-1.57) and dual-vaping versus no vaping (aRR, 1.26; 95% CI, 1.01-1.57). Stratification analysis found these associations among those aged 18-24 and 25-34 years but not older adults (≥35 years). Those exposed to e-cigarette marketing also had increased odds of reporting sole-cannabis vaping versus sole-nicotine vaping (aRR, 1.28; 95% CI, 1.04-1.58). Stratification analysis found this association only among those aged 18-24 years. E-cigarette marketing exposure via several channels (retail stores, billboards, events, newspapers/magazines) was associated with increased odds of reporting sole-cannabis vaping. Discussion: Among a nationally representative sample of U.S. adults in 2021, those who were exposed (versus not exposed) to e-cigarette marketing were about 1.3-times more likely to report sole-cannabis vaping compared to those who reported no vaping or sole-nicotine vaping. Those exposed were also about 1.3-times more likely to report dual-vaping behaviors compared to those who reported no vaping. Importantly,

such associations appeared to be mainly driven by young adults aged 18-24 and 25-34 years, and no associations were found between e-cigarette marketing exposure and sole-nicotine vaping overall or among any age groups. Greater restrictions on tobacco marketing may have reduced the influence of e-cigarette marketing on nicotine vaping, while gaps in such marketing restrictions for cannabis may contribute to the continued influence of e-cigarette marketing on cannabis vaping. Continued monitoring and evaluation of the cannabis industries' marketing practices and their influence is critically needed to inform regulatory actions aimed at minimizing the public harm of cannabis product use. Research is also needed to develop more specific measures that disentangle marketing exposure for nicotine versus cannabis vape products and to examine whether the impacts of e-cigarette marketing on vaping behavior show product use specificity or generalize across product categories.

Exploring Associations Between Cannabis Exposure and Neuropsychological Functioning in People Living With HIV: Effects of Lifetime, 12-Month, and 30-Day Use

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Background: Despite advancements in antiretroviral therapy (ART) and subsequent improvements in health outcomes of people living with HIV (PLWH), concerns persist regarding risk of impairment in neuropsychological (NP) functioning in this population. HIV infection can lead to neuroinflammation, neural injury, increased sensitivity to the effects of opportunistic infections and substance use, and subsequently risk for neurocognitive impairment (NCI). Concurrently, cannabis use has become increasingly prevalent, particularly in PLWH, prompting inquiries into its potential impact on NP function. Research is emerging that regular cannabis exposure may be anti-inflammatory and associated with better NP functioning in PLWH. On the other hand, recent cannabis exposure may acutely affect NP test performance, confounding its chronic effects. The current study explores relationship between several cannabis exposure parameters and NP functioning in PLWH who currently use cannabis. Methods: Participants included 561 PLWH from studies at the HIV Neurobehavioral Research Program between 2003 and 2018 (18-74 years old, 85% male, 46.5% white non-Hispanic, 74% on ART) who used cannabis in the last 30-Days and had

no current (30-Day) substance use disorder diagnoses (excepting cannabis). NP test performance was summarized across a comprehensive test battery as a demographically corrected global deficit score (GDS; higher scores indicate worse NP performance; 41.0% of sample impaired at GDS≥0.5). Independent regression models examined associations between the GDS and individual parameters of cannabis exposure obtained via Timeline Follow-back Interview (i.e., Age of First Use, Days Since Last Use, Days of Use, Quantity, and Density [average daily quantity],) across the lifetime, past 12-Month, past 30-Days, in addition to any past 24 hour exposure. Reading level (WRAT Reading) and nadir (lowest ever) CD4 cell count were included as covariates. Exploratory regression analyses were repeated for domain-specific performance deficits (Verbal Fluency, Executive Functioning, Speed of Information Processing [SIP], Learning, Recall, Attention/Working Memory, and Motor ability). All analyses were evaluated against a Type-I error rate of 0.05 without multiple comparison adjustment. Results: There were no significant associations between GDS and cannabis exposure for any period, including use within 24 hours of testing (n=225). In examining deficits in specific NP domains, worse SIP performance was associated with lower 30-Day Density ($F(1, 544)=5.50$, $p=0.019$), 12-Month Quantity ($F(1, 544)=5.37$, $p=0.021$), and 12-Month Density ($F(1, 544) = -1.98$, $p=0.048$). Worse Verbal Fluency was associated with lower 30-Day Quantity ($F(1, 543) = 3.90$, $p=0.049$) and 30-Day Density ($F(1, 543) = 4.82$, $p=0.029$). Finally, worse Motor function was associated with lower 30-Day Quantity ($F(1, 541) = 4.62$, $p=0.032$). Conclusion: Consistent with emerging findings, we found no evidence of deleterious effects of cannabis exposure over the lifetime, 12-Months, or 30-Days on overall NP functioning among PLWH. Lower recent use (12-Month and 30-Days) was weakly associated with worse performance on limited domains requiring speeded test performance, perhaps reflecting neuroprotective effects. Future research may examine these associations on epochs of increased HIV immunologic vulnerability, such as during periods of immunosuppression (e.g., nadir CD4) or worse viral control (e.g., peak viral load), as these may result in increased sensitivity to effects of cannabis.

Opioids & Cannabis: Pain in the Outpatient Setting

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Background: Pain is the primary reason people seek medical care and chronic pain affects approximately 100 million people in the United States. Chronic pain is associated with substantial costs

to individual patients as well as health care systems and the broader economy. It is a leading cause of disability and individuals struggling with chronic pain have substantially increased medical costs, lost productivity, reduced quality of life, and increased risk for substance abuse. Opioids have been commonly prescribed to patients with pain, even though there is growing evidence of opioid misuse, abuse, and addiction. While offering some pain relief, there has also been an exponential increase in mortality directly related to opioid use. In 2021, the number of people who died from opioid-related overdoses was 6 times more than in 1999 (Centers for Disease Control and Prevention, 2022). The current opioid crisis has driven a search for alternative pain treatments that are both efficacious and safer, with cannabis becoming increasingly recommended for patients with chronic pain. Objectives: This study aimed to compare cannabis users and non-cannabis users with regard to the daily dose and total dose of opioid medications prescribed when presenting to the Emergency Department (ED) and Urgent Care (UC) with pain symptoms. The hypothesis guiding this project, given the changes in opioid prescribing patterns in states with legal access to cannabis, was that daily and total opioid dose would be lower in patients with chronic pain presenting to the ED/UC who disclose cannabis use to their healthcare provider. Design & Methods: A retrospective patient records extraction design was utilized for this study. In coordination with Cottage Health Research Institute, key variables have been extracted from patient records (between the years of 2021 and 2023) from both the ED/UC sites of Cottage Health. The data extraction focused on patients whose primary complaint includes "pain" and or a medical condition in which pain is a main symptom. An independent samples t-test was used to compare the outpatient prescription dose of opioids prescribed by ED/UC clinicians between the two groups of patients with pain symptoms: cannabis users and non-cannabis users. The protocols for this study were reviewed and approved by the Institutional Review Board at Cottage Health (Approval 23-35xs). Outcome/Results/Conclusions: The results of this project, while statistically significant, were not what was hypothesized. The hypothesis was that daily and total opioid dose would be lower in patients with chronic pain presenting to the ED/UC who disclose cannabis use to their healthcare provider. The findings of this project are not consistent with that hypothesis. In fact, the results were the opposite: patients who disclosed cannabis use were prescribed significantly higher daily and total doses of opioids. This project sought to evaluate the impact of cannabis-use disclosure on opioid prescribing from patients with chronic pain presenting to the ED/UC. Patients who disclosed cannabis use received significantly higher daily (M = 5.15 for cannabis users, M = 4.65 for other patients, $p < .0003$) and total doses of opioids (M = 15.64 for cannabis users, M = 14.06 for other patients, $p < .001$). Further research needs to explore the reasons for these prescribing patterns and better understand the need, or lack

thereof, to adjust opioid doses for patients who use cannabis.

Five Years In: An Updated Look at Demographics of the Massachusetts Cannabis Industry

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Background: Many state-led legalization policy designs include equity initiatives to help rectify past harms of historical and disproportionate criminal justice enforcement of drug policy on Black and Hispanic populations, but the effects of equity policies and programs remain unclear. In Massachusetts (MA), multiple equity provisions encourage general diversity and inclusivity in the new industry workforce without a predetermined outcome to reach. In the first 18 months of cannabis legalization in MA, the workforce skewed white and male, specifically in seniority roles, which have greater capacity to create generational wealth (Doonan et al., 2022). In the current study, we reassess industry diversity in a now-maturing market. Methods: All statistics were computed in R version 4.3.1. Descriptive statistics were calculated to compare the demographics of the industry from April 2020 to the updated totals from June 2023. We use a Type III Anova constructed using the 'psych' package (Revelle, 2024) to determine whether the main effects of race and gender, as well as their interaction, are significant. We then used logistic regression (constructed with the 'stats' package installed with core R) to predict the likelihood an agent assumed a senior role from their race/ethnicity and gender, where 'white' and 'male' were used as reference groups. Results: As of June 2023, the entire industry was 70% white (14,482/20,753) and 63% male (13,074/20,753), compared to 75% white and 65% male in 2020. Senior-level agent positions were 77.4% (11,816/17) white and 74% male (2,562/3,444) in 2023, compared to 84% white (337/403) and 82% male in 2020. The state at large, per the 2023 census, was 79.4% white (alone), and 49% male. Type III Anova revealed that the main effects of both race ($F(5,1) = 269.36$) and gender ($F(2,1) = 186.99$) were both significant (ps $< .001$), as was the interaction between race and gender, $F(10,1) = 26.43$, $p = .003$. In comparison to white agents, Black ($B = -.625$, 95% CI = [-.827, -.432]) and Hispanic/Latino ($B = -.941$, 95% CI = [-1.151, -.741]) agents were less likely to assume a senior role (ps $< .001$), where Asian agents were more likely to assume a senior role ($B = 1.032$, 95% CI = [.790, 1.272]) than white agents ($p < .001$). Females were less likely ($B = -.650$, 95% CI = [-.746, -.556]) to assume a senior role than males ($p < .001$). However, interactions between Race and Gender were

significant only in the case of Black agents, where Black females were more likely to assume a senior role than Black males (B = .708, 95% CI = [.358, 1.051], p < .001). Conclusions: Although the employment demographics of the Massachusetts cannabis industry remained predominantly white and male in 2023, there is now greater representation of Black, Hispanic, and female agents both in senior and non-senior roles, in comparison to April 2020. These results highlight the utility of continuously monitoring industry demographics to assess gradual changes to the industry and to assist regulators in identifying inequities and adapting evidence-based initiatives to ensure cohorts disproportionally impacted by cannabis prohibition benefit from legalization.

Exploring "Wake-and-Bake" Practices and Problematic Cannabis Use in Older Adults

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Background: Research indicates that young adults who reported more frequent "wake-and-bake" use (i.e., using cannabis shortly after waking up) endorsed more cannabis use disorder symptoms, but little is known about this effect in older adults who use cannabis (OACU). This study explored the number of hours that passed between waking up and first use of cannabis among OACU, weekly use frequency, and scores on cannabis use disorder screening. Methods: This study utilized items assessing weekly cannabis use frequency and the number of hours that passed between waking and first use of cannabis from The Daily Sessions, Frequency, Age of Onset, and Quantity of Cannabis Use Inventory (DFAQ-CU). Waking use was coded according to four categories: I do not use cannabis at all, within 1 hour of waking up, between 1-9 hours of waking up, and between 9-18 hours of waking up. Weekly cannabis use frequency was measured as 0 days, 1-2 days, 3-4 days, 5-6 days, and 7 days out of the past week. One-way ANOVA analyses were performed to examine the relationship between these patterns of use and Cannabis Use Disorder Identification Test-Revised (CUDIT-R) score. Results: This sample included 52 OACU ages 60+ (M = 67.98, SD = 5.77; 50% = female; 90% = White). Number of hours awake until first cannabis use was significantly associated [F(3,47) = 4.17, p = .01] with CUDIT-R score such that OACU who used cannabis within one hour of waking up endorsed more problematic use (M = 15.63, SD = 5.37) compared to those who first used cannabis between 9-18 hours of waking up (i.e., in the afternoon or evening; M = 9.10, SD = 6.25). Additionally, weekly frequency was significantly associated with problematic use [F(4,47) = 3.22, p = .02]. OACU who used cannabis all days of the past week generated higher scores on the CUDIT-R (M = 13.58, SD = 6.92) compared to those who used

cannabis 1-2 days of the past week (M = 8.09, SD = 4.01). Conclusions: These findings suggest that similar to younger adults, OACU are more likely to endorse problematic cannabis use if they begin using earlier in the day. However, adults over the age of 65 may no longer be working or have daily structure relative to younger adults (i.e., in the context of use disorder screening items that focus on failing to meet responsibilities, caring for children, etc.), and it will be important for future research to examine which symptoms of problematic use have the most utility in understanding this specific population. Future research could also explore possible motivations, such as recreational or medicinal reasons, for why OACU use cannabis at a particular time of day.

Individuals' Values and Preferences Regarding Medical Cannabis for Chronic Pain: A Descriptive Qualitative Study

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Background: Cannabis for select medical purposes has been legal in Canada since 2001 and recreationally since 2018. Medical cannabis has emerged as a management option for chronic pain; however, the relative value that patients place on its benefits and harms remains uncertain. This study aimed to explore the values and preferences of people living with chronic pain (PLwCP) regarding medical cannabis for chronic pain to inform development of a clinical practice guideline. Methods: We conducted a descriptive qualitative study using in-depth interviews with PLwCP. We asked participants about how they weighed the benefits and harms of cannabis use, the barriers and facilitators faced in the use of medical cannabis, the decisions made regarding routes of administration and types of products used, the sources where cannabis was obtained, and the sources of information regarding cannabis for chronic pain. Following both deductive (based on the interview guide) and inductive (guided by the data) approaches, we developed concepts and themes related to the values and preferences of PLwCP on their use (or avoidance) of medical cannabis for chronic pain. Results: We interviewed 52 PLwCP, including 40 current medical cannabis users, 10 previous users, and 2 non-users. There was variability around reasons PLwCP chose to use medical cannabis, including ineffective pain management from other strategies or perception of cannabis as a safer option to pain medications, such as opioids. Perceived benefits of medical cannabis among current users included relief from pain, better sleep, and

improved mental health. Reasons for discontinuing use of medical cannabis included lack of improvement in pain or sleep or undesirable side effects. Perceived barriers or facilitators to use included social acceptability, availability or access, cost, and attitudes and knowledge among healthcare providers. Most PLwCP who used cannabis therapeutically reported the need for experimentation to determine what cannabis products, routes, and doses worked for them. Cannabinoid (CBD)- dominant products were reported to result in minimal adverse events (e.g., physical or mental impairment) compared to tetrahydrocannabinol (THC)-dominant products. Participants noted different routes of cannabis use including oral routes that provided longer-lasting pain relief with a slower onset and inhaled routes that had a more rapid onset with shorter-lived effects. There was also variability in where participants found information on medical cannabis, including medical and recreational cannabis vendors, medical cannabis clinics, and online sources. Participants valued professional expertise and lived experiences to support their choices. Conclusion: Participants' decisions around using medical cannabis for chronic pain were varied, which suggests these decisions are sensitive to individuals' values and preferences. This emphasizes the importance of shared decision-making between PLwCP, their careers, and healthcare professionals to ensure productive conversations and appropriate education and consideration of benefits, harms, barriers, and facilitators.

The Role of Cannabis, Opioids, and Clinical Factors in Mild Cognitive Impairment (MCI) Among Older Adults with HIV

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Background: Older people with HIV (PWH) may be at increased risk of abnormal cognitive aging, including MCI. MCI has two subtypes: amnestic (aMCI) primarily involving memory loss and associated with progression to Alzheimer's Disease (AD) and non-amnestic (naMCI) affecting domains beyond memory. However, the link between MCI subtype and clinical and behavioral factors remains unclear. For instance, although cannabis use is common among PWH, and emerging evidence indicates that lifetime and present cannabis use may exert beneficial cognitive effects in older adults with HIV through reductions in systemic inflammation, its specific association with MCI status in PWH is unknown and may differ based on cannabis use characteristics (e.g., age of onset, frequency, and duration of use). Therefore, the purpose of the current

study was to identify potential associations between substance use, HIV clinical and health-related factors, and MCI subtype in a diverse sample of older adults with HIV. Methods: Our sample consisted of 56 older adults with HIV (age range: 59-77, M = 64.3, SD = 4.43; 57% female; 64% Black) enrolled in a larger study of cannabis use and clinical outcomes in PWH. Participants completed a neurocognitive battery as well as the Functional Activities Questionnaire (FAQ), which evaluates impairment across activities of daily living. Two neuropsychologists assigned consensus diagnoses (aMCI/naMCI/unimpaired) based on available data. Age, duration of HIV, years of education, and antiretroviral therapy adherence (≥ 95%/<95%) were assessed by self-report. The Composite International Diagnostic Interview Substance Abuse Module (SAM) was administered to assess lifetime and current symptoms of DSM-5 Cannabis Use Disorder. Age of onset was operationalized categorically (nonuser/<25/≥25), as was frequency of use (nonuser/daily/less than daily). Among cannabis users, duration of use was reported in days, weeks, months, and years. Lifetime exposure to cocaine, alcohol, and opioids was quantified using the Kreek-McHugh-Schluger-Kellogg scale (KMSK). Associations between MCI subtype and substance use/clinicodemographic variables were assessed with chi-squared tests and Kruskal-Wallis tests. Results: Twenty participants (36%) met clinical criteria for aMCI, while 21 (38%) met clinical criteria for naMCI. Thirty-two participants (57%) reported lifetime use of cannabis (55%, 71%, and 40% of those classified as aMCI, naMCI, and unimpaired, respectively). MCI subtype was not associated with current cannabis use (p = 0.17), age of onset of heaviest period (p = 0.13), frequency of use during heaviest period (p = 0.076), nor duration in years of heaviest use period (p = 0.60). However, MCI status was associated with duration of HIV ($H(2) = 8.26$, p = 0.016, $\eta 2 = 0.19$) and lifetime opioid exposure ($H(2) = 7.82$, p = 0.020, $\eta 2 = 0.11$); post hoc Dunn tests revealed aMCI was associated with a longer time since diagnosis and with greater exposure to opioids relative to naMCI and unimpaired groups. Conclusion: Over half of our participants reported lifetime cannabis use. However, we observed no statistically significant association between any aspect of cannabis use and MCI. Results suggest that duration of HIV (independent of age) and lifetime opioid exposure are associated with memory impairment among older PWH, potentially increasing progression to AD.

Perceived Effectiveness of Cannabis Use for Pain Management in People Living with HIV: An Observational Pilot Study

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Background: Many people living with HIV (PLWH) experience pain. Drugs that are commonly used for pain management include opioids, which are associated with a high risk for substance use disorder, overdose, and adverse effects. Research shows that cannabis may have analgesic properties, making it a popular alternative for pain management. However, few studies have examined the perceived effectiveness of cannabis for managing pain among PLWH, specifically. Moreover, no studies to our knowledge have examined changes in pain intensity from pre- to post-cannabis-use in the daily lives of PLWH. Therefore, the goal of this study was to examine pain intensity ratings before and after cannabis use to determine whether PLWH perceive cannabis to have an effect on their pain in their daily lives. Methods: Data were drawn from a pilot ecological momentary assessment (EMA) study of cannabis use among PLWH (Wardell et al., 2022), in which surveys were administered via a smartphone application before and after each cannabis use for a 14-day period. The current analytic sample were the subsample of participants reporting pain on one or more pre-cannabis surveys (N= 18, 67% Male, 67% White). Pre-cannabis surveys inquired about motivations for cannabis use and pain intensity (from 1 = mild to 5 = severe). Post-cannabis surveys, prompted one hour after pre-cannabis surveys, reassessed pain intensity and assessed the routes of cannabis administration used. Results: Across all participants, 279 pre-cannabis surveys were completed, and 240 (86%) of the prompted post-cannabis surveys were completed. For the analyses, we calculated each participant's average pre-cannabis and average post-cannabis pain intensity scores across all cannabis use events reported during the 14-day period. A mixed analysis of variance (ANOVA) revealed statistically significant within-person reductions in average pain intensity scores from pre-cannabis (M = 3.10, SD = 0.86) to post-cannabis (M = 1.56, SD = 0.90), $F(1, 16) = 61.78$, $p < 0.01$. Further, there was a significant interaction between time (pre- versus post-cannabis) and primary route of administration (oral versus inhaled), $F(1, 16) = 7.93$, $p = 0.012$. Although both groups (those who primarily inhaled cannabis and those who primarily ingested cannabis orally) showed statistically significant pre-to-post-cannabis reductions in pain intensity, the reductions were greater among participants who typically inhaled cannabis (difference score = 1.94) relative to participants who typically administered cannabis orally (difference score = 0.77). Conclusion: Results showed that PLWH reported reductions in pain an hour after using cannabis, suggesting that they perceived it to be useful in managing their pain. Findings also show that there were differences in how much pain relief was reported based on the route of administration, but dosage was not measured making it unclear whether the effect is truly dependent upon the route. Moreover, the timing of the post-cannabis survey (one hour after use)

poses a limitation for examining the effects of oral cannabis, which may take more than an hour to peak. Given the small sample size for this pilot study, analyses should be replicated with larger samples of PLWH to enhance power and generalizability, and multilevel modeling should be applied to examine daily-level associations in future larger studies.

Evaluating the Impact of Canadian Cannabis Legalization on Cannabis Use Outcomes in Emerging Adults: Comparisons to a US Sample via a Natural Experiment

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Background: Federal legalization of cannabis in Canada marked a significant policy shift, but a challenge of understanding the subsequent changes is the absence of a counterfactual control group. While legalization is an intervention that is unfeasible to evaluate using a randomized control trial design, advanced statistical techniques can employ quasi-experimental designs using natural experiments. This study evaluates the impact of cannabis legalization in a longitudinal cohort of Canadian emerging adults by comparing changes over time to changes in a non-legal control jurisdiction in the United States.
Methods: Two samples of emerging adults from Hamilton, Ontario and Memphis, Tennessee were followed longitudinally in 4-month intervals from April 17, 2017 to March 11, 2020, with three pre-legalization and four post-legalization assessments. Doubly robust difference-in-difference (DiD) estimation was used to assess whether cannabis legalization impacted cannabis use frequency or cannabis-related consequences in the Hamilton sample over time. The impact of cannabis legalization on alcohol use and alcohol-related consequences was also assessed to serve as a counterfactual comparison. Cohort differences were adjusted within DiD estimation using propensity score approaches.
Results: Against a general trend of decreasing use over time, the DiD estimation revealed significantly greater cannabis use frequency approximately 6-months post legalization (ATT: 0.2245 (0.0154,

0.4336)), and approximately one year post legalization (ATT:0.3091 (0.0473, 0.5709)) in the Hamilton sample compared to Memphis sample. Similarly, cannabis-related consequences were also greater in the Hamilton sample at each of these time points (ATT: 0.0.7610 (0.0797, 1.4423), (ATT: 1.0396 (0.1864, 1.8928)). Counterfactual alcohol measures showed no impact of legalization at any time point. Conclusions: Findings suggest that cannabis legalization was associated with a shallower reduction in cannabis use frequency and adverse consequences in the Hamilton sample compared to the Memphis control. Although the magnitude of these impacts was small, this may suggest the start of diverging cannabis trajectories. Given that effects of legalization are hypothesized to be longer- rather than shorter-term, further monitoring of the impacts of cannabis legalization is certainly warranted.

A Naturalistic Study of Cannabis Use and Sleep Among Young Adult Females: A Pilot Study Using Wearable Sleep Data

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Background: While a common motivation for cannabis use is as a sleep aid, evidence has been mixed on cannabis's effect on sleep. However, much of this research has relied on self-reported sleep or has been conducted in a sleep lab. Wearable device measured sleep may offer advantages, allowing for objective sleep measures over longer periods of time in a naturalistic environment. Cannabis's effect may be particularly relevant among females, given similar rates of cannabis use and reports of greater sleep disturbance compared to males. Females have historically been underrepresented in substance use research in part to avoid addressing menstrual cycle changes. Objective: This pilot study sought to explore the relationship between cannabis use and wearable device measured sleep over the menstrual cycle in young adult females, assessing the feasibility of larger-scale measurement. Methods: This study is a secondary analysis of data from a randomized controlled trial investigating the effects of methyl-folate supplementation in young adult females. Females, age 18-25, that reported an episode of binge drinking (>4 drinks) in the previous 2-weeks were eligible for participation. Study participation began on approximately the 7th day of their menstrual cycle and took place over 14 days. At baseline, participants completed questionnaires assessing demographics, past month

cannabis use, sleep quality and menstrual cycle. Sleep and cannabis use were measured prospectively via Oura ring and daily interviews, respectively. Participants on hormonal birth control and those who failed to report cannabis use at least once during the study period were removed from analysis. For each participant a visualization of daily cannabis use, sleep metrics, and count-based menstrual cycle phase were created to facilitate data exploration. Results: Participants (N = 8) ranged from having a past month cannabis use frequency from daily to 2-3 times a month. Over the study period, participants used cannabis an average of 4.63 days (SD = 4.66), reporting an average subjective high of 6.22 (SD = 1.98) on a 0-10 scale with 10 being the "highest". Participants reported past month subjective sleep quality ranging from very poor to fairly good. On nights following cannabis use, participants spent an average of 14.35% (SD = 8.91) of sleep in REM relative to 17.45% (SD = 9.07) on nights without cannabis use. After cannabis use participants had 20.61 (SD = 27.91) minutes of sleep onset latency compared to 11.82 (SD = 8.55) minutes on nights following no cannabis use. Conclusions: A number of factors should be considered when examining the effect of cannabis use on objective sleep measurements among a sample of young adult females. Larger scale longitudinal studies of cannabis use and wearable device measured sleep that incorporate menstrual cycle phase (consideration of study timing/duration and assay measures to corroborate menstrual cycle phase) are needed. Accounting for polysubstance use, as well as accurate measurement of quantity, method, and timing of cannabis use will enhance study design.

Cannabis Use Among Emerging Adults in US States With and Without Legal Cannabis Sales Using The International Cannabis Policy Study (ICPS) Wave 4 2021 Data

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Background/Purpose: Cannabis legalization laws have contributed to changes in the US social and policy landscape. While the largest proportion of cannabis use is among emerging adults (EAs) aged 18-25 years compared to people younger and older (SAMHSA, 2022), the effect of adult-use legalization on cannabis behaviors among EAs is less clear. The purpose of this study was to understand the association between legalization (adult-use legal sales status) and cannabis use behaviors among EAs who were under (18-20 years old) and over (21-25 years old) the legal age to purchase cannabis. Methods: Using 2021 International Cannabis Policy Study (ICPS) wave 4 US data (N = 3,467), EAs' cannabis use

frequency, cannabis products, multi-product use, source, and source legality were described. Among EAs who used cannabis in the past 12-months (P12M), logistic and linear regression models were used to understand the associations between cannabis use behaviors and state legality (legal: states with adult-use retail sales; non-legal: states with no adult-use retail sales) among EAs under and over the legal age to purchase cannabis. Results: Among all EAs, 33% consumed cannabis in the P12M and half reported never consuming. Among EAs who were P12M users, dried flower had the highest frequency of use (121 days in the P12M [95% CI: 112.1, 130.0]), the majority used between 1-3 cannabis products, and they obtained 68.1% (95% CI: 65.4, 70.8) of their cannabis from legal sources. After adjusting for sociodemographic and substance use behaviors, EAs who were 21+ years old in legal states had greater odds of P12M use (aOR: 1.38; 95% CI: 1.01, 1.87) and lowered odds of obtaining cannabis from family/friends (aOR: 0.70; 95% CI: 0.53, 0.93) and dealers (aOR: 0.32; 95% CI: 0.24, 0.43) compared to over-age EAs in non-legal states. Compared to EAs under age 21 in non-legal states, EAs in legal states were more likely to obtain cannabis from dispensaries (aOR: 1.96; 95% CI: 1.23, 3.13). EAs under age 21 reported obtaining 21.6% (95% CI: 9.86, 33.38) and EAs over age 21 reported obtaining 26.3% (95% CI: 20.45, 32.12) more cannabis from legal sources in legal vs. non-legal states. Additionally, under-age EAs in legal states who used cannabis concentrates used them on around 28 more days (95% CI: 5.68, 51.06) in the P12M than under-age EAs in non-legal states Conclusions: Living in a state with adult-use legal cannabis sales was associated with cannabis use behaviors among EAs under and over the legal age of purchase. Under-age EAs' increased reports of dispensary use and use of cannabis concentrates in legal states are concerning, due to adverse health effects from the use of high-potency cannabis products. These findings highlight the need for further investigation into under-age dispensary access and understanding of the drivers of increased concentrates use among young people.

Just-In-Time Adaptive Intervention (JITAI) for Young Adults Using Cannabis and Alcohol: Initial Development and Qualitative Feedback

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Simultaneous use of cannabis and alcohol in young adults is common and can be symptomatic of more serious problems compared to the use of either substance alone. Just-in-time adaptive interventions (JITAIs) offer a new way to reach individuals vulnerable to

Substance Use Disorder through the use of mobile technology (e.g., smartphone apps). By combining ecological momentary assessment (EMA) and programmed algorithms, JITAI decision rules can be adjusted to facilitate the delivery of intervention content in a particular moment when participants might need encouragement, strategies, or feedback. The current presentation describes the development of a new JITAI called Smartphone App For Effectively Reducing Risk (SAFERR), which was designed for young adults engaging in simultaneous cannabis and alcohol use. To guide the delivery of SAFERR intervention tips focused on protective behavioral strategies (PBS) and craving reduction, participants are sent signal-contingent EMA prompts three times per day. They are also asked to complete event-based EMA messages prior to and following cannabis or alcohol use. Depending on the participant's study condition, intervention tips are delivered daily and/or are triggered based on EMA responses focused on craving, presence in settings where cannabis or alcohol use occurs, or social context. The SAFERR intervention also includes an introduction module with psychoeducational information about cannabis and alcohol, personalized feedback, and goal setting. Before implementing a clinical trial, an abbreviated version of SAFERR was piloted with the target population. Participants were recruited from Kaiser Permanente Hawaii, a large healthcare system, and asked to complete one-week of EMA and an abbreviated version of the intervention. Following their participation, they were asked to complete brief surveys and a qualitative interview to provide feedback on satisfaction, usability, perceived helpfulness, goal attainment, intervention implementation, and engagement. Pilot participants included two males and four females who were White or Native Hawaiian/Pacific Islander, and their ages ranged from 19 to 28 years. Retention in the pilot was high (83.3%; one dropout) and the average signal-contingent EMA response rate over the one-week pilot was 77%. Participants who completed the intervention enjoyed the app-based delivery and rated SAFERR as easy to use (3.2 out of 4). Most participants engaged with the intervention tips in a timely fashion (i.e., within one hour). All participants completed the introduction module and rated the quality of the content as satisfactory or greater (2.6 out of 4). Few technological issues arose when downloading the app or navigating the intervention, with ratings of good usability. Qualitative feedback provided additional insight, with most participants reporting increased awareness about antecedents of their cannabis and alcohol use, such as mood, social contexts, or environmental setting. Overall, participants rated SAFERR as acceptable, with high satisfaction. An overview of how participant feedback was used to adapt the final version of the intervention will be discussed. A clinical trial of the SAFERR intervention is ongoing and will examine the impact of SAFERR on the use of PBS and negative consequences related to cannabis and alcohol use.

The Impact of Cannabidiol (CBD) Placebo on Neural Responses to an Acute Stressor

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Background and Purpose: A growing body of evidence has suggested that Cannabidiol (CBD) may be a promising treatment candidate for stress and anxiety disorders. Given that CBD is not associated with any overt psychoactive effects, CBD's therapeutic effects might be significantly influenced by expectancy (placebo) effects. However, the extent to which CBD's non-pharmacological factors contribute to its therapeutic properties remains unclear. Our group has previously shown that CBD expectancy alone is sufficient to impact subjective, physiological, and endocrine markers of stress and anxiety. However, it is unclear to what extent these findings reflect altered neural activity. CBD is believed to modulate stress- and anxiety-related neural substrates such as the activity of the Anterior Cingulate Cortex (ACC) and the Ventromedial Prefrontal Cortex (vmPFC). Both brain regions are implicated in the top-down regulation of the Amygdala during stress-related processing. Using the same dataset as the current study, CBD expectancy was demonstrated to reduce functional connectivity between the Amygdala and ACC. However, the potential involvement of the vmPFC in stress reduction following CBD placebo remains unexplored. The current investigation aimed to assess the independent effects of CBD expectancy on Amygdala resting state functional connectivity (rsFC) with the vmPFC following acute stress. Methods: Using a between-subject, repeated measures design, healthy adults (N = 32, 47% female) were randomly assigned to receive accurate (n = 17; Told CBD-Free) or inaccurate (n = 15; Told CBD) instructions regarding the CBD content of a CBD-free oil received sublingually during one experimental session. Resting state functional connectivity was assessed at baseline and following a stress task (serial subtraction with negative feedback). During post-stress rsFC measurement, participants were erroneously informed that they would need to complete a second more difficult version of the counting task following brain activity measurements. This mild deception was implemented to distinguish between acute and anticipatory stress and anxiety, and to prolong task-induced stress. Outcomes were examined with ANCOVA. Subjective state was also measured at several timepoints and was analyzed with marginal linear models. Results: CBD expectancy (vs. CBD-free expectancy) was associated with attenuated rsFC between the left Amygdala and right ACC (p = 0.049). There were no other significant differences in rsFC between groups. For subjective state, a significant main effect of time was identified for stress, anxiety (p < 0.001), and energy (p =

0.032). However, there were no significant main effects of Expectancy or Expectancy by Time interactions. Post-hoc analysis of the time main effect using pairwise comparisons revealed significantly increased stress ($p < 0.001$) and anxiety ($p < 0.001$) following acute stress relative to other timepoints across conditions. Additionally, participants in the Told CBD condition reported decreased stress ($p = 0.017$), and anxiety ($p = 0.021$), from baseline to oil administration, and significantly decreased stress ($p = 0.024$) and anxiety ($p = 0.017$) from post-anticipation to recovery. Conclusion: CBD expectancy effects may be sufficient to alter stress- and anxiety-related neural responses associated with its therapeutic properties. Specifically, Amygdala-ACC connectivity may be particularly sensitive to CBD placebo effects. Further research is warranted to replicate these findings in larger samples, and to examine the interactive effects of CBD's pharmacological and expectancy effects on stress- and anxiety-related neural processing.

Avoiding Driving Under The Influence Of Cannabis: A Longitudinal Study Testing the Theory Of Planned Behavior and an Extended Model Including Social Norms

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Background and aims: Cannabis consumption impairs driving and is associated with increased motor vehicle crashes. Preventative interventions aimed at reducing driving-related injuries among people who use cannabis may benefit from the identification of the factors predicting the avoidance of driving under the influence of cannabis (DUIC). This study aimed to: 1) examine the predictive value of the Theory of Planned Behavior (TPB) over the avoidance of driving under the influence of cannabis (DUIC) among young adults in the community, and 2) examine the added explanatory value of social norms (descriptive, personal, and moral norms). Methods: As part of an ongoing longitudinal study (Project PSICOCANN), we used targeted sampling procedure to access a community sample of 612 young adults (18-25 years), who informed past-month cannabis use and completed baseline questionnaires. Most (82.5%, $n = 505$) completed a 3-month follow-up assessment. According to the aims of this study, we selected those participants who endorsed past-month driving at baseline and responded to the follow-up survey (analytic sample: $n = 211$, females = 32.7%; M age = 21.6 [$SD = 2.01$]). Participants completed measures of the TPB (i.e., attitude, injunctive norm, behavioral control, self-efficacy, intention) at baseline regarding the cannabis-protective behavior "avoiding driving after cannabis use" at follow-up. Moreover, they completed baseline measures of

descriptive, personal (i.e., personal approval of other's DUIC) and moral norms of DUIC. Two hierarchical linear regression models were conducted, both including past behavior (i.e., avoiding DUIC at baseline), gender, age and past-month frequency of cannabis use as covariates. In the first model, intention to avoid DUIC (dependent variable) was regressed onto covariates (step 1), TPB constructs (step 2), and descriptive, personal, and moral norms (step 3). In the second model, avoiding DUIC was regressed onto covariates (step 1), behavioral control and self-efficacy (step 2), and intention (step 3). Results: The explained variance (adjusted R2) in the first model (intention as dependent variable) was 81.3%. Attitude, self-efficacy, personal and moral norms were identified as predictors of intention to avoid DUIC ($p < .05$). Adding social norms to the TPB constructs resulted in a 2.4% increase in explained variance ($p < .01$). In Model 2 (avoiding DUIC as dependent variable), the explained variance was 56.2%, and only intention (neither behavioral control nor self-efficacy) was identified as a significant predictor of avoiding DUIC. Conclusions: Our findings support the utility of one of the most prominent theories of human behavior, the TPB, as an explanatory model for avoiding DUIC. They are also consistent with previous research showing the relevance of personal and moral norms for behaviors morally censored like risky driving-related behaviors. Our results may inform preventative interventions aimed at reducing potential driving-related harms among people who use cannabis. In particular, in light of our findings, it is recommended to target personal and moral norms towards DUIC, and attitudes, self-efficacy, and intentions to avoid DUIC. Note: Project PSICOCANN (PID2020-118229RB-I00), funded by MICIU/AEI/10.13039/501100011033 (PI, Fernández-Calderón). Correspondence to: fermin.fernandez@dpces.uhu.es

The Predictive Value of the Theory of Planned Behavior over Cannabis Use Frequency among Young Adults Who Use Cannabis: Adding Past Behavior and Habit within the Framework of Dual-Process Models

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Background and aims: The Theory of Planned Behavior (TPB) has consistently been shown to be one of the most useful conceptual frameworks in explaining alcohol consumption. However, longitudinal research testing the explanatory value of the TPB over the frequency of cannabis use among young adults is scarce. As a social cognition theory, the TPB assumes that human behavior is determined by rational/deliberative processes (e.g., intentions). However, within the framework of dual-process models, it has been shown that non-

conscious/automatic processes (e.g., habits) can enrich the explanatory value of the TPB. We aimed to longitudinally examine: 1) the predictive power of the TPB over the frequency of cannabis use among a community sample of young adults and 2) test an extended TPB model that includes the effects of past cannabis behavior and habit over the intention to use cannabis and cannabis use frequency. Methods: Using a targeted sampling procedure, we accessed a baseline community sample of 612 young adults (18-25) reporting past-month cannabis use. From these, 505 (82.5%) participated in a 3-month follow-up, comprising the analytic sample (females = 39.0%; *M* age = 20.99 [*SD* = 2.13]). Participants reported on their past month frequency of cannabis use at baseline (i.e., past behavior) and past 3-month frequency of cannabis use at follow-up (follow-up behavior). Baseline measures also included the TPB constructs (attitude, injunctive norm, behavioral control towards cannabis use; self-efficacy to refuse cannabis; and next 3-month intention to use cannabis) and habit strength for cannabis use (also measured at follow-up). Two path analysis models were conducted to predict past 3-month frequency of cannabis use at follow-up. Model 1 included the TPB constructs while controlling for gender, age, quantity of cannabis used, and past cannabis behavior. Model 2 also included: a) a path from past cannabis behavior to habit at baseline, b) a path from habit at baseline to intention at baseline and to habit at follow-up, and c) a path from habit at follow-up to frequency of cannabis use at follow-up. Gender, age, and quantity of cannabis used were also controlled in Model 2. Results: Model 1 explained 65% of the variance in intention and 70% of the variance in follow-up cannabis behavior. Attitudes and injunctive norms were associated with intention, while intention was associated with follow-up cannabis behavior. In Model 2, the explained variance was 65% for intention and 72% for follow-up cannabis behavior. Similarly to Model 1, in Model 2 attitude and injunctive norm were associated with intention, while intention was associated with follow-up cannabis behavior. Moreover, in Model 2, there significant effects of past cannabis behavior on baseline habit, of baseline habit on follow-up habit, and of follow-up habit on follow-up behavior. Conclusions: Our findings may be useful to inform interventions aimed at minimizing the potential harms of cannabis use.

Cannabis Vaping and Perceived Harm: Exploring The Impact On Cannabis Use Frequency Among Young Adult Females

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Cannabis vaping is becoming an increasingly popular route of administration for cannabis, especially among youth and young adults. Despite the negative health consequences of cannabis vaping (e.g., e-cigarette or vaping associated lung injury [EVALI]), young adults continue to describe cannabis vaping as a safer and healthier

alternative to combustible forms of cannabis administration. Recent research supports that perceived risk of cannabis-related harms differs by route of administration using an emergency department sample of emerging adults. However, it is unknown how the perceived level of cannabis harm and use of cannabis vape devices influence cannabis use frequency. This study examined if cannabis vaping moderated the association between cannabis harm perceptions and past 30-day cannabis use frequency. A sample of 949 young adult females (18-25 years old; *M* age=24.33) who reported using cannabis at least weekly were recruited in February 2023 from Amazon Mechanical Turk for a larger study interested in examining cannabis attitudes and beliefs among sexual minority and heterosexual females. Premium qualifications were used to request participants who live in the United States and had an approval rating of 95% or higher. Participants were compensated $1 for completing the 12-15-minute survey. Participants reported on how many days they used cannabis and indicated if they vaped cannabis in the past 30-days. Participants also reported how harmful they believe cannabis is to their health (1=not at all harmful to 5=extremely harmful). A moderation analysis examined if past 30-day cannabis vaping (0=no, 1=yes) moderated the association between cannabis harm perceptions and past 30-day cannabis use frequency. On average, participants reported using cannabis on 12.93 days (*SD* = 7.47) and over a quarter of participants (25.9%) reported vaping cannabis in the past 30-days. Those who vaped cannabis used on more days (*M* = 14.37) than those who did not (*M* = 12.43; $p < .001$). Those who did not vape cannabis and who reported greater perceived harm to their health had higher levels of past 30-day cannabis use than those who did not vape cannabis with lower levels of perceived harm ($p = .015$). There were no differences for participants who reported vaping cannabis ($p = .881$). Results indicate that young adult females who have not vaped cannabis in the past 30-days experience a stronger association between cannabis harm perceptions and past 30-day cannabis use frequency. Participants who report cannabis use, but not cannabis vaping may have higher harm perceptions because they may be experiencing more health problems (e.g., bad cough, trouble catching breath) due to using combustible forms of cannabis administration (e.g., blunts). Regardless, participants reporting cannabis vaping are consuming cannabis more frequently, putting them at higher risk for poly-product use and cannabis use disorder. As such, those who vape cannabis remain an important group to target for interventions to reduce the negative health effects of use, such as EVALI and acute lung injury, and mitigate the harms of frequent cannabis use.

Gender Differences in Cannabis Use Frequency, Severity, and Consequences Among Trauma Survivors

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Medical and recreational cannabis use are increasing among trauma survivors, potentially as attempts to mitigate negative posttraumatic sequelae, including symptoms of posttraumatic stress disorder (PTSD). Though cannabis may acutely mitigate symptoms of PTSD, it may exacerbate PTSD symptoms over time and increase the likelihood of developing cannabis use disorder (CUD). Moreover, men and women trauma survivors differ in their likelihood of experiencing specific traumatic events; for instance, women are at greater risk for sexual violence than men, which confers greater risk for PTSD as compared to other trauma types (e.g., serious motor vehicle accidents, military combat, natural disasters). Prior research has also indicated that men are more likely to engage in cannabis use to cope with PTSD symptoms, as compared to women, who may use more adaptive coping strategies instead of using cannabis. Additional research is needed to further disentangle differences in cannabis use frequency, severity, and consequences among men and women trauma survivors. The current study used a multivariate analysis of variance (MANOVA) controlling for PTSD severity to investigate differences between college men (n = 44) and women (n = 114) trauma survivors' cannabis use frequency (average days per week), cannabis use severity (Cannabis Use Disorder Identification Test scores; CUDIT), combined alcohol and cannabis severity (i.e., co-use; a composite score of the CUDIT and Alcohol Use Disorder Identification Test), and cannabis-related consequences (Short Inventory of Problems - Revised; modified to assess cannabis use). Men in the sample most commonly reported transportation accidents (55.2%) and physical assault (36.8%) as traumatic events. Women also commonly reported transportation accidents (57.9%), as well as sexual assault (40.5%) and other unwanted sexual experiences (60.8%). MANOVA results indicated that men reported significantly higher cannabis use frequency (M = 3.86, SD = 2.82) than women (M = 2.60, SD = 2.66; F = 7.32, p = .008), higher CUDIT scores (M = 6.70, SD = 5.70) than women (M = 4.22, SD = 4.29; F = 8.98, p = .003), higher co-use severity (M = 13.59, SD = 6.26) than women (M = 9.82, SD = 6.21; F = 14.27, p < .001), and more cannabis-related consequences (M = 5.00, SD = 7.30) than women (M = 2.92, SD = 5.10; F = 5.94, p = .02). PTSD emerged as a significant covariate in the model for co-use severity and cannabis use consequences, but not for cannabis use frequency or severity. Findings suggest that although women may endorse severe types of trauma, women trauma survivors may be less likely to engage in hazardous cannabis use than men trauma survivors. Thus, there is a pronounced need for consistent screening practices for cannabis use and probable CUD diagnoses among men trauma survivors in particular across clinical settings. In addition, PTSD may perpetuate alcohol and cannabis co-use

severity and cannabis consequences, suggesting integrative interventions (e.g., trauma-focused components within substance use interventions) may attenuate negative cannabis use-related outcomes among trauma survivors, especially for men.

Mindfulness Profiles and Substance Use Outcomes Among College Students

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Marijuana continues to be one of the most prevalent and heavily endorsed substances on college campuses today (Johnston et al., 2022). Marijuana is associated with negative consequences such as driving under the influence, aggressive behavior (i.e., physical fights, property damage), missing schoolwork, and trouble sleeping (Bravo et al., 2019; Jackson et al., 2020). One protective factor that has been identified to lower problematic marijuana use among this at-risk population is mindfulness. Though studies have found links between mindfulness and lower marijuana use and consequences, research on their relationships heavily relies on variable-centered statistical approaches (e.g., multiple regression, factor analysis, structural equation modeling). However, variable-centered approaches tend to only examine associations between a single mindfulness facet and related outcomes, and they assume that samples represent a homogenous population. Within the mindfulness literature, several studies have used latent profile analyses (LPA; a person-centered approach that identifies distinct homogenous subgroups within a population based on continuous indicators, Collins & Lanza, 2009) to identify subpopulations of individuals on mindfulness facets. Prior research has found strong relationships between mindfulness profiles and psychological health outcomes such as well-being, self-regulation, and attachment (e.g., Bravo et al., 2016). However, research on whether mindfulness profiles differ on marijuana use outcomes is limited. The present study identified distinct profiles of trait mindfulness among 771 college students (66.8% female; 75.7% white, non-Hispanic) who endorsed using marijuana in the past 30 days and completed the Five Facet Mindfulness Questionnaire (Baer et al., 2006). A Lo-Mendell-Rubin adjusted likelihood ratio test and BCH method test on Mplus 8.8 was used to determine the number of latent classes and to test the equality of means across the latent classes on marijuana outcomes. LPA results revealed four distinct mindfulness profiles: non-judgmentally aware (n = 92; 11.93%), judgmentally observing (n = 130; 16.86%), low mindfulness (n = 450; 58.37%), and high mindfulness (n = 99; 12.84%). The non-judgmentally aware group were high on non-judging of inner experience (z = 1.38) and acting with awareness (z = 1.42), but very low on the observing facet of mindfulness (z = −1.71). The judgmentally observing group were the highest on observing (z = 1.04), but very low on non-judging of inner experience (z = −1.76) and acting with awareness (z = −1.42). The low mindfulness group were relatively low on every facet of mindfulness

(−0.30<*z*s<.04). Finally, the high mindfulness group were moderately high on all facets of mindfulness (0.67<*z*s<1.49). In examining mean differences, we generally found that the high mindfulness and non-judgmentally aware groups had the most adaptive marijuana outcomes (i.e., lower marijuana-related problems, CUD symptoms, and social, coping, conformity, and expansion motivations) and did not differ from each other except on expansion motives (higher for the high mindfulness group). In contrast, the judgmentally observing group had the most maladaptive marijuana outcomes (i.e., higher marijuana-related problems, CUD symptoms, and social, coping, conformity, and expansion motives to use marijuana). The low mindfulness group typically endorsed greater marijuana outcomes than the high mindfulness and non-judgmentally aware groups. These findings suggest that future mindfulness-based interventions targeting problematic marijuana use in college students should consider these mindfulness profiles to improve the efficacy of such interventions.

Characterization of The Salivary Metabolome From Cannabis And Tobacco Users: Biochemical Insights to Drug Dependence Risk

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Cannabis and nicotine are two of the most widely used drugs of abuse globally, posing significant harms from smoke exposures, especially from co-use, including chronic disease burden and/or cognitive impairment. Current methods for the assessment of nicotine or cannabis dependence rely on standardized questionnaires, such as the Fagerstrom Test for Nicotine Dependence (FTND), and the Cannabis Use Disorder Identification Test (CUDIT), which are prone to bias and misreporting. There is a need for a more objective and non-invasive approach for the assessment of polysubstance use and drug dependence which can exacerbate mental health conditions particularly among high-risk patients. Herein, we introduce a comprehensive approach to characterize the salivary metabolome from a diverse group of participants recruited for a psychosocial stress study (35% with diagnosed psychiatric co-morbidities) divided into cohorts of self-reported never smokers (n=11, 27.3:72.7 M:F, avg Age 32, avg BMI 24.9), cannabis only (n=34, 50:50 M:F, avg Age 39.9, avg BMI 26.4) and mixed cannabis and tobacco users (n=17, 42:58 M:F, avg Age 36.2, avg BMI 25.5). We verify smoking status and assess drug dependence risk when

compared to self-reports, including the impact of substance co-use (30% reporting mixed use). Metabolomics is an emerging field in functional genomics which encompasses the analysis of low molecular weight metabolites in complex biological samples, including exogenous compounds from environmental exposures. Previous reports have proposed that the salivary metabolome may provide unique insights into behavioral responses to psychological stress using a convenient non-invasive biofluid. A targeted and nontargeted analysis of metabolites from unstimulated saliva samples was performed using capillary electrophoresis-mass spectrometry (CE-MS) and liquid chromatography-mass spectrometry (LC-MS) under positive and negative ionization modes with full-scan data acquisition. Multivariate and univariate statistical analyses of diluted saliva filtrate resulted in the identification of biomarkers associated with smoking status when comparing self-reported non-smokers, cannabis only and mixed cannabis-tobacco users. Salivary nicotine, thiocyanate, cotinine, nornicotine and myosine were investigated as biomarkers of tobacco smoke exposure when comparing cannabis-tobacco users with cannabis only participants and non-smokers. Salivary nicotine was used as an unambiguous marker of tobacco smoking and helped identify non-smoker and cannabis users who self-reported as non-tobacco smokers. Furthermore, risk assessment for nicotine dependence was evaluated by correlating salivary nicotine concentrations with self-reported nicotine dependence scores. Work is underway to confirm cannabis users by measuring salivary phytocannabinoid content, including cannabidiol, Δ9-tetrahydrocannabinol, and related metabolites, which will be compared to self-reported modes of consumption and cannabis use dependence scores. Lastly, the differential impact of drug use patterns on salivary metabolome profiles will be explored to better understand the deleterious effects of mixed cannabis and tobacco use, as well as specific cannabis use patterns. This work provides a timely study which will contribute new biochemical insights into drug dependence and health risks relevant to vulnerable Canadian adults, co-morbid with a high prevalence of mental health conditions, in an era of recreational cannabis legalization.

Disparities in Blunt Use at the Intersection of Multiple Social Identities Among US Adults

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Background: Blunts – cigars with the tobacco filling replaced or mixed with cannabis – incur greater potential health risks than other forms of cannabis due to exposure to additive health harms of tobacco and cannabis and disparate patterns of use in certain subgroups. Blunts are primarily used by populations who suffer disproportionately from tobacco-attributable death and disease in the US, such as people with low income and who experience mental health conditions. Blunts are chiefly used by people who identify as Black/African American (B/AA); therefore, B/AAs are at greatest risk for the health effects of blunt use. Additionally, B/AAs who belong to more than one group susceptible to blunt use may be at increased risk for harm. Applying an intersectionality lens, the objective of this study was to describe patterns of blunt use among US adults with multiple identities associated with greater risk for health disparities. Methods: Using nationally representative data on US adults (N = 30,516) from Wave 6 (2021) of the Population Assessment of Tobacco and Health (PATH) Study, we assessed the association between current blunt use (smoke any type of cigars only as blunts every day or some days) and race (B/AA vs. non-B/AA) + mental health (past-year symptoms of internalizing and externalizing disorders) and socioeconomic status (past-year receipt of public financial assistance). Population and replicate weights were used to adjust for complex study design characteristics. Separate multivariable logistic regression models assessed differences in combined intersectional positions on blunt use, stratified by age (young adults [YAs] 18-34 vs. adults 35+ years). Reference categories included those with joint advantage (non-B/AA + no or low (1-3) internalizing/externalizing symptoms; non-B/AA + no public financial assistance). Results: 8.4% of YAs and 1.4% of adults 35+ reported current use of blunts in 2021. Identifying as B/AA, having 4+ symptoms of internalizing and/or externalizing disorders, and receiving public financial assistance were all independently significantly associated with increased odds of current blunt use across age groups (ps < 0.05). The magnitude of the effect of identifying as B/AA or receiving public assistance on blunt use was greater among adults 35+ years (B/AA: aOR = 4.57, 95% CI = 3.58-5.84; assistance: aOR = 2.59, 95% CI = 1.91-3.50) than among YAs (B/AA: aOR = 2.09, 95% CI = 1.80-2.43; assistance: aOR = 1.41, 95% CI = 1.20-1.64). Compared with the joint advantage groups, those identifying as B/AA who received public assistance (YAs: aOR = 3.08, 95% CI = 2.36-4.03; adults 35+: aOR = 11.21, 95% CI = 7.78-16.16) and those identifying as B/AA and reporting internalizing symptoms (YAs: aOR = 3.50, 95% CI = 2.68-4.57; 35+: aOR = 5.18, 95% CI = 2.88, 9.32) or externalizing symptoms (YAs: aOR = 2.86, 95% CI = 2.02-4.05; 35+: aOR = 6.12, 95% CI = 3.28-11.42) all had greater odds of using blunts. Conclusions: A greater proportion of B/AA adults who either received financial assistance or experienced mental health conditions reported currently using blunts than jointly advantaged groups. While the magnitude of some disparities may be

greater among older adults, disparities persist across ages, and blunt use is highest among YAs. Findings emphasize the importance of examining how multiple social identities intersect and shape blunt use patterns among US adults. Intersectionality-informed interventions to reduce blunt use could improve health equity.

Effects of an Adult-Use Cannabis Law on Blunt and Other Cannabis Use in New Jersey Young Adults

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Background: Growing evidence suggests that cannabis laws are followed by no change or small increases in cannabis use among young adults (YAs) following implementation of cannabis laws. Few studies have assessed the impact of adult-use cannabis laws following full implementation - after retail outlets have opened. In addition, no studies have assessed the impact of these laws on use of blunts - cigars with the tobacco filling replaced or mixed with cannabis. In New Jersey (NJ; United States), adult-use cannabis became legal in February 2021, and retail outlets opened in April 2022. The objective of this study was to assess the impact of adult-use cannabis retail outlets opening in NJ on any cannabis use by YAs and by type of cannabis use, including use of blunts. Methods: Using data on NJ YAs (18-23 years) from the Policy Communication and Evaluation (PACE) NJ Study, we compared the prevalence of ever and past 30-day use of cannabis, specific cannabis sub-types (dried flower, edibles, oral capsules/drops, vaping, drinks, concentrates, hash, tinctures, and topicals), and blunt use (smoked a cigar every day or some days and reported using cigars "to smoke marijuana (i.e., as blunts)") before (Waves 1-3 [March/June 2021 to October/November 2021], n = 1,439) and after (Wave 4 [June/July 2022], n = 1,127) cannabis adult-use retail outlets opened. Separate logistic regression models, controlling for race/ethnicity and income, assessed differences in pre-(reference) and post-retail sales for each outcome of interest. We explored moderation by age due to the legal age of sale (<21 vs. 21+). Results: Ever and past 30-day cannabis use among NJ

YAs was higher in the post-retail sales period than pre-policy period (ever: 56.5% vs. 46.4%, $p < 0.001$; past 30-day: 24.7% vs. 21.4%, $p = 0.039$). In regression models, the odds of ever cannabis use were 51% higher (95% CI = 30%-76%) and past 30-day use 20% higher (95% CI = 0%-43%) in the post-retail period. By type, ever use of dried flower (post vs. pre: 43.0% vs. 36.1%; aOR = 1.35; 95% CI = 1.16-1.58), ever edible use (post vs. pre: 44.2% vs. 34.2%; aOR = 1.54; 95% CI = 1.32-1.79), and past 30-day edible use (post vs. pre: 11.2% vs. 8.5%, $p = 0.015$; aOR = 1.34; 95% CI = 1.05-1.71) were higher in the post-retail sales period, while the use of other product types did not differ. There was also no difference between the prevalence of pre- (3.9%) and post- (3.4%) retail sales period blunt use (aOR = 0.87; 95% CI = [0.57-1.35]). For all pre/post differences, moderation analyses revealed greater effect sizes among those aged 21+ years compared to those <21 years. Conclusions: Ever and past 30-day cannabis use increased among NJ YAs in the three months after adult-use cannabis retail outlets opened, with greater odds of using cannabis edibles and dried flower. Blunt use remained low over both timepoints; sample characteristics or measurement of blunt use may underestimate prevalence or mask changes. Although increases were seen among all YAs, they were greatest among those of legal age to purchase cannabis. Continued monitoring of cannabis use and heterogeneity across product types will be needed over longer follow-up periods in NJ and other states legalizing

Tripping on Weed: A Pilot Study for Understanding Cannabis and Hallucinogen Co-use

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While research on the co-use of cannabis with other substances, such as alcohol and tobacco, has helped illuminate the complexity of use outcomes for each substance, there is little to no research examining the co-use of cannabis and hallucinogens. With changing legislation in Oregon and Colorado and bills being entertained in Massachusetts and Kentucky, legal access to hallucinogens for recreational and medicinal use is increasing. Oregon and Colorado have already legalized recreational use of both cannabis and psilocybin, opening the door to legal co-use of both substances. Currently, researchers and clinicians are unable to make evidenced-based recommendations regarding co-use, as there are no existing definitions of what might constitute problematic co-use and there is scant research examining potential contraindications of cannabis and psilocybin. Our aim in the present study was to begin to understand the effects of co-use of cannabis and psilocybin. We recruited 419 participants from Reddit.com to complete anonymous, self-report surveys pertaining to psilocybin use metrics, use benefits, and undesirable use consequences. One participant was excluded due to failing attention checks.

We used quasi-Poisson count regression on the remaining data (N = 418) to explore whether co-use of psilocybin and cannabis impact one's likelihood of experiencing beneficial or undesirable consequences from their psilocybin use. Co-use was determined by asking participants to indicate from a list which substances they used/ used to use at the same time as psilocybin. Undesirable and beneficial use outcomes were determined with scales developed for this study. Results indicated that co-use of psilocybin and cannabis was associated with a higher incidence of experiencing undesirable psilocybin use consequences (IRR = 1.25, p = .02) when compared to the number of negative use consequences reported by those who did not endorse cannabis and psilocybin co-use. Interestingly, we also observed that psilocybin and cannabis co-use was associated with more psilocybin use benefits when compared to the positive use outcomes reported by participants who did not endorse cannabis and psilocybin co-use (IRR = 1.07, p < .001). That those who engage in co-use indicate benefit from this co-use may also indicate the potential for increasing rates co-use of these substances as legislation in States across the United States continues to evolve. More research is needed to better understand the relationships between cannabis use, psilocybin use, their concurrent use, and what strategies people might use to minimize their risk of experiencing negative use outcomes while maximizing their likelihood of experiencing use benefits.

Cannabis Use in Parkinson's Disease: Patient Access to Medical Cannabis and Physician Perspective on Product Safety

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The rate of medical cannabis use has increased in parallel with the number of states legalizing its use. Parkinson's disease (PD) patients are of particular concern due to their higher cannabis use rate than in the general US population (25-40% PD patient cannabis users vs. ~18% in the general population), as well as their susceptibility to environmental contaminants in cannabis, including pesticides, toxic elements, solvents, microbes, and mycotoxins. In order to address the complex nature of this industry, we examined the changes in PD-related qualifying conditions in the U.S. from 2019 to 2023. We also conducted an online survey to gain insight into the knowledge, risk perceptions, and opinions regarding medical cannabis and contamination issues from physicians who treated PD

patients. The number of states including PD-related qualifying conditions increased over the past 5 years from 28 to 36 states. These conditions included PD (increasing from 14 to 16 states), muscle spasms (14 to 24), anxiety (1 to 5), and pain (17 to 35). State-by-state comparisons revealed high variability in the language used to describe the different qualifying conditions. Online surveys were sent out to 45 neurologists and movement disorder specialists who primarily treated PD patients. The response rate was 44% from nine states (AZ, CA, FL, MA, MN, WI, PA, IL, and NM). When asked if they were aware of any contaminants in cannabis products, we found that 67% of the physicians were unaware of any contaminants commonly found in cannabis and only 22%, 11%, and 11% of them were aware of pesticide, toxic element, and solvent contaminants, respectively. In their free-text opinion response on future policy changes to reduce the health risk of contaminant issues, "lack of regulation" and "comorbidities and PD prognosis" were identified as the two most common themes (15% for both). These results point to the need for further regulatory deliberation regarding risks and susceptibility to cannabis contaminants. Additionally, education is needed to inform physicians on cannabis safety issues. Further research will identify the implementation strategies to reduce contaminant exposure and protect patient health.

Making Sense of Population Trends in Adolescent Cannabis Use and Emotional Concerns: Strengthening, Staying the Same, or Weakening?

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Background: Across high-income countries, adolescent emotional concerns (e.g., depression, anxiety, distress, and suicidality) have starkly increased while common substance use (e.g., alcohol, cannabis, and smoking) has generally declined. It is unclear if and how these population trends are related to one another, including how the co-occurrence of these concerns has been changing over time. Methods: First, we developed the InterSECT Framework, a data- and youth-driven approach to explore the intersection between trends in substance use and emotional concerns. Second, applying this framework, we employed weighted Poisson regression with robust standard errors to examine joint trends in psychological distress (as measured with the Kessler-6) and past month cannabis use using repeated representative surveys of grade 7-12

students across Ontario, Canada from 2013-2019. Results: The framework presents three hypotheses including strengthening of co-occurrence or the "hardening" hypothesis, staying the same or the "consistency" hypothesis, and weakening or the "decoupling" hypothesis. Six existing studies from the US, UK, and Norway (covering trends between 2002 and 2018) have shown mixed results with respect to temporal trends in co-occurring cannabis use and emotional concerns among adolescents; two found strengthening, three consistency, and one weakening of associations over time. In Ontario, psychological distress approximately doubled while the prevalence of cannabis remained relatively stable during the observation period. Analysis of Ontario data provided further support for the consistency hypothesis. Notably, there was a consistent positive relationship between psychological distress and cannabis use over time, with these rates higher for elementary compared to secondary students (PR_elem = 2.68 [99% confidence interval 1.71-4.19]; PR_sec = 1.35 [99% confidence interval 1.17-1.57]). Conclusion: The InterSECT Framework seeks to guide the conceptualization, evaluation, and understanding of changes in the co-occurrence of substance use and emotional concerns over time, including outlining a research agenda informed by pre-existing research and youth perspectives. Applying this framework to examine trends in Ontario students, the magnitude of recent increases in psychological distress appears to be similar for adolescents who do and do not use cannabis use. However, cannabis use remains important to assess and address alongside distress. Further work is needed to replicate and identify the mechanisms driving these trends over time.

Guiding Cannabis Researchers and Regulators Through Complex Industry Testing Standards and Data

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Background: Cannabis is illegal at the federal level, hindering federal research and best regulatory practices. This leaves a heterogenous patchwork of policies nation-wide, including testing, whose safety effects are unknown. Massachusetts (MA) has implemented public cannabis industry testing guidance and data. MA tracks industry data via an inventory control system ("seed-to-sale") platform, where extensive procedural knowledge is required to extract and clean the data for use in research to evaluate product safety. This poster will present MA potency and microbial testing data to illustrate how industry data may be used to assess safety, with a focus on testing data validity and reliability, and summarize recommendations for academic researchers who seek to analyze state testing data. Methods:

Data included four test types: Δ-9 THC %, THCA %, Total THC %, and Total Yeast and Mold (TYM; reported in colony-forming units per gram or cfu/g). We computed descriptive statistics for Total THC and TYM in R version 4.3.0, using 'dplyr' (1.1.4) for descriptive statistics, 'ggplot2' (3.4.4) for plots, and base package 'stats' for statistical tests. We removed all identifiable "nulls" - placeholder results entered to satisfy the system's upload requirement. We computed a Pearson correlation coefficient to evaluate change in Total THC potency from April 2021 to December 2023. We calculated Total THC using the formula THC + (0.877*THCA), as recently mandated by MA's regulatory agency. We calculated the TYM fail rate as the percentage of results greater than the MA allowable limit of 10,000 cfu/g. We generated histograms of Total THC and TYM results for each licensed Independent Testing Lab (ITL) to visually inspect the distributions for anomalies or discontinuities. Results: Total THC trended upward from April 2021 to December 2023 ($r(108{,}568)=0.33$; $p<.001$). Total THC calculation varied: 44% of reported results matched the formula now mandated in MA, while 47% of results matched the formula THC + THCA, and most ITLs appeared to use both formulas. The overall TYM fail rate was 8.48%, ranging by ITL from 0.00% to 14.85%. 68.11% of TYM results were exactly 0 cfu/g, and histograms showed lone spikes at 0 cfu/g for some ITLs, indicating that many unidentified nulls remain. Histograms also showed procedural variation in reporting TYM results, with some ITLs reporting failing results accurate to 500 or 1000 cfu/g, or reporting all passing results as 0 cfu/g. Conclusions: The upward trend in Total THC could reflect increasing potency in the industry overall, but may have other explanations. The range of TYM fail rates and unusual data distributions indicate variation in data reporting standards by ITLs, complicating the validity and reliability of these metrics, and their analytic comparisons. These issues reflect the complexity of the testing data gathered by state regulators for use in research. Creating a safe cannabis industry is a constantly evolving landscape. Without federal oversight, it is critical for stakeholders to comprehensively assess testing protocols and data management to rectify issues as they arise, and for states to provide guidance for using data so safety can be assessed and standardized.

The Impact of Cannabis on Psychosis Among Young people in Black Racialized Communities: Fostering Awareness Through Knowledge Translation Video Games

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Background: Three times a week or more use of cannabis is widely known as a significant risk factor for subsequent psychosis among people under age 20. However, very few strategies exist that translate these research findings in an accessible way for young people. Evidence from pilot studies suggests that youth from Black African and Caribbean communities may experience mental health inequities related to psychosis and could benefit from tailored education about cannabis risk (Archie et al., 2022). Purpose: The purpose of this study is to raise awareness about the consequences of choices involving cannabis use with a knowledge translation (KT) product designed for young people, the Back to Reality Videogame SERIES. The study aims to conceptualize what young people with early-phase psychosis/cannabis use disorder understand about the relationship between cannabis and psychosis, focusing on people from racialized backgrounds. Methods: Participants aged 16-30 years with a first episode of psychosis and cannabis use disorder of Black African, Black Caribbean, and any ethnicity were recruited from early intervention psychosis programs in Ontario. Using a mixed methods design, participants were randomized to play either the KT videogame or a control videogame condition. Participants underwent three individual interviews: 1) to obtain demographic and clinical data, 2) to explore their perspectives on the relationship between cannabis and psychosis, and 3) after playing the video game to assess their knowledge, perspectives, and attitudes about cannabis and psychosis. Next, participants completed a quiz measuring factual knowledge about the impact of cannabis on psychosis and then played whichever game remained. The transcriptions of the qualitative data collected during visits 2 and 3 were subjected to thematic analysis. The quiz scores were statistically analyzed for significant differences based on whether the KT or control video game was played first. Results in Progress: The expected outcome of this study is knowledge acquisition about cannabis and psychosis after playing the KT series. The interview data collected before and after using the KT product will be interpreted using thematic analysis. Preliminary quantitative findings from two previous pilot studies (n=10 young adults with first episode psychosis, and n=55 homeless youth) yielded significant improvements in mean quiz scores pre versus post playing the KT product with at least 18% improvement ($p<.01$, $p<.05$). It is hypothesized that there will be significant differences in participants' understanding of the emotional, social, and mental health impacts of ongoing cannabis use on early episodes of psychosis after playing the KT game compared to the control game. Conclusion: To the best of our knowledge, this is the first study in Canada to investigate the intersection of racial identity, gender, psychosis, and cannabis use, and the impact on the lives of young people with FEP and Cannabis Use Disorder from Black racialized communities. The SERIES may enable future studies

addressing awareness, access, and engagement of young people from traditionally marginalized communities.

Youth Cannabis Use in Canada Post-Legalization: Recommendations from Youth, Parents, and Service Providers

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Background: Canada has one of the highest global prevalences of cannabis use, with the highest rates among young adults aged 20-24 (50%) and youth aged 16-19 (37%). One of the objectives of the Cannabis Act was to protect young people by restricting their access, but youth and young adult cannabis rates have not declined, and young people report that cannabis is easily accessible. Cannabis use among youth is associated with several adverse effects, including an increase in emergency department visits for cannabis-related injuries since its legalization. Research on youth cannabis use since its legalization in Canada remains limited, with a notable scarcity of qualitative studies, an overrepresentation of secondary data analysis across numerous studies, and a lack of studies that incorporate the voices of youth, parents, and/or service providers. This study aims to fill some of these gaps by exploring the perceptions of youth, parents, and service providers regarding youth cannabis use in Canada since its legalization, along with their recommendations for policies, services, training, and education. Methods: This qualitative study used a community-based participatory research approach, in partnership with Families for Addiction Recovery (FAR) - a national charity founded by parents of youth with addiction issues. Virtual semi-structured interviews were conducted, and the data were analyzed using thematic analysis. The sample included 88 participants (n = 31 youth, n = 26 parents, n = 31 service providers). Results: Participants from all three groups made the following recommendations: (1) increase education about cannabis and the risks of youth cannabis use, (2) enhance training for service providers on how to more effectively screen, assess, and intervene with youth using cannabis and their families, (3) reduce access to cannabis for youth and young adults, (4) provide accessible and available public services for youth who are using cannabis, and (5) involve families and caregivers of youth using cannabis in service provision and policy decisions. Conclusions: Our findings align with the recent recommendations of an Expert Panel appointed by the government for a legislative review of cannabis legalization. The panel emphasized the critical need for a public health approach, including strategies to reduce cannabis use among youth and young adults (Health Canada, 2024). Moreover, our study shows that the perspectives and recommendations of our three stakeholder groups – parents, youth, and service providers – are notably similar. Moving forward, it is crucial that their voices are integrated into policy development, practice, and further research to ensure that youth are adequately protected.

Knowledge and Beliefs About Blunts Among Youth in the US

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Introduction: Blunts (i.e., cannabis rolled in cigar paper with or without tobacco) have become a popular way of consuming cannabis among youth in the US. Blunts can expose people to nicotine through the cigar wrapper and could lead to nicotine addiction, cannabis dependence, and use of other tobacco products. Little survey research has examined knowledge and beliefs about blunts, especially among youth, or examined their associations with demographic characteristics, cigar use, and blunt use. Methods: Participants were a convenience sample of $N = 506$ US youth (ages 15-20) recruited April-June 2023 through Qualtrics who reported ever using little cigars or cigarillos (LCCs), past 30-day use of LCCs, or susceptibility to using LCCs. We used adjusted logistic and ordinal regression models to examine correlates of knowledge that blunts contain nicotine and, separately, relative addiction/harm perceptions for blunts vs. unmodified cigars. Results: One-third of youth (32.1%) thought that blunts do not contain nicotine, and 25.7% were not sure. Around half of youth thought that blunts were "much less" or "slightly less" addictive (45.0%) and "much less" or "slightly less" harmful (51.5%) than cigars containing only tobacco. Youth who identified as Black/African American had lower odds (relative to those identifying as white) of knowledge that blunts contain nicotine (aOR = 0.51, 95% CI = 0.30, 0.87). Youth who frequently used blunts were less likely to report that blunts were more addictive (aOR = 0.39; 95% CI = 0.24, 0.63) and harmful (aOR = 0.31; 95% CI = 0.19, 0.52 (vs. unmodified cigars) compared with youth who never used blunts. Conclusions: Our study with a sample of US youth – who have used or are susceptible to using LCCs – found that about 1 in 3 participants did not know that blunts contain nicotine, and many believed blunts were less harmful and addictive than unmodified cigars that only contain tobacco.

Associations Between Affect and Simultaneous Use of Alcohol and Cannabis in Young Adults: The Role of Depression, Anxiety, and Stress

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Background: Young adults frequently use alcohol and cannabis at the same time (i.e., simultaneous alcohol and cannabis use), which is associated with greater harms than using alcohol or cannabis alone. Affect plays a key role in motivating substance use; however, there has been relatively little research investigating how positive and negative affect relate to simultaneous alcohol and cannabis use. Further, individuals who experience symptoms of depression, anxiety, or stress may be more likely to engage in simultaneous use to cope with negative affect, but whether the relationship between affect and simultaneous use is stronger for those with elevated depression, anxiety, or stress symptoms requires further study. Accordingly, this study aimed to investigate (1) the role of typical positive and negative affect, as well as positive and negative affect variability, in simultaneous alcohol and cannabis use, and (2) whether these associations were moderated by symptoms of depression, anxiety, and stress. Methods: 144 young adults (*M*age = 22.08, age range = 19-25, 65% female) completed daily surveys for 21 days assessing morning affect (positive and negative mood), as well as their alcohol use, cannabis use, and simultaneous use during the previous day. Participants also completed the Depression, Anxiety, and Stress Scale (DASS-21; Lovibond & Lovibond, 1995) at baseline. Positive and negative affect ratings were averaged across days for each participant, and affect variability was calculated as the standard deviation of affect ratings across days for each participant. Frequency of simultaneous use was derived by summing the number of simultaneous use days for each participant. Multiple linear regression analyses assessed the associations of typical morning positive and negative affect (in one model), and positive and negative affect variability (in another model), with the frequency of simultaneous use, controlling for the number of daily morning surveys completed. Depression, anxiety, and stress were entered separately into models as moderators. Results: Typical morning positive affect (B = 1.01, SE = 0.40, p = .013) was significantly associated with greater frequency of simultaneous alcohol and cannabis use, while typical morning negative affect (B = 0.04, SE = 0.43, p = .94), negative affect variability (B = -0.31, SE = 0.98, p = .75), and positive affect variability (B = 1.40, SE = 1.24, p = .26) were not. No interactions between symptom and affect variables were statistically significant (all p > .05), so these interactions were trimmed from models. Regarding main effects, higher levels of depression (B = 0.23, SE = 0.06, p < .001), anxiety (B = 0.30, SE = 0.08, p < .001), and stress (B = 0.23, SE = 0.07, p < .001) were all associated with greater frequency of simultaneous use (controlling for typical morning positive and negative affect). These main effects of symptom measures were also observed in models controlling for morning affect variability (all p < .01).

Conclusions: Findings indicate that while depression, anxiety, and stress symptoms do relate to frequency of simultaneous use, typical morning negative affect does not. Instead, typical morning positive affect appears to play a unique role in simultaneous use. Findings suggest that harm reduction interventions for simultaneous use may benefit from focusing on the role of positive affect and mood/anxiety-related symptoms in simultaneous use. As this study assessed only morning affect, future research should explore momentary associations between affect and simultaneous use.

Demography and Health History of Dogs with Cannabidiol and Hemp Use in the Dog Aging Project

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One of the biggest challenges of being a pet owner is when a companion animal experiences pain or discomfort, whether from disease, injury, or age. The quest of owners to provide relief for their pets has led to the use of myriad over-the-counter remedies, some with more research support than others. In particular, the increasing accessibility of cannabis-related products for dogs, such as cannabidiol (CBD) and hemp-derived products, has attracted the interest of pet owners for treating diseases like arthritis and dementia; addressing behavioral problems like anxiety and aggression; and relieving pain caused by injuries and age. Currently, little is known about how often, or for what reasons, companion dogs receive CBD or hemp products. Here, we present survey data from the Dog Aging Project (DAP), an open science initiative that has collected data from dog owners in the U.S. since 2018. We identified 1,533 dogs (out of 18,541 dogs, or 8.3%) that were given CBD and hemp products. Most products were used as a daily supplement (76.5%), followed by non-frequent supplement (23.5%) and non-prescription medication (17.3%) with some overlap. West Virginia had the highest percentage of dogs using CBD and hemp at 14.0% (8/57), with Hawaii a close second at 13.9% (11/79). The Dachshund and Poodle breeds had the highest and lowest reported usage (9.7% and 4.4%; 22/226 and 15/338), respectively, from the ten most common purebred dogs in the DAP. When both purebred and primary breed data were combined, the breed with the highest and lowest percent of dogs using CBD and hemp in the top 10 breeds were American Pitbull Terriers and Poodle, respectively, at 11.9% and 5.7% (56/472 and 46/814). A higher percentage of mature and senior dogs (i.e., > 6 years old; 10.1%) was reported to use CBD and hemp than

young dogs (< 6 years old; 5.5%), and a slightly higher percentage of male than female dogs (8.6% vs 8.0%). 9,898 dogs 6 years and older completed the Canine Social and Learned Behavior survey between 3 months prior and 1 year after data on CBD and hemp use were collected. Dogs with CBD or hemp use had slightly higher (worse) scores, on average (38 ± 6.5 vs. 36 ± 5.1 on a scale from 16 to 80). They were also more likely to have arthritis (22% vs. 13%), suggesting that cognitive decline and arthritis are reasons owners may give their dogs CBD or hemp products. Further analyses of longitudinal data will evaluate associations between extended CBD and hemp use and dementia-related behaviors, such as aggression, non-cognitive aspects of dementia, and cognitive aspects of dementia.

Latent Class Analysis of Cannabis Use Characteristics and Associations With Problematic Use Outcomes, Quitting-Related Factors, and Mental Health Among US Young Adults

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Objective: Given the changes in cannabis use trends (use frequency, product types, modes of use), this study examined latent classes of young adults based on cannabis use characteristics, and use-related outcomes. Methods: We analyzed 2023 survey data among 4,031 young adults (ages 18-34) across the US. Latent class analysis (LCA) identified cannabis use classes among those reporting past-month use, using: days of use (1-5 days [36.0%], 6-20 [31.8%], 21-30 [32.3%]), use/day (1 time/day [27.8%], 2-4 [40.8%], ≥5 [31.4%]), and use modes (herb [56.0%], edibles [16.4%], oils [20.3%], concentrates/other [7.3%]). Multivariable regressions examined: 1) sociodemographics and state non-medical law in relation to: a) any vs. no past-month use; and b) use class among those reporting use; and 2) use class in relation to problematic use, quitting-related factors, and mental health. Results: In this sample (*M* age = 26.29, *SD* = 4.81, 59.4% female, 27.4% sexual minority, 19.0% Hispanic, 13.5% Black, 13.6% Asian), 48.8% reported past-month cannabis use. In multivariable analyses, those reporting past-month use (vs. no) were older and more likely in legalized states, male, sexual minority, Black (vs. white), white (vs. Asian), employed full-time (vs. students), urban (vs. rural), cohabitating (vs. single/other), and parents. Among those reporting past-

month use, LCA identified 4 use classes: 1) 'infrequent' (41.4%), primarily using herb and edibles; 2) 'frequent' (16.8%), primarily using herb; 3) 'moderate-herb' (28.0%), primarily using herb; and 4) 'moderate-oil/other' (13.8%), primarily using oils or other forms. Multinomial logistic regression analyses characterized differences in sociodemographic factors among all classes. First, all other classes were compared to the 'infrequent' use class (referent): other classes were more likely Black (vs. white), less likely college-educated, and more likely parents; 'frequent' and 'moderate-herb' classes were older and more likely male, non-Asian, and cohabitating (vs. single/other); 'frequent' was less likely employed part-time or students (vs. employed full-time) and single/other (vs. married); and 'moderate-oil/other' was less likely to live in suburban or urban settings (vs. rural). Compared to the 'moderate herb' class: the 'frequent' class was less educated and more likely employed part-time (vs. full-time) and suburban; the 'moderate oil/other' class was more educated and less likely unemployed (vs. full-time), suburban or urban (vs. rural), and single/other (vs. cohabitating). Compared to the 'frequent' class, the 'moderate-oil/other' class was younger and more likely straight, Asian (vs. White), college-educated, employed part-time or students (vs. employed full-time), and single/other (vs. cohabitating). In multivariable analyses, compared to the 'moderate-herb' class (referent): 'frequent' reported less problematic use, and 'moderate-oil/other' reported greater; 'infrequent' was less likely to drive after cannabis use and after cannabis and alcohol use while 'frequent' and 'moderate-oil/other' were more likely to drive after cannabis and alcohol use; 'moderate-oil/other' reported higher importance of quitting; 'frequent' and 'moderate-oil/other' reported lower confidence to quit while 'infrequent' reported higher; and 'infrequent' reported lower mental health symptoms while 'moderate-oil/other' reported more. Other comparisons showed no differences. Conclusions: Frequent and moderate cannabis use, particularly of oils and concentrates, may increase risk for mental health symptoms and problematic use, and reduce confidence to quit. Thus, addressing and preventing such use patterns is crucial.

Derived Psychoactive Cannabis Use Among a National Sample of US Young Adults

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Objective: Considering the swift growth of the derived psychoactive cannabis product (DPCP) market, this study examined perceptions, usage, and associated factors of DPCP among young adults across the US. Methods. We analyzed 2023 survey data among 4,031 young adults (ages 18-34) across the US recruited via social media and intended to comprise ~50% reporting past-month cannabis use (achieved 48.9%). Descriptive statistics characterized the sample and three multivariable regression analyses examined sociodemographic factors, cannabis use, and DPCP risk perceptions in relation to: 1) past-month DPCP use status among all participants, 2) number of days used among those reporting past-month use, and 3) likelihood to use DPCPs in the next year among those reporting no past-month use. Results. In this sample (Mage= 26.3, 59.8% female, 64.9% White, 19.4% Hispanic, 49.6% living in states with legal non-medical cannabis), 41.7% reported lifetime use of any DPCP and 24.4% reported past-month DPCP use. Those with past-month DPCP use reported *M*=8.2 days used, and 91.3% reported past-month cannabis use (vs. 35.2% among those without DPCP use). Most participants had heard of DPCPs prior to the survey (67.5%), mainly learning about them from friends or family (44.5%) or online (23.9%). Delta-8 was the most known DPCP (52.1%) and most used among those reporting lifetime use (69.7%). Participants reporting lifetime use most often used DPCPs via edibles (50.5%), dried herbs (50.0%), and vapes (47.1%); used due to curiosity (55.5%), belief that it was federally legal (34.1%), and friend suggestion (34.0%); and accessed them via smoke shops (46.3%) or friends/family (24.7%). Most participants inaccurately believed that DPCPs were required to be tested and approved to be safe (70.3%), were approved by the FDA (59.0%), and were required to have evidence substantiating any health claims (59.7%). Further, in rating DPCPs vs. cannabis, 20.4% perceived DPCPs as less harmful (57.8% same level of harm), 37.7% less addictive (52.2% same), and 10.8% more socially acceptable (59.1% same). Among all participants, correlates of past-month DPCP use were: being Black (vs. white), living in states without legal non-medical cannabis, past-month 'regular' cannabis use, lower perceived DPCP harm, and greater perceived addictiveness and social acceptability. Correlates of more days used among those with past-month use included: not being Hispanic/Latino, having a high school degree or less (vs. undergraduate degree), greater perceived addictiveness, and lower perceived harm. Correlates of reporting a greater likelihood to use DPCPs in the next year among those without past-month use included: living in states without legal non-medical cannabis, being older, Black (vs. white), having a high school degree or less (vs. undergraduate), past-month 'regular' cannabis use, lower perceived harm, and greater perceived addictiveness and social acceptability. Conclusions: In this sample, with ~50% of young adults reporting past-month cannabis use, rates of lifetime DPCP use and awareness were high, yet knowledge about DPCP requirements (e.g., testing, FDA approval) was

lacking. Risk perceptions and state non-medical cannabis laws were associated with past-month usage and the likelihood of future use. Regulations are necessary to limit DPCPs and their marketing to safeguard consumers from misinformation.

Derived Psychoactive Cannabis Product Online Retail: Age and Shipping Restrictions

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Background: The 2018 U.S. Farm Bill's definition of hemp (cannabis products with <0.3% Delta-9 THC [the most naturally prevalent intoxicating form of THC in the plant] by dry weight) resulted in the proliferation of derived psychoactive cannabis products (DPCPs), often chemically created rather than grown. DPCPs lack federal regulations and thus products may be contaminated, marketed towards youth, and are readily available online for purchase. Despite the importance of restricting youth access, few studies have systematically examined the online DPCP retail environment. Methods: In May 2023, Google incognito mode was used to search "buy delta thc." Among the first 100 results, data were collected from the 20 most trafficked websites that sold and delivered DPCPs. For each site, we documented the following policy-relevant information: 1) age verification measures for site entry and purchase attempts, 2) adult signature reportedly required upon delivery (and if it had to match the purchaser's identity), and 3) shipping restrictions (i.e., for certain DPCPs and/or certain states). Websites were independently coded; discrepancies were discussed, and consensus was reached. Results: Overall, 14 websites (70%) required individuals to indicate their age to access the website (n = 7 checkbox for 'age 21+'; n = 2 checkbox for 'of legal smoking age'; n = 2 checkbox 'age 21+ and legal smoking age'; n = 2 required input of date-of-birth; n = 1 checkbox for 'age 18+'). Most websites (n = 13, 65%) did not verify age at attempted purchase, nor indicated that an adult signature was required upon delivery (n = 15, 75%). Only 3 websites (15%) had rigorous age verification procedures during checkout that included contact information as well as an image of their photo ID, which would then be validated through third-party software. None required age verification upon both purchase and delivery. Of the 5 (25%) websites that reportedly required an adult signature upon delivery, 2 only required a signature for vaping devices (1 of these specified the signer must be the purchaser), 1 specified deliveries could not be sent to PO boxes due to signatures but then did not mention anywhere that signatures were required, 1 required signature for all products, and n = 1 allowed individuals to choose between age verification at checkout or adult signature upon delivery. Thirteen websites (65%) mentioned state shipping restrictions; 3

provided lists of states where they would not ship any DPCPs due to bans, 4 provided lists of states to which they would not ship certain DPCP types/forms, 4 provided conflicting information across different sections of the website regarding which states they would not ship to, 1 specified they would only ship 'where legal' but did not provide a list of states, and 1 provided a list of states that may have banned DPCPs but did not specify they would not ship their products there. Discussion: As the e-commerce landscape continues to evolve, clearer regulations regarding DPCP online retail sales and related enforcement are needed. In particular, measures are needed to enforce shipping restrictions and prevent youth access, including increasing the rigor of age verification.

A Marketing Analysis of Four Prominent US Cannabis Companies

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Introduction: Cannabis marketing drives consumer perceptions and use. Despite state regulatory oversight often explicitly prohibiting youth-oriented marketing, false or misleading claims, and requiring health warnings on products, these policies vary across states and in their enforcement. Given the recent, substantial expansion of the US cannabis market, cannabis marketing surveillance is needed to inform regulations and protect consumers. Methods: We analyzed 2020-2021 Vivvix advertising data from 4 US non-medical cannabis companies including two top national companies (Cresco and Medmen), a small national boutique company (Mindy's, which was affiliated with and later acquired by Cresco), and a local company (Uncle Ike's, which only operates in Washington state). Specifically, we examined (1) general advertising characteristics (e.g., number of unique ads and ad occurrences, ad expenditures, market [national or local/regional], media channel [mobile, online, print]); and (2) ad content (i.e., headlines, imagery) and placement (i.e., source themes, e.g., specific websites, magazines), overall and by company. Content was dual-coded independently; discordances were discussed, and consensus was reached. Results: There were 399 unique ads and 1,171 occurrences, totaling $488,617 in expenditures. Cresco and Uncle Ike's accounted for the most unique ads (~45% each); Cresco represented the majority of ad occurrences (52.4%) and expenditures (63.4%). The average expenditure per ad occurrence was $417.26 ($139.29 [Uncle Ike's] to

$642.17 [MedMen]). Most ad occurrences and expenditures targeted national markets for Cresco (occurrences: 96.4%; expenditures: 61.9%) and Mindy's (occurrences: 98.7%; expenditures: 73.4%), while most targeted local/regional markets for MedMen (occurrences: 53.8%; expenditures: 52.8%) and Uncle Ike's (occurrences: 99.3%; expenditures: 98.9%). Most ads were disseminated via online displays (occurrences = 69.2% [62.0% Uncle Ike's to 98.7% Mindy's]; expenditures = 45.8%) or mobile (occurrences = 28.9% [0% Mindy's to 38.0% Uncle Ike's]; expenditures = 23.3%). However, print ad occurrences accounted for 31.0% of expenditures (0% Uncle Ike's to 37.6% Cresco). The primary types of sources for ad dissemination were news/weather (occurrences = 36.3%; expenditures = 40.2%) and pop culture/entertainment (occurrences = 28.9%; expenditures = 26.0%). The most prominent source themes differed by company: pop culture/entertainment (Cresco occurrences: 32.2%; Mindy's: 66.2%); news/weather (Medmen occurrences: 47.2%; Uncle Ike's: 99.3%). Ad headlines most frequently emphasized product type (occurrences = 40.1%; expenditures = 37.0%), holidays/seasons (occurrences = 37.2%; expenditures = 22.9%), and price promotions/discounts/membership programs (occurrences = 24.4%; expenditures = 15.1%). The most common headline themes by company were: holiday/seasonal (Cresco occurrences: 50.0%); product type (Mindy's occurrences: 100%; MedMen: 50.9%); price promotion, discounts, and/or membership programs (MedMen occurrences: 50.9%; Uncle Ike's: 78.1%). Uncle Ike's was also the only company that had headline themes focusing on social responsibility (occurrences: 10.8%). Visual strategies to attract consumer attention included moving ads (e.g., gifs; occurrences = 63.6%; expenditures = 71.1%) and cartoon-like images (occurrences = 10.6%; expenditures = 7.4%). Mindy's also prominently featured food (occurrences: 88.3%; expenditures: 97.4%). Conclusions: Companies differed in their marketing strategies (i.e., volume, markets, media channels, and ad content). Findings underscore the need to restrict cannabis marketing strategies promoting product accessibility and youth-oriented content, to restrict marketing via channels appealing and accessible to young people (e.g., digital, pop culture sources), and to enhance enforcement efforts.

Examining Moment-to-Moment Associations Between Cannabis Use, Context, and Problems in College Students

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Cannabis use and problems are influenced by a variety of contextual factors. The social context surrounding use has been shown to impact the amount of cannabis consumed and the reinforcing value of cannabis in behavioral economic frameworks. Research examining specific links between social context, cannabis use,

and problems has revealed mixed results, with some studies reporting that solitary use is associated with more adverse consequences and solitary use in adolescence predicts cannabis use disorders symptoms in young adulthood. Other studies-including ecological momentary assessment (EMA) protocols-have found that consuming cannabis alone and at home is associated with lower quantity and duration of cannabis use, lower subjective effects, and fewer cannabis use disorder symptoms. Therefore, the specific relationship between cannabis use, problems, and social context is unclear. The current study examined the moment-to-moment association between contextual variables, cannabis use, and problems using EMA data acquired in a college student sample exhibiting hazardous cannabis use. Undergraduate students who reported a CUDIT score of 8+ (n = 62) completed a 14-day EMA protocol consisting of 4 random prompts within 3.5-hour blocks from 10am-Midnight (total observations = 1,846, mean observations/participant = 30). Each assessment collected information about cannabis use, context (i.e., current location [home/school vs. another location], social context [alone vs. with other people], and problems experienced since their last survey (e.g., got into a fight, neglected responsibilities, blacked out, got injured), among other variables. We estimated multilevel negative binomial models (moments [Level 1] nested within persons [Level 2]), with total problems at each moment as the outcome and location, social context, and cannabis use as lagged focal variables. Sex, day of the week, cumulative days in the study were covariates. The main effect model revealed a significant effect for lagged social context, such that being with people who are using substances or people they typically drink / use with was associated with greater problems at the next moment (IRR = 2.10, p = .022, 95% CI: 1.11-3.95). Neither location nor being alone were significantly associated with problems at the next moment (ps > .305). There were no significant interactions (ps > .205). These results suggest that being around people who consume substances is associated with experiencing more problems in the future. Counter to prior research, we did not find that being alone or being at home significantly predicted problems. Taken together, these findings provide additional evidence of moment-to-moment links between cannabis use context and problems.

Using Phenomenography to Understand Native American Perspectives on Cannabis Use for Pain Management

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Introduction: American Indians and Alaska Native (AI/AN) people are disproportionately affected by chronic pain and mental health conditions, life events, as well as social and economic factors associated with chronic pain and decreased access to pain treatment.1,2.3,4 The use of marijuana for medical purposes has been legalized in 34 states, and the recreational use of marijuana has been legalized in 12 states.5,6,7 A Pacific Northwest tribe in the U.S. developed a clinic for natural healing and research that provides cannabis-based care as one avenue for treatment. This clinic offers a unique avenue for understanding AI/AN perspectives regarding cannabis use for pain management. Methods: The current study uses qualitative methods to explore how patients seeking care for pain experience cannabis and its impact on pain. Phenomenography was selected as a methodology to understand and appreciate the differences and similarities between participant experiences with cannabis use and pain management. This methodology will be piloted in a sample of 10 AI/AN participants to evaluate how well it preserves AI/AN voices, experiences, and perspectives. Analysis will be completed through several rounds of coding by the research team that includes Native American (NA) and non-NA researchers. Frequent meetings between researchers will occur to ensure agreement and consensus on emerging codes, categories, and themes. Preliminary results will be shared with 3-5 NA participants for feedback on how well the resulting themes represent the completed interviews as a step in member-checking. Results: Pilot data has been collected from 10 self-identified NA participants through 30-60 minute one-on-one qualitative interviews. The sample consisted of 6 female and 4 male patients, with 60% over the age of 50. The sample was recruited from two pain clinics in the Pacific Northwest, 90% from the tribally-owned clinic. All 10 of the participants reported using both THC and CBD products. Participants shared their experiences and perspectives about the use of cannabis for pain management. Interviews were transcribed verbatim. First round methods of coding, including open coding, began in the spring of 2024. Emerging themes will be presented along with results of validation from participants. Discussion/Conclusion: An understanding of the use of cannabis for pain management among tribal members will allow for future research on the role of cannabis for medicinal use within NA populations. Working with a sample of self-identified AI/AN participants allows for further understanding of how cannabis does or does not align with personal and tribal values, experiences, and perspectives. Feedback will be used to

refine analysis methods for the full data set anticipating recruitment of 30 participants.

Endocannabinoid Science: Cannabis, Sex, and Therapeutic Insights

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The endocannabinoid system (ECS) is a complex network of neurotransmitters and receptors known to regulate various physiological processes, including mood, appetite, pain perception, and reproductive health. Recent research suggests a significant interconnection between the ECS, sexual function, and the therapeutic potential of cannabis. This poster presentation aims to provide comprehensive insights into this relationship through a combined approach of survey methodology and meta-analysis of existing literature. Methodology: The study adopts a dual-pronged methodology. First, a survey-based approach was employed to gather perceptions and experiences related to cannabis use and sexual health. Participants aged 18 and above were recruited through online platforms, and the survey comprised questions addressing demographics, patterns of cannabis use, perceived therapeutic benefits, and sexual health concerns. Concurrently, a meta-analysis review of existing literature was conducted to synthesize findings from relevant studies exploring the association between the ECS, sex, and therapeutic effects of cannabis. The meta-analysis involved systematic identification, screening, and analysis of peer-reviewed articles, clinical trials, and observational studies. Results: The survey results are currently pending analysis. Preliminary examination suggests a diverse demographic profile among respondents, with varying cannabis use patterns and perceived therapeutic benefits related to sexual health. Concurrently, the meta-analysis review identified a wealth of literature exploring the intricate relationship between the ECS, sexual function, and cannabis use. Preliminary findings from the meta-analysis indicate a substantial body of evidence supporting the role of the ECS in modulating sexual behaviour, arousal, and reproductive function. Discussion: The combined approach of survey methodology and meta-analysis offers a comprehensive understanding of the interplay between the ECS, sex, and therapeutic effects of cannabis. Anticipated survey findings may complement existing literature by providing real-world insights into individuals' perceptions and experiences with cannabis use for sexual health purposes. Concurrently, the meta-analysis review synthesizes and contextualizes existing evidence, highlighting the potential mechanisms underlying the observed associations. By integrating survey data and meta-analytic findings, this study aims to provide a nuanced perspective on the therapeutic potential of cannabis in enhancing sexual well-being. Conclusion: Anticipated findings hold implications for advancing research in sexual medicine and guiding evidence-based interventions aimed at optimizing sexual health outcomes. Further analysis of survey results and

meta-analytic findings will contribute to refining our understanding of the therapeutic potentials of cannabis in the context of sexual health.

Cannabis Cigarette Smoke Impairs Syncytiotrophoblast and Mitochondrial Function and Dysregulates Endocannabinoid System Homeostasis

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Rationale: Trophoblast differentiation is a process contingent on the fusion of cytotrophoblasts (CT) into syncytiotrophoblasts (ST) that comprise the maternal-fetal interface. The bioactive components of cannabis, delta-9-tetrahydrocannabinol (THC) and cannabidiol (CBD), disrupt processes involved in syncytiotrophoblast function. Mitochondrial are integral in facilitating stem cell differentiation and are impaired by cannabinoid components. However, less is understood about the effects of THC, delivered in cigarette smoke, on syncytiotrophoblast stress and mitochondrial regulation. We hypothesized that cannabis cigarette smoke conditioned media (SCM) impairs syncytiotrophoblast and mitochondrial function in vitro. Methods: BeWo b30 cells were exposed to SCM from cannabis cigarettes (14% THC:1% CBD) during the process of differentiation, initiated by the addition of forskolin. Following 48 hrs, cells were subjected to cytotoxicity and gene expression analyses. We investigated pathways responsible for cellular differentiation, cellular stress, mitochondrial function, and endocannabinoid signaling. Results: STs treated for 48h, with a range of cannabis smoke concentrations, showed decreased proliferation and cytotoxicity at 10% SCM. We report 500-fold increases in transcript levels of metabolic enzyme CYP1A1 following treatment with 5% SCM. The expression of trophoblast fusion ERVW1 was reduced by 50% following 5% SCM treatment. We also observed an increase in the expression of stress markers (Hsp60 and SOD1) in SCM treated cells. Similarly, mitochondrial dynamics regulator MFN-2 was downregulated 2.2-fold and a marker of mitochondrial stress, TFAM was upregulated by 3.9-fold in SCM. We report 3.1-fold increases in CB1 transcript levels with 2.5% SCM and 2.6-fold increases in FAAH transcript levels with 5% SCM. Additionally, nuclear receptor PPARγ was downregulated by 1.3-fold and ion channel receptor TRPV1 was elevated by 2.1-fold with 5% SCM. Conclusion: Overall, we demonstrate cannabis cigarette smoke impacts syncytiotrophoblast stress and dysregulates mitochondrial and endocannabinoid system homeostasis. Since placentae are rich in mitochondria and its functions are bioenergetically demanding, disruption

of mitochondrial function may have significant consequences for fetal development and programming.

Positive Childhood Experiences and Prospective Cannabis Use Frequency and Quantity in Adolescent and Emerging Adult Females by ACE Dimension

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Background: Exposure to multiple adverse childhood experiences (ACEs) is related to cannabis use in a dose-dependent manner and this association disproportionately effects females. Protective and compensatory experiences (PACEs) during childhood build resilience despite adversity and can offset the negative behavioral effects of ACEs. Most research on ACEs and PACEs focuses on a cumulative approach, whereas regardless of the dimensional nature of childhood adversity (e.g., abuse vs. household dysfunction) or resilience factors, ACEs and PACEs are summed to create overall adversity and resilience scores. A more nuanced approach may be necessary to understand associations between positive childhood experiences and behavioral outcomes that are influenced by childhood adversity. Objective: This study examines the association between individual PACEs and prospective cannabis use at high and low levels of two ACE dimensions; household dysfunction and emotional abuse/neglect. Participants and Setting: One hundred forty-three adolescent and emerging adult females (ages 15-24) completed a sociodemographic questionnaire, the 6-Item ACEs Scale, and the PACEs scale at baseline. Participants returned to the office weekly thereafter for an average of 27 days and were asked to report the frequency and quantity of the prior week's cannabis use via the timeline follow back method. Methods: The sample was stratified by level of household dysfunction (0-1 = low; 2-4 = high) and emotional abuse/neglect (0 = low; 1-2 = high). Scales were created reflecting cannabis use frequency and heavy cannabis use frequency. Poisson regression analyses were conducted to examine the association between PACEs items and prospective cannabis use frequency and heavy cannabis use frequency in each ACE dimension. Results: Unconditional love from a caregiver was associated with less frequent heavy cannabis use in those with high household dysfunction (B = -2.24, 95%

CI -3.98, -.493, p = 0.012) and high emotional abuse/neglect (B = -2.78, 95% CI -4.95, -.602, p = .012). Further, living in a clean, safe home with enough food to eat was predictive of less frequent heavy cannabis use in females with high household dysfunction (B = -1.23, 95% CI -2.36, -.091, p = 0.034). In low adversity contexts, helping others was associated with less frequent cannabis use (low household dysfunction; B = -.908, 95% CI -1.47, -.346, p = 0.002) and less frequent heavy cannabis use (low household dysfunction; B = -1.54, 95% CI -2.43, -.647, p < 0.001; and low emotional abuse/neglect; B = -1.68, 95% CI -2.71, -.640, p = .002). Finally, participation in organized sports was related to more frequent heavy cannabis use in those with high emotional abuse/neglect (B = 1.82, 95% CI .125, 3.51, p = 0.035). Conclusions: Positive childhood experiences have differing strengths of association with prospective cannabis use frequency and quantity in adolescent and emerging adult females, depending on the dimension of cumulative adversity experiences. While results should be replicated in a larger sample, this evidence suggests that in the context of high adversity, unconditional love and living in a clean, safe home with enough food are promotive for less frequent heavy cannabis consumption.

Using Triple Network Theory of Psychopathology to Identify Potential Biomarkers of Cannabis Use Disorder

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Background: As rates of cannabis usage increase, it is imperative to understand the neurobiological underpinning of cannabis use disorder (CUD). Resting-state fMRI is a popular method of investigating neural activity and has been implicated in psychiatric disorders such as Major Depressive Disorder, Anxiety disorders, and Post Traumatic Stress Disorder. The Triple Network Theory of Psychopathology suggests that abnormalities across three brain networks are responsible for mental disorders: 1) Central Executive Network, 2) Default Mode Network, 3) Salience Network (Menon, 2011). While previous literature has investigated resting-state functional connectivity of CUD individuals, no study has assessed whether the Triple Network Theory applies to CUD. Method: The sample consisted of 80 participants from the Human Connectome Project - Young Adults Sample. 40 participants with presumed CUD (i.e. a history of Cannabis Dependence and urinary traces of THC at the time of scan) were matched with 40 adults with previous cannabis experience but without a history of cannabis dependence and THC- at time of scan. 30 minutes of resting-state functional connectivity was analyzed using the CONN toolbox, with a priori seeds corresponding to nodes within 3 brain networks implicated, and an additional node from the dorsal attention network. Significant clusters survived cluster and voxel threshold p <.0001 with family-wise error correction. Group differences were examined with one-way ANOVAs. Results: 60 clusters of resting-state

functional connectivity from 18 different seeds differed between CUD+ and CUD-. CUD+ default mode network exhibited a weaker dissociation of the pre- and post-central gyrus (9 clusters), as well as frontal and parietal regions. CUD+ central executive network exhibited altered connectivity with frontal and parietal regions. CUD+ salience network recruited frontal regions such as the frontal medial and frontal middle gyrus, as well as the temporal gyrus. The dorsal attention network nodes showed altered connectivity with the cerebellum, occipital lobe, and pre-/post-central gyrus. Across all networks, there was aberrant recruitment of frontal regions, as well as the cerebellum. Often CUD+ individuals exhibited weaker functional connectivity (both negative and positive) than CUD- individuals. Some clusters were larger than 1000 voxels and will be further investigated to better detect signal of brain connectivity. Conclusion: Cannabis use disorder has distinct resting-state functional connectivity, compared to healthy individuals who've previously used cannabis. While the triple network theory does not aptly represent CUD (i.e. a majority of significant differences were not between network nodes), improper recruitment between salience network and central-executive nodes in addition to recruitment of frontal regions and the cerebellum across networks implies neuroimaging and / or behavioral studies are still worth pursuing. Future studies should try and correlate brain activity with behavioural differences.

A Prospective Examination Of Cannabis and Alcohol Use Associations During COVID-19 Pandemic

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Introduction: The COVID-19 pandemic was associated with serious health concerns, including significant increases in alcohol consumption and related harms. Given cannabis and alcohol co-use is prevalent, we need to understand whether and how changes in cannabis use (CU) may be associated with increases in alcohol use and problems in the context of the pandemic. CU is strongly linked with heavy drinking and has been shown to be either complementary (i.e., associated with increased drinking) or substitutive (i.e., associated with reduced drinking). This study aimed to examine prospective changes in cannabis and alcohol use following the onset of COVID-19 among individuals endorsing heavy drinking and CU. We hypothesized that 1) both cannabis and alcohol use and problems would increase during the COVID-19 quarantine relative to pre-pandemic use and 2) increases in CU would be prospectively associated with increases in alcohol use and problems. Methods: Data came from 77 participants

(M[*SD*]age=25.8[*5.6*] years; 33.8% female; 35.1% ethnoracial minorities) who completed a pre-pandemic baseline assessment as part of a placebo-controlled laboratory study and a subsequent follow-up survey during the pandemic stay-at-home-orders. CU frequency and alcohol use frequency and quantity (Timeline Followback interview, 60 days), cannabis use quantity (grams per week), and hazardous alcohol use (Alcohol Use Disorders Identification Test [AUDIT]) were assessed at both timepoints. Paired samples *t*-tests were used to examine pre- to post-COVID changes in alcohol and CU variables. Multiple regression analyses were used to examine associations between changes in CU with changes in alcohol use. Covariates included time since baseline, baseline score of the respective dependent variable, and baseline cannabis quantity. Results: Participants reported drinking on 41.1% days and CU on 79.5% days on average at baseline. Results of the *t*-tests indicated significant pre- to post-COVID increases in mean change scores for % drinking days (M=15.50(31.09), $t(76) = 4.38$, $p < 0.001$), % heavy drinking days (M=6.93(31.18), $t(76) = 1.95$, $p = 0.027$) and % cannabis-alcohol co-use days (M = 11.66(31.73), $t(76) = 3.22$, $p< 0.001$); a decrease in average drinks/drinking day (M = -0.98(2.76), $t(76) = -3.14$, p= 0.001) and weekly CU quantity (M = -1.52(7.03), $t(76) = -1.90$, p= 0.03); and no significant changes in AUDIT. Regression analyses indicated pre-to-post increases in weekly cannabis quantity were positively associated with pre-to-post increases in AUDIT scores (B=.20, sr^2=0.47,p=0.016), average number of drinks/drinking day (B=.13, sr^2=0.08,p=0.008), and percent co-use days (B=1.74, sr^2=0.03,p=0.002) but not with changes in % drinking or % heavy drinking days. Changes in cannabis frequency were not significantly associated with changes in alcohol use variables, except for co-use days (B=.43, sr^2=0.16,p<.001). Discussion: Findings indicate robust increases in drinking and co-use of alcohol and cannabis, but a decrease in CU after the start of COVID. However, increases in weekly CU quantity were associated with increased quantity of drinking and hazardous alcohol use during COVID-19. Consistent with prior research, cannabis use appeared to serve as a complement to alcohol use in this young adult cohort. Our findings on complementary co-use are important to consider in the context of evaluating global impact of the pandemic on alcohol risks and interventions targeting combined CU and alcohol use.

Digital Education for Canadians With Chronic Pain Using mlearning and Edutech For Teaching About Therapeutic Cannabis and Chronic Pain: A Canadian Study

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Overview: With the risks associated with pain medications like opioids, there is growing interest in using cannabis for pain management. Despite the legalization of both medical and recreational cannabis across Canada, digital learning gaps in chronic pain and cannabis for

therapeutic purposes (CTP) persist, making it challenging for Canadians with chronic pain to make informed decisions. However, unfortunately, there is a rather large segment of the Canadian chronic pain population with no family doctors or pain specialists, so they fend for themselves. As a result, they do not qualify for many of the services afforded to those with medical access, which also affects many marginalized populations; these unserved (or unknown) populations also tend to self-administer cannabis for their pain management more frequently. Therefore, this study's purpose is to explain and understand the phenomena of digital learning for Canadians with chronic pain, gain insight into where they are currently receiving their digital education on chronic pain (the condition), pain management (the treatment), and the use of cannabis as an analgesic, and gain a better understanding of their digital learning preferences. It will also seek to explain what else they would like to learn about chronic pain and cannabis for therapeutic purposes (CTP), and last but not least, seek to understand better the equity, diversity, and inclusivity issues or barriers that affect digital education and delivery, especially for marginalized or underserved Canadians with chronic pain. Based on these findings, this study will determine if mobile learning (mLearning) and education technology (EduTech) can assist in filling the digital education gaps for Canadians with chronic pain. [Note: Education technology (EduTech) consists of systems such as AI (Artificial Intelligence), VR (Virtual Reality), AR (Augmented Reality), and gamification]. Methodology: A cross-sectional explanatory sequential mixed methods approach has been selected for this study. The aim is to determine whether the qualitative and quantitative data converge (or relate); therefore, the convergent design will also be incorporated into the methodology, which is permitted according to Creswell & Plano Clark (2018). The data collection process will begin with a mobile-optimized survey (quantitative) followed by a focus group to gain perspective on the previously collected quantitative data. To recruit participants for the survey, we will network with relevant professional sites, associations, industry, health organizations, forums, and support groups related to chronic pain or cannabis using online searches and social media through convenience sampling. We will ask them to help by reaching out to their members. For the focus group, the Ontario Pain Foundation director has permitted its members to assist in this study for the qualitative data collection. The final thesis research document will summarize the findings from both methods.

Investigating Daily Harms Associated with Cannabis and Alcohol Co-use Among Transgender and Gender Diverse Youth Who Drink

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Background: Cannabis and alcohol co-use is common among youth and associated with increased substance use harms, including heightened psychological distress. Emerging evidence indicates that transgender and gender diverse (TGD) youth experience a disproportionate impact from substance use and its corresponding harms. This discrepancy is likely influenced by the minority stress prevalent in their daily lives on account of their marginalized gender identities. Most studies on substance use and co-use among TGD youth have been cross-sectional or descriptive in nature. Consequently, our understanding of the relationships between gender minority stress (GMS) and resilience, cannabis and alcohol co-use, and corresponding harms remains limited. The current study employed ecological momentary assessment (EMA) to explore daily associations between cannabis and alcohol co-use and (1) corresponding harms, (2) psychological distress, and (3) GMS and resilience. Method: Forty Canadian TGD youth who typically consume alcohol at least twice per week were included in this secondary analysis. Of these, 12 participants (30.0%) identified as transmasculine, 11 (27.5%) as transfeminine, and 17 (42.5%) as gender diverse (e.g., nonbinary, genderfluid). Participants completed daily EMA measures which assessed their past-day substance use (i.e., frequency of use, number of standard drinks consumed, forms of cannabis consumed), corresponding harms (e.g., engaging in risky behaviours, interpersonal conflict, hangover symptoms), psychological distress, and GMS and resilience for 21 days. To examine associations between these variables at the daily level, generalized linear mixed models (GLMM) were constructed. Results: Across all participants, 104 cannabis-only days, 180 alcohol-only days, and 41 co-use days were reported. Across alcohol use days, the mean number of standard drinks consumed was 2.94 (SD = 2.01). On cannabis use days, cannabis flower, edibles, concentrates, and beverages were consumed on 52.4%, 23.4%, 22.8%, and 1.4% of days, respectively. GLMM results revealed that, on days when participants experienced greater GMS, they were more likely to co-use than to use alcohol only (OR = 1.48, SE = 0.18, 95% CI [1.04-2.11]). Conversely, on days when participants experienced greater resilience, they were more likely to co-use than to use cannabis only (IRR = 1.76, SE = 0.21, 95% CI [1.18-2.64]). On days when participants co-used, they experienced more harms than on alcohol-only days (IRR = 1.63, SE = 0.24, 95% CI [1.03-2.60]), but not cannabis-only days (IRR = 1.03, SE = 0.18, 95% CI [0.73-1.47]). Despite this, on days when participants co-used, they did not experience significantly greater psychological distress than on alcohol-only (B = 0.23, SE = 0.84, 95% CI [-1.42-1.88]) or cannabis-only (B = -0.78, SE = 0.61, 95% CI [-1.98-0.41]) days. Conclusions: These findings raise further concerns about the impacts of GMS and cannabis and alcohol co-use on TGD youth. First, the results

suggest that experiencing increased GMS or resilience is associated with greater odds of engaging in cannabis and alcohol co-use, as compared to alcohol-only or cannabis-only use, respectively. In turn, co-use is associated with experiencing more harms than alcohol-only use at the daily level, which suggests that co-use worsen harms among TGD youth who drink. The results of this study may ultimately inform tailored harm-reduction policy and intervention efforts for TGD youth.

Cannabis Use Among a Statewide Sample of Young Adults: Is Student Status a Risk Factor?

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Aim: There is growing research on the use of legalized cannabis, however, little has examined differences in use by college student status. Thus, the aim of this project is to understand the use of cannabis among non-students and part-time college students compared to college students enrolled full-time in New York State (NYS). Methods: Data was collected from a self-administered, web-based survey that included items on alcohol, patterns of use, other substance awareness, and potential co-use with cannabis. Participants were recruited from a commercial database of young adults (18-25 years) in NYS via postcard mailing and/or e-mail to participate in the online survey. Separate logistic regression models examined the relationship between current (past 30-day) cannabis use and student status and negative binomial models examined Cannabis Use Disorder (CUD; measured with the CUDIT-R) and student status. Both models were stratified by student status (non-student, part-time, full-time) and controlled for college type (i.e., 2 or 4-year college), residency, age, gender, employment, and relationship status. Results: The odds of current cannabis use are higher for part-time students (AOR = 1.44, p = 0.015) and non-students (AOR = 1.72, p < 0.001) compared to full-time students. The incidence of CUD is greater for non-students (IRR = 1.42, p < 0.001) and part-time students (IRR = 1.15, p < 0.001) compared to full-time students. Among full-time students, those attending 2-year colleges (AOR = 1.69, p = 0.009) were more likely to report current cannabis use and have a higher incidence of CUD (IRR = 1.27, p = 0.047) compared to those attending 4-year colleges. Primary residency for full-time students also increases the odds of current cannabis use for those living in a house/apartment with roommates when compared to living with parents (AOR = 2.26, p < 0.05) and when compared to living with a partner/spouse (AOR = 2.35, p = 0.001). Additionally, non-students living with a partner/spouse compared to those who live with their parents have increased odds of current cannabis use (AOR = 1.59, p = 0.045), but there is no significant association for living in a

house/apartment with roommates. Non-students with a relationship status in which the person lives with a dating partner (IRR = 1.33, p = 0.007) compared to being single also increases the incidence of CUD. Conclusion: Student status has a significant impact on the odds of current cannabis use and risk of CUD. Further research is recommended to look at the differences in outcomes among those attending 2-year and 4-year colleges, and for full-time students compared to part-time students. Residence, specifically living with roommates and dating partners, has a significant association with a higher risk of cannabis use. More research may want to be considered looking at social use of cannabis within primary residency comparing romantic partners and platonic roommates.

Comparison of Legal and Illegal Cannabis Vapes and Extracts That Contain Novel Intoxicating Cannabinoids by LC-MS/MS and LC-HRMS.

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On October 17, 2018, cannabis was legalized and regulated under the Cannabis Act, with cannabis edibles, extracts (e.g., vaping products), and topicals becoming available to Canadians in early 2020. As the cannabis industry continues to innovate and expand, new cannabis extract products containing cannabinoids other than Δ9-THC or CBD are becoming available to consumers from both the legal and illegal markets, with limited understanding of their health risks. While many of these novel cannabinoids such as CBN or Δ8-THC can be found in cannabis plants at trace levels, they are typically produced using synthetic or semisynthetic techniques in order to obtain sufficient amounts for use in products deliberately made to contain them. The conditions under which these novel cannabinoids are synthesized can result in unknown impurities in the form of unreacted starting materials, reaction by-products, and degradants, such as synthetic cannabinoid derivatives that are not naturally found in the cannabis plant. Moreover, whereas there is a legal framework that requires that legal cannabis products adhere to strict quality control measures to help mitigate potential quality-associated risks, there are no such controls over the products manufactured and sold by the illegal market. Additionally, significant data gaps exist regarding the composition of Canadian cannabis products containing novel intoxicating cannabinoids regardless of source. This research therefore aims to identify and compare the composition of vaping liquids and other extracts containing novel cannabinoids sourced from the legal and illegal markets. Thirteen legal vape products purchased from the Ontario Cannabis Store, and 16 illegal products

(13 vape, 1 shatter, and 2 distillate products) obtained from Canadian law enforcement were analyzed using UHPLC-HRMS in an untargeted approach to detect unknown compounds. Eighty and 81 different compounds were detected and putatively identified in the legal and illegal samples respectively. Illegal vapes were shown to have a 1.6x higher number of cannabinoid isomers and synthetic cannabinoid derivatives than legal vapes. Illegal products also contained confirmed identifications of pesticides and numerous polyethylene glycol (PEG) compounds. Studies have shown that when PEG is vaped, the carcinogenic compounds formaldehyde and acetaldehyde can be formed. Additionally, a putative identification of a flame retardant was observed in one of the illegal products. Conversely, legal vape products contained putative identifications of flavouring agents and plant fatty acids. Three out of 13 products had putative identifications of plasticizers. These results emphasize the importance of a quality-controlled supply of legal and regulated cannabis products. Furthermore, identifying the impurities of synthesis in such products is important to the understanding of their health and safety risks, including for those who choose to consume illegal products. To our knowledge, this is the first time that Canadian cannabis vapes and other extracts containing novel cannabinoids from the legal and illegal markets have been compared and examined for their composition.

The Highs and Lows: Cannabis Use and Bipolar Spectrum Disorders in a Large Sample of Emerging Adults

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Introduction: Bipolar Spectrum Disorders (BSD) are associated with difficulties in positive emotional processes. Although BSDs and cannabis often co-occur and can lead to worse health outcomes, there is a dearth of work examining the relationships between BSDs, as well as clinically-relevant positive emotion

processes, with cannabis use. This is especially important to investigate among emerging adults who are at both peak risk of mood onset and progression, as well as initial onset of cannabis use and associated difficulties. Accordingly, this study examines associations between BSD risk and mood severity with cannabis use (Aim 1) and BSD-relevant positive emotion processes and cannabis use (Aim 2). Methods: Participants were 963 emerging adults recruited as part of a multi-site investigation across nine North American universities who completed questionnaires assessing BSD risk (HPS-20), current mania and depression symptoms (DSM-5 Cross Cutting Measure-mania and depression domains and the Altman Self-Rating Mania Scale, ASRM), cannabis use (CUPIT adapted), and three clinically-relevant positive emotion processes (Valuing Happiness Questionnaire [VHQ], the Behavioral Activation System-Reward Responsiveness [BAS-RR], and the modified Differential Emotions Scale-Positive Affect subscale [mDES-PA]). The main study analyses were pre-registered on the Open Science Framework (https://osf.io/ag39d). Results: From 1,921 participants who completed the cannabis measure, 49.9% had never used cannabis before and were excluded from the analysis. The remaining 963 participants had an average age of 18.3±0.5 years, 73.5% were female, and 63.4% of the sample was white. For Aim 1, BSD risk was associated with greater scores on the cannabis use composite measure, controlling for age, gender, and study site (B=0.07, p=0.034); however, this association did not remain significant when additionally controlling for current mania or depression symptoms (B=0.06, p=0.079). No significant association was found between cannabis use and current symptoms. For Aim 2, positive emotion experience was associated with decreased cannabis use composite scores when controlling for age, gender, study site, and negative emotion (B= -0.10, $p<0.005$). However, there was no significant association between either reward responsiveness or positive emotion beliefs and cannabis use. Discussion: In a large and diverse multi-site sample of emerging adults, greater self-reported BSD risk was associated with greater cannabis use, though this association did not hold when controlling for current BSD-relevant mood symptoms. This suggests a complex relationship between cannabis use, BSD risk, and current mood symptoms. Further work that can disentangle broader BSD risk from shorter-term mood state is warranted. Furthermore, results indicated that greater positive emotion experience, but not reward responsiveness or positive emotion beliefs, was associated with lower self-reported cannabis use. This suggests divergent associations between basic positive emotion processes and clinically-relevant disorders of positive emotion (i.e., BSDs) with self-reported cannabis use. The study highlights the complexity of cannabis use in relation to emotion processes and mood risk, emphasizing the need for research that integrates clinical science and affective science approaches.

Cannabis Products in Vape Shops: United States, 2023

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Objectives: Since 2020, many new types of derived intoxicating cannabis products (ICPs) have entered the US market. ICPs pose concerns regarding their youth-oriented marketing, potency, and health effects. While research has documented >20 different intoxicating compounds in ICPs in the US market, some ICPs (e.g., Delta-8 THC, THCO) are registered as Schedule 1 substances by the US Drug Enforcement Administration (DEA). Some states have also attempted to ban, restrict, or regulate ICP retail, although the comprehensiveness and enforceability of these laws are unclear. This study provides insights into the retail landscape of ICPs sold across the US. Methods: In November-December 2023, we systematically identified and called vape shops near landmarks (the largest commercial airport and the capitol building) in each US state, Washington DC, and Puerto Rico (52 locations * 2 landmarks each * 5 locations per landmark = 520 total *N* [661 shops were called to achieve target sample; 79% response rate]). Licensed cannabis dispensaries were excluded. We assessed ICP product availability of: Delta-8 THC, Delta-9 THC, Delta-10 THC, HHC, THCA, and THCO. Legal data regarding state non-medical cannabis retail sales and state Delta-8 THC laws were collected. Descriptive statistics and bivariate analyses were used to characterize the sample and summarize patterns. Results: 74% of vape shops sold any ICP (61% Delta-8, 60% Delta-9, 54% HHC, 50% THCA, 47% Delta-10, 26% THCO). ICPs were sold in shops in each state except Washington and Alaska, which banned ICPs and had active retail of legalized non-medical cannabis. States with active retail of legal non-medical cannabis had significantly fewer shops selling ICPs (55% vs. 87%). More shops sold ICPs in states with limited Delta-8 regulations than in states with Delta-8 bans (92% vs. 43%, $p < .05$). There were comparable percentages of shops selling any ICPs between states with limited and severe Delta-8 restrictions (92% vs. 90%). In states where Delta-8 was banned, 43% of vape shops reported selling any ICPs. Among most states with Delta-8 regulations or bans, the ICP most sold in each state varied in ways that may reflect industry response to state laws (e.g., HHC was most often sold if the law required all THCs to be <0.3% by weight). Conclusions: ICPs are widely available in vape shops, even in states with relevant bans/restrictions. The differential availability of ICPs in states with diverse legal frameworks suggests that state-level regulations influence, but do not fully deter, the retail presence of these products.

Enhanced laws, surveillance, and enforcement are needed. The 2024 Farm Bill and state laws should explicitly prohibit derived ICPs.

Help-Seeking Behaviours Among Cannabis Consumers in Canada and the United States: Findings from the International Cannabis Policy Study

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Background: A goal of the federal cannabis act was to enhance public awareness of cannabis-related risks and investment in greater addiction support services, including online sources of support. Little evidence exists on the minority of cannabis consumers who have sought or received help from both formal and informal sources, for their cannabis use. Objectives: The current study examined the percentage of cannabis consumers who sought help to manage cannabis-related problems, the most common sources of help sought, and factors associated with seeking help. Methods: A total of 13,209 past 12-month cannabis consumers in Canada and the US, aged 16-65, completed wave 5 of the cross-sectional online survey, the International Cannabis Policy Study. Respondents past 12-month help-seeking behaviours, along with their perceived addiction to cannabis, legal status of cannabis in their jurisdiction, and scores on the WHO ASSIST scale for problematic cannabis use were assessed. Logistic regression models examined correlates of help seeking and sources of help. Results: A total of 9.2% individuals sought help from any source with the most likely being a doctor/physician (44.9%), followed by online sources (29.2%). Younger, mixed race, more educated, financially stable males who perceived themselves to be more addicted to cannabis were most likely to seek help. No overall differences were observed in the percentage of consumers who sought any type of help based on cannabis laws/jurisdiction between Canada (8.4%), US 'illegal' states (9.2%), US 'medical' states (9.1%), and US 'recreational' cannabis states (9.9%). That said, those who resided in illegal jurisdictions were less likely than those in legal jurisdictions to seek help from a doctor or physician and more likely to seek help from family and friends. Implications: Few consumers report seeking help to manage their cannabis use problems with similar levels of help seeking across jurisdictions with different cannabis laws.

Food Restriction on Cannabis Use Days: An Assessment of Consequences and Motivations

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Cannabis is one of the most used substances among college students, a population at risk for experiencing its negative use-related effects. College students also commonly exhibit disordered eating behaviors such as food restriction (e.g., intentional fasting, not eating on a day leading up to an event), which frequently co-occurs with substance use. This pattern of behavior is associated with greater use related consequences regarding other substances (i.e., alcohol), but little research exists on the effects of food restriction and cannabis use. The current cross-sectional study investigated college student cannabis use consequences, food restriction, and disordered eating motivations on cannabis use days in the past year and month. The sample contained 614 students who used cannabis in the past year (58.9%; n = 496 past month use). Independent samples t-tests revealed that those who restricted food on cannabis use days in the past year (n = 128; 20.8% of past year cannabis users) exhibited significantly higher scores on the Cannabis Use Disorders Identification Test (CUDIT) than those who did not restrict. Those who restricted food on a cannabis use day in the past month (n = 96; 15.6% of past year cannabis users) reported significantly more cannabis consequences on the Brief Marijuana Consequences Questionnaire (B-MACQ) than those who did not restrict. A cannabis-adapted College Eating and Drinking Behaviors Scale (CEDBS) was used to assess motivations for disordered eating on cannabis use days in the past year. The CEDBS has 3 subscales: Quickened Intoxication (QI), Offsetting Calories (OC), and Alternative Methods (AM). We retained these subscales for the cannabis version of the measure. Most items were modified by replacing "alcohol" with "cannabis," but some items were modified in greater detail to capture more nuanced differences in eating behaviors among cannabis restriction days. The adapted measure and two of its subscales had excellent reliability (αtotal = .95, αQI = .94, αOC = .96), but the Alternative Methods subscale was less than adequate (αAM = .69). Restricting because you plan to eat after you've consumed cannabis, consuming cannabis by inhalation/ smoking rather than edibles, and being so busy you forget to eat were the most endorsed items on the adapted CEDBS. Regression analyses revealed that, after controlling for sex, greater scores on the adapted CEDBS Quickened Intoxication subscale were associated with significantly higher scores on the CUDIT and BMACQ, as well as significantly greater cannabis use frequency in the past 30 days. Higher scores on the CEDBS Offsetting Calories subscale were associated with significantly lower scores on the CUDIT, as well as lower past 30-day cannabis use frequency. CEDBSQI scores were not significantly associated with BMACQ sum scores. These results establish the presence of the risk associated with food restriction on cannabis use days, meriting additional

research on the contexts of this restriction, bottom-up developed disordered eating measures specific to cannabis, and targeted interventions to reduce harm.

The Role of Cannabis Motives in the Association Between Medicinal Cannabis Use and Cannabis Related Outcomes

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Background: A growing number of young adults are using cannabis to manage both mental health and physical symptoms (i.e., medicinal cannabis use), and they often report using cannabis for self-medication without consulting a healthcare provider or obtaining medical cannabis authorization. This is notable as medicinal cannabis use is linked with greater frequency of cannabis use and risk for cannabis-related problems compared to recreational-only cannabis use. However, there has been little research on mechanisms that may help to explain the relationship between medicinal cannabis use and cannabis-related problems. One potential mechanism is motives for cannabis use, which have been shown to play a role in individual differences in cannabis use outcomes. For example, reporting greater coping motives for cannabis use is associated with greater cannabis use and problems. However, how medicinal cannabis use relates to common motives for cannabis use in young adults has received little research attention. The aim of this study was to examine the role of motives for cannabis use in the relationship between self-reported medicinal cannabis use and both frequency of cannabis use and risk for cannabis use disorder. Methods: Undergraduate students (N = 295; 70.1% female; M age = 19.51, SD = 1.8) who were part of a research participant pool at a large Canadian university completed an online questionnaire, including items assessing medicinal and recreational reasons for cannabis use, past month frequency of cannabis use, the Marijuana Motives Measure (MMM; Simons et al., 1998), and the Cannabis Use Disorders Identification Test-Revised (CUDIT-R; Adamson et al., 2010). Two path models were specified, one for each of the outcome variables (cannabis use frequency and CUDIT-R score). In both models, medicinal cannabis use status (i.e., any medicinal use vs. recreational-only use) was specified as the independent variable, and all five cannabis motives from the MMM (i.e., coping, enhancement, social, conformity, and expansion) were entered as parallel mediators. Results: 37.6% (n = 111) of participants reported any medicinal cannabis use, while 62.4% (n = 184) reported only recreational cannabis use. Findings revealed significant indirect associations between medicinal cannabis use and both cannabis outcomes through two of the five cannabis motives. Specifically, there were significant indirect associations between medicinal cannabis use and frequency of consumption via both

coping motives (95% CI = [0.12, 1.42]) and expansion motives (95% CI = [0.13, 1.73]), as well as significant indirect associations between medicinal cannabis use and CUDIT-R scores via coping (95% CI = [0.3, 1.6]) and expansion motives (95% CI = [0.12, 0.94]). Conclusions: Our results suggest that coping and expansion motives partially explain the association between medicinal cannabis use and both increased frequency of cannabis use and risk for cannabis use disorder, providing new insight into the specific types of motives that are implicated in these associations. These findings may help to inform harm reduction efforts for young adults who engage in medicinal cannabis use, suggesting that interventions should target elevated coping and expansion motives in this population and raise awareness about the links between these motives and cannabis use problems.

Grant Funding in Cannabis Research: Perspectives Across Training Stages and US and Canadian Mechanisms

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Grant funding plays a crucial role for psychologists in advancing research, clinical care, and professional careers. In research settings, grant funding provides support for understanding, addressing, and solving current issues by covering various research-related expenses including researcher and staff income, participant compensation, lab materials and equipment, and travel for collaborations and research activities. Clinically, grant funding can assist in better serving communities by providing, maintaining, and expanding programs, interventions, and resources. Professionally, experience and skill in writing and obtaining grants can increase an individual's competitiveness for future job and promotion opportunities, academic productivity and contributions, and breadth of training experiences for mentors and mentees. However, the grant funding process is becoming increasingly competitive and there is a lack of accessibility to training and collaborations in grant writing. Therefore, it is imperative that efforts are made to increase accessibility, transparency, and education about the grant writing process for those interested in obtaining funding, such as discussing strategies, barriers, and solutions for securing funding. This panel discussion will focus on writing and obtaining grants in cannabis research across career stages with inclusion from US and Canadian researchers. Panelists are successful, grant-funded researchers with experience in various mechanisms at the national, local, and university level. Panel members will provide unique perspectives on grant writing during the predoctoral (Smith-LeCavalier, US), postdoctoral (Parnes, US), and independent investigator (Metrik, US;

Wardell, Canada) stages as well as mentoring training grants (Metrik, US; Wardell, Canada). Panelists will provide an overview of grant mechanisms, discuss strategies for grant writing, and explore current barriers and solutions to obtaining grant funding.

We Don't All Like Being Stoned the Same Way: Cannabis Use Across Sexual Orientation

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INTRODUCTION: This study explores relations between cannabis use patterns and sexual orientation. Although there is a growing acceptance of cannabis use in the United States, limited research exists on its differences across sexual orientations (SO). There is a consistent trend of condensing sexual orientation into broad categories (e.g. heterosexual, gay/lesbian, and bi +) due to insufficient representation of SO across data. Previous literature suggests there is a higher frequency of cannabis use among individuals who identify as pansexual when compared to individuals who identify as gay or lesbian (Scroggs, 2022), suggesting that pattern variations across sexual orientation merit additional research. This study builds on existing research by comparing cannabis use patterns among both discrete identities and traditionally combined identity categories to evaluate methodology concerns that may stem from the different categorization approaches. Further research is needed to understand the complexities of identity-based use patterns, to develop targeted interventions for the well-being of diverse sexual communities, and to continue refining methodological approaches to marginalized populations. METHOD: The study is a secondary analysis using Prolific data on cannabis and alcohol co-use (N = 410). We used the New Statistics to conducted Cohen's d analyses comparing effect sizes across expanded and condensed models of SO within a typical week's consumption pattern. RESULTS: We hypothesized that Cohen's d would highlight meaningful differences between the expanded and condensed models of SO, particularly among participants holding infrequently acknowledged identities when predicting typical cannabis use patterns. This hypothesis was supported by our results. In contrast to the results indicated by condensed models, results highlighted a small, positive effect size (d = 0.36) in both lesbian and pan identity groups. Results also indicated a small, negative effect size (d = -0.44) among individuals who identify as asexual. DISCUSSION: Our hypothesis was supported, highlighting significant differences in effect size between some identities in the sample, notably centered on under-represented SO identities often endorsed by women and gender-expansive individuals. These results suggest that researchers should utilize expanded models of SO when possible and should acknowledge the limitation of gender bias in

condensed SO models when looking at cannabis usage.

Popular Brands of Intoxicating Cannabis Products Sold in Vape Shops Across the United States, 2023

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Background: The 2018 U.S. Farm Bill's definition of hemp resulted in the emergence of numerous derived psychoactive cannabis products (DPCPs, such as Delta-8 THC) because many have interpreted their retail sale as federally legal. A concerning trend is the increase in the number of DPCP brands that have become available. However, no study has systematically documented DPCP brands sold in physical stores, which is critical to informing effective regulations and understanding the evolving cannabis market. Methods: In November and December 2023, we contacted vape shops (excluding licensed cannabis dispensaries) that were systematically identified near landmarks (the largest commercial airport and capitol building) in each US state, Washington DC, and Puerto Rico (5 calls for each of the 2 landmarks for each of the 52 locations, N = 520 [661 shops were called to achieve target sample; 79% response rate]). We inquired about popular brands of THC products sold at each location. Descriptive statistics were used to characterize the sample and summarize patterns. Results: Across the 520 shops, 464 (89.2%) provided brand information over the phone. In sum, there were over 300 brands. The top 10 brands (in descending order) included: Mellow Fellow (sold in 4.1% of shops), Torch (4.0%), Hidden Hills (3.7%), Cake (3.1%), Urb (3.0%), Looper (2.3%), Extrax (2.1%), Ghost (1.8%), Space Gods (1.8%), and Stiizy (1.8%). The top 10 brands only accounted for 27.7% of brand responses captured through the 520 calls. Discussion: Across the US, there are hundreds of reportedly popular THC product brands available in vape shops, including in states that have bans/restrictions on DPCPs. This demonstrates the rapidly evolving market, which is important given the role of market competition in prices and promotions. Given the lack of data on product safety and that their production can result in toxic chemical byproducts and residue, which has led to a rising number of poisonings, hospitalizations and, in rare cases, death the 2024 Farm Bill and state laws should unambiguously exclude DPCPs from the federal definition of "hemp". Information on currently popular cannabis brands will facilitate related monitoring, implementation, and enforcement efforts.

Disentangling In-The-Moment Effects of Cannabis Co-Use on Antecedents and Responses to Cigarette Smoking and Alternative Tobacco Product Use Among Youth

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Cannabis and tobacco co-use among youth is a prevalent and concerning use pattern for public health. Simultaneous use of these two substances may be primed, such that using cannabis elicits craving and use of tobacco. Little work, however, has evaluated in-the-moment antecedents of tobacco use among youth. We analyzed one week of ecological momentary assessment (EMA) data from a pre-randomization period of a larger clinical trial of adolescent daily smokers. Pre- and post-use cigarette craving, pre-use affect, and subjective smoking response were assessed via self-initiated reports of cigarette and alternative tobacco product use with a custom smartphone application. Participants were a subset who reported past-month cannabis use (n= 39; M age= 18.8 years, SD= 0.9; 51% female sex at birth; 85% cisgender; 41% minoritized race or ethnicity; 66% gay/lesbian, bisexual, or unsure/questioning). Youth self-initiated 476 cigarette and 190 alternative-product reports; to reduce burden, two-thirds were selected to include additional queries. Despite high rates of baseline daily cannabis use, only 85 of 526 tobacco-use reports indicated recent cannabis use (16%), and 16 indicated recent alcohol use (3%). Mixed, random-intercept models accounted for nested EMA reports and disaggregated momentary effects by covarying participant means. Herein, "craving," refers to assessments of "desire or craving to smoke [a] cigarette," completed before and after tobacco use. Craving had significant momentary and participant-level variability (ICCs= .28, .50, respectively). On average, cravings were lower prior to using alternative products, relative to cigarettes, where cravings were higher after using alternative products, ps< .001. Accounting for use type, sex, age, race and ethnicity, nicotine dependence, and average craving, momentary cigarette cravings were positively related before and after tobacco use (b= 0.20, SE=0.04, p< .001). Pre-use cigarette craving was elevated during times of heightened anger, anxiety, difficulty concentrating, impatience, and stress, but lower when reporting greater happiness and unaffected by depression, hunger, and boredom. Anger and impatience were uniquely related to pre-use craving, over and above other affective precursors (b= 0.21, SE= 0.06, p< .001; b= 0.18, SE= 0.05, p= .001), whereas average happiness, rather than momentary fluctuations, was uniquely related (b= 0.45, SE= 0.18, p= .019). Recent cannabis use (just before tobacco use) and baseline (daily vs. non-daily) cannabis use did not have direct effects on pre-use craving and did not moderate affective relations. Recent cannabis use was marginally related to elevated residual cigarette craving just after use, however (p= .078), as was recent alcohol use (p= .090; but note infrequent reports). In contrast, baseline daily cannabis use was related to lower cigarette craving after tobacco use (p= .084), and neither recent nor

baseline cannabis use were related to subjective smoking response (i.e., pleasure, satisfaction). These data do not support the theory that cannabis use increases cigarette craving or subjective responses in the moment, either directly or via affective mechanisms. Rather, cannabis use may elicit sustained craving after tobacco use, an effect which could prompt additional smoking. Overall, findings point to the importance of disentangling effects of co-use at multiple levels, and much work remains to understand co-use patterns.

Mental Health and Dispositional Predictors of Simultaneous versus Concurrent Cannabis and Alcohol Use in a Canadian Context

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Background: Cannabis has become more available in Canada since its legalization in 2018. Many individuals who use cannabis also use alcohol (co-use), which can be used either at the same time (simultaneous use) or at different times (concurrent use). Though studies have identified predictors of co-use relative to single-substance use, less is known about the predictors of specific types of co-use. The present study examined the mental health and dispositional predictors of simultaneous relative to concurrent use of the two legal substances (cannabis and alcohol) among adults in Canada. Method: Canadian adults reporting past-year use of both cannabis and alcohol (N = 1,528) were recruited from Academic Prolific and six Canadian universities. Participants completed online self-report measures of demographic characteristics, cannabis and alcohol co-use, mental health symptoms, impulsivity, and personality traits. Results: Binary logistic regression analyses revealed that when independent variables were each entered separately into their own model, greater severity of depressive, anxiety, PTSD, and ADHD symptoms; impulsivity; and negative urgency and lack of premeditation each predicted increased likelihood of reporting past-year simultaneous versus concurrent use. When independent variables were entered simultaneously, greater severity of anxiety and ADHD symptoms remained significant predictors of simultaneous relative to concurrent use. Discussion: Individuals with elevated anxiety and ADHD symptoms may be more inclined to engage in simultaneous use to self-medicate and achieve greater symptom reduction. Future studies may examine the directionality of these relations and motives (e.g., coping) that may

differentiate simultaneous and concurrent use.

Consumer Perceptions of FDA Prohibited Claims in CBD Advertisements

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Background: CBD products are advertised to consumers in ways that are prohibited by the US Food and Drug Administration (FDA), including the use of health claims that promote unsubstantiated medicinal benefits, and misleading marketing indicating the products are FDA-approved. Products are sold as dietary supplements or food products, and target youth. We evaluated consumer perceptions of real-world CBD advertisements in three states with disparate cannabis policies (North Carolina, Maryland, Colorado). Methods: Two trained data collectors conducted observational assessments of CBD retailers (n=150) using wearable imaging technology. Ads were content analyzed for the FDA prohibited claim types (i.e. unapproved drug/therapeutic benefit, FDA-approved/endorsed; marketing to youth; dietary supplement; and food additive). A total of 1,176 unique ads were documented that contained at least one FDA-prohibited claim. Of those, 55 were included in a 20-minute online survey of 3,076 adults, ages 18-65 who were from a probability-based panel (AmeriSpeak) to assess consumer perceptions. Current CBD and ever CBD users were oversampled. Eligible participants were randomly assigned to view five claims and rate the extent the ad conveyed content for the FDA prohibited claim types. Of the 55 ads in the survey, 87% were coded by the study team as unapproved drug/therapeutic benefit; 33% as food additive; 13% as dietary supplement; 5% as marketing to youth; and 4% as FDA-approved/endorsed. Results: The sample was 53.5% female, 70.1% White and 14.3% Hispanic; mean age of 42.9 years. The sample was 32.8% current CBD users, 34.2% ever CBD users, and 33% non-users. Among all ads, 71% were perceived by consumers as making an unapproved drug/therapeutic claim; 21.8% as promotion as a dietary supplement and 18.2% as a food additive; 34.5% were perceived as marketing to youth and 3.6% were perceived as FDA approved/endorsed. We compared agreement between consumer perceptions and the study team's content analysis and found similar agreement for FDA approved/endorsed claims; however, consumers perceived more ads to be targeting youth and making dietary supplement claims. They were less likely to perceive CBD as a making unapproved

drug/therapeutic or food additive claims. We also examined differences between consumers by CBD use status and found among all ads, CBD current users reported higher ad appeal and ad believability compared to non CBD users ($p < 0.05$). In addition, compared to ever users, current CBD users reported higher ad appeal for 47.3% (n=26) of ads and higher believability for 60% (n=33) of ads ($p < 0.05$). Current CBD users consistently perceived ads to make claims of therapeutic effect and dietary supplement more than ever CBD users or non-users. Conclusions: Consumers perceived the majority of ads as making at least one FDA-prohibited health claim, with therapeutic benefit being the most common. Consumers were more likely to perceive ads targeting youth and as a dietary supplement compared to researchers. Understanding consumer perceptions of CBD advertising is important, as prohibited claims could mislead consumers about the risks and benefits of CBD use. This study provides critical data that can inform regulatory action at the state and federal level.

Inhaled Cannabis for Medical Purposes for Chronic Pain: A Systematic Review and Meta-Analysis Of Randomized Clinical Trials

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Background: Use of cannabis and cannabinoids for medical purposes is increasingly common for chronic pain, particularly in North America where there is considerable interest in alternatives to opioids. Inhalation (i.e., smoked, vaporized) is a common form of consuming cannabis for medical purposes; however, the benefits and harms of inhaled cannabis for chronic pain are uncertain. Objectives: We conducted a systematic review and meta-analysis of randomized clinical trials (RCTs) to assess the effectiveness of inhaled forms of cannabis for medical purposes for chronic pain. Methods: We searched MEDLINE, EMBASE, AMED, PsycInfo, CENTRAL, CINAHL PubMed, Web of Science, Cannabis-Med, Epistemonikos, and trial registries up to January 2024 to identify RCTs of inhaled cannabis for medical purposes for chronic pain. Paired reviewers independently assessed risk of bias and extracted data from eligible studies. We used random-effect models for all meta-analyses and the grading of recommendations assessment, development, and evaluation (GRADE) approach to assess the certainty of

evidence. Results: A total of 12 eligible trials with 395 adult patients living with chronic non-cancer pain compared inhaled cannabis for medical purposes vs. placebo. Seven trials administered cannabis cigarettes and five trials randomized patients to receive vaporized cannabis. The median sample size was 33 patients (interquartile range [IQR] 26-39) and the median length of follow-up was 1.6 days (IQR 5 hours to 5 days). Moderate to high certainty evidence shows that, compared with placebo, inhaled medical cannabis probably improves short-term pain relief with a larger proportion of patients achieving at least 30% pain reduction: risk difference [RD] 20% (95% CI 11% to 30%) based on a relative risk [RR] 1.60 (95% CI 1.30 to 1.95), and a weighted mean difference [WMD] of -0.70 cm on a 10 cm visual analogue scale [VAS] (95% CI 1.04 to -0.36 cm); and increases the risk of dizziness (RD 10%, 95% CI 3% to 25%), cough (RD 16%, 95% CI 3% to 44%), and euphoria (RD 12%, 95% CI 4% to 23%); but probably results in little or no improvement in physical, emotional, role functioning, or sleep quality at a short-term use. Low to very low certainty evidence shows that short-term inhaled medical cannabis might not increase the risk of cognitive impairment, anxiety, paranoia, shortness of breath, tachycardia, hypotension, fatigue, weakness, vomiting, nausea, bad taste, and dry mouth. Conclusions: Short-term use of non-inhaled medical cannabis results in an important improvement in pain relief among patients who live with chronic noncancer pain, along with several transient adverse side effects, compared to placebo. However, the long-term benefits and harms of inhaled cannabis remain uncertain.

Non-Inhaled Medical Cannabis or Cannabinoids For Chronic Pain: A Systematic Review And Meta-Analysis Of Randomized Clinical Trials

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Background: Chronic pain affects one in five adults globally and is associated with reduced quality of life and increased healthcare costs. The shift away from long-term opioid therapy to medical cannabis or cannabinoids for chronic pain has increased dramatically. There is conflicting evidence and recommendations from guidelines. Objectives: We conducted a systematic review and meta-analysis of randomized clinical trials (RCTs) to assess the benefits and harms of non-inhaled medical cannabis or cannabinoids for chronic pain. Methods: We searched MEDLINE, EMBASE, AMED, PsycInfo, CENTRAL, CINAHL, PubMed, Web of Science, Cannabis-

Med, Epistemonikos, and trial registries up to January 2024 to identify RCTs of medical cannabis or cannabinoids for chronic pain at ≥1 month follow-up. Paired reviewers independently screened literature, assessed risk of bias, and extracted data. We performed random-effects models meta-analyses and used GRADE to assess the certainty of evidence. Results: A total of 34 RCTs with 5195 adult patients were included, 30 of which compared medical cannabis with placebo. Medical cannabis was administered orally (n = 32) or topically (n = 2) for chronic non-cancer pain (n = 30) and cancer-related pain (n = 4). Length of follow-up ranged from 1 to 5 months. Compared with placebo, non-inhaled medical cannabis or cannabinoids probably result in a small increase in the proportion of patients experiencing at least the minimally important difference (MID) improvement in pain relief (modelled risk difference [RD] of 11%, 95% confidence interval [CI] 5% to 16% for achieving at least MID of 1.5 cm on a 10 cm visual analogue scale [VAS], based on a weighted mean difference [WMD] of −0.53 cm, 95% CI −0.79 to −0.27 cm, moderate certainty), physical functioning improvement (4% modelled RD, 95% CI 0.1% to 8% for achieving at least MID of 10 points on the 100-point SF-36 physical functioning scale, WMD of 1.7 points, 95% CI 0.06 to 3.34, high certainty), and sleep quality improvement (7% modelled RD, 95% CI 4% to 11% for achieving at least MID of 1 cm on a 10 cm VAS, WMD of −0.42 cm, 95% CI −0.63 to −0.22 cm, high certainty). Medical cannabis or cannabinoids taken orally does not improve emotional, role, or social functioning (high certainty). Moderate certainty evidence shows medical cannabis or cannabinoids taken orally probably results in a small increased risk of memory impairment (RD 3%; 95% CI 0.4% to 7%), vomiting (RD 3%; 95% CI 0.4% to 6%), drowsiness (RD 4%; 95% CI 2% to 8%), impaired attention (RD 3%; 95% CI 1% to 8%), nausea (RD 5%; 95% CI 2% to 8%), and diarrhoea (RD 4%; 95% CI 2% to 8%); while high certainty evidence shows greater increased risk of dizziness (RD 8%; 95% CI 4% to 12% for trials with <3 months follow-up versus RD 33; 95% CI 21% to 50% for trials with ≥3 months follow-up; interaction test p < 0.001; moderate credibility of subgroup effect). Conclusions: Non-inhaled medical cannabis or cannabinoids result in a small improvement in pain relief, physical functioning, and sleep quality among patients with chronic pain, along with several transient adverse side effects, compared with placebo. This review provides evidence for Canadian Cannabis for Medical Purposes and Chronic Pain Guideline.

Who Is Asked About Marijuana Use During Pregnancy? Identifying Racial Differences In A Sample of Pregnant Women With STI Risk

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Background: Marijuana use during pregnancy is on the rise, increasing by 62% over the past decade, in part due to an increased perception of its safety. Marijuana use during pregnancy is associated with preterm birth, stillbirth, growth restriction, and developmental problems. The national guidelines recommend that all pregnant people should be asked about their marijuana use by their healthcare provider. The objective of the current study is to characterize the experiences of our sample of pregnant women at risk for marijuana use and sexually transmitted infections (STIs). Methods: We enrolled 176 pregnant cisgender women (Mean age = 30.2, *SD* = 5.02; 26% Black) who endorse alcohol/drug use and condomless sex or multiple sexual partners in our randomized controlled trial testing an innovative, technology-delivered brief intervention, the Health Check-up for Expectant Moms (HCEM), which aims to reduce these health risks during pregnancy. Participants completed baseline questions regarding marijuana use, risk perceptions, and attitudes around use during pregnancy. Possible racial bias in discussions about marijuana use was investigated through a logistic regression adjusting for prior marijuana use. Results: Overall, 15% (*n* = 26) self-reported their frequency of marijuana use as four or more times a week, and 13% (*n* = 22) reported using monthly or less. The most cited reasons for marijuana use were relaxation or tension relief (53%), sleep aid (45%), and euphoria or to get high (43%). On a 1-10 Likert scale asking how harmful to your health smoking marijuana is, the average score of all women was 5.10 (*SD* = 3.17). The majority of the sample (55%) responded "no" to "Since being pregnant, has your doctor or nurse asked you about your marijuana use?" and 65% responded "no" to "Has your doctor or nurse ever talked to you in general about marijuana use during pregnancy or breastfeeding?" We found that black women were significantly more likely than their white counterparts to have been talked to by their provider about marijuana use during pregnancy or breastfeeding (51% vs. 29%, $p = 0.007$). The significant difference prevailed even after adjusting for prior marijuana use (adjusted odds ratio = 2.27, 95% CI: 1.10 -4.71, $p = 0.028$). Conclusions: These findings highlight reasons why our sample of pregnant women are using marijuana during pregnancy. Our results suggest that, among our sample, there is a perception that marijuana is not harmful to maternal and fetal health during pregnancy. Furthermore, the majority of women reported that their providers seemingly neglected the topic of marijuana use during their prenatal visits. Importantly, our results suggest a racial bias that led to significantly more black women being asked about marijuana use during pregnancy or breastfeeding, as compared to their white counterparts, even when adjusting for prior marijuana use. Based on these findings and prior studies that have

demonstrated racial bias in the context of the provision of perinatal care and breastfeeding, there is a clear need to improve bias training and its impact on health equity for providers, to minimize stigmatization during the antenatal period.

Pain as a Predictor of Cannabis Initiation Among Emerging Adults: Results from the Population Assessment of Tobacco and Health (PATH) Study

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Purpose: Pain is highly prevalent among emerging adults (18-25 years old), and rates of cannabis use are increasing among this population. Indeed, 1.2 million emerging adults in the US initiated cannabis use in 2022 alone. A growing body of research suggests pain may be a unique antecedent and motivator for substance use. Although several risk factors for cannabis initiation have been identified (e.g., alcohol use and depression), this is the first study to examine pain as a prospective predictor of cannabis initiation among emerging adults. Methods: Data were drawn from five annual waves of the Population Assessment of Tobacco and Health Study (PATH) study. Emerging adults who denied cannabis use at baseline (n = 4,185; 53.4% female; 69.5% White) were included in the analysis. Adjusted Cox regression analysis tested pain as a predictor of cannabis initiation across four subsequent waves of data. Covariates included: sex, race, ethnicity, lifetime alcohol use, past-month polysubstance use, current cigarette use, and mental health. Population weights and balanced repeated replication methods were applied to produce nationally representative estimates per PATH requirements. Data: Past-week pain was assessed using a 0-10 numerical rating scale at baseline and dichotomized to indicate no/low (<4/10) or moderate/severe pain (≥4/10), which is a commonly used cutoff in research and practice to suggest clinically relevant pain. Initiation of cannabis use was defined as respondents who did not endorse lifetime cannabis use at Wave 1 and who subsequently endorsed past-year cannabis use at any of the following four waves. Time to cannabis initiation was measured in years (waves). Results: At baseline, 10.9% of emerging adults reported moderate/severe pain (≥4/10), which is consistent with pooled prevalence rates from a prior meta-analysis. Adjusted Cox regression analysis revealed that emerging adults with moderate/severe pain at baseline initiated cannabis use earlier than those with no/low baseline pain (AHR = 1.19, SE = 0.10; 95% CI [1.01, 1.41], p = .039). Conclusions: Emerging adults with moderate/severe pain were more likely to initiate cannabis use earlier than those with no/low baseline pain. These findings provide initial evidence for pain as a risk factor for cannabis initiation during emerging adulthood. Future research should investigate how pain may motivate cannabis initiation

in the context of a changing legal landscape, beliefs about the efficacy of cannabis for pain management, and how other motives (e.g., social) may vary among emerging adults with and without pain.

The Impact of Cannabis Legalization on Drug-related Offenses in Washington State

Guangzhen Wu
(University of Utah)
Roarke R. Cullenbine
(University of Maryland Francis King Carey School of Law)

An important public concern surrounding the legalization of recreational cannabis is its impact on offenses related to hard drugs such as heroin, cocaine, and other dangerous drugs, about which competing perspectives exist. Prior research using rigorous methodology to empirically examine this issue remains limited. Based on Uniform Crime Reporting (UCR) Program data from 2007 to 2019 and a quasi-experimental research design involving interrupted time series analysis (ITSA) and the synthetic control method (SCM), this study examines the effects of recreational cannabis legalization on the rates of a variety of drug offenses including possession violations related to cannabis, heroin/cocaine and their derivatives, and other dangerous nonnarcotic drugs in Washington State (WA), which passed its recreational cannabis law (RCL) in late 2012 and began legal sales in July 2014. This study found that WA has experienced decreases in the rate of possession offenses for the two categories of more harmful drugs-heroin/cocaine and their derivatives, and other dangerous nonnarcotic drugs-over the post-sale period, relative to the states that have not legalized cannabis for recreational use, offering some evidence suggesting a drug offense reduction effect of cannabis legalization.

SYMPOSIA

Symposium Title:
New Directions in the Use of the Marijuana Purchase Task to Assess Behavioral Economic Demand for Cannabis: Meta-analytic, laboratory, and neuroimaging findings

Chair: Michael Amlung
(University of Kansas)
Discussant: R. Lorraine Collins
(University at Buffalo)

The Marijuana Purchase Task (MPT) is an efficient and ethical method of measuring behavioral economic demand for cannabis (i.e., hypothetical cannabis consumption across escalating prices, reflecting the relative reinforcing value of cannabis). Nearly a decade of research using the MPT has characterized associations between cannabis demand and cannabis use as well as the severity of cannabis-related problems at the trait level. More recently, experimental studies using state-based MPTs have begun to examine how cannabis demand fluctuates in response to internal and external factors (e.g., cue-elicited craving, next-day responsibilities, and other experimental manipulations). This symposium will feature three talks by behavioral economists and cognitive neuroscientists who are expanding the

use of the MPT in several new directions. First, Dr. James MacKillop will review the trait cannabis demand literature, including findings from a recent meta-analysis documenting the concurrent validity of MPT indicators of cannabis demand in relation to cannabis use and cannabis use disorder severity. Second, Dr. Michael Amlung will present findings from three laboratory and crowdsourcing studies investigating contextual influences on cannabis demand, including cannabis-related cues, next-day responsibilities, and everyday cannabis use scenarios. Third, Dr. Iris Balodis will present findings from a neuroeconomics study using functional MRI to investigate the neural correlates of cannabis demand in individuals with heavy cannabis use. Finally, Dr. R. Lorraine Collins (Discussant), will integrate these findings and discuss the proliferation of cannabis demand research and priorities for the future.

Talk 1:

Cannabis Reinforcing Value in Relation to Cannabis Use and Misuse: A Meta-Analysis of Trait-Level Cannabis Demand and Cannabis Involvement as Measured by a Marijuana Purchase Task

James MacKillop
(McMaster University
Alba González-Roz
(University of Oviedo)
Víctor Martínez-Loredo
(University of Sevilla)
Elizabeth R Aston
(Brown University)
Jane Metrik
(Brown University)
James Murphy
(University of Memphis)
Iris Balodis
(McMaster University)
Roberto Secades-Villa
(University of Oviedo)
Kyla Belisario
(McMaster University)

A reinforcer pathology approach to addictive disorders emphasizes drug reinforcing value, immediate reward orientation, and availability of alternative reinforcers as key determinants. Reinforcing value is increasingly assessed using the marijuana purchase task (MPT), leading to a sizable literature of behavioral studies. This meta-analysis sought to synthesize the concurrent validity of MPT indicators of cannabis demand in relation to cannabis involvement across studies. Electronic databases and pre-print repositories were searched for MPT studies that examined the cross-sectional relationship between frequency and quantity of cannabis use, problems, dependence, and five MPT indicators: intensity (i.e. unrestricted consumption), Omax (i.e. maximum consumption), Pmax (i.e. price at which demand becomes elastic), breakpoint (i.e. first price at which consumption ceases), and elasticity (i.e. sensitivity to rising costs). Random effects meta-analyses of cross-sectional effect sizes were conducted, with Q tests for examining differences by cannabis variables, meta-regression to test quantitative moderators, and publication bias assessment. Moderators included sex, number of MPT prices, variable transformations, and year of publication. The searches

yielded 14 studies (N= 4077, median % females: 44.8%: weighted average age = 29.08. Intensity, Omax, and elasticity showed the most robust concurrent validity (|rs| = 0.147-325, ps < 0.014) with the largest significant effect sizes for quantity (|r| intensity = 0.325) and cannabis dependence (|r| Omax = 0.320, |r| intensity = 0.305, |r| elasticity = 0.303). A higher proportion of males was associated with increased estimates for elasticity-quantity and Pmax-problems. A larger number of MPT prices significantly altered the magnitude of effects sizes for Pmax-problems, suggesting biased estimates when few prices are used. Methodological quality was good, with minimal evidence of publication bias observed. Across studies, the reinforcing value of cannabis was consistently associated with cannabis involvement outcomes, most robustly for intensity, Omax, and elasticity. Moderator analyses suggest potentially meaningful sex differences in the reinforcing value of cannabis and the importance of enough prices for a high-resolution demand curve.

Talk 2:

Laboratory and Crowdsourcing Studies Investigating Contextual Influences on Cannabis Demand

Michael Amlung
(University of Kansas)
Brandon P. Miller
(University of Kansas)
Elizabeth R. Aston
(Brown University)
William Davis
(Johns Hopkins University)
Benjamin L. Berey
(Brown University)
Ashley N. Dowd
(Johns Hopkins University)
Tory R. Spindle
(Johns Hopkins University)

Behavioral economic demand reflects the relative reinforcing value of a substance and is commonly assessed via hypothetical purchase tasks. In the context of cannabis, the Marijuana Purchase Task (MPT) provides an efficient measure of self-reported cannabis consumption (e.g., in hits, grams, joints, etc.) at escalating prices (e.g., Free to $20/hit). At the trait level, indices of cannabis demand obtained from the MPT are significantly correlated with level of cannabis use and cannabis use disorder severity. However, cannabis demand is also sensitive to contextual and environmental factors at the state level. Assessments of cannabis demand at the state level commonly use a modified version of the MPT that measures cannabis consumption in the present moment instead of a typical cannabis use scenario. An expanding body of research has begun to characterize how cannabis demand fluctuates in different situations and in response to various experimental manipulations. This talk will share results from three studies that investigated the effects of cannabis-related cues, next-day responsibilities, and other hypothetical cannabis use scenarios on cannabis demand assessed via state MPTs. The first laboratory study assessed the effects of cannabis cues and upcoming activities on cannabis demand in a community sample of regular cannabis consumers. Participants underwent a cue exposure protocol involving

exposure to either cannabis or neutral pictorial cues. Following the cues, participants completed multiple MPTs measuring cannabis consumption in a typical situation and in the context of having to drive or of going to sleep. Cannabis demand was sensitive to the driving requirements, such that participants reported lower consumption and expenditure when they had to drive soon compared to a typical use situation. When participants were told they would be going to sleep soon, cannabis demand was increased following exposure to cannabis cues but not neutral cues. The second study used online crowdsourcing to examine the effects of various next-day responsibilities (e.g., work, recreation, and caregiving) on cannabis demand in adult cannabis consumers. Results indicated that cannabis demand was significantly reduced in the context of next-day responsibilities, but potentially important individual differences in the degree of reduction were present. The final crowdsourcing study is examining different hypothetical driving scenarios on cannabis demand, including manipulations of the timing of the driving, the distance to be traveled, and other driving conditions. Data collection from this study is ongoing, and we will present preliminary findings in this symposium. Taken together, these studies reveal that cannabis demand fluctuates in meaningful ways in response to different contextual factors. Implications for reducing harms from cannabis use will be discussed.

Talk 3:

Exploring the Neural Substrates of Valuation in Cannabis Use Disorder

Iris Balodis
(McMaster University)

With increases in cannabis use and rates of cannabis use disorder (CUD) across North America, understanding the biobehavioural determinants of cannabis risks and harms is critical for informing treatment and policy. This presentation will explore behavioural and neural motivational profiles for cannabis- and non-cannabis-related stimuli in heavy cannabis users. An established characteristic of CUD is overvaluation of cannabis, which is typically measured by cannabis demand, a behavioural economic measure of an individual's value of cannabis as a reinforcer. Cannabis demand is linked to cannabis misuse by overvaluation of cannabis; the current presentation applies principles of neuroeconomics to understand cannabis demand choice behaviour in CUD. The project characterizes the neural activity associated with existing behavioural findings on a Marijuana Purchase Task (MPT) adapted for functional magnetic resonance imaging (fMRI). Here, we demonstrate how the brain represents cannabis value as measured by cannabis demand in individuals with heavy cannabis use (N = 20), in areas including the anterior cingulate cortex, insula, and caudate. The findings also show differential recruitment of these areas during the Inelastic, Elastic, and Suppressed motivational phases of the task, with the greatest activity during the Elastic phase. Additionally, the current study was able to detect relationships between THC metabolites

and multiple behavioural economic demand measures and find associations between THC metabolites and specific brain activity (bilateral caudate) during distinct MPT phases. In contrast to overvaluation of cannabis, low motivation for non-cannabis related stimuli is also a characteristic of CUD. We present data assessing effort-based decision-making for non-cannabis rewards using the Effort Expenditure for Rewards Task (EEfRT) during fMRI. Applying this task in a CUD population (n = 21), we demonstrate alterations in valuation signaling relative to a healthy control group (n = 20). In particular, the CUD group showed decreased ventromedial prefrontal cortex activation relative to the HC group during initial coding of a prospective effort. Exploratory correlational analyses demonstrate multiple positive relationships between bilateral VS activity during prospective effort processing and choice behaviour, driven mostly by the CUD group. Collectively, these findings show behavioural and neural alterations underlying effort-based decision-making process in CUD, further highlighting important differences in fronto-striatal processing that may occur with heavy cannabis use. Characterizing how valuation processes are represented in the brain can help us understand influences on choice behaviour.

Symposium Title:
Advancing Science on Cannabis' Potential Harms and Therapeutic Benefits: Insights from Experimental Cannabis Administration Studies
Chair: Benjamin L. Berey
(Providence VA Medical Center; Brown University)
Discussant: Jane Metrik
(Brown University; Providence VA Medical Center)

Recreational and medical cannabis use is now legal in 76% and 48% of US states, respectively, and historical trends indicate that past-month and near-daily cannabis use among adults ages 19-55 has increased substantially since 2013. Contemporaneously, burgeoning access to novel and increasingly potent products necessitates a deeper understanding of cannabis' potential harms and factors linked to the progression from initial to hazardous use. Experimental cannabis administration studies using fixed-dose or self-administration paradigms are ideal for examining how individuals use cannabis within a session, identifying formulation-specific psychopharmacological and potential therapeutic effects, and testing behavioral and pharmacotherapy intervention efficacy. These talks will highlight the utility of different experimental methodologies to identify how different populations use cannabis, risk-factors for hazardous cannabis use, and inform future prevention and intervention efforts. Dr. Elder will present on methodological considerations for human laboratory cannabis, cannabinoid, and phytochemical studies including blinding, route of administration, and drug preparation. Dr. Berey will present data on individual-difference and state affective predictors of cannabis smoking behaviors in the laboratory. Dr. Lisano will present

research exploring the moderating effects of physical activity on affective changes among adults with mild-to-moderate anxiety randomized to three different cannabis chemovars for ad libitum use over four weeks. Dr. Aston will present data characterizing the effects of behavioral economic demand and delay discounting on cannabis smoking topography in the laboratory. Dr. Metrik will synthesize findings from these studies by discussing the utility of various experimental paradigms to advance knowledge concerning cannabis use etiology, prevention, and intervention.

Talk 1:

Best Practices for Human Lab Studies of Cannabis and Cannabis Constituents: Considerations for Blinding and Drug Preparation for Different Routes Of Administration

Harrison J. Elder
(Johns Hopkins University)
Tory R. Spindle
(Johns Hopkins University)

Controlled human laboratory studies are critical to increasing understanding of the behavioral, toxicological, and therapeutic effects of cannabis and its constituents. However, given the diversity of cannabis products and cannabis constituents, conducting such studies presents numerous challenges and there are important methodological factors to consider. This talk will discuss various methodological strategies for conducting rigorous human laboratory research using four recent exemplar studies. Issues related to dosing, blinding of participants and research staff, and drug formulation/preparation across various routes of administration (e.g., oral, vaporized) will be discussed. A study (n=20) assessing the pharmacokinetic and pharmacodynamic effects of acute oral (0, 10, 25mg) and vaporized (0, 5, 20mg) THC in healthy volunteers was conducted to characterize impairment using novel (Driving Under the Influence of Drugs, DRUID®) and standard (e.g. Divided Attention Test, DAT) performance measures. Drug preparation and formulation methods utilized in this study illustrate some best practices for ensuring consistent drug delivery and absorption. Oral ingestion occurred via cannabis-infused brownies, which is a high fat vehicle known to result in robust absorption of cannabinoids such as THC, and 0mg THC brownies were infused with placebo cannabis to account for potential differences in taste between active and inactive doses. Participants were also fed a standardized low-fat breakfast at a fixed time prior to dosing to minimize the influence of food on cannabinoid absorption. A different study of smoked and vaporized cannabis (THC: 0, 10, 25mg) in 17 infrequent cannabis users illustrates the use of certain best practices for inhaled dosing to preserve blinding and minimize variability in dose. For smoked cannabis, participants were instructed to inhale the entire dose of cannabis within a constrained period (10 minutes) from a pipe fitted with a metal top to preserve blinding and minimize drug loss due to side-stream smoke. For vaporized conditions, the self-administration period was constrained to the same length of time,

but participants inhaled the study drug using a medical-grade vaporizer (Volcano medic) which captures cannabinoids in a plastic clear balloon (an opaque bag was placed around the balloon to minimize vapor visibility and preserve the study blind). Lastly, in two recent studies, THC and two terpenes (pinene and limonene) were self-administered using a handheld vaporizer (the Mighty medic). As with our other studies, the timing of dosing was constrained to reduce variability in drug absorption and the onset of effects. Because of differences in visibility between terpenes and THC, participants exhaled into a smoke filter (Sploofy) after each puff to preserve study blinding. Additional observations from the studies that warrant consideration in future research include key differences in the magnitude and onset of effects across routes of administration. Specifically, the timecourse of effects between smoked and vaporized cannabis were similar, but vaporization produced significantly stronger drug effects, while oral dosing resulted in a significant delay in the onset of effects (but similar magnitude) to inhaled dosing. Thus, inhalation requires more frequent measurement of pharmacodynamic outcomes after dosing and a shorter overall observation period (6 hrs) compared with oral administration (8 hrs).

Talk 2:

Using Experimental Laboratory Methods to Identify Affective and Individual-Difference Predictors of Cannabis Smoking Topography

Benjamin L. Berey
(Providence VA Medical Center, Brown University)
Holly K. Boyle
(Brown University)
Elizabeth R. Aston
(Brown University)

Medical cannabis legislation in the U.S. implicitly conveys that cannabis can effectively treat myriad conditions despite minimal empirical support. Contemporaneously, cannabis risk perceptions have declined despite well-documented potential harms from cannabis misuse. Research often focuses on use frequency/quantity but more nuanced behaviors, like how cannabis is used within a session (e.g., topography), can provide insights about when and for whom cannabis may result in negative outcomes. Indeed, alcohol and tobacco research indicate that certain topography profiles (e.g., faster pace of consumption, shorter intervals between drinks/puffs) relate to negative consequences. Yet, minimal cannabis smoking topography research exists and knowledge about situational and individual-difference factors impacting these behaviors is limited. This laboratory study examined affective predictors of cannabis smoking topography. We hypothesized greater pre-session negative affect and craving would predict more cannabis puffs, longer puff durations, greater overall puff volume (inhalation amount) and average puff flow (inhalation speed), and shorter inter-puff-intervals (IPIs). Given limited prior research, an exploratory aim examined whether participants' baseline proportions of medical/recreational cannabis use

related to smoking topography. Adults (n=67; 63% Male, mean [sd] age=23 [5]) reporting frequent past-month cannabis use completed a laboratory session where they used the Clinical Research Support System (CReSS) device and smoked up to two cannabis cigarettes ad libitum over 1-hour. Cannabis use (medical use frequency, medical/recreational cannabis use proportions, typical grams used per session) was assessed at baseline; state negative affect (Positive and Negative Affect Schedule) and cannabis craving (Marijuana Craving Questionnaire) were measured immediately before the experimental session. The CReSS topography device recorded each self-administered puff, individual puff duration and volume, IPI, and average puff flow. Study hypotheses and exploratory aims were tested via bivariate correlations, one-way ANOVAs, and hierarchical linear regressions controlling for age, sex, and baseline cannabis. Higher pre-session craving was correlated with shorter IPIs ($r=-.25$, $p<.05$). A higher baseline proportion of medical cannabis use was positively associated with number of puffs, faster smoking pace (total puff volume/smoking duration), and average puff flow ($rs=.30$-$.33$, $ps<.05$). Negative affect was not significantly correlated with smoking topography. One-way ANOVAs indicated that participants with less than monthly medical cannabis use (versus monthly, weekly, or daily/almost daily) took significantly fewer puffs and had smaller total puff volumes ($ps<.05$). Smoking topography did not significantly differ among participants with monthly, weekly, or daily/almost daily medical cannabis use. Regressions demonstrated that a larger proportion of baseline medical cannabis use predicted more self-administered puffs, higher total puff volume and average puff flow, and faster smoking paces ($ps<.024$). Neither pre-session craving nor negative affect predicted smoking topography. Hypotheses were partially supported. Participants with more medical cannabis use had topography profiles characterized by more frequent and intense puffs. Future prevention, intervention, and public health efforts targeting higher-risk cannabis smoking topographies (e.g., tailored protective behavioral strategies) may reduce potential harms. Likewise, knowledge about smoking topography can help clinicians educate patients about safer ways to use cannabis medicinally. Given the emergence of novel cannabis products, future research should examine how different formulations, modes, and potencies affect smoking topography.

Talk 3:

Synergistic Effects of Physical Activity and Cannabis Use on Negative Affect: Exploration in a Sample With Elevated Anxiety Symptoms

Jonathon K. Lisano (University of Colorado Boulder)
Paige Phillips
(University of Colorado Boulder)
Greg Giordano
(University of Colorado Boulder)
Marco Ortiz Torres
(University of Colorado Boulder)
Angela D. Bryan
(University of Colorado Boulder)
L. Cinnamon Bidwell
(University of Colorado Boulder)

Emerging research indicates that seeking relief from depression and anxiety, two core components of negative affect, are some of the strongest medical motives for cannabis use. Physical activity (PA) is associated with reductions in negative affect, with reviews showing it is as effective as medication for mild to moderate depression. Given the linkages between cannabis use and PA, there may be synergistic effects between PA and cannabis use on affect. In a group of individuals with self-reported anxiety symptoms using either a CBD-dominant (CBD), THC-dominant (THC), or equal parts THC+CBD (THC+CBD) cannabis product ad libitum over 4 weeks, this study aimed to explore if levels of PA were different between product groups (CBD vs. THC vs. THC+CBD), and if PA moderated changes in negative affect over time by group (CBD vs. THC vs. THC+CBD). 178 participants with actigraph-measured PA data were analyzed from a larger NIH-funded study assessing outcomes of THC and CBD in individuals using cannabis to cope with their anxiety. Participants had Generalized Anxiety Disorder Scores ≥ 5, mean age of 34±14 years, and were randomly assigned to use CBD (n=60), THC (n=62), or THC+CBD (n=56) cannabis flower or edible products at the beginning of the 4-week study. Participants were asked to consume their products ad libitum over the study period and negative affect was measured at baseline and week 4 via the Depression, Anxiety, and Stress Scale-21 (DASS-21). Participants were asked to wear wrist-worn activity monitors (ActiGraph LLC) to measure PA during the second 2 weeks of their cannabis use. Activity data were analyzed using ActiLife 6.13.5. A comparison of average PA by group over the wear period was done using ANOVA. Due to the non-normal distribution of PA data, a generalized estimating equation (GEE) multilevel model assessed whether PA moderates the relationship among cannabis group (CBD, THC, and THC+CBD) and changes in negative affect over time (baseline to week 4). A trend was observed ($F(2,170)=2.65$, $p=.07$) for the THC group to engage in more PA compared to the CBD group ($p=.06$), but not the THC+CBD group ($p=.37$). In the moderation model, there was a main effect of time showing decreases in DASS-21 scores from baseline to week 4 ($p=.01$). Qualifying this main effect was a significant three-way interaction between cannabis group, time, and PA ($p=.03$). At low (mean-1 SD), moderate (mean), and high (mean+1 SD) PA, the CBD and THC groups demonstrated improvements in negative affect over time ($p's<.01$). In the THC+CBD group negative affect improved over time at moderate and high PA ($p's<.01$), but not at low PA ($p=.77$). These results are the first to explore whether PA moderates cannabis-associated improvements in negative affect. These data suggest that various cannabis products may be associated with differences in PA engagement in individuals with self-reported anxiety and that there is a complex interplay between PA, cannabis use, and negative affect.

Talk 4:

Leveraging Experimental Methods to Assess Cannabis Reinforcer Pathology via Smoking Topography

Elizabeth R. Aston
(Brown University)
Benjamin L. Berey
(Providence VA Medical Center; Brown University)
James MacKillop
(McMaster University)
Jane Metrik
(Brown University; Providence VA Medical Center)

Reinforcer Pathology (i.e., RP) is one way to conceptualize hazardous substance use that is characterized by preferences for substances immediately (i.e., delay discounting; DD) paired with willingness to pay for substances despite increasing cost (i.e., demand). RP relates to more frequent self-reported cannabis use in cross-sectional surveys/research; however, no previous study has extended RP to actual cannabis use in the laboratory. Moreover, the way in which one smokes (i.e., topography) has been linked to numerous negative outcomes in tobacco research, but there is a paucity of work on cannabis smoking topography. The present investigation sought to replicate RP at baseline in a sample endorsing frequent cannabis flower smoking; this was subsequently extended to ad libitum smoking topography. This study recruited adults endorsing cannabis flower smoking (≥twice weekly) to participate in a laboratory cannabis administration study. At baseline, participants completed a trait-Marijuana Purchase Task (MPT), Monetary Choice Questionnaire (MCQ), Daily Sessions, Frequency, Age of Onset, and Quantity of Cannabis Use Inventory, and a Structured Clinical Interview to assess cannabis use disorder symptoms (CUD). Participants returned for ad libitum cannabis smoking topography; they completed a state-MPT and smoked up to two cannabis cigarettes via a smoking topography device over 1-hour. The device measured puff number, volume, duration, and inter-puff-interval [IPI]. The final analytic sample (N = 61) included participants with complete MPT data (37.7% female, mean [SD] age = 22.9 [4.8], cannabis use days/week = 5.2 [1.6]). Linear regressions controlling for age and sex examined whether trait demand, DD, and their interaction predicted baseline cannabis use (i.e., typical grams/session) and CUD symptoms. RP was next tested during ad libitum laboratory cannabis administration by examining whether state demand, DD, and their interaction predicted topography. Cross-sectionally, demand (i.e., breakpoint: price suppressing demand to zero) was uniquely positively associated with grams/session (p < .01) and DD (i.e., log K) was uniquely positively associated with CUD symptoms (p < .05). State demand prior to ad libitum administration (i.e., breakpoint, elasticity: decreased consumption as price escalates) was negatively associated with puff number (ps < .05) and volume (ps < .05). Omax (i.e., maximum expenditure) was negatively associated with smoking duration (p < .05). DD and DD by demand interactions were not significantly associated with smoking topography. This is the first study to extend RP to ad libitum cannabis administration with

an emphasis on smoking topography. RP was confirmed cross-sectionally via unique prediction of cannabis use and CUD symptoms by trait demand and DD, respectively. Subsequently, significant relations between state demand and topography, but not DD, were demonstrated. Demand and DD tap distinct aspects of choice: demand is strongly linked with volumetric use, while DD is strongly associated with cannabis problems and addiction pathology. The lack of relation between DD and topography may be explained by DD reflecting decisions that typically impact distal substance-related problems rather than topography, which may be more reflective of immediate volumetric use. Topography is likely an important process for continued study, particularly in light of the rapid evolution of cannabis legalization. Future work should assess whether topography may be manipulated to facilitate cessation or reduction in cannabis use.

Symposium Title:

Advances in Understanding Antecedents and Consequences of Cannabis and Alcohol Co-Use: Insights From Momentary Data in Young Adults

Chair: Rachel Gunn
(Brown University)
Discussant: Jeffrey D. Wardell
(York University; University of Toronto; Centre for Addiction and Mental Health, Toronto)

Research on the widespread use of cannabis with alcohol (co-use) and specifically, simultaneous use (using cannabis and alcohol together so that their effects overlap), has generated compelling data suggesting that co-use is associated with increased alcohol and cannabis consumption and greater risk of substance-related consequences. The increased prevalence of cannabis use among young adults in the wake of expanding legalization has raised important questions about the impact of cannabis use on alcohol-related risk in this population, who have the highest prevalence of co-use. However, given the complexity and heterogeneity of cannabis use patterns, the impact of co-use (and simultaneous use) is nuanced and evolving. In particular, there is significant variability from between- (individual-level) and within-person (event-level) patterns of use, and parsing these effects is critical to furthering our understanding of co-use. In this symposium, we will present four studies on co-use that provide new insight into these complex substance use behaviors, with a focus on daily and momentary studies that disentangle between- and within-person variance in co-use. This symposium takes a thorough look at predictors of simultaneous use, in-the-moment changes in subjective response during use episodes, and next-day consequences. We provide a nuanced analysis of cognitive, social, and physiological predictors of co-use patterns and consequences. We will also synthesize competing findings to understand how co-use may confer specific risks relative to cannabis-only and alcohol-only events. Findings reflect cutting-edge research in the area and discussion will include clinical, policy, and public health implications of this work.

Talk 1:

A Systematic Review of Proximal Antecedents and Acute Outcomes of Simultaneous Alcohol and Cannabis Use: Findings from Within-Person Studies

Kyra N. Farrelly
(York University)
Tahmina Amini
(York University)
Sophie G. Coelho
(York University)
Nicolle Fox
(York University)
Nicole Dimitrova
(York University)
Christian S. Hendershot
(University of North Carolina-Chapel Hill)
Jeffrey D. Wardell
(York University, University of Toronto)

Background: Research on simultaneous alcohol and cannabis use is rapidly growing against the backdrop of recent changes in cannabis regulations occurring globally. Examining simultaneous use is important given its high prevalence and association with elevated substance-related consequences compared to single substance use. Between-person comparisons have revealed increased substance-related consequences between those who engage in simultaneous use and those who use alcohol or cannabis alone, yet more recent within-person studies examining daily- and event-level associations with simultaneous use are less consistent. Understanding within-person differences is imperative, as differences between those who use alcohol and cannabis simultaneously and those who do not could be explained by dispositional risk factors for engaging in simultaneous use rather than by the acute effects of simultaneous use. Thus, within-person comparisons are needed to examine the acute consequences of simultaneous use versus single substance use. Although previous reviews have broadly summarized the simultaneous use literature, many were published prior to the recent growth in daily and event-level studies and did not specifically look at within-person associations. Method: This systematic review aimed to summarize the emerging literature on within-person differences in proximal antecedents and acute outcomes between simultaneous use and single substance use occasions. This review followed PRISMA guidelines and was pre-registered with PROSPERO (registration ID: CRD42023425606). Empirical studies that compared simultaneous use to alcohol-only and/or cannabis-only use, within-person, using day- or event-level data were eligible for inclusion. Our search revealed 21 eligible studies. Two categories of antecedents (i.e., internal motives for use and external location and social context of use) and three classes of outcomes (i.e., consumption behavior, general positive and negative consequences, and specific consequences) were identified. Results: The current literature suggests that within-person variation in certain antecedents (i.e., increased social and enhancement motives, social context with more people) were proximal predictors of engaging in simultaneous use compared to alcohol- or cannabis-

only use at the day- or event-level. However, while most evidence pointed to heavier alcohol consumption on simultaneous use versus single substance occasions, findings of risk for acute consequences on simultaneous use occasions compared to single substance use occasions were mixed and appeared to depend on the level of alcohol consumed. There was preliminary evidence that engaging in simultaneous use increased the risk of specific consequences (e.g., sleep problems, impaired driving); however, evidence that simultaneous use led to more negative consequences at the event level was less consistent. Further, some findings showed more consistent evidence of increased consequences when comparing simultaneous use to cannabis-only use rather than to alcohol-only use. Conclusion: This review identifies specific antecedents for simultaneous use events but suggests that simultaneous use events are not always associated with more acute harms than single substance use events. This review helps to highlight areas for future research and could inform "just in time" interventions to target antecedents of engaging in a simultaneous use event. Findings may also inform harm reduction efforts by suggesting a need to focus on levels of alcohol consumption as an important variable in understanding the acute consequences of simultaneous use.

Talk 2:

Descriptive Norms for Simultaneous Cannabis and Alcohol Use Predict Simultaneous Use Patterns Assessed Via Daily Surveys

Sophie G. Coelho
(York University)
Christian S. Hendershot
(University of North Carolina-Chapel Hill)
Roisin M. O'Connor
(Concordia University)
John A. Cunningham
(Kings College London, Institute for Mental Health Policy Research, University of Toronto)
Jeffrey D. Wardell
(York University, University of Toronto)

Background: Simultaneous use of cannabis and alcohol is common among young adults. Given the often-social nature of simultaneous use, perceived descriptive norms – or individuals' perceptions about others' simultaneous use patterns – may help to explain young adult simultaneous use. Select studies have examined associations of descriptive norms for simultaneous use with simultaneous use patterns. However, these studies have not controlled for normative perceptions of the frequency and quantity of cannabis use and alcohol use in general (i.e., not limited to simultaneous use). Thus, the specificity of descriptive norms for simultaneous use in predicting simultaneous use patterns is unclear. This study examined the unique associations of descriptive norms for simultaneous use with simultaneous use patterns assessed via daily surveys, including the tendency to engage in simultaneous use across days and quantities of cannabis and alcohol consumed on simultaneous use days. Method: Young adults reporting simultaneous use (N = 150; 63% female; mean age 22 years) completed a

baseline questionnaire that included measures of descriptive norms for the frequency of simultaneous use and the amounts of cannabis and alcohol consumed during a typical simultaneous use occasion. Further, participants completed standard measures of descriptive norms for the frequency and quantity of cannabis and alcohol use in general (i.e., not limited to simultaneous use). All norms were assessed with reference to both peers of the same age and gender and friends of the same gender. Participants subsequently completed daily smartphone surveys for 21 days, which assessed cannabis use and alcohol use each day. Results: Multilevel models showed that perceiving more frequent simultaneous use among friends was associated with a greater propensity for simultaneous use relative to cannabis-only use across the daily assessments (OR = 0.81, B = -0.21, *SE* = 0.07, *p* = .003), even while controlling for descriptive norms for cannabis use frequency and alcohol use frequency in general. However, descriptive norms for simultaneous use were not significantly associated with propensity for simultaneous use relative to alcohol-only use across days (*p* > .05). In addition, in multilevel models predicting quantities of cannabis consumed on simultaneous use days, normative perceptions of heavier cannabis consumption during simultaneous use occasions among friends (*B* = 0.31, *SE* = 0.10, *p* = .002) were associated with greater quantities of cannabis consumed across simultaneous use days, controlling for descriptive norms for quantities of cannabis consumed in general. Further, in multilevel models predicting quantities of alcohol consumed on simultaneous use days, normative perceptions of heavier alcohol consumption during simultaneous use occasions among friends (*B* = 0.08, *SE* = 0.03, *p* = .014) were associated with greater quantities of alcohol consumed across simultaneous use days, controlling for descriptive norms for quantities of alcohol consumed in general. Conclusions: This study provides novel evidence that descriptive norms for simultaneous use contribute uniquely to simultaneous use patterns, over and above standard measures of descriptive norms for cannabis use and alcohol use in general. Findings suggest that normative perceptions that are specific to simultaneous use should be examined in future research as potential targets of harm reduction interventions for simultaneous use among young adults.

Talk 3:

Exploring Planned vs. Unplanned Cannabis Use on Cannabis Only and Alcohol Co-Use Days: Cannabis Outcomes and Order Effects

Lindy K. Howe
(Brown University)
Holly K. Boyle
(Brown University)
Jane Metrik
(Brown University)
Timothy J. Trull
(University of Missouri)
Sharon Lipperman-Kreda
(Pacific Institute for Research and Evaluation)
Rachel L. Gunn
(Brown University)

Background. Alcohol and cannabis co-use, including simultaneous use (SAM; using alcohol and cannabis at the same time so that the effects overlap), is increasingly prevalent among young adults, prompting research into factors influencing risky patterns and outcomes of co-use. Such factors may include intentions (i.e., plans) for using each substance. Growing research has examined planned and unplanned alcohol use, and ecological momentary assessment (EMA) studies have found that planned (versus unplanned) alcohol use is associated with increased consumption and likelihood of alcohol-related consequences. However, studies examining planned and unplanned cannabis use are scarce. Given unique patterns and contexts of cannabis and alcohol use, specific examination of cannabis intentions (planned/unplanned use) is warranted. Additionally, emerging evidence indicates that the order of alcohol and cannabis consumption during co-use events influences consumption levels, yet no studies have examined the impact of order effects in the context of planned versus unplanned cannabis use. The current study explores the significance of cannabis intentions by investigating associations with consumption patterns, consequences, and the influence of co-use order effects. Methods. 103 non-treatment seeking individuals aged 18-30 participated in a 28-day EMA study. Participants completed morning surveys (n=2,585 days) of previous day's cannabis and alcohol use, positive (e.g., “was more sociable”, “felt more energetic”) and negative (e.g., “neglected responsibilities”, “had difficulty concentrating”) consequences, and intentions to use cannabis on current day. Separate multilevel models (controlling for between-person effects) assessed the associations between cannabis intentions and quantity of flower consumed and experience of positive/negative cannabis-attributed consequences on all cannabis use days (n=1,711 days). The interaction between daily order and intentions on consequences was examined on co-use days (n=1,014 days). Results. Person-level planned cannabis use predicted increased flower consumption (ß=0.77, p<.001). Also, planned cannabis use predicted the likelihood of experiencing a negative (but not positive) cannabis consequence at the day level (OR=1.77, p<.01). Analyses examining co-use days revealed no main effect of order, and no interaction between planned cannabis use and order. However, findings did reveal a main effect of SAM use (versus co-use). Specifically, SAM use was associated with a higher likelihood of experiencing a negative consequence at the day level (OR=2.66, p<.001). Conclusions. Findings underscore the importance of considering cannabis intentions when examining the relationships between cannabis use and consequences. Findings indicate that planned cannabis use may increase the risk of negative outcomes, paralleling observations on alcohol intentions. Although no significant order effects were found, main effects of SAM use suggest that overlapping effects may contribute to negative cannabis outcomes. Integrating these findings into preventive interventions, such as

addressing cannabis intentions before or after alcohol use, could enhance targeted approaches to mitigate the harms associated with alcohol and cannabis co-use among young adults.

Talk 4:

Within-Episode Relations Among Simultaneous Alcohol and Cannabis Use and Continued Drinking: The Role of Momentary Subjective Responses, Craving, and Drinking Context

Jack T. Waddell
(Arizona State University)
William R. Corbin
(Arizona State University)
Kevin J. Grimm
(Arizona State University)
Jane Metrik
(Brown University)
Christine M. Lee
(University of Washington)
Timothy J. Trull
(University of Missouri)

Objective: Simultaneous alcohol and cannabis use is associated with riskier daily drinking. However, little research has focused on momentary mechanisms through which simultaneous use confers risk for continued drinking behavior during acute drinking episodes. The current study tested whether simultaneous use moments conferred risk for within-episode increases in subjective responses, craving, and continued drinking, and whether these relations were potentiated in social vs. solitary settings. Methods: Emerging adults who co-use alcohol and cannabis (N = 85) completed 21 days of ecological momentary assessment with event-contingent reports during drinking episodes. Three-level multilevel models tested whether moments characterized by simultaneous use were indirectly associated with subsequent, continued drinking through subjective response patterns (i.e., high arousal positive/reward, high arousal negative/aggression, low arousal positive/relaxation, low arousal negative/impairment) and alcohol craving, and whether relations differed by social vs. solitary contexts. Results: Within drinking episodes, simultaneous use moments were associated with increased reward, which was indirectly associated with continued drinking through increased alcohol craving. In addition, the relation between simultaneous use and rewarding effects was potentiated during solitary drinking moments, whereas the relation between rewarding effects and craving was potentiated during social drinking moments. Finally, simultaneous use moments were associated with increased relaxation, which was indirectly associated with a lower likelihood of continued drinking through lesser craving. Conclusions: Simultaneous use conferred acute risk for within-episode drinking, and acute subjective effects and craving served as mechanisms of risk, dependent upon drinking context. Just-In-Time interventions should consider the role of affect, craving, and context in event-specific interventions.

Making Decisions about Cannabis Use Before, During, and After Pregnancy

Chair: Lauren Micalizzi
(Brown University)
Discussant: Robin J. Mermelstein
(University of Illinois Chicago)

The prevalence of cannabis use during pregnancy mirrors the upward trend seen in the general population, despite potential risks to both the pregnant person and child. It is therefore imperative and timely to delve into decision-making surrounding cannabis use before conception, in pregnancy, and postpartum. This symposium serves as a platform to present a comprehensive array of empirical findings, encompassing qualitative, quantitative, and mixed-method studies conducted on both local and national levels. Dr. Gunn will present a qualitative analysis of symptom management posts from an online pro-cannabis forum for expecting parents. Ms. Denson will share insights from a mixed-method study examining motives for cannabis use and information sources among women planning to conceive or in the early postpartum phase. Dr. Mian will present findings from a mixed-methods study exploring clinical decision-making around intervention and impact on intervention engagement from the perspectives of mental health clinicians working with pregnant patients who use cannabis. Dr. Micalizzi will report on a national study of disclosure to providers and sources of information regarding cannabis use during pregnancy. Discussant, Dr. Mermelstein will synthesize findings and explore pathways for evaluating perinatal cannabis use and for providing stigma-free information about cannabis use before, during, and after pregnancy. This symposium brings together researchers studying perinatal cannabis use through diverse lenses and methods, shedding light on provider and patient perspectives to provide a balanced understanding of the needs and concerns of individuals who engage in cannabis use while also identifying avenues to mitigate potential adverse effects.

Talk 1:

Use of Cannabis to Manage Symptoms of Mental Health And Physical Conditions During Pregnancy: Analysis of a Pro-Cannabis Pregnancy Forum

Rachel L. Gunn
(Brown University)
Elizabeth R. Aston
(Brown University)
Lia Artis
(Brown University)
Jacqueline Nesi
(Brown University)
Lauren Micalizzi
(Brown University)

Background: Rates of prenatal cannabis use (PCU) have increased in recent years in tandem with the legalization and medicalization of cannabis. Despite clear evidence of developmental health consequences to offspring, there has been a reduction in the perception of PCU-related harms. Due to the stigma and risk of legal consequences associated with reporting cannabis use (CU) during pregnancy, individuals are often cautious to seek information about CU during pregnancy from their healthcare providers. Thus, pregnant people are more likely to seek information from anonymous sources, such as online support forums. Information from these anonymous online forums can shed

light on the patterns and motives for CU among this population. These insights can help to better inform prevention efforts aimed at reducing potential harms of PCU and improve intervention efforts for symptoms that are being managed with CU. Methods: Posts (n= 120) from an online pro-cannabis pregnancy forum called "Ganja Mamas" on whattoexpect.com were randomly selected (ten threads per month from June 2020 to May 2021) and analyzed if they covered topics related to PCU. A qualitative coding structure based on the existing PCU literature was used to apply thematic analysis to posts. Each post was analyzed by two coders and associated codes were grouped into themes. Codes on symptom management for physical and mental health were analyzed for the current study. Results: Four themes related to symptom management were identified. First, forum members discussed the use and impacts of cannabis use for a variety of mental health symptoms and related conditions including depression and anxiety. Posters also discussed how they used cannabis for physical health symptoms and conditions, such as nausea and pain. Third, they discussed the use of cannabis to achieve a general state of homeostasis and manage stress. Finally, forum members discussed decision-making about using cannabis for symptom management, such as using cannabis instead of prescription medications. Conclusions: Individuals use cannabis during pregnancy for a wide variety of mental and physical health symptoms, including as a general strategy for managing pregnancy-related stress. In this pro-cannabis forum, most discussions reflected perceptions that cannabis was effective in treating the conditions for which it was used, but limitations of cannabis' efficacy were also discussed. There is a need for reduced stigma and increased open communication between pregnant persons who use cannabis and their providers in discussing how to manage their mental and physical health symptoms. Understanding the various symptoms for which individuals use cannabis during pregnancy to self-treat can inform these conversations and the expansion of harm reduction strategies.

Talk 2:

Beliefs, Message Sources and Message Impact About Pre- and Postnatal Cannabis Exposure

Rebecca K. Denson
(University of Illinois Chicago)
Natania A. Crane
(University of Illinois Chicago)
Mayra Guerrero
(University of Illinois Chicago)
Robin J. Mermelstein
(University of Illinois Chicago)

Background and Aims: The American College of Obstetricians and Gynecologists and public health agencies recommend that people who are pregnant, planning to get pregnant, or breastfeeding not use cannabis, as not all of the potential harms of cannabis use surrounding pregnancy are known. Despite these cautionary messages, reported use of cannabis during pregnancy is increasing. Many women are unaware of the risks of prenatal cannabis use or do not discuss

their use with their health care providers. The goals of this study were to understand more about reasons and beliefs about prenatal cannabis use, messages, and trusted sources of information about cannabis use during and after pregnancy among individuals contemplating pregnancy or recently pregnant to help guide future message development. Methods: Females aged 21-40 were recruited for focus groups. Eligible participants used cannabis at least once/week and had been pregnant in the last year or planned to become pregnant in the next year. A baseline questionnaire assessed substance use and pregnancy history. Focus group discussions covered reasons for cannabis use during pregnancy, messaging received, and trusted sources of information on prenatal cannabis exposure. Focus groups were audio-recorded, transcribed, and analyzed using Dedoose to identify key themes. Results: Participants (mean age =31 years, 17% Hispanic/Latina, 83% Black/African-American, 17% white; mean cannabis use 4.08 days/week (SD=0.41); mean CUDIT-R score 14.0 (SD=6.07)) reported an average of 1.17 pregnancies (SD=0.41), and half planned to become pregnant in the next year; half reported current breastfeeding, and all planned to breastfeed in the future. Most got their cannabis products through social sources and not formal dispensaries. Most reported current alcohol drinking (2-4x/month), and 17% reported current use of cigarettes or e-cigarettes. Thematic analyses revealed the importance of cannabis use to cope with physical and mental symptoms (e.g., nausea, stress) both during and post-pregnancy and its use to help increase enjoyment of the postpartum period. Relative risks/benefits of not using cannabis versus using were also apparent in their decision making. Participants perceived cannabis to be safer than tobacco or alcohol during pregnancy, but myths about potential negative effects on infants through breast feeding were also voiced. Participants were eager to have information about cannabis from trustworthy sources and most relied on friends/family or internet sources. Mixed experiences with medical providers about potential cannabis discussions were reported, with trust issues paramount. For example, concerns were expressed about potential negative outcomes with reporting use, particularly if states required reporting of use to public health authorities. Conclusions: Addressing mental health concerns throughout pre and post pregnancy may help reduce pre- and postnatal cannabis exposure. Efforts to educate women about the health effects of cannabis use surrounding pregnancy should consider reasons for use and trust of medical providers. Women may prefer to learn about the risks of prenatal cannabis use from friends and family members.

Talk 3:

Mental Health Clinicians' Perceptions on Patient Motivations and Intervention Engagement for Prenatal Cannabis Use: A Mixed Methods Study

Maha N. Mian

(University of California, San Francisco; Kaiser Permanente Northern California)
Monique B. Does
(Kaiser Permanente Northern California)
Andrea Altschuler
(Kaiser Permanente Northern California)
Andrea Green
(Sacramento Medical Center, Kaiser Permanente Northern California)
Deborah R. Ansley
(Regional Offices, Kaiser Permanente Northern California)
Carley Castellanos
(Regional Offices, Kaiser Permanente Northern California)
Derek D. Satre
(University of California, San Francisco; Kaiser Permanente Northern California)
Kelly C. Young-Wolff
(University of California, San Francisco; Kaiser Permanente Northern California)

Aims: Mental health clinicians are uniquely suited to provide interventions to individuals who use cannabis during pregnancy. Examining the perspectives of these clinicians can provide important insights about pregnant patients' motivations for cannabis use and the factors that keep patients engaged in care. This mixed-methods study explored how mental health clinicians engage pregnant patients using cannabis. Methods: Participants were licensed mental health clinicians (Early Start Specialists; ESS) from Kaiser Permanente Northern California's Early Start perinatal substance use screening, assessment and counseling program embedded within obstetrics clinics. ESS completed an online survey (N=27; 100 % Female; 73.1% White; Mage=48.1) and a semi-structured qualitative interview (n=14) on their perceptions about patients' motivations for prenatal cannabis use and factors contributing to patient engagement in the Early Start program. Interviews were transcribed and thematically analyzed. Results: Quantitative results indicated that ESS perceived that nausea/morning sickness was the most common motive for using cannabis during pregnancy, and that pregnant individuals were most likely to get information about prenatal cannabis use from their peers. Quantitative and qualitative results indicated that ESS most often used motivational interviewing (MI) and psychoeducation to directly address cannabis use (100%). When working with patients who used cannabis to alleviate pregnancy-related symptoms, ESS most often used psychoeducation (88.5%) to discuss alternatives to using cannabis. ESS most often considered patients' motivation to change (100%) and prioritized harm reduction (HR) content (76.9%) when choosing an intervention, and further reported how patient readiness, therapeutic rapport, and interest in mental health support, particularly at the first clinical encounter, broadly facilitated intervention engagement and willingness to quit and/or reduce cannabis use during pregnancy. Qualitative results also demonstrated that ESS often integrated their expertise in other areas (e.g., sleep, family/child therapy, child

development) to support their work with pregnant patients who used cannabis. Conclusions: This mixed-methods study found that developing strong rapport and using interventions that are tailored to patients' readiness to quit and include harm-reduction components can increase pregnant patients' willingness to engage in a perinatal substance use intervention. Future clinical interventions might benefit from opportunities to address motivations for use and readiness to engage in care, emphasize peer support, bolster other sources of information for patients, and supporting the implementation of complementary interventions to address cannabis use.

Talk 4:

Prenatal Cannabis Use: Disclosure and Sources of Information

Lauren Micalizzi
(Brown University)
Lia Artis (Brown University)
Eric Pedersen
(University of Southern California)
Rachel Gunn
(Brown University)

Background: Concern over reports to child protective services and stigma can serve as powerful incentives for pregnant people to conceal cannabis consumption from their providers. This reluctance presents a significant obstacle that hampers the delivery of comprehensive and effective prenatal care. Consequently, other anonymous, but potentially less accurate, sources of information are often pursued. This study characterizes disclosure of prenatal cannabis use (PCU) to healthcare providers and assesses the sources of PCU-related information. Methods: N=25 pregnant persons (M_{age} = 30.24 [SD = 5.81], 68% White, 22% Hispanic/Latine) who currently use cannabis products with THC and live in the United States completed a video conferencing call to confirm their identity, screen for eligibility, and provide consent. This call was followed by a self-administered survey that queried demographics, substance use, disclosure, and cannabis-related beliefs and behavior via both closed- and open-ended questions. Participants in the first (28%), second (56%), and third (16%) trimesters retrospectively reported on PCU since finding out they were pregnant. Results: First trimester PCU was daily or almost daily for 44% of the sample. While nicotine use was uncommon, 52% of the sample reported any alcohol use in the first trimester. Of those, 38% reported drinking at least weekly. Second trimester PCU was daily or almost daily for 33% of the sample and 33% reported any alcohol use; of those, one-third used alcohol at least weekly. Frequency of PCU was at least weekly for all participants in their third trimester. Use of other substances was uncommon, with no third trimester nicotine use identified, and only one participant reported any third trimester alcohol use. Approximately half (52%) of the sample had not disclosed PCU to their provider; of those who did, 83% reported being completely honest about their use. Of the 96% who sought PCU-related information, the internet (75%) and family/friends (63%) were the sources most used. Less than half of the sample sought information about

cannabis use from their physician (42%) and/or a midwife (33%). Qualitative analysis of responses to open-ended questions about the information received from these sources indicated that some pregnant people feel that they received mixed messages about the harms of PCU (e.g., "Mixed messages…it's old research that needs to be considered") while others concluded that PCU was safe based on the information garnered (e.g., "there are no case studies of weed being harmful during pregnancy"). Conclusions: It is imperative to create a safe space for non-judgmental, accurate patient-provider conversations about PCU. Exploring individual difference characteristics of patients and providers, as well as aspects of the patient-provider relationship that promote honesty and disclosure, are worthy of further investigation.

Symposium Title:
Reaching the Modern Cannabis Consumer: Using Research to Guide Messages and Strategies to Close Knowledge Gaps and Catch Up to Rapidly Changing Cannabis Policy Landscapes
Chair: Sarah Okey (Washington State Liquor and Cannabis Board)
Discussant: Kristen Haley (Washington State Liquor and Cannabis Board)

Cannabis policy has outpaced scientific knowledge on cannabis. As a result, misinformation about cannabis use is a concern and exists at both the industry- and consumer-level. This symposium discusses current dissemination practices of evidence-based health and safety cannabis information to consumers. The first presentation by Dr. LoParco explores the quickly evolving online cannabis market space and shared findings on the prevalence and change in health warnings, benefits, and promotions across 175 U.S. cannabis retailers with online storefronts. The second presentation by Dr. Williams explores the extent to which consumers recognize health warning labels and recalls on cannabis packaging across three years using the International Cannabis Policy Study. The third presentation by Dr. Okey discusses knowledge levels, current purchasing decisions, potential avenues for education, and areas of interest for Washington state consumers and retail employees. All presentations explore differences between important subgroups, such as gender, age, and cannabis use characteristics. Finally, discussant Kristen Haley, Public Health Education Liaison at the Washington State Liquor and Cannabis Board, integrates these three presentations. With her background in public health for over a decade overseeing instrumental marketing campaigns to promote health education, she highlights the importance of promoting evidence-based information for legal cannabis users to reduce harm and promote safety. She additionally discussed the importance of continued collaboration across regulators, researchers, and public health professionals within this quickly evolving cannabis landscape.

Talk 1:
Non-Medical Cannabis Online Retail Practices in 5 US Cities: 2022 To 2023

Cassidy LoParco
(George Washington University)
Yuxian Cui
(George Washington University)
Zongshuan Duan
(Georgia State University)
Katie Vinson
(George Washington University)
Katelyn Romm
(University of Oklahoma Health Sciences Center)
Yan Wang
(George Washington University)
Patricia A. Cavazos-Rehg
(Washington University)
Erin Kasson
(Washington University)
Y. Tony Yang
(George Washington University)
Carla J. Berg
(George Washington University)

Objectives – Cannabis industry marketing is a well-documented determinant of individual perceptions and use. Retailers frequently promote their business/products online, reaching a broad range of consumers. However, online cannabis retail regulations are often non-existent, vague, or difficult to enforce. Given the evolving cannabis marketplace (e.g., products, marketing strategies), this study examined online cannabis marketing practices over time. Methods – In 2022 and 2023, researchers independently assessed 175 randomly-selected non-medical cannabis retailers' websites across 5 US cities (Denver, Colorado; Seattle, Washington; Portland, Oregon; Las Vegas, Nevada; Los Angeles [LA], California, n = ~35/city) and dual-coded website content (e.g., age verification, sales, delivery, warnings, ad content, promotional strategies); consensus was reached. Analyses compared data from 2022 vs. 2023 and considered regulatory factors across cities. Results – Similar to 2022, in 2023, 76.6% required age verification for site entry, 85.1% used social media promotion, and 90.9% offered online sales (82.4% of which required age verification for online purchase, 34.6% offered delivery, and 39.0% [vs. 57.6% in 2022, $p < .001$] indicated age verification for pickup/delivery). There were significant ($p < .05$) decreases from 2022 to 2023 in the proportions indicating medical card requirements (27.4% to 15.4%), purchase limits (59.4% to 47.4%), health warnings (38.9% to 29.7%), health benefits (60% to 47.4%), discounts/price promotions (92.6% to 86.3%), and providing information/links to medical/mental health resources (25.7% to 3.4%). Less than half (41-45%) sold CBD-only products across time points; there was a decrease in those selling Delta-8 THC (8.0% to 0.6%, $p < .001$). Across time points, similar proportions had imagery targeting teens/young adults (25.7%-30.3%), veterans (22.3%-28.6%), and LGBTQ+ (5.7%), but there were increases in imagery targeting racial/ethnic minorities (4.6% to 21.1%) and sexualized imagery (1.7% to 12.6%). In 2023, proportions differed across cities in ways reflecting whether state/local law allowed online sales (>90% in Denver, Las Vegas, LA), allowed discounts/price promotions (100% in Denver and Las Vegas), or required health warnings (48-60% in Seattle and LA vs. <20% elsewhere). Despite all sites prohibiting youth-oriented content and all but Denver and Las Vegas prohibiting health claims,

30.3% posted content targeting youth/young adults (LA = 8.1% to Denver = 74.2%) and 47.4% health claims (Seattle = 27.0% to Denver = 71.0%). Conclusions – Increased use of social media, online cannabis retail, and delivery (especially without clear age verification procedures) presents risks for access and appeal to minors. Moreover, online retail tended to emphasize health benefits and use price promotions, regardless of restrictions, indicating a need for greater regulatory efforts. Notably, the proportion of websites showing health warnings decreased over time, which is concerning given that each of these states mandates specific warnings at the point of sale, indicating additional risk with online retail. Additionally, the study revealed evidence of targeting specific subpopulations (e.g., youth, veterans, racial/ethnic minorities), indicating the need for increased surveillance among these populations and policies (and related enforcement) to restrict targeted marketing.

Talk 2:

Health Warning Labels Awareness and Recall and Health Beliefs in Washington State

Jason Williams
(University of Washington)
Sharon Garrett
(University of Washington)
Beatriz Carlini
(University of Washington)
David Hammond
(University of Waterloo)

Health Warning Labels (HWL) are a low-cost, sustainable way of communicating the health effects of products to consumers. In Washington State cannabis product packages are required to display some HWLs. We include under the umbrella of HWLs warnings about legality that are implicitly about health, regarding driving after consumption and consumption by those under 21 years of age. HWL requirements vary slightly by product type. The current presentation provided WA State findings on HWL awareness and recall from three years of data post-legalization (2020-2022) from the International Cannabis Policy Study, a repeat cross-sectional study. The presentation focused on respondents who had reported seeing a cannabis product package in the past 12 months (n = 1018 in 2020, n = 1061 in 2021, n = 1848 in 2022). Initial analysis indicated 40% of these respondents reported seeing at least one HWL, with higher levels among more frequent cannabis users. Among those who reported seeing a HWL, 50% recalled a warning against driving or operating machinery, the highest rate of recall. The presentation included information on the correspondence of specific HWL recall and specific health beliefs, and the relationship between HWL awareness and recall and gender, age, and cannabis use patterns.

Talk 3:

Current Knowledge Levels and Interest in Education Among Cannabis Consumers and Retail Employees in Washington State

Sarah Okey
(Washington State Liquor and Cannabis Board)
Kristen Haley

(Washington State Liquor and Cannabis Board)
Brian McQuay
(Washington State Liquor and Cannabis Board)
Jordan Arias
(Washington State Department of Health)
Nikki Meline
(Washington State Department of Health)
Sally Riggs
(Washington State Department of Health)
Mary Segawa
(Washington State Liquor and Cannabis Board)

Objectives: More adults have access to legal cannabis than ever before. However, content knowledge about cannabis products and safer ways to use remains limited. Research is needed to better understand what extent consumers are interested in learning more and potential avenues to promote informed decision making. As such, the Washington State Liquor and Cannabis Board (LCB) and the Washington State Department of Health collaborated to develop a survey that would inform future educational campaigns and promote public health and public safety of adults who use cannabis. Methods: Adults aged 21+ (N= 439) completed an anonymous, voluntary survey from December 2023 through January 2024. Respondents were both legal cannabis consumers and retail employees who accessed the online survey through QR codes displayed in Washington retail cannabis stores. Survey respondents answered questions on demographics, cannabis use, where they typically get information about cannabis, information currently used to make purchasing decisions, and interest in further education. Respondents additionally took a knowledge quiz that tested current understanding of basic cannabis information (e.g., "True or False: Cannabis products are approved by the FDA to treat, cure, and prevent disease"). Linear and binary logistic regressions were used to examine purchasing decisions, interest in learning more, and avenues for education. Covariates included age, gender, frequency of cannabis use, length of time using cannabis, knowledge levels, and employment at a retail store. Results: Current knowledge levels for consumers were relatively low with the average score on the knowledge check being 43% for consumers and 57% for retail staff. Cannabis retail staff (β = 1.03, p < .001) and those who had been using cannabis for a longer period of time (β = 0.02, p = 0.05) answered more questions correctly. When examining information used to make purchasing decisions, subgroup differences emerged. For example, employees were less interested in knowing the THC concentration when making a purchase relative to cannabis consumers (β = -1.72, p < .001). Most people (50%) reported being interested or extremely interested in receiving more education at retail stores. Again, subgroup differences emerged on what information would be most interesting. For example, more frequent users were more likely to be interested in tips for safer use relative to less frequent users (OR = 1.26, p = 0.03). By far, the two most popular avenues for education identified by all respondents were

cannabis product labels and budtenders. Conclusions: Consistent with prior research, findings underscore the need to increase effective, evidence-based information for both cannabis consumers and retail employees. Survey results provide a positive outlook that consumers and staff are interested in becoming more informed about cannabis. Group differences emerged related to specific types of information consumers currently weigh when making purchases as well as what types of information would captivate their attention. Further research is needed on how to provide reliable and evidence-based information using the avenues (budtenders and packaging) identified by respondents.

Symposium title:

The Effects of Cannabinoids In Different Contexts, Age Groups, and Conditions: New Neuroscientific and Behavioral Directions

Chair & Discussant: Godfrey D. Pearlson
(Yale University/Institute of Living)

The symposium focuses on a series of new directions in emerging neuroscience research, investigating two of the best-studied cannabinoids – THC and CBD. Although the field is poised to use cannabinoids to modify behavior in a wide variety of circumstances, there is a clear need to quantify the real-world impact of potential risks (e.g. cognitive impairment, motor vehicle crashes) versus benefits (e.g. clinical treatment of a wide variety of medical and psychiatric conditions). In turn, these risks and benefits are likely to differ across different populations, doses, and at different life stages. Similarly, cannabinoid effects may vary significantly across different cognitive domains, and differentially affect underlying neurobiological mechanisms. Different effects across the adult age spectrum are particularly important to study. Increasing numbers of older individuals are beginning to use cannabis both recreationally and medicinally, yet reported evidence is contradictory (e.g., THC is reported to improve certain aspects of memory in aging rodents but impairs immediate memory function in younger human laboratory participants). This symposium focuses on using neuroscience tools to quantify cannabinoid effects on brain and behavior at different doses and in different age and diagnostic groups. We report on five diverse questions: 1) cannabis-related driving behavioral and subjective impairment, 2) THC effects on resting-state fMRI, 3) THC effects on memory and subjective effects across the adult age span, 4) potential therapeutic effects of CBD on memory function in psychosis, and 5) THC impairment of mental timekeeping mechanisms.

Talk 1:

Cannabis-Impaired Driving: Insights from a Randomized, Placebo-Controlled, Double-Blind Driving Simulator Study

Shashwath A. Meda
(Yale University/Institute of Living)
Godfrey D. Pearlson
(Yale University /Institute of Living)
Erwin Boer
(Entropy Control Inc.)

Nicholas Ward
(University of Montana)
Marilyn Huestis
(Institute for Emerging Health Professions/Thomas Jefferson University)
Nina Fernandez
(Institute of Living)
Cole Arnold
(Institute of Living)
Michael C. Stevens
(Institute of Living/Yale University)

Background: Driving safety under the influence of prescribed and recreational drugs is a major concern. With the legalization of medical and recreational cannabis, the number of drivers intoxicated from recent cannabis use will continue to increase. Different studies provide wide ranges of risk estimates for being involved in a cannabis-associated motor vehicle crash or driving-related injury. Thus, we need more direct, informative approaches to understand cannabis effects on driving safety. Methods: We utilized a randomized, placebo-controlled, counterbalanced, double-blind design to study 38 psychiatrically healthy adults, aged 18-40 years, with >2 years of recent highway driving experience and a current driver's license. 34/38 participants were regular cannabis users, (at least once weekly for the last 3 months). Each participated in three separate full-day sessions. Participants inhaled an acute dose of vaporized cannabis, either 29.5 mg, 65 mg THC, or an identical placebo using a computer-paced inhalation protocol, ensuring standardized route and timing. Throughout each 8-hour assessment day, at four time points, participants underwent simulated driving tests, including lane-keeping, car following, and overtaking tasks, capturing nineteen different behavioral metrics. A linear mixed model in SPSS assessed main effects of dose, time, and dose × time adjusted for sex, time since dose, usage group, and age for the above driving metrics. Results: Blood metabolite analysis revealed that primary delta-9-THC levels increased significantly until ~22 minutes after cannabis inhalation. Subsequently, differences in THC levels compared to placebo became non-significant. Secondary delta-9-carboxy-THC levels were significantly higher until ~ 83 minutes post-dose. Blood THC and metabolite measures were essentially unrelated to driving impairment. We identified six specific impaired driving outcomes that were significantly affected by cannabis use across the three simulated driving tasks. Lane Keeping Task: Participants exhibited reduced steering reversal rates (SRR) post-drug. This impairment in vehicle control persisted for up to 5.5 hours following the 65 mg and 3.5 hours following the 29.5 mg dose of cannabis. Car Following Task: Participants showed significant reductions in pedal engagement and reversal rates post-drug, indicating impaired responsiveness to changes in driving conditions. Similar to the lane-keeping task, these impairments persisted for 1-3 hours after cannabis use (65 mg dose only). Overtaking Task: Post-drug, drivers demonstrated a shorter median gap to passed cars, resulting in less time estimated to a potential collision. They spent more time in the oncoming traffic lane while passing, an effect that

persisted longer in the 65 mg condition. These measurements improved slowly and to varying degrees over time. Self-reported assessments indicated that two-thirds of the participants were willing to drive despite being subjectively aware that they were impaired. Objective measurements, however, revealed significant impairments in driving performance during these periods, highlighting the potential risks associated with individuals underestimating their impairment. Conclusion: This study provides valuable insights into cannabis effects on driving behavior. Findings highlight the complex nature of cannabis-related impairments, affecting both automatic and goal-directed driving behaviors. Future research should explore the interaction between drug effects and drivers' risk awareness to inform public health policies and legal standards for cannabis-related driving safety.

Talk 2:

THC Affects Resting State Brain Network Connectivity Differently in Older and Younger Adults

Michael C. Stevens
(Institute of Living/Yale University)
Shashwath A. Meda
(Yale University /Institute of Living)
Cole Arnold
(Institute of Living)
Nina Fernandez
(Institute of Living)
Godfrey D. Pearlson
(Yale University /Institute of Living)

Background: As cannabis legalization expands, it becomes more important to understand its acute effects on brain function across different age groups. The effects of Δ9-tetrahydrocannabinol (THC) – the primary psychoactive compound in cannabis – on cognition and brain function have been extensively studied in younger populations, but almost entirely neglected in older adults. There are well-described age-related changes in brain structure and function that raise the possibility that the endocannabinoid system changes with age in ways that could influence the older individuals' response to THC. This study compared the acute effects of THC on resting-state brain function in young and older subjects using functional magnetic resonance imaging to quantify whole brain connectivity during an unstructured resting state paradigm (rs-fcMRI). Methods: We conducted a double-blind, randomized, placebo-controlled, within-subject crossover acute cannabis challenge study with 29 adults, comprising 15 younger (mean/*SD* age = 25.5/4.2 years) and 14 older individuals (66.2/3.5 years). On two separate days, participants received a single dose of 65 mg of THC or a 0 mg THC placebo using a paced inhalation vaporizer administration protocol. Approximately 30 minutes after dosing, participants underwent 7 minutes of eyes-open rs-fMRI data collection. fMRI data was prepared for modeling using a standard fMRIPrep 20.2.6 protocol. An automated and adaptive independent component analysis (ICA) based on the Neuromark template in the GIFT toolbox was used to derive 53 statistically independent intrinsic networks across eight functional domains - sensorimotor (SM), visual (VIS), auditory (AUD), default mode (DMN), cognitive control (CC),

cerebellar (CB) and subcortical (SC). Individual level static functional network connectivity matrices were computed by calculating Pearson correlations between the time courses of the 53 intrinsic ICA networks, Fisher Z-transformed, then subjected to a mixed-model analysis in R to explore the effects of drug, group, and drug × group interactions (pilot results thresholded $p < 0.01$ uncorrected). Results: After placebo, older adults had increased connectivity between nodes of SM-SC/AUD/VIS networks and SM-CB, as well as lower connectivity between SM-AUD/VIS and SC-CB networks. This age-related difference was comparable after active THC, but older adults showed additional reductions in AUD-VIS and increased SM-CB connectivity compared to younger adults. Drug × group interactions were noted primarily in network connections between SC-SM/VIS/CC, SM-CC/DMN, VIS-CC, and CC-DMN, many of whose regions are rich in CB1 receptors. Conclusion: These alterations in functional connectivity suggest older adults' brains have distinctly different responses to THC, potentially indicating the drugs' agonist effect on cannabinoid receptors alters the exchange of information among distal brain regions. These findings contribute to our understanding of the impact of cannabis on brain function across the lifespan and emphasize the importance of considering age-related variables in cannabis research and clinical interventions. Further investigation into the underlying mechanisms driving age-related differences in THC effects on brain connectivity is warranted, with implications for informing personalized approaches to cannabis use and mitigating potential risks associated with its consumption, particularly in older populations.

Talk 3:

Acute Effects of THC on Memory Performance and Related Brain Activation Across the Adult Age Spectrum

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(Yale U./Institute of Living)
Godfrey D. Pearlson
(Yale U./Institute of Living)
Nique Pichette
(Institute of Living)
Nina Fernandez
(Institute of Living)
Cole Arnold
(Institute of Living)
Michael C. Stevens
(Institute of Living/Yale U.)

Background: Cannabis legalization has significantly increased cannabis use among older adults. Compared to extensive research on acute THC effects in young adults, little is known about whether THC affects older adults differently or confers greater risk. THC impacts memory significantly, a domain crucial for function and quality-of-life at older ages, whose impairments may presage dementia. We examined whether THC disrupts short-term relational and item-specific memory performance and associated hippocampal activity more in older vs younger adults. Methods: Fifteen younger (mean/*SD* age = 25.5/4.2 years) and 14 older cannabis-using adults (66.2/3.5 years) participated in a double-blind, randomized, counterbalanced, placebo-controlled, within-subject,

crossover, acute cannabis challenge study. On two separate study days, participants inhaled a single dose of either 65 mg THC or 0 mg (placebo) THC from vaporized cannabis plant material. Twenty minutes later, they underwent fMRI using the Relational and Item-Specific Encoding (RISE) paradigm. After quantifying expected memory performance and brain activity alterations in both groups on relational encoding, item-specific encoding, and recall/recognition, differences between age groups were evaluated in R mixed models (i.e., the Drug × Group interaction). Preliminary results at $p <$ .05 are reported (fMRI results used a contiguous clusterwise extent $k = 10$). Results: Behavioral analyses revealed slowed ($p < 0.05$) overall reaction time for older versus younger adults, with similar accuracy across all conditions. During the associative recognition phase, there was a trend-level significance for a drug × group interaction ($p < 0.08$) for RT. Older adults also reported feeling more subjective intoxication (VAS 'high') on the active drug, (trend-level $p < 0.1$). Across all conditions, placebo administration resulted in significantly greater hippocampus/ parahippocampus brain response in older adults. THC altered this profile of older adult activity in different ways for every stage of memory encoding and recognition we examined - older adults 1) activated more voxels during encoding, 2) had a more widespread extent of decreased activity compared to younger subjects during item recognition, 3) failed to show the expected normal older adult difference during relational memory recognition, and 4) activated a greater extent of voxels during associative item recognition. In the rest of the brain, we observed many group × drug interactions that indicate THC affected widespread brain activity differently for older and younger adults. These included the insula, cerebellum, anterior cingulate, thalamus, and caudate across all conditions, as well as prefrontal (BA 10/11) and inferior frontal (BA 47) cortices during encoding and item recognition. Conclusions: Our findings show that in older adults the same 65 mg THC dose slows memory task performance more and that this is accompanied by diverse, widespread differences in cortical and subcortical brain activation during some forms of recognition. The greater impact on memory-related circuitry in older adults suggests that THC intoxication can induce complex differential effects in key brain regions related to memory function between younger and older adult populations. Further research is warranted to replicate these findings and to address existing knowledge gaps, to help develop informed public health strategies and to guide clinical practices tailored to the unique needs and vulnerabilities of older cannabis users.

Talk 4:

Exploring Cannabidiol Effects on Memory Dysfunction In Psychosis: A Pilot fMRI Study

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(Yale University /Institute of Living)
Michael C. Stevens
(Institute of Living/Yale University)
Cole Arnold
(Institute of Living)
Nina Fernandez

(Institute of Living)
Tremearne Hotz
(Institute of Living)
Shashwath A. Meda
(Yale University /Institute of Living)

Background: Deficits in relational memory are extensively documented in individuals with psychosis. Contradictory evidence suggests that cannabidiol (CBD), a non-intoxicating constituent of cannabis, may possess antipsychotic properties in individuals with established psychosis. This study sought to elucidate the potential impact of CBD on mitigating memory impairments and clinical symptoms observed in psychosis. Methods: Fourteen patients with established psychosis, not currently in an acute episode, but with significant residual symptoms (mean/SD age = 37.5/9.5; 7 females) and five healthy controls (27.2/7.6; 3 females) participated in a double-blind, randomized, placebo-controlled, within-subject, crossover design study. Participants received a single dose of orally administered CBD (600 mg) or a matched placebo on separate days. Three hours post-administration, participants underwent fMRI scanning using a relational and item-specific encoding (RISE) paradigm. During the RISE fMRI task, participants engaged in encoding tasks where they formed associations between stimuli (relational encoding) or remembered individual items (item-specific encoding). Subsequently, memory for these stimuli was assessed, including recognition of individual items and associations. Corresponding behaviors (accuracy and reaction time) for the above task conditions were evaluated for group, dose, and group × drug interactions using R. Brain activation interactions between controls/psychosis groups and dose conditions were analyzed across the three task phases (encoding, item recognition, and associative recognition) using a second-level analysis in SPM. Given the exploratory nature of the study, fMRI results were thresholded at $p < 0.05$ uncorrected voxelwise, $k = 10$ cluster. Results: During the relational item recognition phase, a significant main effect of drug ($p = 0.004$; CBD > Placebo) and drug × group interaction ($p = 0.003$) emerged for the standard deviation of reaction time, while all other behavioral effects were non-significant. In terms of brain function, under the placebo condition, the psychosis group exhibited lesser brain activity in the hippocampus and/or parahippocampus across all task phases. Furthermore, there were many drug × group interactions across all task phases in various brain regions, including the hippocampus/ parahippocampus, putamen, caudate, cerebellum, anterior cingulate, fusiform gyrus, and insula. Notably, interactions were also observed in inferior/mid-prefrontal regions during encoding and item-specific recognition tasks. For the psychosis subjects, a modest (but non-significant) improvement in positive symptoms as assessed using the Positive and Negative Syndrome Scale (PANSS) was noted after CBD administration. Conclusions: Current findings from this small-scale study suggest CBD has the potential to change memory-related brain activation in psychosis, performance variability, and symptom severity. These results

highlight potential therapeutic targets for future interventions aimed at improving psychosis-associated cognitive deficits.

Talk 5:

New Insights Into How THC Disrupts Our Estimation of Time

Michael C. Stevens
(Institute of Living/Yale University)
Shashwath A. Meda
(Yale University /Institute of Living)
Erwin Boer
(Entropy Control Inc.)
Nicholas Ward
(University of Montana)
Godfrey D. Pearlson
(Yale University /Institute of Living)

Background: THC can alter how we experience the passage of time, most notably over-estimation of elapsed time interval duration. Some believe THC may speed up the brain's internal clock, possibly through CB1 receptor agonist effects. But it is unknown exactly how THC alters timekeeping-related processing, or what macro-scale brain systems are involved. Design: We used "drift-diffusion" computational modeling to test whether THC accelerates information aggregation when comparing time interval estimates. We also examined fMRI-measured brain activity to identify regions underlying THC's effects. $N = 44$ healthy adult cannabis users underwent an acute drug challenge using inhaled vaporized cannabis of 0 mg, 29.5 mg, or 65 mg THC on separate study days in a within-subject, randomized, counterbalanced design. At fixed times between 0.5- and 5.5-hours post-dosing, participants completed an fMRI Time Estimation task. They attended to two successively presented short- (500-900 msec) or long-interval (1500-1900 msec) visual stimuli, then discriminated which had the longest duration. Average reaction-time differences were evaluated using R mixed-models. Informative parameters were derived from individual trial choice and reaction-time data using a Python-based Hierarchical Drift Diffusion Modeling toolbox (HDDMv0.8.0). Parameters included speed of information accumulation ('v'), amount of evidence needed to reach a threshold that triggered responses ('a'), and speed of non-decision sensory and motor processes ('t'). Single-trial brain activity estimates were extracted from fMRI timeseries so HDDM regression models could identify which regions' activity predicted parameter values and evaluated THC's effects on these relationships. Dose and persistence effects for HDDM parameters and fMRI brain activity were evaluated using Bayesian statistics ($p > .90$ were meaningful). Results: Following 65 mg THC doses, neither information accumulation rate 'v' nor non-decision time 't' changed. Participants showed significantly higher 'a' decision-making for 65 mg THC versus placebo for long-interval trials, both 0.5 ($p = .93$) and 2.5 ($p = .92$) hours post-dose. Parameter effects after 29.5 mg THC were comparable but less definitive. fMRI analysis found trials with lower activity, relative to placebo, in left dorsolateral, ventrolateral, anterior cingulate and other prefrontal regions predicted higher 'a' decision thresholds. Higher 'a' thresholds were also linked to greater activity in the left cerebellum, left thalamus, and left-hemisphere

frontoparietal network regions. Conclusion: While 65 mg THC doses generally slowed time estimation task performance for up to 3.5 hours, this appeared unrelated to information aggregation speed, sensory, or motor processing on long-interval trials. Instead, 65 mg THC caused participants' decisions to require greater neural evidence compared to placebo, reflecting diminished activity in brain regions specialized for executive function and working memory. This drug-induced threshold change could reflect many mechanisms. Prior research reports that higher 'a' thresholds typically lead to slower but more accurate responses to overcome 'noise' in decision-making processes. However, the relevance of specific disruption to mental timekeeping is underscored by this 'a' threshold effect being only observed clearly for long-interval trials that presumably confer greater demands to represent and use time duration information to guide choices. Future studies can use drift-diffusion modeling with a different tasks and various endocannabinoid system altering drugs to better understand THC's modulatory effects of brain function and cognition.

Symposium Title:
Retail Cannabis Dispensaries: Examining Purchasing Behavior and Exposure to Product Marketing
Chair: Eric R. Pedersen
(Keck School of Medicine, University of Southern California)

Cannabis retail dispensaries have proliferated in the United States in recent years, making it an important time for conducting research on purchasing behaviors and exposure to product marketing within these environments. Purchasing behaviors may be driven by how consumers in dispensaries view and interpret cannabis product packaging, including how they view the health benefit claims and warning labels displayed on the products. Storefront employees are also promoters of the products and the claims employees make could influence purchase decisions. Thus, it is important to better understand how cannabis products are marketed to consumers within dispensaries. In this series of four talks, presenters will describe research studies conducted within cannabis dispensaries to examine regulatory compliance (e.g., age verification), health warnings displayed, promotion of health benefits, and purported effects on mood and behavior (e.g., sleep, energy). Researchers will discuss a variety of methods to obtain their findings, including self-report surveys, observations, qualitative interviews, and experimental manipulation of products within controlled settings. In addition to informing methods for the future of cannabis dispensary research, findings have implications for policy around dispensary locations and regulation within these environments.

Talk 1:
Young Adults' Experiences with Cannabis Retailer Marketing and Regulatory Compliance: Differences by Sociodemographic Characteristics and Associations with Cannabis Use-Related Outcomes
Carla J. Berg

(Milken Institute School of Public Health, George Washington Cancer Center, George Washington University)
Katelyn Romm
(TSET Health Promotion Research Center, Stephenson Cancer Center, University of Oklahoma Health Sciences Center)
Cassidy R. LoParco
(Milken Institute School of Public Health, George Washington University)
Matthew E. Rossheim
(School of Public Health, University of North Texas Health Science Center)
Yuxian Cui
(Milken Institute School of Public Health, George Washington University)
Darcey McCready
(Milken Institute School of Public Health, George Washington University)
Y. Tony Yang
(George Washington Cancer Center, School of Nursing, George Washington University)
Elizabeth Platt
(Center for Public Health Law Research, Temple University Beasley School of Law)
Patricia A. Cavazos-Rehg
(Washington University School of Medicine)

Objectives – Limited cannabis retail surveillance has been conducted, particularly assessing retailer practices in relation to consumer sociodemographic factors or use-related outcomes. This study examined young adults': exposure to promotions, health claims, warnings, and age restrictions at cannabis retailers; demographic correlates of retail exposures; and retail exposures in relation to use-related outcomes. Study Design – Cross-sectional quantitative analysis. Methods – We analyzed 2023 survey data among 876 young adults in states with legal non-medical cannabis, reporting past-month cannabis use and past-year retailer visits. Results – In this sample (*M*age = 27.1, 44.1% male, 31.7% sexual minority, 17.7%, Black, 11.2% Asian, 25.1% Hispanic), 46.7% 'at least sometimes' noticed free samples, 76.5% price-promotions, 37.4% subpopulation-targeted promotions; 72.5% health claims on products/ads, 63.1% signage, and 70.5% from budtenders; 72.5% warnings on labels, 65.5% signage, and 38.9% from budtenders; and >80% age verifications. Multivariable analyses identified sociodemographic correlates of exposure outcomes: greater promotion exposure was associated with Black race; greater health claim exposure with being heterosexual, Black, and less educated; less warning exposure with less education; and less age restriction exposure with being younger, male, and Black. Retail exposures were associated with use-related outcomes: more frequent cannabis use was associated with less health claim exposure; greater perceived social acceptability with greater promotion and age restriction exposure; greater perceived risk with greater warning and less age restriction exposure; more problematic use and driving after use with greater promotion and less age restriction exposure. Conclusions – Cannabis retail exposure disparities and their associations with use-related outcomes highlight the

importance of regulatory and prevention efforts.

Talk 2:

Point-of-Sale Cannabis Marketing: Findings from a Direct Observation Study of Recreational Cannabis Outlets in Massachusetts

Kristina M. Jackson
(Rutgers Addiction Research Center, Rutgers Robert Wood Johnson Medical)
Michelle L. Rogers
(Survey Research Center, Brown University School of Public Health)
Elizabeth R. Aston
(Center for Alcohol and Addiction Studies, Brown University School of Public Health)
Katie M. Yetter
(Center for Alcohol and Addiction Studies, Brown University School of Public Health)
Jennifer Merrill
(Center for Alcohol and Addiction Studies, Brown University School of Public Health)
Holly K. Boyle
(Center for Alcohol and Addiction Studies, Brown University School of Public Health)
Jane Metrik
(Center for Alcohol and Addiction Studies, Brown University School of Public Health, Providence VA Medical Center)

Messages about the health benefits and risks of cannabis products directly shape individuals' reasons for use. Identifying the sources of messaging about the effects of cannabis is critical for understanding the processes by which messages impact cannabis use. The goal of this direct observation study was to explore point-of-sale marketing as an important cannabis messaging source. We conducted systematic coding of cannabis retail outlets in Massachusetts, a state with legalized recreational cannabis use since 2016. Sixty licensed retail outlets were randomly selected within six regions from the Massachusetts Cannabis Control Commission website. Trained coders aged 21+ conducted site visits in two-person teams and coded aspects of the outlet exterior (e.g., signage) and interior (e.g., product labels) during the visit or immediately upon exit. Codebooks were developed based on existing surveillance tools and our pilot work to develop codes for therapeutic benefits and/or health harms/warnings. Coders noted minimal signage on the exterior, with 27% displaying sidewalk signs about cannabis products sold, and only one billboard in view. Other visible buildings/retail stores (83% of outlets) included 9 alcohol retailers, 3 vape shops, and 3 tobacco retailers. In the interior, warning signs related to ID and age 21+ were common (85%, 87%), followed by bans on consumption on premises (~50%). Thirteen percent of outlets had signage that vape products may cause harm; information about consumption during pregnancy was noted in only 2 outlets. Displays with cannabis risks were minimal and were present largely at the ordering counter (13% of outlets), with none on product display cases and only one on the wall. In the vast majority of outlets (82%), no warnings about cannabis' effects were displayed openly, and those shown were few (e.g., caution about driving after using, protect from kids). Effects ("buzzwords") of cannabis were presented primarily on product display

cases (63%), with 23% on wall displays and only 8% at the counter. Improved sleep was the most commonly reported effect (50% of outlets); others pertained to energizing effects: energetic (37%), uplifting (28%), aroused (10%); sedating effects: relaxed (28%), calm (22%); mood effects: happy (20%), stress (15%), mood (7%), anxiety/anti-anxiety (5%); other: focus (15%), creative, inspired (10% each). Pain relief was reported as a benefit in 20% of outlets. Terpene-specific displays were few and predominately contained therapeutic effects, including anti-anxiety, anti-inflammatory, anti-depressant, and pain relief. Few risks of cannabis use were depicted across outlets and were only displayed at point of purchase. Effect descriptions were limited to product display cases and included energizing and sedating effects; other than sleep there were modest claims about therapeutic effects. Retail outlets may be motivated to promote positive effects and minimize negative effects as a means of increasing sales revenue. Findings also provide early evidence that the cannabis industry is marketing terpenes as a means to promote the health benefits of cannabis products. As the legal cannabis market continues to rapidly increase nationwide, a better understanding of marketing strategies is imperative as these venues become an even greater influential source of messaging.

Talk 3:

Budtender Recommendations of Cannabis Products for Therapeutic and Recreational Use: A Cannabis Retailer Surveillance Study

Jane Metrik
(Center for Alcohol and Addiction Studies, Brown University School of Public Health, Providence VA Medical Center)
Elizabeth R. Aston
(Center for Alcohol and Addiction Studies, Brown University School of Public Health)
Holly K. Boyle Center for Alcohol and Addiction Studies, Brown University School of Public Health)
Jennifer Merrill
(Center for Alcohol and Addiction Studies, Brown University School of Public Health)
Katie M. Yetter
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Michelle L. Rogers
(Survey Research Center, Brown University School of Public Health)
Kristina M. Jackson
(Rutgers Addiction Research Center, Rutgers Robert Wood Johnson Medical School)

Cannabis is widely perceived as normative and therapeutic despite limited scientific evidence to support such claims for many conditions. There is insufficient data to provide guidance on the use of cannabinoids for the treatment of various medical and mental health conditions within the current regulatory framework. Nevertheless, cannabis retail outlet employees (i.e., budtenders) guide patrons in their selection of specific product strains, cannabinoid profiles, and formulations for desired physical and mental effects. In states with legal cannabis markets, budtenders are an important transmitter of knowledge

regarding benefits and potential risks of cannabis; however, little is known about the types of messages communicated to customers looking to use cannabis recreationally or for common indications such as pain, anxiety, and sleep. The current study aims to characterize cannabis messaging from budtenders using validated surveillance and qualitative methods. In Summer 2023, trained coders (n=4) aged 21+ visited 60 licensed adult-use recreational cannabis retail outlets that were randomly selected from 6 regions in Massachusetts (MA). Working in 2-person teams, one coder engaged a budtender in a conversation seeking product recommendations for pain (n=22), anxiety (n=23), or sleep problems (n=17) as well as recommendations for recreational use (n=41). The other coder listened and recorded the recommendations electronically using a checklist and open-ended field notes. Both coders debriefed and audio-recorded their narrative immediately upon exiting the outlet. Field notes were reviewed against transcribed audio-recordings and quantitative checklists for accuracy and then dual-coded using applied thematic analysis by two individuals not involved in data collection. Several prominent themes were identified in budtender recommendations across condition: (1) product formulation, (2) plant species, and (3) cannabinoid profiles. For pain, the majority of recommendations were for edible products containing cannabidiol (CBD) in higher or equal ratios to delta-9-tetrahydrocanabinol (THC), as well as those labeled as "hybrid" (indica and sativa) species. For sleep, the vast majority of recommendations were for edible indica products containing cannabinol (CBN) or a THC/CBD combination. For anxiety, the majority of recommendations were for edibles or flower, indica-based products, CBD in higher or equal ratios to THC, low THC concentrations, and warnings against use of primary sativa products. For recreational use, the majority of recommendations were for edibles/drinkables followed by flower pre-rolls containing lower THC and/or CBD doses; recommendations for sativa-dominant or hybrid products were predominant, often including explicit mention of expected effects (e.g., social, uplifting). Consistent with the documented expansion of the cannabis edibles industry, findings suggest oral formulations are now marketed for both medicinal and recreational purposes, often to a greater extent than inhaled cannabis products. Products with specific cannabinoid profiles and plant species were recommended for their alleged therapeutic effects despite the dearth of controlled research on the pharmacological effects of the specific cannabis chemotypes and constituents as well as lack of standardized dosing guidelines. This research finds evidence of cannabis retailers sending influential messages to consumers, even though MA state regulatory requirements prohibit advertisement of cannabis' therapeutic effects when not supported by substantial scientific evidence.

Talk 4:

Developing a Retail Cannabis Shop for Research: Exploring Employee Messaging and Consumer Decisions on Cannabis Products

Eric R. Pedersen
(Keck School of Medicine, University of Southern California)
Mark A. Prince
(Colorado State University)
Bethany Gray
(Colorado State University)
Ireland M. Shute
(Keck School of Medicine, University of Southern California)
Megan B. Brown
(Keck School of Medicine, University of Southern California)
Keegan Buch
(Keck School of Medicine, University of Southern California)
John Monterosso
(University of Southern California)

Almost half of the states in the U.S. have legalized recreational cannabis for sale and possession. Most of the legalized states have licensed retail stores that offer purchase and delivery of cannabis products. The city of Los Angeles alone has over 230 of these licensed retail cannabis dispensaries, where consumers are exposed to a wide variety of products in packages that contain unique labels describing the required risk statements, recommended serving sizes, purported health benefits, and ingredients. Researchers have begun to examine how cannabis consumers view and interpret cannabis product packaging, including how they view the health benefits and stated risks of the product based on labeling. Given the increasing access to cannabis dispensaries, it is important to examine the purchasing behavior of young adults, to learn more about what attracts them to certain products and what health and risk messages they glean from product packings. Beyond the messaging that the products alone convey to consumers, it is important to examine how storefront employees (managers, budtenders, cannabis consultants) interpret product messaging and how they would convey such messaging to consumers. Employees have been shown to be an influential source of messaging about products for young adults, including promotion of health benefits and minimization of potential risks. In this presentation, we describe the development of a mock cannabis dispensary, where we observe cannabis consumers' product purchasing decisions and employees' selling behaviors in an experimentally manipulated environment. We built connections with local dispensaries to help us stock the shelves with packaging-only products (i.e., products that contain no cannabis but look and feel like they do). We gathered and labeled products of different types (edibles, vapes, flower prerolls, concentrates, beverages, topicals) with different amounts of cannabinoid concentrations (e.g., THC, cannabidiol [CBD], cannabinol [CBN]) and varying levels of potency (e.g., high levels THC in a single edible). We named the facility the CANNEX (or the "Cannabis Annex") and it serves as a mock cannabis dispensary where we invite cannabis retail store workers to view the products we are offering and describe, via recorded qualitative interviews and brief surveys, what

messages they would share about the products with consumers if they were selling those products in their stores. We also invite young adults with varying levels of cannabis use experience (infrequent use of < 6 times per year, occasional use with between 2 times per month to once per week, and regular use with near daily/daily use) to come to the CANNEX, view the products on display, and use a generous "budget" to "purchase" products. Research staff interview the participants to learn why they chose each product for purchase, what subjective effects they believe the product would have based on packaging, and why they did not purchase other products within the dispensary. The CANNEX represents one of the first mock cannabis dispensary labs in the country that allows for observation of participants in a dispensary environment that can be manipulated to fit the needs of researchers.

Symposium Title:
A Within-Subjects and Placebo-Controlled Observational Assessment of Self-Administered Cannabis Edibles

Chair: Emma E. Smith
(Colorado State University)
Discussant: Bradley T. Conner
(Colorado State University)

The present study is a double-blind, placebo-controlled investigation of the subjective and objective intoxication onset from different THC forms in edibles among 20 regular cannabis users across three sessions in a mobile laboratory. Participants consumed regular-acting THC gummies (10mg THC), fast-acting THC gummies (10mg THC), and placebo gummies (0mg THC) they purchased from dispensaries. The study measured subjective and objective intoxication and biological outcomes at 13 time points before and after ingestion, aiming to determine if fast-acting gummies induced quicker intoxication compared to regular-acting and placebo gummies by assessing blood concentrations of THC and its metabolites, THC-OH, and THC-COOH. Participants were screened for cannabis use and other drug use at each session, and those meeting inclusion criteria underwent a series of intoxication measures and blood draws via an intravenous port placed by researchers at the beginning of each session. The research sought to provide empirical evidence on the effects of THC in edible forms, contributing to the understanding of typical intoxication profiles of THC compounds in legally marketed edibles and their public health implications. This observational study aimed to close gaps in cannabis science, particularly around the onset of intoxication from THC, offering insights into safer consumption practices and informing future cannabis research and policy.

Talk 1:
Methods and Recruitment in a Mobile Cannabis Van Study: An Overview

Kira Sturgess
(Colorado State University)
Emma E. Smith
(Colorado State University)
Samuel M. DiCecco
(Colorado State University)
Katelyn Weldon

(Colorado State University)
Bradley T. Conner
(Colorado State University)

At first glance, it may seem like finding potential participants who are willing to engage in multiple six-hour long experimental sessions while using cannabis provided by a stranger in a white van would be an impossible task. However, researchers at a large western state university successfully recruited and screened 687 participants for a mobile van study examining if fast acting cannabis compounds act faster than typical cannabis compounds. Prior research reveals that targeted advertisements through social media posts show significantly higher recruitment numbers in cannabis-specific studies (Satchell et al., 2023). With this knowledge, recruitment methods consisted of circulating flyers around town and posting Reddit and Craigslist ads weekly. Specifically, flyers were placed in local businesses, ranging from dispensaries and bars to ice cream shops. Additionally, flyers were posted around the campus of the university and dispersed within some classrooms. Within the participant pool, 106 individuals met inclusion and exclusion criteria and 465 were deemed ineligible. Specifically, eligible participants had no prior history of self-harm or psychiatric disorders and were not taking medications that could interfere with cannabis use. Additionally, participants were between the ages of 21-65, had not used recreational drugs besides cannabis within the last 60 days, and had used cannabis products within the last ten days. Participant cannabis usage must have been at least twice a week for three months or more. Participants also had to have used a cannabis edible product within the past year, had no prior history of a serious medical condition, and must had been willing to have their blood drawn. We had 49 participants requiring follow-ups for clarification in determining their eligibility, and 7 participants within the eligible pool who chose to withdraw. In total, we had 20 participants complete all three experimental sessions. Out of the eligible participants, 53% identified their sex as male and 47% identified as female. The average participant age was 29.63 (SD = 8.19, Range = 21-57). When asked to indicate their racial identity, 75.51% reported White, 6.12% Black, 5.10% American Indian or Alaska Native, 4.08% Another, 3.06% Asian, 3.06% Do Not Wish to Respond, 2.04% Native Hawaiian or Pacific Islander, and 1.02% Arab or Muslim. Further, 27.17% reported their ethnicity as Hispanic or Latin/a/o/x/e, 66.3% as not Hispanic or Latin/a/o/x/e, 5.43% as Another, and 1% Do Not Wish to Respond. The future of conducting successful cannabis research may lie in the way in which we choose to advertise and recruit participants. The ease and convenience of mobile recruitment, in conjunction with local advertisement methods resulted in successful data collection over the course of only one year. This dynamic model of recruitment methods and the mobility of the lab offers the potential to improve the efficacy of future behavioral and therapeutic studies on cannabis efficacy. Observing real-time

effects of cannabis use can further the science and understanding of cannabis on cognition, behavior, physiology, and psychology.

Talk 2:

Subjective and Objective Intoxication of Self-Administered Cannabis Edibles Over Time

Emma E. Smith
(Colorado State University)
Samuel M. DiCecco
(Colorado State University)
Katelyn Weldon
(Colorado State University)
Kira Sturgess
(Colorado State University)
Bradley T. Conner
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Cannabis is a commonly used drug and is used in many ways, yet evidence elucidating the effects of using cannabis in different routes of administration, as well as the compounds present, are limited. Considering recent advances in legal-market products that have led to the development of presumably fasting-acting forms of edibles, literature into the acute physical and psychological effects of these legal-market products is crucial to deepen our understanding of cannabis use's public health implications (Ewell, 2021). The present study sought to close gaps in the current cannabis literature though providing empirical support for the onset of subjective and objective intoxication effects of THC in multiple forms. Researchers at Colorado State University recruited a community sample of individuals who regularly use cannabis (N=20) to participate in 3 study sessions, which involved individuals self-administering different cannabis gummy products (regular acting THC-dominant gummies [10mgTHC], fast acting THC-dominant gummies [10mgTHC], and placebo gummies [0mg THC]) that participants purchase themselves from cannabis dispensaries. Subjective intoxication, objective intoxication, and biological outcomes assessed via the collection of blood samples were measured repeatedly over the course of the experiment, specifically at 13 intervals before and after cannabis consumption: at baseline, then at 5, 10, 15, 30, 60, 90, 120, 150, 180-, 210-, 240-, and 270-minutes post-ingestion. Specifically, participants reported on their subjective intoxication and related affect by responding to the Subject High Assessment (SHAS) and the Drug Effects Questionnaire (DEQ). Due to the ongoing nature of blood sample analysis, researchers and participants of this double-blind, placebo-controlled study remain blinded to the three edible conditions prior to presenting full results at the conference itself. Despite being blinded to the products at this time, preliminary time series analysis and one-and two-way ANOVAs were conducted to detect differences in subjective high/intoxication across products and time. Results revealed a significant effect of time ($F = 4.43$, $p < .001$), with peak intoxication for edible A occurring at 30-minutes, while edible C showed a peak intoxication around 60-minutes post-ingestion. In addition, there was a significant main effect of product on intoxication across time ($F = 4.59$, $p = .02$), and a significant interaction effect

between product and time (product × time interaction F = 2.108, p = .003). The data collected from this observational study aimed to close significant gaps in cannabis science, particularly regarding the typical intoxication onset profiles of THC compounds in legally marketed edibles. This research may further underscore the complexity of cannabis use and the need for detailed measures beyond use frequency to comprehend its full impact.

Talk 3:

Exploring Objective Physical Health Measures During Cannabis Edible Consumption

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Samuel M. Dicecco
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Despite the increasing prevalence of legal-market cannabis use, there remains a startling lack of empirical data on its objective effects. As methods for cannabis administration evolve, this disparity becomes increasingly more evident. This is particularly relevant for cannabis edible products, including fast-acting THC compounds, which remain largely unexplored in scientific research. Recent national data reveals that nearly 30% of adults have consumed a cannabis edible product in their lifetime, highlighting the pressing need for further investigation into its effects (Schauer et al., 2016). Therefore, the present study aims to bridge this gap in the existing literature by evaluating the objective intoxication effects of THC-dominant edibles in multiple forms. Participants engaged in three five-hour mobile laboratory sessions in which they consumed one of the following cannabis edible products at each session: Regular-acting THC-dominant gummy (10mg THC), fast-acting THC-dominant gummy (10mg THC), and placebo gummy (<0.1% THC). For at least four days prior to each study session, participants were instructed to refrain from cannabis use to mitigate the effects of tolerance on results. Further, participants were required to fast for eight hours before their sessions and were provided with a 400-calorie snack with approximately (6%) of fat to regulate the absorption and metabolism of cannabinoids. Throughout each mobile laboratory session, objective physical health measures, including heart rate, blood oxygen saturation, blood pressure, and temperature were assessed at multiple time points before and after cannabis consumption. Finally, following each study session, participants were instructed to complete a post-session survey in which they answered questions to determine if there were any lasting effects of their cannabis edible product ingestion. Although currently blinded, preliminary findings offer substantial insights into the effects of THC consumption on objective physical health measures. These findings hold particular promise in elucidating distinctions between regular and fast-acting gummies, thus enhancing our understanding of cannabis edibles.

This study serves as a novel solution to the methodological barriers present in current cannabis research. Foremost, the utilization of a mobile laboratory provides a unique experimental environment that allows for robust, observational research that is highly representative of real-world cannabis use. It facilitates participants' consumption of legal market cannabis and enables researchers to observe objective intoxication effects in real-time. This fills a large gap in previous research which predominantly utilized low-potency THC and animal models. Further, the use of a within-subjects design eliminates individual differences in participant data, allowing for a more holistic comparison of fast-acting and regular-acting cannabis edibles.

Talk 4:

Acute Cognitive and Behavioral Effects of Self-Administered Cannabis Edibles

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Katelyn Weldon
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Bradley T. Conner
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Cannabis use can cause significant cognitive changes following acute administration, resulting in various forms of impairment such as difficulty concentrating, confusion, and time dilation. However, the time effects of these impairments as well as if certain cannabis products may result in greater impairment along certain dimensions requires further investigation. In our observational assessment of edible cannabis products, we measured both behavioral and subjective reports of impairment at various timepoints post administration of two cannabis products (one fast acting and one standard 10mg edible product) and a placebo. These measurements were taken using the DRUID app for behavioral impairment and the Subjective High Assessment Scale for subjective reports. Due to ongoing double-blind conditions prior to blood processing, the identity of these products is still unknown at the time, however several differences between the edible products have been identified. For the purposes of this abstract, the products will be referred to as "A", "B", and "C", to be fully disclosed at the conference itself. Through time series analysis, one- and two-way ANOVA analyses, and post hoc analyses, Product A was found to have significantly different and earlier behavioral measures of impairment compared to Product B and C, peaking at 90 minutes. This behavioral impairment was followed by Product C reaching its behavioral impairment peak at 150 minutes post ingestion. Further, Product C appeared to have stronger and significantly delayed subjective reports of confusion, intoxication, and difficulty concentrating effects found through an interaction effect between time and product at 180 minutes post ingestion. Meanwhile time dilation and alcohol-use-like effects were found to only differ between Product B and the other two products and with no difference in time course. The differences in

behavioral measurements as well as subjective reports of effect of impairment found in this study indicate some level of variance in both the time course of the edible cannabis products and the cognitive impairments specific to each product. While blood level analysis will be needed for a fuller picture on the THC levels coinciding with these impairment time courses, these findings suggest a need for greater understanding of different pharmacokinetic, behavioral, and subjective effects of similar commercially available cannabis products.

Symposium Title:
Cannabis and Physical Activity
Joanna S. Zeiger
(Canna Research Foundation)

Studies have shown that cannabis and physical activity are used concomitantly among people of all ages and athletic ability. Cannabis is being used for reduction in anxiety, pain relief, sleep improvement, and enjoyment of exercise, among other reasons. This symposium will focus on cannabis use and physical activity. Abstracts will focus on studies that are cross-sectional, observational, longitudinal, or clinical trials. Topic areas include, but are not limited to: differences in cannabis use in athletes with varying demographic and athletic backgrounds, impact of route of administration on athletic performance, cannabis use and mental health, impact of physical activity on cannabis use, metrics of athletic performance while using cannabis. Original research is encouraged, but a literature review or history of cannabis use in athletics will also be considered.

Talk 1:
Moderating Effect of Physical Activity on Cannabis Use And Psychological Distress in a National Cohort
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(Canna Research Foundation)
Robert S. Zeiger
(Kaiser Permanente Bernard J. Tyson School of Medicine, Canna Research Foundation)
Bradley Conner
(Colorado State University, Ft. Collins)

Background: Psychological distress (PD) impacts daily living and well-being of millions of individuals worldwide. Physical activity (PA) has been shown to decrease the physiological and psychological impacts whereas cannabis use has been related to increases in PD. Objective: To determine how cannabis use impacts PD and whether PA moderates this relationship in a national cohort. Methods: Data from the 2023 American College Health Association-National College Health Assessment III (ACHA-NCHA III) survey were used to evaluate past 3-month cannabis use, average weekly leisure time physical activity, and PD [measured by the Kessler Psychological Distress Scale (K6); higher scores indicate more severe PD]. Only participants who ever used cannabis in their lifetime were included in the analyses. Past 3-month cannabis use (CU) was categorized as 'never', 'once-monthly', and 'weekly-daily'. Average weekly PA was categorized in hours, as '0', '1-5', and "6+'. ANOVA and chi-square were used to examine

continuous and categorical variables. The Process macro in SPSS was utilized to test for main effects of PA and CU on PD and for moderation of PA on CU and PD. Univariate logistic regression was used to obtain K6 estimated marginal means (EMM) for the main effects and the interaction of PA and CU (i.e. moderation). All analyses were adjusted for age, biological gender, and ethnicity. Results: 170,006 of the 394,184 (43.1%) total participants met eligibility for these analyses, 70% were biologically female and 72% were white. The unadjusted mean K6 score was 9.0 (*SD* = 5.3), 23.3% had 0 hours of PA, 46.1% had 1-5 hours of PA, and 30.7% had 6+ hours of PA. 34.3% did not use cannabis in the past 90 days, while 39.9% used it one time up to monthly, and 25.8% used cannabis weekly to daily. The main effects of both PA ($p < 0.001$) and cannabis use ($p < 0.001$) were significantly associated with K6 scores (model: $F = 1346.7$, $df = 11$, $r2 = 0.29$). Hours of PA lowered K6 scores from an EMM of 10.7 ($SE = 0.03$) for none, 8.96 ($SE = 0.2$) for 1-5 hours, and 8.12 ($SE = 0.02$) for 6+ hours ($p < 0.001$). Cannabis use increased EMM for K6 scores from 8.5 ($SE = 0.02$) in never users, to 9.1 ($SE = 0.02$) in once-monthly users, and 10.3 ($SE = 0.02$) in weekly-daily users ($p < 0.001$). The moderating effect of PA on CU for PD was significant ($F = 7.94$, $df = 1.0$, $p < 0.001$). K6 scores were always higher as cannabis use increased, but these scores were ameliorated as PA increased. PA reduced K6 scores by a clinically meaningful difference within each cannabis use category for the three levels of exercise with reductions in scores ranging from 1.6 to 2.7 points. Conclusions: Increased cannabis use increased psychological distress as measured by the Kessler Psychological Distress Scale while physical activity decreased K6 scores. Moderation between cannabis use and physical activity was significant with PA enhancing the decrease in K6. Physical activity can be a valuable means of reducing PD in cannabis users.

Talk 2:

Can Physical Activity Manage Cannabis Use? Findings from Conducting Experimental and Intervention Research

R. Lorraine Collins
(University at Buffalo, SUNY)

Research suggests that physical activity (PA) has numerous benefits including enhancing fitness and promoting positive affect. PA has shown some success for managing tobacco and alcohol use. These findings led us to conduct research on PA as an approach for managing young adults' cannabis use. We began by examining PA to manage craving, as a precursor to using cannabis. To explore this issue, we conducted a 3-week within subject crossover experiment with young adult (ages 18 to 25 years) men and women who self-reported regularly (> 3 per week) using cannabis. We used a cue exposure paradigm to stimulate craving, followed by 10-minutes of exercise (rest, moderate, vigorous). Craving was assessed multiple times; before and immediately after the induction and at three 10-minute intervals (total = 30 minutes). Although post exercise craving rebounded for both exercise conditions, among those who consumed larger quantities of cannabis,

craving rebounded more quickly after vigorous exercise compared to moderate exercise; an unexpected finding that led us to conclude that moderate exercise might be the best option for managing cannabis use. Results for our craving experiment were incorporated into a pilot test of an intervention that included four in-person sessions to learn cognitive behavioral (CB) + motivational enhancement (ME) strategies for managing cannabis. All participants used a study-specific smartphone app for reporting ecological momentary assessment data. Along with the CB and ME strategies, one of the intervention conditions included a PA component in which participants were encouraged to regularly use one of three PA apps that had been vetted by the program staff. Cannabis use was examined at the end of the intervention and at 1-month, 3-month, and 6-month follow-ups. At 6months, results showed that both CB + ME conditions led to reductions in cannabis use. However, participants in the PA intervention reduced their use of cannabis to a significantly greater degree than participants in the CB + ME condition. Thus, even when left to make their own decisions about the nature and frequency of PA, having access to PA via a smartphone app proved to be a useful strategy for young adults to manage/reduce cannabis use over time. A second intervention study involved random assignment of young adults who regularly use cannabis to one of three conditions (Attention Control, PA-only, PA + cannabis management strategies). Participants in the two intervention conditions were randomly assigned to Facebook groups where they received 8-weeks of e-health coaching. The intervention conditions were more effective in reducing cannabis use (smoking and vaping), compared to the control condition. At 3-month and 6-month follow-ups, PA-only participants showed reductions in cannabis use. The PA + cannabis groups also showed reductions but had higher rates of attrition. Although findings were mixed, this study showed that interventions that included PA content were feasible and acceptable to young adults seeking to manage their cannabis use. In conclusion, regardless of methodology, PA has been shown to be a useful component of cannabis interventions. Future research is needed to explore the parameters of the use of PA-based interventions.

Talk 3:

Towards Precise Mental Health Screening in College Athletics and Associations with Cannabis Use and Other Health-Risk Behaviors

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Sydney Mack
(Ohio State University)
Mark A. Prince
(Colorado State University, Ft. Collins)

Background: College mental health symptomatology is highly prevalent on college campuses across the nation. Student-athletes experience mental health issues at similar rates to their non-athlete peers. While colleges and universities have introduced mental health screening efforts to the general student body, most do not have formal plans to screen and treat student-athlete mental health concerns despite

widespread interest. Purpose: Considering the heterogeneity in experiences with mental health issues like anxiety and depression, applying person-centered analyses may help discern unidentified subgroups of student-athletes at greater risk of cannabis use and other potential health-risk behaviors. These efforts can help inform precise, cost-effective procedures for athletics departments to use for screening, prevention, and intervention. Methods: Participants were 27,642 student-athletes that completed the American College Health Association's (ACHA) National College Health Assessment between 2015 and 2019. The present study used latent class analysis to discern unidentified subgroups of student-athletes characterized by patterns of mental health symptoms. We compared rates of help-seeking behaviors, health risk behaviors, and performance-related outcomes across latent classes. Results: Results indicated that a five-class model best fit the data. Patterns of symptom endorsement within these classes ranged from high symptom endorsement within the past month, to recent experiences of feeling overwhelmed and exhausted, to no current or past-year mental health symptoms. We identified significant differences in engagement of health-risk behaviors among latent classes of mental health symptoms. Classes characterized by high general symptom and high anxiety symptom reported using significantly more cannabis than classes characterized by feeling overwhelmed and exhausted or no recent mental health symptoms. Discussion: This study is the first effort to discern latent subgroups of student-athletes characterized by self-reported mental health symptoms. Findings from the present study can help identify student-athletes in need of mental health and/or behavioral support. Additionally, these findings provide guidance for quick and cost-effective ways to conduct precise mental health screening that can inform effective prevention, intervention, and referral efforts.

Talk 4:

Association between physical activity and cannabis use: A cluster analysis

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(Kaiser Permanente Bernard J. Tyson School of Medicine, Canna Research Foundation)
Bradley Conner
(Colorado State University, Ft. Collins)

Background: The relationship between exercise and cannabis is unclear with some studies indicating that exercise reduces cannabis use while others show the opposite. It has been observed that cannabis is used in conjunction with exercise to increase enjoyment, reduce pain, and aid in recovery. Objective: This secondary analysis of the 2023 American College Health Association-National College Health Assessment III (ACHA-NCHA III) survey sought to determine the relationship between exercise habits and cannabis use. Methods: A Two-Step cluster analysis in SPSS which included days per week of strength exercise and minutes of moderate and vigorous physical activity revealed a two-cluster solution named:

high exercise (n = 83,198, 49.5%) and low exercise (n = 84,853, 50.5%). The dependent variable, past 90 days of cannabis use, was dichotomized as 'use' or 'no use'. Binomial logistic regression was used to assess the relationship between cluster membership and cannabis use adjusted for age, biological sex, and ethnicity. Results: Moderate physical activity mean minutes were 295 (SD = 394) for the high exercise cluster and 164 (SD = 262) for the low exercise cluster while vigorous physical activity for the high compared to low exercise cluster was 217 minutes (SD = 229) vs. 8 minutes (SD = 13). The high exercise group had a mean of 2.87 (SD = 1.9) days of strength training whereas the low exercise had less than one day of strength training (M = 0.9, SD = 1.5). There was a significant association between cluster membership (i.e. levels of exercise) and cannabis use, with those in the high exercise cluster showing higher cannabis use (p < 0.001). However, it should be noted the differences between groups were nominal (high exercise cluster cannabis use = 50.8%; low exercise cluster cannabis use = 49.2%). Conclusions: These findings challenge conventional assumptions about cannabis use and alleged idleness and underscore the complex interplay between exercise behaviors and cannabis use. These analyses further contribute to our understanding of the relationship between cannabis use and exercise. Future research should explore underlying mechanisms and potential confounding factors to better inform interventions aimed at promoting healthier lifestyle behaviors and reducing substance misuse.