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PAPERS & POSTERS

Treatment Efficacy of Cannabis and Cannabinoids for Symptoms of Autism Spectrum Disorder: A Meta-Analysis of Validated Outcomes
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Cannabis and cannabinoid use has increased in children with conditions such as epilepsy, cancer, and autism spectrum disorder (ASD). As states continue to enact medical- and adult-use cannabis laws, many have begun pursuing answers about the efficacy and mechanism of action by which cannabinoids may benefit autistic individuals. This meta-analysis evaluated the effectiveness of cannabis and cannabinoid formulations on ASD symptom domains, with a primary focus on core symptoms, in a sample of N = 716 participants. Observational studies demonstrated a significant reduction in total symptom severity (g = −0.70, 95%

CI [−1.11, −0.28]; k = 3), whereas randomized controlled trials (RCTs) showed a small, non-significant effect (g = −0.23, 95% CI [−0.51, 0.06]; k = 2). Single-study evidence indicates that cannabinoid-based treatment is most consistently associated with improvements in comorbid symptoms such as anxiety and sleep disturbances. Still, the limited number of studies precluded meta-analysis. In contrast, evidence for improvement in core social communication deficits and restricted and repetitive behaviors remains inconsistent. Overall, observational studies generally reported larger effect sizes than RCTs in core symptom improvement. These findings suggest that cannabinoid-based medicines may have therapeutic potential for specific symptom domains in ASD; however, further standardized and controlled research is necessary to clarify efficacy, dosing parameters, subgroup response, and long-term outcomes.

Cannabis Quit Rates Among Dual Users Contacting a State Tobacco Quitline

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Background and Introduction: Kick It California (KIC) is a statewide quitline service that provides evidence-based telephone counseling to help people stop tobacco use. A previous study found that a substantial proportion of KIC callers (27.2%) report dual use of tobacco and cannabis. When asked, 42.9% of these dual users report interest in quitting cannabis as well, even though the program is only advertised as a resource to help people stop using tobacco. This study examines the quit rates for both tobacco and cannabis. Methods: This study is a prospective observational analysis of KIC data. Tobacco and cannabis use status were assessed when callers first reached KIC. Participants were followed up at 3 months; follow-up data collection occurred from 4/14/24 to 1/16/26. Only individuals who used both tobacco and cannabis and expressed a desire to quit both were included in this study (N=421). Outcomes reflect an analysis of 3-month follow-up data. The 30-day abstinence rate was assessed via self-report (e.g., 'Have you smoked cigarettes in the last 30 days?' and 'Have you used marijuana in any form in the last 30 days?'). Frequency of use was recorded at baseline. Heavy users were defined as those using products for 20 days or more per month, while light users were those using products for fewer than 20 days. All participants received tobacco cessation services; no cannabis-specific counseling was provided. Results: Overall, 30-day abstinence rates were not significantly different for cigarettes (40.6%) and cannabis (37.5%, p=0.31). However, when stratified by frequency of use at baseline, heavy users of cannabis were significantly less likely to have quit than heavy users of tobacco (29.6% vs. 37.4%, p< 0.05). Similarly, light users of cannabis were significantly less likely to quit cannabis than light users of cigarettes were to quit cigarettes (44.6% vs. 61.8%, p< 0.05). The reason the overall quit rate did not differ significantly

between the two products was that there were few light cigarette smokers among these dual users (13.1%), whereas more than half of cannabis users were light users (52.7%). Conclusion and Discussion: A significant percentage of dual tobacco and cannabis users quit cannabis after enrolling in the quitline, even though the program only provided counseling for tobacco cessation. However, quit rates for cannabis were significantly lower than those for tobacco when frequency of use was taken into account. A cannabis-specific counseling protocol may improve cessation outcomes for cannabis, as it has done for tobacco.

Negative Affect Relates More to Subjective Cannabis Outcomes Than Objective Use: A Cross-Sectional Replication

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Experimental research suggests negative affect may influence how individuals report substance-related experiences. An affect-induction experiment showed participants who underwent an affect induction reported greater cannabis problems and negative expectancies, but not cannabis use frequency or quantity, compared to those who underwent a control condition (Altman & Earleywine, 2023). The present secondary analyses examined whether this pattern would replicate in an independent cross-sectional dataset without affect induction. Adults with prior cannabis use (N=476) self-reported state negative affect, subjective outcomes (cannabis problems, negative cannabis expectancies), and objective consumption indices (typical intoxication, past-week use). Associations between negative affect and cannabis outcomes were examined through bivariate correlations, and Meng's z tests compared strength of correlations between negative affect and subjective outcomes with correlations of objective consumption indices. A median split was applied to past-week use to stratify participants (less versus more frequent use) to explore potential use-related differences. Participants had a mean age of 36.9 (SD = 11.6); 49.4% identified as female and 50.6% as male, and the sample was predominantly White (72.9%). In unstratified models, negative affect was strongly associated with both cannabis problems ($r = 0.51$) and negative cannabis expectancies ($r = 0.54$, p's $< .001$). Consistent with the original affect induction study, affect's negative associations with intoxication ($r = 0.23$, $p < .001$) and weekly cannabis use ($r = 0.05$, $p > .05$) were weaker. Meng's z tests (p's $< .001$) confirmed that the associations between negative affect and cannabis problems ($z = 6.13$) and negative affect and expectancies ($z = 6.68$) were each stronger than the correlation between negative affect and intoxication. Similarly, the associations between negative affect and cannabis problems ($z = 7.67$) and negative affect and expectancies ($z = 8.98$) were stronger than the correlations between negative affect and weekly cannabis use. Participants who used cannabis frequently reported higher weekly use ($M = 25.3$, $SD = 18.2$) compared to those using cannabis less frequently ($M = 4.93$, $SD = 3.02$; $t(282.95) = 18.14$, $p < .001$). The overall pattern of associations did not differ as a function of weekly use. Among participants who used cannabis less frequently, negative affect was associated with cannabis problems ($r = 0.54$), negative expectancies ($r = 0.50$), and intoxication ($r = 0.26$, p's $< .001$), but not with weekly use ($p > .05$). Among participants who used

cannabis frequently, negative affect was associated with cannabis problems (r = 0.48), negative expectancies (r = 0.57), and intoxication (r = 0.19, p's<.01), but not with weekly use (p>.05). Associations between negative affect and cannabis problems persist outside laboratory affect induction. Patterns from experimental work that indicate negative affect covaries more consistently with subjective cannabis outcomes than with more objective indices of consumption also appear in cross-sectional data. Though directionality cannot be determined, results indicate that current negative affect aligns more closely with reports of cannabis problems and negative expectancies than with behavioral measures of use. Future work that measures state affect alongside cannabis outcomes could help distinguish affect-congruent reporting from more stable indicators of harm.

THC-Infused Beverages: Awareness, Perceptions, and Use Among Young Adults Who Drink Alcohol

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Cannabis legalization and commercialization have lowered public harm perceptions about cannabis while increasing the number and types of available cannabis products. Δ9-tetrahydrocannabinol (THC)-infused beverages have emerged as a rapidly growing, novel cannabis product. These beverages are commonly sold as seltzers, sodas, or teas, often marketed as alcohol alternatives. Young adults who drink alcohol may be particularly susceptible to using THC beverages, yet little is known about THC beverage use. This study examines awareness, exposure, perceptions, and use of THC beverages among young adults who drink alcohol. This is a secondary analysis from a national observational study in young adults who report alcohol use. Between 2025-2026, 159 participants (Mage=22.3 (SD=1.81), 40.9% female, 64.2% white, 86.4% reported weekly binge drinking (4+/5+ drinks/occasion for women/men)) completed a survey on THC-infused beverages assessing: (a) product awareness, (b) retail/marketing exposure, (c) perceived risks relative to other cannabis and alcohol use, (d) perceived health benefits, and (e) substitution and/or complementary use (i.e., co-use) with alcohol. Those who reported awareness of THC beverages also responded to questions about intentions to use THC beverages in the next year and actual use. Among never users, responses for use intentions (definitely not, probably not, probably yes, definitely yes) other than 'definitely not' were coded as susceptible. Unadjusted comparisons and adjusted multinomial logistic regressions controlling for demographics, alcohol use, and cannabis use examined relationships among perceptions, susceptibility, and THC beverage use. Most participants (90.6%) were aware of THC beverages, typically through dispensaries, friends, and social media. Participants were classified as non-susceptible (31.0%), susceptible (28.5%), or having consumed THC beverages (40.5%), with 10.7% reporting past-month use. Most participants perceived THC beverages as less harmful than inhaled cannabis (85.5%) or alcohol (72.3%). Compared with non-susceptible individuals, those who had consumed THC beverages were more likely

to perceive these products as less harmful than inhaled cannabis (OR=3.23, p=.002), other edibles (OR=2.28, p=.014), or alcohol (OR=2.58, p=.002), and to perceive THC beverages as having health benefits (OR=2.14, p=.027). In contrast, susceptible individuals did not differ from non-susceptible individuals on these perceptions. Both individuals who consumed THC beverages (OR=2.92, p<.001) and susceptible individuals (OR=3.09, p<.001) were more likely to view THC beverages as a good substitute for alcohol and report greater willingness to co-use THC beverages with alcohol (OR=4.53 and 3.41, respectively, ps<.001) compared to non-susceptible individuals. Young adults who drink alcohol report substantial awareness of, susceptibility to, and use of THC beverages. Lower harm perceptions were associated with THC beverage use. Likewise, perceiving THC beverages as a good alcohol substitute and willingness to co-use with alcohol were associated with use and susceptibility to use THC beverages. These findings highlight the complex role THC beverages may play in alcohol and cannabis use patterns among young adults. Although some individuals may perceive THC beverages as a lower risk alternative to alcohol, their potential use alongside alcohol raises concerns about co-use and associated harms. As the THC beverage landscape expands, more research among young adults is warranted for informing alcohol and cannabis harm prevention efforts and regulatory policy.

Cannabis Use is Associated With Blunted Cortisol Stress Reactivity in Individuals with Early Life Stress and Anxiety and Trauma Disorders

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Cannabis remains a widely consumed drug worldwide. While motivations for use vary, many report using for therapeutic purposes like pain relief, stress, and insomnia. Emerging evidence suggests that the regular use of exogenous cannabinoids, like delta-9-tetrahydrocannabinol (THC), can disrupt the hypothalamic-pituitary-adrenal (HPA) axis. Blunted stress reactivity has been observed among those who use cannabis using laboratory tasks of psychological and physiological acute stress manipulation. The present study aimed to evaluate the association between cannabis use and stress reactivity, particularly among individuals with early life stress who have trauma or anxiety disorders. Secondary data were drawn from a case/control study of adults aged 18-40 (N = 195). Participants in the case group experienced neglect, abuse, or parental loss before age 11, whereas participants in the control group had no history of

maltreatment, loss, or psychopathology. Participants completed three study visits, approximately one week apart, including blood draws and biospecimen collection, clinical interviews and self-report measures, anthropometrics and calorimetry, cognitive assessments, and dietary recall. At the third visit, participants completed the Trier Social Stress Test (TSST), a standardized laboratory stress induction involving an impromptu speech and mental arithmetic in front of evaluators. The TSST reliably activates the HPA axis and autonomic nervous system, producing robust cortisol and physiological stress responses. An intravenous catheter was placed in the forearm, and eight blood samples were collected at 15-minute intervals throughout the TSST. Plasma cortisol concentrations were assessed, and stress reactivity was operationalized as the change from baseline to peak cortisol after stress induction. Study group contrasts were defined as healthy controls (n = 80), individuals with early life stress (cases) with a lifetime or current anxiety or trauma diagnosis, and individuals with early life stress (cases) without a lifetime or current anxiety or trauma diagnosis. General linear models evaluated the main and interactive effects of cannabis use (yes/no) and study group (healthy controls, cases with a diagnosis, cases without a diagnosis) on stress reactivity (i.e., change in cortisol concentration during the TSST). Separate models assessed lifetime and current anxiety or trauma diagnoses, resulting in four total analyses. All models controlled for perceived stress, sex, age, BMI, and pack-years of smoked cigarettes. Results indicated that those with early life stress (cases) who had a current anxiety disorder had significantly higher cortisol responses compared to those without a current anxiety disorder ($b = 0.54$, $p < .05$). Across models assessing anxiety, cannabis use was associated with lower cortisol reactivity, whereas this effect was not observed in models assessing trauma. In trauma-focused models, among participants who have early life stress and a lifetime trauma diagnosis, higher cannabis use was associated with lower cortisol reactivity ($b = -0.434$, $p = 0.041$). Together, these findings suggest that cannabis use is linked to blunted or dampened cortisol responses among individuals who have experienced early life stress and either a current

anxiety disorder or a lifetime history of trauma.

Beyond Trauma Exposure: The Role of Subjective Traumatic Impact in Cannabis Risk Outcomes

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Childhood trauma is associated with cannabis risk outcomes, including increased use, cannabis use disorder (CUD), and earlier first age of cannabis use. This relationship is often attributed to the enduring effects of chronic stress on the endocannabinoid system, as well as the use of cannabis as a coping mechanism. Although prior research has established a link between childhood trauma and cannabis risk outcomes, few studies account for variability in the subjective traumatic impact of these experiences. To date, no studies have examined whether subjective traumatic impact (i.e., how traumatic an event is experienced by the individual) is associated with cannabis risk outcomes or whether it influences the relationship between trauma exposure and cannabis risk outcomes. The present study aimed to address this gap and investigated whether subjective traumatic impact moderates the relationship between exposure to a range of childhood traumatic events and cannabis risk outcomes. Secondary analyses were conducted using baseline data from a larger longitudinal study examining naturalistic cannabis use and negative affect. The analytic sample included adults who reported using cannabis to cope with anxiety and reported experiencing at least one childhood traumatic event (N = 346, Mage = 32, SD = 13, 64.3% female). Participants completed measures of childhood trauma exposure and impact, cannabis use frequency, age of first use, and CUD symptoms. Trauma exposure was operationalized as the number of distinct event types endorsed by each participant (i.e., not the frequency of occurrence), and impact ratings were averaged across endorsed events. Gender was included as a covariate in all models. Due to non-normal distributions, generalized linear models (GLM) were fit and tests of simple slopes were run for significant interactions. Results indicated significant main effects of trauma exposure, such that exposure to each additional childhood traumatic event type was associated with a 15% increase in CUD symptoms (IRR = 1.15, p = .02) and a 0.17-day increase in cannabis use frequency (β = 0.17, p = .04). Subjective traumatic impact was not independently associated with any cannabis risk outcomes. Lastly, subjective traumatic impact moderated the relationship between childhood trauma exposure and age of first cannabis use (β = 0.40, 95% CI (0.03, 0.07), p = .03). Exposure to a greater number of childhood traumatic event types is associated with increased cannabis risk outcomes. Subjective traumatic impact of these events may influence the first age of cannabis use. These results suggest that it is necessary to assess both childhood trauma exposure and subjective traumatic impact when evaluating cannabis risk.

Motives for Use, Background Mood, and Experienced Mood Effects of Cannabis Use Among Young Adults

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Background: Young adults report mood-related motivations for cannabis use,

including coping with negative moods and pleasure enhancement. Little research has focused on whether subjective mood experiences with cannabis map onto these motives or background moods. This study examined how real-time changes in positive (PA) and negative affect (NA) with cannabis use relate to use motivations and background anxiety and depression symptoms. Method: Participants were 241 young adults, (mean age: 25.9 years (SD = 4.7); 51% male; 53.1% White), in a longitudinal, observational study, who co-used nicotine and cannabis. Baseline measures included: demographics; cannabis use patterns; CES-D-10 (depression); GAD-7 (anxiety), CUDIT-R (cannabis dependence), and Marijuana Motives Measure (MMM). Participants completed 7days of EMA, capturing product use and subjective and affective experiences. EMA assessed PA and NA with adjectives rated on a 10-point Likert scale. Participants first rated how they felt 'now' and after rating all items, participants rated each one again for how they felt just before product use. Change scores were calculated for the PA scale (4 items) and NA scale (9 items) for post-pre use. This study includes EMA interviews only from instances of cannabis use (n=3,011). Results: Participants used cannabis an average of 26.1 (SD = 6.8) days in the past 30, and averaged 15.2 (SD = 6.0) on the CUDIT-R. Depression (M = 10.4, SD = 6.0) and anxiety symptoms (M = 7.4, SD = 5.6) were in the moderate range. With cannabis use, participants had a significant increase in PA (M = 1.3 points increase, SD = 0.9), and a significant decrease in NA (M change = -0.6, SD = 0.8). PA change was positively correlated with anxiety (r = .188, p = .005) and coping motives (r = .186, p = .005); individuals with higher anxiety and coping motives experienced higher increases in PA with cannabis use. PA change was not associated with depression (r = .106, p = .114). Depression (r = -.311, p = < .001), anxiety (r = -.241, p = < .001), and coping motives (r = -.182, p = .007) were negatively associated with NA change; higher levels of depression, anxiety, and coping motives were associated with greater reductions in NA with cannabis use. Depression (r = .348, p = < .001), anxiety (r = .307, p = < .001), coping (r = .506, p = < .001) and enhancement (r = .385, p = < .001) motives were significantly positively associated with CUDIT-R; greater cannabis dependence was linked to higher depression, anxiety, and motives to use cannabis for mood management. Conclusion: Young adults' NA reduction with cannabis maps onto their background levels of depression, anxiety, and motives for use. Boost in PA was associated with background anxiety, but not depression. Mood management motives were associated with experienced changes in both PA and NA, and cannabis dependence was significantly related to mood motives, background affect, and experienced mood change. These findings shape our understanding of how young adults use cannabis for in-the-moment mood management.

Association Between Neighborhood Deprivation, Distance, and Compliance With a State Ban on Sales to Apparently Alcohol-Intoxicated Customers by Adult-Use Cannabis and Alcohol Retailers

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Background: In the United States, states regulate who is eligible to purchase adult-use

cannabis and alcohol. Nearly all states prohibit alcohol sales to apparently intoxicated customers, and some states prohibit cannabis sales to such customers. Research questions analyzed were 1) what the patterns of compliance with state laws were prohibiting sales to apparently alcohol-intoxicated customers by cannabis and alcohol retailers in Portland, Oregon, and 2) was compliance associated with neighborhood deprivation (i.e., socioeconomic disadvantage) and/or geographic proximity. Methods: Three data sources were included. 1) Sales to apparently alcohol-intoxicated buyers in state-licensed cannabis stores (n=138) and alcohol premises (n=75; n=40 on-premises sales [e.g., bars/restaurants] and n=35 off-premises sales [e.g., package stores]) in Portland, Oregon were assessed by pseudo-patrons (PP) teams (feigning alcohol intoxication) during a single visit (cannabis stores in 2024; alcohol premises in 2024 [n=32] and 2026 [n=43]). Concordance measures were created for each cannabis-alcohol establishment pair (n=10,350 pairs): refusal concordance (1=both refused vs. 0=else) and selling concordance (1=both willing to sell [cannabis]/sold [alcohol] vs. 0=else). 2) Euclidean geographic distance in kilometers (km) (median=20.9 km, range=0.1-54.5 km) was estimated between each establishment pair. 3) Neighborhood Deprivation Index (NDI), a composite metric of wealth, education, occupation, and housing, was calculated for Oregon census tracts containing the cannabis and alcohol establishments. Difference in NDI was calculated for each pair (range=-4.04-3.92). A dichotomous measure of NDI for alcohol premises (low - less deprived v. high - more deprived neighborhoods) was calculated using statewide median NDI=0.079. Results: PP visits occurred mostly on Thursday (cannabis 41.3%, alcohol 30.7%), Friday (cannabis 35.1%, alcohol 46.7%), and Saturday (cannabis 20.7%, alcohol 22.7%) evenings. Observers' mean rating of obviousness of PP buyers' intoxication displays was 4.4 (out of 5). Of the 10,350 cannabis-alcohol establishment pairs, 12.7% were refusal concordant and 34.8% were selling concordant. Moran's I test of spatial clustering was statistically significant for refusal concordance ($I=0.001$, $p<0.001$; weak spatial clustering) and trended for selling concordance ($I=-0.001$, $p=0.051$; weak spatial dispersion). More cannabis-alcohol pairs were selling concordant when alcohol premises were in high NDI areas (alcohol median NDI OR=1.733, $p<0.001$) and refusal concordant when alcohol premises were in low NDI areas (alcohol median NDI OR=0.762, $p=0.002$). Proximity of establishments in cannabis-alcohol pairs within the high NDI areas was associated with more selling concordance (distance x NDI difference x alcohol median NDI OR=1.106, $p=0.014$). However, cannabis-alcohol pairs with refusal concordance were at farther distances when cannabis stores were in higher NDI areas than alcohol premises (distance x NDI difference OR=0.992, $p=0.007$). Conclusions: Neighborhood deprivation may be an important determinant of compliance with state laws prohibiting sales of adult-use cannabis and alcohol to apparently intoxicated customers, due to differences in enforcement activities or community norms for safe sales practices. Proximity between cannabis and alcohol establishments appeared to increase non-compliance in high-deprived neighborhoods but not low-deprived neighborhoods. This may be partly explained by high-deprived neighborhoods being more closely adjacent to one another than low-deprived neighborhoods in Portland, Oregon. The small spatial components and modest number of establishments limited the analysis.

Understanding How Leading Cannabis Brands Use 'Natural,' 'Clean,' 'Pure,' and 'Organic' Claims in Their Marketing

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Introduction: Cannabis brands are increasingly using terms such as 'natural,' 'clean,' 'pure,' and 'organic' in their marketing. In the tobacco literature, similar terms have been shown to lower perceived risk and increase product use interest. To inform cannabis marketing surveillance and policy discussions, this study examined how leading U.S. cannabis brands use these terms on their websites by identifying the types of phrases most commonly associated with each descriptor. Methods: In September 2025, we reviewed the websites of 300 leading U.S. cannabis brands, including content on the main page, product pages, company information pages, and cultivation/manufacturing pages. We identified and archived screenshots of phrases containing the terms 'natural,' 'pure,' 'clean,' and/or 'organic' from 155 brand websites. The final analytic sample included 702 unique marketing phrases (natural = 212; pure = 211; clean = 173; organic = 106). Three trained coders developed an inductive codebook and double-coded the screenshot content in pairs, with discrepancies resolved through team discussion. Results: Content coding identified four themes: (1) Product and Composition Attributes (Product Theme), which describes what the product is, its form, and what it contains; (2) Production and Manufacturing Claims (Production Theme), which describes how the product is grown, sourced, processed, or produced; (3) Sensory and Experiential Appeals (Sensory Theme), which describes sensory qualities or the subjective experience of use; and (4) Effect, Potency, and Functional Claims (Effects Theme), which describes use effects, potency, or functional outcomes. Across all phrases, the most common theme was the Product Theme (61.8%), followed by the Production Theme (27.2%), Sensory Theme (20.9%), and Effects Theme (10.7%). Theme distributions did not differ meaningfully for phrases using 'natural.' In contrast, phrases using 'pure' more often reflected the Production Theme (73.5%) and Effects Theme (16.6%) than other phrases, while phrases using 'clean' more often reflected the Sensory Theme (31.8%). Phrases using 'organic' more often reflected the Production Theme. Discussion: In this content analysis of leading U.S. cannabis brand websites, we found that 'natural,' 'clean,' 'pure,' and 'organic' terms are frequently used to communicate product composition and form, production and manufacturing practices, sensory and use experiences, and expected effects, potency, and functional outcomes. Across 702 unique marketing phrases, most phrases emphasized product and composition attributes, suggesting that brands commonly deploy these phrases as broad quality signifiers attached to product identity (e.g., product form, general cannabis terminology, and select constituent references). At the same time, each term exhibited a distinct pattern of co-occurring themes, indicating that cannabis brands may use them as differentiated marketing tools that relate to specific promotional tactics and consumer inferences. From a public health and regulatory perspective, these findings provide a foundation for monitoring potentially ambiguous marketing language that may be interpreted as lower risk or higher quality of cannabis products. Results can support regulatory discussions about whether and how these marketing terms should be defined, substantiated, or restricted in cannabis marketing. Results can also support future research for examining whether these

terms causally influence cannabis risk perceptions, product appeal, and behavioral intentions to understand their behavioral impact.

Perceived Meaning of Naturalness-Related Marketing Descriptors on Cannabis Vape Product Packaging Among U.S. Adults

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Introduction: Cannabis vape product (CVP) packaging uses descriptors such as 'Natural,' 'Pure,' 'Organic,' and 'Additive-free.' Although these descriptors are not always clearly defined, they may suggest that a product is purer, more natural, or free from harmful substances. This raises public health concerns because CVP use is associated with physical and mental health harms, and such descriptors may minimize perceived risks or make products more favorable. Research on tobacco products shows that similar naturalness-related language can lower perceptions of harm and create favorable impressions. However, less is known about how these descriptors influence adults' views of cannabis products. This study examined whether naturalness-related descriptors on CVP packaging affect adults' product perceptions and intentions to use and explored how adults interpret these descriptors. Methods: Data came from a marketing stimuli-based experiment embedded in a web-based survey of U.S. adults ages 18-45 (n = 1,387). Participants were randomized to view 1 of 5 CVP package conditions: a no-descriptor control or packages labeled 'All Natural,' '100% Pure,' 'Organic,' or 'Additive-free.' To resemble real-world packaging, all stimuli included a fictional brand name, product image, THC percentage, and flavor name. After viewing their assigned package, participants completed closed-ended measures of product use intention, positive and negative outcome expectancies, and perceived mental and physical health risks. Participants assigned to the descriptor conditions also answered an open-ended question about what the descriptor meant to them. The experiment effect was assessed by using closed-ended outcomes with an ordinal logistic regression. Open-ended responses (n = 1,096) were coded inductively. The final codebook included 11 themes, and coding reliability was high. Descriptive analyses and Chi-square tests examined interpretation patterns overall and by condition. Results: Overall, the descriptors had limited effects on closed-ended outcomes. Among the four descriptors, only 'All Natural' was associated with lower perceived physical health harm of the featured CVP (OR = 0.89, 95% CI = 0.55-0.98). No other significant effects were observed for the remaining descriptors or outcomes. In contrast, participants' open-ended responses revealed extensive interpretation of the descriptors. Across conditions, participants most commonly interpreted the terms as indicating that the product contained no additives or extra ingredients (34.9%), was natural or plant-based (30.7%), or contained no harmful chemicals (29.7%). Descriptor conditions varied for interpretations related to no additives or extra ingredients ($p < 0.001$), natural or plant-based ($p<0.001$), no harmful chemicals ($p<0.001$), and organic cultivation ($p < 0.001$). For example, '100% Pure' was more likely to be interpreted as no additives or extra ingredients than 'All Natural' ($p < 0.001$) and 'Organic' ($p < 0.001$); 'All Natural' was more likely to be interpreted as natural or plant-based than '100% Pure' ($p < 0.001$) and 'Additive-free' ($p < 0.001$). Discussion: Although naturalness-related descriptors on CVP packaging did not consistently alter

perceptions of risk or intentions to use, they clearly influenced how adults interpreted the product. Rather than producing immediate changes in explicit attitudes, these descriptors appeared to shape perceptions through ingredient-based and naturalness-related inferences that could support more favorable impressions. These findings highlight the importance of continued monitoring of cannabis marketing practices that may imply reduced harm or cleaner composition.

Green Corridors: A County and Municipality Level Assessment of Adult Use and Medical Dispensary Density in Massachusetts

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Background: As of February 2026, there are 418 adult-use marijuana retailers and 151 medical retailers (Medical Treatment Centers, or MTCs) operating in Massachusetts. The geographic density of these state-regulated retailers varies by region; therefore the adequacy of patient and consumer access to medical and adult-use marijuana products may also vary. In this study, we leverage census and industry data to identify areas that may lack adequate patient access. Methods: We used three datasets to estimate density in each municipality and county. Population estimates were obtained from the 2020-2024 American Community Survey. Adult-use and medical marijuana retailer data was derived from the CCC's Open Data Catalog. Density was measured as the number of retailers ('Establishments') present in a given county or municipality ('Location') per 100,000 population, calculated as [Establishments per 100k = (Establishments in Location/Population in Location)*100,000]. Results: Berkshire (18.54), Hampshire (17.90), and Nantucket (13.81) had the highest density of adult-use marijuana retailers per 100,000 population, where Norfolk (1.78), Essex (4.43), and Middlesex (4.39) had the lowest density. Retailer density was particularly high in the communities of Rowley (Essex; 149.10), Great Barrington (Berkshire; 142.0), and Provincetown (Barnstable; 139.9). Nantucket (13.81), Hampshire (5.55) and Dukes (4.78) counties had the highest density of MTCs per 100,000 population. Out of Massachusetts' fourteen counties, five had less than two MTCs per 100,000 population, with Norfolk (1.37), Franklin (1.41), and Essex (1.48) having the fewest MTCs per 100,000 population. MTC Density was highest in the communities of Chester (Hampden;113.7), Holland (Hampden; 57.8), and Rowley (Essex; 37.3). Conclusions: Among the top 10 municipalities by retailer density, five were in Western Massachusetts (4 in Berkshire, 1 in Franklin), and three were on the Cape (all in Barnstable). Among the top 10 municipalities by MTC density, three were in Western Massachusetts (2 in Hampden, 1 in Berkshire) and four were on the Cape (3 in Barnstable, 1 in Dukes). These results may be driven by the smaller populations of the most retail-dense counties and communities. Nantucket and Hampshire counties, for instance, rank as the least populated and fifth least-populated (out of 14) counties in the state. Just one community ranked in the top ten communities for either retailer or MTC density (Bourne in Barnstable County) had above 10,000 residents by 2024 estimates. This critical high-level analysis found continuing geographic fluctuation in retailer density, including for MTCs, highlighting the need

for policymakers to monitor market saturation and ensure continued medical patient access in states with recreational and medical markets.

'Growing Up in the Hempire': Using ICPS Data to Contextualize Youth Novel Cannabinoid Use In Massachusetts

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Background: The increased adoption of recreational cannabis laws has also increased concerns for public safety, particularly around underage use. These concerns have fueled media coverage and claims that state-regulated cannabis markets are amplifying harms to youth. However, creating effective public policy to mitigate harm requires not only understanding the quantity and frequency of youth use of cannabis products, but also which products they are using and how they are sourcing them. It remains an open question how youth use is influenced by the growing availability and popularity of hemp-derived and/or 'novel' cannabinoids, a set of lesser-known cannabinoids outside of Delta-9 that are often available outside of state-regulated, age-gated state-regulated cannabis dispensaries. Here we use data from the International Cannabis Policy Study (ICPS) to understand Massachusetts residents' experiences with hemp-derived and novel cannabinoids. Methods: We used survey data from the 2023 and 2024 ICPS waves to understand the reported experiences of youth participants aged 16-20 years old (n=194) and adult participants aged 21-65 years old (n=4,250). We investigated newly added items related to participants' familiarity with and use of the novel cannabinoids Delta 8, Delta 10, THCA, HHC (hexahydrocannabinol), THC-O-acetate, THCP (tetrahydrocannabiphorol), and the fictional cannabinoid 'Delta 4'. Results: Awareness of these novel cannabinoids ranged from 7.7% (HHC) to 22.2% (Delta 8) in participants under age 21, and from 5.8% (HHC) to 18.5% (Delta 8) in the remaining sample (i.e., 21 and older participants), highlighting a varying familiarity with these cannabinoids across all ages. Youth were more likely to be aware of Delta 8 (22.2%-18.5%), HHC (7.7%-5.8%), THC-O-acetate (10.8%-6.3%), THCP (9.8%-8.6%), and Delta 10 (12.9%-8.6%); in contrast, 21-65-year-olds were more familiar with THCA than were youth (18%-12.9%). Youth were almost twice as likely to report awareness of the fictional Delta 4 (10.3%) than were older participants collectively (5.3%). Conclusions: Results suggest participants had relatively high awareness of the six novel cannabinoids included in the survey, particularly the 16-20 year old 'youth' demographic. These initial analyses showed gaps in understanding of and familiarity with novel cannabinoids in both youth and adult participants, highlighting an opportunity for public education and the need for regulators, public health agencies, and researchers to understand the limitations of available data. Future preventative applications and resourcing should focus on public education targeting youth and cannabinoid knowledge, such as extending the Massachusetts More About Marijuana, a Public Awareness Campaign, 2018-2019.

Cannabis Use Among Autistic Adolescents and Young Adults: Differences by Timing of ASD Diagnosis

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U.S. data describing cannabis initiation and escalation in youth diagnosed with Autism Spectrum Disorder (ASD) remains limited. This gap is especially important to address given the growing public discourse about perceived medical benefits and low risk of cannabis use, including for conditions with limited pharmacological options such as ASD. The present study characterizes lifetime and recent cannabis use in a sample of autistic youth and examines whether cannabis use patterns differ by the timing of ASD diagnosis. Participants included 380 autistic adolescents and young adults (*M*age = 19.38, *SD* = 3.55; 50.4% female at birth; 88.7% White), grouped by age at first ASD diagnosis: 9 years and under (n = 175), 10 to 17 years (n = 105), and 18 years and over (n = 87). Descriptive analyses examined lifetime cannabis use (binary y/n), lifetime history of getting high from cannabis (binary y/n), age at first use, lifetime use frequency, weekly use for at least one month (binary y/n), recent cannabis use (past 12 months and past 3 months, binary y/n and frequency), and therapeutic/medical cannabis use. Group differences in these cannabis use variables, by age of diagnosis, were tested using chi-square tests or ANOVAs, as appropriate. Complementary binary logistic regression models were conducted for binary outcomes to examine whether associations with diagnostic timing persisted after adjusting for current age and sex at birth. Initial analysis indicated that lifetime cannabis use differed significantly by diagnostic timing. Participants diagnosed at age 18 or older reported the highest prevalence of lifetime cannabis use (69.8%), compared with those diagnosed at ages 10 to 17 (31.4%) and 9 or younger (21.3%), $p < .001$. A similar pattern emerged for ever having gotten high from cannabis ($p = .005$), age at first cannabis use ($p = .002$), and lifetime frequency of cannabis use ($p = .024$), with participants diagnosed at age 18 or older showing the highest levels across these outcomes. In contrast, no significant group differences emerged for weekly cannabis use for at least one month, past 12-month cannabis use, past 3-month cannabis use, frequency of recent use, or therapeutic/medical cannabis use. Additionally, therapeutic/medical cannabis use did not vary significantly by diagnostic timing in this sample. In adjusted logistic regression models, only lifetime cannabis use remained significantly associated with diagnostic timing. Compared with participants diagnosed at age 9 or younger, those diagnosed at age 18 or older had greater odds of lifetime cannabis use (*OR* = 3.12, 95% *CI* [1.56, 6.26], $p = .001$), whereas the 10 to 17 group did not differ significantly from the reference group. Findings suggest elevated lifetime cannabis exposure among autistic youth diagnosed later in life, which may reflect greater exposure to developmentally normative social environments or other clinical differences associated with later ASD diagnosis. At the same time, recent and therapeutic cannabis use patterns did not vary significantly by diagnostic timing in this sample. These results highlight the importance of collecting detailed substance use data in autistic populations and of considering developmental context when identifying youth who may be at greater risk for cannabis exposure.

Marijuana and Alcohol Use in High School as Predictors of Mental and Cognitive Health 40 Years Later Using Data from the NLSY79.

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Annual data from the longstanding Monitoring the Future Study (https://monitoringthefuture.org/; MTF) reveal that high school seniors from 1979 were more likely to report marijuana use than seniors from any other year, before or since. In comparison, MTF data show the likelihood of seniors reporting alcohol use has remained relatively steady from year to year. The National Longitudinal Survey of Youth 1979 (https://www.nlsinfo.org/content/cohorts/nlsy79; NLSY79; $N \approx 12{,}686$) is a longitudinal project following a cohort of American youth born between 1957–1964, with data available from 1979 (Round 1) through 2022 (Round 30). Using the NLSY79 data, we examined 1979 marijuana and alcohol involvement as predictors of 2022 mental health and cognitive outcomes, adjusting for demographic and other potential confounds. Marijuana involvement was measured as the number of months used in 1979 (0–12 months), with supplemental dummy-coded comparisons of 1–2 months, 3–11 months, and 12 months versus 0 months. Alcohol involvement was operationalized using repeated measures from 1982–1984, calculated as the average frequency of heavy drinking (6 or more drinks on one occasion) across those waves. Models adjusted for sex, nativity, race/ethnicity, other drug use, and delinquency. We estimated joint logistic regression models predicting later-life life satisfaction measured with the Satisfaction With Life Scale (SWLS), anxiety symptoms measured with the Generalized Anxiety Disorder-7 (GAD-7), depressive symptoms measured with the 7-item Center for Epidemiologic Studies Depression Scale (CES-D), and recall-based cognition measured with word recall scores. In joint models including both predictors, greater alcohol involvement in early adulthood was associated lower life satisfaction (B = -0.181, p = .047), higher anxiety symptoms (B = 0.140, p = .017), and poorer performance on recall-based cognition (B = -0.126, $p < .001$) in later adulthood. Moreover, early adulthood marijuana involvement was not significantly associated with any of the later-life mental health and cognitive outcomes (all p's > .26). Finally, neither alcohol nor marijuana involvement in early adulthood was associated with depressive symptoms in later adulthood in the fully adjusted models. Overall, our findings suggest that alcohol involvement in early adulthood, but not marijuana involvement, was associated with poorer mental health and cognitive functioning forty years later among high school seniors from 1979.

Cannabis Use Associated with Emergent Behavioral Tasks and Risky Behavior

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Cannabis use is frequently associated sensation seeking, a personality trait in which

an individual has increased motivation to pursue highly stimulating experiences and is willing to engage in risky behaviors to do so. We have previously created two novel tasks quantifying self-directed emergent behavior in a 3D virtual environment and successfully identified associations between these behaviors to sensation seeking personality trait (DiCecco, Sharma, & Conner, 2026). Several measured behavioral patterns from the tasks showed significant associations with sensation seeking. We have also since utilized these tasks in functional neuroimaging contexts and to directly compare behaviors with participation in various risky behaviors. During the current study, we aimed to further identify any relationships between engagement in substance use, including cannabis use, with those measured behaviors in the tasks. We identified several associations between emergent task behaviors, sensation seeking, and cannabis use. Ever endorsed cannabis use, reported use within the last 6 months, and frequency of use, all are associated with a greater amount of time engaging in emergent risky behavior outside the realm of the explicit requests of the task. For example, frequency of use as reported by the CUDIT-R is associated with greater exploration outside of the task area, which requires engagement in 'risky' behavior to achieve (Rho = .36, $p < .001$, CI: 0.17-0.52). In addition, CUDIT-R items involving inability to stop cannabis use as desired, concentration issues, and hazardous cannabis use were also associated with more frequent engagement in 'dangerous' activities within the tasks. Multivariate regressions assessing for both sensation seeking and cannabis use simultaneously confirmed that cannabis use remains a unique predictor of task behavior with the inclusion of sensation seeking, and in some cases appears to carry to predominant unique variance over sensation seeking (ß = 7.23, $p < .05$). These findings suggest that risky behavior captured by emergent task performance is not only associated with personality traits, but direct engagement in behaviors such as cannabis use. Future work should assess the utility of risky behavior in future cannabis use through a longitudinal study, as well as an assessment of if cannabis or substance use behavior mediates the associations between sensation seeking and any neural correlates.

Examining Cannabis Use as a Moderator of Depressive Symptoms and Pain Experiences in Young Adults with Chronic Pain

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Chronic pain, defined as pain that persists or recurs for more than three months, affects 1 in 5 adults and is often associated with significant emotional distress and functional disability. Depression has been identified as a strong prospective risk factor for developing pain problems, and its prevalence is notably elevated in younger adults with chronic primary pain conditions-whose symptoms are often underrecognized and undertreated. Barriers to accessing treatment for both conditions, particularly in young adults, may lead some individuals to seek alternative pain coping strategies, including cannabis use. However, little is known about whether cannabis use influences the relationship between depressive symptoms and chronic pain in young adults. Understanding whether cannabis modifies this relationship may help clarify its role in pain management for individuals experiencing comorbid mental health concerns. As part of an ongoing study among young adults with chronic pain who use

cannabis (current N = 49; anticipated N = 80), we examined the extent to which cannabis use moderates the relationship between depressive symptoms and pain experiences. The current cross-sectional analysis focused on baseline survey measures examining depressive symptoms (DASS), cannabis use (past 30-day use frequency), and pain-related outcomes (pain interference and catastrophizing). The sample reported clinically elevated pain-related interference (t-score = 62.88, SD = 5.45) and moderate usual pain intensity (M = 5.59, SD = 1.26, 0-10 Numerical Rating Scale). On average, they reported past 30-day cannabis use on 22.29 days (SD = 9.06) and mild depressive symptoms (M = 11.88, SD = 8.96). Using a regression framework, we examined the main effects of depressive symptoms, cannabis use, and the depressive symptom X cannabis use interaction on PROMIS pain interference and CSQ pain catastrophizing. There was a significant main effect of depressive symptoms on catastrophizing ($\beta = .51$, $p < .001$). No other main effects of depressive symptoms or cannabis use occurred for catastrophizing or pain interference ($\beta s < -.07$; $ps > .28$), nor were there any significant depressive symptoms X cannabis use interactions ($\beta s < .02$; $ps > .17$). These preliminary findings suggest that cannabis use may not buffer, nor harm, the relationship between depressive symptoms and pain among young adults living with chronic pain. Given the relatively small sample size and the early nature of data collection, these interpretations are made with caution. Improving the understanding of how cannabis use interacts with depressive symptoms and pain perception may help inform clinical decision-making, further influencing approaches to pain management for individuals experiencing comorbid depression and chronic pain. As the prevalence of using cannabis for pain management increases, continued research examining its role in both physical and mental health outcomes remains important for improving treatment strategies and patient care.

Perceived Potency and THC Vaping Behavior in Young Adults: An Ecological Momentary Assessment Study

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Background: Cannabis (THC) vaping is highly prevalent among young adults. Because some vaping products contain very high levels of THC, health officials have raised concerns that higher-intensity use of vaping products may increase THC exposure and related harms. However, few studies examine product potency in relation to THC vaping intensity. The purpose of this study is to examine daily associations between perceived potency of THC vaping products and intensity of THC vaping in a sample of young adults. Methods: Young adults (n=104; average age 25; 50% female) recruited from a California-based longitudinal cohort study participated in a 3-week ecological momentary assessment (EMA) protocol in 2023. Participants reported daily THC vaping behavior (number of puffs), perceived product potency (1=Very low THC to 5=Very high THC), and same-day other substance use (any other cannabis; alcohol; nicotine). Mixed linear regression models examined associations between perceived THC potency and number of puffs per day; sensitivity analyses examined these associations adjusting for symptoms of problem cannabis use (CUDIT-SF scores) and indicators of THC vaping history (age of initiation; total years vaping; vaping

frequency), assessed in 2021-2022. Results: Perceived potency (B = 2.67, SE = 0.94, p = 0.005) and any (vs. no) same-day other cannabis product use (B = 7.67, SE = 1.74, p < 0.0001) were associated with a greater number of puffs on THC vaping days. The association between product potency rating and THC vaping puffs per day remained after accounting for past CUDIT-SF score and indicators of cannabis use history, although magnitude of the association was slightly attenuated (B = 1.33 [SE = 0.23], p < .0001). Conclusions: Among young adults who currently vape cannabis, higher perceived product THC potency and same-day other cannabis product use (e.g., flower) were associated with greater daily intensity of THC vaping, which may increase total THC exposure and related risks.

Relations Between Anxiety Sensitivity, Impulsive Traits, and Cannabis Consequences

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Background/Rationale: Cannabis use is common among young adults, and a substantial portion of individuals experience negative consequences related to their use (e.g., psychological distress, physical and mental impairment, symptoms of dependence). Identifying individual differences/factors that increase vulnerability to these adverse outcomes remains an important goal in prevention and intervention efforts. One factor consistently linked to problematic cannabis use is anxiety sensitivity, defined as the tendency to fear anxiety-related sensations. Similarly, impulsive personality traits are another well-established risk factor for cannabis-related negative outcomes, and theory may suggest that certain facets of impulsivity, particularly negative urgency (i.e., rash action in a negative mood state), may interact with anxiety sensitivity to shape cannabis-related negative consequences. Yet, it remains unclear whether impulsivity strengthens or weakens the association between anxiety sensitivity and negative cannabis related consequences. Methods: Participants (N=435) completed a survey focused on cannabis use, negative cannabis consequences, anxiety sensitivity, and impulsive personality traits. Linear regression models tested whether anxiety sensitivity predicted negative cannabis consequences, and if relations differed as a function of impulsive traits. Age, sex, recreational versus medical use, and cannabis use frequency were covaried. Results: Higher scores on anxiety sensitivity were associated with more negative cannabis consequences (b=.14, SE=.04, 95%BCI=[.06,.22]), as were higher levels of negative urgency (b=.20, SE=.04, 95%BCI=[.12,.29]) - however, no other impulsive traits had main effects on negative consequences. When testing interactions by impulsive traits, there were interactions between anxiety sensitivity and negative urgency (b=-.24, SE=.12, 95%BCI=[-.48,-.04]), positive urgency (b=-.23, SE=.10, 95%BCI=[-.43,-.04]) as well as sensation seeking (b=-.49, SE=.13, 95%BCI=[-.75,-.26]). Across interactions, simple slopes suggested that, contrary to hypotheses, anxiety sensitivity was associated with more negative consequences within individuals who had lower (versus higher) levels of impulsive traits. However, marginal mean plots revealed that this was due to largely equivalent (yet high) levels of consequences at high levels of impulsivity, regardless of anxiety sensitivity. Conclusions: While anxiety sensitivity and negative urgency independently predict greater negative cannabis consequences among young adults, their combined effects were complicated, at best. Specifically, higher levels of impulsivity (particularly

negative/positive urgency and sensation seeking) attenuated the association between anxiety sensitivity and negative consequences, however this was in part due to elevated levels of consequences for individuals high in impulsive traits across levels of anxiety sensitivity. These findings highlight the complex interplay of emotional sensitivity and impulsivity in cannabis-related risk and suggest targeted interventions may benefit from a multi-pronged approach incorporating both.

Differences in Cannabis Use Problems, Consequences, and Protective Behavioral Strategies Based on Gender Conformity

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Aims: While the literature has identified greater cannabis use quantity and frequency among gender nonconforming groups (e.g., transgender vs cisgender), there is limited examination into potential differences in other cannabis use constructs. The present study examined differences in cannabis use problems, consequences and protective behavioral strategies (PBS) based on gender conformity status and sex. Methods: Participants included 1,833 college students (66% female; 75% White non-Hispanic) who engaged in past month cannabis use. The sample divided into three gender conformity categories: no gender nonconformity (93%), mild gender conformity (5.5%) and high gender nonconformity (1.3%) based on responses to a measure adapted from the gender unicorn and a sex assigned at birth item. Participants completed measures of cannabis use problems (CUDIT), consequences (BMACQ), and cannabis PBS (PBSM, subscales context and quantity). Results: A series of ANOVAS revealed significant differences across all outcomes examined. Where assumptions of homogeneity of variance were violated (cannabis use problems, consequences, contextual PBS), Welch's tests were used. In particular, females reported lower cannabis use problems and consequences, but higher use of contextual and quantity-base cannabis PBS than males (ps < .05). However, males high in gender nonconformity also reported lower cannabis use problems than females with no or mild gender conformity (ps < .05) and did not differ from females regardless of gender conformity status on contextual cannabis PBS. Conclusions: While exploratory given small subgroups sizes, findings suggest high levels of gender nonconformity may be protective for some cannabis use domains in males. Future research should explore these associations in larger samples and using gender identity (e.g., transgender vs cisgender) to confirm.

Competing Measurement Models for the Measurement of Cannabis Protective Behavioral Strategies

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Cannabis protective behavioral strategies (PBS) have consistently emerged as a robust protective factor associated with reductions in cannabis use, negative cannabis-related consequences, and symptoms of cannabis use disorder (CUD). The Protective Behavioral Strategies Marijuana (PBSM) scale is the primary instrument used to assess these behaviors. While early development work suggested a unidimensional structure (Pedersen et al., 2017), recent psychometric

evaluations have proposed a two-factor solution consisting of 'Quantity' (strategies to limit amount consumed) and 'Context' (strategies to avoid social or situational trouble). Despite this shift, reported model fit for the two-factor structure has been marginal when utilizing standard continuous estimators (Mian et al., 2021). The present study posits that the marginal fit observed in previous research may be due to the non-normal, skewed distribution of PBSM items, which are likely better represented as categorical rather than continuous indicators. Using three large, independent samples of college student cannabis users (n = 1,200; n = 1,308; n = 607), we compared the performance of one- and two-factor models using both Maximum Likelihood with Robust standard errors (MLR; continuous) and Weighted Least Squares Mean and Variance adjusted (WLSMV; categorical) estimators. Across all three samples, treating PBSM items as categorical variables significantly improved model performance. Specifically, the two-factor solution utilizing the WLSMV estimator yielded acceptable to good model fit (.937 < CFIs < .952), whereas models treating items as continuous indices consistently demonstrated poorer fit. Furthermore, structural equation modeling revealed distinct predictive pathways for the two factors. The Quantity factor was most robustly associated with lower levels of cannabis use, which subsequently mediated a relationship with fewer consequences and CUD symptoms. In contrast, the Context factor did not significantly predict use frequency but demonstrated a direct, significant relationship with lower negative consequences and CUD symptoms. These findings suggest that the PBSM is a multi-faceted construct that is best modeled by accounting for the categorical nature of its indicators. From a clinical perspective, the results highlight the unique utility of different strategy types. Whereas quantity-based strategies are essential for reducing overall consumption, context-based strategies may serve as a direct buffer against the development of harms regardless of level of use. Interventions targeting cannabis harm reduction should consider these divergent pathways to optimize outcomes for student populations.

Incentivized Potency Reduction and Genetic Polymorphism in Young Adult Users of High Potency Products

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Objective: The feasibility of using monetary incentives to reduce use of highly concentrated tetrahydrocannabinol products was assessed across five weeks using hybrid data-collection. Urinary THC was evaluated relative to self-reported use of retail products and genetic variation in CYP2C9*3 polymorphism. How sustained reduction in product potency impacted symptoms of depression was assessed, as was the valuation cannabis products in a Marijuana Purchase Task (MPT). Method: Participants included 21-25 year-old habitual users of high-potency (>85% THC) concentrates. Urinalysis-dependent monetary incentives were used to encourage a reduction in the percent-THC concentrations of their retail products. Weekly and remote assessments of THC consumption included self-report of use frequency and product photography. Blood

testing identified CYP2C9*3 polymorphisms. Self-reported measures of cannabis use disorder (8-item CUDIT) and depressive symptomology (Beck Depression Inventory, BDI) were used at study intake and conclusion. The MPT was used to assess preferences for high (80% THC) and lower-potency (45%) retail products at both timepoints. Results: 750 eligible participants were recruited by social media, 52 participants enrolled, and 49 (94%) completed the study. At study intake, urinary THC concentrations correlated with self-reported use and Cannabis Use Disorder severity. Twenty-nine percent of those enrolled were CYP2C9*3 intermediate metabolizers of THC. Variability in urine THC was greater for this group relative to the group of normal metabolizers, resulting in some creatinine-corrected samples > 10,000 ng/mL. Mixed linear modeling demonstrated a significant reduction in depressive symptoms across weeks ($F(1, 45.94) = 8.57$, $p < 0.01$). Experience with lower potency products throughout the study was also related to systematic changes in MPT preferences for both high (80% THC) and lower (45% THC) potency products. Conclusions: The protocol demonstrated high feasibility of the hybrid assessment of urinary THC in the context of incentivized product-THC concentration reduction. Median urinary THC concentrations in this group of non-treatment seeking young adults was high relative to what has been reported previously in the literature. The small number of participants in the study prevents conclusions from being drawn regarding the influence of the CYP2C9*3 polymorphism on cannabis use, or the influence of potency reduction on depressive symptoms, but the results warrant further investigation.

Prevalence of Past 12-Month Blunt Use Among Young Adults in the United States by Cannabis Policy Exposure, 2013 to 2023

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Background: Blunts are cigars with the tobacco filling replaced or mixed with cannabis. Three-quarters of young adults (YAs) in the United States (US) who use cigars in the past 30 days use them to create blunts. Blunts are disproportionately used by people who experience health inequities, primarily YAs identifying as Black or African American. A dearth of research has evaluated the impact of cannabis laws on blunt use, and no study has assessed differential policy impacts on people with the highest prevalence of blunt use. This study's objective was to measure YA blunt use over time and in relationship to state cannabis laws, including whether this relationship differed by race. Methods: This study estimated the weighted annual prevalence of past 12-month blunt use from Waves 1 (2013/2014) to 7.5 (2023) of the Population Assessment of Tobacco and Health (PATH) Study. We also estimated changes in prevalence over time and differences in prevalence by state cannabis policy exposure (no policy, medical use only [MUO], adult and medical use [AMU]) using an unweighted generalized estimating equations (GEE) model, controlling for gender, education, income, and policy coverage of cigar flavor bans. GEE models included an interaction term for race (Black/African American vs. other). Results: Prevalence of past 12-month blunt use among US YAs ranged from 13.0% in Wave 1 to 15.0% in Wave 7.5, with a peak of 19.0% in Wave 5. GEE models revealed that on average, past

12-month blunt use was fairly stable over time, as the odds of blunt use increased by 1% (95% CI: 0-2%) for each additional survey wave. YAs living in states with MUO laws (OR: 1.19; 95% CI: 1.13-1.27) and AMU laws (OR: 1.32; 95% CI: 1.23-1.42) had higher odds of blunt use compared with those living in states with no laws. Black/African American YAs had 2.07 times the odds (95% CI: 1.91-2.25) of blunt use compared with non-Black/African American YAs. A significant interaction between cannabis policy exposure and race showed that average blunt use prevalence was significantly higher in states with cannabis laws (MUO: 13.8%, AMU: 15.0%) compared with states with no law (11.8%) for YAs not identifying as Black/African American, while there were no significant differences across states for Black/African American YAs (no policy: 21.6%, MUO: 23.1%, AMU: 23.1%). Blunt use prevalence was also higher among females, people with <high school education or who had some college education, people who made <$25,000 per year, and people living in states with lower coverage of a ban on the sale of flavored cigars. Conclusions: Over the past decade, at its peak prevalence, nearly one-fifth of US YAs used blunts in the past 12 months. While this varied by wave, prevalence of blunt use was highest in states with cannabis laws for non-Black/African American YAs but was high across all states for Black/African American YAs. Research to understand policy impacts and inform policy actions or other interventions is needed to reduce blunt use inequities.

Evaluating the Accuracy of Cannabis Quantity Estimations

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Introduction: Recent calls to estimate cannabis consumption in milligrams of THC requires cannabis consumers to estimate the quantities of cannabis they consumed. Common units to measure quantity include number of grams or hits of product. Prior studies have demonstrated that consumers tend to overestimate the number of grams of flower and concentrate, regardless of whether they were given a visual aid or not. However, it is unknown whether consumers can accurately estimate the number of hits they consumed. In this study, we provide preliminary data from an ongoing study evaluating the accuracy with which consumers estimate the number of grams and hits of cannabis flower they consumed. Methods: Participants (N=18; mean age=23.8 (4.0), 78% White, 56% cisman) were recruited from an undergraduate research pool at Colorado State University. Participants completed a virtual study appointment in which researchers observed participants consume cannabis in a naturalistic setting. During the visit, participants were first asked to load their cannabis device (e.g., pipe, bowl, joint, etc.) with their desired quantity of cannabis flower and estimate the number of grams of product they loaded. One third (n = 6) of the participants were provided with a visual aid depicting different cannabis weights to help estimate the number of grams. Participants were also asked to estimate the number of hits to finish the amount of flower they loaded. Participants weighed the empty and loaded device on a provided scale to determine the actual number of grams loaded. Participants were then instructed to smoke the product how they normally would while the researcher counted the number of hits the participant consumed. Participants were then asked to estimate the number of hits they consumed during the study visit at two timepoints, 10 minutes after smoking and 24 hours after smoking. To evaluate accuracy,

we compared each estimate of the number of grams/hits at each timepoint to the actual number of grams/hits using paired t-tests. To determine if the visual aid impacted accuracy, we compared the difference in actual and estimated number of grams between the visual aid groups using an independent t-test. Results: On average, participants overestimated the number of grams of flower loaded compared to the actual number loaded ($t(17) = 4.6$, $p < 0.001$). There was no difference in grams accuracy between visual aid groups ($t(8) = -0.08$, $p = 0.93$). There was no significant difference between the actual number of hits taken and the estimate of the number of hits at the pre-smoking, 10-minute, and 24-hour timepoints, respectively ($t(17) = 1.5$, $p = 0.14$; $t(17) = -0.75$, $p = 0.45$; $t(17) = -1.6$, $p = 1.22$). Discussion: These preliminary results follow previous research and suggest estimating quantity in number of grams may lead to inaccurate estimations, with no improvement from visual aids. Additionally, these preliminary results suggest that measuring cannabis consumption in number of hits warrants further investigation, as it could facilitate more accurate quantity estimations. Further investigation is needed into the accuracy of cannabis quantity estimations.

Comprehensive Evaluation of Cannabis Use Patterns among College Students

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As the landscape of cannabis legalization and product availability continues to shift, traditional measures of 'frequency of use' may fail to capture the nuance required to predict cannabis-associated harms. Modern consumption patterns involve a diverse array of administration modes-including flower, concentrates, dabs, and edibles-each with varying potencies and typical ages of onset. As part of three multi-site studies of college students (N = 1,200; N = 1,308; N = 607), we administered a comprehensive battery of cannabis use items developed by the Measurement Group of the Addictions Research Team to further extend the cannabis use patterns captured by the Daily Sessions, Frequency, Age of Onset, and Quantity of Cannabis Use Inventory (DFAQ-CU, Cuttler & Spradlin, 2017). First, we provide detailed information regarding the forms of cannabis used, frequency, quantity, intoxication, and potency for each product type. Second, we examine how each of these domains of cannabis use relate to cannabis-related outcomes (i.e., negative cannabis-related consequences, cannabis use disorder symptoms) at the bivariate and multivariate level. Third, we use machine learning methods (e.g., elastic net regression, random forest, decision trees) to identify the most salient predictors of cannabis-related outcomes. Across a range of machine learning models, we found that a simple past 30 day cannabis frequency measure is the strongest predictors of negative cannabis-related consequences and cannabis use disorder symptoms followed by several more specific frequency indicators (e.g., past week frequency of flower use). Hierarchical regressions suggest that estimates of quantity, intoxication, and potency predict negligible variance in cannabis-related outcomes, perhaps due to the high levels of inaccuracy in these self-report measures. We discuss implications of our findings on improving cannabis-related measurement for the purpose of understanding and mitigating cannabis-related harms.

Cannabis Protective Behavioral Strategies as a Proximal Mediator of the Relationship Between Psychosocial Risk Factors and Cannabis-Related Outcomes

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Cannabis use remains a significant public health concern among young adults due to its association with various adverse outcomes. Cannabis protective behavioral strategies (PBS) are individual-level harm reduction techniques shown to mitigate cannabis-related harms including negative cannabis-related consequences and symptoms of cannabis use disorder (CUD). Several risk/protective factors for cannabis-related harms have been identified including cannabis use motives, indicators of mental health, cannabis user identity, and other psychosocial factors. Cannabis PBS is a plausible proximal mechanism that can fully or partially account for the relationships between these factors and cannabis-related outcomes. Using three large, independent samples of college student cannabis users (n= 1,200; n=1,308; n = 607), we conducted mediation analyses using the PROCESS macro for SPSS (Model 4) to evaluate the indirect effects of these predictors on cannabis-related consequences. Outcomes included past 30 day cannabis use frequency, Marijuana Consequences Questionnaire (MACQ), and the Cannabis Use Disorder Identification Test (CUDIT-R). PBSM significantly mediated the relationship between nearly all predictors and cannabis-related outcomes including cannabis use motives (except for conformity motives), a wide range of mental health variables, harm reduction self-efficacy, sleep quality, and stress. These findings suggest that while PBSM is a robust mediator for most psychosocial risk factors, its protective utility may vary depending on the specific nature of the user's motivation or environmental stressors.

Path Analysis of Alcohol, Cannabis, and Simultaneous Co-Use Frequency on Positive and Negative Consequence Severity

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Simultaneous alcohol and cannabis co-use has been linked to elevated substance-related harms, but less is known about how individual and co-use frequency relate to negative and positive consequences specific to each mode. Prior research suggests co-use may amplify consequences; however, positive consequences remain understudied, and most work has focused on occurrence rather than severity. The present study regressed severity ratings of positive and negative consequences onto simultaneous co-use, alcohol-only, and cannabis-only use frequency using path analysis. Participants were 408 undergraduate students recruited from a psychology research pool who reported on their alcohol, cannabis, and/or simultaneous co-use frequency, as well as write-in positive/negative outcomes and corresponding severity. Structural equation modeling was conducted and standardized estimates reported. Co-use frequency was specified as a predictor of six consequence

severity domains: co-use negative and positive, cannabis negative and positive, and alcohol negative and positive. Cannabis use frequency was included as a predictor of cannabis consequence severity, and alcohol use frequency as a predictor of alcohol consequence severity. Covariances were specified among all exogenous variables and among outcomes. The model demonstrated good overall fit to the data, $\chi^2(8) = 13.70$, $p = .090$, RMSEA = .042 (90% CI [.000, .078]), CFI = .986, TLI = .943, and SRMR = .035. Co-use frequency was significantly associated with greater negative consequence severity across domains. Specifically, higher co-use frequency predicted greater co-use ($\beta = .158$, $p = .009$), cannabis ($\beta = .157$, $p = .006$), and alcohol ($\beta = .148$, $p = .001$) negative consequence severity. Co-use was also significantly associated with co-use positive consequence severity ($\beta = .159$, $p = .005$). In contrast, co-use frequency was not significantly associated with cannabis ($\beta = .023$, $p = .604$), or alcohol ($\beta = -.015$, $p = .784$) positive consequence severity. For single substance frequencies, cannabis only was strongly associated with cannabis positive consequence severity ($\beta = .373$, $p < .001$) but not negative consequence severity ($\beta = .025$, $p = .624$), while alcohol only was associated with both alcohol negative ($\beta = .250$, $p < .001$) and positive ($\beta = .224$, $p < .001$) consequence severity. Co-use frequency was moderately correlated with both cannabis use frequency ($r = .498$, $p < .001$) and alcohol use frequency ($r = .415$, $p < .001$). All consequence domains were significantly positively intercorrelated. Findings indicate that co-use frequency is a robust predictor of negative consequence severity across alcohol, cannabis, and combined use, even when accounting for substance-specific use frequency. In contrast, co-use frequency does not predict positive consequence severity reported for individual substances. These results support models suggesting that co-use frequency uniquely contributes to risk, highlighting it as an important target for intervention. Further, results suggest that cannabis only use frequency does not significantly predict the experience of negative cannabis consequence severity when controlling for the effects of simultaneous co-use, which does not hold true for alcohol. These results support previous work identifying cannabis as a harm-reducing alternative to other drugs when individuals are unable or unwilling to discontinue their use.

Day-Level Associations Between Cannabis Use and Sleep During Pregnancy

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Cannabis is among the most common and increasingly used substances during pregnancy in the United States. Qualitative studies suggest pregnant individuals use cannabis to manage pregnancy-related symptoms such as nausea, negative mood, anxiety or depression, pain, stress, and problems with sleep. Sleep disturbances, in particular, are prevalent among ~50% of pregnant individuals, with sleep quality declining throughout

pregnancy. Importantly, studies in non-clinical, non-pregnant samples have demonstrated that poorer sleep quality and shorter sleep duration are associated with increased cannabis use. To date, no studies have examined whether poor sleep in pregnancy increases the risk of cannabis use, despite sleep being commonly disrupted among pregnant individuals. Therefore, understanding the relationship between cannabis use and sleep during pregnancy is necessary to elucidate whether cannabis use may increase distal risks for adverse maternal and fetal outcomes associated with poor sleep during pregnancy and inform the corresponding clinical guidelines. The present study aimed to investigate whether: (1) subjective sleep quality predicts next day cannabis use (CU), (2a) whether subjective sleep quality is associated with next day morning reports of intentions to use cannabis that day, and (2b) whether morning reports of intentions to use cannabis that day mediate the relationship between the previous evening's subjective sleep quality and that day's CU. This study draws on pilot data from a longitudinal multimethod study combining laboratory assessment and ecological momentary assessment (EMA)-from pregnant individuals (N=20) who use cannabis at least twice weekly over the past 60 days. The EMA protocol included morning assessments, which allowed for evaluation of previous day cannabis use, time to first cannabis use, sleep quality, and day-level intentions for use. While participants described their subjective sleep on average as 'fair' in morning reports (scale range: 1-5; M = 3.17, SD = 0.95), their scores on the Pittsburgh Sleep Quality Index (PSQI) at baseline indicated that all participants demonstrated poor sleep quality over the past month (cutoff:> 5; M = 10.95, SD = 2.56). Results from multilevel mixed effects models indicated no significant association between prior-night subjective sleep quality and next day cannabis use (incidence rate ratio [IRR] = 1.17, 95% confidence interval [CI] [0.77-1.80]). Additionally, there were no significant associations between prior-night subjective sleep quality and morning intentions to use cannabis (IRR = 1.02, 95% CI [0.66-1.59]). Finally, there was no evidence of mediation via morning cannabis use intentions between prior-night subjective sleep quality and subsequent cannabis use (average causal mediation effect (ACME) = 0.04, 95% CI [-1.21, 1.54]). Overall,

day-to-day subjective sleep quality may not play a central role in shaping either intentions to use cannabis or actual cannabis use the following day in those that regularly use cannabis in pregnancy. Larger, more well-powered studies are needed to clarify the factors that contribute to cannabis use in pregnancy, and the potential association between sleep and CU.

Association Between Legal Access to Cannabis and Rates of Suicide Mortality Among Adults in the United States from 2012 to 2023

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Objective: Cannabis use legalization has been related to higher suicide rates among adolescents and increased self-harm among adult males, but less is known about whether legal access to cannabis dispensaries is associated with suicide mortality. Using 12 years of state-level mortality data, we examined associations between legalized medical cannabis dispensaries (MCD), legalized recreational cannabis dispensaries (RCD), and adult suicide death mortality rates in the United States from 2012 to 2025. Method: We used annual state-level age-adjusted adult suicide mortality rates across 47 states from the National Center for Health Statistics Mortality Data during 2012–2025, and linked these to state-year dispensary policy status. We applied a staggered difference-in-differences (DiD) framework to estimate the average treatment effects on the treated (ATTs) of MCD and RCD access, conditioning on state-level demographic and socioeconomic covariates measured in the pre-treatment period. Group-level ATTs were estimated for each treated year and then aggregated into an overall ATT and into ATTs by length of exposure. Results: States with legal MCD access had 2.98 (95% CI: −5.60, −0.37) fewer suicide deaths per 100,000 adults than states with no legal access to any cannabis dispensary; this reduction was statistically significant after five years of MCD access. By contrast, RCD access was not significantly associated with suicide mortality, whether compared to states without RCD access (overall ATT = −0.19; 95% CI: −0.55, 0.92) or to states with MCD access (overall ATT = 0.49; 95% CI: −0.32, 1.31). RCD states did show 1.78 (95% CI: −3.10, −0.46) fewer suicide deaths than states with no dispensary access, but this difference likely reflects the effect of co-occurring MCD access rather than an

independent effect of RCD. Conclusion: Legal access to medical cannabis dispensaries may be associated with reduced suicide rates among adults in the US, whereas legal access to recreational dispensaries was not. Further research should identify which adult subpopulations are most affected and clarify psychosocial mechanisms involved, to better inform cannabis regulation and suicide prevention policy.

Characteristics of Cannabis Warnings in the United States: A Content Analysis

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Background: Cannabis warnings can inform people about cannabis use risks; however, states have different cannabis packaging and labeling standards. The goal of this study was to describe characteristics of US cannabis warnings. Methods: From September 2024 to February 2025, we compiled regulations related to cannabis warnings on product packages in states with legalized cannabis sales (medical and adult-use), verifying regulations with regulators from each state. Two coders independently coded warning regulations for different characteristics. Results: We identified 60 cannabis programs across the US with legalized cannabis sales. Of these 60 programs, 56 (93%) required cannabis warnings. Of the programs requiring warnings, 56% included warning content about a specific health risk, most often addiction (41%) and intoxication (34%). Few programs had warnings about cannabis' effects on mental health (16%), respiratory health (5%), or cardiovascular health (4%). Most states required some formatting for warnings (70%), including a minimum size requirement (61%), but font sizes could be as small as 6-point font. Few programs required warnings to contrast with backgrounds (23%), rotating warnings (7%), or front-of-package warnings (4%). The mean number of words for warnings was 57 (SD: 30), and the mean reading level was 9th grade. Conclusions: Although 93% of cannabis programs with legalized sales require warnings, fewer use best practices for warning labels-only half mention specific health risks; few require rotating or front-of-package warnings; and warnings may be difficult to read and understand. Further research is vital to strengthen cannabis warning labels.

Exposure to Information About Cannabis Health Risks Among Adults in the United States

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Background: While cannabis can confer medicinal and therapeutic benefits for some conditions, it is also associated with health risks. Limited research has examined whether exposure to cannabis health risk information is associated with risk perceptions and knowledge of cannabis risks. Methods: We conducted an online survey with a convenience sample of N=609 US adults (ages 18+) recruited in November 2023. We used adjusted logistic and linear regression models to examine the effects of exposure to cannabis health risk information via messages and warnings. Outcomes included risk perceptions of monthly, weekly, and daily/near-daily cannabis use and knowledge of cannabis health risks (with respondents answering questions on 10 negative health effects of cannabis plus one "decoy" health effect). Results: In our sample of US adults, 30.4% of participants reported past 30-day cannabis use, and exposure to cannabis health risk information was low (27.4% for messages, 17.4% for warnings, and 20.4% for healthcare providers). In terms of risk perceptions and knowledge, 61.6% of participants believed daily cannabis use was high risk, and on average, participants reported knowing about 2.8 health risks associated with cannabis use (range: 0-10). Overall, exposure to cannabis risk messages was significantly associated with higher risk perceptions (aORs ranging from 1.84 to 3.10, ps<.05) and knowledge (B=1.06, p<.05), including among past 30-day cannabis users. However, exposure to warnings was less consistently associated with cannabis risk perceptions and knowledge, especially among past 30-day cannabis users. Conclusions: Exposure to cannabis risk messages was associated with higher risk perceptions and knowledge of cannabis risks among US adults, but less consistent impacts were seen for cannabis warnings. These findings underscore the potential of cannabis risk messages to convey information to cannabis users, as well as the importance of research on strengthening cannabis warnings for consumers in the US.

Healthcare Distrust and Cannabis and Alcohol Use by Age Cohorts: Evidence from HINTS

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Background: Research indicates that lower trust in the healthcare system is associated with greater use of complementary and alternative medicine (CAM) and greater skepticism towards the use of prescription drugs. Cannabis is often viewed as safe because it is 'natural,' and it is used both medically for symptom management and recreationally. However, there is little data on cannabis use and trust in the healthcare system. This study examines trust in the healthcare system by age cohort and its association with cannabis and alcohol use among a sample of U.S. adults. Methods: Self-reported, nationally representative data from the Health Information National Trends Survey 2024 cycle (HINTS 7) were used (n=7,278). Multivariable regression analyses separately examined associations between trust in the healthcare system and cannabis and alcohol use. Trust was measured with a single question asking, 'How much do you trust the healthcare system (for example, hospitals, pharmacies, and other organizations involved in healthcare)?' measured on a 4-point scale from 'Not at all' to 'A lot.' To examine the impact of trust in the healthcare system by age cohort (young adults: 18-34, middle-aged: 35-49, and older adults: 50+ years), an interaction term was tested in the final models. All analyses were conducted with jackknife estimation using sampling weights to provide population-representative estimates for both descriptive

and inferential statistics. Results: There were age cohort-dependent increases in the prevalence of 'a lot' of trust in the healthcare system: 28.1% for young adults, 30.5% for middle-aged, and 39.4% for older adults; with corresponding decreases in 'not at all' trust (6.8%, 4.1%, and 2.5%, respectively). One-quarter (23.3.%) of adults had used cannabis in the past year. Past year cannabis use was highest among young adults (31.3%), followed by middle-aged (25.9%) and older adults (17.9%). Alcohol use ranged from 2.4 to 3.1 drinks per week among young adults and older adults, respectively. In adjusted models, relative to 'a lot' of trust, participants with no trust, a little, and some trust in the healthcare system had greater odds of past year cannabis use (respectively: AOR = 4.74, 95% CI = 1.84, 12.23; AOR = 2.00, 95% CI = 1.03, 3.89; AOR = 2.43, 95% CI = 1.30, 4.57)). The interaction between healthcare trust and age cohort was significant (F=2.71, p=.025), indicating that the association between no trust and cannabis use was strongest for young adults. In contrast, trust was not associated with alcohol consumption, and the interaction between healthcare trust and age cohort for alcohol consumption was not significant (F=1.45, p=.218). Conclusions: Findings indicate that trust in healthcare institutions may be an important risk factor to consider when assessing cannabis use, especially among young adults. As these results are cross-sectional in nature, it may also be the case that cannabis use may be a sign of mistrust with the healthcare system. Findings for cannabis use and trust were in contrast to the relationship between alcohol use and trust, indicating that adult consumers may contextualize cannabis differently than other substances, specifically alcohol.

Exploring Cannabis Problem Severity as a Moderator of Cannabinoid Potency on Perceived Health Effects and Likelihood to Use

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Cannabinoid potency (i.e., THC and CBD) influences how people perceive information about cannabis products. Cannabis use problem severity also impacts perceptions of cannabis products. The purpose of this exploratory analysis was to determine whether cannabis use problem severity moderates the relationship between product potency and perceptions of health harm, benefits, and likelihood to use cannabis products. Using an online within-subjects experimental design, participants (N = 431, mean age = 38.2 years, 41.8% female, 68.9% White/Caucasian) who used cannabis flower in the past three months viewed three images of cannabis packages with different potency combinations in random order: THC-dominant (24% THC, 0.1% CBD), equal THC:CBD (9% THC, 10% CBD), and CBD-dominant (1% THC, 23% CBD). For each product, participants reported health harm and benefit perceptions and likelihood to use. Participants also completed a self-report assessment battery, including the Self-Reported Symptoms of Cannabis Use Disorder (SRSCUD) measure. Previously reported findings showed relative to equal THC:CBD and CBD-dominant, THC-dominant products were rated higher for perceived harms (ps < .001, ds = 0.20-0.40) and likelihood to use (ps < .001, ds = 0.28-0.68), but lower for perceived benefits (ps < .02, ds = 0.10-0.20). Exploratory moderation was tested across three multilevel models on each outcome. Potency condition and SRSCUD score were entered as simultaneous predictors along with interaction effects.

THC-dominant was set as the referent group for potency. SRSCUD scores significantly predicted perceived harms (b = .029, se = .008, p < .001) and likelihood to use (b = .037, se = .012, p = .002) but not perceived benefits (b = .001, se = .010, p = .939). There were no significant interactions between potency and SRSCUD scores for harms and benefits (all ps > .05). However, SRSCUD scores moderated the effect of CBD-dominant vs. THC-dominant products on likelihood to use (b = -.028, se = .013, p = .035). The limited moderation results indicate effects of cannabinoid potency on health perceptions may be broadly shared among people who use cannabis, regardless of individual problem use severity. While reporting higher rates of likelihood to use, individuals at greater risk of cannabis problems may recognize their risk (as evidenced by the positive main effect of SRSCUD on perceived harm). Future work should explore interventions focused on education on the relative risks and benefits of different cannabinoid potencies. Understanding differences in how people respond to cannabinoid content labeling can inform evidence-based regulatory strategies and enhance the design of product labels and educational interventions, ensuring that risk communication effectively reaches the populations most at risk for harm.

Buffering Against Risk: Cannabis Protective Behavioral Strategies as a Moderator of the Relationship Between Psychosocial Risk Factors and Cannabis-Related Outcomes

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Cannabis use and its associated consequences remain a significant concern among college students in the United States. Cannabis protective behavioral strategies (PBS) are harm reduction techniques shown to reduce frequency, quantity, intoxication, and/or related harms. The present study investigated whether cannabis PBS serves as a buffer (moderator) between several established psychosocial risk factors and cannabis-related outcomes, including cannabis use frequency, negative cannabis-related consequences, and symptoms of cannabis use disorder (CUD). Data were analyzed from three large, independent multisite samples of college student cannabis users (N = 1,200; N = 1,308; N = 607). Moderation analyses were conducted using the PROCESS macro for SPSS (Model 1) to evaluate the interactive effects of PBSM and various risk factors (depression, anxiety, stress, etc.) on cannabis-related outcomes. Moderation analyses revealed that cannabis PBS significantly buffered the relationship between several mental health risks and cannabis-related outcomes. For example, when cannabis PBS use was low (-1 SD), indicators of poor mental health were robust predictors of higher negative cannabis-related consequences and CUD symptoms. However, these associations were significantly attenuated among individuals reporting high levels of cannabis PBS (+1 SD). Our findings suggest that cannabis PBS can function as a critical buffer, reducing the impact of psychological distress on cannabis-related harms. These results highlight the utility of incorporating cannabis PBS into harm reduction interventions for high-risk college students, particularly those experiencing co-occurring mental health challenges.

Co-Use of Commercial Tobacco and Cannabis in American Indian Young Adults

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Introduction: Commercial tobacco and cannabis use in American Indian populations is disproportionately high compared to non-American Indian groups, and a nuanced understanding of patterns, contexts, and motivations for co-use of these products is needed. Methods: American Indian young adults (N=52, ages 21-29) in California currently using commercial tobacco and cannabis participated in a community-engaged study where they completed in-depth interviews about their commercial tobacco and cannabis use between 2023-2024. Results: Participants co-used commercial tobacco and cannabis to tailor psychoactive effects (e.g., alertness from nicotine and relaxation from cannabis). Social factors influenced co-use patterns. Some participants reported using certain products like vapes or blunts to facilitate bonding in social settings. Products were commonly shared, and their use often involved taking multiple hits from the same device or product. Co-use routines also depended on participants' responsibilities for the day, including caregiving and working, or considerations for public environments. For some, mixing commercial tobacco and cannabis was a cost-saving strategy. Conclusions: Co-use is complex and contextual, often influenced by multiple factors, including psychoactive effects, social settings, and day-to-day responsibilities. Future interventions addressing co-use among American Indian individuals should address cravings and environmental and behavioral cues, social contexts, and promote alternative coping strategies.

Recall of Cannabis Advertising Messages and Warnings Among US Young Adults: An Experimental Study

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Introduction: Cannabis use, particularly via vapes and edibles, continues to rise. Most states require cannabis warning labels. However, limited research has assessed recall of these messages, which impacts knowledge, perceptions, and use behaviors. This study assessed recall of various cannabis warnings. Methods: We analyzed data collected in June-November 2024 among 3,581 US young adults ages 18-34 (~50% past-month cannabis use). Participants were randomized to 1 of 8 conditions for 2 experiments (edibles, vapes). A 2x4 design was used (2 advertising messages [psychological effects, flavors] and 4 warnings [none, adult-use, intoxication, edible-/vape-specific]). Warning recall was

categorized as: correct, don't know, incorrect. Logistic regressions examined warning and advertising message exposure in relation to recall, controlling for sociodemographics, state cannabis law, and past-month cannabis use. Results: Participants mostly had incorrect recalls (edible: 47.2%; vape: 49.5%) or didn't know the correct response (edible: 27.2%, vape: 31.8%). Compared to the 'no warning' condition, adult-use, intoxication, and edible-/vape-specific warnings had higher odds of 'don't know' or incorrect response (vs. correct). Excluding participants assigned to 'no warning', analyses showed that participants exposed to the edible/vape-specific warning (vs. adult-use) had higher odds of responding incorrectly (vs. correctly) for both experiments. Advertising message was not associated with recall. Other correlates of incorrect (vs. correct) recall included past-month cannabis use, being Asian (vs. White) and heterosexual (vs. sexual minority). Conclusions: Despite required warnings in states with legal cannabis, individuals may not accurately recall these messages. Future research should explore enhancements to warnings (e.g., pictorial) to increase recall and behavioral impact.

Retail Availability of THC and Mushroom Products Across Eleven Cities: Differences by State Laws

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Objective: Retail sales of intoxicants, including derived intoxicating cannabis products (DICPs) such as delta-8 tetrahydrocannabinol (THC) and hallucinogenic mushrooms, have rapidly increased throughout the US, despite their sale being federally illegal. This study assessed DICP and hallucinogenic mushroom availability in US smoke shops with differing DICP and psilocybin laws. Methods: In May-October 2025, using Google's Incognito mode, we searched 'smoke shop in [city, state]' across eleven cities in states (California, Colorado, Florida, Maryland, New York, Nevada, Oregon, Pennsylvania, Texas, Virginia, Washington) with differing legal contexts for THC and mushrooms (7 explicitly prohibited DICP sales, 2 decriminalized psilocybin, Amanita was not explicitly illegal in any). We called each store (n=1,023) to assess product availability. Bivariate tests assessed differences by state laws. Results: 73.0% (n=747/1,023) answered the phone and responded about DICP availability: 51.4% (n=384/747) reported selling DICPs (39.6% DICPs illegal vs. 80% not explicitly illegal, $p<.05$; range: 2.0% in New York City to 93.8% in Jacksonville, FL). Overall, 70.2% (n=718/1,023) answered questions about mushroom availability: 59.7% (n=414/718) sold mushrooms (56.6% decriminalized psilocybin vs. 57.9% illegal psilocybin, $p=.786$; range: 0% in New York City to 84.0% in Las Vegas, NV). Among those selling mushrooms, 54.1% specified they sold Amanita mushrooms, 28.5% did not

know mushroom type, and 17.4% said 'something else'. Conclusions: DICPs were sold widely, including in states where they were expressly illegal (~40%). One-third of retailers were unable to identify mushroom type sold. Collectively, findings suggest the need for greater retail surveillance, education, and enforcement.

THC Beverages Sold by Online Alcohol Retailers

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Background: Sales of intoxicating tetrahydrocannabinol (THC) beverages has expanded rapidly in the United States, despite FDA guidance indicating they are being sold unlawfully. Prominent alcohol brands, manufacturers, and retailers have entered this market. To inform regulatory and enforcement efforts to reduce use and associated harms, a clearer understanding of this market in needed. Methods: From October-December 2025, data were collected regarding THC beverages from 8 US-based online alcohol retailers (2 state-run liquor store systems located in alcohol control states, 5 regional retail chains in non-control states, and 1 national retail chain). Searches were conducted using an incognito browser and the terms 'delta', 'thc', 'tetrahydrocannabinol', 'cbd', and 'hemp'. A PhD-level researcher coded product characteristics including brand, THC content, package size, container size, price, and presence of other cannabinoids or functional ingredients. Descriptive analyses summarized unique products and brands, THC content, and price. Results: Neither of the state-owned and operated liquor store chains sold THC beverages. The remaining six sold THC beverages in cans (n=6 retailers), as 'spirits' (n=2 retailers), and 'shots' (n=3 retailers). Across retailers, there were 323 unique canned THC beverage products across 142 brands. Cans contained an average of 7.4 mg of THC (range: 1.5mg to 20mg) and had an average price of $21.36 per package (range: $4.99 to $54.99). There were 34 unique THC spirit products across 14 brands;. most did not specify the THC content. The average price of THC spirits was $29.03 (range: $1.50 to $64.99). There were 17 products sold as 'shots' across 10 brands, each containing an average of 8.1mg of THC (range: 2mg to 10mg). The 'shots' cost an average of $4.90 (range: $2.99 to $7.49). Across all products, >30% contained non-intoxicating cannabinoids (CBD, CBG, CBN, CBC), and a few contained non-THC substances that are often marketed for functional effects (caffeine, L-theanine, lion's mane, electrolytes, Reishi, blue lotus, cordyceps, maca, rhodiola, chamomile, tryptophan, melatonin, and magnesium). Conclusions: The widespread online availability of THC beverages through alcohol retail channels is concerning given the federal illegality of marketing consumable products containing cannabinoids. Their accessibility through established alcohol retailers may facilitate normalization and market expansion. More consistent enforcement is needed to address the public health risks.

Sensation Seeking, Impulsivity, and Risky Sexual Behavior Among Inpatient Youth: The Moderating Role of Morning Cannabis Use

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Sensation seeking and impulsivity traits have been linked to engagement in risky sexual behaviors (RSB), which in turn increases the likelihood of adverse health outcomes such as sexually transmitted infections and unintended pregnancies. Cannabis use patterns may influence this relationship by reducing inhibitions and impairing judgement. This may be particularly relevant for youth receiving inpatient psychiatric treatment, who often demonstrate elevated impulsivity and greater engagement in risk-taking behaviors. The present study aimed to further understand the relation between sensation seeking facets, impulsivity facets, and engagement in RSB, as well as the moderating role of cannabis use patterns. Data were obtained from a larger cross-sectional study assessing engagement in health-risk behaviors among youth in an inpatient psychiatric setting in Colorado. Participants (N = 300; Mage = 15.9, SD = 1.3; age range = 13-24; 61.0% female; 82.1% White) completed the Sensation Seeking Personality Type Scale, UPPS-P Impulsive Behavior Scale Short Form, Marijuana Use Grid, and Risky Behavior Inventory - Sexual Behavior, as well as questions regarding preferred/most common method of cannabis consumption. Zero-inflated negative binomial regressions were conducted. First, sensation seeking and impulsivity subscales were included as predictors in logistic and count models to identify the most robust predictors of engagement in RSB; Risk Seeking and Negative Urgency remained in the final logistic models, and Lack of Premeditation and Negative Urgency remained in the final count models. Interaction terms were then included to examine the moderating effect of morning cannabis use, preferred method (flower, concentrate, or edible), and years of use. The interaction between sensation seeking/impulsivity facets and preferred method and years of use were not significant. However, morning cannabis use moderated the relation between risk seeking and RSB (b = -1.36, SE = 0.67, OR = 0.26, p = .04). The main effects of risk seeking (b = 0.96, SE = 0.18, OR = 2.60, p < .001) and negative urgency (b = 0.49, SE = 0.17, OR = 1.63, p = .004) were significantly and positively associated with the odds of ever engaging in RSB. Probing the interaction revealed that higher risk seeking increased the odds of engaging in RSB among individuals who did not report morning cannabis use (b = 0.96, SE = 0.18, OR = 2.60, p < .001); however, this association was non-significant among morning cannabis users. These findings suggest that risk seeking may be a stronger predictor of RSB among individuals who do not engage in morning cannabis use. One possible explanation is that individuals high in risk seeking who do not use cannabis in the morning may be more willing to take risks in ways other than cannabis use, such as RSB engagement. The non-significant association among morning users may reflect a ceiling effect, as morning users may already engage in high levels of RSB.

Associations Between Past Year Psilocybin Use, Cannabis Use Frequency, and Cannabis Use Disorder Among College Students

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Among college students, cannabis is one of the most widely used substances, with up to 15% of adults ages 18-25 meeting criteria for cannabis use disorder (CUD) in the United States (SAMHSA, 2025). While rates of CUD have stabilized in the college-age population since 2021, the overall frequency of use has increased, which has associations with worse mental health outcomes (Baldwin et al., 2024; Sanz-Pérez et al., 2025). The use of psilocybin, the active compound in magic mushrooms, is also on the rise in the United States, with more states decriminalizing its use and increasing research into potential benefits in treatment for mood and addictive disorders (Rockhill et al., 2025). While psilocybin is found to have promising effects in substance use disorder treatment (Meshkat et al., 2025), other work shows a potential link between lifetime naturalistic psychedelic usage and greater CUD and cannabis dependence (Zech et al., 2025; Stenger et al., 2024). Despite rising trends in the use of both substances, not much is known about how recent (i.e., past year) naturalistic use of psilocybin specifically relates to cannabis use and CUD, especially among college students. In this cross-sectional study, we examined a sample of 1,809 college students ages 16-51 (Mage = 19.14, SDage = 2.16, 78% female) to assess associations between past-year psilocybin use, past 3-month cannabis use frequency, and CUD symptoms. Results found that 171 participants (9%) reported past-year psilocybin use, 856 (47%) reported using cannabis within the past 3 months, and 422 (23%) met criteria for CUD (i.e., at least 2 symptoms). Past-year psilocybin use was significantly correlated with cannabis use frequency ($r = .06$, $p = .01$) and CUD symptoms ($r = .41$, $p < .01$). Among those who met criteria for CUD, past-year psilocybin use was significantly correlated with greater CUD severity ($r = .23$, $p < .01$). Overall, we found that past-year psilocybin use was associated with more frequent cannabis use, and more strongly associated with CUD symptoms and CUD severity in college students. These results establish a connection between past-year psilocybin use and greater CUD symptoms in college students and reflect recent findings in broader adult populations with lifetime psilocybin use (e.g., Zech et al., 2025). While these relationships do not support directional or causal claims, they do suggest that those with more CUD symptoms are more likely to have used psilocybin in the past year and vice versa. A possible reason for this association may be that cannabis and psilocybin use tend to occur in similar settings and contexts, with up to 40% of psilocybin usage being co-administered with cannabis (Rocky Mountain Poison & Drug Safety, 2025). Future research is needed to examine longitudinal and directional aspects of the relationship between psilocybin and cannabis and whether this relationship differs in controlled therapeutic settings.

Cannabis Use Among US Young Adult Cancer Survivors: Impacts of Legal Context, Information Sources, and Interactions With Healthcare Providers

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Background. Although most healthcare providers recognize medical cannabis (MC)

as a legitimate treatment option for certain symptoms/conditions, healthcare providers face several barriers to discussing or prescribing MC, such as federal illegality; legal liability; lack of training/knowledge, evidence, and endorsed clinical guidelines; and concerns about addiction or other adverse consequences. Therefore, many individuals medically use cannabis guided by their own judgment or dispensary personnel, rather than healthcare provider recommendation. This is particularly relevant to cancer survivors, as they may use MC for several symptoms related to cancer and its treatment. This qualitative study assessed MC use and related factors among young adult cancer survivors (ages 18-39). Methods. In April-June 2025, we conducted qualitative interviews with 23 young adult survivors reporting past-month cannabis use (Mage=33.65 [SD=5.99], 73.9% female, 73.9% White, M=1.22 [SD=1.09] years post-treatment). Topics included: implications of cannabis legalization, MC information sources, healthcare provider interactions, symptoms/conditions managed with MC, and current and future cannabis use. Data were analyzed using deductive-inductive thematic analysis. Results. During treatment, 56.5% lived in states with MC-only legal and 34.8% fully legal cannabis; at time of interview, 21.7% lived in states with MC-only legal and 73.9% fully legal. Themes included: 1) the importance of legal context in facilitating or impeding MC access/use; 2) reliance on dispensaries, social networks, and personal research/experimentation for MC information; 3) varied experiences with healthcare providers (i.e., little communication about MC, provider hesitancy due to insufficient evidence or concerns about patient self-management, providers supporting MC use, contradictory information from providers); 4) need for voice in healthcare decisions; 5) concerns about use-related stigma; 6) conditions/symptoms managed with MC and effectiveness; 7) hopes that future healthcare better incorporates MC; 8) concerns/cautions about MC use vs. other alternatives; and 9) current and future cannabis use behaviors (e.g., ongoing, minimal/decreased). Conclusions. Findings highlight MC's perceived utility in managing symptoms among young adult cancer survivors, alongside fragmented policies and systems that impede evidence-based information or healthcare provider input and may ultimately hinder optimal health outcomes. These results have implications for research and practice. First, future research is needed to advance the evidence regarding MC benefits or consequences via clinical trials. This is crucial to address patient-provider communication gaps, which pose several concerns (e.g., potential contraindications for cannabis use or drug interactions). Second, given the limitations of this study, there is a need for additional research on this topic, using larger, more diverse samples, varied methodological approaches (e.g., quantitative, mixed methods, experimental designs), and assessments of use motives (i.e., medical, nonmedical) and patterns over time (pre- to post-treatment) and socio-structural supports (e.g., healthcare providers).

Distinguishing Medical from Nonmedical Cannabis Use Among US Young Adult Cancer Survivors

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Background. With increases in cannabis use among young adults (YAs), access to medical and nonmedical cannabis nationally, and interest in utilizing cannabis to offset cancer side effects among the medical community, it is important to understand YA cancer survivors' motives (i.e., medical, nonmedical) for using cannabis and their experiences with cannabis use. Notably, despite some potential adverse consequences of cannabis use among YAs (e.g., occupational, academic, and financial challenges; addiction), a significant proportion of YA cancer survivors report using cannabis, often to manage pain, nausea, insomnia, and mental health symptoms (e.g., anxiety, depressive symptoms). However, most YA cancer survivors do not discuss their cannabis use with their healthcare providers. This literature must be advanced to inform approaches to assessing, monitoring, and intervening on cannabis use among YA cancer survivors. Thus, this qualitative study assessed YA cancer survivors' experiences with medical and nonmedical cannabis use and how they distinguish their medical vs. nonmedical use. Methods. In April-June 2025, we conducted qualitative interviews with 23 YA survivors (ages 18-39) reporting past-month cannabis use (Mage=33.65 [SD=5.99], 73.9% female, 73.9% White, M=1.22 [SD=1.09] years post-treatment). Data regarding experiences with and distinctions between medical vs. nonmedical use were analyzed using deductive-inductive thematic analysis. Results. The majority first used nonmedically (60.9%) and currently used both medically and nonmedically (56.4%). Some participants felt the distinction was clear (i.e., medical use addresses specific symptoms), with several likening nonmedical use to how people generally use alcohol (e.g., to relax, socialize). Some distinguished medical vs. nonmedical use based on context (e.g., daytime for nonmedical vs. bedtime for medical) or product used (e.g., sativa for nonmedical, indica for medical). Some believed people had overly-restricted definitions of medical use (e.g., for those in chemotherapy or hospice), which disregards other medical uses (e.g., for pain, anxiety, insomnia). The majority said the medical vs. nonmedical distinction was unclear, particularly regarding use for anxiety. Several underscored that using cannabis to treat symptoms (e.g., pain, nausea, anxiety) provided both symptom relief that enabled enjoyable activities and the recreational 'high'. Conclusions. A large proportion of YA survivors first used cannabis for nonmedical purposes, currently used for both medical and nonmedical purposes, and had difficulty discerning their medical vs. nonmedical use, particularly when it pertained to medically using to treat mental health symptoms such as anxiety or because their medical use also provided some nonmedical effects or benefits. Notably, given that using for both medical and nonmedical purposes may pose particular risks (e.g., problematic use) and that many YA cancer survivors do not discuss their cannabis use with healthcare providers, current findings underscore the need to better understand YA cancer survivors' cannabis use patterns in order to inform approaches to improve healthcare provided oversight and supports for YA cancer survivors to help manage their symptoms and monitor their use and related consequences.

Social Support and Coping Self-Efficacy Among Women Intimate Partner Violence Survivors Engaging in Cannabis and Alcohol Co-Use

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Intimate partner violence (IPV) increases the risk of mental and physical health difficulties including co-occurring posttraumatic stress disorder (PTSD) and substance use disorder (SUD; Goodrum et al., 2022). Following the development of co-occurring PTSD and SUD, women IPV survivors experience greater symptom severity and functional impairment, poorer physical health, and increased suicide risk than women experiencing either disorder alone (Sullivan et al., 2016), highlighting the importance of understanding the factors that may mitigate this risk. Perceived social support (i.e., one's belief regarding the accessibility of help and care) and trauma coping self-efficacy (i.e., one's belief in their capacity to manage trauma-related challenges; CSE-T) are two mechanisms that may improve mental health following IPV through improved help-seeking approaches and adaptive use of coping strategies (Sapkota et al., 2022). However, research has yet to examine the complexity of how cannabis and/or alcohol use may demonstrate differential associations with CSE-T and social support specifically among women survivors of IPV. The current study examined the roles of cannabis and/or alcohol use with CSE-T and perceived social support in a sample of 145 women IPV survivors (*M*age = 38.02, *SD*age = 11.99, 66.2% White) to hopefully inform interventions to support women's recovery processes following IPV. Two one-way ANOVAs were conducted to examine this research question. Participants from a larger study examining IPV and risky-behaviors were included in the sample if they reported lifetime cannabis use and/or past-year alcohol use. Among this subsample, 28.3% of women reported lifetime cannabis use alone (n = 41), 37.9% reported past-year alcohol use alone (n = 55) and 33.8% reported both lifetime cannabis and past-year alcohol use (n = 49). In the first model, the main effect of cannabis and/or alcohol use (i.e., lifetime cannabis-only, past-year alcohol-only, or cannabis and alcohol use) on perceived social support was significant $F(2, 141) = 5.00$, $p < .01$. LSD post hoc tests were also performed, finding that the cannabis use only group (M = 52.02, SD = 17.01) reported significantly lower perceived social support than the alcohol use only group (M = 62.49, SD = 13.27, $p < .01$) and alcohol and cannabis use group (M = 59.51, SD = 18.08, $p < .05$). In the second model, the main effect of cannabis and/or alcohol use on CSE-T was nearly significant, $F(2, 142) = 2.99$, $p = .053$. LSD post hoc tests indicated that the cannabis only group (M = 35.80, SD = 12.32) reported significantly lower CSE-T than the alcohol use only group (M = 40.85, SD = 9.17, $p < .01$) and alcohol and cannabis use group (M = 40.86, SD = 12.25, $p < .05$). Findings will be discussed, including clinical implications for screening procedures, assessment tools, and targeted intervention strategies for cannabis and alcohol use, especially within integrated trauma-focused treatment, to improve long-term psychosocial outcomes among women IPV survivors.

Longitudinal Edible Cannabinoid Use, Pain Disability, and Prescription Medication Use Among Individuals with Chronic Low Back Pain

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Introduction: Nearly two-thirds of people reporting medical cannabis use in the U.S. report chronic pain as their primary motivation. While some data suggest that cannabis is effective for improving pain, many questions remain. For instance, it is unknown what cannabinoid profile is most effective for pain management, what the efficacy of prolonged use is for pain, how cannabinoid use interacts with patterns of other medication use, and what dependency risks may exist for those initiating medically-motivated use. Thus, the primary aim of this study is to evaluate the effects of naturalistic use of edible cannabinoid products among participants with chronic low back pain on pain-related disability, symptoms of cannabis use disorder (CUD), and other medication use over a 6-month period. Method: This data is part of a larger study that recruited participants with chronic low back pain (at least 12 weeks) who intended to use cannabis products for pain relief. For these analyses, a total of 174 participants (58% male (M=47.2 years, SD=15.7), initiated use of a self-selected edible cannabis product that was categorized as CBD (n=72), THC+CBD (n=79), or THC (n=23). We first evaluated whether participants continued using their initial cannabis product of choice and whether they began using other cannabinoid products (i.e., flower, concentrates) over the 6-month period. The primary outcome was the Roland-Morris Disability Questionnaire for assessing physical disability caused by low back pain. CUD was assessed using the DSM-5 modified Marijuana Dependence Scale and we also captured frequency and quantity of other prescription pain medications, all of which were self-report questionnaires. T-tests and linear regression models, controlling for age, gender, education, and cannabis pain-relief expectancies were used to examine differential effects on the specified outcomes between baseline and month 1 and months 1 to 6 after initiating use. Results: Both the use of participants' initially selected cannabinoid product and use of other cannabinoid products declined from study initiation to month 1 (44.8% and 62.1%, respectively) and further at month 6 (19.5% and 38.5%, respectively). There was significant reductions in pain disability ratings from baseline to month 1 ($p<.001$) and between months 1 and 6 for the entire sample ($p<.001$) as well as a significant decrease in use of prescription pain medication from baseline to month 1 ($p<.001$) and between months 1 and 6 ($p=.024$). Notably, there were no significant changes in CUD scores when comparing month 1 to month 6 timepoints ($p>.05$). Finally, there were no significant differences across cannabis product groups for any outcome from baseline to month 1 and between months 1 and 6 ($p>.05$). Conclusions: Our results show that participants with chronic low back pain reduced their cannabinoid use overtime but also experienced a reduction in pain disability and took fewer other medications by month 6. Further, findings suggest that prolonged use of cannabinoid products may be associated with relief from chronic pain symptoms long-term without posing a significant risk for cannabis use disorder. Finally, our results are unique and present novel findings on longitudinal edible cannabis product use for individuals with chronic low back pain.

Cannabis Involvement and Suicidal Ideation: Examining the Utility of the Integrated Motivational-Volitional Model of Suicide

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Background: Cannabis use has been linked to elevated risk for suicidal ideation (SI), yet findings across the literature remain mixed and the mechanisms underlying this association are poorly understood. Foundational suicide frameworks have been applied to this association in the past-for example, Buckner et al. (2017) demonstrated that interpersonal risk factors from the Interpersonal-Psychological Theory of Suicide (IPTS) partially explained the link between daily cannabis use and SI. However, despite the existence of multiple theoretical frameworks for understanding suicide risk, the Integrated Motivational-Volitional (IMV) model (O'Connor & Kirtley, 2018) has not yet been examined in this context. The IMV model posits that experiences of defeat lead to feelings of entrapment, which in turn elevate SI. This pathway may be particularly relevant given that cannabis use, and by extension, cannabis-related problems, extend beyond the interpersonal domain to include functional and intrapersonal consequences and impairment. The present study tested whether cannabis-related problems were indirectly associated with SI through the IMV motivational pathway of defeat and entrapment. Methods: Participants were 344 adults reporting past-year cannabis use (68.3% female; 68% White; 65.4% Heterosexual; M age = 21.47 years, SD = 3.17) recruited via Prolific and a university study board using Qualtrics. Self-report measures assessed cannabis-related problems, defeat and entrapment, and lifetime SI. Serial mediation analyses were conducted using SPSS PROCESS Model 6 with 5,000 bootstrap samples to test whether defeat and entrapment mediated the association between cannabis-related problems and SI. Additional exploratory models examined past-month use frequency and daily versus non-daily use status as alternative predictors. Results: Greater cannabis-related problems were associated with higher defeat ($b = .15$, $SE = .07$, $p = .033$), which in turn predicted greater entrapment ($b = .87$, $SE = .02$, $p < .001$). Entrapment was positively associated with SI ($b = .23$, $SE = .07$, $p = .002$). The direct effect of cannabis-related problems on SI was not significant ($b = .06$, $SE = .04$, $p = .187$). Instead, analyses indicated a significant serial indirect effect of cannabis-related problems on SI through defeat and then entrapment (indirect effect = .030, SE = .02, 95% CI [.004, .073]). The overall model was significant ($p < .001$). Exploratory models examining past-month use frequency and daily versus non-daily use did not demonstrate significant indirect effects through defeat and entrapment, suggesting that cannabis-related problems, rather than frequency of use alone, may be more relevant to IMV processes associated with SI. Conclusions: These findings provide preliminary support for the IMV model in understanding the cannabis-suicidality association. Specifically, results suggest that cannabis-related problems (e.g., negative consequences of cannabis use across interpersonal, intrapersonal, and functional domains), rather than frequency of use alone, may contribute to SI through increased feelings of defeat and entrapment. These findings may have implications for suicide risk screening and intervention efforts, suggesting that assessing problems as a result of cannabis use-rather than frequency alone-may help identify individuals experiencing elevated psychological vulnerability.

Exploring Associations between Cannabis Use and Suicidality in Emerging Adults: A Scoping Review

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Objective: The objective of this scoping review was to map and synthesize the existing evidence on associations between cannabis use and suicidality (ideation, planning, attempts) among emerging adults aged 18-30 years. Introduction: Emerging adulthood is characterized by peak rates of cannabis use and elevated suicide risk. Although research examining links between cannabis use and suicidality has increased in recent years, findings remain mixed and highly heterogenous. No prior review has focused specifically on emerging adults, limiting understanding of how cannabis involvement may relate to suicide risk during this unique developmental period defined by unique stressors and transitions related to education, employment, and interpersonal relationships. Inclusion criteria: Studies were included if they examined cannabis use (frequency, amount, or cannabis use disorder) and suicidality (ideation, planning, or attempts) among emerging adults aged 18-30 years, used quantitative or mixed-method designs, were peer-reviewed, published in English between 2015 and 2025, and reported age-specific analyses. Reviews, qualitative studies, dissertations, and studies not directly examining target variables or not stratifying by age were excluded. Methods: A comprehensive search of PubMed, PsycINFO, Web of Science, and Google Scholar was initially conducted in May 2025. An updated search using the same strategy was conducted in February 2026 to identify studies published since the original search. A three-step search strategy following Joanna Briggs Institute methodology was utilized. Two independent reviewers screened studies, extracted data, and resolved discrepancies through discussion. Extracted data include study design, sample characteristics, cannabis and suicidality measures, and statistical associations. Findings were synthesized descriptively and organized by study design (cross-sectional vs longitudinal). Results: 19 studies met inclusion criteria, including 14 cross-sectional and five longitudinal designs. Sample sizes ranged from 193 to 323,896 participants, with studies conducted primarily in the United States, followed by Canada, Brazil, France, Mexico, the United Kingdom, and Switzerland. Most cross-sectional studies reported significant associations between recent or problematic cannabis use and suicidal ideation and/or attempts, including large nationally representative datasets demonstrating elevated adjusted odds of suicidal ideation among past-month cannabis users. However, effect sizes varied depending on measurement approach, statistical control, and population characteristics. Longitudinal findings were less consistent. Some studies found that early initiation, high-frequency use, and cannabis use disorder predicted later suicidal ideation or attempts, whereas others reported attenuation of associations after controlling for depression, polysubstance use, or shared familial influences. Across studies, substantial heterogeneity was observed in measurement of both cannabis use and suicidality, with frequent reliance on dichotomized variables and single-item assessments. No studies examined suicide death as an outcome. Conclusions: Available evidence suggests a consistent concurrent association between cannabis use and suicidality in emerging adults; however, longitudinal evidence clarifying temporal directionality remains inconsistent. Methodological heterogeneity, limited examination of suicide planning or deaths, and underrepresentation of marginalized populations represent knowledge gaps. More rigorous longitudinal, mechanistic, and

intersectional research is needed to clarify causal pathways and inform prevention and intervention efforts targeting suicide risk among emerging adult cannabis users.

Predicting Cannabis Use from Cannabis Demand using Ecological Momentary Assessment with Midwestern Community Adults

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Ecological momentary assessment (EMA) is a burgeoning method to study how behavioral economic demand for cannabis predicts self-reported cannabis consumption in people's natural environments. Given the nascent nature of this research area, replications and extensions are important. Here we report on our ongoing 14-day EMA study, including an interim sample of 24 adults (37% female; mean age = 34.79, SD = 10.79; target N = 100) reporting at least weekly cannabis use. Following a baseline session including a standard marijuana purchase task (MPT) among other measures, participants completed 1 morning and 4 random surveys/day for 2 weeks (1,410 surveys total; average completion rate = 83.93%). Participants reported consumption of a THC product in 47.4% of random surveys. Initial linear regression models examined whether cannabis demand assessed at baseline predicted the number of surveys where a person endorsed using any THC product since their last survey. Significant effects were found for intensity (consumption at free price) and Omax (maximum expenditure), but not Pmax (price at Omax). For every one-gram increase in intensity and Omax, there was a 0.53 ($p = .02$; $R2\ adj = 0.186$) and 0.17 ($p = .04$; $R2\ adj = 0.136$) increase in the number of surveys endorsing THC use, respectively. We also plan to use linear mixed-effects models to test whether momentary changes in cannabis demand predict subsequent use. These results have the potential to advance understanding of how the reinforcing value of cannabis is associated with consumption in daily life.

Confiscated Cannabis Products from U.S. Schools, 2021-2025: Product Types and Brand Trends

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Background. Cannabis products, including vaping devices, flower, and edibles, are present in U.S. schools despite being illegal for youth in all states and prohibited on school grounds. Systematic surveillance of confiscated cannabis products remains limited, yet school confiscation data may serve as a valuable early indicator of emerging product trends among youth. Understanding characteristics of different product types and brands youth use can generate signals to better inform prevention, enforcement, and policy efforts targeting youth cannabis access. Data were collected as part of a nationwide initiative aimed at monitoring youth tobacco product use to inform cancer prevention and other public health efforts. Methods. Using a voluntary survey completed by K-12 school staff and community partners, photos of confiscated products submitted between November 2023 and December 2025 from the 2021-2025 school years were coded by the research team. Products were first identified as nicotine or cannabis and then all cannabis products were classified by type (e.g., vape, cartridge, battery with cartridge, flower, edible) and brand. Additional analyses examined vape-specific brand distribution

overall, by school year, and by state for the five states with the highest submission volume. Results. A total of 275 submitted images containing 1,370 cannabis products were identified across 21 states. Cannabis disposable vapes were the most common product type (48.6%, n=666). When combining them with all vaping-related device types, including battery with cartridge (20.0%, n=274), cartridge (15.5%, n=212), and battery alone (14.9%, n=204), vaping products and components accounted for 99.0% of confiscated cannabis products. Flower (0.6%, n=8) and edibles (0.4%, n=6) made up the remaining 1.0%. Among confiscated disposable cannabis vapes, the most frequently identified brands were Muha Meds (14%, n=93), Ace (5.3%, n=35), Cake (4.1%, n=27), and Torch (4.1%, n=27). Nearly one quarter of vaping products could not be identified by brand due to poor photo quality or generic and unmarked packaging (25.0%, n=166). Vape device type varied across academic years. Cartridges dominated confiscations before 2023-2024 (47.6%), but disposable vapes became increasingly prevalent over time, rising from 22.4% in 2021-2023 to 41.3% in 2023-2024, 62.1% in 2024-2025, and 73.8% in 2025-2026. Brand distribution varied by state. The most frequently identified vape brands were Stiizy in California (22.7%), Select in Maine (17.6%), Boutiq and Jungle Boys in Colorado (5.5% each), Ace in North Carolina (13.8%), and Cake and Muha Meds in Wisconsin (11.4% each). Conclusions. Cannabis products confiscated from U.S. schools reflect a diverse and shifting market dominated by vaping devices. The increase in disposable vapes over the study period, along with the wide variety of brands identified, suggests continued evolution in the cannabis products youth are accessing. Monitoring changes in youth use and types of cannabis products confiscated from schools may help identify emerging trends and inform regulation, prevention, and enforcement efforts targeting youth access.

Cannabis and Psilocybin Co-use: Associations with Stress and Well-being

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Objective. The use of cannabis and hallucinogens, a broader category that includes psilocybin, has reached historically high prevalence rates among adults in the United States. While cannabis may be utilized to cope with stress, psilocybin has been shown to have potential therapeutic effects in both clinical and recreational settings. Despite these trends, research on the mental health implications of their co-use remains scarce. The existing literature on polysubstance use often suggests negative mental health effects for substance co-use, yet clinical trials indicate psilocybin may reduce anxiety and depression symptoms. Furthermore, there is limited research regarding potential sex differences in the effects of cannabis and psilocybin, as suggested in preclinical models. Thus, the current study examined the effects of cannabis and psilocybin co-use, sex assigned at birth, and their interaction on self-reported stress and well-being. Specifically, it was

hypothesized that recent cannabis and psilocybin co-use would be associated with lower stress and higher well-being compared to cannabis use alone, and that these associations would differ by sex. Methods. Following exclusionary criteria, 725 adults from an online survey were included in the current pre-registered study. Participants were categorized into a cannabis-only group (n = 479; at least one day of cannabis use in the past 30 days) or a cannabis/psilocybin co-use group (n = 246; at least one day of cannabis use in the past 30 days and at least one day of psilocybin [≥0.25 grams] use in the past 90 days). Participants completed the Perceived Stress Scale (PSS) and the Warwick-Edinburgh Mental Wellbeing Scale (WEMWBS). Hierarchical multiple linear regression models were conducted to test the effects of substance use group, sex, and their interaction on perceived stress and well-being, controlling for age, gender identity, education, and past 30-day alcohol and nicotine use. Results. Co-use was associated with lower stress ($\beta = -0.12$, $p < .001$) and higher well-being ($\beta = 0.15$, $p < .001$) after controlling for covariates. Additionally, female sex was associated with higher stress ($\beta = 0.30$, $p = .005$) and lower well-being ($\beta = -0.27$, $p = .014$). However, the interaction between substance use group and sex was not significant for either stress ($p = .976$) or well-being ($p = .727$), suggesting the associations were consistent across sexes. Conclusion. As hypothesized, in this non-clinical sample, the co-use of cannabis and psilocybin was associated with lower self-reported perceived stress and higher subjective well-being compared to cannabis use alone. However, the findings did not support interactions between substance use group and sex. Future research should investigate the nuances of co-use by examining how frequency and quantity of use are related to psychological symptoms. Furthermore, subsequent studies should explore whether differences in co-use relative to cannabis use alone may be observed in other areas of brain health, such as neurocognition.

In the High of the Budholder: Assessing Subjective Cannabis Potency Associations in Adolescents and Young Adults Using Timeline Followback

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Advancements in cannabis research have focused on accurately measuring THC

consumption and estimating THC standard doses. Assessing THC consumption requires knowledge of cannabis consumption quantity and potency. Most adolescents and young adults (AYA) cannot legally purchase cannabis, which poses a barrier to knowing its objective potency (i.e., percent THC). Conversely, AYA can provide subjective estimations of their cannabis' potency; however, limited research has evaluated the usefulness of such estimations. We used baseline timeline followback data from AYA (N = 58, M age = 19.1, 54% female) alcohol clinical trials to examine associations between subjective cannabis potency, quantity, frequency, subjective intoxication, and cannabis use disorder (CUD) symptoms. We conducted timeline followback interviews assessing day-level cannabis use, including method, quantity, subjective potency (5-point scale from 'very mild' to 'very strong'), and subjective intoxication, and a diagnostic interview to assess CUD symptoms. Multilevel modeling evaluated hypothesized within- and between-person relations. Results found that participants reported that concentrates were more potent than flower ($p = .009$), and both were more potent than edibles ($p < .001$ concentrate vs. edibles; $p = .04$ flower vs. edibles). Additionally, consuming a larger quantity of cannabis flower in the past month was associated with meeting criteria for more CUD symptoms ($p = .02$), while past-month frequency and subjective potency were unrelated to CUD. There was also a within-person interaction ($p = .02$) whereby the quantity of cannabis flower consumed was more strongly related to subjective intoxication at lower levels of subjective potency. Our findings suggest that subjective potency may be a useful proxy for objective potency, particularly at the within-person level. Research among similar populations may benefit from assessing subjective cannabis potency.

Acculturative Stress, Coping Motives, and Cannabis Use Among Latino College Students

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Acculturative stress, arising from navigating multiple cultural contexts, discrimination, and identity conflict, has been identified as an important risk factor for substance use among ethnically diverse college populations. Prior research suggests that higher levels of acculturative stress are associated with greater engagement in substance use behaviors, including cannabis use (Yockey et al., 2020), and may worsen substance-related consequences. Consistent with this, longitudinal research has shown that acculturative stressors, particularly perceived discrimination, predict higher levels of substance use across adolescence and into emerging adulthood (Unger et al., 2014). However, less is known about the mechanisms linking acculturative stress to cannabis-related consequences, especially among Latino-identifying college students. The present study examined whether coping-related behaviors (e.g., using cannabis to manage stress) and cannabis use quantity mediate the association between acculturative stress and cannabis-related consequences. Participants included 255 (74.1% female; mean age = 20.20) Latino college students who regularly consume cannabis within a typical week and completed measures of acculturative stress, cannabis use motives (particularly coping), cannabis use quantity, and cannabis-related consequences. Within our estimated path model (i.e., acculturative stress → coping motives → cannabis use quantity →

cannabis-related consequences), findings revealed that greater acculturative stress was indirectly associated with greater cannabis-related consequences through coping motivations (indirect β = .09; 95% CI = .04, .17). Specifically, acculturative stress was positively associated with greater coping motivations, which in turn was associated with more cannabis-related consequences. Additionally, a significant serial indirect effect was observed such that greater acculturative stress was associated with greater coping motivations, which was then associated with higher cannabis use quantity and, in turn, more cannabis-related consequences (indirect β = .01; 95% CI = .002, .031). The indirect effect through cannabis use quantity alone was not statistically significant, suggesting that cannabis coping motivations plays a primary role in linking acculturative stress to cannabis-related harm. These findings highlight coping-related processes as a key mechanism linking acculturative stress to cannabis-related harm among Latino college students. These findings suggest that interventions aimed at reducing cannabis-related consequences among Latino college students may benefit from addressing acculturative stress and promoting adaptive coping strategies to mitigate risk.

Usage of and Adverse Reactions to Traditional Cannabis and Intoxicating Hemp-Derived Products Among Kentucky College Students

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Intoxicating hemp-derived products (IHDPs) are a new category of federally legal cannabis products that contain intoxicating cannabinoids such as Δ8-THC. In the state of Kentucky, IHDPs have been legally available for purchase since 2018; whilst traditional cannabis has only been legally purchasable for authorized medicinal use since 2025. Recent studies have indicated potential for adolescent use and adverse reactions to IHDPs due to inadequate age verification by IHDP vendors, misrepresentation in potency labeling, and harmful residuals from the synthesis process used to make IHDPs. Furthermore, little research has compared patterns of use and adverse reactions between IHDPs and traditional cannabis. The present study aimed to investigate whether this increased availability and the suspected discrepancies in product contents impacts the use of, and adverse reactions to, IHDPs compared to traditional cannabis. Moreover, as much of the existing literature has examined only Δ8-THC, this study aims to investigate IHDPs collectively. It is hypothesized that Kentucky young adults will report significantly more current and retrospective use of, as well as adverse reactions to, IHDPs, compared with traditional cannabis. Young adults from Kentucky colleges (N = 427; M Age= 20.3, SD = 2.4) completed an online screener survey assessing lifetime and past-year cannabis use. 109 individuals (M age = 21.0, SD = 2.82) met study inclusion criteria and completed the full survey. The full survey contained the Daily Sessions, Frequency, Age of Onset, Quantity - Cannabis Use (DFAQ-CU) Inventory and the Adverse Reactions to Cannabis Scale modified to expand items on age of onset and to assess IHDPs. Contrary to our hypothesis, lifetime and past-year use of IHDPs were less frequent than traditional cannabis use. Paired sample t-tests from the full survey found that frequency of IHDP use was significantly lower than frequency of traditional cannabis use before ages 16 ($t(76) = -1.88$, $p = .032$, d

= -.214), 18 (t(76) = -2.54, p = .007, d = -.290), and 21 (t(76) = -1.80, p = .038, d = -.204). Total adverse reactions to IHDPs (M = 8.5, SD = 5.5) and traditional cannabis (M = 8.6, SD = 5.9) were not significantly different (t(76) = .247, p = .403, d = .040). Results indicate that traditional cannabis is the most commonly used type of cannabis among Kentucky college students, even in a state where IHDPs are more readily and legally available. Due to the recent inception of IHDPs, further analysis is necessary to determine whether prevalence of use prior to ages 16, 18, and 21 differs across respondent age groups. The lack of distinction regarding adverse reactions between IHDPs and traditional cannabis suggests that traditional cannabis products may be subject to similar inconsistencies in potency or composition, or that these differences may not meaningfully influence users' experiences. Policymakers should consider these similarities, as well as the higher prevalence of illegal traditional cannabis use relative to legal IHDP use, when designing equitable cannabis legislation.

Inside the Regulatory Process of Developing and Implementing Cannabis Product Warnings: A Qualitative Study

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Background: Cannabis is the most commonly used federally illegal drug in the United States, with nearly half of all US adults reporting lifetime use. Cannabis use is associated with negative health risks; however, many adults underestimate or are unaware of these health risks. Warnings on cannabis packages serve as a population-level intervention to inform people about the risks of cannabis use, yet many cannabis warnings are lengthy, unclear and are not noticed. Each state oversees cannabis regulations, which includes the development of warnings on cannabis packages. We interviewed state regulators to understand existing processes for developing and implementing cannabis warnings and to gather their perspectives on how cannabis warnings can be strengthened. Methods: In partnership with the Cannabis Regulators Association (CANNRA), we recruited US cannabis regulators from medical and adult-use programs who were familiar with their state's existing cannabis warning regulations. From October to December 2024, we conducted 17 online interviews, which were recorded and professionally transcribed. Participants were asked about their roles as state regulators, the purpose of cannabis warning labels, the development and implementation of warnings, and considerations related to federal oversight. Using ATLAS.ti, we dual-coded transcripts and performed thematic data analysis. Results: A total of 17 cannabis regulators were interviewed, representing 16 states: four were states with legalized medical use of cannabis, and 12 were states with legalized medical and adult-use cannabis. Central themes include: 1) Collaborating to Work Toward Shared Goals among state partners, '...it's certainly a partnership, and it takes both sides.' 2) Balancing Product Considerations,

Population Needs, and Industry Interests, '...we were thinking about targeting specific audiences-being youth, pregnant women...' and '... the tension we are constantly up against is limited real estate and a lot of information...' 3) Seeking Stronger, Succinct, Research-Based Cannabis Warnings, '...we need actual research on the cannabis to get the health effects, to get the warnings...', and 4) Balancing Federal Standardization with State Flexibility in Cannabis Warnings, '...standardization is important. And the feds cannot take action on this soon enough.' Conclusions: The findings highlight the challenge of designing effective cannabis warnings, given the tension between limited space for warnings on packaging and regulators' desire for comprehensive messaging that addresses the needs of different populations and the various health effects associated with different cannabis administration methods. Importantly, regulators emphasized the need for further research on cannabis products and the impact of cannabis warnings and largely favored federal oversight and standardization of cannabis policies and warnings across the US.

Are You an Asshole for Smoking? Cannabis Norms Related to Neighbor Disputes, Public Use, and Narcing

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This descriptive study seeks to evaluate dominant cultural sentiments surrounding cannabis norms using the popular subreddit 'Am I The Asshole?' (AITA). Existing studies on cannabis norms and user etiquette are based on samples of subcultural insiders, but how does the larger dominant culture define appropriate and inappropriate uses of the drug? With over 14 million members, AITA is a large public forum for conflict resolution where users debate cultural norms and moral codes. Using thematic content analysis, the current study analyzed 583 cannabis-related posts from the AITA subreddit and collected each post's top three replies to evaluate consensus among the final judgments. Select themes for this presentation include disputes between neighbors over the smell of cannabis, the acceptability of using cannabis in public, and the ethics of narcing on cannabis users. These are prominent public controversies as evidenced in numerous news articles and op-eds on the pungent smell of cannabis in both private and public spaces. For situations where neighbors complained about cannabis use and smoke, cannabis users were judged as assholes in about 43% of cases. If a cannabis user was following community guidelines (e.g., smoking in designated areas), they were largely not seen as an asshole. Smoking inside or on the balcony of non-smoking apartments was almost always judged as inappropriate. Furthermore, social norms intersect with laws here, as asshole judgments were more common in non-legal areas. Private property norms were also powerful here, as using cannabis in one's own house or backyard was largely seen as acceptable, even if neighbors disagreed or could smell the smoke. Users who consume cannabis in public were considered assholes about 62% of the time. If using in a legal area, smoking cannabis outside in parks or on the street was largely deemed acceptable if it was done respectfully. Yet outdoor public use in non-legal areas was largely frowned upon as laws often mirror community sentiments. Indoor public use was almost always deemed to be an asshole move regardless of legal context. Finally, for situations involving narcing, cannabis users were deemed assholes in about 54% of cases. The prevailing norm here is that there should be an attempt to resolve disagreements privately before notifying authorities, landlords, parents, or bosses. Narcing without notice was almost always judged to be an asshole move, and

was even seen as a more severe norm violation than any problematic form of cannabis use (e.g., smoking indoors in an apartment building). Yet it was generally permissible to narc without notice if the cannabis users were younger teenagers, or if the users were endangering themselves or others (e.g., young children).

Cannabis Use Changes Self-Reported Stress Among College Students with Cannabis Use Disorder: An Ecological Momentary Assessment

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Cannabis use disorder (CUD) is prevalent among college students, a population characterized by heightened levels of stress (American College Health Association, 2025). Negative reinforcement models propose that negative affect, such as stress, is central to CUD onset, maintenance, and relapse through learned associations between cannabis use and decreased negative affect (Baker et al., 2004). Despite stress reduction being a commonly endorsed motive for cannabis use, and a motive associated with worse mental health outcomes including chronic use (Godosky & Cuttler, 2020; Brodbeck et al., 2007; Hyman & Sinha, 2009), few studies have specifically focused on how cannabis use influences the temporal dynamics of stress. Instead, studies tend to focus on global negative affect, an approach that has led to mixed findings (Wycoff et al., 2018). One way to address these mixed findings is to examine how cannabis use influences individual affective states that are highly relevant to this population, such as stress. The current study explored the autoregressive effects of stress across time, and whether cannabis use changed stress moment-to-moment among individuals with CUD. College students who met criteria for CUD (N = 109) completed an ecological momentary assessment (EMA) protocol in which they completed five brief surveys daily for two weeks (observations = 3,716). In each survey, participants were asked to report their feelings of stress in the past 30 minutes on a scale of 0 (Not at all) to 10 (Extremely), and if they had used cannabis since their previous survey. Multilevel modeling revealed a significant autoregressive association for stress at the moment-level ($b = .434$, $p < .001$), indicating moderate carry-over effects of stress across time. Cannabis use significantly moderated this relationship ($b = -.111$, $p = .002$), such that when people with CUD reported that they used cannabis, they reported lower stress in the next moment compared to when they didn't use cannabis. These findings suggest that cannabis use changes the temporal dynamics of stress by attenuating the autoregressive continuity of stress across time. The observed reductions in stress are consistent with negative reinforcement models of substance use. Linear effects further indicate that the effect of cannabis on stress does not depend on the intensity of stress at the previous moment. Given elevated stress levels among college students, this population may be particularly vulnerable to developing problematic patterns of using cannabis as a coping strategy. Future research should examine whether alternative stress-reduction strategies may function as more adaptive reinforcers and reduce dependence on cannabis among college students with CUD.

Beliefs and Informational Influences Contributing to Medical Cannabis (MC) Use Between Established and New MC Users in Florida

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Background: Medical cannabis (MC) use is increasingly common in the United States, with users reporting MC effective for managing symptoms related to anxiety, stress, pain, and sleep. Despite the increased use, there is a lack of clinical guidance and dosing recommendations for MC users. MC dispensaries offer a wide variety of products, and patients are often instructed to utilize a trial-and-error approach to find effective products. Given the need for better guidance, it is important to understand how MC users' beliefs and sources of informational influence related to MC use may differ between more established and newer MC users (new initiators), which is the primary aim of this abstract. Methods: Data were obtained from the Florida-based Medical Marijuana & Me (M3) study, combining two subsamples. One is a single cross-sectional survey assessing demographics, beliefs, and sources of influence among more established users. The other is a longitudinal study surveying newer users at three timepoints: baseline, 3 months, and 9 months. Demographic data were collected at baseline and beliefs and sources of influence were collected at follow-up. Only baseline and 3-month follow-up data were analyzed in the present study. Beliefs of MC use were assessed using questions on beliefs about THC, CBD, and terpenes, provider awareness of MC use, interest in growing cannabis flower, concerns regarding dependency, and likelihood of MC use in a year. Sources of informational influence related to MC use were assessed using questions on the level of influence that recommendations from physicians, dispensary staff, peers, and online sources, as well as personal experience, price, and sales had on which MC products they have tried. A total of 955 participants were included, 610 established users and 345 new users. Descriptive analyses, chi-square, and t-tests compared demographics, beliefs, and sources of informational influence between established and new users. Results: Established users were significantly older ($p<0.001$) and more likely to have Medicare insurance coverage ($p<0.001$) and an annual household income above $60,000 ($p=0.02$) compared to new users. Established users were more likely to believe that high THC products are more effective ($p<0.001$), value CBD ($p<0.001$) and terpenes ($p<0.001$) in products, indicate providers' awareness of MC use ($p<0.001$), express interest in growing flower ($p=0.002$), and anticipate continuing use of MC in a year ($p<0.001$), while new users were more likely to prefer low THC products ($p=0.001$). Additionally, established users reported higher mean levels of influence for personal experience ($p<0.001$), while new users reported higher mean levels of influence for recommendations from peers ($p<0.001$) and online sources ($p=0.03$). Conclusions: These findings suggest that beliefs about MC treatment and sources of influence on product information vary meaningfully between established and new MC users. This aligns with the common trial-and-error approach, as new patients prefer lower THC products and rely on recommendations from peers and online resources to identify effective products. Future research should explore how MC users' experiences change over time to better inform clinical guidance.

Impulsive Personality Traits Predict, Use Frequency, and Cannabis Effects

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Introduction: Although cannabis is a widely used substance and expectancies are well studied, it is less known how individuals evaluate the effects of use. Theories suggest that individuals with stronger impulsive personality traits report more positive

expectancies and fewer negative ones. A complementary hypothesis to this may be that they also perceive the valence of these effects differently, though this may depend on use frequency. The current study tested this hypothesis. Methods: College students (N=258) reported on their evaluations of cannabis effects, fitting into general positive (e.g., feeling sociable), sedative (e.g., feeling slowed down), and anxious/paranoia-like effect (e.g., feeling paranoid) categories. Participants also reported their impulsive traits and use frequency, and regression models tested the main and interactive effects of impulsive traits and use frequency on cannabis effect evaluations. Results: Positive urgency was associated with more positive evaluations of general positive (b=.97, SE=.35, p=.006), and less positive evaluations of sedative (b=-1.11, SE=.31, p<.001) and anxious, paranoia-like cannabis effects (b=-1.01, SE=.28, p<.001). However, no other impulsive traits predicted evaluations of cannabis effects. However, there was an interaction between sensation seeking and cannabis use frequency when predicting perceived valence of sedating cannabis effects. Probing suggested that sensation seeking was associated with more positive evaluations of sedative effects when use frequency was higher (b=.67, SE=.33, p=.043) versus lower (b=-.81, SE=.38, p=.035). Discussion: Individuals with higher positive urgency reported augmented appetitive evaluations of popularly studied positive cannabis effects and augmented aversive evaluations of popularly studied negative cannabis effects. Rather, individuals higher in sensation seeking reported more aversive evaluations of negative cannabis effects when reporting less (versus more) use patterns. Findings suggest that personality traits shape how individuals appraise cannabis experiences, which may inform risk assessment and intervention efforts targeting cannabis misuse.

Characterizing Cannabis Use Among Recently Trauma-Exposed Emergency Department Patients

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Background: Across diverse populations, there is evidence that posttraumatic stress disorder (PTSD) diagnoses and symptom severity have been associated with increased cannabis use and cannabis use problems (Cornelius et al., 2010; Cougle et al., 2011; Boden et al., 2013; Metrik et al., 2016). Additionally, there is preliminary research finding that cannabis related outcomes are uniquely associated with different types of trauma exposures (Levin et al., 2021). In a 2013 study, Ullman et al. found that when trauma types were separated into two categories, interpersonal and non-interpersonal, only interpersonal trauma was associated with substance use. Importantly, there is limited research that looks at cannabis use following hospitalization for acute trauma. The goal of the current study is to characterize cannabis use patterns among

recently trauma-exposed individuals in the emergency department and the weeks following. Methods: The current data come from an ongoing, longitudinal study of individuals who use cannabis in the weeks after admittance to the Emergency Department (ED) across three hospitals in the Northeast. We examined cannabis use patterns from participants who had completed baseline procedures (N=83), as well as those who attended the laboratory follow-up 2 weeks post-ED admittance (N=41). Cannabis use was characterized high frequency (≥5 times/week) and/or chronic (>1 year) based on responses to the Daily Sessions, Frequency, Age of Onset, and Quantity of Cannabis Use Inventory (DFAQ-CU). Additionally, trauma type upon emergency department admittance was obtained from medical chart review and categorized into major thematic categories, such as motor vehicle collision, pedestrian versus car, physical assault, and other. Consistent with current literature, trauma type was further collapsed into interpersonal and non-interpersonal trauma. PTSD symptom count, as well as cannabis use disorder diagnosis, was obtained from the Clinician-Administered PTSD Scale for DSM-5 (CAPS-5) and Structured Clinical Interview for DSM-5 (SCID-5) at the 2-week follow-up. Results: Over half of participants (57.3%) were characterized as high-frequency users, 66.0% as chronic users, and 51.5% as both chronic high-frequency users. With regards to trauma type, 14% of participants reported experiencing a physical assault (such as gunshot wound, stabbing), with the remaining 86% of participants experiencing non-interpersonal trauma (such as motor vehicle collision). Individuals who reported a chronic, high frequency cannabis use pattern were more likely to have experienced a physical assault versus a non-interpersonal trauma ($p = 0.04$). No significant differences between PTSD symptom count in the weeks following hospitalization were observed across cannabis use categories. Of those that attended the 2-week follow-up, 88% of participants met criteria for current cannabis use disorder. Conclusion: This study provides descriptive data characterizing cannabis use patterns among recently trauma-exposed individuals admitted to the ED, a unique and understudied population. Though these associations are not causal, results indicated a pattern in

which chronic, high frequency cannabis use was associated with having experienced an interpersonal trauma (versus a non-interpersonal trauma). The descriptive data highlights the emergency department as a critical setting for identifying cannabis use and developing holistic treatment interventions for this population.

Associations of Cannabis Use with Current Tobacco Use among US Veterans: Findings from Wave 7 of the Population Assessment of Tobacco and Health Study

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Introduction: Cannabis is used widely by many Veterans, including some for attempts to manage pain and mental health conditions. Cannabis use is also associated with cigarette smoking initiation, continued use, and cessation failure. The relationship between cannabis and tobacco co-use among Veterans is less understood. Cannabis use is high among Veterans who use tobacco, but it is not known whether cannabis use might be associated with specific tobacco product use, including multiple tobacco product use and combustible tobacco product use (e.g., cigarettes, cigars). Both multiple tobacco product use and combustible product use increase health risks, and those risks can be exacerbated with co-use of cannabis. Methods: Data for this cross-sectional, descriptive study were from Wave 7 of the Population Assessment of Tobacco and Health Study, collected in 2022. Weighted multivariable logistic regression analyses were conducted to examine the association between current (past month) cannabis use with the following tobacco and nicotine product (referred to as tobacco) outcomes: (1) any current (past month) tobacco use, (2) each tobacco/nicotine product (cigarette, cigar, e-cigarette, hookah/pipe, other [smokeless, pouch, oral]), (3) any combustible tobacco use, (4) and polytobacco use. Models were adjusted for sociodemographics, health perceptions, and military-specific variables. Results: The analytic sample included 1204 US Veterans, who were mostly male (91.4%), White (83.5%), ages 65+ (50.2%), who had served in the Army (46.2%) or the Navy/Coast Guard (19.6%). Current cannabis use was reported among 13% of Veterans. Veterans who reported current cannabis use had higher odds of current tobacco product use (aOR = 2.6, 95%CI 1.8, 3.7), multiple tobacco product use (aOR = 2.5, 95%CI 1.4, 4.5), and any combustible tobacco product (aOR = 3.0, 95%CI 2.0, 4.4), compared to Veterans who did not use cannabis. When examining specific tobacco products, we found that Veterans who reported current cannabis use, compared to no use, had higher odds of current use of cigarettes (aOR = 2.7, 95%CI 1.8, 4.1) and e-cigarettes (aOR = 2.2, 95%CI 1.2, 4.0). Conclusions: Veterans currently using cannabis have increased odds of current tobacco use, including the most harmful combustible products (i.e., cigars

and cigarettes) and higher risk for multiple tobacco product use. Study findings underscore the importance of addressing cannabis use as a potential barrier when implementing tobacco cessation programs for Veterans. Future research is needed with Veterans to elucidate reasons for cannabis use to better understand the association between cannabis use and tobacco product use and to inform clinical and population level interventions.

Cannabis Use Eating Experiences and Use Disorder Symptoms Among University Students Who Engage in Binge Eating and Heavy Episodic Drinking

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One of the most common disordered eating behaviors among university students is binge eating (consuming large quantities of food in a short time while experiencing a loss of control), with up to 50% of some samples reporting this behavior. Also common among university students is cannabis use, with 39.5% of students reporting past-year use in 2024. Frequent engagement in these behaviors is associated with both physical and mental health consequences (e.g., cannabis use disorder, eating disorders). Prior research has indicated a link between cannabis use and binge eating, which may be related to the pleasurable and hunger-inducing effects of cannabis. A tendency to experience the hedonic effects of eating while using cannabis has been associated with more frequent cannabis use, but little research has identified how, in addition to constructs such as trait impulsivity, subjective eating experiences while under the influence of cannabis relate to cannabis use and cannabis use outcomes. Assessing these potential risk factors will help to identify points of intervention to reduce binge eating- and cannabis use-related harms. The present study assessed how the hedonic and appetitive subscale scores from the Cannabinoid Eating Experiences Questionnaire (CEEQ), a measure of the experiences of cannabis effects on appetite, and scores on the Short Urgency-Premeditation-Perseverance-Sensation Seeking-Positive Urgency scale (SUPPS-P), a measure of trait impulsivity, related to cannabis use disorder symptoms (assessed with the Cannabis Use Disorder Identification Test-Revised; CUDIT-R). Participants were graduate and undergraduate students who engaged in recent binge eating behavior and were enrolled in a larger study testing the effects of an online program to reduce binge eating and binge drinking behavior. Participants completed a baseline survey assessing their substance use behavior (cannabis use frequency, cannabis use disorder symptoms), trait impulsivity (SUPPS-P), and subjective cannabis effects on appetite (CEEQ). Approximately half of the participants used cannabis in the past month. Linear regression analyses were used to assess the relationship between subjective cannabis eating experiences (CEEQ hedonic and appetitive subscale scores), trait impulsivity (SUPPS-P scores), cannabis use frequency, and cannabis use disorder (CUDIT-R) symptoms. In bivariate models, cannabis use frequency, CEEQ appetitive subscale scores, and impulsivity were all significantly positively associated with CUD symptoms, whereas the hedonic subscale of the CEEQ was not. In the multivariate model, only cannabis use frequency and impulsivity remained

significantly positively associated with CUD symptoms. Results are consistent with prior research identifying impulsivity as a risk factor for CUD symptoms among those who use cannabis and binge eat. While it was anticipated that participants who tend to experience the pleasurable aspects of eating while under the influence of cannabis may be reinforced to continue using cannabis to experience those positive subjective effects, results did not support this. Interventions remain important among those who exhibit high trait impulsivity to protect at-risk individuals from health consequences.

Detecting Cannabis Intoxication Using Wearable Biosensors and Machine Learning: A Pilot Study

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Background. Cannabis use is increasing in the United States, creating need for objective intoxication and impairment detection methods. Wearable biosensors continuously measure physiological signals (e.g., heart rate, electrodermal activity, movement) and may provide a non-invasive method for detecting cannabis-related physiological responses. Additionally, machine learning can integrate multiple biometric signals to determine whether physiological patterns correspond with subjective intoxication or impairment. This pilot study examined whether wearable physiological signals change after acute cannabis use and relate to subjective intoxication and impairment. Methods. Participants were recruited via Reddit and presented to Colorado State University for baseline testing and distribution of a wrist-worn wearable sensor (Empatica-EmbracePlus), which continuously recorded heart rate (HR), skin temperature, electrodermal activity (EDA), and accelerometry. Participants were monitored via videoconference while using personal cannabis products purchased from licensed Colorado dispensaries. At five timepoints (T0-T4; 30-minute intervals), participants completed the DRUID impairment app, the Subjective High Assessment Scale (SHAS), and a two-minute sit/stand/walk assessment. Participants smoked cannabis ad libitum approximately 10 minutes before T1 and could optionally use again before T2. Data were analyzed using descriptive statistics, repeated-measures ANOVA, and paired t-tests. Exploratory machine learning models using L2-regularized logistic regression with leave-one-subject-out cross-validation evaluated whether change-from-baseline biometric features classified subjective intoxication (SHAS) and impairment (DRUID). Additional models examined whether accounting for cannabis tolerance (mg/THC and DFAQCU global score) improved performance. Results. Twenty participants completed the protocol (11 male; mean age = 32.1 years, range = 22-58). Twelve participants smoked prior to both T1 and T2 assessments, where eight smoked only once before T1. DRUID scores and SHAS ratings increased significantly across timepoints ($p = .003$ and $p < .001$). Heart rate increased significantly from baseline prior to all timepoints ($p < .001$) and was strongly correlated with DRUID ($r = .75$, $p < .001$) and SHAS ($r = .57$, $p < .001$) scores. During sit/stand/walk testing, heart rate increased at

T1 (p's < .001) and T2 (p's < .01), and overall step counts decreased across time (p = .0008). EDA decreased significantly between T1 and T2 (p's < .05). Skin temperature and aggregate accelerometry did not significantly change across timepoints. Exploratory machine learning models using change-from-baseline biometric features demonstrated moderate classification performance for subjective intoxication (balanced accuracy = 0.70; AUC = 0.80). Residualizing biometric features with respect to DFAQCU scores yielded the highest balanced accuracy (0.80; AUC = 0.76), whereas controlling for mg/THC tolerance did not improve performance. Feature importance indicated that temperature variability and EDA features contributed most strongly to intoxication classification. Models predicting DRUID impairment showed lower predictive performance (balanced accuracy = 0.61; AUC = 0.64). Conclusions. Wearable biosensors detected significant physiological changes following cannabis use, particularly increased heart rate and decreased electrodermal activity, which were associated with higher subjective intoxication and impairment scores. Exploratory machine learning analyses suggest wearable-derived biometric patterns may help classify subjective intoxication, although predictive performance varied and should be interpreted cautiously given the small pilot sample. Findings support wearable physiological monitoring as a potential approach for detecting cannabis intoxication and impairment.

Spirituality and Cannabis Use among U.S. College Students: Exploring Spiritual Cannabis Use Motives, Compatibility, and Benefit

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Cannabis has been recognized as an entheogenic substance for hundreds of years (Heide et al., 2022; Johnstad, 2020), eliciting transcendent individual experiences via spiritual rituals, holistic healing, and various cultural uses. Cannabis is also one of the most popular drugs used on college campuses (Blavos et al., 2017) with past-year cannabis use increasing to a 42-44% prevalence rate within a nationally representative sample of U.S. college students (Hai et al., 2022). Prior work thoroughly investigates cannabis use motives in college students but does not adequately investigate how spirituality relates to cannabis use motives and outcomes (i.e., frequency and consequences). Interestingly, recent literature suggests young adults may endorse using cannabis for spiritual reasons and endorsing a spiritual motive of cannabis use experience has been associated with fewer negative use consequences (Johnstad, 2020). Although spiritual motivations for cannabis use are less investigated, prior research suggests it may be protective against negative cannabis-related consequences and provide spiritual benefits when compatible with spiritual values (Heide et al., 2022; Johnstad, 2020). The present study aimed to further elucidate the relationship between spirituality and cannabis use motives and outcomes (e.g., frequency and consequences) among U.S. college students. We hypothesized that individuals endorsing greater spirituality would endorse a greater spiritual motive for using cannabis and greater enhancement and expansion motives, and those who endorse less spirituality would endorse a lower spiritual motive and greater coping motivations. Lastly, we predicted that those with greater spirituality will endorse greater spiritual motives of cannabis use, especially if they endorse a perceived spiritual benefit and spiritual compatibility of their cannabis use (i.e., test of moderation). Participants were U.S. undergraduate college students (n

= 658; 57.9% female) from Psychology Department research pools from 5 universities across 3 states (Colorado, New York, Virginia). Preliminary correlational findings reveal spirituality was significantly positively associated with cannabis use consequences, use frequency, and social, coping, enhancement, and spiritual motives. Independent t-tests revealed that students that endorsed a spiritual benefit of cannabis reported more negative cannabis-related consequences (d = 4.44), greater coping (d = 1.25), social (d = 1.18), enhancement (d = 1.17), expansion (d = 1.20), and spiritual motives (d = 0.61) (all p's < .001) compared to those who did not. Although no significant interactions were found, we did find several significant main effects. Specifically, and controlling for spiritual compatibility, individuals endorsing greater spirituality endorsed a greater spiritual motive (β= .66). Additionally, individuals endorsed greater expansion (β=.23), enhancement (β=.19), social (β=.10) and coping motives (β= .14). They also endorsed greater consequences (β =.12) and frequency (β=.17). Also, when controlling for spirituality, individuals claiming a spiritual benefit endorsed a greater use consequences (β=.36) and frequency (β=.30). They also endorsed greater coping (β=.32), social (β=.31), enhancement (β=.42), expansion (β=.73) and spiritual motives (β=.66). Our results also support the existence of a spiritual cannabis use motive, highlighting an important area of research that warrants further investigation. Future work should seek to further explore this relationship and its potential impact on cannabis use motives, behaviors, and consequences among young adults.

Exploration of the Relationship Between Cannabis and Incentive-Sensitization

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Intro: The incentive-sensitization theory of addiction argues that feelings of 'wanting' and 'liking' develop separately with repeated use of psychoactive substances. Wanting is an incentive to seek the drug via reward signals; whereas liking is a subjective experience of pleasure. It is theorized that with continued use of a substance, 'wanting' is amplified while 'liking' is diminished or stagnant. Little empirical data exists on whether the incentive-sensitization theory applies to cannabis use. In this study, we tested the relationship between years of cannabis use and craving for cannabis and pleasure derived from cannabis. Methods: Participants (N = 20; Average Age = 32.1 (9.5); 45% Female, 90% White) completed a baseline survey and remote study visit. The baseline survey queried cannabis consumption patterns (i.e., age of initiation, quantity, potency, method of administration), and positive and negative consequences of cannabis use. In the remote study visit, participants consumed a weighed amount of cannabis flower or concentrate and then were administered the drug effects questionnaire (DEQ) at 10-, 30-, 60-, 90-, and 120 minutes post consumption. Enjoyment of the drug was operationalized as the number of positive consequences endorsed during the baseline appointment, with a maximum of 25. Craving was operationalized as a single item adapted from the DEQ asking participants 'Would you like more of the drug you took right now', scored on a 0 to 10 scale. We used a Poisson regression to determine whether years of regular use predicted craving (i.e., wanting more cannabis 10 minutes after smoking) while controlling for the milligrams of THC consumed within the session. Milligrams of THC was calculated by multiplying the

quantity of product consumed in grams by the potency of the product and adjusting for the method of administration. To determine whether years of regular use predicted the number of positive consequences we used a Poisson regression. Results: Holding milligrams of THC constant, years of regular use was positively associated with craving such that for each additional year of regular use, craving increased by 4% (IRR=1.04, p<0.001, 95%CI: 1.02, 1.07). Years of regular use was negatively associated with enjoyment, such that for each additional year of regular use, enjoyment decreased by 2% (IRR = 0.98, p = 0.02, 95%CI: 0.96, 0.99). Discussion: These data support the claim that long-lasting use of cannabis can increase cravings, while decreasing derived pleasure. It is important to note that this pattern was shown in self-report data as early as 10 minutes post-smoking. However, with this study's small sample size, results may have been skewed and need to be replicated. Better understanding the incentive-sensitization for cannabis use may help increase understanding of the development of cannabis use disorder and how to treat it.

Health Halo and Horn Effects on Cannabis Edible Packaging

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Cannabis use in the form of edibles continues to increase in the United States, but is not federally regulated, including product labeling. Potentially misleading labels are used on edible packaging that may alter perceptions and influence behavior to use. Labels can elicit a health halo effect giving the impression of a 'healthy' product (e.g., natural) and can also elicit a health horn effect giving the impression of a 'harmful' product (e.g., inorganic). Little research has investigated how labels can elicit these health halo and horn effects on cannabis edible packaging. The current study tested the effect of labeling on perceptions of health harms and benefits, product appeal, and willingness to use. We hypothesized cannabis edible products with health halo labels would elicit greater benefit perceptions, product appeal, and willingness to use, and lower harm perceptions compared to packages without health halos. Health horn labels were hypothesized to elicit lower benefit perceptions, product appeal, and willingness to use, and greater harm perceptions compared to packages without health horns. Using pre-registered between-subjects experimental designs, adult participants residing in the U.S. (N = 544) were randomly assigned to view one of four product images with a different halo label (natural, organic, plant-based, no label) or horn label (synthetic, processed, imitation, no label). Participants then evaluated perceived harm and perceived benefit to health, product appeal, and willingness to use using 7-point response scales (not at all = 1; very much/extremely = 7). Planned contrasts compared each halo/horn label to no label on outcomes of interest. In the halo condition, no statistically significant label differences emerged on any of the evaluative outcomes (all ps > 0.13, ds 0.01-0.34). In the horn condition, compared to no label, the processed label was evaluated as more harmful to health (p = 0.04, d = 0.35), and the synthetic label was evaluated as more harmful to health (p = <.001, d = 0.74), less beneficial to health (p = 0.03, d = 0.39), and less willing to use (p = 0.003, d = 0.52). Follow-up pair-wise comparisons found that the synthetic label was seen as more harmful compared to both the processed (p = 0.01, d = 0.42) and imitation (p = <.001, d = 0.59) label. Past 30-day cannabis use did not moderate any of the observed relationships for halo or horn labels. Findings suggest

health horn labels may influence cannabis product perceptions more than halo labels. The use of health horn labels may impact behavioral intentions for cannabis edible use. With growing popular perceptions of cannabis health benefits, it is possible that cannabis edibles themselves are perceived to be positive and beneficial to health (i.e., the product itself is a 'halo'), which may weaken the effect of halo labels. Further research on cannabis packaging characteristics (e.g., product type, potency, imagery) is important to identify the impact of halo/horn effects to inform cannabis regulation and policy.

Identifying High-Impact Cannabis Protective Behavioral Strategies Using Machine Learning

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Research has consistently identified Cannabis Protective Behavioral Strategies (PBS) as robust protective factors associated with lower levels of cannabis-related harms. However, most of the existing literature focuses on aggregate data, such as total scores or subscales of the Protective Behavioral Strategies for Marijuana (PBSM) scale. This approach may obscure the unique predictive utility of individual behaviors. The present study aimed to bridge this gap by identifying which specific cannabis PBS items are the strongest predictors of cannabis use frequency, negative cannabis-related consequences, and cannabis use disorder (CUD) symptoms. To achieve a nuanced understanding of these relationships, we utilized two machine learning approaches: random forest and elastic net regression. Each of these techniques allow for the identification of the most influential variables within a large dataset while accounting for multicollinearity. Cannabis-related consequences were measured using the Marijuana Consequences Questionnaire (MACQ), and CUD symptoms were assessed via the Cannabis Use Disorder Identification Test-Revised (CUDIT-R). The random forest models demonstrated significant predictive power, accounting for over half of the variance in cannabis use frequency (R2=.504) and substantial variance in CUD symptoms (R2= .428). The model explained a more modest, yet significant, amount of variance in negative cannabis-related consequences (R2=.260). Elastic net regression yielded comparable results, accounting for similar variance in cannabis use (R2=.447), CUD symptoms (R2=.448), and negative consequences (R2=.210). We highlight items that emerged as the most robust predictors of lower cannabis-related harms (e.g., 'Avoid using marijuana habitually (that is, every day or multiple times a week),' 'Limit use to weekends'). Notably, the hierarchy of the strongest predictors varied across the three outcome measures, suggesting that different strategies may be more or less effective depending on the specific type of harm being targeted. These findings suggest that while PBS are broadly effective, not all strategies carry equal weight in harm reduction. Furthermore, the variability of predictors across outcomes has significant implications for the development of tailored cannabis reduction and harm reduction interventions. By focusing on the most high-impact, specific behaviors-such as limiting use to weekends-clinicians and public health advocates can more effectively target the behaviors most likely to produce meaningful reductions in cannabis-related problems.

Material Hardship and Intention As Moderators of Cannabis Co-use to

Reduce Opioid Use, Withdrawal, and Withdrawal-related Pain Among Community Recruited People Who Inject Drugs in Los Angeles, CA and Denver, CO

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Introduction: Previous literature has identified cannabis as a potential mechanism for managing opioid withdrawal. We conducted an exploratory analysis to examine how cannabis and opioid use vary by intent and material hardship among a community sample of people who inject drugs (PWID) and use opioids. We considered two moderators: 1) intent and 2) material hardship. Both, intentionality and access to basic needs resources (lack of access to living needs such as food, shelter, clothing, water) may shape when, how, and if cannabis is used in withdrawal management routines. Methods: We recruited 472 PWID in Los Angeles, CA and Denver, CO between 2021 and 2022 and collected data on recent (last 3 months) cannabis use frequency, material hardship levels and cannabis use intentions (i.e., opioid withdrawal or use management). We used mixed-models with Poisson and zero-inflation regression to examine associations between cannabis use, opioid use, opioid withdrawal and withdrawal pain with material hardship and cannabis use intention as moderators. Additionally, we constructed post-hoc multinomial regression models to observe material hardship as a predictor of the use of cannabis to reduce opioid withdrawal. Results: In the sample, 355 (77.34%) PWID used cannabis and 350 (74.15%) reported opioid withdrawal. Cannabis use frequency (p=0.09) and material hardship (p=0.06) were not associated with opioid withdrawal in the full sample, but cannabis use was associated with reduced opioid withdrawal in Denver (p=0.01). Compared to PWID who did not use cannabis, cannabis use with intent to reduce opioid withdrawal was associated with higher opioid withdrawal (p=<0.01). Cannabis and material hardship interacted with each other with higher material hardship predicting a positive association between cannabis and opioid withdrawal (p=<0.01). Higher material hardship predicted higher opioid withdrawal pain (p=<0.01). Participants with medium (p=<0.01) or high (p=<0.01) material hardship were more likely to use cannabis to reduce opioid withdrawal compared to participants with low material hardship. Discussion: Cannabis use was only associated with lower withdrawal in Denver and not in Los Angeles, which suggests moderation by region. Cannabis use with intention to manage withdrawal was associated with higher opioid withdrawal, which suggests that people with higher opioid withdrawal are more likely to use cannabis with an intention to manage the opioid withdrawal. Participants with higher material hardship were more likely to use cannabis with the intent to reduce opioid withdrawal, suggesting that hardship influences those experiencing withdrawal to seek alternative substances to achieve pain relief.

Alcohol Use, Cannabis Expectancies, and Cannabis Use Among Women with and Without Anxiety Disorders

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Background: Co use of alcohol and cannabis (concurrent and simultaneous) is highly prevalent and associated with higher alcohol use disorder (AUD) risk and worse mental health than single substance use. Polysubstance and co use patterns are linked to elevated depression and anxiety, yet most studies do not incorporate cannabis expectancies or focus specifically on women with anxiety disorders. Cannabis expectancies predict use and are increasingly targeted in intervention research. However, it remains unclear, particularly among women with anxiety disorders, whether higher alcohol use is associated with higher cannabis use, how positive and negative cannabis expectancies relate to cannabis use, and whether these associations differ by anxiety disorder status. The present study evaluated associations between alcohol use, cannabis expectancies, and current cannabis use among women with and without anxiety disorders Methods: A 2022-2023 cross sectional online survey was conducted among 412 women in Florida (52% diagnosed with generalized and/or social anxiety disorder; 48% without anxiety disorder). Measures included past 30 day cannabis use (days/month), alcohol use, depressive symptoms, PTSD symptoms, and positive and negative cannabis expectancies. Stepwise linear regression models, stratified by anxiety disorder status, identified independent predictors of cannabis use frequency. Results: The majority of the women identified as White college educated women. Most participants preferred edibles (e.g., gummies) compared to other forms of cannabis use, with equal amount using it for recreational and medicinal purposes. Both groups preferred high THC/low CBD (49%), followed by equal THC/CBD ratios (28%). Women with an anxiety disorder differed significantly from those without on several characteristics: they were younger (mean age 52.6, SD = 12.4 vs. 57.0, SD = 12.6; $p < .001$) and reported higher depressive symptoms (mean 10.8, SD = 5.7 vs. 4.7, SD = 4.8; $p < .001$), anxiety symptoms (mean 12.5, SD = 3.9 vs. 7.9, SD = 3.7; $p < .001$), and PTSD symptoms (mean 2.5, SD = 1.4 vs. 1.5, SD = 1.5; $p = .026$) and positive cannabis expectancies (mean 49.5, SD = 9.3 vs. 47.3, SD = 11.3; $p = 0.032$). No significant differences for negative cannabis expectancies (mean 65.3, SD = 14.2 vs. 63.5, SD = 16.2; $p = 0.29$). Across women with and without anxiety disorders, higher positive cannabis expectancies were associated with more frequent cannabis use ($\beta = 0.42$, $p < .001$), whereas higher negative expectancies predicted less frequent use ($\beta = -0.45$, $p < .001$), consistent with prior expectancy work. Among women with anxiety disorders, greater alcohol use was independently associated with more cannabis use per month ($\beta = 0.18$, $p = .010$) after adjusting for age, PTSD, and depressive symptoms; this association was not observed in women without anxiety disorders. Conclusions: Among women, cannabis expectancies show the expected positive and negative associations with cannabis use. Only women with anxiety disorders exhibited a significant alcohol-cannabis association after accounting for age, PTSD, depression. The findings in this study highlight an anxiety specific alcohol-cannabis co use pathway and modifiable expectancy targets that can inform patient relevant, gender responsive interventions for women with co occurring anxiety and substance

CBD Advertisements: Differences in CBD Appeal, Perceived Product Safety and Perceptions of Prohibited Claims Among CBD Users and Never Users

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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 misleading marketing and health claims that promote unsubstantiated medicinal benefits. However, little is known about how consumers interpret misleading marketing for CBD. Using real-world CBD advertisements, we sought to evaluate the appeal of CBD, perceived product safety, and perceptions of prohibited claims. Methods: Fifty-five real-world CBD advertisements were included in a 20-minute online survey that was completed by 3,076 adults, ages 18-65, who were from a probability-based panel (AmeriSpeak). Ads contained at least one FDA-prohibited claim (drug effect; FDA approved/endorsed; dietary supplement; food additive; false/misleading (scientific); false/misleading (targeting youth)). Current and ever CBD users were oversampled. Participants were randomly assigned to view 5 ads; after viewing each one, participants rated the extent the ad conveyed each FDA prohibited claim type using a 5-point scale from 1-not at all to 5-extremely. After viewing all 5 ads, CBD appeal and product safety were assessed. We calculated the percent of ads with each prohibited claim type, defined as ads that >50% of participants scored as a 3 (somewhat), 4 (quite a bit) or 5 (extremely) on the 5-point scale. We calculated the overall mean scores to indicate if perception of prohibited claim types, appeal, and product safety differed by use status. Sampling weights were applied. Higher scores indicated higher appeal, higher product safety, and recognition of prohibited claims. Results: The sample was 53.3% female, 72.9% White, and 13.5% Hispanic; mean age of 43.6 years. The sample was 32.8% current, 34.2% ever, and 33% never CBD users. Participants perceived 71% of ads as making an unapproved drug/therapeutic claim; 21.8% as promoting a dietary supplement and 18.2% a food additive; 34.5% were perceived as marketing to youth, 23.6% as misleading science, and 3.6% as FDA approved/endorsed. We examined differences in means for perception of the ad conveying a prohibited claim for the 6 claim types for all ads, combined. For all six claim types, current users had higher means indicating the ads contained prohibited claim types compared to ever ($p<0.001$) and never users ($p<0.001$). In addition, current users reported higher CBD appeal compared to ever ($p<0.001$) and never users ($p<0.001$). Current users also reported significantly higher perceived product safety compared to ever ($p<0.001$) and never users ($p<0.001$). Conclusions: Consumers perceived most ads as making at least one FDA-prohibited health claim, with therapeutic benefit the most common. Identification of prohibited claims, ad appeal, and product safety was consistently higher among current users compared to ever and never users. This suggests that current users may be more knowledgeable about CBD and

thus able to identify misleading advertising, but still find the advertising appealing and perceive CBD as safe to use. It also highlights that never and ever users may be more susceptible to misleading advertising because they do recognize prohibited messaging. Understanding consumer perceptions of CBD advertising is important, as prohibited claims could mislead consumers about the risks and benefits of CBD use.

Randomized Controlled Trial to Assess the Impact of CBD Advertising on CBD Product Purchase

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Background. The Agriculture Improvement Act of 2018, (a.k.a. Farm Bill), removed hemp as a Schedule I drug, resulting in an increase of cannabidiol (CBD) products in the marketplace and heightened consumer interest. Approximately 40% of US adults have tried CBD, despite the lack of scientific evidence on its safety and efficacy. Illicit health claims promoting CBD as an unapproved drug, dietary supplement, and food product have accompanied the market expansion and have been documented at the point-of-sale (POS). Our goal was to assess the impact of CBD advertising made at the point-of-sale on the purchase of CBD products. Design. We conducted an in-person randomized controlled trial (RCT) at a physical convenience store laboratory in North Carolina between January and August 2025. The sample consisted of 460 adults, ages 18-79 who were current CBD users (past 30-day use) (n=153), non-current users (no use within the past 12 months) (n=152) and susceptible non-users (never CBD use and responded probably or definitely yes to being curious about using CBD; trying CBD if a good friend offered; or using CBD in the next six months) (n=155). Participants were randomized to see either non-CBD advertisements (control condition) or CBD advertisements (experimental condition), placed throughout the store. CBD advertisements included real-world advertisements containing marketing claims that are currently prohibited by the FDA, including marketed as an unapproved drug, dietary supplement, food product, FDA-approved/endorsed product or with false and/or misleading information. For both arms, the store contained CBD and non-CBD labeled products from two categories, 1) food/beverages such as chocolates, gummies, and water; and 2) personal products, such as oils and lotion. Participants received instructions to complete an in-store shopping task, along with a $75 debit card. After completing the shopping task, participants completed a survey on a laptop, received a $75 incentive, but did not keep any of the products purchased during the task. The primary outcome was the purchase of at least one CBD product modeled using logistic regression with a fixed effect for experimental condition adjusted for user group, age, sex and race. Results. The sample was 68.9% female, 66.1% White and 7.4% Hispanic, with a mean age of 44 years. Among all participants, 74.3% of those in the

experimental condition purchased at least 1 CBD product, compared to 70.9% in the control condition. This difference was not statistically significant in adjusted models (p=0.517). However, there was a significant interaction between experimental condition and user group (p=0.040). Among susceptible non-users, those who saw CBD ads were 2.23 times more likely to purchase a CBD product than those who did not see the ads (p=0.02). There was no statistically significant effect of CBD ads for current or ever users. Conclusions. Our findings show that CBD advertising affects susceptible non-users' decision to purchase CBD products. Efforts are needed to regulate and monitor misleading advertising about CBD to prevent those who have never used from trying.

Everyday Discrimination, Insomnia Symptoms, and Cannabis Use

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Previous research showed that perceived discrimination (Lei et al., 2021; Qeadan et al., 2022) and insomnia symptoms were associated with substance use (Hasler et al., 2016; Wong et al., 2015; Miller et al., 2021). In this study, we examined whether insomnia symptoms mediated the relationship between perceived discrimination and substance use. Data was drawn from ART 3.0, an ongoing study that examined risk and protective factors of substance use at ten U.S. universities. Participants were 886 college students who reported lifetime marijuana use (Mage= 20.61, SD=5.24; 73% female, 68% White, 14% Black/African American). Perceived discrimination was measured by the Everyday Discrimination Scale (Williams et al., 1997). Insomnia symptoms were measured by the Insomnia Severity Index (ISI) (Bastien et al., 2000). Cannabis use was measured by the Cannabis Use Disorders Identification Test (CUDIT) (Adamson et al., 2010). Data were analyzed by multiple and logistic regression models. Mediation analyses were conducted using the Process Macro in SPSS. All analyses controlled for age, sex, and race (0=non-Black/AA; 1=Black/AA). Everyday discrimination (b=.055 (.018), p<.01) and insomnia symptoms (b=.141 (.037), p<.001) significantly predicted cannabis use and related problems. Higher perceived discrimination predicted more insomnia symptoms (b=.133 (.016), p<.001). Insomnia symptoms significantly mediated the relationship between everyday discrimination and cannabis use and related problems (95% bootstrap CI=.008 to .030, p<.05). Everyday discrimination (OR=1.012, p<.05) and insomnia symptoms (OR=1.027, p<.05) also predicted hazardous cannabis use (CUDIT score > 8). Insomnia symptoms significantly mediated the relationship between perceived discrimination and hazardous cannabis use (95% bootstrap CI=.002 to .009, p<.05). African Americans and Blacks reported significantly more discrimination (b=2.163 (.572), p<.001) and more insomnia symptoms than other racial groups (b=.823 (.292), p<.01). Whites reported significantly less insomnia symptoms than non-Whites (b=-1.062 (.22), p<.001). There were no racial or ethnic differences on cannabis use and related problems. Implications of these findings on the prevention and intervention of cannabis use and misuse among college students will be discussed.

Driving by Frequent Cannabis Users 'the Morning After' Last Use of Smoked Cannabis: Relationship to THC

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Aims: Cannabis can affect driving in the hours after use of cannabis, but the duration of these effects is not known. Driving after the use of cannabis is deterred through measurement of delta-9-tetrahydrocannabinol (THC) in blood and oral fluid. However, the relationship of blood and oral fluid THC to driving the day after cannabis use is not clear. The purpose of the present study was to evaluate driving the morning after smoking cannabis the night before and to study the relationship of driving to blood and oral fluid THC. Methods: This was a parallel group observational study in which frequent cannabis users (>4 times a week) were asked to smoke their usual, preferred and legally sourced cannabis the night before (12-15 hours), the test session. Performance was compared to a control group that had not used cannabis recently. Results: In total, 65 participants in each group completed all study procedures, with 33 males in each group and a mean age of 30 years (SD cannabis group: 7.2; control group: 6.6). The groups were matched on age and sex, years of driving experience, amount of driving in the past year/week, amount of sleep, but differed in race and highest education attained. Under both standard and dual task (higher cognitive load) conditions, standard deviation of lateral position (SDLP) was higher in the control group (standard: 0.305 + 0.008 meters; dual task: 0.272 + 0.006 meters) compared to the cannabis group (standard: 0.28 + 0.008 meters; dual task: 0.256 + 0.006 meters); these differences were small (Cohen's d -0.389 (standard) and -0.359 (dual task)) but significant ($p<0.05$). Measures of speed and following distance were not impacted. Blood and oral fluid THC concentrations were not significantly correlated with any measure of driving. Mean concentrations of blood THC were 2.75 (+3.97) ng/mL, which is above the 2 ng/mL limit used to define impaired driving in some jurisdictions. Conclusions: The results of the present study suggest that frequent cannabis users may not be impaired the morning after last use of smoked cannabis. However, mean levels of THC was still above the legal limit; there is an uncertain relationship of driving to blood and oral fluid THC. Future studies should test participants who use cannabis less frequently or after different routes of administration.

Patient-Reported Patterns of Cannabis Consumption and Subjective Effects in Rheumatic and Musculoskeletal Diseases

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Kaleb Michaud (University of Nebraska)

Background: Prior research suggests cannabis is used by subsets of patients with rheumatic and musculoskeletal diseases (RMD), particularly for pain and symptom

management; however, cannabis use has not been well characterized across RMD populations more broadly. Most existing studies focus on specific conditions or rely on simplified classifications of cannabis use that may not reflect real-world patient behavior. We describe current cannabis use across a diverse RMD population using detailed patient-reported data. Methods: We conducted a cross-sectional, anonymous online survey of adults with self-reported RMD between November 1, 2025 and February 10, 2026. The survey assessed demographics, RMD diagnoses, pain and health status, current cannabis consumption (past 30 days), purpose of use, THC-containing product use (with or without CBD), routes of administration, perceived benefits and adverse effects, and changes in use of other medications. Analyses are descriptive. Results: A total of 818 respondents completed the survey. The sample was predominantly female (63%), White (93%), over 60 (71.7%) and highly educated, with 65% reporting at least a bachelor's degree. Chronic pain lasting longer than three months was reported by 76.0% of respondents. The most commonly reported RMD diagnoses were rheumatoid arthritis (41.8%), osteoarthritis (41.6%), fibromyalgia (15.6%), psoriatic arthritis (5.7%), and ankylosing spondylitis (5.3%). Current cannabis consumption (past 30 days) was reported by 166 respondents (20.3%). Among current consumers, 46.4% reported both medical and recreational use, 30.1% medical-only use, and 23.5% recreational-only use. Nearly one-quarter (23.9%) of current consumers reported having a medical cannabis card. In the past four weeks, 76.0% of current consumers reported THC-containing products (with or without CBD), indicating that THC use spans medical, recreational, and dual-use groups. Among current consumers reporting THC-containing product use, oral routes were most common, including edibles (71.4%), followed by smoking (26.2%), vaping (19.6%), oils or tinctures (16.1%), and topical products (17.3%). Licensed dispensaries were the primary source of purchasing cannabis, reported by 62.4% of current consumers. Benefits were reported from cannabis use, with 39.8% and 47.0% reporting that cannabis made them feel much or somewhat better, respectively. THC- and CBD-containing products were used four or more times per week by 52.4% and 36.7% of consumers, respectively, indicating regular consumption among a substantial proportion of respondents. Positive subjective effects included less pain (79.9%), improved sleep (73.6%), reduced anxiety (42.5%), and less suffering related to illness (29.9%). Adverse subjective effects were common, including dry mouth (40.4%), drowsiness (36.1%), feeling 'high' (30.7%), difficulty concentrating (16.3%), anxiety or paranoia (9.0%), and dizziness (6.0%). Opioid or narcotic reduction was reported by 19.2% of current users. Conclusions: Across a broad RMD population, patient-reported cannabis consumption was common and heterogeneous with respect to THC exposure, route of administration, and frequency of use. A substantial proportion of current users reported frequent use and meaningful symptom improvement, including reduced pain, improved sleep, and reduced overall suffering with adverse effects of dry mouth, drowsiness, and feeling high. These findings highlight the importance of capturing real-world patterns of cannabis consumption and patient-centered outcomes when characterizing cannabis consumption in medical populations.

2025 Survey of New Mexico Cannabis Consumers: Findings from Registered Medical Cannabis Patients

Ismail Zoutat (State of New Mexico Department of Health)

Dominick Zurlo (State of New Mexico Department of Health)
Rosalie Nava (State of New Mexico Department of Health)
Carman Batista (State of New Mexico Department of Health)
Adrian Estrada (State of New Mexico Department of Health)
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The New Mexico Department of Health's Center for Medical Cannabis and Psilocybin conducted a statewide survey (March-May 2025) to understand medical cannabis patient experiences. Among 748 respondents, 32.4% (n=242) were registered medical cannabis patients. Cannabis use exclusively for medical purposes continued to decline compared to previous survey years, with more patients reporting combined medical and adult-use consumption. Most medical patients used cannabis regularly (94% monthly; 55% daily), and 60% intentionally selected high-THC products. Those taking tolerance breaks more often reported greater symptom improvement. Thirty-eight percent (38%) of new patients registered through a primary care provider, though most described the enrollment process as easy. Patients (71%) reported improved supply and cost after adult-use legalization, and 84% planned to remain in the program. Overall patient satisfaction with the Medical Cannabis Program remained high, and most respondents reported plans to remain enrolled. (NMDOH, 2025, pp. 14-26).

PANELS AND SYMPOSIA

Symposium Title:
Weeding Through the Complexities of the Cannabis Continuum
Chair: Elizabeth R. Aston (Brown University)
Discussant: Hayley Treloar Padovano (Brown University)

Addiction is both a reality and a myth. Diagnostic labels, such as cannabis use disorder (CUD), offer valuable conceptual and biological shorthand for the behaviors and experiences of 'addiction,' but the etiology is inherently dynamic, unfolding over time with repeated drug exposures. Viewing CUD symptoms at a fixed point is helpful to triage preventative interventions and treatment, but the concept of a 'stable diagnosis' is a misnomer. This symposium stands on the shoulders of many others by seeking to describe the elusive concept of cannabis dependence, which is at once fluid and unchanging, and its development. This symposium will aim to weed through the complexities and map the cannabis continuum from its pre-exposure roots. Our speakers will illustrate how innate vulnerabilities meet environmental opportunity, ultimately demonstrating a multifaceted conceptualization of addiction. Dr. Aston will present results from work validating a novel behavioral economic purchase task for cannabis edibles among young adults; Dr. Smith-LeCavalier will present research characterizing the co-use phenotype of cannabis use and same-day alcohol consumption among adolescents; Dr. Sokolovsky will discuss daily correlates of CUD risk among young adults endorsing dual use of combustible and electronic cigarettes; and Dr. Micalizzi will present findings from a prospective study of susceptibility and risk for CUD progression using bioverified prenatal tobacco exposure. All presentations will discuss implications for the study of CUD, including its progression and maintenance. Dr. Treloar Padovano will synthesize these presentations and will comment on the complex and labile nature of CUD from gestation through young adulthood.

Talk 1:

Gimmie the Gummies: Initial Validation of the Edibles Marijuana Purchase Task (eMPT) Among Young Adults

Elizabeth R. Aston (Brown University)
Michael Amlung (University of Kansas)

Background: The traditional Marijuana Purchase Task (MPT) assesses hypothetical demand (i.e., relative value) for cannabis flower (i.e., cannabis sativa plant material) across escalating price, and has been related to use, cannabis expenditure, and cannabis use disorder (CUD) symptoms. However, the MPT is specific to demand for cannabis flower, resulting in limited utility for individuals who endorse use of other cannabis formulations. While flower remains the most commonly used formulation, other formulations are rapidly increasing in popularity. Edibles are the second most endorsed formulation; their increasing popularity may be attributed to their discretion, convenience, effect duration, and health-related appeal as no combustion or inhalation into the lungs is required. As such, the present investigation aimed to validate a novel measure of edible demand: the eMPT. Method: Data were drawn from a sample of young adults attending a baseline laboratory session as part of a longitudinal investigation on cannabis use patterns (n=74). All participants endorsed lifetime use of cannabis edibles. Participants completed the eMPT, the MPT, and key cannabis use outcome measures including the Cannabis Use Disorders Identification Test – Revised (CUDIT-R). Separate demand curves for hazardous (CUDIT-R total score ≥ 8; n = 65) and non-hazardous (CUDIT-R total score < 8; n = 9) cannabis consumers were plotted. Participants also reported on cannabis expenditures. Results: Demand data from the eMPT was highly systematic and prototypical. Individual-level demand curves showed substantial variability in consumption. Participants reported they would consume on average fifteen 0.5mg edibles if they were free, would stop consuming edibles above $8.31/each, and would spend a maximum of $21 on edibles to use over a seven-day period. Multiple eMPT indices were significantly intercorrelated (rs =.43-.93), and correlated with corresponding MPT indices (rs =.52-.69), past 30-day expenditures on cannabis (rs =.39-.41), and past 6-month expenditures on cannabis (rs =.49-.54). Multiple eMPT indices were also significantly associated with CUDIT-R total score (rs =.24-.41). There were

no statistically significant differences for any demand index as a function of CUDIT-R score (ps >.125; ds =.11-.44). Conclusions: These findings demonstrate that the eMPT is a valid assessment of cannabis edible demand and fulfills an unmet need in the cannabis demand literature for edible-specific purchase tasks. Though eMPT indices were not significantly differentiated as a function of CUDIT-R score, this may be attributed to 88% of the sample endorsing hazardous use, resulting in a small sample size in the non-hazardous group. Findings from the present investigation have implications germane to public health as there is great benefit in the availability of a tool that can assess cannabis demand in a way that better maps on to the shifting commercial market, with the ultimate goal of mitigating formulation-specific harms. Experimental cannabis marketplaces, both simulated and virtual, may be used to assess demand for multiple formulations at the same time, better modeling rising multi-formulation use behavior and real-world dispensary purchasing experiences. Subsequent research should continue to develop purchase tasks for other increasingly prevalent cannabis formulations due to the proliferation of novel cannabis products in the recreational market.

Talk 2:

Characterizing the Co-use Phenotype of Cannabis Use and Same-Day Alcohol Consumption Among Adolescents

Kirstyn N. Smith-LeCavalier (Brown University)
Jane Metrik (Brown University)
Jamie E. Parnes (University of Massachusetts, Amherst)
Hayley Treloar Padovano (Brown University)

Background: Earlier initiation of cannabis use robustly predicts unwanted cannabis-related consequences and more rapid progression to daily use and cannabis use disorder (CUD). While efforts have been made to better understand adolescent cannabis use, significant work is still needed given the complexity and developmental nature of contributing factors during this period. It is increasingly common for adolescents to use cannabis in combination with alcohol, and co-use during this period is associated with greater consequences than single-substance use. Broader literature has provided support for both substitution (i.e., use of one offsets use of the other) and complementary (i.e., encourages use) effects of alcohol and cannabis co-use, which suggests there are nuanced patterns of co-use. Extant research examining these associations among non-treatment seeking adolescents and young adults suggests greater likelihood of complementary effects. The present research expands current understanding of cannabis use patterns during the sensitive developmental period of adolescence by examining cannabis use as a predictor of alcohol use and overuse (i.e., drinking more than planned) at the daily level. We

hypothesized greater alcohol consumption and drinking more than planned on days when cannabis use was also reported. Methods: Daily co-use data were sourced from a larger study examining development of alcohol pathology in adolescents (15-17) using three 24-day bursts of ecological momentary assessment (EMA). For the parent study, adolescents (N=112) endorsed recent alcohol use but did not meet criteria for moderate or severe AUD. The evaluable dataset included the subset (n=89) who reported cannabis use for at least one EMA report during any wave of the study. At screening, adolescents reported an average age of 16.4 years (SD=0.78; 60.7% female), and 29.2% reported a minoritized racial or ethnic identity. Generalized linear mixed-effect models examined associations of cannabis use (day-level use and person-level proportion cannabis-use days) with same-day total standard drinks (counts; negative binomial) and drinking more than planned (yes/no; binary). Models controlled for sex, age, and daily covariates (weekend status, nicotine use). Results: Findings partially supported hypotheses: on days when adolescents used cannabis, they also consumed more drinks (M=4.46) than days they did not use (M=3.54), RR 95CI (1.05, 1.51), disaggregated from effects of person-level cannabis on alcohol use, which were nonsignificant, RR 95CI (0.58, 1.15). Cannabis use at day and person levels was not significantly associated with drinking more than planned. Conclusions: Findings provide support for complementary effects of same-day cannabis and alcohol use in adolescents, which could increase risk of acute and long-term harms. The associations with drinking more than planned were not supported suggesting heavier drinking may be planned on co-use days-a novel question for ongoing research. Future research would benefit from replication with higher temporal resolution to examine ordering effects of cannabis and alcohol use and associations with a wider range of consequences.

Talk 3:

Daily-Life Behavioral Correlates of CUDIT-R Classifications of CUD Risk Among Young Adult Dual Users of Combustible and Electronic Cigarettes

Alexander W. Sokolovsky (Brown University)

Introduction: With the growing prevalence and legalization of cannabis, there is a concomitant need to screen for cannabis use disorder (CUD) to enhance clinical care. A wealth of research has examined the psychometrics, validity, and utility of the CUDIT-R in a variety of populations and clinical settings. However, it remains unclear whether syndromal CUD, as operationalized by the CUDIT-R, actually corresponds to differences in lived experiences. While the utility of screening would not necessarily be undermined if such differences did not emerge, given the heterogeneity in symptom presentations, it would suggest that such screening should potentially be interpreted as a marker of ipsative versus normative risk. To this end, the present study used ecological momentary assessment (EMA) to investigate daily-life behavioral correlates of the CUDIT-R. Methods: Participants (N=68) were recruited from the local community near Providence, RI and enrolled in a multi-method study of combustible and electronic cigarette dual users. Study procedures comprised completing a baseline survey, two laboratory sessions, and 28 days of EMA, including the random, morning, and self-initiated tobacco use surveys investigated herein. For the present analyses, we retained data from a subset of n=37 (54.4%) participants who reported any cannabis use during the EMA portion of the parent study, resulting in nobs=3,125 random reports, nobs=725 tobacco use reports, and nobs=706

morning reports. To examine the daily-life behavioral correlates of CUDIT-assessed CUD risk classifications, we fit a series of models regressing daily or momentary variables often associated with CUD onto individuals' person-level CUDIT risk classification (i.e., 'low', 'moderate', and 'high' risk) and continuous CUDIT scores. All models adjusted for age, sex, race, and ethnicity. We also adjusted for concurrent alcohol and tobacco use quantity and a binary measure of other drug use. In the model investigating subjective intoxication as an outcome we adjusted for latency since cannabis use. Results: Among the 37 retained participants (Mage=25.68, SD=4.14), n=17 (45.9%) were classified by the CUDIT as low, n=8 as moderate (21.6%), and n=12 (32.4%) as high-risk for CUD. High but not moderate CUD risk was associated with increased odds of daily cannabis use and a greater number of daily hits of cannabis flower than individuals classified as low risk. Gradient effects associated with CUDIT sum scores were also observed for these outcomes. In contrast, we did not observe differences between CUDIT risk classifications or gradient effects of sum scores for either degree of intoxication, total sleep time, or cannabis use while at work. Conclusions: Considerable differences in daily cannabis consumption, but not other situational factors, were observed across CUDIT-R risk classifications. As cannabis consumption is universal across in CUD whereas other indicators (e.g., those related to consequences) are heterogeneously present across individuals (and are of unknown relative predictive value for risk), developing novel ways to use this screening that account for ipsative risk and individuals perceptions of harm rather than relying on normative cutoff scores across individuals may be worthwhile.

Talk 4:

Bioverified Prenatal Tobacco Exposure and Adolescent Cannabis Use Risk: A Prospective Study of Susceptibility and Risk Progression

Lauren Micalizzi (Brown University)

Introduction: There is some evidence that offspring exposed to prenatal tobacco use have elevated risk of cannabis use in adolescence, with some studies suggesting dose-response associations. Early susceptibility to substance use, such as curiosity about or willingness to try substances, predicts later initiation, but no prior study has examined prenatal tobacco exposure in relation to both adolescent cannabis use and susceptibility, or progression toward use over time. Methods: This study used data from a subset of adolescents (N=99; Mage=14.9, SD=1.4; 52% male) whose mothers participated in a randomized trial of a smoke avoidance intervention approximately 15 years earlier. Prospectively collected, bio-verified prenatal (34 weeks' gestation) and postnatal (6 months postpartum) smoke exposure from the parent study were linked with adolescent self-reported cannabis use and susceptibility in the current study. At each wave, baseline, 6 months, and 12 months, adolescents reported lifetime cannabis use. Among those who had not used cannabis, susceptibility was assessed. Susceptibility was defined as any positive indication to six items assessing willingness to use cannabis if offered in various settings and across various time scales. A three-level ordinal cannabis risk variable was created (0=neither, 1=susceptible, 2=lifetime use) at each wave. Ordinal logistic regression models tested whether prenatal smoke exposure predicted baseline cannabis risk (Model 1), and whether baseline risk predicted progression to higher-risk outcomes at 6 months (Model 2) and 12 months (Model 3). Models also considered whether prenatal smoke exposure

moderated these associations, adjusting for age, sex, and postnatal smoke exposure. Results: Third-trimester smoke exposure was not significantly associated with cannabis risk at baseline (OR=1.00, 95% CI [0.99, 1.01], p=.28; Model 1). At 6 months, prenatal smoke exposure was not associated with cannabis risk among adolescents with no baseline risk (OR=0.35, 95% CI [0.06, 1.93], p=.23). Baseline cannabis risk significantly predicted higher-risk outcomes at follow-up among both unexposed youth (OR=0.06, 95% CI [0.02, 0.24], p<.001) and exposed youth (OR=0.02, 95% CI [0.001, 0.18], p=.001), with no evidence of moderation (Model 2). A similar pattern was observed at 12 months (Model 3). Prenatal smoke exposure was not associated with follow-up risk among adolescents with no baseline risk (OR=0.74, 95% CI [0.20, 2.74], p=.65), whereas baseline risk predicted higher-risk outcomes among both unexposed (OR=0.06, 95% CI [0.01, 0.24], p<.001) and exposed youth (OR=0.19, 95% CI [0.06, 0.68], p=.01). Conclusion: Baseline susceptibility emerged as the strongest predictor of progression to higher-risk cannabis outcomes across follow-up. Prenatal smoke exposure was not independently associated with risk and did not moderate risk progression. Given the limited number of progression events, findings should be interpreted cautiously but suggest that early susceptibility may be a more proximal indicator of cannabis risk progression than prenatal smoke exposure.

Symposium Title:

Understanding Adolescent and Adult Cannabis Co-use with Alcohol and/or Nicotine: Integrating Experimental and EMA Findings

Chair: Holly K. Boyle (Yale School of Medicine)

Co-use of cannabis with other psychoactive substances, particularly alcohol and nicotine, is increasingly common among adolescents and adults. This symposium presents four studies using laboratory and ecological momentary assessment (EMA) methods to examine patterns, predictors, and effects of cannabis co-use. The first presentation reports a laboratory experiment examining whether cannabis use influences cigarette puff choices under normal versus very low nicotine cigarette (VLNC) conditions among adolescents who smoke. Although cannabis use was associated with greater cigarette use, it did not influence the effectiveness of VLNC cigarettes for reducing cigarette choice. The second study presents a moderation analysis of a double-blind crossover trial (smoked THC vs. placebo) among adults, finding that observed alcohol-reducing effects of acute THC are attenuated by high baseline cannabis frequency and medical motives. Shifting to naturalistic settings, the third study used EMA to examine cannabis co-use with alcohol and/or nicotine among young adults. Compared with cannabis-only days, cannabis co-use with alcohol and/or nicotine was associated with more frequent cannabis use. Additionally, cannabis-nicotine co-use days were associated with greater likelihood of flower use, lower likelihood of edible use, and lower subjective 'high'. Lastly, the fourth study used EMA to assess whether cannabis acutely reduces alcohol craving among young adults. No evidence was found for cannabis' momentary impact on alcohol craving relative to non-use moments. However, examining cannabis use moments, a significant positive association between subjective cannabis 'high' and alcohol craving was identified. Together, these findings advance understanding of cannabis co-use and inform harm reduction and public health policy.

Talk 1:

Does Marijuana Use Weaken the Effect of Reducing Nicotine on Choices to Smoke in Adolescents Who Smoke Cigarettes?

Rachel N. Cassidy (Brown University)
Jennifer W. Tidey (Brown University)
Mariel S. Bello (Medical University of South Carolina)
Eric Donny (Wake Forest University School of Medicine)
Dorothy Hatsukami (University of Minnesota)
Suzanne M. Colby (Brown University)

Cigarette smoking remains a leading cause of death in the United States. With 480,000 deaths attributed to smoking every year, new approaches to tobacco control are needed. One innovative tobacco policy that has been proposed by FDA is to mandate a reduction in the level of nicotine allowed in commercial cigarettes, which would lessen the addictiveness of these harmful products and promote complete smoking cessation or switching to less harmful sources of nicotine and, ideally, eventual nicotine cessation. Adolescents are an important population for tobacco control, as most smoking begins before the age of 21. Adolescents also have unique patterns, motivations, and barriers to cessation relative to older adults, such as higher rates of concurrent marijuana use, which may impact how they would respond to a potential nicotine reduction standard (NRS). We conducted a laboratory study which asked adolescents ages 18-20 (N=80) who smoked daily to abstain from smoking overnight and then make choices between receiving puffs of a cigarette and puffs of an e-cigarette across 10 trials. The participants were randomized to receive either a very low nicotine content (0.4mg/g nicotine, VLNC) or normal nicotine content cigarette (15.8 mg/g nicotine, NNC; between-subjects factor). Participants completed four sessions in which the concurrently available e-cigarette varied in flavor (tobacco or non-tobacco flavor) and concentration (3mg or 18mg of nicotine). The primary analysis found that VLNC assignment and e-cigarette availability reduced cigarette choices. In this secondary analysis, we found that greater days of marijuana use was significantly correlated with cigarettes per day at baseline, ($r=.24$, $p=.03$); thus, we hypothesized that greater marijuana use may be associated with more choices to smoke overall. We then conducted a regression analysis to determine if marijuana use was predictive of greater cigarette choices in the laboratory task. We found that, contrary to our hypothesis, marijuana use was not predictive of greater cigarette choices across trials ($\beta=-.07$, $p=.51$), while VLNC cigarette assignment was associated with fewer cigarette choices as expected ($\beta=-.37$, $p<.001$) when controlling for baseline cigarettes per day ($\beta=.21$, $p=.05$). This secondary analysis suggests that despite a significant correlation between marijuana use and cigarettes per day, marijuana use did not diminish the main effect of VLNC assignment, such that this factor drove fewer cigarette choices evenly among this group. These results also comport with data from clinical trials with adults that suggest that adolescents who smoke and use marijuana would still benefit from an NRS.

Talk 2:

Variability in Cannabis Use Patterns Modulates Acute Effects of THC on Alcohol Consumption

Lindy K. Howe (Brown University)
Rachel L. Gunn (Brown University)
Jane Metrik (Brown University)

Background. Cannabis use is observationally linked to heavier drinking, yet experimental evidence on the causal effects of delta-9-tetrahydrocannabinol (THC) on alcohol outcomes is limited. A recent double-blind crossover randomized clinical trial tested the effect of smoked THC (placebo, 3.1%, 7.2%)

on alcohol self-administration and found that THC significantly reduced alcohol consumption relative to placebo, suggesting acute THC administration may decrease alcohol use in some contexts. However, these effects may vary across individuals based on cannabis use patterns and motives. For example, individuals that frequently use cannabis or endorse use for 'medical' reasons may exhibit altered sensitivity to THC due to functional tolerance or differing motivations for therapeutic use. The current study is a secondary analysis of the clinical trial data examining baseline frequency of cannabis use and use for therapeutic purposes as moderators of THC's acute effect on alcohol self-administration. Method. Participants (N=138; 34.8% female; M(SD) age=25.6 (5.1); 63% White) reported heavy episodic drinking at least monthly and cannabis use at least twice per week. Baseline cannabis frequency (% Timeline Follow Back days) and therapeutic cannabis use ('How often have you used marijuana for therapeutic purposes'; never [0] - daily [4]) were assessed prior to three laboratory sessions involving smoked cannabis (7.2% THC, 3.1% THC, or placebo) followed by an ad libitum alcohol choice task. Generalized estimating equations examined whether (1) baseline cannabis use frequency and (2) frequency of therapeutic use moderated the dose-dependent effects of THC (7.2% and 3.1% vs. placebo) on alcohol consumption (% alcohol consumed). Results. 1) Baseline cannabis use frequency moderated the effect of THC on alcohol consumption at the 3.1% dose ($b=0.28$, $p<.01$), but not the 7.2% dose ($p=.18$). Simple effects analyses (±1SD) indicated that the 3.1% dose significantly reduced alcohol consumption among participants with lower ($b=12.44$, $p<.001$) and mean ($b=9.61$, $p<.001$) baseline levels of cannabis use frequency, while no significant reduction was observed for those with higher levels of baseline cannabis use ($p=0.75$). 2) Similarly, frequency of therapeutic use (±1SD) moderated the effect of THC at the 3.1% dose ($b=2.77$, $p=.033$) but not for the 7.2% dose ($b=2.88$, $p=.052$). Specifically, the 3.1% THC dose reduced alcohol consumption relative to placebo for participants reporting lower ($b=10.80$, $p<.001$) and mean ($b=6.76$, $p<.01$) frequency levels of therapeutic use while the effect was non-significant for those reporting higher frequent therapeutic use ($p=.33$). Discussion. Overall, these findings suggest baseline cannabis patterns are related to THC's acute effects on alcohol consumption, with results potentially suggesting reduced sensitivity among more frequent users. The higher THC dose may produce a sufficiently strong pharmacological effect to reduce alcohol consumption regardless of cannabis use frequency. These results highlight the importance of considering individual cannabis use patterns when evaluating THC's impact on alcohol-related outcomes.

Talk 3:

Day-Level Cannabis Use Patterns and Perceived Intoxication During Alcohol and/or Nicotine Co-Use Among Young Adults

Holly K. Boyle (Yale School of Medicine)
Jennifer E. Merrill (Brown University)

As cannabis legalization expands across the U.S., exclusive use of flower has become less common, while use of high-potency cannabis products such as concentrates and edibles are increasing. This shift coincides with rising co-use of cannabis with alcohol and nicotine among young adults, raising public health concerns. Despite its prevalence, little research has examined how alcohol and/or nicotine use with cannabis may influence cannabis consumption behaviors and subjective experiences. This study examines whether product choice, use of multiple versus a single form, consumption patterns,

and perceived high differ across co-use contexts. We hypothesized that cannabis use with alcohol and/or nicotine (versus cannabis-only use) would be associated with more frequent cannabis use and increased subjective high. Young adults reporting heavy drinking completed 28 days of ecological momentary assessment. Each morning, participants reported alcohol, cannabis, and nicotine use from the prior day. On cannabis days, participants reported: (1) forms of cannabis used (flower, concentrates, edibles), (2) number of cannabis sessions, and (3) how high they felt (not at all-extremely). Across 1400 cannabis days, 19.9% were polysubstance use days (cannabis, alcohol, nicotine), 12.9% were cannabis-nicotine co-use days, 30.7% were cannabis-alcohol co-use days, and 36.5% were cannabis-only days. Multilevel modeling was used for all analyses controlling for day of week, day in study, sex, age, and (when predicting subjective high) number of cannabis sessions. Compared to cannabis-only days, young adults were more likely to use flower on cannabis-nicotine co-use days (OR=2.42, 95% CI=1.02-5.73) and polysubstance use days (OR=2.42, 95% CI=2.23-4.77), and less likely to use edibles on cannabis-nicotine co-use and polysubstance use days (OR=0.27, 95% CI=0.09-0.83 and OR=0.40, 95% CI=0.16-0.99, respectively). Likelihood of using multiple versus a single cannabis form did not differ across days. Participants reported more cannabis sessions on cannabis-alcohol co-use days (OR=1.10, 95% CI=1.01-1.21), cannabis-nicotine co-use days (OR=1.19, 95% CI=1.01-1.39), and polysubstance use days (OR=1.16, 95% CI=1.04-1.29) relative to cannabis-only days. Controlling for number of cannabis sessions, participants reported lower subjective high on cannabis-nicotine co-use days compared to cannabis-only days (β=-0.25, p=0.045). Cannabis use with nicotine appears to shape both cannabis product selection and subjective high among young adults. The greater likelihood of using flower when nicotine is also used may reflect shared administration routes (e.g., smoking or vaping cannabis flower and tobacco) and social contexts that facilitate co-use. Lower likelihood of edible use on nicotine co-use days suggests rapidly acting inhaled products may be preferred when these substances are used together. Cannabis use with alcohol and/or nicotine was also associated with more frequent cannabis use, which has important public health implications, as greater cannabis use when combined with alcohol or nicotine may increase risk for acute harms, greater intoxication-related impairment, and heavier substance use. Lower perceived intoxication on nicotine and cannabis co-use days may contribute to misperceptions of impairment and further increases in cannabis consumption. Future research should examine how cannabis co-use with alcohol and nicotine influences short- and long-term health risks to inform targeted prevention and harm reduction efforts among young adults.

Talk 4:

Cannabis Use is Associated with Lower Alcohol Craving in the Natural Environment Among Young Adults

Rachel L. Gunn (Brown University)
Lindy K. Howe (Brown University)
Jane Metrik (Brown University)

Background: In the wake of expanding legalization and reduced risk perception of cannabis, there is increasing interest in the potential of cannabis as a substitute for other substance use, particularly alcohol. However, there is contrasting theory and concern that cannabis could exacerbate alcohol misuse and resulting consequences, as cannabis use is associated with heavy drinking and poorer alcohol treatment outcomes. Craving is a key factor in the proximal prediction of alcohol

use, a persistent symptom of AUD, and therefore a critical indicator of cannabis' potential substitutive versus complementary effect. Recent placebo-controlled laboratory work has demonstrated that cannabis does acutely reduce alcohol demand and consumption, in part due to reductions in alcohol craving. This highly controlled laboratory work builds the foundation for understanding the behavioral pharmacology of these effects yet is limited in external validity. Direct examination of the momentary impact of naturalistic cannabis use on alcohol craving would aid in further clarifying these competing theories and directly inform intervention and prevention methods. The present study sought to test the substitutive effects of cannabis on alcohol craving in the natural environment by examining: 1) whether cannabis use events were associated with lower craving relative to non-use; and 2) whether higher levels of subjective intoxication during cannabis use were associated with lower alcohol craving. Method: A sample of young adults endorsing frequent alcohol and cannabis use (N=115, M(age)=23, 57% female) completed 28-days of ecological momentary assessment (EMA). EMAs included up to four daily random surveys and event-contingent 'begin-use' cannabis surveys just after initiating cannabis use. Multilevel models were used to contrast alcohol craving on random surveys where no substance use was reported (non-use events) versus cannabis begin-use surveys. Participants reported subjective 'high' (10-point Likert scale) on begin-use surveys and subjective 'urge' (i.e., craving, 10-point Likert scale) on both survey types. Both models controlled for person-level demographics (age, sex, race, ethnicity) and day-level covariates (time of day [ref: morning] and day of week [ref: weekday]). Results: Model 1 (cannabis on alcohol craving) revealed no significant effects of cannabis use on alcohol craving. Significant covariates included time of day (afternoon: Est= .77(CI: .50-1.04), p<.001; evening: Est= 1.14(CI: .88-1.400)) and weekend (weekend: Est= .33(CI: .25-.42), p<.001). Model 2 (subjective intoxication on alcohol craving) revealed a significant and positive effect of subjective high on alcohol craving (Est= .13(CI: .06-.20), p<.001). Time of day (afternoon: Est= .80(CI: .44-1.6), p<.001; evening: Est=.90(CI: .58-1.22)) was also significant in this model. Conclusions: Results were not consistent with substitution models suggesting that cannabis use reduces craving for alcohol in this young adult non-clinical sample. In fact, results were more aligned with complementary theory, such that higher levels of cannabis intoxication (subjective 'high') were associated with higher levels of alcohol craving ('urge'). This data cautions against the conclusion that cannabis may act as a substitute for alcohol use in young adults. Future work should examine additional contextual factors (e.g., social settings) and samples who may be seeking to reduce alcohol consumption (e.g., AUD treatment samples).

Driving Human Subjects Research in a State of Change: Measurement, Recruitment, and Ethical Lessons Learned in a Cannabis and Open-Road Driving Performance Protocol

Nicole Ennis (Florida State University)
Katie Kloss (Florida State University)
Sara Green (Florida State University)
Yuxia Wang (Florida State University)
Bianca Jean Philippe (Florida State University)
Michael Killian (Florida State University)
John Markowitz (University of Florida)
Jason Rogers (University of Florida)
Sherrilene Classen (University of Florida)

Conducting human subjects research on cannabis in Florida presents a unique set of challenges shaped by legal, regulatory, and

social factors. This panel discussion will focus on lessons learned in implementation through measurement, recruitment, and regulatory processes. Specifically, we will: 1) describe the sample (N=40 to date) and discuss measurement of cannabis and driving performance; 2) examine current recruitment challenges, engagement of community partners and the impact of the changing legal landscape on qualified medical marijuana physicians; and 3) discuss the regulatory and ethical hurdles of this work and describe impactful solutions.

Talk 1:

Quantifying Cannabis: Improving Measurement Strategies Through Data Triangulation

Nicole Ennis (Florida State University)
Sherrilene Classen (University of Florida)
Yuxia Wang (Florida State University)
John Markowitz (University of Florida)
Michael Killian (Florida State University)
Jason Rogers (University of Florida)

Accurately measuring cannabis use remains a persistent challenge in cannabis research, as quantifying consumption reliably across participants is difficult. Dose estimation is particularly problematic due to substantial variability in product potency, routes of administration, and individual metabolic differences. These sources of variation complicate comparisons of consumption patterns and contribute to the limitations of self report. Urinalysis of tetrahydrocannabinol (THC) metabolites which confirm presence or absence, can also provide a marker for level of exposure that is valuable for quantifying chronic use that may impact driving performance (measured as type and frequency of driving errors assessed, on-road, in a test vehicle, by a certified driver rehabilitation specialist). Although measurement of THC metabolites such as liquid chromatography-tandem mass spectrometry (LC-MS/MS) provides valuable insights for assessing cannabis exposure and characterizing patterns of use especially among chronic users, metabolite data also carry important interpretive constraints. In this presentation, we draw on case examples from our current protocol to illustrate a data triangulation approach designed to enhance the credibility, validity, and completeness of cannabis use quantification and discuss its value in the context of driving performance research.

Talk 2:

The Practical Challenges of Recruitment: Managing Recruitment Roadblocks

Katie Kloss (Florida State University)
Bianca Jean Philippe (Florida State University)
Sara Green (Florida State University)
Nicole Ennis (Florida State University)

In addition to standard recruitment challenges, including limited eligibility among potential participants, time and logistical barriers, retention and follow up difficulties, and persistent mistrust of research, cannabis studies in Florida face the added complexity of a rapidly evolving legal landscape. While medical cannabis is currently permitted, statewide debates regarding broader legalization continue. Currently, partnerships with qualified medical marijuana physicians remain essential for successful community-based research; however, these physicians are also navigating a shifting regulatory environment. As of the first week of March 2026, Florida reported 932,991 active medical marijuana cards and 2,162 qualified medical marijuana physicians. In contrast, during the first week of March 2022, there were 688,672 active cards and 2,740 qualified medical marijuana physicians, reflecting a 35.5% increase in patient demand accompanied by a 21.1% decrease in physician availability. These

trends highlight emerging pressures on the medical cannabis system that may influence research feasibility and stakeholder engagement. In this presentation, we outline current considerations and strategies for managing the challenges posed by Florida's evolving cannabis landscape.

Talk 3:

Ethical and Regulatory Lessons Learned from Implementing a Cannabis and Driving Performance Protocol

Sara Green (Florida State University)
Katie Kloss (Florida State University)
Sherrilene Classen (University of Florida)
Nicole Ennis (Florida State University)

As cannabis policy evolves, researchers conducting human subjects research must navigate complex ethical and regulatory considerations that influence study activities and participant protections. In Florida, where medical cannabis is permitted but recreational use remains illegal, investigators must operate within a shifting legal and social environment that can affect institutional oversight, participant willingness to enroll, and the engagement of community partners. This portion of the panel will examine the ethical and regulatory considerations encountered during the implementation of an open-road driving performance protocol involving cannabis use. Drawing on the perspective of bioethics and human subjects protections, the discussion will focus on three key domains: informed consent, risk-benefit assessment, and privacy and confidentiality. Particular attention will be given to how these ethical principles must be operationalized in research involving a substance that remains federally prohibited yet widely used and medically authorized at the state level. Panelists will discuss strategies used to ensure that participants are adequately informed about potential legal, social, and safety considerations associated with participation. In addition, we will examine how risk-benefit analyses were conducted in the context of studying real-world driving performance and how privacy protections were implemented to safeguard sensitive information related to cannabis use. The discussion will highlight practical solutions and lessons learned that may inform future cannabis research conducted in similarly complex regulatory environments.

Symposium Title:

Exploring the Link Between Mental Health and Cannabis Use and Co-use in Young Adults: With Considerations for Clinical Practice

Chair: Kyra N. Farrelly (York University) & Reagan Fitzke (University of New Mexico)
Discussant: Adrian J. Bravo (William & Mary)

Anxiety and stress-related disorders (e.g., posttraumatic stress disorder; PTSD) are highly prevalent and linked with problematic cannabis use and other risky behaviors, including polysubstance use. As rates of cannabis use are higher among individuals who report greater distress, it is critical to consider the relationships between anxiety/stress and cannabis-related consequences in high-risk populations, like young adults, and to consider the implications of this relationship in treatment for co-occurring disorders. This symposium integrates perspectives from the U.S. and Canada to consider anxiety/stress and related psychopathology as predictors of cannabis-use outcomes in young adults, including co-use with other substances, factors that may influence these relationships, and implications for clinical practice. Ms. Penta will use qualitative data to explore cannabis motives, related harms, and mental health factors among transgender and gender-diverse adults who co-use cannabis and alcohol. Ms. Farrelly will then discuss

internalizing symptoms as a predictor for cannabis outcomes and co-use with other substances, examining how medicinal and recreational cannabis use can influence these relationships. Ms. Fitzke will extend this to consider how PTSD symptoms predict daily-level cannabis and polysubstance use, and the mediating role of mood. Ms. Carter will present a case study of a client with co-occurring Cannabis Use Disorder and Generalized Anxiety Disorder to discuss clinical relevance and treatment implications of the relationships explored across talks. This symposium will highlight the relationship between anxiety/stress with cannabis use and related consequences and can help illustrate the importance of competency to address both cannabis use and mental health in clinical practice.

Talk 1:

Cannabis Motives, Harms, and Mental Health Among Canadian Transgender and Gender Diverse Adults Who Co-use Cannabis and Alcohol: A Qualitative Study

Stephanie M. Penta (Toronto Metropolitan University)
Theo F. Quinn (Toronto Metropolitan University)
Sarah S. Dermody (Toronto Metropolitan University)

Background: Cannabis and alcohol are the most commonly co-used substances among Canadian adults (excluding nicotine). Transgender and gender diverse (TGD) adults experience elevated mental health and substance-related harms linked to gender minority stress (GMS), including higher rates of depression and anxiety that may shape substance use motives and harms. The current study explored cannabis motives, harms, and harm reduction strategies among TGD adults who co-use cannabis and alcohol and report problematic cannabis use. Method: Data include a subsample of semi-structured qualitative interviews (n = 19 out of N = 43) from TGD adults who reported cannabis and alcohol co-use, and scored greater than 7 on the CUDIT-R, indicating hazardous or dependent cannabis use. Interviews explored participants' cannabis motives, perceived harms, likes and dislikes, and harm reduction strategies. Interviews were de-identified, transcribed verbatim, and analyzed using combined inductive-deductive reflexive thematic analysis informed by existing measures of cannabis motives and harms. Two researchers independently coded each transcript, and then met to reach consensus. Results: Analyses were based on 18 transcribed interviews, since one was audio file unusable due to distortion. Four participants identified as women/transfemme, 6 as men/transmasc, and 8 as within the gender diverse umbrella (including combinations of nonbinary, agender, genderqueer, genderfluid, gender nonconforming, multigender, two-spirit, and binary identities). On average, participants were 25.83 years old (SD = 6.18) and scored in the dependent range on the CUDIT-R (M = 15.17, SD = 6.64). Participants reported moderate depressive and anxiety symptoms on average (PHQ-8 M = 10.44, SD = 6.08; GAD-7 M = 12.89, SD = 6.15). Many cannabis motives were described, the most common of which included coping with GMS, stress, and anxiety; enhancement; social; relaxation; habit; and medicinal use (e.g., for sleep or pain). Reported harms were diverse and notably included impaired control, hangover symptoms (e.g., feeling drowsy, dehydrated, headache), physical and physiological dependence, and cognitive difficulties (e.g., brain fog, poor executive functioning). Participants described liking cannabis for its emotional and cognitive effects (e.g., mental quiet, introspection), sensations (e.g., relaxation, amplified senses), and attributes of the product or

process (e.g., taste, affordability, process of preparing joints), and disliked it for its emotional (e.g., anxiety), cognitive (e.g., delayed processing), and physical side effects (e.g., impacts on sleep-wake cycle). Common harm reduction strategies included leaning on social supports, intrapersonal awareness (e.g., recognizing personal boundaries and responsibilities), and modifying one's relationship with cannabis (e.g., awareness of harms, limiting use or access, periods of abstinence, using alternative forms). Conclusions: Among TGD adults with hazardous or dependent cannabis use who co-used alcohol, participants reported using cannabis for diverse reasons, frequently to cope with stress, anxiety, depression, and GMS. They also experienced substantial cannabis-related harms, including dependence, hangovers, and cognitive effects, while demonstrating awareness of these harms and engaging in harm reduction. Findings highlight the need for interventions that address GMS and strengthen existing coping and harm reduction strategies.

Talk 2:

Internalizing Symptoms and Cannabis Use and Co-Use Outcomes among Young Adults: The Moderating Role of Medicinal Use

Kyra N. Farrelly (York University)
Keila A. Echakowitz (Centre for Addiction and Mental Health)
Mahalia Dixon (Centre for Addiction and Mental Health)
Matthew T. Keough (York University)
Sergio Rueda (Centre for Addiction and Mental Health)
Lena C. Quilty (Centre for Addiction and Mental Health)
Sherry H. Stewart (Dalhousie University)
Abby L. Goldstein (University of Toronto)
James MacKillop (McMaster University)
Jo Henderson (Centre for Addiction and Mental Health)
Jeffrey D. Wardell (York University; Centre for Addiction and Mental Health; University of Toronto)

Background: Internalizing symptoms (i.e., depression, anxiety, stress) are risk factors for cannabis-related problems and risky behaviors such as combining cannabis with other substances. However, there is a dearth of research that has considered how internalizing symptoms may predict cannabis-related outcomes in young adults who report using cannabis to manage physical and mental health symptoms. This medicinal orientation to cannabis is relevant, as elevated internalizing symptoms may be an especially potent predictor of greater cannabis use and associated outcomes among those who are using cannabis specifically to manage symptoms. Thus, we aimed to examine internalizing symptoms as a predictor of cannabis-related outcomes (i.e., frequency of use, problematic cannabis use, and co-use with other drugs) among young adults who use cannabis to manage symptoms and explored degree of medicinal and recreational orientation toward cannabis as moderators of these relationships. Method: Data came from a larger study of young adults who use cannabis for both medicinal and recreational reasons. Participants (N=152, Mage = 24.4, 52% women) completed a variety of online self-report surveys to assess frequency of cannabis use, dependence risk, co-use of cannabis with alcohol, tobacco and other drugs, and internalizing symptoms (depression, anxiety, and stress scales; DASS). Medicinal and recreational cannabis use orientation were measured with a 4-point scale from Not at All to Very Much. A series of regression analyses were run with each of the DASS scales as the independent variable in separate models. Dependent variables were co-use of cannabis with the other substances, cannabis use frequency, and

problematic use. An interaction between medicinal and recreational orientation with each internalizing symptom was specified. Results: Participants reported greater medicinal (M=3.15, SD=0.67) than recreational (M=2.60, SD=0.69) orientation to cannabis (p=.02). Greater stress (B=0.13, p=.02) and recreational orientation to cannabis (B=0.73, p=.02) predicted greater odds of cannabis and alcohol co-use. Further, recreational orientation moderated the associations of greater anxiety (B=0.31), stress (B=0.24), and depressive (B=0.27) symptoms with greater odds of cannabis and tobacco co-use (ps <.05), such that the relationships were stronger for those with greater recreational orientation. Conversely, greater stress and anxiety symptoms predicted higher risk of problem cannabis use, but only for those with greater medicinal orientation to cannabis (interactions B=0.38 and 0.36 respectively, ps<.05). Greater medicinal orientation also strengthened the relationship between higher stress and greater cannabis use frequency (interaction B=0.50, p=.03). Conclusion: This study extends previous research finding greater cannabis use and related problems for those who engage in medicinal cannabis use, but a higher prevalence of co-use among those who engage recreational versus medicinal use. That individual differences in medicinal and recreational orientation to cannabis moderated the relationship between internalizing symptoms and co-use and problems is novel and reveals the unique roles of medicinal and recreational cannabis orientation among young adults who use cannabis for both medicinal and recreational reasons. Future research should examine the utility of targeted intervention strategies that emphasize coping skills for internalizing symptoms among young adults who use cannabis, with content tailored toward different outcomes associated with medicinal or recreational cannabis use.

Talk 3:

Examining the Role of Affect in Both PTSD Symptoms and Alcohol/Cannabis Co-use Using Momentary Methods

Reagan E. Fitzke (University of New Mexico)
Lexi M. Sheffield (University of New Mexico)
Lela Elliott (University of New Mexico)
Colin T. Mahoney (University of New Mexico)
Elizabeth A. Yeater (University of New Mexico)

Cannabis and alcohol co-use is common among young adults, and may be particularly prevalent among individuals experiencing posttraumatic stress disorder (PTSD) symptoms. Negative affective experiences often are proposed as a mechanism linking PTSD with substance use; however, much of this work relies on retrospective reports rather than real-time assessments. However, ecological momentary assessment (EMA) allows for the examination of affective processes that may contribute to substance use behaviors in real-time. College women (N = 101) first completed a baseline survey assessing mental disorder symptoms (e.g., PTSD); second, they completed 42 days of EMA (3X times per day) surveys assessing substance use patterns and mood. Person-level aggregate EMA variables were created by averaging nine mood states (i.e., angry, tired, irritated, happy, sad, tense, restless, stressed, overwhelmed) across the monitoring period. Logistic regression models tested whether baseline PTSD symptom severity (PCL-5) predicted (1) any cannabis use and (2) alcohol/cannabis co-use (defined as use of both alcohol and cannabis within the same EMA report). Further, mediation models examined the indirect effect of baseline PTSD symptoms on co-use frequency via aggregate mood states across

the EMA period. Results revealed that higher PTSD symptoms significantly predicted the increased likelihood of alcohol/cannabis co-use; PTSD was not associated with cannabis use alone though. In addition, these mood states did not significantly mediate the association between PTSD and co-use frequency. Findings suggest PTSD symptoms may be more strongly associated with polysubstance use than with cannabis use alone among college women. Null findings regarding mediation may reflect limitations of person-level summaries of affect, which likely obscure dynamic within-person processes captured by EMA. Ongoing analyses will examine day-/occasion-level associations between mood and alcohol/cannabis use to better characterize potential affective pathways linking PTSD and co-use. Findings suggest important clinical implications for real-time assessment approaches, such as EMA, in enhancing measurement-based care. Such robust measurement approaches may improve identification of affective contexts, and potentially relevant emotion regulation strategies, associated with alcohol/cannabis co-use among women trauma survivors.

Talk 4:

A Case Study on the Intersection of Heavy Cannabis Use and Severe Anxiety

Brenna A. Carter (Colorado State University)
Carolyn A. Lorenzi (Colorado State University)

Clinical cases often feature co-morbidity and symptom presentations which moderate other presenting concerns. This case initially presented as a case of moderate substance use disrupting academic performance. Over the course of treatment, it became clear that her patterns of cannabis use were frequent and hazardous enough to qualify as severe Cannabis Use Disorder, co-morbid with severe Generalized Anxiety Disorder. This presentation discusses the etiology of her presentation, integration of her medical complexities, and the course of treatment leading to eventual decrease in severity of treatment targets. The client is a cisgender female enrolled in college classes, age 19 at initiation of treatment. She participated in 1 hour sessions every two weeks while university was in session for 2 years, focusing primarily on Mindfulness-based CBT and Harm Reduction. Anxiety symptoms were assessed using the Generalized Anxiety Disorder-7 (GAD-7) and Cannabis Use was measured using the Cannabis Use Disorder test (CUDIT-R). Clinically meaningful change was evaluated using estimated Minimal Clinically Important Difference (MCID) and Reliable Change Index (RCI). Cannabis use scores decreased from 21 to 13, with CUD diagnostic rating moving from severe to mild. Her GAD-7 scores varied greatly over the course of treatment, often spiking after a reduction in cannabis use to approximately 13 then restabilizing to a score of 6 after extended treatment and the introduction of Vanoxerine at 10mgs. These scores exceed the estimated MCID suggesting clinically meaningful improvement and exceed the estimated RCI threshold, suggesting the change is beyond measurement error in both cases.

Symposium Title:

'Weed Work Well Together': State Approaches to Cannabis Research and Regulation, Collaboration is Key

Chair: Julie Johnson (Commonwealth of Massachusetts)
Discussant: Julie Johnson (Commonwealth of Massachusetts)

"State enacted and implemented cannabis policies and programs have been constantly evolving since California first legalized for

medical use in 1996. Since cannabis remains illegal at the federal level, research consistently falls behind law, leaving state-enacted policies and programs with many scientific unknowns. In fact, regulators often write policy in the absence of verified research and data, or ability to assess program effectiveness once implemented. Gaps in cannabis research and program effectiveness can contribute to major regulatory challenges and unknown research outcomes. As the science on cannabis accumulates and regulated programs evolve, it is critical that regulators and researchers alike understand effects of cannabis laws, policy provisions, and state-enacted programs (e.g., medical and social equity programs), ensuring evidence-based fidelity to programmatic missions and research alike. The goal of the 2026 RSMJ Regulation Research Panel is threefold: 1) Discuss varying applied cannabis regulatory research implemented across the U.S., 2) Show how states use conceptual frameworks and real-world data to access patient outcomes, as well as effectiveness of medical and social equity programs, and lastly, 3) Provide space for researchers from academia to discuss research's role in cannabis regulation, and how these roles, traditionally siloed, can work together to ensure evidence-based cannabis policies in future. This panel brings regulator and academic researchers together to understand applied cannabis research at the intersection of changing cannabis policies, research, and state-enacted medical and social equity programs. Each panelist brings specialized knowledge in an area of policy in New York, Illinois, Maryland, and Massachusetts."

Talk 1:

Leveraging Real-World Data (RWD) to shape cannabis policy and future research design.

Kaitlin Kosinski (New York State Office of Cannabis Management)
Sang Choi (New York State Office of Cannabis Management)
Alexandria Wilkins (New York State Office of Cannabis Management)
Junella Chin (New York State Office of Cannabis Management)
Nakesha Abel (New York State Office of Cannabis Management)

Rates of cannabis consumption are increasing, including for medical purposes, but the scientific research about cannabis and the endocannabinoid system is lagging behind public interest in consumption. Existing clinical trial evidence for medical cannabis is limited and largely derived from small pilot studies with varied formulations and routes of administration. There is increasing interest in understanding how cannabis products are integrated in real-world settings to manage chronic health conditions, however, the current regulatory landscape of cannabis in the United States presents significant barriers to conducting research. Capturing Real-World Data (RWD) on medicinal use of cannabis presents an opportunity to leverage public insights as preliminary evidence to inform future research studies and policy development in this evolving area. We will outline the New York State (NYS) Office of Cannabis Management (OCM) framework for research evaluating commercially available medical and adult-use cannabis products. We will use observational studies to generate RWD on cannabis product consumption. By combining patient-reported outcomes using established clinical evaluation tools and patterns of real-world product consumption, these studies aim to assess the feasibility of conducting research that can generate RWD to inform regulatory policy, improve patient access frameworks, and guide the design of future clinical research. Participants will be

enrolled remotely and prospectively evaluated using established and validated clinical assessment tools to characterize patterns of cannabis product consumption, concomitant medication use, adverse events, and changes in symptom burden. This RWD will provide insight into how patients incorporate cannabis products into existing treatment regimens and how such products are utilized in routine care settings. The studies will also explore potential barriers to healthcare access that may influence participation in regulated medical cannabis systems. This research framework aims to generate standardized real-world evidence on cannabis product consumption and patient-reported outcomes across diverse populations. By systematically characterizing patterns of consumption in community settings, this work will contribute to the evidence base needed to inform cannabis policy development, evaluate medical cannabis regulatory frameworks, and support the design of future research studies.
Supported by: Commonwealth of New York

Talk 2:

Barriers and Facilitators to Medical Cannabis in New York - Perspectives of Medical Cannabis Patients in New York State, Analysis of Three Cross-Sectional Surveys 2023-2025

Alexandria Wilkins (New York State Office of Cannabis Management)
Kaitlin Kosinski (New York State Office of Cannabis Management)
Sang Choi (New York State Office of Cannabis Management)
Junella Chin (New York State Office of Cannabis Management)
Nakesha Abel (New York State Office of Cannabis Management)

The New York State Medical Cannabis Program was implemented in January 2016 allowing New Yorkers with qualifying conditions to purchase medical cannabis safely under the supervision of certified providers and with access to cannabis-knowledgeable pharmacists. In 2021, New York State established the Marihuana Regulation and Taxation Act (MRTA), legalizing adult-use cannabis and expanding provisions of the Medical Cannabis Program. However, data show that enrollment in medical cannabis programs across the United States declines when adult-use cannabis programs are implemented. This analysis examines three consecutive New York statewide surveys of program participants to understand trends in barriers to participation and impacts of adult-use availability since the legalization of adult-use cannabis. The New York State Office of Cannabis Management (the Office) administered anonymous cross-sectional surveys via email to registered patients with active, expired, or canceled certifications in June 2023 (10,781 responses), July 2024 (5,451 responses), and October 2025 (6,671 responses). The surveys captured demographics, program participation, cannabis consumption patterns, perceived therapeutic impacts, adverse effects, costs, provider engagement, and access barriers. Survey questions were disaggregated by self-identified active vs. inactive status. County of residence was added in 2024. Between 20% and 30% of respondents (21% in 2023, 30% in 2024, and 20% in 2025) indicated they may renew their medical cannabis certification. In the 2024 and 2025 survey cycles, reasons for discontinuing certification include preference for purchasing from adult-use dispensaries and long distances to medical dispensaries. Ten medical dispensaries shuttered in 2024, leaving 32 dispensaries open across the state and reducing geographic access to medical cannabis. Across all three surveys, lack of adequate access to a medical cannabis was indicated as a barrier to medical cannabis - about 40% of surveyed patients cited it was

difficult and inconvenient for them to access a medical cannabis dispensary in 2023 compared to 15% in 2024 and 26% in 2025. Patients identified cost as another important barrier. In 2023 and 2025, only 40% of patients specified they were able to afford the amount of product to adequately manage their symptoms. Thirty-five percent of patients indicated the same sentiment in 2024. Cost and lack of geographic access to medical cannabis dispensaries continue to be the main barriers of participation in New York State Medical Cannabis Program as evidenced by three consecutive patient experience surveys.

Talk 3:

Pioneering Cannabis Social Equity: Results from Illinois 2025 Cannabis Diversity Survey

Nathaniel Inglis Steinfeld (Illinois Cannabis Regulation Oversight Office, State of Illinois)
Kirsten Davis-Franklin (Illinois Cannabis Regulation Oversight Office, State of Illinois)
Erin Johnson (Illinois Cannabis Regulation Oversight Office, State of Illinois)
Joseph Alger (Illinois Cannabis Regulation Oversight Office, State of Illinois)
Lance King (University of Illinois, Gies School of Business)
Justin Leiby (University of Illinois, Gies School of Business)

Background: Illinois legalized adult use cannabis with the Cannabis Regulation and Tax Act ('CRTA') in July 2019. The State was the first nationally to legislatively legalize adult use. A key factor for passage was the extensive social equity program. The law mandated automatic expungements for many cannabis-related arrests plus robust pathways for executive pardons, local mass expungements, and individual expungements of cannabis-related convictions. For local reinvestment, large-scale annual social equity grant programs using cannabis tax revenue in local government and nonprofit entities was added. Importantly, the CRTA created social equity application criteria for adult use licenses. The goal was to provide economic opportunities for people most impacted by past prohibition. Using the 2025 Cannabis Diversity Survey and state administrative data, this analysis reviews the demographics of the Illinois cannabis market. Since legalization, Illinois cannabis market has grown: it is now $1.6 billion in retail and $500 million wholesale. With strict licensing limits on the number of businesses a license may own, the market has grown in complexity, competitiveness, and diversity. Methods: Illinois conducts an annual survey of the cannabis industry that is required to renew a license. Using two years of data, the analysis includes ownership demographics of roughly all licensed businesses (N=192). An anonymous survey is distributed to cannabis employees and over a third responded in 2025 (N=3,123). Further analysis uses the state's seed-to-sale tracking data to identify market share and activity of these businesses. Results: In 2025, 45% of the licensed businesses report the majority of their equity is held by owners identified as Black, Hispanic, Asian, additional races or a coalition of races. These results demonstrate significant success in diversifying the industry with the race-neutral social equity applicant criteria. Analysis shows that over half of the licenses active in Illinois are now those issued through the social equity process, and these new businesses now make up roughly half of the monthly commercial activity at retail. The market share of these businesses continues to make progress. Discussion: Illinois provides a public policy example that directly impacts business ownership structure in a highly regulated marketplace. The CRTA brought Illinois' cannabis market from almost an entirely

white-male owned industry to a diversely owned, competitive market. With detailed annual tracking, policymakers can use these examples to inform future programs. Additional analysis of gender, disability status, LGBTQAI+, and past criminal justice involvement are available with the data collected. These tools provide a detailed look at intersectionality and complexities of race, business formation, and competition in a large market.

Talk 4:

Cannabis Social Equity as a Structural Determinant of Health: A Maryland Implementation Framework

Audrey Johnson (Maryland Office of Social Equity)

"Background Cannabis legalization in the United States increasingly includes social equity provisions designed to address harms created by decades of prohibition. While much research focuses on market growth or therapeutic science, fewer studies examine how equity-focused cannabis policies may function as structural interventions addressing social determinants of health in communities disproportionately impacted by criminalization. Maryland's Cannabis Reform Act established one of the nation's more comprehensive equity frameworks, including the creation of the Maryland Office of Social Equity, social equity licensing pathways, and the Community Reinvestment and Repair Fund (CRRF). These mechanisms aim to expand participation in the cannabis industry while directing reinvestment to communities historically impacted by prohibition. This presentation introduces a conceptual model linking cannabis equity policy to social determinants of health. Using Maryland's framework as a case study, it examines the relationship between historical policy harms, equity-focused legislation, implementation systems, community reinvestment strategies, and potential community health outcomes. Conceptual Model A conceptual framework examines cannabis social equity policy through a public health lens, proposing that equity-focused regulatory structures may operate as upstream interventions influencing community-level determinants of health, including economic stability, neighborhood investment, and access to opportunity. Rather than focusing solely on legislative intent, this work centers on implementation systems, exploring how policy design, regulatory oversight, and community reinvestment mechanisms translate statutory goals into real-world outcomes. The framework outlines a five-stage pathway through which cannabis equity policy may influence community health outcomes: 1. Structural Harm Context: Drug enforcement disparities created long-term inequities in incarceration, economic opportunity, and community investment. 2. Policy Design: Equity-focused legislation introduces mechanisms intended to address historical harm, including social equity licensing and reinvestment strategies. 3. Implementation Systems: Regulatory agencies, technical assistance programs, and oversight structures operationalize policy. 4. Community Participation and Reinvestment: Policies influence local conditions through business participation, workforce opportunities, capital access, and community reinvestment. 5. Community Health and Equity Outcomes: Expanded economic participation and reinvestment may strengthen determinants of health such as economic stability and neighborhood development. Discussion and Conclusion Across these stages, implementation fidelity and oversight determine whether equity policies produce meaningful structural change. This framework presents early implementation insights and policy considerations for strengthening the

alignment between cannabis equity programs, community investment strategies, and broader public health goals. The presentation will conclude with early implementation insights and policy considerations for strengthening the alignment between cannabis equity programs, community investment strategies, and broader public health goals."

Talk 5:

Evaluating the Delivery Exclusivity Policy in Massachusetts

Graelyn Humiston (Cannabis Control Commission, Commonwealth of Massachusetts)
Jacob Harrington (University of Massachusetts Donahue Institute)
Marianne Sarkis (Cannabis Control Commission, Commonwealth of Massachusetts)
Ember Skye Kane-Lee (University of Massachusetts Donahue Institute)
Kevin Fagundo-Ojeda (University of Massachusetts Donahue Institute)
Kazmiera Breest (University of Massachusetts Donahue Institute)
Alexander M. Colby (Cannabis Control Commission, Commonwealth of Massachusetts)
Victoria Jean-Louis (Cannabis Control Commission, Commonwealth of Massachusetts)
Hailey Pensky (Cannabis Control Commission, Commonwealth of Massachusetts)
Julie K. Johnson (Cannabis Control Commission, Commonwealth of Massachusetts)
Mark Melnik (University of Massachusetts Donahue Institute)
Rebecca Loveland (University of Massachusetts Donahue Institute)

Background The Massachusetts Cannabis Control Commission established three cannabis delivery license types to encourage industry participation by people disproportionately impacted by the War on Drugs. Regulations restricted eligibility to applicants who met Social Equity Program (SEP) or Economic Empowerment Applicant (EEA) criteria for the first three years, with a possible extension if the Commission found that the goals of this exclusivity period were not met. In 2025, the University of Massachusetts Donahue Institute (UMDI) operationally defined program goals based on criteria pursuant to regulations and assessed whether these goals were met. Methods The study included two phases. In Phase I, UMDI operationally defined the goals of the exclusivity period and criteria for 'success' of the policy. UMDI interviewed past and current Commissioners and current Commission Equity Programming and Community Outreach (EPCO) staff, analyzed feedback given during prior public comment periods, and reviewed the Commission's existing datasets. UMDI then created an analysis plan to evaluate the operationalized criteria for success and determine whether the goals were met. In Phase 2, UMDI evaluated the goals defined in Phase 1. The study team surveyed delivery-type license holders and applicants; analyzed quantitative data on licenses, applications, sales, employment, using internal Commission datasets and external benchmarks for the Massachusetts economy; examined Social Equity Trust Fund (SETF) grants; and analyzed qualitative data gathered in Phase I. UMDI presented a report to the Commission detailing their analyses and recommendations regarding the delivery exclusivity period and other equity-related policies. Results Analysis of the qualitative data found common themes, including structural limitations of the delivery license types, difficult market conditions, and strong support for extending the exclusivity period. Quantitative data analyses determined that,

while some criteria for success were partially met, the goals of the delivery exclusivity policy were unmet overall. The number of delivery licenses and the volume of sales transacted by these businesses grew slowly and inconsistently, compared to the overall state-regulated cannabis market, and difficult market conditions limited profit margins. Furthermore, the relief offered by recent regulatory changes and newly available SETF grants had not had sufficient time to benefit equity licensees. Discussion UMDI determined from their analyses that the delivery exclusivity policy had not yet achieved its goals of full participation and financial feasibility in the industry for people disproportionately impacted by the War on Drugs. They recommended that the delivery exclusivity period be extended for five to seven years, and that the Commission should make further policy changes to achieve full participation and financial feasibility for licensees. The Commission voted in 2026 to extend the delivery exclusivity period for three years, with a continuing mandate to assess whether the goals of the period have been met, and the option to extend the period further based on this assessment. The analyses and overall project highlighted the importance of thoroughly evaluating and improving equity policies as state-regulated markets mature and evolve.

Symposium Title:
Cannabis in Context: Polysubstance Use Profiles, Mental Health, and Social Determinants Among Adolescents
Chair: Verlin Joseph (University of New Mexico Health Sciences Center)

Historically, cannabis use among adolescents has generally been investigated as an isolated substance use outcome. However, emerging evidence suggests cannabis use occurs among broader patterns of polysubstance use with distinct psychosocial risks and outcomes. Moreover, much of the existing literature relies on samples that are not fully representative of adolescent substance use patterns, limiting the ability to develop evidence-based interventions for adolescents experiencing elevated substance use risk. As such, this symposium will present findings derived from four empirical studies using data from the New Mexico Youth Risk and Resiliency Survey (YRRS) to examine cannabis-involved polysubstance use outcomes among adolescents. Using latent class analysis, we identified three distinct substance use profiles characterized by low use, moderate polysubstance use, and high polysubstance use. Across the studies presented in this symposium, we examine how these cannabis-involved polysubstance profiles relate to mental health outcomes, structural and social determinants of health, and protective psychosocial outcomes. Results indicate that adolescents in high-polysubstance use classes experience elevated risks of depression, anxiety, and suicidality. While structural adversity including homelessness, food insecurity, bullying, and unsafe school environments increase the likelihood of membership in high-risk substance use profiles. Conversely, protective resources such as strong parent relationships, school connectedness, engagement, and personal confidence are associated with lower odds of membership in cannabis-involved polysubstance classes. Together, these studies demonstrate that adolescent cannabis use is best understood within broader substance use ecosystems shaped by structural vulnerability and protective developmental assets.

Talk 1:
Cannabis-Involved Polysubstance Use Profiles Among Adolescents: A Latent Class Analysis
Verlin Joseph (University of New Mexico Health Sciences Center)

Lillian Walker (University of New Mexico Health Sciences Center)
Esperanza D Wells (University of New Mexico Health Sciences Center)
Eunice Kim (University of New Mexico Health Sciences Center)
Michael G Miranda (University of New Mexico Health Sciences Center)
Azizi Ray (University of New Mexico Health Sciences Center)
Grace Chung (University of New Mexico Health Sciences Center)
Laura B Nellums (University of New Mexico Health Sciences Center)

Adolescent substance use is often studied as isolated behaviors with single substance use outcomes. However, many adolescents engage in polysubstance use, defined as the use of two or more substances within the same period of time. This study used latent class analysis to identify distinct patterns of adolescent substance use using data from the New Mexico Youth Risk and Resiliency Survey (YRRS). Survey-weighted analyses were conducted using responses from N=17,606 high school students. Substance use indicators included past 30-day use of cannabis, alcohol, vaping products, cigarettes, and non-medical pain medication use. Model fit statistics supported a three-class solution (BIC = 48,825.55; entropy = 0.87). The first class represented a low-use group characterized by minimal engagement with most substances. The second class represented a moderate polysubstance profile in which adolescents reported elevated use of cannabis, alcohol, and vaping products. The third class represented a high polysubstance profile characterized by high probabilities of use across multiple substances, including cannabis. Cannabis use emerged as a prominent feature of both moderate and high-risk substance use profiles. These findings suggest that adolescent cannabis use frequently occurs within broader polysubstance patterns rather than as an isolated behavior. Identifying these latent profiles provides a foundation for understanding how substance use patterns are correlated with mental health, structural vulnerability, and protective developmental factors examined in subsequent studies within this symposium.

Talk 2:

Mental Health and Suicide Risk Across Cannabis-Involved Polysubstance Use Profiles

Eunice Kim (University of New Mexico Health Sciences Center)
Lillian Walker (University of New Mexico Health Sciences Center)
Esperanza D Wells (University of New Mexico Health Sciences Center)
Michael G Miranda (University of New Mexico Health Sciences Center)
Azizi Ray (University of New Mexico Health Sciences Center)
Grace Chung (University of New Mexico Health Sciences Center)
Laura B Nellums (University of New Mexico Health Sciences Center)
Verlin Joseph (University of New Mexico Health Sciences Center)

Adolescent substance use is strongly correlated with mental health outcomes, yet there remains a paucity of research examining how different patterns of polysubstance use are correlated with mental health and suicidality among youth. Using the latent classes identified in the previous study, this analysis examined associations between polysubstance use profiles and multiple mental health outcomes among adolescents in the New Mexico Youth Risk and Resiliency Survey (YRRS). Survey-weighted logistic regression models were used to examine associations between substance use classes and depression, anxiety, persistent sadness, suicidal ideation,

suicide attempts, and suicide injury while adjusting for demographic covariates. Results revealed a strong gradient in mental health risk across substance use profiles. Compared with adolescents in the low-use class, those in the moderate polysubstance class had significantly elevated odds of depression (OR =2.50, 95% CI: 2.16-2.90), anxiety (OR = 2.21, 95% CI: 1.88-2.60), and persistent sadness (OR = 3.52, 95% CI: 3.12-3.99). Further, increased risks were also noted among those expressing suicidal ideation (OR = 3.63, 95% CI: 3.11-4.23), suicide attempts (OR = 5.02, 95% CI: 4.11-6.13), and suicide injury (OR = 6.96, 95% CI: 4.90-9.89). Adolescents in the high polysubstance class experienced substantially greater mental health risk across all outcomes. Relative to the low-use class, adolescents in the high polysubstance class had markedly higher odds of depression (OR = 9.42, 95% CI: 5.52-16.06), anxiety (OR = 9.39, 95% CI: 5.23-16.85), and suicidal ideation (OR = 9.81, 95% CI: 6.52-14.78). These findings demonstrate that cannabis-involved polysubstance use profiles are strongly associated with severe mental health outcomes, particularly suicidality, highlighting the importance of examining substance use patterns rather than individual substances in isolation.

Talk 3:

Social Determinants of Cannabis-Involved Polysubstance Use Among Adolescents

Lillian Walker (University of New Mexico Health Sciences Center)
Eunice Kim (University of New Mexico Health Sciences Center)
Esperanza D Wells (University of New Mexico Health Sciences Center)
Michael G Miranda (University of New Mexico Health Sciences Center)
Azizi Ray (University of New Mexico Health Sciences Center)
Grace Chung (University of New Mexico Health Sciences Center)
Laura B Nellums (University of New Mexico Health Sciences Center)
Verlin Joseph (University of New Mexico Health Sciences Center)

Substance use behaviors among adolescents are shaped by broader social and structural conditions. This study examined how social determinants of health predict membership in cannabis-involved polysubstance use profiles identified through latent class analysis of the New Mexico Youth Risk and Resiliency Survey (YRRS). Survey-weighted logistic regression models were used to examine associations between structural adversity and membership in moderate and high polysubstance classes compared with the low-use class. Key indicators of social adversity included food insecurity, homelessness or unstable housing, bullying, unsafe school environments, and academic performance. Results indicated strong associations between structural vulnerability and polysubstance use risk. Adolescents experiencing food insecurity had significantly greater odds of membership in the moderate polysubstance class (OR = 2.41, 95% CI: 2.02-2.86) and the high polysubstance class (OR = 8.80, 95% CI: 5.75-13.48) compared with adolescents in the low-use class. Experiences of bullying (OR = 5.65, 95% CI: 3.62-8.83 for high polysubstance use) and skipping school due to safety concerns (OR = 5.39, 95% CI: 3.64-7.99) were also significantly associated with higher-risk substance use profiles. These findings highlight the importance of addressing structural and social conditions when developing interventions to reduce adolescent polysubstance use.

Talk 4:

Protective Factors Associated With Lower Odds of Cannabis-Involved Polysubstance Use

Esperanza D Wells (University of New Mexico Health Sciences Center)
Eunice Kim (University of New Mexico Health Sciences Center)
Lillian Walker (University of New Mexico Health Sciences Center)
Michael G Miranda (University of New Mexico Health Sciences Center)
Azizi Ray (University of New Mexico Health Sciences Center)
Grace Chung (University of New Mexico Health Sciences Center)
Laura B Nellums (University of New Mexico Health Sciences Center)
Verlin Joseph (University of New Mexico Health Sciences Center)

While structural adversity increases the risk of substance use, protective developmental assets may reduce the likelihood of adolescents engaging in high-risk substance use patterns. This study examined protective psychosocial factors associated with membership in cannabis-involved polysubstance use classes among adolescents in the New Mexico Youth Risk and Resiliency Survey (YRRS). Survey-weighted logistic regression models examined associations between multiple protective factors and membership in moderate and high polysubstance classes relative to the low-use class. Protective factors included positive parent relationships, school connectedness, community relationships, engagement, confidence, sense of direction, coping skills, and positive self-worth. Results indicated that several psychosocial resources were strongly associated with lower odds of polysubstance use. Adolescents reporting positive parent relationships had substantially lower odds of membership in the high polysubstance class (OR = 0.33, 95% CI: 0.17-0.63) and moderate polysubstance class (OR = 0.56, 95% CI: 0.48-0.65). Similarly, adolescents reporting a stronger sense of direction had significantly lower odds of high polysubstance use (OR = 0.34, 95% CI: 0.17-0.68). Additional protective factors included confidence (OR = 0.49, 95% CI: 0.27-0.90), engagement (OR = 0.49, 95% CI: 0.25-0.95), positive school relationships (OR = 0.46, 95% CI: 0.24-0.86), and positive community relationships (OR = 0.49, 95% CI: 0.28-0.88). These findings suggest that supportive relationships, psychological resources, and developmental assets may play important roles in preventing adolescent polysubstance use. Together, these findings highlight potential targets for prevention strategies aimed at strengthening protective social and psychological resources among adolescents.

Symposium Title:

Warning about Cannabis Liking and Wanting: Linking Subjective Effects from Acute Response to Longitudinal Risk

Chair: Jane Metrik (Brown University)

Subjective drug effects are central to addiction theory, particularly within the incentive salience framework, which distinguishes between dimensions of 'liking' (hedonic reward) and 'wanting' (motivational drive). While laboratory research has established that Δ-9-THC reliably produces dose-dependent increases in subjective intoxication and positive affect (e.g., euphoria), negative responses (e.g., anxiety) often emerge at higher doses or among less frequent users. However, the influence of specific individual characteristics, biological markers, and event-level variables on these experiences remains poorly understood. The symposium elucidates these acute and longitudinal determinants by synthesizing findings across laboratory, observational, and intensive longitudinal designs. The series of four talks starts by demonstrating how novel

approaches to quantifying cannabinoid biomarkers improve the precision of estimating subjective intoxication. The session further illustrates how subjective responses signal a heightened risk for problematic use across vulnerable populations: first, by showing how longitudinal increases in positive subjective effects and diminished sensitivity drive progression toward chronic use in adolescents; second, by demonstrating that acute craving serves as a potent motivator for continued use, particularly in social contexts for those with problematic use; and finally, by showing how individual differences in distress intolerance amplify acute subjective reinforcement. Collectively, these studies illustrate how subjective experiences relate to biological markers and are shaped by situational cues, developmental trajectories, and individual vulnerabilities that can escalate risk. Implications for evidence-based interventions targeting cannabis reinforcement, alongside policy strategies to mitigate adverse effects and refine intoxication detection, are discussed.

Talk 1:

Cannabinoid Molar Metabolite Ratios are Superior to the THC in Predicting Subjective Intoxication

Claire L. Pince (Department of Psychology and Neuroscience, University of Colorado Boulder)
Megan E. Brown (Department of Psychology and Neuroscience, University of Colorado Boulder)
Carillon J. Skrzynski (Department of Psychology and Neuroscience, University of Colorado Boulder)
Marco O. Torres (Institute of Cognitive Science, University of Colorado Boulder)
Angela D. Bryan (Department of Psychology and Neuroscience, Institute of Cognitive Science, University of Colorado Boulder, University of Colorado Boulder)
Kent E. Hutchison (Department of Psychiatry, University of Colorado Anschutz Medical Campus)
L. Cinnamon Bidwell (Department of Psychology and Neuroscience, Institute of Cognitive Science, University of Colorado Boulder)

Purpose. Cannabis-impaired driving is a pressing public health concern given widespread legalization across the United States. Several U.S. states impose legal driving limits (> 5 ng/mL THC) despite evidence that blood THC poorly reflects intoxication due to individual variability in tolerance and metabolism (e.g., residual THC may be detected in the bloodstream for several days following cannabis use in frequent users, well beyond the window of intoxication). Cannabinoid molar metabolite ratios (MMRs) have been identified as potential alternative measures, as they account for the primary inactive metabolite which accumulates with higher frequency use (MMR1 = Delta-9-tetrahydrocannabinol [THC] / 11-nor-9-carboxy-THC, MMR2 = THC + 11-Hydroxy-THC /11-nor-9-carboxy-THC). MMRs outperform blood THC in detecting recent cannabis use, however effects on intoxication have yet to be empirically evaluated. This study aims to test whether MMRs are superior predictors of subjective intoxication compared to THC and if this effect is moderated by baseline cannabis use frequency. Methods. Data were harmonized across three mobile laboratory-based legal-market cannabis administration studies. During mobile laboratory sessions, all participants self-administered inhaled cannabis products ad libitum (flower or concentrate ranging from 1-90% THC potency, containing < 1-24% CBD). Blood samples and subjective intoxication [measured using the Addictions Research Center Inventory-Marijuana (ARCI-M) and 2 items from the Drug Effects Questionnaire

(DEQ)], were assessed immediately after use and 1 hour post-use. Participants who reached a peak plasma THC concentration of at least 20 ng/mL were included in analyses. Analyses. Three separate linear mixed effects models were estimated for each intoxication outcome, corresponding to different cannabinoid predictors (THC, MMR1, MMR2). Models included sex assigned at birth and age as covariates and a Time x Cannabinoid interaction effect, as well as random slopes and intercepts for each participant. Secondary models tested cannabis use frequency as a covariate and moderator, with the most parsimonious models presented. Models were compared based on AIC/BIC values. Results. The final sample consisted of 314 participants (Mean age: 31.61, SD = 12.75; 58% female; 84.7% White; Mean past-month cannabis use: 20.43 days, SD = 11.77; 70% self-administered flower cannabis). Primary models revealed significant positive relationships between plasma MMR1 and MMR2 concentrations and subjective intoxication outcomes ($p < .05$). Significant interaction effects indicated THC concentrations were positively associated with intoxication immediately but not 1h post-use. Cannabis use frequency significantly moderated the relationship between MMRs and subjective intoxication, such that there was a stronger relationship between MMRs and subjective intoxication scores for higher frequency cannabis users. In general, MMR models demonstrated superior fit to THC models based on AIC/BIC values. Conclusions. The present findings suggest that plasma MMRs are superior predictors of subjective intoxication over time, compared to THC alone, and may better account for individual variability in tolerance and metabolism. Findings have implications for roadside testing applications and human laboratory cannabis research; however, further research is needed to assess the relationship between MMRs, subjective intoxication, and actual impairment.

Talk 2:

Tolerance to Cannabis Subjective Effects with Cumulative Cannabis Use Experience During Adolescence

Yi-Chun Chang (University of Southern California Institute for Addiction Science)
Adam Leventhal (University of Southern California Institute for Addiction Science)

BACKGROUND. Cannabis subjective effects are presumed to change over time as individuals accumulate more experience using cannabis, especially during the vulnerable period of adolescence. Human observational evidence addressing these assumptions is lacking. This study examined whether cannabis subjective effects changed across time as a function of recent cannabis exposure and cumulative cannabis use duration during adolescence. METHOD. Data were drawn from the Happiness & Health Study-a longitudinal cohort survey that recruited 9th graders in Los Angeles in 2013 and followed them with 9 (semi)annual survey waves across 6 years. Respondents included youth reporting past-6-month cannabis use at >1 survey (n=1,405; 54.8% female, 55.5% Hispanic, 17.0% Non-Hispanic [NH] White, 9.5% NH-Asian, 7.0% NH-Multiracial, 5.9% NH-Another race; 5.1% NH-Black). The analytic dataset included all waves during which youth reported retrospective typical subjective effects experienced while using cannabis during the preceding 6 months (N=3,558 observations; Mean[SD]=2.5[1.8] waves/participant). Time-varying positive (6-item; e.g., happy, relaxed) and negative (6-item; e.g., dizzy, drowsy) cannabis subjective effect composites were regressed on concurrent time-varying recent cannabis exposure (cross-product of past-30-day number of days used × typical quantity per

day), cumulative duration of cannabis use (number of preceding 6-month interval survey waves cannabis was used), and the recent exposure × cumulative duration interaction. Analyses used multi-level intensive longitudinal models that disaggregated within- and between-person associations and adjusted for sex and baseline age. RESULTS. Positive cannabis subjective effects were positively associated with within-person variation in recent cannabis exposure (Std-Beta[95%CI]= .09[.06, .12], p<.001) and cumulative prior duration of cannabis use (Std-Beta[95%CI]= .06 [.03, .09], p<.001) main effects and the within-person recent cannabis exposure × cumulative duration interaction (Std-Beta[95%CI]= -.05 [-.07, -.02], p<.001). The interaction showed that the association of level of recent cannabis exposure with more positive subjective effects degraded with increasing cumulative duration of cannabis use across adolescence. Negative subjective effects were not associated with recent cannabis exposure or cumulative duration main effects (ps>.62) but were associated with the recent exposure x cumulative duration within-person interaction (Std-Beta[95%CI]= -.03 [-.06, -.01], p=.02). The interaction revealed a modest positive association between recent cannabis exposure and higher negative subjective effects during the initial survey wave, which became a null association with increasing cumulative duration of cannabis use across adolescence. Between-person associations largely concorded with within-person estimates. CONCLUSION. In this naturalistic observational study, youth tended to experience more positive subjective cannabis effects as they accrued more cumulative use experience and used cannabis more frequently or intensely than they typically used throughout adolescence. Yet, the propensity to experience more subjective cannabis effects during high exposure periods degraded with cumulative cannabis exposure, indicating tolerance or habituation. These findings are the first of their kind to demonstrate naturalistic cannabis use during adolescence might produce subjective effect profiles that change over time in ways that could reinforce more frequent or intense use with increasing experience. Reducing youth exposure to cannabis products that produce strong positive subjective effects merits consideration in efforts to prevent progression to frequent, chronic use trajectories into adulthood.

Talk 3:

Acute Cannabis Craving and Use Behavior in Daily Life: Contextual Influences and Variation by Use Severity

Jack T. Waddell (Department of Psychology, Arizona State University)
Michael Erickson (Department of Psychology, Arizona State University)
Sarah A. Okey (Washington State Liquor and Cannabis Board, University of Washington)
Jane Metrik (Center for Alcohol and Addiction Studies, Brown University School of Public Health)
William R. Corbin (Department of Psychology, Arizona State University)

Rationale: Cannabis craving is one of the most important subjective effects of cannabis use, given that it is a central component of Cannabis Use Disorder and is thought to predispose the continuation of use behavior within an episode. However, our understanding of the acute predictors and outcomes of naturalistic cannabis craving, and for whom these relations exist during daily life use episodes, remains scant. Craving is theorized to be a context-sensitive process wherein contextual cues facilitate craving based upon prior experience. Similarly, individuals reporting higher severity use problems are theorized to be

particularly sensitive to such contextual influences. Therefore, the current study tested a theoretical model wherein social (vs. solitary) cannabis use contexts heighten acute, in-the-moment cannabis craving and likelihood of continuation of cannabis use thereafter, particularly for individuals with higher (versus lower) severity cannabis use problems. Methods: Participants (N=104; Mean age = 36.16; 53% female) completed a baseline assessment and then 14-days of ecological momentary assessment (EMA). As part of the EMA protocol, participants self-initiated cannabis use reports shortly after cannabis use, which then triggered follow-up reports 1.5 hours and 3 hours later. Participants reported their severity of cannabis problems at baseline. Participants then reported their current social context, type and potency of cannabis used, and cannabis craving during cannabis use reports, and reported if they used any additional cannabis 1.5 and 3 hours later during follow-up cannabis reports. Multilevel moderated mediation models tested whether social (vs. solitary) cannabis use contexts indirectly predicted continuation of cannabis use via heightened cannabis craving within individuals reporting higher (vs. lower) severity cannabis problems. Results: Social (vs. solitary) cannabis use contexts were not associated with momentary upticks in cannabis craving across the sample (b=.01, SE=.03, 95%BCI=[-.04,.06]), but higher cannabis craving during cannabis use reports was associated with a higher likelihood of cannabis use continuation during the next 1.5 hours (b=.22, SE=.06, 95%BCI=[.09,.33]). However, there was a significant cross-level interaction between social context and cannabis use severity scores predicting cannabis craving (b=.36, SE=.11, 95%BCI=.12,.56]), such that social contexts were associated with upticks in craving within individuals reporting above average (but not below average) cannabis use problems. Thus, there was a conditional indirect effect of social context on cannabis use continuation during use episodes operating via augmented cannabis craving in individuals reporting higher (but not lower) severity cannabis use problems. Findings were consistent when estimating continuation of cannabis occurring 1.5 and 3 hours after the cannabis use report. Conclusions: Craving management techniques may help reduce the continuation of cannabis use during use episodes. For individuals with higher severity of cannabis problems, harnessing craving management techniques may be particularly important when they are using cannabis in social contexts.

Talk 4:

Distress Intolerance Moderates Subjective Response to Cannabis

Sharla Kirkpatrick (Brown University School of Public Health)
Rachel L. Gunn (Center for Alcohol and Addiction Studies, Brown University School of Public Health)
Elizabeth Aston (Center for Alcohol and Addiction Studies, Brown University School of Public Health)
Christopher Kahler (Center for Alcohol and Addiction Studies, Brown University School of Public Health)
Robert Swift (Center for Alcohol and Addiction Studies, Department of Psychiatry and Human Behavior, Brown University)
Jane Metrik (Center for Alcohol and Addiction Studies, Brown University School of Public Health)

Introduction: In the United States, 23% of adults reported cannabis use in the past year, with 30% of those meeting the criteria for cannabis use disorder (CUD). Emotional vulnerability factors, such as distress intolerance (DI, an individual's inability to tolerate distressing states), are associated

with cannabis use and increased risk for CUD. Negative-reinforcement motivational models of addiction posit that those with high distress intolerance experience stronger reinforcing effects from acute drug use, which can promote problematic use. The purpose of the present study was to examine whether DI moderates the acute effect of cannabis on subjective intoxication and positive and negative affect in a randomized placebo-controlled crossover trial. Methods: Participants (n=138, mean age = 25.6 years; 34.8% female, 36.9% racial minorities) who reported cannabis use at least twice a week smoked cannabis containing either 7.2% THC, 3.1% THC, or placebo across three experimental laboratory sessions. Participants completed measures of subjective intoxication (the Addiction Research Center Inventory, Marijuana Scale [ARCI-MJ]), positive affect on the Self-Assessment Manikin-Happy (SAM-Happy) and Visual Analogue Scale-Relaxed (VAS-Relaxed), and negative affect on the Visual Analogue Scale-Anxious (VAS-Anxious) immediately post-smoking. Generalized estimating equations were used to examine interactions between DI and THC dose on subjective intoxication, and positive and negative subjective drug effects. Simple slopes tests were used to probe significant interactions across levels of DI. Results: There was a significant interaction between DI and 7.2% THC, but not 3.1% THC, on the ARCI-MJ (β=-.75; CI:-1.34,-0.15; p=0.01). 7.2% THC significantly increased subjective intoxication across all DI levels but to a greater extent for those with higher DI (+1SD: β=2.61,CI: 1.97, 3.25, p<0.001; mean: β=3.15, CI: 2.71, 3.59, p<0.001; -1SD: β=3.70, CI:3.11,4.29, p<0.001). A significant interaction between DI and 7.2% THC, but not 3.1% THC, was found on SAM-Happy (β= -0.22, CI: -0.36, -0.09, p= 0.001). THC increased positive affect for those with mean and high DI but not those with low DI (mean: β= 0.14, CI: 0.02, 0.26, p= 0.02; -1SD: β= 0.31,CI: 0.14, 0.47, p<0.001). Models for VAS-Relaxed and VAS-Anxious demonstrated no significant interactions between DI and THC doses. Conclusion: Findings indicate that individuals with higher DI experience stronger acute subjective effects of cannabis, including positive affective states. However, there were no differences by DI level on negative affective states. This suggests that among those with greater difficulty tolerating distress, heightened reinforcement from cannabis could be the mechanism linking emotional dysregulation to problematic use and CUD progression. Future research should explore whether distress intolerance skills training could be a way to mitigate the effects of emotional vulnerability on CUD.

Symposium Title:

Cannabis Use Across the Lifespan: Epidemiology, Cognitive Vulnerability, and Brain-Behavior Function

Chair and Discussant: Godfrey Pearlson (Yale University; Olin Neuropsychiatry Research Center, Institute of Living, Hartford Healthcare)

This symposium integrates epidemiological, neuro-cognitive, and complex behavioral imaging perspectives to examine the effects of cannabis use across the human lifespan. Despite evidence suggesting that different points across human adulthood may present differential benefits and risk profiles presentations from cannabis use, the majority of human cannabis research to date has focused on younger individuals. This lack is highlighted by the fact that increasing numbers of individuals in older age groups are using cannabis for both medical and recreational purposes, yet remain an understudied population. Symposium presentations span population-level analyses of cannabis use disorder and mental health

symptoms stratified by age, experimental and observational studies of age-related cognitive vulnerability, and large-scale database investigations of cognitive aging. A final talk links cannabis-related impairment in simulated driving to functional MRI measures of brain activity, bridging neural mechanisms with real-world behavior. Together, these studies highlight how age moderates cannabis-related risk, following acute and chronic cannabis exposure, probing convergent evidence across levels of analysis and underscoring the need for lifespan-informed models of cannabis effects on brain and behavior.

Talk 1:

Effects of Cannabis Use on Brain Health Across the Lifespan

Anika M. Guha (University of Colorado Anschutz Medical Campus)
Zeining Fu (Tri-institutional Center for Translational Research in Neuroimaging and Data Science; Georgia State University; Georgia Tech; Emory University)
Vince Calhoun (Tri-institutional Center for Translational Research in Neuroimaging and Data Science; Georgia State University; Georgia Tech; Emory University)
Kent E. Hutchison (University of Colorado Anschutz Medical Campus)

Research on the effects of cannabis use on brain health across the lifespan has yielded mixed and, at times, contradictory findings. Studies in adolescents and younger adults have frequently linked cannabis use to adverse outcomes, including reductions in brain volume. In contrast, emerging evidence in older adult samples indicates a more complex pattern, with multiple studies, including prior work from our group, reporting larger subcortical volumes among individuals who use cannabis. However, these findings have generally been based on small samples and have often lacked comprehensive cognitive assessments, limiting conclusions about their functional significance. To address these gaps, our group leveraged data from the UK Biobank to examine associations between cannabis use, regional brain volume, and cognitive function in a large sample of aging adults. Although measures of cannabis exposure in this dataset were limited, lacking detailed information on frequency, potency, and mode of use, the extent of available data provides exceptional statistical power and enhances the generalizability of findings. Results indicated that lifetime cannabis use was positively associated with brain volume in regions rich in cannabinoid (CB1) receptors, including the right caudate ($p = 0.04$), bilateral putamen (right: $p = 0.01$; left: $p < 0.001$), bilateral hippocampus (left: $p < 0.001$; right: $p = 0.04$), bilateral amygdala (left: $p < 0.001$; right: $p = 0.04$), and bilateral anterior cingulate cortex (left: $p = 0.04$; right: $p = 0.04$). Lifetime cannabis use was also associated with better performance across multiple cognitive assessments, including Symbol Digit Substitution ($p < 0.001$), Numeric Memory ($p < 0.001$), Duration for Trail Making #1 ($p = 0.04$), Reaction Time ($p < 0.001$), and Paired Associate Learning ($p < 0.001$). Collectively, these findings contribute to a growing body of evidence suggesting that cannabis use may be associated with greater brain volume and preserved or enhanced cognitive performance in older adulthood, particularly in cannabinoid receptor-dense regions. These patterns are consistent with preclinical models suggesting that cannabinoids may exert neuroprotective effects in aging through mechanisms involving neurogenesis and anti-inflammatory pathways.

Talk 2:

Cannabis and Cognition in the Aging Brain

Ashley Schnakenberg-Martin (Yale University)
Khaled Draghmeh (Yale University)
Michael Stevens (Yale University; Institute of Living, Hartford Healthcare)
Godfrey Pearlson (Yale University; Institute of Living, Hartford Healthcare)
Deepak Cyril D'Souza, (Yale University; Institute of Living, Hartford Healthcare)

Cannabis and its principal active constituent THC is known to acutely impair a number of cognitive processes including attention, working memory, verbal memory, processing speed, and executive function. Some studies also suggest longer lasting cognitive impairments. Much of the research exploring the impact of cannabis on cognition has focused on young adults, leaving the impact of cannabis on cognition in older adults vastly understudied. This gap in the literature is critical as cannabis use is rapidly growing in adults aged 50 and older, with recent statistics indicating an increase in recreational cannabis use by 75% and higher use of medical cannabis in older adults compared to younger adults. Older adults may be more vulnerable to the cognitive effects of cannabis given known age-related 1) changes in cognition (e.g., decline in memory, processing speed, visuospatial ability), 2) decreases in cognitive reserve, 3) decreases in endocannabinoid signaling, and 4) slowing drug metabolism. Cannabis may also affect cognition in aging indirectly through the disruption of sleep, which is known to have age-related changes as well (e.g., reduced REM and slow-wave sleep, increased awakenings) and resulting in impaired memory consolidation. However, this has not been studied conclusively. The limited human research in this area remains mixed and hindered by significant limitations, such as a lack of placebo controls, uncontrolled dosing, and the inclusion of adults with chronic cannabis use which introduces the nuance of tolerance effects. Preclinical findings suggest that aging may be protective to the cognitive effects of cannabinoids, although the translation of this work to humans is unknown. In humans, there are several barriers to conducting research in older adults, including safety concerns related to multi-morbidity affecting cardiovascular health (e.g., hypertension, diabetes, heart failure) or pulmonary health (e.g., COPD, asthma), polypharmacy which is more common in older adults and regulatory hurdles related to increased risk associated with older adults. Methodological considerations also arise related to THC vs whole plant cannabis and various routes of administrations (e.g., smoked vs inhaled vs oral). Understanding the relationship between cannabis and cognition in older adults is important as increased vulnerability to cannabis may be associated with decreased independence and quality of life. The proposed presentation will review recent evidence highlighting these points, and emphasizing the importance of studying the impact of cannabinoids in older adults, the current state of the literature regarding key findings and limitations, as well as critical methodological considerations and implications for future research.

Talk 3:

Evaluating the Prevalences of Cannabis Use Disorder and Mental Health Symptomatology in a U.S. Nationally Representative Sample of Adults, Stratified by Age

Lauren Pacek (Rutgers University)
Julia Chen-Sankey (Rutgers University)
Meagan O. Robichaud (Rutgers University)
Allison Glasser (Rutgers University)

Likely due to the increasing legalization and medicalization of cannabis in the United States

(U.S.), the prevalence of cannabis use and cannabis use disorder (CUD) have increased. Mental health conditions and cannabis use are frequently comorbid, and the likelihood of CUD is greater among persons with a mental health condition, and vice versa. While the potential harms of cannabis use are not yet fully understood, available evidence indicates that cannabis use is associated with adverse mental health outcomes: Cannabis use associated with an increased risk of developing psychosis in a dose–dependent manner. Additionally, continued cannabis use after the onset of psychosis is associated with more severe positive psychotic symptoms and longer hospital admissions. Cannabis use may also increase the risk of developing major depressive disorder and promote the progression of depressive symptoms. Cannabis use and CUD have also been found to be increasing among specific segments of the population, including young adults and older adults. However, the epidemiology of CUD and mental health symptomatology at the intersection of age remains relatively understudied. This gap in knowledge is potentially significant given observed increases in CUD among certain age subgroups. Using data from adult respondents to the 2021–2024 National Survey on Drug Use and Health, we examined the prevalence of past–year major depressive episode (MDE) and past–year serious psychological distress (SPD) among persons with CUD, stratified by age group. Overall, the prevalence of CUD was greatest among young adults ages 18–25 and decreased as age category increased; The overall prevalences of MDE and SPD mirrored this pattern. Similarly, the prevalence of MDE among respondents with CUD was significantly greater among those ages 18–25 (32.3%) compared to ages 26–34 (24.7%), 35–49 (20.2%), and ≥50 (17.8%). The prevalence of SPD among respondents with CUD was also most prevalent among those ages 18–25 (51.6%), versus ages 26–34 (44.9%), 35–49 (31.9%), and ≥50 (22.2%). Given that cannabis use can prolong and exacerbate psychiatric symptoms, the sizable prevalence of MDE and SPD among persons with CUD–regardless of age group–serves as justification for continued public health surveillance of these conditions. The disproportionately high prevalence of CUD and MDE/SPD among those with CUD in respondents ages 18–25 is especially concerning when

considering that the majority of lifetime mental health disorders have their onset in late adolescence and early adulthood. Findings also suggest the need for mental health screening among persons who are identified as having CUD, particularly young adults.

Talk 4:

Multivariate Associations Between Cannabis Induced Alterations in Global Brain Connectivity and Driving Performance: A Behavioral Partial Least Squares Analysis

Shashwath A. Meda (Institute of Living, Hartford Healthcare)
Michael C. Stevens (Yale University; Institute of Living, Hartford Healthcare)
Erwin Boer (Entropy Control Inc)
Deepak Cyril D'Souza (Yale University)
Cole Arnold (Institute of Living, Hartford Healthcare)
Nique Pichette (Institute of Living, Hartford Healthcare)
Godfrey Pearlson (Yale University; Institute of Living, Hartford Healthcare)

Cannabis intoxication impairs driving ability, yet the specific network level functional brain changes that drive this impairment remain poorly understood. This study investigated the multivariate relationship between cannabis induced alterations in global brain connectivity (GBC) and corresponding changes in driving performance during a simulated driving task. We employed a placebo controlled, within subject design (N = 28; Age (Mean/SD): 23.3/4.6). Dose change scores (Active Cannabis 0.5 gm (13% THC) - Placebo) were calculated for 19 behavioral driving metrics (assessing car following, lane keeping and overtaking) and fMRI derived GBC across 91,282 vertices after approximately 30 mins of ingestion. To maximize statistical power and isolate true signal covariance, we implemented a data driven Behavioral Partial Least Squares (BPLS) pipeline with PCA dimensionality reduction and matrix back projection. Significance was determined via non-parametric permutation testing (N = 5,000), and feature stability was assessed using bootstrap resampling (1,000 bootstraps; $|BSR| > 2.0$). BPLS identified a significant multivariate latent variable capturing the shared covariance between cannabis induced GBC changes and driving impairment ($r = 0.67$; $p < 0.05$). Behaviorally, the latent axis contrasted longitudinal tracking fidelity (Car Following Correlation; BSR = +2.20) and lateral instability and near collision risk (e.g., Lane Keeping Time to Collision < 4.0s; BSR= -2.41). This risk profile was further supported by strong sub-threshold trends in LK steering variability (BSR = -1.90) and lateral weaving (SDLP; BSR = -1.80). Crucially, this behavioral profile covaried with a widespread, distributed functional network, including, bilateral superior/middle frontal gyri, anterior/posterior cingulate, sensorimotor cortices, and lateral temporal regions, where all significant vertices exhibited negative BSRs. Cannabis induced increases in global brain connectivity within a distributed fronto-parietal, cingulate and sensorimotor network are robustly associated with increased lateral collision risk and decreased longitudinal tracking fidelity. These findings for the first time provide a network level neurological signature for cannabis-induced driving impairment using an objective multivariate data driven method.

Symposium Title:

Contemporary Challenges in Cannabis Research: Understanding Perceptions, Evaluating Harm Reduction, and Quantifying Use

Chair: Matthew R. Pearson (University of New Mexico)
Discussant: Matthew R. Pearson (University of New Mexico)

As cannabis legalization and product diversity expand, understanding the factors that drive or mitigate cannabis-related harms among young adults is paramount. This symposium integrates three distinct yet complementary perspectives-a pre-registered experiment, systematic review, and methodological innovation-to provide a comprehensive overview of the current landscape of cannabis science in college populations. The first presentation examines how cannabinoid content (THC vs. CBD) and route of administration (flower vs. edibles) influence health perceptions. Utilizing a large multisite experimental design, the results suggest that while CBD-dominant flower is viewed as relatively 'healthier,' young adults generally draw minimal distinctions between products based on potency, regardless of their underlying use motives. The second presentation provides a systematic review of cannabis protective behavioral strategies (PBS). By synthesizing nearly 60 studies, this talk identifies key antecedents of PBS use-ranging from personality traits to motives-and evaluates the evidence for PBS as a proximal mechanism of behavior change in harm reduction interventions. Finally, the third presentation addresses a critical measurement issue regarding the inaccuracy of self-report quantity estimates. Using qualitative coding of estimation methods, the authors demonstrate that the relationship between cannabis quantity and negative outcomes is significantly moderated by estimation precision, suggesting that the risk of quantity is only visible when measured accurately. Together, these presentations emphasize that reducing cannabis-related harm requires a nuanced understanding of how users perceive products, how they actively manage risk through protective behaviors, and how researchers can more accurately quantify use to predict cannabis-related outcomes.

Talk 1:

Perceived Effects of THC and CBD Content on Cannabis-Related Health Risks and Benefits: Exploring Motives and Use

Renee E. Magnan (Washington State University)
Benjamin O. Ladd (Washington State University)
Matthew R. Pearson (University of New Mexico)
Addictions Research Team

Despite being modifiable targets of behavior, investigation of health perceptions of cannabis remains limited regarding the different forms by which cannabis is used. We conducted two parallel experimental studies to address perceptions of a range of specific health consequences of cannabis based on cannabinoid content and route of administration (i.e. flower and edible products). Using registered between-subjects experimental designs (Magnan et al., in press), young adult college students (N=2047) recruited from a U.S. national collaboration across 10 universities were randomly assigned to answer questions about positive and negative health perceptions of flower (Study 1) or edible (Study 2) products based on one of three combinations of delta-9-tetrahydrocannabinol (THC)/cannabidiol (CBD) potencies: dominant THC, dominant CBD, and equal THC/CBD strains. For flower products only, the CBD dominant product was perceived as better for health relative to the THC dominant and equal THC/CBD strains ($p=.002$, $d=.21$). No other significant effects emerged for flower or edible products. These patterns were not moderated by current cannabis use status.

The aim of the current investigation was to probe the relationship of cannabinoid content and health perceptions among individuals who currently use cannabis (N=478) by exploring cannabis use motives and use indices as moderators. While a number of these factors were associated with perceived benefits and risks, only coping motives emerged as a moderator of potency on perceived risks ($p=.04$, $\eta_p^2 =.014$). In contrast to expectations, outcomes across these two studies suggest that young adult college students may draw minimal distinctions of health positive or negative consequences of cannabis based on cannabinoid content, and this pattern changes little based on use motives or use behavior. These findings provide valuable insight for researchers and health professionals regarding communication and prevention efforts around cannabis.

Talk 2:

A Systematic Review of the Use of Cannabis Protective Behavioral Strategies

Chloe E. Martinez (University of New Mexico)
Matthew R. Pearson (University of New Mexico)

To identify critical gaps and suggest important directions for future research, we are conducting a systematic review of all articles examining cannabis-specific protective behavioral strategies (PBS). Similar to previous comprehensive reviews conducted on alcohol protective behavioral strategies (Pearson, 2013; Prince et al., 2013), we highlight 1) measurement properties of cannabis PBS scales, 2) distal and proximal antecedents that are associated with cannabis PBS, 3) summarize mediation and moderation effects, and 4) evaluate the evidence for cannabis PBS as a potential mechanism of behavior change in the context of interventions. We conducted a comprehensive literature search of PsycInfo and PubMed and conducted a forward-search using Google Scholar to find any article that cited an established measure of cannabis PBS. We identified 59 that meet our criteria (i.e., English-language, peer-reviewed, quantitative data, measured cannabis PBS). Although our review is ongoing, most published studies to date have used either the long-form or short-form of the Protective Behavioral Strategies for Marijuana (PBSM) scale, though different factor structures have been examined (predominantly a one-factor or a two-factor solution). We have identified several robust predictors of cannabis PBS use that include distal antecedents like personality traits (e.g., big five personality traits, impulsivity-like traits) to proximal antecedents like cannabis use motives (i.e., coping and enhancement motives). We distinguish between well-established effects and those that warrant replication. We pay special attention to mediation and moderation models as they can inform the development and tailoring of effective harm reduction interventions. Finally, we focus on causally informative designs and the quality of evidence for establishing cannabis PBS as a mechanism of behavior change that can at least partially account for interventions effects. We discuss critical gaps in the literature highlighting important directions for future research.

Talk 3:

Does Estimation Method Moderate the Relationship between Cannabis Quantity and Cannabis-Related Outcomes

Mason L. Hatwan (University of New Mexico)
Matthew R. Pearson (University of New Mexico)
Addictions Research Team

Previous research has demonstrated that estimation of quantity of cannabis is poor, ranging from 50% to over 200% overestimation (Prince et al., 2018). Surprisingly, this overestimation is present even among individuals who work in the cannabis industry. Further, metrics of cannabis use quantity have largely not robustly predicted cannabis related negative consequences. For example, our previous work with the Marijuana Use Grid found very weak associations between quantity and cannabis related outcomes compared to frequency. One plausible explanation is that poor estimation of quantity obscures the true relationship between cannabis quantity and cannabis-related outcomes. In a multi-site sample of college students who reported using cannabis in the past month (n=862), we asked participants to estimate the number of grams of cannabis flower that they use in a typical session (typical flower quantity), number of negative cannabis-related consequences experienced in the past month (Marijuana Consequences Questionnaire), and cannabis use disorder symptoms (Cannabis Use Disorder Identification Test-Revised). About a quarter of our sample (23.2%) did not provide an estimate of grams, endorsing 'I have no idea, I can't even guess.' Among those who did report number of grams, we asked how they estimated number of grams. Using ChatGPT 5.4, we coded these qualitative responses from the least precise (0=nonresponse/clearly inaccurate) to the most precise (4=most accurate/standardized estimate). Using the PROCESS macro (v4.2) in SPSS, we examined whether estimation precision moderated the relationship between typical flower quantity and cannabis-related consequences. In the model predicting consequences, we found that typical flower quantity was associated with higher consequences (b=.46, p=.0033), estimation method was associated with higher consequences (b=.30, p=.0228), and a significant synergistic interaction (b=.21, p=.0468) showed that the relationship between typical flower quantity and consequences was strongest among those reporting more precise estimation methods. In the model predicting cannabis use disorder symptoms, we observed a stronger synergistic interaction exhibiting the same pattern. In fact, Johnson-Neyman significance regions showed that the relationship between quantity and cannabis use disorder symptoms was non-significant for those with the least precise estimation method (b=.1664, p=.5590) and was strongest for those with the most precise estimation method (b=2.3744, p<.0001). To determine the replicability of this finding, we will examine whether these findings replicate in two additional multi-site college student samples, and how results compare using different classification systems for deriving the estimation precision scores. Findings from the current study suggest that the observed link between cannabis quantity and cannabis-related harm depends on part on an indicator of subjective quantity estimation precision, potentially reflecting individual differences in familiarity with cannabis use and the ability to describe quality with greater precision.

Symposium Title:

The PBSM 10 Years Later: Advancing Cannabis Protective Behavioral Strategy Measurement Across Populations and into the Modern Cannabis Landscape

Chair: Eric R. Pedersen (University of Southern California)

Protective behavioral strategies (PBS) are harm-reduction behaviors individuals use before, during, or after substance use to reduce risk. The Protective Behavioral Strategies for Marijuana Scale (PBSM) was developed a decade ago to assess cannabis-

specific strategies associated with lower use and fewer negative consequences. Since its introduction, the PBSM has become a widely used measure of cannabis protective strategies, with several versions including the original item pool, a 36-item item bank, and a commonly used 17-item short form. This symposium provides a 10-year update on the PBSM and examines how the measure can be adapted for emerging populations within a changing cannabis landscape. Eric Pedersen opens with an overview of the development of the PBSM, including item generation, psychometric refinement, and evidence supporting its use across studies of cannabis use and consequences. Two presentations then examine adaptations for specific populations. Keegan Buch evaluates the dimensional structure of the 17-item PBSM among sexual minority college students, identifying a four-factor structure that may reflect unique safety considerations and motivations for protective strategy use among this group. Kristina Phillips introduces the PBSM-O, a revised version for adults aged 50 and older who use cannabis, demonstrating a four-factor structure capturing controlled use, mindful use, contextual responsibility, and situational safety. Mark Prince then presents ongoing work to update the PBSM through development of the Protective Behavioral Strategies for Cannabis (PBSC) scale, designed to reflect contemporary cannabis products and modes of administration. The symposium concludes with discussion of future research directions and opportunities for collaboration.

Talk 1:

Dimensional Structure of the Protective Behavioral Strategies for Marijuana Scale among Sexual Minority College Students

Keegan D. Buch (San Diego State University; University of California, San Diego)
Mark A. Prince (University of Southern California)
Ireland M. Shute (University of Southern California)
Reagan E. Fitzke (University of New Mexico)
Megan E. Brown (University of Colorado Boulder)
Eric R. Pedersen (University of Southern California)

Background: College students across the US use cannabis at alarmingly high rates, and myriad negative consequences (e.g., poor academic performance, impaired driving, physical and mental health complications) may be associated with these elevated levels of use. Protective behavioral strategies (PBS), however, show potential for mitigating harms related to cannabis use. The Protective Behavioral Strategies for Marijuana (PBSM) scale was developed to characterize and measure these strategies (e.g., only using cannabis on weekends, limiting mixing with other substances). While this scale has been used reliably with broader college student populations, its current form has not been validated for use among sexual minority (SM) college students. SM college students may use cannabis at higher rates and be at increased risk of related consequences when compared to their heterosexual peers. Thus, an accurate understanding of their use of PBS is vital for culturally competent prevention and intervention efforts. Methods: The present study used exploratory graph analysis (EGA) to examine the dimensional structures of the 17-item PBSM scale using a convenience sample of college students (N = 1,014) recruited from a single university in the Fall semester of 2023. More specifically, analyses were split by SM college students (N = 263) versus heterosexual college students (N = 751) to compare the dimensional structures among these groups. A follow-up

confirmatory factor analysis (CFA) of the EGA-identified dimensional structures was conducted to assess model fit, factor loadings, and factor covariances. Results: The EGA yielded a four-dimension structure for the SM subsample ('Consumption Control and Safety,' 'Avoidance of Use in Stressful Contexts,' 'Designate Times for Use,' 'High-Risk Situation Avoidance') and a single-dimension structure for the heterosexual subsample (consistent with the original 17-item PBSM structure). The follow-up CFA of the EGA-identified dimensional structures suggested good model fit for the structures specific to SM college students (CFI = .998, RMSEA = .044, SRMR = .039) and to heterosexual college students (CFI = .993, RMSEA = .075, SRMR = .054). Conclusions: The observed factor structure among SM college students may be related to increased self-awareness and intentionality around cannabis-related safety behaviors in this population. It is possible that, given experiences with minority stressors and stigma, SM individuals are more conscious of their risk reduction strategies and their motivations for implementing them. These findings ultimately suggest that SM college students' use of PBS for cannabis has additional nuance compared to heterosexual peers, and thus the original PBSM scale may need to be modified for use among SM college students as a single scaled score. Further research is needed to better understand SM college students' use of PBS, as well as potentially unique strategies utilized by this population that are not measured by the existing PBSM scale.

Talk 2:

One Size Doesn't Fit All: Adapting the PBSM for Adults Over Age 50 Who Use Cannabis

Kristina T. Phillips (Kaiser Permanente Hawaii Center for Integrated Health Care Research; Kaiser Permanente Bernard J. Tyson School of Medicine)
Mark A. Prince (University of Southern California)
Eric R. Pedersen (University of Southern California)

Background: As cannabis legalization expands across the U.S., rates of adult cannabis use have increased, with those over age 50 experiencing some of the most dramatic growth. Despite this trend, middle- and older-age adults remain one of the least studied populations who use cannabis. Compared to younger adults, those over 50 have higher rates of chronic health conditions, potentially increasing vulnerability to cannabis-related adverse effects such as respiratory illness, medication interactions, and falls. At the same time, many adults over 50 report perceived benefits of cannabis use, including pain relief and improved sleep. Both medical and recreational (non-medical) use is common in this age group, but no prior studies have examined strategies used by this population to reduce potential harm. Protective behavioral strategies (PBS) are modifiable behaviors intended to limit substance use or reduce risk. The original Protective Behavioral Strategies for Marijuana (PBSM) scale was developed and tested with a sample of young adults, but does not fully account for patterns of medical, non-medical, and combined use common among adults over 50. The goal of this study was to adapt the PBSM for adults over 50 (PBSM-O) and evaluate its underlying factor structure. Method: Adults aged 50+ who reported cannabis use in the past month were recruited from an integrated healthcare system as part of a larger study ('CanabisOver50'). Eligible participants completed a 30-minute online survey via REDCap between January and April 2023. Select items from the original 50-item PBSM were revised, replaced, or

removed to reflect age-relevant contexts, resulting in a 32-item pool. The structure of the revised measure was evaluated using Exploratory Graph Analysis (EGA) to estimate dimensionality, followed by Unique Variable Analysis (UVA) to identify redundant items. The resulting structure was then tested using confirmatory factor analysis (CFA). Results: The sample included 342 adults (M age = 65.9, SD = 8.7), with 56% endorsing male sex. Participants reported primarily White (65%), Native Hawaiian or Pacific Islander (10%), Asian American (10%), or more than one (9%) race. Participants used cannabis on an average of 18.9 of the past 30 days (SD = 11.4). Most reported non-medical (27%), medical-only (25%), or combined non-medical/medical cannabis use (48%). EGA and UVA supported a refined 23-item, four-factor PBSM-O structure: (1) Controlled Use Practices (8 items), (2) Mindful and Intentional Use (7 items), (3) Contextually Responsible Use (4 items), and (4) Situational and Functional Safety (4 items). CFA indicated acceptable-to-good model fit, $\chi^2(224) = 416.87$, $p < .001$, RMSEA = .050 (90% CI [.043, .058]), CFI = .920, TLI = .910, SRMR = .047. All standardized loadings were significant (.43-.78, $p < .001$). Factors were moderately to strongly correlated (r = .44-.83), suggesting related but distinguishable dimensions. Conclusions: Findings support the structural validity of the PBSM-O for adults over 50 who use cannabis. This revised measure provides a developmentally relevant tool for assessing harm-reduction strategies in older adults and may inform future research examining links between protective behaviors and health outcomes in this population.

Talk 3:

Updating Protective Behavioral Strategies for Marijuana Scale for the Modern Cannabis Landscape: Development of the PBSC Scale

Mark A. Prince (University of Southern California)
Denise D. Tran (University of Southern California)
Bethany A. Gray (Colorado State University)
Ireland M. Shute (University of Southern California)
Eric R. Pedersen (University of Southern California)

Background: Protective behavioral strategies (PBS) are behaviors individuals use before, during, or after substance use to reduce harm. The Protective Behavioral Strategies for Marijuana (PBSM) scale has been widely used to assess such strategies among cannabis users and has demonstrated small to moderate associations with reduced cannabis use and fewer cannabis-related consequences. However, the scale was developed over a decade ago, primarily reflects strategies related to combustible cannabis use, and was validated largely among college student samples. Methods: To address these limitations, we are developing an updated measure: the Protective Behavioral Strategies for Cannabis (PBSC) scale. The revised terminology reflects both the evolving language surrounding cannabis and the broader range of products and modes of administration now common in the modern cannabis marketplace. Item development combined large language model-assisted item generation with expert review. Results: An initial pool of 236 candidate items was generated and evaluated by nine PBS experts, resulting in a refined 69-item candidate item bank designed to capture a broader set of harm-reduction strategies relevant to contemporary cannabis use. Conclusions: Data collection is currently underway with two large community samples of cannabis users. Planned analyses will

apply network psychometric approaches, including exploratory graph analysis, unique variable analysis, and measurement invariance testing, to identify the optimal scale structure and evaluate measurement properties. The resulting PBSC aims to provide an updated tool for assessing cannabis-specific protective behavioral strategies within the contemporary cannabis landscape.

Symposium Title:

Derived Intoxicating Cannabis Products: An overview of retail, marketing, perceptions, and use behaviors

Chair: Dan Petrovitch (Texas Tech University; The University of Texas Health Science Center at Houston)
Discussant: Dan Petrovitch (Texas Tech University; The University of Texas Health Science Center at Houston)

This symposium utilizes a Socioecological Model perspective to integrate retail, marketing, and individual-level epidemiological data on derived intoxicating cannabis products (DICPs), federally illegal substances that have been increasing in retail sales and use in the US. The first presentation, by Dr. Cassidy LoParco, provides an overview of retail availability of DICPs from point-of-sale audits across smoke shops (N = 126 smoke shops) in 9 US cities. The second presentation, by Dr. Julia Chen-Sankey, describes retailer marketing practices used by 9 leading DICP brands on their Instagram accounts (N = 837 posts). The third presentation, by Dan Petrovitch, uses data from an online survey among a convenience sample (N = 1,189) of US adults to examine differences between 'traditional' cannabis and DICP risk perceptions and motives. Lastly, the presentation by Dr. Carla Berg utilizes survey data among a national sample of young adults (N = 3,437) to examine correlates of medical and non-medical use of cannabis and DICPs. Findings across studies indicate the widespread prevalence of DICP retail, marketing, and use. Cross-study findings reveal convergence across levels of analysis: point-of-sale and social media marketing both featured youth-oriented materials, individual-level product preferences aligned with observed retail characteristics, and medical-use motives were prevalent across samples yet only modestly reflected in online advertising content. Youth-oriented marketing and lack of age verification procedures indicate the need for continued surveillance of DICPs and greater enforcement of DICP laws for harm reduction purposes.

Talk 1:

Smoke Shops' Marketing Practices and Retail of Intoxicating Substances: A 2025 Point-of-Sale Audit in 9 US Cities

Cassidy R. LoParco (George Washington University)
Matthew E. Rossheim (The University of North Texas Health Science Center)
Kayla K. Tillett (The University of North Texas Health Science Center)
Patricia A. Cavazos-Rehg (Washington University School of Medicine)
Carla J. Berg (George Washington University)

Background: Retail sales of intoxicants, including kratom, hallucinogenic mushrooms, and derived intoxicating cannabis products (DICPs) such as delta-8 tetrahydrocannabinol (THC) have rapidly increased throughout the US. These products are generally illegal to market and sell under the Federal Food, Drug, and Cosmetic (FD&C) Act, as they contain unapproved food additives and do not meet the Generally Recognized as Safe (GRAS) standard. Previous research has documented their prominent availability in smoke shops; ongoing retail surveillance regarding the

nature of their marketing is crucial to inform regulations and enforcement efforts. This study conducted point-of-sale audits of US smoke shops and described marketing of these and other intoxicating products. Methods: We examined retail practices, including specific product sales and marketing themes (e.g., targeted populations, price promotions), among 126 smoke shops in 9 US cities (range of 9 to 17 in Baltimore, Maryland; Denver, Colorado; Houston, Texas; Jacksonville, Florida; Las Vegas [LV], Nevada; Los Angeles [LA], California; Philadelphia, Pennsylvania; Portland, Oregon; Virginia Beach, Virginia) from July, 2025 to February, 2026. Results: One-third of shops had signage indicating no minors/18+ (n=41, 32.5%), while ~10% had signage indicating ID required upon entry (n=12, 9.5%) or purchase (n=14, 11.1%); very few shops ever asked for ID (n=8, 6.3%). DICPs available for sale included: THCA (n=103, 81.7%), delta-9 THC (n=88, 69.8%), THCP (n=76, 60.3%), blends containing multiple types of THC in a single product (n=72, 57.1%), delta-8 THC (n=69, 54.8%), HHC (n=60, 47.6%), delta-10 THC (n=18, 14.3%), and THCO (n=13, 10.3%). Types of DICPs sold included: edibles (n=99, 78.6%), pre-rolls (n=93, 73.8%), disposable vapes (n=90, 71.4%), flower (n=74, 58.7%), beverages (n=44, 34.9%), reusable vapes (n=42, 33.3%), concentrates (n=30, 23.8%), and tinctures (n=11, 8.7%). Shops also sold other substances including: e-cigarettes (n=123, 97.6%), kratom (n=120, 95.2%), intoxicating mushrooms (n=110, 87.3%), sexual enhancement drugs (n=80, 63.5%), nitrous oxide (n=75, 59.5%), kava (n=67, 53.2%), nitrite poppers (n=21, 16.7%), mad honey (n=14, 11.1%), blue lotus (n=9, 7.1%), ADALL focus drugs (n=9, 7.1%), and alcohol (n=5, 4.0%). Youth-oriented merchandise was common (n=81, 64.3%), and 28.6% of shops sold DICPs with youth-oriented packaging (n=36; e.g., cartoons). Some shops sold DICPs within 12 inches of toys/youth-oriented products (n=11, 8.7%). A variety of price promotions were available: daily/weekly/monthly specials (n=10, 7.9%), membership/loyalty programs (n=9, 7.1%), buy-one-get-one free/discounted DICPs (n=7, 5.6%), incentives for providing reviews (n=6, 4.8%), punch cards (n=4, 3.2%), military/veteran discounts (n=4, 3.2%), free DICPs without purchase (n=3, 2.4%), happy hours (n=2, 1.6%), first-time customer discounts (n=2, 1.6%), and discounts for college students (n=1, 0.8%). Few stores offered home delivery (n=3, 2.4%) or had drive-thru options (n=2, 1.6%). Conclusions: Across smoke shops, retail of intoxicating products was prevalent, particularly DICPs, kratom, and intoxicating mushrooms - all of which are federally illegal to market/sell. Additionally, age verification was uncommon, and products/packaging particularly appealing to youth were prominent. Findings indicate the need for greater enforcement to reduce the retail availability of harmful, intoxicating substances.

Talk 2:

Marketing Features of Derived Intoxicating Cannabis Product Brands on Instagram: A Content Analysis

Kathryn La Capria (Rutgers University)
Siyan Meng (Rutgers University)
Alisa A. Padon (Public Health Institute)
Kayla K. Tillett (University of North Texas Health Science Center)
Scott I. Donaldson (Rutgers University)
Jon-Patrick Allem (Rutgers University)
Matthew E. Rossheim (University of North Texas Health Science Center)
Cassidy LoParco (George Washington University)
Carla J. Berg (George Washington University)
Kristina M. Jackson (Rutgers University)
Julia Chen-Sankey (Rutgers University)

Background: Use of derived intoxicating cannabis products (DICPs) has increased in the U.S., as have associated poisonings, psychotic episodes, and emergency department visits. Brand marketing on social media, a largely underregulated marketing channel, may be contributing to these increases. To inform prevention efforts, this study characterized marketing used by leading DICP brands on Instagram, which is widely used by adolescents and young adults. Methods: We conducted a qualitative content analysis of 837 Instagram posts published by accounts of nine leading DICP brands (CannaAid, Cycling Frog, Delta Extrax, Elyxr, Fly Urb, Hometown Hero, Koi CBD, Mood, and Official Canna River) between February 2024 and February 2025. A codebook of marketing features and product types was developed using inductive and deductive approaches. Two trained coders independently coded posts. Frequencies were calculated and chi-square tests examined differences in marketing themes by brand and product type. Results: We identified six themes through content coding: (1) product descriptors and imagery (product theme; 84.8% of the posts), which characterized the product's ingredients and flavors in ways that may enhance appeal; (2) recreational effects and enjoyment appeals (recreational theme; 52.0%), which emphasized pleasurable effects and lifestyle-oriented use; (3) youth-oriented imagery and cultural cues (youth theme; 49.5%), which incorporated visual and cultural elements likely to attract youth; (4) brand and value positioning appeals (brand theme; 35.7%), which conveyed brand identity and product value; (5) health and therapeutic benefit claims (health theme; 10.2%), which framed products as promoting wellness or offering therapeutic benefits; and (6) health and age warnings (warning theme; 2.5%), which included age restrictions and health or safety warnings. Product theme appeared frequently across all brands. Recreational theme was more common in posts from Cycling Frog (83.7%) than other brands combined. Youth theme appeared more often in posts by Mood (64.6%), Delta Extrax (60.1%), and Cycling Frog (56.6%). Brand theme was more prevalent in posts from Cycling Frog (50.6%) and Hometown Hero (45.0%), while health theme was more likely to appear in posts from Hometown Hero (23.7%) and Koi CBD (17.7%). Product, recreational, youth, and brand themes were more common in beverage-related posts (98.3%, 81.4%, 56.4%, and 44.8%, respectively) than other products combined. Conclusions: This content analysis of leading DICP brands on Instagram revealed that marketing primarily emphasized product features, recreational use, lifestyle integration, and youth-oriented cultural cues, whereas health warnings and risk-related messages appeared infrequently. The presence of unapproved health-related claims in some posts, alongside limited warning language, highlights the need for strengthened regulatory and consumer protection efforts in promoting DICPs on social media. Beverage products heavily use youth, recreational, and brand themes to market their products. In addition, leading DICP brands differ in how they market their products, with some more heavily emphasizing youth-oriented, recreational, and brand-building content, indicating that prevention and regulatory efforts may benefit from a brand-specific focus. Continued surveillance of social media marketing practices is needed to inform regulatory development and enforcement, social media platform policy enforcement, and public health responses addressing the evolving DICP marketplace to reduce associated harms.

Talk 3:

Risk Perceptions and Motives for Cannabis and Derived Intoxicating Cannabis Products: A Cross-Sectional Survey in a Non-Probability Sample of Co-Using U.S. Adults

Dan Petrovitch (Texas Tech University; University of Texas Health Science Center at Houston)
Sarah E. Victor (Texas Tech University)
Adam T. Schmidt (Texas Tech University)
Jason Van Allen (Texas Tech University)
Andrew K. Littlefield (Texas Tech University)

Background. Cannabis and derived intoxicating cannabis products (DICPs) exhibit important epidemiological differences despite pharmacological similarities. While robust prevalence data exist, few studies have characterized DICP risk perceptions (RPs) and motives, which are critical psychosocial determinants of substance use. We compared RPs and motives for cannabis vs. DICPs to determine whether individuals who have used both (co-users) perceive and use these substances differently. Methods. Recruitment: An online, cross-sectional, self-report survey was distributed via diverse non-probability recruitment channels between November 2024-October 2025. Each recruitment source was electronically verified with custom, anonymous URLs. Measures: RPs included legal and safety risks of driving under the influence (DUI), chemical impurity, and general health/psychological risks. Motives included five-factor subscales (e.g., coping, enhancement), self-treatment, policy-, and risk-related motives. Survey Design: Participants were repeatedly presented with risk-neutral vignettes defining cannabis and DICPs. Each RP/motive measure was presented twice (once for cannabis, once for DICPs). The survey used a planned-missingness design, with randomized measure and item ordering. Analysis: Missing data were addressed via multiple imputation. Participants were stratified by state-level adult-use cannabis policy (prohibited vs. legal) and models were estimated in each stratum. Cumulative link mixed models and linear mixed-effects models tested within-person differences in DICP vs. cannabis RPs/motives while characterizing variability across heterogeneous recruitment avenues. Results. Pre-imputation, participants were 1,189 lifetime co-using U.S. adults (mean age = 36 years, 56% female, 80% White, 11% Black, 16% Hispanic, 40% Texas residents, 28% non-students, 60% employed, over 50% current cannabis or DICP use more than monthly). Notable recruitment sources were Meta advertisements (35.1%), an undergraduate psychology research participant pool (12.4%), Prolific (8.7%), and online substance use/harm reduction (10.2%) and DICP communities (7.2%). RPs: In both prohibited and legal states, cannabis was seen as riskier than DICPs for DUI legal consequences (OR = 1.54-2.08), yet DUI safety RPs were identical across drugs. Conversely, DICPs were viewed as riskier for their chemical impurity and manufacturing process (similarly across policy contexts: OR = 1.72-2.27). For general health/psychological risks, DICPs may be perceived as slightly riskier, but findings were inconsistent across measures. Motives: In both policy contexts, individuals reported higher social, coping, enhancement, conformity, expansion (raw b = 0.06-0.33, scale range = 1-4) and self-treatment motives (sleep, depression, anxiety, and anger: OR = 1.39-2.27) for cannabis. For participants in cannabis prohibition states, legality (OR = 7.02), accessibility (OR = 4.35), and price (OR = 2.54) motives were much more salient for DICPs (attenuated in legal states: OR = 1.70-1.76). Participants endorsed using DICPs as cannabis substitutes (OR = 3.50-5.61), but not due to lower RPs (OR = 1.56-

2.13 favoring cannabis). Conclusions. Cannabis-DICP co-users endorsed RP differences-perceived DUI legal risks were greater for cannabis, while chemical-impurity RPs were greater for DICPs, informing the translation of cognitive interventions for risky cannabis use to DICP use. Motives analyses suggested that DICPs largely function as cannabis substitutes in prohibition states, converging with prior data on the epidemiology of DICP use and informing ongoing policy debates about federal DICP bans.

Talk 4:

Medical Use of Cannabis and Derived Intoxicating Cannabis Products in a Sample of Young Adults in the US

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Background. Scant research has assessed medical use of cannabis or derived intoxicating cannabis products (DICPs), particularly among young adults who have higher prevalence of use of both. It is crucial to understand how young adults use these products for medical and/or nonmedical purposes, the specific conditions for which they use, their engagement of healthcare providers, and potential adverse consequences (e.g., use disorder symptoms), as such data are needed to inform intervention efforts. This study assessed young adults' medical use of cannabis and DICPs, use-related characteristics, and correlates of medical use and doctor recommendation. Methods. We analyzed 2024 survey data among 3,437 young adults (ages 18-34) representing all 50 US states, recruited via social media. Measures included sociodemographics, state cannabis laws (based on participant state), past-6-month use of cannabis and DICPs, and among those who reported use, the purpose of their use (only-medical, primarily-medical, equally-medical/nonmedical, primarily-nonmedical, only-nonmedical), use disorder symptoms, and healthcare provider recommendation. Multivariable regression examined: 1) sociodemographics and state cannabis law in relation to any vs. no past 6-month medical use among those reporting past 6-month use of cannabis and DICPs, respectively; and 2) extent of medical vs. nonmedical use in relation to: a) use disorder symptoms; and b) healthcare provider recommendation among those using medically. Results. Among those reporting past 6-month use of cannabis (n=1,520, 44.2%) or DICPs (n=934, 27.2%), >50% used at least sometimes medically (cannabis: n=910/1,520, 59.9%; DICPs: n=475/934, 50.9%). Specifically, for cannabis, 6.3% used only-medically, 12.7% primarily-medically, 26.6% equally-medical/nonmedical, 14.3% primarily-nonmedically, and 36.4% only-nonmedically. For DICPs, 11.1% used only-medically, 13.0% primarily-medically, 19.1% equally-medically/nonmedically, 7.7% primarily-nonmedically, and 40.1% only-nonmedically. Factors associated with higher odds of any (vs. no) medical cannabis use included: being older (aOR=1.12; CI=1.09-1.15) and <Bachelor's degree educated (aOR=2.06; CI=1.62-2.63); being

male (aOR=0.60; CI=0.48-0.76), Black (vs. White; aOR=0.55; CI=0.41-0.75), and Asian (vs. White; aOR=0.36; CI=0.23-0.57) were associated with lower odds. Factors associated with higher odds of any (vs. no) medical use of DICPs included: being older (aOR=1.05; CI=1.02-1.08) and <Bachelor's degree educated (aOR=1.53; CI=1.14-2.05); being male (aOR=0.68; CI=0.51-0.90) was associated with lower odds. Among those reporting past 6-month cannabis or DICP use, compared to only-nonmedical, primarily-medical (cannabis: B=1.95, SE=0.52; DICPs: B=2.27, SE=0.67), equally-nonmedical/medical (cannabis: B=2.48, SE=0.41; DICPs: B=2.55, SE=0.58), and primarily-nonmedical (cannabis: B=3.29, SE=0.49; DICPs: B=4.48, SE=0.81) reported greater use disorder symptoms. Among those reporting medical use of cannabis or DICPs, common conditions managed by cannabis or DICP use were pain (36.0% cannabis; 35.4% DICPs), migraines (33.1%; 27.6%), and PTSD (32.1%; 29.5%). Additionally, provider recommendation was reported among 20.1% for cannabis and 9.7% DICPs. Compared to those using only medically, those using primarily for nonmedical purposes had lower odds of doctor recommendation (cannabis: aOR=0.29; CI=0.15-0.58; DICPs: aOR=0.20; CI=0.06-0.74). Conclusions. Given the increased use disorder symptoms among those reporting cannabis and/or DICP use for a mix of medical and nonmedical purposes, research to better understand these use patterns is crucial to inform prevention and intervention efforts. Furthermore, communication gaps between healthcare providers and those using cannabis or DICPs for medical purposes must be addressed.

Symposium Title:

Advancing Evidence-Based Interventions for Cannabis Use Through Novel Approaches

Chair: Kristina T. Phillips (Kaiser Permanente Hawaii; Kaiser Permanente Bernard J. Tyson School of Medicine)

Increased availability and reduced perceptions of harm related to cannabis have driven higher rates of cannabis use among adults in the U.S., underscoring a growing need for effective treatments and interventions. Although legal for adults in many U.S. states, cannabis use can lead to clinically significant impairment for many individuals, especially as product potency continues to rise. Young adults remain at heightened risk due to ongoing neurodevelopment and greater exposure to contexts where cannabis use is prevalent. These trends highlight the urgency of advancing evidence-based approaches to prevention and treatment. In this session, speakers will present cutting edge work spanning different samples, with a focus on innovative and novel approaches designed to meet the evolving public health challenges associated with increasing cannabis use. Kristina Phillips will open with an overview of the current science related to cannabis interventions, followed by a presentation focused on the design of a just-in-time adaptive intervention for young adults who use cannabis and alcohol who are enrolled in an ongoing clinical trial. Jenni Teeters will present findings from a recently completed randomized controlled trial evaluating a mobile brief intervention designed to reduce cannabis impaired driving among emerging adults. Kathyrn Gex will discuss the acceptability of Computer-Based Training for Cognitive Behavioral Therapy (CBT4CBT) and its effects on cannabis use outcomes among adults with cannabis use disorder. Collectively, these three talks provide important insights into novel ways to address cannabis use in diverse populations.

Talk 1:

Understanding How and When to Intervene: Examining the Mechanics of a Just-in-Time Adaptive Intervention for Cannabis and Alcohol Use

Kristina T. Phillips (Kaiser Permanente Hawaii; Kaiser Permanente Bernard J. Tyson School of Medicine)
Ho Suk Choi (University of Hawai‘i - Mānoa)
Mark A. Prince (University of Southern California)
Michael M. Phillips (University of Hawai‘i - Mānoa)

Background: Simultaneous cannabis and alcohol use among young adults is common and associated with greater negative consequences than use of either substance alone. Just-in-time adaptive interventions (JITAIs) deliver personalized, in-the-moment support, but little is known about how their decision rules function in practice or how to optimize content delivery. This presentation examines the design and implementation of decision rules within SAFERR, a smartphone-delivered JITAI targeting simultaneous use. Over four weeks, participants received protective behavioral strategy (PBS) messages delivered either daily or triggered based on need in-the-moment. We evaluated which contextual domains most frequently triggered PBS delivery, the timing and frequency of triggered messages, and missed opportunities for intervention in non-triggered conditions. Method: Young adults aged 18-30 reporting simultaneous cannabis and alcohol use were recruited from the community and enrolled in a clinical trial. Following baseline assessment, participants were randomized to one of eight conditions in a fractional factorial design varying intervention delivery components. All participants received signal-contingent ecological momentary assessment (EMA) items administered three times daily (morning, afternoon, evening). Analyses focused on the four conditions that included triggered PBS messages based on EMA responses. Ten EMA items were used to determine whether a PBS message would be delivered in these four conditions. These EMA responses served as decision rules for real-time message delivery across three domains: (1) social context (current or anticipated), (2) location, and (3) cannabis or alcohol use (recent use, intoxication, or intentions). We quantified frequency and timing of the responses that triggered PBS messages and identified missed delivery opportunities in non-triggered conditions to characterize intervention mechanics and inform optimization. Results: A total of 66 participants who enrolled in the ongoing clinical trial were included. Participants were 71% female and endorsed primarily White (38%), Native Hawaiian or Pacific Islander (19%), Asian American (16%), or More than one (13%) race, with 17% who were Hispanic/Latino. Mean age was 24.07 years (SD=3.6). In the four conditions that received triggered PBS, the mean number of participant responses that triggered messages over the 4-week intervention was 24.56, with the majority of triggers occurring in the afternoon (37%) or evening (39%) periods. Of the three EMA domains that could trigger PBS content, social context made up the largest category (n=788; 48%), followed by cannabis or alcohol use (n=753; 46%), and location (n=102; 6%). The majority of PBS messages were triggered based on endorsing one (55%), two (18%), or three (13%) EMA items. When comparing endorsement of these same EMA items among participants assigned to other study conditions, we found similar patterns, in that the same questions at similar frequencies would have triggered PBS, suggesting a substantial number of missed opportunities for intervention. Conclusions: Findings demonstrate that JITAI PBS content was usually triggered by one to three EMA items, most often later in

the day and primarily based on social context or cannabis or alcohol use. Future JITAI studies with young adults using cannabis and alcohol should consider incorporating these contextual factors into decision rules for prompting intervention content.

Talk 2:

Evaluation of an Interactive Mobile Phone-Based Brief Intervention to Reduce Driving Under the Influence of Cannabis Among Emerging Adults: A Randomized Controlled Trial

Jenni B. Teeters (Western Kentucky University)
Alejandro B. Ramirez (Western Kentucky University)
Nathan D. Meredith (Western Kentucky University)

Background and Aims: Driving under the influence of cannabis (DUIC) is a national public health concern in the United States. The present study examined the efficacy of a mobile phone-based brief intervention aimed at reducing driving under the influence of cannabis among emerging adult cannabis users in the context of a 3-group randomized clinical trial. Design: Participants in this RCT were randomly assigned to one of three conditions: a) a substance impaired-driving personalized feedback plus MI-style interactive text messaging intervention (PF + MIT), b) a substance impaired-driving personalized feedback only intervention (PF), and c) a substance information control condition (IC). Setting: Participants were recruited from a university in the Southeastern United States and within a 60-mile radius of campus. All interventions were delivered remotely via mobile phone. Participants: 149 emerging adults who endorsed driving under the influence of cannabis at least three times in the past three months were enrolled in the RCT. Intervention and comparator: Participants in the PF + MIT condition (n = 45) received personalized feedback on substance-impaired driving plus a series of interactive, motivational interviewing-style text messages delivered by a trained graduate student over a single session. Participants in the PF condition (n = 50) received personalized feedback only. The control group (IC; n = 54) received standard, non-personalized substance use information. Measurements: The primary outcome was the number of times driving under the influence of cannabis (DUIC) in the past 3 months, which was self-reported via mobile web survey during follow-up assessments at 3- and 6-months post-intervention. The secondary outcome was the number of times driving after simultaneous alcohol and cannabis use (DUIAC) in the past 3 months. Analyses followed an intention-to-treat (ITT) approach. Findings: Negative binomial mixed models analyses indicated that participants in the PF + MIT condition showed significantly greater reductions in driving under the influence of cannabis at 3 months compared to the IC group (IRR = 0.34, 66% reduction; $p < 0.001$) and maintained reductions at 6 months (IRR = 0.40, 60% reduction; $p < 0.001$). Participants in the PF condition demonstrated significant reductions in DUIC at 6 months relative to IC (IRR = 0.25, 75% reduction; $p < 0.001$). No significant differences over time between conditions were found for the number of times driving after simultaneous use of alcohol and cannabis. Conclusions: The present study showed accelerated reductions in driving under the influence of cannabis in the MI-text condition at the 3-month follow-up and delayed reductions in the personalized feedback only condition at the 6-month follow-up.

Talk 3:

Exploring Acceptability and Cannabis Use Outcomes Following CBT4CBT in

Adults Seeking Treatment for Cannabis Use Disorder

Kathryn S. Gex (Medical University of South Carolina)
Kevin Branson (Medical University of South Carolina)
Nathaniel Baker (Medical University of South Carolina)
Aimee McRae-Clark (Medical University of South Carolina)
Rachel L. Tomko (Medical University of South Carolina)

Background: Rates of cannabis use and cannabis use disorder (CUD) in adults continue to increase; however, treatment seeking for CUD is generally low, often due to greater perceived social acceptability of cannabis and low perceived risk compared to other drugs. Additionally, few treatments specific to CUD exist. CBT4CBT (Computer-Based Training for Cognitive Behavioral Therapy) is a highly accessible online treatment for general substance use disorder (SUD); however, given the low-risk perceptions of cannabis and limited treatment options for CUD, it is critical to understand how patients perceive the acceptability of this treatment approach and examine cannabis use treatment outcomes. Method: Adults with CUD (N=164) completed the full 7-module CBT4CBT as part of a larger study exploring CUD remission. Midway through the study, an updated version of CBT4CBT was released, so approximately 60% (n=93; 60% female; M age=31.2) completed the original version of CBT4CBT and the other 40% completed the updated version (n=71; 37% female; M age=30.6). Participants provided quantitative ratings (on a scale of 0-10, with 10 being most favorable) and qualitative feedback on CBT4CBT overall and for each module, as well as cannabis use outcomes at baseline and 4-, 8-, 12-, 16-, and 20-week follow-ups. Results: Ratings for each module ranged from 4.8 (module 7) to 7.1 (module 5), and there were no significant differences in acceptability of 6 of the 7 modules between the two versions. Module 7, which had the most significant difference in content, was rated more positively among participants who received the revised version, indicating it was perceived to be more personally relevant ($t(159)=10.7$, $p<0.001$), interesting ($t(162)=4.3$, $p<0.001$), useful ($t(162)=5.8$, $p<0.001$), and effective in modifying cannabis use ($t(160)=8.6$, $p<0.001$) for this population. The original module 7 was perceived less interesting or relevant primarily due to the focus on safe sex practices and injection drug use, which participants viewed as unrelated to cannabis use. The revised version was generally viewed more positively, even when asked what they found least interesting/relevant, and participants' most common issue was that it was simply a review of prior modules that didn't add anything new. Accounting for participant sex and age, multilevel models with repeated observations (level 1) nested within individuals (level 2) found no effect of CBT4CBT version on changes in past month cannabis use days (Est.=-5.46, SE=4.12, t=-1.33, p=0.19, 95% CI [-13.595, 2.675]), cannabis use sessions (Est.=-6.61, SE=19.83, t=-0.33, p=0.74, 95% CI [-45.772, 32.558]), total grams of cannabis (Est.=-11.16, SE=11.14, t=-1.00, p=0.32, 95% CI [-33.157, 10.830]), or CUD symptom count (Est.=1.35, SE=0.95, t=1.42, p=0.16, 95% CI [-0.524, 3.226]). Conclusions: While no differences were observed between CBT4CBT versions in terms of cannabis use outcomes, acceptability data suggest that general SUD treatment approaches may not resonate strongly with this population. This was most clearly demonstrated in response to the original CBT4CBT module 7 on safe sex and injection drug use; however, acceptability ratings across all modules were moderate. There is substantial room for improvement for CUD treatments, and more research is

needed to better tailor content to cannabis specifically.