



Short communication

Prevalence and socio-demographic correlates of multi-modal cannabis use among young adults who currently use cannabis

Caroline North^a, Srishty Arora^a, C. Nathan Marti^a, Jacob E. Thomas^a, Keryn E. Pasch^a, Anna V. Wilkinson^b, Alexandra Loukas^{a,*}

^a Department of Kinesiology and Health Education, The University of Texas at Austin, 2100 San Jacinto Blvd D3700, Austin, TX, 78712, USA

^b Department of Epidemiology, UTHealth Houston, School of Public Health, 1616 Guadalupe Street, Suite 6.300, Austin, TX 78701, USA

ARTICLE INFO

Keywords:

Cannabis
Marijuana
Multi-modal
Young adults

ABSTRACT

Cannabis use is common in young adulthood, yet little is known about the prevalence and patterns of multi-modal (i.e., use of more than one mode) cannabis use.

Objective: We aimed to (1) determine the past 30-day prevalence of five modes (smoke, vape, edible, dab, other) of cannabis use, (2) describe the prevalence of multi-modal cannabis use (single vs. dual vs. poly-modal), and (3) identify socio-demographic correlates of multi-modal use among young adults.

Method: Participants were 764 22–30-year-olds who currently used cannabis from Wave 9 (Spring 2019) of the Marketing and Promotions Across Colleges in Texas Project. Participants were 25.11 years old on average (SD = 1.81), 63.6% female, 38.7% identified as non-Hispanic white, 30.6% as Hispanic/Latino, 13.0% as Asian and 9.4% as Black, and 8.2% identified with two or more races or another race/ethnicity. Bivariate analyses and a multinomial regression were used to examine study questions.

Results: Smoking was the most common mode of cannabis use followed by vaping and then edibles. Nearly 43% of participants reported single-modal cannabis use, 33% reported dual-modal use, and 24% reported poly-modal use. Males and those identifying as non-heterosexual were at a greater risk than their counterparts for using multiple modes of cannabis. Participants identifying as Black were at a reduced risk for poly-modal compared to single-modal use.

Conclusion: Multi-modal use is common among young adults who currently use cannabis, indicating a need for universal efforts aimed at all young adults. Tailored interventions aimed toward those at elevated risk for multi-modal use also are needed.

1. Introduction

In recent years there has been an increasing variety of cannabis products including not only dried flower, but also edibles, topical forms, and hash oils/concentrates. Although smoking remains the most common mode of use (Wadsworth et al., 2022), cannabis use via vaping, eating/drinking, and dabbing (i.e., the method of ingesting butane hash oil by placing a wax/oil on the end of a glass rod that is heated creating a vapor that is inhaled) are increasingly popular (Schauer et al., 2020). Compared to smoking, non-smoked modes of cannabis often yield higher levels of THC (delta-9-tetrahydrocannabinol), the primary psychoactive ingredient in cannabis (Schauer et al., 2020).

Young adults have the highest prevalence of cannabis use compared to other age groups (Substance Abuse and Mental Health Services

Administration, 2021). Cannabis use in young adulthood is concerning given that young adults are particularly vulnerable to the addictive properties of THC (Squeglia and Gray, 2016) and cannabis use is associated with deficits in cognitive performance (Cohen et al., 2019). Yet, limited contemporary research examines patterns of past 30-day cannabis use during young adulthood. Thus, there is a need for research aiming to determine the types of cannabis products being used by young adults, the patterns of cannabis use via multiple modes, and who among young adults are most at risk for using multiple cannabis modes.

Research conducted in 2015 indicates that concurrent use of two or more modes of cannabis (i.e., multi-modal use) is common among adolescents (Peters et al., 2018). One of the only studies of young adults, conducted in 2017 indicated that concurrent use of cannabis types

* Corresponding author at: 2019 San Jacinto Blvd. #D3700, USA.

E-mail address: alexandra.loukas@austin.utexas.edu (A. Loukas).

<https://doi.org/10.1016/j.pmedr.2024.102775>

Received 21 January 2024; Received in revised form 22 May 2024; Accepted 25 May 2024

Available online 25 May 2024

2211-3355/© 2024 Published by Elsevier Inc. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

(plant, concentrate, and/or edible) was common (Gunn et al., 2020). Another study indicated that young adults living in a legalized cannabis market and who currently used cannabis used an average of 3.2 cannabis products in the past month in 2018–2019 (D'Amico et al., 2020). A study of 18–34-year-olds conducted in 2015 indicated that when using multiple cannabis products, young adults most often reported using two primary combinations of cannabis products: plant-based cannabis products with cannabis concentrates or plant-based cannabis products with edibles (Krauss et al., 2017).

The increasing variety and availability of modes of cannabis introduces an unknown potential for young adults to experiment with multiple modes of cannabis. This is troubling given multi-modal cannabis use is associated with a greater frequency of cannabis use (Krauss et al., 2017), greater dependence and increased risk for adverse effects (Baggio et al., 2014). Smoking cannabis is associated with respiratory problems (Russell et al., 2018) and consuming edibles may result in unintentional overconsumption of cannabis (Allen et al., 2017). Dabbing and vaping may further increase abuse liability because of the high THC concentrations (Stogner and Miller, 2015). However, little is known regarding the prevalence and patterns of multi-modal cannabis use or the concurrent use of more than one mode of cannabis in a 30-day period. Research on multi-modal use is also limited in States where recreational cannabis use is not legalized, limiting our ability to approach prevention development for young adults who use cannabis.

1.1. Current study

The present study aimed to (1) determine the past 30-day prevalence of five modes (smoke, vape, edible, dab, other) of cannabis use, (2) describe the prevalence of multi-modal use patterns (single vs. dual vs. poly), and (3) identify socio-demographic correlates of multi-modal use among young adults who currently use cannabis. These aims were examined among a sample of young adults recruited in Texas, where legal use of cannabis is limited to those who fall under the Compassionate-Use Act, which allows the use of low-THC cannabis products for those with one of a few medical conditions (Library, 2024). We hypothesized that (1) smoking will be the most prevalent mode of use and (2) multi-modal cannabis use patterns will significantly vary by socio-demographic characteristics. Younger participants, males, those identifying as non-heterosexual, and those identifying as racial/ethnic minority will be significantly more likely to report multi-modal cannabis use compared to single-modal based on research indicating that these groups are more likely to either use cannabis, use multiple modes, and/or experience cannabis dependence (Schauer et al., 2020; Al Rifai et al., 2020; Wu et al., 2016).

2. Method

2.1. Participants and procedures

Participants were a convenience sample of 764 22–30-year-olds from the Wave 9, (Spring 2019) of the Marketing and Promotions Across Colleges in Texas Project (Project M–PACT). A total of 5,482 18–29-year-old young adults were recruited from 24 Texas colleges across five counties surrounding the four largest Texas metropolitan areas in the United States. During Fall 2014 college students were invited via email to participate in the online survey and were followed until Spring 2019. Study procedures were IRB-approved and additional information on Project M–PACT is reported elsewhere (Loukas et al., 2016).

Only participants that reported past 30-day cannabis use at Wave 9 ($n = 901$), the only wave where multiple modes of cannabis use were assessed, and those with complete data ($n = 764$) for all study variables, including socio-demographic information, were included in the present study. A series of chi-square tests and t-tests were used to examine the differences between participants who were included in the present study versus those excluded due to missing data. Included participants ($n =$

764) did not differ from excluded participants ($n = 137$) on age, race, sexual identity, or past 30-day cannabis use. However, excluded participants were more likely to be male (19.7%) than female (12.3%). The 764 included participants were an average age of 25.11 years ($SD = 1.81$), 63.6% were female, 38.7% identified as non-Hispanic white, 30.6% as Hispanic/Latino, 13.0% as Asian and 9.4% as Black, and 8.2% identified with two or more races or another race/ethnicity.

2.2. Measures

Socio-demographic variables included: age group (22–25 vs. 26–30 years old), sex (male vs. female), racial/ethnic identity (non-Hispanic white, Hispanic/Latino, Black, Asian, another), and sexual identity (heterosexual vs. lesbian/gay/bisexual/other). Age was coded into a binary (22–25 vs. 26–30) variable based on the emerging adulthood literature. The race/ethnicity variable was computed by combining two items, one that assessed race and the other that assessed Hispanic/Latino ethnicity. The ‘another’ category was computed by combining those who identified as American Indian or Alaskan Native, Native Hawaiian or other Pacific Islander, an unlisted race/ethnicity, and those who endorsed two or more race/ethnicity categories.

The five modes of past 30-day cannabis use were assessed with the question, “Please indicate how you have used marijuana in the past 30 days” (Response options: No/Yes) followed by a list of five modes: smoke, vape, dab, edible, and tincture/drops. Multi-modal cannabis use patterns were classified by the number of modes of cannabis a participant used (i.e., single modal = 1 mode; dual modal = 2 modes; and poly modal = 3 + modes).

2.3. Data analysis

Descriptive statistics were run to determine the past 30-day prevalence of five modes (smoke, vape, edible, dab, other) of cannabis use (Q1), and the prevalence of multi-modal use patterns (single vs. dual vs. poly; Q2). Bivariate chi-square analyses were conducted to describe differences between single-, dual- and multi-modal cannabis use by each of the socio-demographic characteristics. A multinomial regression was then run to identify socio-demographic correlates of multi-modal cannabis use patterns (Q3). The outcome was cannabis use type (single vs. dual vs. poly) and the predictors were age, sex, race/ethnicity, and sexual identity. All analyses were conducted using IBM SPSS Version 28.

3. Results

Smoking was the most prevalent mode used in the past 30-days, followed by vaping, and each mode was reported by more than 50% of participants (Q1; see Table 1). Moreover, 42.7% of participants endorsed single-modal use, 33% endorsed dual-modal use, and 24.4% endorsed poly-modal use (Q2). Smoking was the most prevalent single-mode of use and the most prevalent in combination with other modes. The most common combination of dual-modal use was smoking and vaping. Smoking, vaping, and ingesting edibles was the most common combination among those endorsing poly-use. In addition, smoking, vaping, and ingesting edibles were the most common combination among those endorsing poly-use, with 50% endorsing the use of all three in the past month (see Table 1).

See Table 2 for bivariate descriptives and multinomial regression results for cannabis use patterns by socio-demographic characteristics. The multinomial regression identifying socio-demographic correlates of multi-modal cannabis use patterns (single- vs. dual- vs. poly-modal use; Q3) indicated that males (vs. females) were at a greater risk for using at least three modes of cannabis compared to one mode. Those identifying as gay/lesbian/bisexual/other (vs. heterosexual) were at a greater risk for using two, and three modes of cannabis compared to one. Finally, those identifying as Black were at a reduced risk for using three modes compared to one mode.

Table 1

Prevalence of each mode of cannabis use, including patterns of single, dual, and poly-modal cannabis use, among young adults who used cannabis in the past 30-days (N = 764).

| Overall | | % |
|----------------------------------|----------------|----------|
| Smoke | 615 | 80.50 |
| Vape | 435 | 56.94 |
| Edible | 269 | 35.21 |
| Dab | 116 | 15.18 |
| Other | 31 | 4.15 |
| Single-modal cannabis use | | |
| | n = 326 | % |
| Smoke | 206 | 63.19 |
| Vape | 73 | 22.39 |
| Edible | 43 | 13.19 |
| Dab | 4 | 1.23 |
| Other | 2 | 0.62 |
| Dual-modal cannabis use | | |
| | n = 252 | % |
| Smoke + Vape | 160 | 63.49 |
| Smoke + Edible | 55 | 21.83 |
| Vape + Edible | 18 | 7.14 |
| Smoke + Dab | 11 | 4.37 |
| Vape + Dab | 5 | 1.98 |
| Dab + Edible | 3 | 1.19 |
| Poly-modal cannabis use | | |
| | n = 186 | % |
| Smoke + Vape + Edible | 93 | 50.00 |
| Smoke + Vape + Dab + Edible | 47 | 25.27 |
| Smoke + Vape + Dab | 36 | 19.35 |
| Smoke + Dab + Edible | 7 | 3.76 |
| Vape + Dab + Edible | 3 | 1.61 |

Note. Single modes of use presented in the “Overall” category are not mutually exclusive, participants could endorse more than one mode of cannabis use. The subsequent categories (single, dual, and poly-modal) are mutually exclusive. The “Other” category includes tinctures/drops and “other” unspecified modes.

4. Discussion

The current study is one of the first to report patterns (i.e., single vs. dual vs. poly-modal) of multi-modal cannabis use among young adults who currently use cannabis. Consistent with expectations and prior

research (Wadsworth et al., 2022), smoking was the most common mode of use, followed by vaping, reflecting the increasing popularity of vaping cannabis (Schauer et al., 2020). Moreover, more than half of participants used at least two modes of cannabis in the past 30-days, which is troubling given the increased risk of experiencing negative health effects with concurrent use of multiple modes (Russell et al., 2018; Allen et al., 2017; Stogner and Miller, 2015). Among those endorsing dual and poly-modal cannabis use, vaping cannabis was one of the most common modes used in combination with other modes. It is possible that the ability to vape cannabis may provide those who use cannabis an opportunity for disguised use, ultimately allowing greater opportunities to circumvent anti-cannabis legislation (Morean et al., 2017). Future research should determine how cannabis use behaviors vary by mode of use. For example, young adults who use cannabis may be more likely to smoke cannabis in private settings but vape cannabis in public settings, possibly contributing to an increase in the frequency of use.

Notably, more than a third of the sample indicated they used edibles in the past 30 days and edible use was the third most prevalent mode of cannabis use in combination with other modes after vaping and smoking. Edible cannabis use is generally perceived by young adults as not harmful even though this mode of cannabis use is associated with an increased likelihood of overconsumption of THC (Allen et al., 2017). Young adults engaging in multi-modal cannabis use may use edibles to supplement their other preferred mode of cannabis (e.g., smoking or vaping), however, additional research is needed to determine why those who currently use multiple modes of cannabis use their preferred modes.

Also consistent with expectations and prior research (Schauer et al., 2020; Al Rifai et al., 2020), males and those identifying as non-heterosexual were at a greater risk for multi-modal use. Multi-modal cannabis use among young adults identifying as sexual minorities is concerning given that these individuals are more likely to experience cannabis use disorders (Boyd et al., 2020). Thus, there is a critical need for cannabis use prevention and intervention programs aimed at reducing cannabis use among sexual minority populations. In contrast, although Black young adults are more likely to experience cannabis dependence (Wu et al., 2016), participants identifying as Black were at a reduced risk for poly-modal use compared to single-modal use. Black young adults are more likely to smoke cannabis via blunts and less likely to use other modes (Montgomery and Oluwoye, 2016), and for this reason may be less likely to report multi-modal use. Future research

Table 2

Results from bivariate analyses and multinomial regression analysis examining associations between socio-demographic factors and cannabis use patterns among young adults who report past 30-day cannabis use (N = 764).

| | Bivariate Analyses Prevalence (%) | | | Multinomial Regression Analysis (Odds Ratios [95 %CI]) | | |
|---|-----------------------------------|----------------------|----------------------|--|--------------------|--------------------|
| | Single-Modal (n = 326) | Dual-Modal (n = 252) | Poly-Modal (n = 186) | Single vs. Dual | Single vs. Poly | Dual vs. Poly |
| Age (%) | | | | | | |
| 22–25 (vs. 26–30) | 58.59 | 62.30 | 66.13 | 0.84(0.60, 1.18) | 0.69(0.47, 1.02) | 0.83(0.55, 1.23) |
| Sex (%) | | | | | | |
| Male (vs. female) | 34.05 ^a | 34.13 ^a | 43.55 ^b | 1.04(0.73, 1.48) | 1.56(1.07, 2.29) * | 1.50(1.01, 2.23) * |
| Race & Ethnicity (%) | | | | | | |
| Non-Hispanic White | 38.96 | 38.49 | 38.71 | Reference | Reference | Reference |
| Hispanic/ Latino | 26.07 | 32.15 | 36.56 | 1.27(0.85, 1.90) | 1.47(0.95, 2.27) | 1.16(0.74, 1.81) |
| Black | 12.27 ^a | 9.13 | 4.84 ^b | 0.77(0.43, 1.38) | 0.43(0.20, 0.94) * | 0.56(0.24, 1.29) |
| Asian | 14.11 | 11.90 | 12.36 | 0.89(0.52, 1.52) | 0.93(0.52, 1.67) | 1.05(0.56, 1.97) |
| Two + or Another race/ ethnicity | 8.59 | 8.33 | 7.53 | 1.00(0.53, 1.87) | 0.93(0.46, 1.90) | 0.94(0.44, 1.98) |
| Sexual Identity (%) | | | | | | |
| Gay/Lesbian/Bi/Other (vs. Heterosexual) | 16.26 ^a | 23.41 ^b | 24.73 ^b | 1.58(1.04, 2.40) * | 1.83(1.16, 2.89) * | 1.16(0.74, 1.82) |

Note. Superscripts that vary are significantly different from one another. * = significant at p < 0.05. Non-Hispanic white was the reference group for racial/ethnic identity differences.

should examine socio-demographic differences in perceptions across modes of cannabis use to determine if favorable perceptions of the cannabis use modes explain use behaviors.

4.1. Strengths, limitations, and future research

The strengths of the present study include a large ethnically diverse sample of young adults and the measurement of multiple modes of cannabis. Limitations include the lack of generalizability to other young adults outside of Texas, a state where recreational cannabis use is not legalized (Library, 2024). Another limitation is the dichotomization of sexual orientation (i.e., heterosexual vs. lesbian/gay/bisexual/other), which may overgeneralize differences in cannabis use. Additional research is needed that examines multi-modal cannabis use in representative populations of young adults across the United States. Furthermore, although not within the scope of this paper, the impact of state policies legalizing cannabis on young adults' patterns of use is unclear. As of December 2023, 38 states have legalized medical-use cannabis and 24 states have legalized recreational cannabis use, which may contribute to an increased perception that cannabis use is not harmful to health. Considering the current cannabis landscape we may be seeing an increase in young adult use due to the growing number of cannabis products and increased availability of these products. Future research should aim to determine whether cannabis legalization policies in surrounding states impact the prevalence of cannabis use in states where cannabis use (both medically and recreationally) is still illegal.

4.2. Conclusion

Findings from the present study provide evidence that multi-modal cannabis use is common among young adults who currently use cannabis and that males and those identifying as non-heterosexual are at higher risk for multi-modal cannabis use. Multi-modal cannabis use is concerning given that it is associated with dependence and a greater risk for adverse effects (Baggio et al., 2014). This information can be used to tailor prevention efforts to young adults at an increased risk for multi-modal cannabis use.

5. Role of funding source

This work was supported by the National Institutes of Health [1 P50 CA180906, & 1 R01 CA249883-01A1], from the National Cancer Institute (NCI) and the Food and Drug Administration Center for Tobacco Products (CTP). The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health (NIH) or the Food and Drug Administration (FDA). Neither NIH nor FDA had any role in the study design, data collection, analysis, or writing of this paper.

CRedit authorship contribution statement

Caroline North: Writing – review & editing, Writing – original draft, Visualization, Conceptualization. **Srishty Arora:** Writing – review & editing, Writing – original draft. **C. Nathan Marti:** Writing – review & editing, Formal analysis. **Jacob E. Thomas:** Writing – review & editing. **Keryn E. Pasch:** Writing – review & editing. **Anna V. Wilkinson:** Writing – review & editing. **Alexandra Loukas:** Writing – review & editing, Supervision, Funding acquisition, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial

interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

References

- Al Rifai, M., Mirbolouk, M., Jia, X., et al., 2020. E-cigarette use and risk behaviors among lesbian, gay, bisexual, and transgender adults: the behavioral risk factor surveillance system (BRFSS) survey. *Kans J. Med.* 13, 318–321. <https://doi.org/10.17161/kjm.vol13.13861>.
- Allen, J.A., Davis, K.C., Duke, J.C., Nonnemaker, J.M., Bradfield, B.R., Farrelly, M.C., 2017. New product trial, use of edibles, and unexpected highs among marijuana and hashish users in Colorado. *Drug Alcohol Depend.* 176, 44–47. <https://doi.org/10.1016/j.drugalcdep.2017.03.006>.
- Baggio, S., Deline, S., Studer, J., Mohler-Kuo, M., Daepfen, J.B., Gmel, G., 2014. Routes of administration of cannabis used for nonmedical purposes and associations with patterns of drug use. *J. Adolesc. Health* 54 (2), 235–240. <https://doi.org/10.1016/j.jadohealth.2013.08.013>.
- Boyd, C.J., Veliz, P.T., McCabe, S.E., 2020. Severity of DSM-5 cannabis use disorders in a nationally representative sample of sexual minorities. *Subst. Abus.* 41 (2), 191–195. <https://doi.org/10.1080/08897077.2019.1621242>.
- Cohen, K., Weizman, A., Weinstein, A., 2019. Positive and negative effects of cannabis and cannabinoids on health. *Clin. Pharmacol. Ther.* 105 (5), 1139–1147. <https://doi.org/10.1002/cpt.1381>.
- D'Amico, E.J., Rodriguez, A., Dunbar, M.S., et al., 2020. Sources of cannabis among young adults and associations with cannabis-related outcomes. *Int. J. Drug Policy* 86, 102971. <https://doi.org/10.1016/j.drugpo.2020.102971>.
- Gunn, R.L., Aston, E.R., Sokolovsky, A.W., White, H.R., Jackson, K.M., 2020. Complex cannabis use patterns: associations with cannabis consequences and cannabis use disorder symptomatology. *Addict. Behav.* 105, 106329 <https://doi.org/10.1016/j.addbeh.2020.106329>.
- Krauss, M.J., Rajbhandari, B., Sowles, S.J., Spitznagel, E.L., Cavazos-Rehg, P., 2017. A latent class analysis of poly-marijuana use among young adults. *Addict. Behav.* 75, 159–165. <https://doi.org/10.1016/j.addbeh.2017.07.021>.
- Library, T.S.L., 2024. Guides: cannabis and the law: <i class="sll-fa-guide-nav fas fa-file-alt" aria-hidden="true"></i> General Information. Accessed April 10, 2024. Published. <https://guides.sll.texas.gov/cannabis/general-information>.
- Loukas, A., Chow, S., Pasch, K.E., et al., 2016. College students' polytobacco use, cigarette cessation, and dependence. *Am. J. Health Behav.* 40 (4), 514–522. <https://doi.org/10.5993/AJHB.40.4.13>.
- Montgomery, L., Oluwoye, O., 2016. The truth about marijuana is all rolled up in a blunt: prevalence and predictors of blunt use among young African-American adults. *J. Subst. Abus.* 21 (4), 374–380. <https://doi.org/10.3109/14659891.2015.1037365>.
- Morean, M.E., Lipshie, N., Josephson, M., Foster, D., 2017. Predictors of adult E-cigarette users vaporizing cannabis using E-cigarettes and vape-pens. *Subst. Use Misuse* 52 (8), 974–981. <https://doi.org/10.1080/10826084.2016.1268162>.
- Peters, E.N., Bae, D., Barrington-Trimis, J.L., Jarvis, B.P., Leventhal, A.M., 2018. Prevalence and sociodemographic correlates of adolescent use and polyuse of combustible, vaporized, and edible cannabis products. *JAMA Netw. Open* 1 (5), e182765.
- Russell, C., Rueda, S., Room, R., Tyndall, M., Fischer, B., 2018. Routes of administration for cannabis use – basic prevalence and related health outcomes: a scoping review and synthesis. *Int. J. Drug Policy* 52, 87–96. <https://doi.org/10.1016/j.drugpo.2017.11.008>.
- Schauer, G.L., Njai, R., Grant-Lenzy, A.M., 2020. Modes of marijuana use – smoking, vaping, eating, and dabbing: results from the 2016 BRFSS in 12 States. *Drug Alcohol Depend.* 209, 107900 <https://doi.org/10.1016/j.drugalcdep.2020.107900>.
- Squeglia, L.M., Gray, K.M., 2016. Alcohol and drug use and the developing brain. *Curr. Psychiatry Rep.* 18 (5), 46. <https://doi.org/10.1007/s11920-016-0689-y>.
- Stogner, J.M., Miller, B.L., 2015. Assessing the dangers of “dabbing”: mere marijuana or harmful new trend? *Pediatrics* 136 (1), 1–3. <https://doi.org/10.1542/peds.2015-0454>.
- Substance Abuse and Mental Health Services Administration. Substance Abuse and Mental Health Data Archive | CBHSQ Data. Published 2021. Accessed January 18, 2022. <https://www.samhsa.gov/data/data-we-collect/samhda-substance-abuse-and-mental-health-data-archive>.
- Wadsworth, E., Craft, S., Calder, R., Hammond, D., 2022. Prevalence and use of cannabis products and routes of administration among youth and young adults in Canada and the United States: a systematic review. *Addict. Behav.* 129, 107258 <https://doi.org/10.1016/j.addbeh.2022.107258>.
- Wu, L.T., Zhu, H., Swartz, M.S., 2016. Trends in cannabis use disorders among racial/ethnic population groups in the United States. *Drug Alcohol Depend.* 165, 181–190. <https://doi.org/10.1016/j.drugalcdep.2016.06.002>.