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Changes in perceived harms of tobacco and cannabis and their correlations with use: a panel study of young adults 2014–2020

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Abstract

Purpose: Perceived harm is associated with substance use. Changes in product and policy landscapes may impact perceived harms of tobacco and cannabis. This study aimed to examine changes in young adults' perceived harms of tobacco and cannabis and their associations with use behavior during a period including both before and after legalization of cannabis.

Methods: We conducted a panel survey of California Bay Area young adults (mean age=23.5 years old, 64.4% female) in 2014 and 2019–2020. Participants (N=306) reported past 30-day use and perceived harms of tobacco and cannabis at both waves. Perceived harms to health of cannabis and tobacco (cigarettes, e-cigarettes, hookah, smokeless tobacco, and secondhand tobacco smoke) were measured from 1-"Not at all harmful" to 7-"Extremely harmful." Mixed-effects logistic regressions examined associations between perceived harms and use of tobacco and cannabis, controlling for demographics.

Results: Participants perceived lower harm for cannabis than for tobacco products. Perceived harms of e-cigarettes, hookah, and smokeless tobacco significantly increased over time; while perceived harms of cigarettes, secondhand tobacco smoke, and cannabis did not change. Increased perceived harm of e-cigarettes was associated with lower odds of any tobacco use (OR=0.72, 95%CI=0.56, 0.92), and increased perceived harm of cannabis was associated with lower odds of any cannabis use (OR=0.51, 95%CI=0.42, 0.62).

Conclusions: Findings suggest that perceived harms of e-cigarettes and cannabis play important roles in driving young adult use behaviors. Risk communication efforts that increase perceptions

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of health harms related to e-cigarettes and cannabis may decrease use of tobacco and cannabis among young people.

Keywords

harm perception; risk perception; co-use; polysubstance use; marijuana; youth

1. Introduction

Perceived harm is an important driver of tobacco and cannabis use among young adults (YAs) (Berg et al., 2015). Use of these substances is popular among U.S. YAs and confers health risks (e.g., respiratory diseases) (Nguyen et al., 2019). Tobacco and cannabis are available in various forms, including combustible, smokeless, and vaporized products (Nguyen et al., 2019), and previous research showed that YAs perceived differential harms by product type, with vaporized products perceived as less harmful than combustible products (Nguyen et al., 2022). Low perceived harm of vaporized products among YAs is partly due to exposure to unauthorized health claims and targeted industry advertising (Wagoner et al., 2022). Increasing cannabis legalization in the US may also influence social norms and public opinion about safety of cannabis use (Steigerwald et al., 2020). These contextual changes in product and policy landscapes may impact YAs' perceived harms of tobacco and cannabis (Berg et al., 2015; Gali et al., 2021). Understanding how perceived harms of tobacco and cannabis change over time and whether changes influence use behavior is warranted.

Previous studies of perceived harms of tobacco and cannabis were mostly cross-sectional, with few longitudinal studies assessing changes over time (Gali et al., 2021; Strong et al., 2019). Several studies examining perceived harms of both substances indicated lower perceived harm toward cannabis compared to tobacco products (Berg et al., 2015; Popova et al., 2017; Roditis and Halpern-Felsher, 2015). However, two of these studies were qualitative and the quantitative study was conducted in 2013. More recent quantitative studies comparing perceived harms of tobacco and cannabis are warranted.

To address these gaps, we analyzed longitudinal panel data of YAs in the Bay Area, California to examine changes in perceived harms of tobacco products and cannabis from 2014 to 2019–2020 and their associations with use behavior. California legalized adult use of cannabis in 2018. After legalization, studies have reported an increase in cannabis use among YAs, especially those who use e-cigarettes (Meng et al., 2022). Our study capturing data both before and after legalization addresses changes in perceived harms of both tobacco and cannabis and associations with YA use to inform prevention efforts.

2. Methods

2.1. Design and participants

We used panel data from the San Francisco Bay Area Young Adult Health Survey, a probabilistic multi-mode household survey of 18–26-year-old YAs conducted in Alameda and San Francisco counties in California. Survey procedures have been described in detail

elsewhere (Holmes et al., 2022). Participants completed a baseline survey in 2014 and a follow-up survey in 2019–2020. Informed consent was obtained from all participants. The survey was approved by the University of California San Francisco IRB. Of 1363 participants who completed the baseline survey, 864 agreed to be recontacted and 306 completed the follow-up survey. The response rate was 35%, which is in line with ongoing state and national YA surveys, such as the California Health Interview Survey (16.2% for response rate at the latest wave) and Monitoring the Future (36.2% for the most recent wave) (Patrick et al., 2021; Sherr et al., 2021). Unlike those surveys, our data collection period was a 6-year interval, and we did not send respondents any project materials in the interim. Compared to follow-up survey respondents, non-respondents were younger, more likely to be male or Hispanic, less likely to have a college degree or higher, and more likely to report past 30-day use of cigarettes and cigars at baseline. There were no significant differences between the respondents and the non-respondents in terms of harm perceptions and use of other tobacco products and cannabis.

2.2. Measures

2.2.1. Perceived harms—Perceived harms were assessed in the baseline and follow up questionnaires for each tobacco product (cigarettes, e-cigarettes, hookah, smokeless tobacco, and secondhand tobacco smoke) and cannabis. Participants were asked, "How harmful you think [product] is to general health?" Response for each item was measured from 1-"Not at all harmful" to 7-"Extremely harmful.".

2.2.2. Tobacco and cannabis use—Participants were asked, "During the past 30 days, on how many days did you use [product]?", followed by a list of tobacco products [cigarette, e-cigarette, hookah, cigar/cigarillo, and smokeless tobacco] and cannabis. Current (past 30-day) use of each product was defined as using at least 1 day in the past 30 days. Those reported currently using any tobacco product were classified as current tobacco users. The outcomes were past 30-day use of any tobacco or any cannabis, not changes in use between two waves.

2.2.3. Demographic covariates—Age was calculated based on self-reported date of birth. Sex was dichotomized as female and male. Race/ethnicity was categorized into Hispanic, non-Hispanic White, Black, Asian/Pacific Islander, and Multiracial/Other. Educational attainment was dichotomized as "Less than college degree" and "Having a college degree or higher."

2.3. Analysis

Statistical analyses were performed using STATA 15. Design-based (weighted) point estimates were computed to describe perceived harms and use of tobacco and cannabis at the two waves. We used the Wilcoxon signed-rank test with Bonferroni correction for multiple comparisons between perceived harms of tobacco and cannabis at each wave. We examined whether perceived harms significantly differed between the two waves by fitting a mixed-effects linear regression model for each perceived harm item and year of data collection. We then examined the associations between perceived harms and tobacco use by fitting a mixed-effects logistic regression model with all tobacco-related perceptions as

independent variables and current use of any tobacco as a dependent variable. Another mixed-effects logistic regression model was used for cannabis-related perceived harm and the current cannabis use outcome. All models were adjusted for age, sex, race/ethnicity, and educational attainment. Due to the small amount of missing data (3%), the analysis used complete data. Variance inflation factors were less than 2 for all analyses, indicating that multicollinearity was not present. All hypothesis tests were two-tailed with a significance level of $\alpha < 0.05$.

3. Results

3.1. Changes in perceived harm and use of tobacco and cannabis between two waves

The sample had mean age of 23.5 years old (SD=2.2) at baseline. The majority were female (64.4%), non-Hispanic White (38.9%), and had attained a college degree or higher (51.6%). At baseline, perceived harm of cannabis was significantly lower than perceived harms of tobacco products (p-values <0.001), except for perceived harm of e-cigarettes (p=0.708). At follow up, perceived harm of cannabis was significantly lower than perceived harms of all tobacco products (p-values <0.001). During 2014–2020, perceived harms of e-cigarettes, hookah, and smokeless tobacco increased significantly (p<0.05); while perceived harms of cigarettes, secondhand tobacco smoke, and cannabis did not change (Figure 1a). Use of any tobacco decreased significantly over time (from 30.6% at baseline to 20.8% at follow up, p=0.011), while cannabis use increased significantly (from 28.5% to 32.9%, respectively, p=0.047) (Figure 1b). Use of specific tobacco products also decreased over time, but the decreases were statistically significant only for hookah (p=0.001). Current use of both tobacco and cannabis at baseline and at follow up, respectively, was reported by 17.5% and 14.9% of the total sample, 54.1 % and 71.6% of participants who used tobacco, and 54.1% and 45.3% of participants who used cannabis.

3.2. Associations between perceived harms and use of tobacco and cannabis

Results from the mixed-effects regression models were conditional on the random effects and represented the average effect across all levels of the random effects (Table 1). Of tobacco-related perceived harms, only change in perceived harm of e-cigarettes was significantly associated with past 30-day use of any tobacco (OR=0.72, 95% CI=0.56, 0.92). It meant that, taking into account variability of participants' changes over time, an increase in perceived harm of e-cigarettes was associated with lower odds of current tobacco use. Likewise, taking into account variability of participants' changes over time, an increase in perceived harm of cannabis was associated with lower odds of current cannabis use (OR=0.51, 95% CI=0.42, 0.62).

4. Discussion

This study extends the literature by elucidating changes in perceived harms for both tobacco and cannabis over a 6-year period. We found increases in perceived harms of e-cigarettes, hookah, and smokeless tobacco among California YAs during 2014–2020. Notably, increased perceived harm of e-cigarettes, but not of other tobacco products, was associated with lower odds of past 30-day use of any tobacco product. YAs perceived

lower harm of cannabis compared to all tobacco products, and the average perceived harm of cannabis did not change in general. However, YAs with increased perceived harm of cannabis were less likely to report past 30-day cannabis use. These findings suggest that perceived harms of e-cigarettes and cannabis play important roles in driving YA use behaviors.

The observed increases in YAs' perceived harms of e-cigarettes, hookah, and smokeless tobacco could be explained by multiple factors. As these products become more regulated, evolving policies (e.g., Tobacco 21, flavored tobacco sale restrictions) that limit the availability of these products may indirectly increase YAs' awareness of harms (Holmes et al., 2022). Accumulating evidence regarding deleterious health impacts of emerging tobacco products coupled with increasing educational programs and communication campaigns targeting young populations may also contribute to heighten YAs' perceived harms of these products (Liu et al., 2020). In particularly, public attention to vaping-related negative health effects and anti-vaping campaigns (e.g., the "Tell Your Story" vaping cessation campaign in California) likely altered perceived harms of e-cigarettes (Miech et al., 2021).

The cannabis legalization in California implemented in 2018 may have increased accessibility and availability of cannabis products and impacted social norms around use. Our surveys were conducted in 2014 and 2019–2020, and thus, captured perceived harms of cannabis both before and after legalization. Although the mean score of perceived harm of cannabis slightly decreased between two waves, this decrease was not statistically significant. However, a study among California older adults found an increase in perceived health benefits of cannabis at 6-month post-legalization (Gali et al., 2021). More longitudinal data over a longer time period and in diverse populations are warranted to track changes in perceptions of both harms and benefits related to cannabis.

Our findings have important implications. As multiple tobacco product use is prevalent among YAs (Nguyen et al., 2019), educational campaigns should include information on health risks related to use of all tobacco products. Communication strategies might prioritize emphasizing health harms related to e-cigarette use as this is a strong driver of YA tobacco use behavior in our study. Perceived harms of cigarettes remained highest of all tobacco products; it is important to reinforce perceived harms of cigarettes and secondhand smoke to prevent switching from non-cigarette tobacco products to cigarettes. Although much remains unknown about its health effects, cannabis was perceived as less harmful than tobacco. More research on health effects related to cannabis use and co-use with tobacco are needed. Finally, since co-use of tobacco and cannabis is common among YAs (Nguyen et al., 2019), risk communication strategies for both tobacco and cannabis can be integrated to address these linked needs.

Our study has limitations. As the sample was representative of YAs in the San Francisco Bay Area, our findings might not be generalizable to other samples or locations with different policies on tobacco and cannabis. Non-response in the follow-up survey may introduce nonresponse bias; thus, findings should be interpreted with caution. Due to the small number of tobacco users, we could not examine associations between perceived harm and use of specific tobacco products. Self-reported data is subject to recall and social desirability bias.

Data on use and perceived harms of specific cannabis products (e.g., joints, vaporized, edible) were not collected. As YAs may perceive harms differently by cannabis product (Nguyen et al., 2022), future research should examine perceived harms for specific cannabis products.

5. Conclusions

YAs' perceived harms of e-cigarettes, hookah, and smokeless tobacco increased between 2014–2020; while perceived harms of cigarettes, secondhand tobacco smoke, and cannabis did not change. YAs perceived cannabis to have lower health harms than tobacco products, and increased perceived harms of e-cigarettes and cannabis were associated with decreased tobacco and cannabis use. Education about health risks of e-cigarettes and cannabis may prevent tobacco and cannabis use in YAs.

Acknowledgement:

References

Berg CJ, Stratton E, Schauer GL, Lewis M, Wang Y, Windle M, Kegler M, 2015. Perceived Harm, Addictiveness, and Social Acceptability of Tobacco Products and Marijuana Among Young Adults: Marijuana, Hookah, and Electronic Cigarettes Win. Subst. Use Misuse 50, 79–89. 10.3109/10826084.2014.958857 [PubMed: 25268294]

Gali K, Winter SJ, Ahuja NJ, Frank E, Prochaska JJ, 2021. Changes in cannabis use, exposure, and health perceptions following legalization of adult recreational cannabis use in California: a prospective observational study. Subst. Abuse Treat. Prev. Policy 16, 16. 10.1186/s13011-021-00352-3 [PubMed: 33579324]

Holmes LM, Lempert LK, Ling PM, 2022. Flavored Tobacco Sales Restrictions Reduce Tobacco Product Availability and Retailer Advertising. Int. J. Environ. Res. Public. Health 19, 3455. 10.3390/ijerph19063455 [PubMed: 35329145]

Liu J, Gaiha SM, Halpern-Felsher B, 2020. A Breath of Knowledge: Overview of Current Adolescent E-cigarette Prevention and Cessation Programs. Curr. Addict. Rep 7, 520–532. 10.1007/s40429-020-00345-5 [PubMed: 33204602]

Meng Y-Y, Yu Y, Ponce NA, 2022. Cigarette, electronic cigarette, and marijuana use among young adults under policy changes in California. Addict. Behav. Rep 16, 100459. 10.1016/j.abrep.2022.100459 [PubMed: 36176360]

Miech R, Leventhal A, Johnston L, O'Malley PM, Patrick ME, Barrington-Trimis J, 2021. Trends in Use and Perceptions of Nicotine Vaping Among US Youth From 2017 to 2020. JAMA Pediatr. 175, 185–190. 10.1001/jamapediatrics.2020.5667 [PubMed: 33320241]

Nguyen N, Barrington-Trimis JL, Urman R, Cho J, McConnell R, Leventhal AM, Halpern-Felsher B, 2019. Past 30-day co-use of tobacco and marijuana products among adolescents and young adults in California. Addict. Behav 98, 106053. 10.1016/j.addbeh.2019.106053 [PubMed: 31357072]

Nguyen N, Wong M, Delucchi K, Halpern-Felsher B, 2022. Adolescents' and Young Adults' Perceptions of Risks and Benefits Differ by Type of Cannabis Products. Addict. Behav 131, 107336. 10.1016/j.addbeh.2022.107336 [PubMed: 35436697]

Patrick M, Schulenberg J, Miech R, Johnston L, O'Malley P, Bachman J, 2021. Monitoring the Future Panel Study Annual Report.

Popova L, McDonald EA, Sidhu S, Barry R, Richers Maruyama TA, Sheon NM, Ling PM, 2017. Perceived harms and benefits of tobacco, marijuana, and electronic vaporizers among young adults

in Colorado: implications for health education and research. Addict. Abingdon Engl 112, 1821–1829. 10.1111/add.13854

Roditis ML, Halpern-Felsher B, 2015. Adolescents' Perceptions of Risks and Benefits of Conventional Cigarettes, E-cigarettes, and Marijuana: A Qualitative Analysis. J. Adolesc. Health Off. Publ. Soc. Adolesc. Med 57, 179–185. 10.1016/j.jadohealth.2015.04.002

Sherr S, Best J, Goyle A, Langdale K, Engle-Bauer M, 2021. Report 4: Response Rates. UCLA Center for Health Policy Research, Los Angeles, CA:

Steigerwald S, Cohen BE, Vali M, Hasin D, Cerda M, Keyhani S, 2020. Differences in Opinions About Marijuana Use and Prevalence of Use by State Legalization Status. J. Addict. Med 14, 337–344. 10.1097/ADM.0000000000000593 [PubMed: 31821192]

Strong DR, Leas E, Elton-Marshall T, Wackowski OA, Travers M, Bansal-Travers M, Hyland A, White M, Noble M, Cummings KM, Taylor K, Kaufman AR, Choi K, Pierce JP, 2019. Harm perceptions and tobacco use initiation among youth in Wave 1 and 2 of the Population Assessment of Tobacco and Health (PATH) Study. Prev. Med 123, 185–191. 10.1016/j.ypmed.2019.03.017 [PubMed: 30878572]

Wagoner KG, Reboussin BA, Ross JC, Denlinger-Apte R, Spangler J, Sutfin EL, 2022. Exposure to e-cigarette health claims and association with e-cigarette use and risk perceptions: A cohort study of young adults. Addict. Behav 132, 107359. 10.1016/j.addbeh.2022.107359 [PubMed: 35576816]

Highlights

- We examined young adults' perceived harms of tobacco and cannabis during 2014–2020

- Perceived harm of cannabis was lower than those of tobacco products

- Perceived harms of e-cigarettes, hookah, and smokeless tobacco increased over time

- Increased e-cigarette perceived harm was associated with lower odds of tobacco use

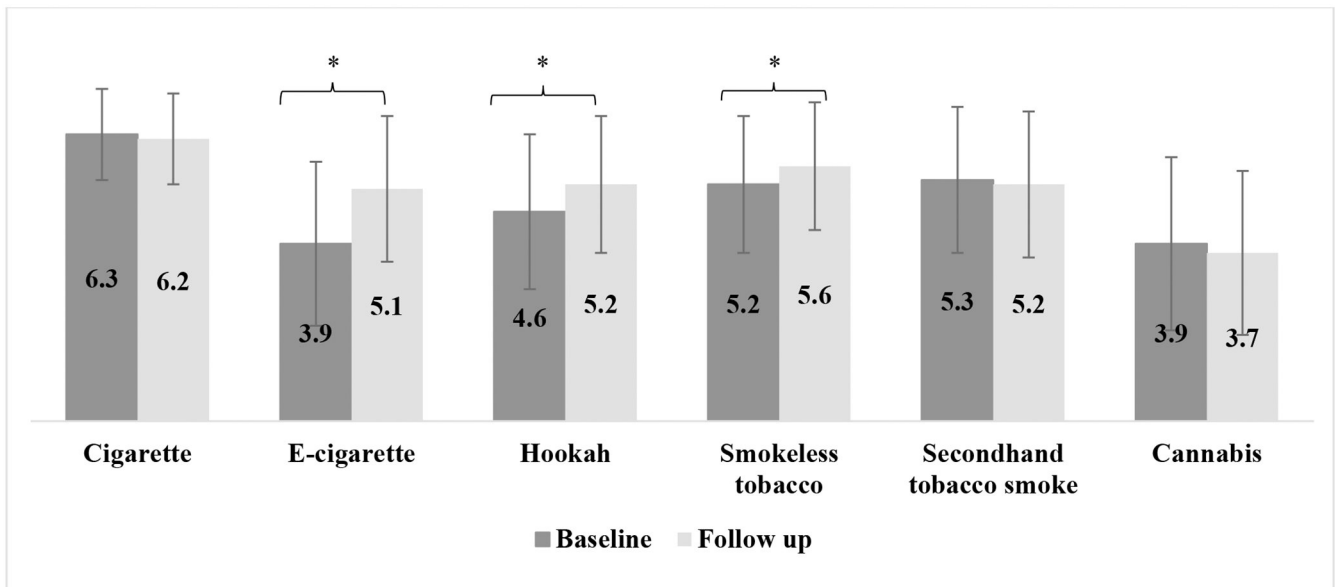- Increased cannabis perceived harm was associated with lower odds of cannabis use

Figure 1a:
Mean score of harm perception toward tobacco and cannabis use at baseline (2014) and follow up (2019–20), Bay Area Young Adult Health Study, N=306
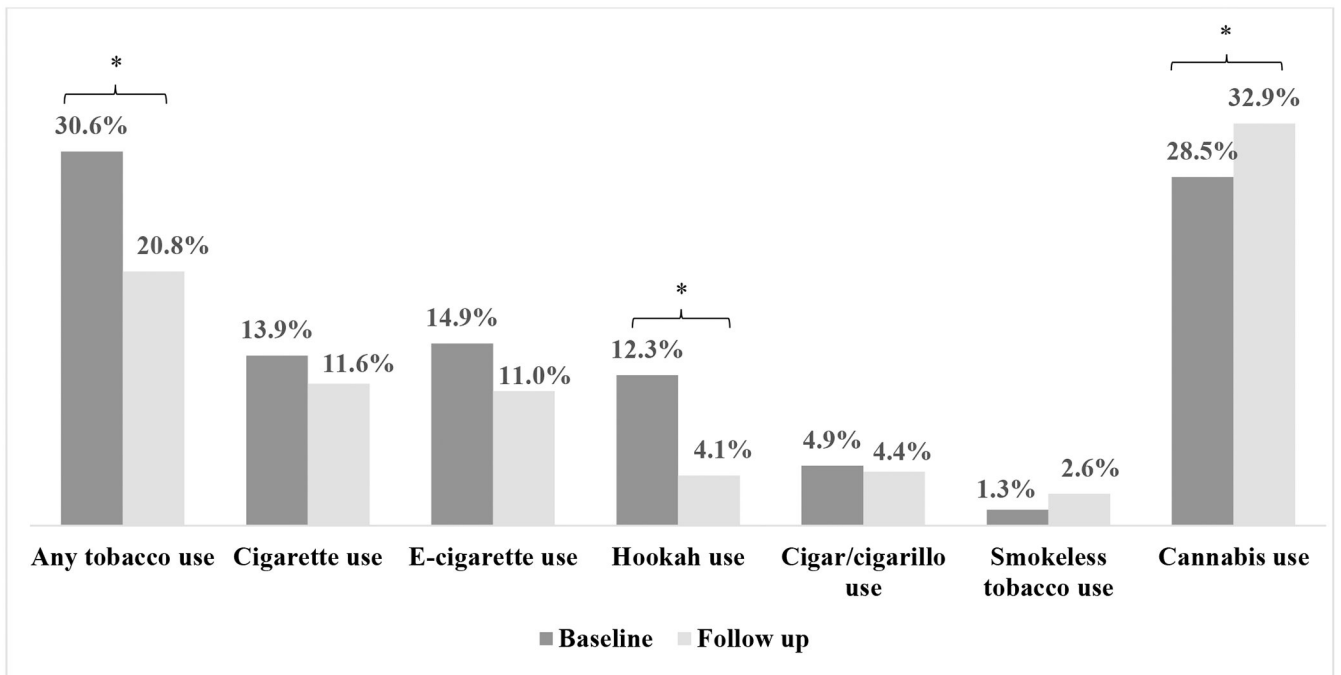
Figure 1b:
Proportion of tobacco and cannabis use at baseline (2014) and follow up (2019–20), Bay Area Young Adult Health Study, N=306

(*: statistically significant difference between the two waves)

Table 1:

Associations between perceived harms and past 30-day use of tobacco and cannabis during 2014–2020 (N=299)

Harm perception	Adjusted Odds Ratio (95% CI)
Outcome = Past 30-day use of any tobacco	
Perceived harm of cigarettes	0.71 (0.48, 1.05)
Perceived harm of e-cigarettes	0.72 (0.56, 0.92)[*]
Perceived harm of hookah	0.88 (0.68, 1.15)
Perceived harm of smokeless tobacco	1.15 (0.85, 1.54)
Perceived harm of secondhand tobacco smoke	1.06 (0.81, 1.39)
Outcome = Past 30-day use of any cannabis	
Perceived harm of cannabis	0.51 (0.42, 0.62)[**]

[*] Note: p<0.05;

[**] p<0.001.

CI: Confidence Interval. Two multivariable mixed-effects logistic regression models were fit separately for tobacco use and cannabis use outcomes. All perceived harms of tobacco were included simultaneously in the model for the tobacco use outcome. All models were adjusted for age, sex, race/ethnicity, and education attainment.