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## Use of Marijuana Edibles by Adolescents in California

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### Abstract

We explored how adolescent marijuana edible users differ in regards to marijuana use and related beliefs from marijuana users who do not use edibles. We analyzed California Healthy Kids Survey data collected in one Northern California school district with a racially and ethnically diverse student population. Survey respondents were youth in grades 9 – 12. Overall, 33% of respondents reported having used marijuana in their lifetime, and 50% of lifetime marijuana users reported using marijuana in the past 30 days. Seventy-two percent of lifetime marijuana users and 82% of past month marijuana users reported having used edibles in their lifetime. Comparing marijuana users who have never used edibles to those users who have, we found that edible users reported using marijuana more frequently in their lifetime. Edible users were also more likely to have used marijuana in the past 30 days, more frequently in the past 30 days, more likely on school property and more frequently on school property. Edible users and non-users differed in their perceptions of risk; edible users were less likely to agree that edible use is very risky. Edible users also reported a younger age of first marijuana use and more attempts to stop using marijuana than non-edible users. Multi-level regression analyses indicate that prevalence of edible use among marijuana users was related to perceived risk of edible use. Perceived risk of edible use among marijuana users was higher among marijuana users who do not use edibles, females, and those youth who perceive school rules to be clear. The findings indicate that prevalence of edible use is high among marijuana users, especially frequent users.

### Keywords

Youth; Marijuana; Edibles; Marijuana-infused products

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Compliance with ethical standards

Statement of human rights: All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

**Informed consent:** Informed consent was obtained from all individual participants included in the study.

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## Introduction

The rapidly changing legal status of marijuana and the growing marijuana market have led to an increase in the availability of food products such as cookies, brownies, and candies that are infused with marijuana or hashish (edibles). For example, in 2014 in Colorado, sales of infused edibles made up about 40 percent of the legal marijuana marketplace (Weiss, 2015). The first annual report by Colorado's Marijuana Enforcement Division on marijuana sales stated that 4.8 million edible marijuana products were sold (Colorado Department of Revenue, 2015a). A study of a nationally representative sample of adults aged 18 years and older who used marijuana for recreational and medicinal use found that 30% of lifetime marijuana users and 16% of past month users reported edible use (Schauer, King, Bunnell, Promoff, & McAfee, 2016).

As the availability and use of edibles are becoming more common, a number of problems have emerged. One problem is that some edibles are packaged to mimic candies and sweets, which raises concerns that this increases their appeal to children and young people (MacCoun & Mello, 2015). One study has shown that accidental marijuana ingestions among young children increased after medical marijuana was legalized and became available in Colorado in 2001 and that most of those ingestions involved marijuana edibles (Wang, Roosevelt, & Heard, 2013). A recent study examining the effects of marijuana legalization in Colorado blamed edible marijuana for the majority of health care visits for marijuana intoxication for all ages (Monte, Zane, & Heard, 2015).

One of the reasons why edibles are likely responsible for increases in health care visits is that even adult users can fail to anticipate the delayed effects of ingested marijuana (Monte, Zane, & Heard, 2015). When ingested, THC, the most potent psychoactive cannabinoid, is absorbed more slowly into the bloodstream than if smoked and absorption can take 30 minutes to 3 hours (Huestis, 2007). As a result, the lag before experiencing the high may prompt users to inadvertently consume an overdose amount while waiting. In addition, THC in edibles can interact with other drugs in the body because the liver is involved in metabolizing the THC, unlike inhaled THC that directly affects the brain.

Other reasons for overdosing are that THC dosage in edibles varies and product labeling may be confusing to consumers. Edibles are available with different THC content, and can range from 5 – 200+ mg THC, depending on the state's regulation concerning edibles. For example, the top 15 edibles chosen by *High Times*, a magazine about marijuana, included beef jerky and a muffin containing 100 mg THC each and a chocolate bar containing 240 mg THC (McDonough, 2015). Though individuals differ in what they consider a sufficient dose to have the desired effect, multiple sources, including Colorado's Marijuana Enforcement Division and Washington's State Liquor and Cannabis Board, define one serving as containing no more than 10 mg THC (Colorado Department of Revenue, 2015b; Washington State Liquor and Cannabis Board, 2015). This means that consumers have to be sufficiently disciplined to eat just a portion of a marijuana edible. For example, users wanting a dose of no more than 10 mg THC may only eat a tenth of a muffin containing 100 mg THC.

Another problem with edibles is that THC content can vary widely, even when a product is labeled. A study conducted by *The Denver Post* tested THC levels in 13 marijuana-infused products and found that THC levels often are less than claimed but also found instances in which THC levels exceeded the advertised amounts (Baca, 2014). Mandatory testing was implemented in Colorado by the Marijuana Enforcement Division in July 2014, and more than 98% of edibles now pass the potency test (Colorado Department of Revenue, 2015b). However, edible products in other states may be less regulated. A study of THC content in edibles available through the mostly unregulated medical marijuana market in California and Washington found that more than 23% of edible products tested had at least 10% more THC than stated on the label, and on average THC dosage in these edibles was 28% higher than indicated on the label (Vandrey et al., 2015).

To date, we know little about edible use by adolescents. A national survey of youth found that in states with medical marijuana laws, 40% of 12<sup>th</sup> graders who reported using marijuana in the past year said they had consumed edibles versus 26% in states without legalized medical marijuana (Johnston et al., 2014).

We examined adolescents' edible use in California, where medical marijuana is legal and marijuana is fairly easily accessible. We present findings about how edible users differ from marijuana users who do not use edibles in regards to marijuana use and related beliefs. Marijuana lifetime use prevalence in California is 10% for 7<sup>th</sup> graders, 26% for 9<sup>th</sup> graders and 42% for 11<sup>th</sup> graders (Wested, 2016). Findings from a qualitative study with California youth indicate that high school students can access edibles through multiple sources (Friese, Slater, Annechino & Battle, 2016). For example, some youth reported that they can purchase edibles from other students who make the edibles themselves. Some youth have access to edibles through others who have a medical marijuana card, and obtain edibles from medical marijuana dispensaries. Considering the significant rate of edible use among adolescents and the potential risks associated with use, it is important to learn more about edible use in this population.

## Methods

### Survey data

The data were collected as part of the California Healthy Kids Survey (CHKS), a biennial survey funded by the California Department of Education that is designed to assess youth health risk behaviors and resilience. The CHKS includes a core module that is required of all participating schools. This module contains questions about demographics and alcohol, tobacco, and other drug (ATOD) use. The self-administered survey is usually conducted with 7<sup>th</sup>, 9<sup>th</sup> and 11<sup>th</sup> graders throughout California, though schools have the option to survey all grades. Until 2011, the CHKS was required for all schools receiving Title IV funding under the federal Safe and Drug Free Schools and Communities Act or the State's Tobacco Use Prevention Education Program (approximately 85% of all districts). All eligible schools and their eligible classrooms and students were required to participate. In 2011, the participation requirement for schools receiving funding under the Safe and Drug Free Schools and Communities Act was lifted. However, there appear to have been no significant changes in

student participation. Depending on the school board's policy, active or passive parental consent is required.

We used data collected in one Northern California school district with a racially and ethnically diverse student population. The reason for focusing on this particular school district was that it added custom questions to the CHKS about marijuana edible use. Data collection in this district included grades 9 – 12 in six high schools. Response rates were 79% for the core module and 68% for the custom module. One potential reason for the lower response rate for the custom module questions, which are at the end of the survey, may be that not all youth were able to finish the survey in the allotted time.

**School-level archival data**—The student data were supplemented with school-level data obtained from the California Department of Education (2015).

## Variables

**Edible use**—Respondents were asked how many times in their lifetime they have eaten foods containing marijuana or hashish (edibles). Response categories were: 0 times, 1 time, 2 times, 3-9 times, 10-19 times, 20-30 times, and more than 30 times. Range responses were recoded into category midpoints (0, 1, 2, 6, 14.5, 25, 30) (He, Assanangkornchai, Cai & McNeil, 2015).

**Perceived risk of edible use**—Response categories were strongly disagree (1), disagree (2), neither agree nor disagree (3), agree (4), and strongly agree (5).

**Overall marijuana use**—Lifetime marijuana use was measured by asking respondents how many times during their life they have used marijuana (pot, weed, grass, hash, bud). Response choices included: 0 times, 1 time, 2 times, 3 times, 4-6 times (recoded to 5), and 7 or more times. Marijuana use in the past month was assessed by asking respondents on how many days during the past 30 days they used marijuana. Response categories were: 0 days, 1 day, 2 days, 3-9 days, 10-19 days, and 20-30 or more days which were recoded into category midpoints (0, 1, 2, 6, 14.5, 25). Marijuana use on school property was assessed by asking respondents on how many days in the past 30 days they smoked marijuana on school property. Response categories were: 0 days, 1 day, 2 days, 3-9 days, 10-19 days, and 20-30 or more days and those with ranges were recoded into category midpoints (0, 1, 2, 6, 14.5, 25).

**Age at first marijuana use**—Youth were asked how old they were the first time they used marijuana or hashish. Response categories were: 10 or under, 11, 12, 13, 14, 15, 16, 17, and 18 or over.

**Perceived harm from marijuana use**—Youth were asked two questions about their perceptions of harm from marijuana use. Respondents were asked how much they thought people risk harming themselves if (a) they smoke marijuana occasionally, and (b) they smoke marijuana once or twice a week. Response categories were: no risk (1), slight risk (2), moderate risk (3), and great risk (4).

**Perceived ease of access**—Youth were asked how difficult it is for students in their grade to get marijuana if they really wanted to. Response categories were: very difficult (1), fairly difficult (2), fairly easy (3), very easy (4), and don't know. Responses of "don't know" were recoded as missing.

**Marijuana cessation attempts**—Youth were asked how many times they have tried to quit or stop using marijuana. Response categories were: don't use (recoded as missing), 0 times (0), 1 time (1), 2 to 3 times (2.5), and 4 or more times (4).

**Perceived clarity of school rules**—A total of five questions constituted the perceived clarity of school rules scale, a measure of the school environment. Youth were asked to indicate their level of agreement or disagreement with the following statements: rules in this school are made clear to students; this school clearly informs students what would happen if they break the rules; students know how they are expected to act; students know what the rules are; and this school makes it clear how students are expected to act. Response categories were: strongly disagree (1), disagree (2), neither agree nor disagree (3), agree (4), and strongly agree (5). Responses to these questions were combined and the mean was calculated.

**School-level variables**—Three school-level variables were included: (a) total number of students enrolled in the school; (b) percent free and reduced lunch eligible students; and (c) percent African American students.

**Background variables**—Background variables included sex, age, race and ethnicity, and parents' education. Respondents were asked about their sex (male, female). Youth were asked how old they were (10 years or younger, 11, 12, 13, 14, 15, 16, 17, or 18 years old or older). The age category "10 years or younger" was coded as 10, and the age category "18 years or older" was coded as 18. Youth were asked about their ethnicity (Are you of Hispanic or Latino origin? Yes, No) and race (What is your race?). Response choices for race included: American Indian or Alaska Native, Asian, Black or African American, Native Hawaiian or Pacific Islander, White, and mixed (two or more) races. Parents' educational attainment was obtained by asking youth about the highest level of education their parents completed and instructing them to mark the education level of the parent who went furthest in school. Response choices included: did not finish high school, graduated from high school, attended college but did not complete four-year degree, graduated from college, and don't know. This variable was recoded into two categories: parents did not attend college (0) or attended college (1). Responses of "don't know" were recoded as missing.

### School-level descriptives

The high schools included in the study had a mean enrollment of 1,186 students ( $SD = 242$ ), and ranged from 865 to 1,486 students. On average, 65% of students were eligible for free and reduced lunch ( $SD = 19$ ; range: 41% - 93%). Percent African American students ranged from 6% - 29% with a mean of 21% ( $SD = 9$ ). Percent White students ranged from 1% - 19%, with a mean of 9% ( $SD = 7$ ). Percent Hispanic students ranged from 20% - 85% with a

mean of 47% ( $SD = 24$ ). *Sample characteristics.* A total of 5,390 students completed the survey. Sample characteristics are in Table 1.

## Analyses

Because youth are nested within schools, we conducted multi-level regression analyses to examine the relationships between individual and school-level factors and edible use and related beliefs using HLM Version 7.0 (Raudenbush et al., 2010). Linear regression was used for continuous outcomes, and a logit link function was used for dichotomous outcomes. Due to small numbers, students who identified as Native American or Native Hawaiian/Pacific Islander were combined with multi-racial youth for the hierarchical linear modeling.

## Results

### **Marijuana and edible use and perceived risk by individual characteristics—**

Overall, 33% of respondents ( $n = 1,697$ ) reported having used marijuana at least once in their lifetime and 50% of lifetime marijuana users ( $n = 829$ ) reported using marijuana in the past 30 days. Seventy-two percent of lifetime marijuana users ( $n = 1,023$ ) and 83% of past month marijuana users ( $n = 577$ ) reported having used edibles in their lifetime. These percentages may represent an underestimate of actual marijuana users who have consumed edible marijuana. Of the youth reporting edible marijuana use, 256 did not report lifetime marijuana use. We believe the most likely explanation for this inconsistent reporting is that the edible marijuana question was explicit about edible use, asking how often respondents had eaten foods containing marijuana or hashish (edibles); however, the lifetime marijuana question did not define what was meant by “use”. It seems likely that some youth interpreted the lifetime use question as referring to smoked marijuana; if they used edibles but did not smoke marijuana, this would result in the inconsistencies found. Therefore, it seemed to us most reasonable to keep these self-reported edible users in the analysis.

On average, those who used edibles in their lifetime, reported consuming them 7.9 times ( $SD = 9.8$ ). When asked about how strongly they agree or disagree with the statement that edible use is very risky, 23% of respondents who did not report any lifetime use of marijuana (including edibles) agreed and 31% strongly agreed with the statement. Nineteen percent of lifetime marijuana users who have used edibles agreed and 12% strongly agreed that edible use is very risky. Table 1 details lifetime and 30 day marijuana use prevalence, edible use prevalence, mean frequency of use, and perceived risk of edible use by individual characteristics.

Comparing lifetime marijuana users who have never used edibles to those users who have, we found a number of statistically significant differences in marijuana use and related attitudes (Table 2). Edible users reported using marijuana more frequently in their lifetime than non-edible users (4.3 vs. 3.5 times). Edible users were also more likely to have used marijuana in the past 30 days (46% vs. 29%), more frequently in the past 30 days (5.0 vs. 1.8 times), more likely on school property (20% vs. 9%) and more frequently on school property (2.0 vs. .7 times) when compared to non-edible users. Edible users also reported a younger age of first marijuana use than non-edible users (13.6 vs. 14.2). Edible users and



non-users differed in their perceptions of risk from edible use; edible users were less likely to agree with the statement that edible use is very risky (2.9 vs. 3.2). The perceptions of edible users and non-users did not differ in regards to the risk of regular and occasional marijuana use. Edible users and non-users also did not differ in the likelihood of having attempted to quit marijuana, although edible users reported more attempts to stop using marijuana than non-users (1.0 vs. .8 times).

**Edible use prevalence**—The regression analyses using responses from all survey participants, regardless of whether they had used marijuana, indicate differences by race, gender, age, perceived risk of edible use, and perceived clarity of school rules, in regards to the prevalence of edible use (Table 3). Asians were less likely than African Americans to have consumed edibles, as were males relative to females. Age was positively related to edible use. Perceived risk of edible use and perceiving school rules to be clear were both negatively related to edible use. When considering only marijuana users, perceived risk of using edibles was the only variable related to the likelihood of having used edibles. Marijuana users who perceived edible use to be more risky were less likely to report edible use in their lifetime. None of the school-level variables were related to edible use; neither were other school-level variables, such as percent of English learners, percent Hispanic/Latino and a rating of school grounds.

**Perceived risk of edible use**—When examining the perceived risk of edible use by all respondents regardless of marijuana use, Asians, compared to African Americans, perceived edible use to be more risky (Table 4). Males, compared to females, perceived edible use to be less risky. Age was negatively related to perceived risk. Parents' educational attainment was positively related to perceived risk of edible use, as was adolescents' perceived clarity of school rules.

When examining marijuana users only, we find that edible users, compared to marijuana users who do not use edibles, perceived edible use to be less risky. Male marijuana users perceived edible use to be less risky when compared to female marijuana users. Marijuana users' perceived risk of edibles was positively related to clarity of school rules. That is, youth who more strongly agreed that school rules are clear perceived the risk of edible use to be higher. None of the school-level variables were significantly related to perceived risk of edible use.

## Discussion

Findings from this study indicate that 72% of adolescents from a school district in Northern California who are lifetime marijuana users, and 82% of adolescents who used marijuana in the past 30 days, reported having used edibles in their lifetime. In this sample, edible users appear to be heavier users of marijuana than marijuana users who do not consume edibles. Edible users, compared to marijuana users who have not used edibles, were more likely to have used marijuana in the past 30 days, more frequently in the past 30 days, more likely to use marijuana on school property, more frequently on school property, and more likely to have initiated marijuana use at a younger age. Edible users also reported a higher number of attempts to quit using marijuana. More frequent users of marijuana may ingest marijuana in

multiple ways, including edibles. Future research should examine whether heavier users engage in multiple modes of marijuana consumption, such as vaping, dabbing, or smoking blunts.

Regression analyses indicate that females were more likely to use edibles than males, even though males in general showed lower perceived risk of edible use. These findings provide quantitative confirmation of earlier qualitative research results (Friese et al., 2016), which suggested that female users preferred edibles to smoking marijuana, because it was more covert and less potentially socially stigmatizing (e.g., odors, reputation as a “smoker”). It is also surprising that use is higher among females, even though they consider edible use to be more risky. Some of the female respondents in our prior qualitative study (Friese et al., 2016) compared consuming edibles to consuming a spiked drink, not knowing what is in it and what effect it may have, and potentially putting themselves at risk for sexual assault.

Students’ perceived clarity of school rules was linked to their perceived risk of edible use regardless of marijuana use. The reason for this relationship may have to do with edible use at school. Our research indicates that edibles may be preferred for use while at school because, unlike smoking marijuana, eating marijuana-infused food leaves no odor (Friese et al., 2016). Adolescents’ knowledge about potential punishments may influence edible use and affect how risky such use is perceived to be. However, perceived clarity of school rules is just one measure of the perceived school environment. Edible use and perceived risk of edible use could also be related to other aspects of the perceived school environment. School-level variables, such as school size, percent students receiving free and reduced lunch, percent English learners, school grounds, and racial/ethnic composition were not related to edible use or the perceived risks of edible use.

With more states legalizing recreational and medical marijuana, we may see an increase in adolescents’ edible use due to the increasing normalization of marijuana use and retail availability. Policies and strategies to address access to edibles and edible use by youth are needed. In 2014, the Colorado Department of Public Health and Environment proposed a ban on sales of nearly all edibles after several deaths related to them (Ingold, 2014). However, the proposed ban resulted in a strong industry outcry, which is not surprising considering that edibles constitute a sizable portion of the marijuana market (Ingold, 2014). Attempts to limit edibles in other states will likely face similar opposition.

Even though a ban on edibles is unlikely, there are other regulations that can be considered, such as packaging, labeling, and dosage regulation. For example, packaging of edibles should not mimic packaging of candy. MacCoun and Mello (2015) suggest that packaging of edibles to mimic candies evokes the tort-law concept of “attractive nuisance,” which is defined as a “hazardous condition that is foreseeably likely to attract children who are unable to appreciate the risk involved.” MacCoun and Mello (2015) warn that consumers injured by consumption of edibles packaged in this manner may sue manufacturers. Furthermore, regulating dosage and clearly marking edibles so that consumers can easily understand how much they can safely consume seems to be a reasonable precaution. For example, Colorado and Washington now require individually wrapped edibles of no more than 10 mg THC, and edibles containing more than one serving have to be clearly marked to



indicate the size of one serving (Colorado Department of Revenue, 2015a; Washington State Liquor and Cannabis Board, 2015). In addition, Colorado and Washington have instituted testing to assure that edibles for retail have potency consistency. In Washington, edibles may not be packaged in a manner that makes them appealing to children (e.g., brightly colored packaging) and are required to be in child-proof packaging (Washington State Liquor and Cannabis Board, 2015). Even though the Washington State Liquor and Cannabis Board requires review and approval of edibles sold in Washington, there are over 1,000 different edibles on the State's approved list of edibles (2016).

Limiting access to edibles will be an important aspect of reducing and preventing youth's use of edibles. Though relatively few youth have medical marijuana cards to purchase medical marijuana legally, some youth can access marijuana through diversion (Boyd, Veliz, & McCabe, 2015), typically by an older sibling or friend who purchases the edibles and then passes them on to youth. Such social sources of marijuana edibles present a significant challenge, as exchanges of the edibles are likely take place in private, thereby making enforcement difficult.

In addition, limiting retail access to edibles, including through diversion, will not keep youth from accessing edibles. Our prior research (Friese et al., 2016) indicates that some youth may be making their own edibles which they then sell to their peers. Therefore, it is important to prevent youth from accessing Canna butter from retail outlets which they can use to make edibles. However, beyond that, options to reduce access to homemade edibles are limited. Education of adolescents about the risks of edible use, especially homemade, unlabeled edibles, may be one way to limit edible use among adolescents.

**Study limitations**—One of the limitations of this study is that the youth surveyed in this Northern California school district may not be representative of youth in California or other areas of the U.S.. Furthermore, 11% of the eligible participants did not complete the additional survey module that contained the question on edible use. Reading comprehension and speed may have influenced completion of the survey, thus potentially excluding students of marginal literacy. In addition, the survey only asked about lifetime, and not past 30 day edible use. There were as noted 256 respondents who reported edible use but not lifetime marijuana use. This discrepancy introduces some uncertainty in estimates of the percentage of marijuana users who also use edibles. Moreover, we believe that discrepancy suggests lifetime use measures that do not explicitly define use in terms of both eating and smoking marijuana or marijuana-derived products may result in underestimates of lifetime use, if some youth who only use edibles assume “use” refers to smoking and do not then self-report in response to such items. Clarifying lifetime use items in this way would also permit more confidently identifying and studying youth who use edibles but do not smoke marijuana. In spite of these limitations, the study provides important initial data on youth who use edibles. Future quantitative studies should examine how youth access edibles and reasons for using edibles. We also need to examine whether marijuana edibles constitute an entry into marijuana use for new users, especially girls. Findings from these studies could help us develop strategies to reduce edible access and use.

The marijuana market is a rapidly growing business sector. California, where this study was conducted, is currently the largest marijuana market in the U.S. (ArcView Market Research, 2015). A report by ArcView estimates that legalization nationwide would result in \$36.8 billion in sales, which would exceed the \$33.1 billion organic foods market in the U.S.. However, the report also cautions that there could be threats limiting future growth, including adverse events involving edibles. The threat of lawsuits may motivate the industry to work with public health professionals and others to develop policies that limit underage access to edibles and prevent overdoses.

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**Table 1**

Use prevalence of marijuana and edibles and individual characteristics

	Total sample (n = 5,390) (%)	Lifetime marijuana users (%)	30 day marijuana Users <sup>b</sup> (%)	Lifetime edible users <sup>b</sup> (%)	Mean number of lifetime edible use <sup>e</sup>	Non-users agreeing that edible use is risky <sup>c, d</sup> (%)	Marijuana edible users agreeing that edible use is risky <sup>c</sup> (%)
Race/Ethnicity							
African American	19.5	40.4	49.0	68.1	7.3 (9.46)	43.5	29.5
Asian	22.6	15.9	44.4	69.4	7.7 (9.88)	66.7	37.3
Native American <sup>a</sup>	1.4	42.3	59.1	84.2	13.2 (12.47)	54.5	31.6
Nat. Hawaiian/ Pacific Islander <sup>a</sup>	4.9	34.2	54.7	69.1	9.7 (11.10)	58.3	39.5
Multi-racial	37.3	36.7	52.7	74.0	8.2 (10.05)	54.4	30.9
White	14.4	40.0	58.8	71.1	7.3 (9.06)	53.7	33.1
Hispanic	50.6	34.9	49.9	74.3	8.1 (9.85)	52.2	31.2
Gender							
Male	52.3	31.1	50.6	70.4	9.9 (11.05)	50.6	26.6
Female	47.7	34.9	49.4	73.2	6.0 (8.03)	61.4	37.0
Age							
14	17.3	21.9	50.5	66.2	6.0 (8.52)	61.3	34.7
15	27.1	29.6	50.0	71.5	7.0 (9.35)	55.6	35.0
16	27.1	35.3	47.9	74.0	8.7 (10.17)	54.1	32.0
17	21.1	39.6	53.3	71.0	8.7 (10.28)	55.0	27.3
18	7.4	42.5	47.7	75.5	8.0 (9.65)	43.9	32.5
Parents Education							
Parents did not attend college	50.1	35.1	51.6	74.8	7.9 (9.65)	53.2	29.9
Parents attended college	49.9	31.9	49.2	69.6	7.5 (9.55)	60.0	35.3

Standard deviations in parentheses

<sup>a</sup>Due to small numbers, Native Americans and Native Hawaiians/Pacific Islanders were combined and included in the multi-racial/other category for HLM analyses.

<sup>b</sup>Lifetime marijuana users only

Respondents agreeing or strongly agreeing that consuming edibles is risky  
Respondents who have never used marijuana or marijuana edibles  
Marijuana edible users only

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**Table 2**

Comparison of lifetime marijuana users who consume edibles and those who do not

	Lifetime marijuana user who have used edibles ( <i>n</i> = 1,290)	Lifetime marijuana users who have not used edibles ( <i>n</i> = 400)	<i>p</i>
Mean lifetime marijuana use	4.30 (2.96)	3.46 (2.45)	<.001
30 day marijuana use prevalence	46.4%	29.4%	<.001
Mean 30 day marijuana use frequency	5.04 (8.68)	1.78 (5.20)	<.001
30 day marijuana use on campus prevalence	19.8%	9.4%	<.001
Mean 30 day marijuana use frequency on campus	2.01 (6.02)	.66 (3.47)	<.001
Ever attempted to stop using marijuana	47.0%	43.0%	<i>ns</i>
Mean number of attempts to stop using marijuana	1.02 (1.37)	.77 (1.18)	.016
Mean perceived risk of edible use	2.91 (1.26)	3.17 (1.35)	<.001
Mean perceived risk of occasional marijuana use	2.22 (1.18)	2.23 (1.11)	<i>ns</i>
Mean perceived risk of regular marijuana use	2.29 (1.20)	2.37 (1.16)	<i>ns</i>
Mean perceived access to marijuana	3.50 (.91)	3.48 (.90)	<i>ns</i>
Mean age at first marijuana use	13.64 (1.84)	14.22 (1.82)	<.001

Standard deviations are in parentheses



**Table 3**

Summary of regression analyses predicting edible use

	<b>B</b>	<b>SE</b>	<b>t</b>	<b>p</b>	<b>OR</b>
Edible use prevalence (all survey respondents)					
Hispanic <sup>a</sup>	.04	.09	.46	.648	1.04
Asian <sup>a</sup>	-.94	.14	-6.96	<.001	.39
White <sup>a</sup>	.14	.12	1.14	.253	1.15
Multi-racial and other <sup>a</sup>	.09	.09	1.08	.280	1.10
Male	-.31	.08	-4.04	<.001	.74
Age	.21	.03	6.65	<.001	1.24
Parents have college education	-.08	.08	-.94	.346	.92
Perceived risk of edible use	-.19	.03	-6.90	<.001	.83
Perceived clarity of school rules	-.28	.04	-6.24	<.001	.76
Enrollment <sup>b</sup>	.0002	.0002	.927	.452	1.00
Free and reduced lunch <sup>b</sup>	-.001	.003	-.33	.773	1.00
% African American students <sup>b</sup>	.004	.006	.59	.614	1.00
Edible use prevalence (marijuana users)					
Hispanic <sup>a</sup>	.24	.15	1.60	.111	1.28
Asian <sup>a</sup>	-.02	.25	-.08	.934	.98
White <sup>a</sup>	.03	.21	.14	.889	1.03
Multi-racial and other <sup>a</sup>	.12	.15	.80	.425	1.13
Male	-.25	.13	-1.88	.061	.78
Age	.01	.06	.24	.808	1.01
Parents have college education	-.25	.15	-1.70	.089	.78
Perceived risk of edible use	-.15	.05	-2.68	.007	.86
Perceived clarity of school rules	-.02	.08	-.27	.789	.98
Enrollment <sup>b</sup>	.0001	.0005	.13	.910	1.00
Free and reduced lunch <sup>b</sup>	-.007	.006	-1.07	.398	.99
% African American students <sup>b</sup>	-.02	.02	-1.24	.341	.98

<sup>a</sup>African American is the reference group<sup>b</sup>School-level variables

**Table 4**

Summary of regression analyses predicting perceived risk of edible use

	<b>B</b>	<b>SE</b>	<b>t</b>	<b>p</b>
Perceived risk of edible use (all survey respondents)				
Hispanic <sup>a</sup>	.09	.06	1.62	.105
Asian <sup>a</sup>	.42	.07	5.96	<.001
White <sup>a</sup>	.14	.08	1.85	.064
Multi-racial and other <sup>a</sup>	.04	.05	.76	.451
Male	-.21	.04	-4.76	<.001
Age	-.05	.02	-2.75	.006
Parents have college education	.12	.05	2.32	.021
Perceived clarity of school rules	.40	.03	14.99	<.001
Enrollment <sup>b</sup>	.0001	.0003	.160	.888
Free and reduced lunch <sup>b</sup>	-.003	.004	-.61	.605
% African American students <sup>b</sup>	-.001	.01	-.12	.915
Perceived risk of edible use (marijuana users)				
Edible user	-.21	.08	-2.67	.008
Hispanic <sup>a</sup>	.03	.08	.36	.722
Asian <sup>a</sup>	.14	.14	1.03	.303
White <sup>a</sup>	.17	.12	1.49	.136
Multi-racial and other <sup>a</sup>	.001	.08	.01	.990
Male	-.26	.07	-3.64	<.001
Age	-.02	.03	-.76	.448
Parents have college education	.10	.08	1.27	.205
Perceived clarity of school rules	.36	.04	8.82	<.001
Enrollment <sup>b</sup>	.0001	.0004	.34	.764
Free and reduced lunch <sup>b</sup>	.0009	.006	.15	.895
% African American students <sup>b</sup>	.003	.01	.22	.848

<sup>a</sup>African American is the reference group.<sup>b</sup>School-level variables