



## Short Communication

## Place over traits? Purchasing edibles from medical marijuana dispensaries in Los Angeles, CA

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## ABSTRACT

**Objectives:** To examine discrete purchasing behaviors of marijuana-infused edibles from medical marijuana dispensaries with the aim to identify potential venue- and individual-level targets for prevention.

**Methods:** Two-stage, venue-based sampling approach was used to randomly select patrons exiting 16 medical marijuana dispensaries in Los Angeles, California during Spring 2013. Hierarchical generalized linear modeling was used to examine the likelihood of purchasing edibles among 524 patrons reporting a discrete purchase regressed on characteristics of the sampled dispensaries and their patrons.

**Results:** At a venue level, patrons were more likely to purchase edibles from dispensaries located within Census tracts with higher median incomes or in close proximity to a higher number of dispensaries. At an individual level, patrons who identified as Black or Hispanic were associated with a lower likelihood of purchasing edibles when compared to patrons who identified as other non-White, non-Hispanic race/ethnicity.

**Conclusions:** Place-based policies focused on regulating edible sales through dispensaries may be fruitful in influencing access to edibles. Additionally, social marketing campaigns may benefit from targeting both locations where edible purchases are more likely and populations who are more likely to purchase edibles.

## 1. Introduction

Place-based distribution of marijuana products has increased throughout the United States with the rise of state-level policies permitting medical and/or recreational consumption of marijuana (National Conference of State Legislatures, 2016). This distribution model has come with an increased availability of marijuana-infused edibles, such as cookies, brownies, or candy (Ghosh et al., 2016). Studies have observed higher consumption of marijuana-infused edibles in states permitting medical and/or recreational marijuana use when compared to states not permitting this use (Borodovsky, Crosier, Lee, Sargent, & Budney, 2016; Lamy et al., 2016).

Use and availability of marijuana-infused edibles can negatively affect health and well-being of users. First, over-consumption of THC may be more likely with edibles as they often have higher concentration of THC per dose and take longer to metabolize. Thus users may take more in an attempt to feel high more quickly, increasing the likelihood of erratic behaviors associated with adverse psychological effects arising from overconsumption (Ghosh et al., 2016). Second, accidental ingestion by and poisonings of young children may occur because edibles often look like candy or baked goods (Onders, Casavant, Spiller,

Chounthirath, & Smith, 2016). These products are also attractive to adolescents as it makes it easier to conceal use (Freise, Slater, Annechino, & Battle, 2016). Finally, unintentional driving while under the influence may result (given delayed effects observed for edibles) (Ghosh et al., 2016).

Current policies have focused on regulating production and packaging of these products (Hudak, 2015); however, understanding purchasing behaviors can inform the utility of place-based prevention efforts to minimize public harm related to the purchase and use of edibles. This exploratory study aimed to understand if venue- and individual-level characteristics were associated with the discrete purchase of edibles by patrons exiting medical marijuana dispensaries in Los Angeles, California.

## 2. Methods

This study used a two-stage, venue-based sampling approach to systematically explore discrete purchasing behaviors of edibles and other products by patrons exiting medical marijuana dispensaries (MMDs) in Los Angeles, California during Spring 2013. Sixteen dispensaries were randomly sampled from a census of dispensary

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**Table 1**  
Correlates of marijuana-infused edible purchases during a discrete visit.

Variables	OR	[95% CI]	p Value
<i>Level 2 – MMD location (n = 16)</i>			
Intercept	0.142	[0.014, 1.483]	0.095
Census tract median income (in US \$1000)	1.020	[1.004, 1.036]	0.019
MMD density (count within 0.5 km)	1.362	[1.043, 1.777]	0.026
<i>Level 1 – individual (n = 524)</i>			
Age (in years)	0.993	[0.971, 1.015]	0.519
Male	0.675	[0.355, 1.283]	0.229
Race/ethnicity:			
Other <sup>a</sup>	Ref		
White Non-Hispanic	0.505	[0.227, 1.122]	0.093
Black Non-Hispanic	0.326	[0.127, 0.834]	0.020
Hispanic	0.326	[0.126, 0.841]	0.021
Networked distance from home [ln(m)]	0.903	[0.762, 1.071]	0.241

<sup>a</sup> Other race/ethnicity was composed of patrons identifying as the following: 24 (39.3%) Asian, Native Hawaiian, or Pacific Islander; 22 (36.1%) specified other race (e.g., Armenian, Palestinian, Persian); and 15 (24.6%) multi-racial.

locations verified by in-person visits during Summer/Fall 2012. Patrons were then randomly sampled when exiting each location and asked to participate in an exit survey about their demographic information and purchase behaviors during their most recent visit (Thomas & Freisthler, 2016). Respondents received a \$20 cash incentive.

A total of 595 patrons completed the exit survey (84% completion rate). This study focused on the 524 patrons who reported purchasing marijuana products during their most recent visit to the sampled location with complete data. The sampled locations were located in Census tracts with annual median incomes that ranged from \$23,600 to \$119,900. In addition, the number of other MMDs within a 0.5 km of sample locations averaged about 2.6 dispensaries (range 1 to 8). The sample was 77% male, average of 34 years (range 18 to 80 years), and racially and ethnically diverse (31% white, 31% black, 26% Latino, and 12% other race/ethnicity). Individuals in the sample lived an average of 12.58 km (shortest networked distance) from the sampled dispensary.

The dependent variable for this study was whether or not the patron self-reported purchase of marijuana-infused edibles during their most recent visit to the sampled location. Venue-level characteristics included: Census Tract median income (based on 2013 GeoLytics estimates) and count of other MMDs within a 0.5 km of a sampled location (calculated using ArcGis 10.3). Patron-level characteristics included: patron age, biological sex, race/ethnicity, and shortest networked distance from the patron's home to the sampled location.

Hierarchical generalized linear modeling (HGLM) was used to examine likelihood of purchasing edible products regressed on characteristics of sampled dispensaries (level 2) and their patrons (level 1) (Raudenbush & Bryk, 2002). The unconditional model had a reliability estimate of 0.653 and a variance component (Tau) of 0.675 ( $\chi^2(15) = 57.007$ ,  $p < 0.001$ ). The final model had a reliability estimate of 0.451 and a variance component (Tau) of 0.313 ( $\chi^2(13) = 25.232$ ,  $p = 0.021$ ).

### 3. Results

Of individuals purchasing marijuana products, 64 (12.2%) reported purchasing marijuana-infused edibles, predominantly baked goods ( $n = 33$ ; 6.3%) and candies ( $n = 26$ ; 4.9%). Bivariate analyses indicated a discrete purchase of edibles was significantly associated with race/ethnicity. Discrete purchase of edibles was not significantly associated with age, biological sex, or shortest networked distance from one's home to the sampled MMD location.

Table 1 shows the results of the final model. Patrons were more likely to purchase edibles from MMDs located within Census tracts with higher median incomes (OR = 1.020, 95% CI [1.004, 1.036],

$p = 0.019$ ) or in close proximity (0.5 km) to a higher number of other MMD locations (OR = 1.362, 95% CI [1.043, 1.777],  $p = 0.026$ ). Individual traits of patrons who identified as Black or Hispanic were associated with a lower likelihood of purchasing edibles compared to patrons who identified as another non-White, non-Hispanic racial/ethnic category group.

### 4. Discussion

For our sample, variation in purchase of edibles during a discrete visit to a MMD appears to be partially explained by venue-specific variables and by individual traits of patrons. Percentages of patrons reporting purchase of marijuana-infused edibles is comparable with prior studies observing edibles consumed at lower rates relative to combustible products (Schauer, King, Bunnell, Promoff, & McAfee, 2015). At a venue-level, MMDs in high income areas may be serving more patrons with disposable incomes, which allows for specialty purchases. Alternatively, MMD density in Los Angeles may have increased to a point where market segmentation has occurred (Gruenewald, 2007). If this is the case, communities with a higher density of MMDs (or higher demand) place pressure on a specific MMD location to distinguish themselves with a broader range or higher quality of specialty products, such as edibles.

At a patron-level, significant differences in likelihood of purchasing edibles were observed across self-identified racial/ethnic categories. Prior studies focused on types of ingestion methods or edibles have not specifically focused on racial/ethnic group differences (Borodovsky et al., 2016; Lamy et al., 2016; Schauer et al., 2015). However, these findings mirror racial/ethnic differences observed for purchase of loose-leaf marijuana in illicit markets (Caulkins & Pacula, 2006). Future work should explore purchase behaviors of understudied racial/ethnic populations to better understand these findings.

Understanding the role of venue-specific purchasing behaviors is likely as important as understanding the variation in individuals who are consuming edible products. However, this study is not without its limitations. The study findings are focused on a constrained geographic area and in a state that only permitted distribution for medical use at the time of the study. That being said, there is potentially a large degree of overlap between medicinal and recreational marijuana users, and an increased likelihood of consuming edibles was observed for individuals living in states with medical marijuana laws (Borodovsky et al., 2016; Schauer et al., 2015). Future research is needed to understand place-based effects on purchasing across different regions of the U.S. and within states permitting recreational use.

As more states legalize medical marijuana and shift to recreational use, the concern about distribution of marijuana-infused edibles is likely to increase. Currently, there is little regulation by individual states for venue-level distribution of edibles. In fact, policies have typically focused on regulation of edible production, packaging, and labeling (Ghosh et al., 2016; Thomas & Freisthler, 2016). Our findings suggest that place-based regulations focused on products sold within MMDs may prove to be effective for reducing access to and purchasing of edibles. Public health interventions are also focusing on education of the public about harms of edibles to reduce overconsumption of THC, accidental poisonings of young children, and driving under the influence of marijuana (Ghosh et al., 2016). Targeted prevention efforts should focus on educating populations most likely to purchase edibles to reduce potential harms. In addition, social marketing campaigns that target these issues may benefit from concentrating efforts proximal to MMD locations within communities with a high-income median income or a high density of MMDs.

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