Journal of Adolescent Health 63 (2018) 88–93

ELSEVIER

JOURNAL OF ADOLESCENT HEALTH

www.jahonline.org

Original article

Medical Marijuana Availability, Price, and Product Variety, and Adolescents' Marijuana Use

Yuyan Shi, Ph.D. *, Sharon E. Cummins, Ph.D., and Shu-Hong Zhu, Ph.D.

Department of Family Medicine and Public Health, University of California, San Diego, California

Article history: Received September 20, 2017; Accepted January 9, 2018
Keywords: Medical marijuana dispensary; School neighborhood; Adolescent health; Drug abuse

A B S T R A C T

Purpose: We aimed to examine the availability of medical marijuana dispensaries, price of medical marijuana products, and variety of medical marijuana products in school neighborhoods and their associations with adolescents' use of marijuana and susceptibility to use marijuana in the future.
Methods: A representative sample of 8th, 10th, and 12th graders (N = 46,646) from 117 randomly selected schools in California participated in the cross-sectional 2015–2016 California Student Tobacco Survey (CSTS). Characteristics of medical marijuana dispensaries in California were collected and combined with school locations to compute availability, price, and product variety of medical marijuana in school neighborhoods. Multilevel logistic regressions with random intercepts at school level were conducted to test the associations, accounting for individual and school socioeconomic characteristics.
Results: The distance from school to the nearest medical marijuana dispensary (within 0- to 1-mi and 1- to 3-mi bands) was not associated with adolescents' use of marijuana in the past month or susceptibility to use marijuana in the future, nor was the weighted count of medical marijuana dispensaries within the 3-mi band of school. Neither the product price nor the product variety in the dispensary nearest to school was associated with marijuana use or susceptibility to use. The results were robust to different specifications of medical marijuana measures.
Conclusions: There was no evidence supporting the associations of medical marijuana availability, price, or product variety around school with adolescents' marijuana use and susceptibility to use.

IMPLICATIONS AND CONTRIBUTION

There are concerns that adolescents could be influenced by medical marijuana dispensaries in the neighborhood. Linking dispensaries with schools through precise location measures, this study found no empirical support of associations of medical marijuana availability, price, and product variety around schools with adolescents' marijuana use and susceptibility to use.

In recent years, the proportion of adolescents who use marijuana has surpassed the proportion who smoke cigarettes in the United States. In 2016, the Monitoring the Future survey estimated that the national prevalence of past-month marijuana use among 8th, 10th, and 12th graders was 5.4%, 14.0%, and 22.5%, respectively [1]. Early initiation of marijuana use is linked to a wide range of negative health consequences and socioeconomic outcomes [2–6]. Preventing experimentation of marijuana and regular marijuana use among adolescents has become a public health priority [7].

The increase in marijuana use in adolescents coincided with the increasing number of states passing medical marijuana laws, a common provision of which is the protection of medical marijuana dispensaries [8]. Although providing marijuana for medical

Conflicts of Interest: The authors have no conflicts of interest relevant to this article to disclose.
Financial Disclosure: The authors have no financial relationships relevant to this article to disclose.
Contribution of Authors: Dr. Shi conceptualized and designed the study, collected dispensary data, carried out the statistical analyses, drafted the initial manuscript, and reviewed and revised the manuscript. Dr. Cummins and Dr. Zhu designed the survey data collection instruments, coordinated and supervised survey data collection, and reviewed and revised the manuscript. All authors approved the final manuscript as submitted and agree to be accountable for all aspects of the work.
* Address correspondence to: Yuyan Shi, Ph.D., 9500 Gilman Drive, MC 0607, La Jolla, CA 92093-0607.
E-mail address: yus001@ucsd.edu (Y. Shi).

1054-139X/
https://doi.org/10.1016/j.jadohealth.2018.01.008

use in dispensaries usually requires additional scrutiny for patients under age 18, there are concerns that adolescents could be still influenced by the presence of dispensaries in the neighborhood. Medical marijuana dispensaries may increase adolescents' access to marijuana, normalize their attitudes toward marijuana use, and expose them to marketing tactics. Unlike statewide law provisions that allow for possession and cultivation, patient registry system, and approval of certain medical conditions [9], the location and density of medical marijuana dispensaries are usually subject to city or county licensing policies and zoning ordinances [10]. The huge variations in these local regulations across and within states have contributed to variations in the availability of medical marijuana dispensaries in neighborhoods, which may potentially generate differential influences on adolescents' marijuana use behaviors.

Despite the strong relationship between retail outlets and alcohol and tobacco use documented by a number of studies [11–14], examination of the associations of medical marijuana dispensaries with marijuana use remains limited. The existing research on statewide laws provides little insight into within-state spatial variations. The dearth of research at the neighborhood level is largely due to a lack of data associating geographic locations with individuals. Even when location data such as zip code and city were available, exact point address was unknown. To date, only three studies have provided empirical evidence at the neighborhood level and all of them defined neighborhood broadly as zip code or city. Two California studies on adults reported that higher prevalence of adults' marijuana use and abuse in cities/zip codes was associated with higher density of dispensaries [15,16]. In contrast, the one study on adolescents approximated school point locations with zip code centroids and found that the presence of dispensaries around schools was not associated with past-month use of marijuana among adolescents [17]. City or zip code level measures may be too crude to represent neighborhood characteristics that influence the daily life of individuals. A narrowly defined neighborhood is particularly meaningful to adolescents who drive vehicles less often than adults do.

Using point location measures, this study aimed to ascertain whether the availability, price, and product variety of medical marijuana in school neighborhoods were associated with adolescents' use of marijuana and susceptibility to use marijuana in the future. The study utilized a representative sample of adolescents in California, the state with the longest history of medical marijuana legalization and the largest number of dispensaries and registered patients [18].

Methods

Study sample

Funded by the California Department of Public Health, the 2015–2016 California Student Tobacco Survey (CSTS) is a cross-sectional survey to collect data on tobacco and other drug use, including marijuana use behaviors. CSTS has been conducted approximately every 2 years since 2001–2002. The 2015–2016 wave was administered by the University of California, San Diego, between October 2015 and June 2016. A two-stage random-stratified sampling design was employed, which randomly selected public and nonsectarian schools from regions in the first stage and invited all classrooms in a grade level to participate in the second stage. When a school was not able to recruit all classrooms (23% of schools), classrooms within a grade level were randomly sampled.

The survey was self-administered on paper by 14% of schools and online by 86% of schools. Both English and Spanish versions were available to students. Consent procedures included obtaining the appropriate parental/guardian consent (using passive or active consent, as dictated by the school district) and students providing assent. The survey was approved by the Human Research Protections Program at the University of California, San Diego (#150256) and the California State Committee for the Protection of Human Subjects (#15-04-1992).

A total of 119 schools participated in the CSTS 2015–2016 survey, representing 45% of schools initially contacted. Among schools that responded, the minimal acceptable response rate for students was set at 30%. Two schools had a lower than 30% students response and were excluded, leaving 117 in the dataset. The mean response rate for students from these schools was 75.5% and the median was 79.2%. Our analysis focused on students who were 8th, 10th, and 12th graders in the survey (N = 47,981). The final analyses excluded 1,335 students (2.8%) with incomplete information, resulting in effective sample size of 46,646 students. The overall racial and ethnic distribution of the study sample was similar to the student profile provided by the Department of Education for all the students in California [19].

Measures

Outcome measures: marijuana use and susceptibility to use

The individual-level outcome variables included two dichotomized indicators assessing (1) whether an adolescent was a current marijuana user, and (2) if not identified as a current marijuana user, whether an adolescent was susceptible to use marijuana in the future. Current marijuana use was defined as using marijuana (including blunts) in the past month. Susceptibility has been a strong indicator for future use in the tobacco control literature [20]. We used one of the three items that were validated for assessing susceptibility in smokers and adapted it to assess susceptibility to marijuana use [21]. Specifically, adolescents who had not used marijuana in the past month (nonusers) were classified as being susceptible to use marijuana if their response to the question "if one of your best friends offered you marijuana (including blunts), would you use it?" was "definitely yes," "probably yes," or "probably not." Only adolescents who responded with the strongest negative response, "definitely not," were classified as not being susceptible to marijuana use.

Primary explanatory measures: medical marijuana availability, price, and product variety

The school-level explanatory measures of interest were a series of variables representing the availability, price, and variety of medical marijuana products in school neighborhoods. We obtained exact street addresses, price, and detailed product information for all medical marijuana dispensaries with storefronts in California from a previously validated crowd-sourced Web site (weedmaps.com) [15], which posts the most up-to-date information voluntarily contributed by dispensary owners and marijuana users. The dispensary data were compiled in March–June, 2016. A total of 994 dispensaries with storefronts were listed on weedmaps.com during the data collection period. We removed 52 dispensaries (5%) that lacked exact street