# Correlates of Amount Spent on Marijuana Buds During a Discrete Purchase at Medical Marijuana Dispensaries: Results from a Pilot Study

Nancy Jo Kepple Ph.D., Elycia Mulholland M.S.W., Bridget Freisthler Ph.D. & Elizabeth Schaper M.S.W.

Published online: 12 Jan 2016.

Submit your article to this journal ⬈

Article views: 23

View related articles ⬈

View Crossmark data ⬈

# Correlates of Amount Spent on Marijuana Buds During a Discrete Purchase at Medical Marijuana Dispensaries: Results from a Pilot Study

Nancy Jo Kepple, Ph.D. [a], Elycia Mulholland, M.S.W.[b], Bridget Freisthler, Ph.D.[c,d], and Elizabeth Schaper, M.S.W.[e]

[a]Assistant Professor, School of Social Welfare, University of Kansas, Lawrence, KS; [b]Research Assistant, Department of Social Welfare, Luskin School of Public Affairs, University of California Los Angeles, Los Angeles, CA; [c]Professor, Department of Social Welfare, Luskin School of Public Affairs, University of California Los Angeles, Los Angeles, CA; [d]Faculty Affiliate, California Center for Population Research, University of California Los Angeles, Los Angeles, CA; [e]Research Assistant, California Center for Population Research, University of California Los Angeles, Los Angeles, CA.

## ABSTRACT

Marijuana purchasing behaviors vary by the purchaser's individual characteristics; however, little is known about patients' purchasing behaviors when buying from medical marijuana dispensaries (MMDs). Our objective was to explore whether patient characteristics were associated with amount spent during one financial transaction at medical marijuana dispensaries. We conducted a pilot study of four purposively sampled MMD locations in Long Beach, California, in 2012. A total of 132 medical marijuana patients (33 patients per dispensary) participated in an exit survey about their demographic characteristics, conditions for their medical marijuana recommendation, amount spent at the dispensary, and cross-streets of where they lived. The sample reported amounts spent on discrete purchases of marijuana buds averaging $40.82 (ranging from $10 to $255). Multivariate regression analyses indicated average amount spent differed significantly by patient age and condition. An increase in 10 years of age was associated with a 10% higher amount spent. Receiving a recommendation for anxiety and/or sleeping problems or other nonspecified conditions was related to higher discrete purchase amounts than chronic pain. This pilot suggests that variations in patient purchasing behaviors from MMDs exist. These purchase behaviors can provide insight into variations in how patients use dispensaries, consume products, and allocate personal resources.

The line between licit and illicit marijuana use has become blurred in states such as California, which permit restricted medical use based on a physician recommendation and distribution via place-based venues. In 1996, California became the first state to permit use of marijuana to treat physician-identified, serious medical conditions (California Compassionate Use Act 1996). However, this law remained ambiguous as a result of the inclusion of diagnostic categories such as *chronic pain* and *any other illness which marijuana provides relief*. By 2003, MMDs were identified as legitimate distribution sources for medical marijuana by California law (Pacula and Sevigny 2014). In the context of medical marijuana dispensaries (MMDs) and associated laws, purchasing behaviors might identify those people who are bypassing traditional medical treatments, or in the case of nonsanctioned use, those who are at risk for abuse and dependence. Observed variation in purchasing behaviors by patient characteristics might indicate differential distribution of use

behaviors and potential risks (e.g., cognitive impairments, marijuana abuse and dependence, unregulated sources of medication) which can be targeted for prevention and intervention (Lucas et al. 2013; Martín-Sánchez et al. 2009; Pacula et al. 2014).

Most of what we know of marijuana purchasing has been extrapolated from research on illicit markets. For example, larger total purchases in illicit marijuana markets were observed among men and non-Hispanic Whites (Caulkins and Pacula 2006). Considering the fact that illicit market purchase behaviors differ by demographics, medical marijuana purchase behaviors might differ by patient demographic characteristics as well. In fact, trends of medical marijuana patients in California from 2001 to 2012 parallel high-quantity purchasers identified in illicit markets, both being predominantly men, young adults, and non-Hispanic Whites (O'Connell and Bou-Matar 2007; Ryan-Ibarra, Induni, and Ewing 2014).

Medical marijuana purchases may also differ by the diagnosis for which patients receive their

CONTACT Nancy Jo Kepple ✉ njkepple@ku.edu ◉ School of Social Welfare, University of Kansas, 1545 Lilac Lane, 115 Twente Hall, Lawrence, KS 66045, USA; phone: +1-310-755-8802

recommendations. Patients have primarily reported medical conditions of chronic pain, sleeping problems, and anxiety (O'Connell and Bou-Matar 2007; Ryan-Ibarra et al. 2014). Among these patients, it is possible that including chronic pain as a qualifying condition for marijuana could have variable influences on effects of medical marijuana recommendation and distribution policies (Pacula et al. 2015). For example, if chronic pain is actually a "catch-all" diagnosis for medical marijuana that allows doctors to provide recommendations for virtually any pain, it may allow nonmedical users to exploit the law for recreational use. The extent to which they spend different amounts on a purchase compared with those addressing a more serious terminal condition (e.g., cancer) may provide information on patterns of use. Finally, the buyer's distance from an MMD might influence purchasing behaviors (Caulkins and Pacula 2006; Pacula et al. 2010). For instance, patients who live farther from the dispensary might spend more at one given time (by purchasing higher amounts of product) because it is less convenient to access the dispensary often for smaller amounts, compared with a patient who lives closer.

This pilot study aimed to assess whether variation in purchasing behaviors by patient characteristics was present among individuals who purchased medical marijuana from dispensaries in Long Beach, California, in 2012. We explored how patient characteristics specific to demographics, medical condition for medical marijuana recommendation, and distance traveled were associated with individuals' amount spent on marijuana buds during one financial transaction.

## Method

### Study design and sampling procedures

The pilot study purposively sampled four MMD locations in Long Beach, California, in 2012. This sampling approach allowed us to capture variation in MMDs specific to their geographic location, size, and patient demographics. Patients were asked to participate in the survey as they exited the dispensaries. Data were collected via portable handheld devices, and survey workers obtained verbal informed consent. The survey included questions about respondents' demographic characteristics, medical conditions, amount spent on marijuana buds only on that particular visit to the dispensary, and cross-streets of where they lived. Respondents received a $20 cash incentive to participate in a five-minute survey with the hope of engaging them in completing a longer, online survey for additional compensation; this amount is commensurate

with other venue-based surveys (Miller et al. 2005). A total of 132 patients (33 patients per dispensary) agreed to complete the survey from the 166 patients who were approached. The incentive rate resulted in a high initial response rate (79.5%), but the conversion rate to the online survey was low (approximately 20%).

Data collection occurred during one day at each dispensary, with a morning shift from 10 a.m. to 1 p.m. and an afternoon shift from 2 p.m. to 5 p.m. Assessment of sample bias between respondents and nonrespondents indicated that nonrespondents were significantly more likely to be male ($\chi^2$ = 4.79, $p$ = 0.029). No difference was observed in demographic characteristics based on time of day of the survey. Study protocols were approved by the University of California, Los Angeles' Institutional Review Board.

### Measures

The dependent variable for the study was amount spent to purchase marijuana buds only, given that the vast majority of the sample (92%) reported purchasing only marijuana buds (as opposed to concentrates and edibles). The dependent variable was defined as a ratio scale of dollar amounts with patient reports ranging from $10 to $255. Independent variables included age, gender, race/ethnicity, condition for which medical marijuana recommendation was originally obtained, and distance from home address to the dispensary where the survey occurred. Respondents could specify more than one condition for medical marijuana recommendation, and those conditions were categorized into four mutually exclusive categories: specific medical conditions, anxiety and/or sleeping problems, chronic pain, and other nonspecified conditions. Specific medical conditions included anorexia, arthritis, Crohn's disease, glaucoma, HIV/AIDS, multiple sclerosis, and migraines. Anxiety and sleep problems (that did not co-occur with a specific medical condition) were combined into one category, given the high prevalence of sleep disturbances and anxiety disorders co-occurring (Staner 2003). Chronic pain included respondents who reported chronic pain without any other reported specific medical conditions, anxiety, and/or sleep problems. Other nonspecified conditions included respondents who reported "other condition" on the survey without any further specification and who did not identify any of the prior categories for their medical marijuana recommendation. To account for multiple conditions, a count of the total number of conditions reported was included.

To measure distance, straight-line distance to each dispensary was calculated by asking participants for the

nearest cross-street to their home address. Twelve out of 132 cross-streets (9.1%) were unable to be geocoded because the streets reported could not be found in ArcGIS or on Google Maps. This variable was dichotomized into respondents residing within one mile and those residing greater than one mile from the dispensary, because of the right-skewed distribution of this variable. One mile was chosen as a cut-off to capture respondents that were more likely to reside within walking or a short driving distance from the utilized dispensary.

## Data analysis

Descriptive statistics were reported for age, race, gender, condition for medical marijuana recommendation, purchase amount, number of conditions, and residence proximity to the dispensary for the whole sample ($n = 132$). Bivariate comparisons (i.e., $t$ tests, $F$ tests, and Pearson's correlations) were used to assess whether demographic characteristics, including age, gender, race, medical condition, and patient proximity to their respective dispensaries, were related to purchase amount. We used multivariate linear regression to examine whether these patient characteristics were correlated with purchase amount. Purchase amount was log transformed to address the skewed distribution of the continuous dependent variable resulting from the presence of an outlier. Given the small number of dispensaries sampled for the exit survey ($n = 4$), we controlled for patients clustering within dispensary locations by including individual level vectors for the dispensary at which the patient was surveyed (Newman and Newman 2012; Raudenbush and Bryk 2002).

The final analytic sample used in the bivariate comparisons and multivariate linear regressions was composed of 106 patients with complete information. We observed no significant differences between patients with ($n = 106$) and without ($n = 26$) complete information for any of the study variables. Finally, regression coefficients from the multivariate analyses were exponentiated to discuss percent difference in amount spent on a discrete purchase.

## Results

Table 1 details characteristics for the full sample. Descriptive analyses indicated that the majority of patients in our study were male, about 30 years of age, and of different races. The average discrete purchase for marijuana buds was $40.82 (with a range of $10 to $255). At the time of the study, the $40 average purchase price was likely indicative of a purchase of

Table 1. Characteristics of participants recruited at four medical marijuana dispensaries (N = 132).

| | Sample n | % or $\bar{x}$ (sd) | Min | Max |
|---|---|---|---|---|
| Purchase amount (dollars) | 117 | 40.82 (33.89) | 10.00 | 255.00 |
| Age (years) | 132 | 30.46 (12.01) | 18.00 | 76.00 |
| Gender | | | | |
| Male | 97 | 73.48 | | |
| Female | 35 | 26.52 | | |
| Race/Ethnicity | | | | |
| Non-Hispanic White | 34 | 25.75 | | |
| Non-Hispanic Black | 41 | 31.06 | | |
| Latino | 43 | 32.58 | | |
| Other, including Asian | 14 | 10.61 | | |
| Condition for medical marijuana recommendation | | | | |
| Specific physical illness | 33 | 25.19 | | |
| Anxiety and/or sleep problems | 44 | 33.59 | | |
| Chronic pain | 32 | 24.43 | | |
| Other nonspecified condition | 22 | 16.79 | | |
| Number of conditions | 131 | 1.62 | 1.00 | 4.00 |
| Distance to MMD (miles) | 120 | 3.91 (4.53) | 0.03 | 22.05 |

one-eighth ounce of marijuana, which was a typical amount for these dispensaries; the upper range value of $255 is akin to amounts needed to purchase a full ounce of marijuana. Residence straight-line distance from the dispensary locations averaged 3.91 miles, with a range from 0.03 to 22.05 miles.

Results from bivariate comparisons indicated race/ethnicity ($F(3, 102) = 4.04$, $p = .009$), condition for medical marijuana recommendation ($F(3, 102) = 3.34$, $p = .022$), number of conditions reported ($r(104) = .27$, $p = .005$), and residence within one mile of the MMD ($t(104) = 2.48$, $p = .015$) were all significantly associated with discrete purchase amount of medical marijuana buds. No significant bivariate relationships were observed for age ($r(104) = .18$, $p = .069$) or gender ($t(104) = -0.51$, $p = .610$).

Table 2 displays the results from the multivariate regressions. Model 1 included all patient demographic variables, and Model 2 shows the full model that included patient demographics, primary conditions for medical marijuana recommendation, and proximity of residence to the MMD. A nested $F$ test indicated the block for medical conditions and proximity significantly added to the explained variance of the model.

The subsequent text describes the percentage change or difference obtained by the exponentiation of the regression coefficients reported in Table 2, Model 2. When controlling for all other variables in the full model, discrete purchase of marijuana buds increased 1% on average for every increase in one year of age. For example, an MMD patient who reported being 45 years old spent 20% more on average for a discrete purchase of marijuana buds compared with an MMD patient who reported being 25 years old. In addition, the average purchase amount for patients obtaining marijuana through a recommendation to treat anxiety and/or

**Table 2.** Log of purchase amount regressed on respondent characteristics, condition for medical marijuana recommendation, and proximity to MMD (n = 106).

| Variables | Model 1 | | Model 2 | |
|---|---|---|---|---|
| | b (SE) | p | b (SE) | p |
| Constant | 3.35 (0.34) | < .001 | 2.58 (0.39) | < .001 |
| Sampling location (ref: MMD 1) | | | | |
| MMD 2 | 0.00 (0.20) | .997 | −0.05 (0.20) | .811 |
| MMD 3 | −0.26 (0.19) | .175 | −0.11 (0.20) | .578 |
| MMD 4 | −0.17 (0.19) | .393 | −0.08 (0.19) | .678 |
| Age (years) | 0.01 (0.01) | .088 | 0.01 (0.01) | .036 |
| Male | 0.15 (0.16) | .469 | 0.21 (0.16) | .189 |
| Race/ethnicity (ref: White) | | | | |
| Latino | −0.21 (0.19) | .265 | −0.09 (0.20) | .646 |
| Black | −0.49 (0.18) | .021 | −0.27 (0.18) | .146 |
| Other race | 0.12 (0.25) | .648 | 0.01 (0.25) | .963 |
| Condition for medical marijuana recommendation (ref: chronic pain) | | | | |
| Specific physical illness | | | 0.11 (0.21) | .613 |
| Anxiety and/or sleep problems | | | 0.39 (0.20) | .049 |
| Other condition | | | 0.43 (0.21) | .042 |
| Number of conditions | | | 0.21 (0.11) | .058 |
| Residence ≤ 1 mile of MMD | | | −0.27 (0.16) | .101 |
| $R^2$ | .16 | | .28 | |
| Nested F Test | | | 3.00 | .015 |

sleep problems was 48% higher than for those obtaining marijuana through a recommendation to treat chronic pain. Patients reporting a recommendation primarily for any other condition (nonspecified) were associated with a 54% higher average purchase amount for marijuana buds than those reporting a recommendation primarily for chronic pain. No significant relationship was observed between proximity of patient residence to the MMD and discrete purchase amount.

## Discussion

This pilot study suggests that variation in purchase behaviors may be associated with patient characteristics. Demographic characteristics related to sex and age were consistent with other studies, suggesting venue-based clients are overwhelmingly young adults and male (Grella and Rodriguez 2014; Nunberg et al. 2011; Reiman 2007; Reinarman et al. 2011). However, the current sample was more diverse than that in prior studies, which found that more than 50% of medical marijuana users and MMD clients identified as non-Hispanic White (O'Connell and Bou-Matar 2007; Nunberg et al. 2011; Reiman 2007; Reinarman et al. 2011; Ryan-Ibarra, Induni, and Ewing 2014). Age was positively associated with discrete purchase amounts, suggesting that older clients spend more on average at a given time, which may be indicative of higher consumption of and/or higher concentration of THC within products. However, age may also be acting as a proxy for higher income among older clients. This finding could also arise from younger clients spending less with more frequent visits or spending less on marijuana buds and more on other types of products, such as edibles and tinctures, compared with older clients.

Client reports of medical conditions associated with receiving a medical marijuana recommendation are consistent with both physical and mental health issues observed in prior studies (e.g., Grella and Rodriguez 2014; Reiman 2007). Higher amounts were spent by patients with recommendations for anxiety and/or sleep problems compared with chronic pain. The higher purchase amounts by patients reporting anxiety or sleeping problems might result in MMDs focusing on marketing to patrons with these conditions (Gruenewald 2007), which is concerning given evidence supporting marijuana withdrawal exacerbating these conditions (e.g., Budney and Hughes 2006; Haney et al. 1999). Patients suffering from anxiety may also consume marijuana in larger amounts as a social lubricating mechanism or to alleviate withdrawal symptoms, increasing the risk for developing abuse and dependence. In addition, patients reporting a recommendation for other, nonspecified conditions were associated with a higher discrete purchase amount compared with patients reporting a recommendation for chronic pain. Given that these conditions might not fall into categories originally intended for medical marijuana use, this category of patients could be composed of medical marijuana users with a higher proportion of nonsanctioned use and at higher risk for abuse and dependence.

Findings should be considered in context of study limitations. First, the study used a nonrandom sample of four dispensaries and collected data from a small sample of patients. Statistical power is limited in the current study. Although the current study distinguished between the most predominant medical conditions associated with medical marijuana use (i.e., specific medical conditions, chronic pain, anxiety, sleep problems; Reinarman et al. 2011), future studies should evaluate both recommended conditions and standardized measures of respondent's current health. This information would provide insight into purchase behaviors associated with sanctioned and nonsanctioned use. Finally, limited information can be derived from total discrete purchase amount alone. Future studies should refine measures to include price per ounce, total amount of product purchased, variation in potency, and number of discrete purchases over time (Caulkins and Pacula 2006; Sevigny,

Pacula, and Heaton 2014). These refinements are important given the preliminary findings that medical marijuana laws, including legitimization of MMDs, were associated with increased potency and decreased prices of a high-potency product (Pacula et al. 2010; Sevigny, Pacula, and Heaton 2014). The types of strains purchased may also provide some information about the match between the condition of referral and known ability of the strain to address those conditions.

This pilot study offers an avenue of research on legal marijuana outlets that moves beyond the study of patient demographics. Economic factors, such as purchasing decisions and behaviors, provide insight into how individuals are obtaining and possibly consuming marijuana products sold from this newer type of drug outlet. Future research can begin to explore whether larger purchases contribute to higher consumption and/or a higher concentration of THC associated with psychotropic effects and adverse outcomes (Harder and Rietbrock 1997). In addition, there is a great potential for diversion with larger purchase amounts. While small purchase amounts are more likely to be consumed immediately, larger purchase amounts are more likely to result in leftover marijuana products that can be sold or given to individuals who do not have a recommendation or are underage (Salomonsen-Sautel et al. 2012; Reinarman et al. 2011; Caulkins and Pacula 2005).

Recent evidence suggests a shift in the California medical marijuana population toward more patients reporting medical marijuana use for anxiety and/or insomnia (Nunberg et al. 2011; Reinarman et al. 2011). More information regarding purchasing behavior can help policy makers understand the consumption patterns and needs of this growing subpopulation of medical marijuana users. For patients who report substituting marijuana use for traditional prescription medication (Nunberg et al. 2011; Reinarman et al. 2011), understanding how economic factors (e.g., cost and lack of insurance) might contribute to this choice could provide insight into identifying the best treatment options for a patient. Physicians might need to explore a client's motivation for medical marijuana use in relation to effectiveness, adverse effects, and cost in relation to other available treatment options.

Future studies could help to clarify whether observed differences in purchasing behaviors are due to medical versus nonsanctioned use of marijuana. If larger purchase amounts are being driven by nonsanctioned use, research should explore the implications of marijuana access and potential for abuse behaviors in states where legal venues (both medical and recreational) are present. In addition, understanding how purchasing behaviors are associated with physical and psychological consequences of use can help policy makers and interventionists to identify whether policy-level prevention strategies are effective in minimizing potential adverse consequences, as observed with alcohol outlets (Wagenaar, Salois, and Komro 2009).

In sum, the findings from this pilot study suggest the value of exploring economic factors and their interplay with patient characteristics. Purchase behaviors can provide insight into variations in how patients use dispensaries, consume products, and allocate personal resources. These data could allow clinicians, policy makers, and researchers to make more informed decisions about the use of medical marijuana and their distributors based on a better understanding of how individuals are using these newer drug outlets and being affected by consumption of their products.

## Funding

## ORCID

Nancy Jo Kepple  http://orcid.org/0000-0003-2741-9293

## References

Budney, A. J., and J. R. Hughes. 2006. The cannabis withdrawal syndrome. *Current Opinion in Psychiatry* 19 (3):233–38. doi:10.1097/01.yco.0000218592.00689.e5.

California Compassionate Use Act. 1996. Cal. Health & Saf. Code § 11362.5. Retrieved December 1, 2014, from http://www.cdph.ca.gov/programs/MMP/Pages/CompassionateUseact.aspx

Caulkins, J. P., and R. L. Pacula 2005. Marijuana markets: Inferences from reports by the household population. Paper 20. *Heinz Research*. Available at: http://repository.cmu.edu/heinzworks/20

Caulkins, J. P., and R. L. Pacula. 2006. Marijuana markets: Inferences from reports by the household population. *Journal of Drug Issues* 36 (1):173–200. doi:10.1177/002204260603600108.

Grella, C. E., and L. Rodriguez. 2014. Differences between younger and older medical marijuana users from a cluster-based sample of dispensaries in Los Angeles. *Drug and Alcohol Dependence* 140:e75–e76. doi:10.1016/j.drugalcdep.2014.02.225.

Gruenewald, P. J. 2007. The spatial ecology of alcohol problems: Niche theory and assortative drinking. *Addiction* 102 (6):870–78. doi:10.1111/add.2007.102.issue-6.

Haney, M., A. S. Ward, S. D. Comer, R. W. Foltin, and M. W. Fischman. 1999. Abstinence symptoms following smoked

marijuana in humans. *Psychopharmacology* 141 (4):395–404. doi:10.1007/s002130050849.

Harder, S., and S. Rietbrock. 1997. Concentration-effect relationship of delta-9-tetrahydrocannabiol and prediction of psychotropic effects after smoking marijuana. *International Journal of Clinical Pharmacology and Therapeutics* 35 :155–59. PMID: 9112136

Lucas, P., A. Reiman, M. Earleywine, S. K. McGowan, M. Oleson, M. P. Coward, and B. Thomas. 2013. Cannabis as a substitute for alcohol and other drugs: A dispensary-based survey of substitution effect in Canadian medical cannabis patients. *Addiction Research & Theory* 21:435–42. doi:10.3109/16066359.2012.733465.

Martín-Sánchez, E., T. A. Furukawa, J. Taylor, and J. L. R. Martin. 2009. Systematic review and meta-analysis of cannabis treatment for chronic pain. *Pain Medicine* 10 (8):1353–68. doi:10.1111/j.1526-4637.2009.00703.x.

Miller, B. A., C. D. Furr-Holden, R. B. Voas, and K. Bright. 2005. Emerging adults' substance use and risky behaviors in club settings. *Journal of Drug Issues* 35 (2):357–78. doi:10.1177/002204260503500207.

Newman, D., and I. Newman. 2012. Multilevel modeling: Clarifying issues of concern. *Multiple Linear Regression Viewpoints* 38 (1):26–33.

Nunberg, H., B. Kilmer, R. L. Pacula, and J. R. Burgdorf. 2011. An analysis of applicants presenting to a medical marijuana specialty practice in California. *Journal of Drug Policy Analysis* 4 (1). Online. doi:10.2202/1941-2851.1017.

O'Connell, T. J., and C. B. Bou-Matar. 2007. Long-term marijuana users seeking medical cannabis in California (2001–2007): Demographics, social characteristics, patterns of cannabis and other drug use of 4117 applicants. *Harm Reduction Journal* 4 (16). Online. doi:10.1186/1477-7517-4-16.

Pacula, R. L., B. Kilmer, M. Grossman, and F. J. Chaloupka. 2010. Risks and prices: The role of user sanctions in marijuana markets. *The BE Journal of Economic Analysis & Policy* 10 (1). Article 11. Online. doi:10.2202/1935-1682.1992.

Pacula, R. L., B. Kilmer, A. C. Wagenaar, F. J. Chaloupka, and J. P. Caulkins. 2014. Developing public health regulations for marijuana: Lessons from alcohol and tobacco. *American Journal of Public Health* 104 (6):1021–28. doi:10.2105/AJPH.2013.301766.

Pacula, R. L., D. Powell, P. Heaton, and E. L. Sevigny. 2015. Assessing the effects of medical marijuana laws on marijuana use: The devil is in the details. *Journal of Policy Analysis and Management* 34 (1):7–31. doi:10.1002/pam.2015.34.issue-1.

Pacula, R. L., and E. L. Sevigny. 2014. Marijuana liberalization policies: Why we can't learn much from policy still in motion. *Journal of Policy Analysis and Management* 33 (1):212–21. doi:10.1002/pam.21726.

Raudenbush, S. W., and A. S. Bryk. 2002. *Hierarchical linear models: Applications and data analysis methods*, vol. 1. Thousand Oaks, CA: Sage.

Reiman, A. 2007. Medical cannabis patients: Patient profiles and health care utilization patterns. *Journal of Evidence-based Complementary & Alternative Medicine* 12 (1):31–50. doi:10.1177/1533210107301834.

Reinarman, C., H. Nunberg, F. Lanthier, and T. Heddleston. 2011. Who are medical marijuana patients? Population characteristics from nine California assessment clinics. *Journal of Psychoactive Drugs* 43 (2):128–35. doi:10.1080/02791072.2011.587700.

Ryan-Ibarra, S., M. Induni, and D. Ewing. 2014. Prevalence of medical marijuana use in California, 2012. *Drug and Alcohol Review* 34 (2):141–46. doi:10.1111/dar.12207.

Salomonsen-Sautel, S., J. T. Sakai, C. Thurstone, R. Corley, and C. Hopfer. 2012. Medical marijuana use among adolescents in substance abuse treatment. *Journal of the American Academy of Child & Adolescent Psychiatry* 51 (7):694–702. doi:10.1016/j.jaac.2012.04.004.

Sevigny, E. L., R. L. Pacula, and P. Heaton. 2014. The effects of medical marijuana laws on potency. *International Journal of Drug Policy* 25:308–19. doi:10.1016/j.drugpo.2014.01.003.

Staner, L. 2003. Sleep and anxiety disorders. *Dialogues in Clinical Neuroscience* 5 (3):249–58.

Wagenaar, A. C., M. J. Salois, and K. A. Komro. 2009. Effects of beverage alcohol price and tax levels on drinking: A meta-analysis of 1003 estimates from 112 studies. *Addiction* 104 (2):179–90. doi:10.1111/add.2009.104.issue-2.