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Temporal trends in marijuana attitudes, availability and use in Colorado compared to non-medical marijuana states: 2003–11☆

Joseph Schuermeyer[a], Stacy Salomonsen-Sautel[a], Rumi Kato Price[b], Sundari Balan[b], Christian Thurstone[a,c], Sung-Joon Min[d], Joseph T. Sakai[a,*]

[a] Department of Psychiatry, University of Colorado Anschutz Medical Campus, Aurora, CO, United States
[b] Department of Psychiatry, Washington University School of Medicine, St. Louis, MO, United States
[c] Denver Health and Hospital Authority, Denver, Colorado, United States
[d] Department of Medicine, University of Colorado Anschutz Medical Campus, Aurora, CO, United States

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ABSTRACT

Background: In 2009, policy changes were accompanied by a rapid increase in the number of medical marijuana cardholders in Colorado. Little published epidemiological work has tracked changes in the state around this time.
Methods: Using the National Survey on Drug Use and Health, we tested for temporal changes in marijuana attitudes and marijuana-use-related outcomes in Colorado (2003–11) and differences within-year between Colorado and thirty-four non-medical-marijuana states (NMMS). Using regression analyses, we further tested whether patterns seen in Colorado prior to (2006–8) and during (2009–11) marijuana commercialization differed from patterns in NMMS while controlling for demographics.
Results: Within Colorado those reporting "great-risk" to using marijuana 1–2 times/week dropped significantly in all age groups studied between 2007–8 and 2010–11 (e.g. from 45% to 31% among those 26 years and older; $p = 0.0006$). By 2010–11 past-year marijuana abuse/dependence had become more prevalent in Colorado for 12–17 year olds (5% in Colorado, 3% in NMMS; $p = 0.03$) and 18–25 year olds (9% vs. 5%; $p = 0.02$). Regressions demonstrated significantly greater reductions in perceived risk (12–17 year olds, $p = 0.005$; those 26 years and older, $p = 0.01$), and trend for difference in changes in availability among those 26 years and older and marijuana abuse/dependence among 12–17 year olds in Colorado compared to NMMS in more recent years (2009–11 vs. 2006–8).
Conclusions: Our results show that commercialization of marijuana in Colorado has been associated with lower risk perception. Evidence is suggestive for marijuana abuse/dependence. Analyses including subsequent years 2012+ once available, will help determine whether such changes represent momentary vs. sustained effects.

1. Introduction

Twenty states and the District of Columbia have legalized marijuana for certain qualifying medical conditions (ONDCP, 2013) and more than 280,000 individuals are registered for medical marijuana in the United States (Bowles, 2012). In 2012, Colorado and Washington state legalized possession of an ounce or less and recreational use of marijuana for those 21 years of age or older (Johnson, 2012; Gurman, 2012). Such ongoing policy shifts underscore the critical need to provide accurate scientific information to the public on the impact of marijuana medicalization/legalization; the potential impact of such legal and policy changes remains hotly debated.

Medical marijuana proponents cite the potential medical benefits of marijuana (Hecht, 2012), the increased tax revenue to states from the medical marijuana industry (Cooper, 2012), potential reduction in traffic fatalities due to alcohol (Anderson et al., 2013), potential reduction in criminal activities and criminal justice costs (Warf, 2005; Single, 1989) and the relative safety of cannabis as compared to other substances (SAFER, 2012). Opponents of medical marijuana legalization raise a multitude of concerns including: medical marijuana may lead to increasing adolescent marijuana use

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* Corresponding author at: Division of Substance Dependence, Department of Psychiatry, University of Colorado Anschutz Medical Campus, Building 400, 12469 East 17th Place, Aurora, CO 80045, United States. Tel.: +1 303 724 3182; fax: +1 303 724 3178.
E-mail address: joseph.sakai@ucdenver.edu (J.T. Sakai).

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(Joffe, 2004; Joffe and Yancy, 2004; Svrakic et al., 2012); medical marijuana may be diverted to adolescents (Thurstone et al., 2011, 2013; Salomonsen-Sautel et al., 2012) or may lead to toxic ingestions by children (Wang et al., 2011, 2013); adolescent exposure to marijuana is associated with subsequent psychosis (Moore et al., 2007) and decline in IQ (Meier et al., 2012); and that medical marijuana may negatively impact public health by increasing prevalence of addiction, crimes and motor vehicle accidents (HDFC, 2012).

Only a handful of published findings document changes temporally associated with medical marijuana laws using epidemiological datasets. Using the second wave of National Epidemiologic Survey on Alcohol and Related Conditions collected in 2004–5, Cerdá et al. (2012) found that the prevalence of adult marijuana use, abuse and dependence was higher in states with medical marijuana laws compared to those without. Wall et al. (2011) using years 2002–8 of the National Survey on Drug Use and Health (NSDUH), showed a higher prevalence of adolescent marijuana use and lower perceptions of riskiness of use in states with medical marijuana laws compared to those without. Harper et al. (2012) replicated and extended the work of Wall et al. concluding that passage of medical marijuana laws had little impact on the prevalence of marijuana use or perceived risk; however, these results were based on findings from only 5 of the 16 states with existing medical marijuana laws which reduced its generalizability (Wall et al., 2012). Most recently, using the Youth Risk Behavior Survey for Montana, Rhode Island, Michigan and Delaware, Lynne-Landsman and colleagues examined whether medical marijuana laws were associated with changes in adolescent marijuana use; they concluded that such laws had not had a measurable impact on use patterns, at least in the first few years after enactment (i.e., 1–5 years; Lynne-Landsman et al., 2013).

As the scientific community begins to disentangle the effects of marijuana legalization/commercialization, certain US states present unique scientific opportunities. Colorado is a case in point. For example, Colorado not only maintains a medical marijuana registry but also posts summary information to the Colorado Department of Public Health and Environment (CDPHE) website, allowing monitoring of temporal trends. In many other states, it is difficult to assess the impact of medical marijuana laws and policy change because they do not maintain a medical marijuana registry (e.g., Washington), the state registry is voluntary (e.g., California), or information from the registry is not made available to the public (e.g., Hawaii; Bowles, 2012). Although in November, 2000, with the passage of Amendment 20 to the state constitution, Colorado legalized marijuana for medical purposes, review of the CDPHE records supports that from June, 2001 through January, 2009 only 6369 new patient applications were received by the CDPHE. In 2009 there was a confluence of three major policy decisions: (1) Attorney General Eric H. Holder Jr. announced an end to raids on distributors of medical marijuana in states where medical marijuana was legal (Johnston, 2009); (2) the Justice Department noted that federal resources should not be focused on prosecuting medical marijuana patients and caregivers who were operating in "clear and unambiguous compliance with existing state law" (Ogden, 2009); and (3) a Denver District Court ruling determined that a "caregiver" need only dispense marijuana to a registered patient and was not required to provide any additional care, which opened the way for large-scale retail medical marijuana centers (hereafter referred to as dispensaries; Elliott, 2009).

Following this, the Colorado medical marijuana industry experienced rapid growth. News reports quoting the acting Denver city treasurer indicated that by the beginning of 2010 there were nearly 400 medical marijuana dispensaries in Colorado (Channel 7 news, 2014), though the formal process of state licensing of dispensaries would not begin until that summer (Personal Communication, Julie Postlethwait, Medical Marijuana Enforcement Division). As of April 30th, 2013, there were 376 licensed dispensaries and 132 operating in Colorado under pending applications, bringing the total to 508 (personal communication Julie Postlethwait). During this same period the Colorado media attention to the issue of legal marijuana also rapidly increased (see Supplemental Figure 1[1]). Although very few medical marijuana registry applications were received between 2000 and 2008, starting in 2009 the number of medical marijuana license holders in Colorado rapidly increased, reaching 116,198 individuals, or about 3% of Colorado's adult population, by the end of 2010 (refer to Supplemental Figure 2[2]; CPDHE website; Census, 2010). Colorado's medical marijuana industry quickly matured, accumulating retail sales revenue of more than $219,000,000 between July, 2011 and June, 2012 (Colorado Department of Revenue, 2014). Instead of focusing on the point of legalization (pre-post passage of Amendment 20) when the medical marijuana industry in Colorado was relatively quiescent, here we focus on the potential impact of the rapid growth of the commercial medical marijuana industry in Colorado beginning in 2009.

In this study, we utilized the NSDUH to answer three questions: (1) How have marijuana attitudes and marijuana-use-related outcomes changed across time from 2003–4 to 2010–11 within Colorado? (2) Considering these same variables, did Colorado differ from 34 states without medical marijuana laws in years 2003–4, 2005–6, 2007–8, 2009–10 and 2010–11? (3) Do trends in Colorado between 2006–8 and 2009–11 differ from those seen in non-medical marijuana states (NMMS) for the same time periods while adjusting for demographic differences?

2. Methods

The Colorado Multiple Institutional Review Board approved the study as an exempt protocol.

2.1. Study design and sample

We utilized nine years of data from the NSDUH (2003–11); each year of the NSDUH survey employs a multistage probability sampling design to recruit a nationally representative sample of the United States civilian, non-institutionalized population aged 12 and older. Since 1999, most questions in the NSDUH interview are administered as an audio computer-assisted self-interview to provide a private mode for responding to sensitive questions; for other less sensitive items computer-assisted personal interviewing is utilized. The design is state-based with a within-state independent, multistage area probability sampling, which allows estimating generalizable state-level prevalence rates. For each of the eight most populous states (e.g., California), approximately 3600 respondents are interviewed annually; for each of the remaining 42 states and the District of Columbia, approximately 900 respondents are interviewed per state, per year. The design oversamples youths and young adults such that each state's sample is approximately equally divided into those 12–17 years, 18–25 years and 26 years and older. For Colorado considering year pairings of 2003–4, 2005–6, 2007–8, 2009–10 and 2010–11, sample sizes for 12–17 year olds, 18–25 year olds and those 26 years and older, respectively, ranged from 557 to 656, 570 to 681 and 581 to 650. See Substance Abuse and Mental Health Services Administration (SAMHSA) publications for further details (e.g., SAMHSA, 2008, 2009, 2010a, 2011).

[1] Supplementary material can be found by accessing the online version of this paper at http://dx.doi.org and by entering doi:...

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