Adolescent marijuana use from 2002 to 2008: higher in states with medical marijuana laws, cause still unclear

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Abstract

Purpose—Since 1996, 16 states have legalized marijuana use for medical purposes. The current study provides a scientific assessment of the association of medical marijuana laws (MML) and adolescent marijuana use using national data.

Method—State representative survey data on approximately 23,000 12–17 year olds was collected by the National Survey on Drug Use and Health annually from 2002–2008. Yearly state-specific estimates of prevalence of past-month marijuana use and perception of its riskiness were statistically tested for differences between states with and without MML by year and across years.

Results—States with MML had higher average adolescent marijuana use, 8.68% (95% CI: 7.95–9.42) and lower perception of riskiness, during the period 2002–2008 compared to states without MML, 6.94% (95% CI: 6.60–7.28%). In the eight states that passed MML since 2004, in the years prior to MML passage, there was already a higher prevalence of use and lower perceptions of risk in those states compared to states that have not passed MML.

Conclusions—While the most likely of several possible explanations for higher adolescent marijuana use and lower perceptions of risk in MML states cannot be determined from the current study, results clearly suggest the need for more empirically-based research on this topic.

Introduction

Between 1996 and 2011, 16 states passed laws legalizing use of marijuana for medical purposes when medically authorized [1]. Due to the potential for serious short- and long-term consequences of marijuana use in adolescence [2–7], prevention of adolescent marijuana initiation is a key NIDA strategy [8]. Although the potential impact of MML has

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been much discussed in the popular press, formal scientific assessments of the relation between MML and adolescent marijuana use using national data are lacking. Using 2002–2008 data from the National Survey on Drug Use and Health (NSDUH), we compared the prevalence of marijuana use and perceptions of its riskiness among 12–17 year olds in states that have passed medical marijuana laws (MML) to states without such laws.

Methods

The NSDUH is administered to approximately 70,000 individuals annually and oversamples adolescents so that approximately one-third (n=23,300) of the sample includes 12 to 17 year olds. Publicly available state-level estimates for NSDUH respondents aged 12–17 were compiled from 2002–2008 with 2008 being the most current results presently available [9]. The NSDUH survey was initiated in 1999, but due to improvements in data collection procedures in 2002, prevalence rates before 2002 are not comparable and are thus not included [10]. State-level estimates are derived using a survey-weighted hierarchical Bayes estimation approach [10] aggregated over two-year intervals. We analyzed two NSDUH outcomes: (1) prevalence (percent) of past-month marijuana use and (2) percent responding that "great risk" is associated with smoking marijuana at least once a month.

First, we plotted and summarized the prevalence of past-month marijuana use by year and state and MML status (see footnote of Figure 1). Second, for each year, we performed 2-sample t-tests comparing the outcomes in states which had passed MML by that year to states that had not passed MML by the same year. For example, we compared the prevalence of past-month use in 8 states with MML in 2002 to the remaining 42 states that had not passed MML by 2002. Third, we performed a longitudinal analysis including a random intercept for state and a fixed linear trend for year to compare the prevalence of marijuana use and perceived riskiness in the years prior to MML passage (data available for 8 states prior to MML) to that of: 1) post-MML years in states that passed MML and 2) all years for states that did not pass MML by 2011.

Results

The overall prevalence of past-month marijuana use among 12–17 year olds averaged across all states and years was 7.50%. Figure 1 shows the prevalence by year for each state. The 16 states which passed MML (thick lines; solid after passage and dashed before passage) by 2011 had higher average use, 8.68% (95% CI: 7.95–9.42%), during the period 2002–2008 compared to the 34 states without MML, 6.94% (95% CI: 6.60–7.28%). Two states without MML but with high average use were New Hampshire (9.50%) and Massachusetts (9.34%), which both had years with prevalence above 10%. Mean use in New Jersey (6.43%), Arizona (7.35%), and Delaware (7.58%) the three states to pass MML most recently, and California (7.30%) the first MML state in 1996, was on the lower end of states with MML.

In each year, the prevalence of marijuana use was significantly higher in states with MML, and perceived riskiness of marijuana use was significantly lower (Table 1). Longitudinal analyses controlling for a statistically significant decreasing trend in marijuana use from 2002–2008 (β= −.35, t-value = −15.9, p-value <.0001) found that among the 8 states that passed MML since 2004, the prevalence of use in the years prior to passing laws was 8.88%, not significantly different (p=0.25) than states that had already passed laws (8.58%), but significantly higher than the prevalence for states without MML by 2011 (6.94%, p<.0001). Perceived riskiness of marijuana use in states in the years prior to passing MML was 30.5%, not significantly different than states that already passed laws (30.9%, p=0.58) but significantly lower than states without MML (35.7%, p<.0001).

Discussion

Between 2002 and 2008, adolescent marijuana use was higher and perception of its riskiness lower in states with medical marijuana laws compared to states without such laws. There are several possible explanations for this observation. First, it is possible that states with higher marijuana use and lower perceptions of risk are more likely to enact MML. This explanation is supported in the current analysis by the observation that among states that eventually enacted MML, use was higher and perceptions of risk lower even prior to passage of MML. Second, it is possible that MML causes changes in marijuana use and perceptions thereof. A longer time window of pre/post data would be needed to provide enough information both before and after passage of MML for each state to investigate this possibility. Third, it is possible that common factors drive both use and perceptions of risk and implementation of MML. For example, changing cultural norms around drug use may influence both. Given the fast-changing nature of medical marijuana laws and the fact that most claims about its association with adolescent marijuana use are based on opinion, the current study provides needed information describing the relationship and suggests the clear need for more empirically-based research on this topic.

Acknowledgments

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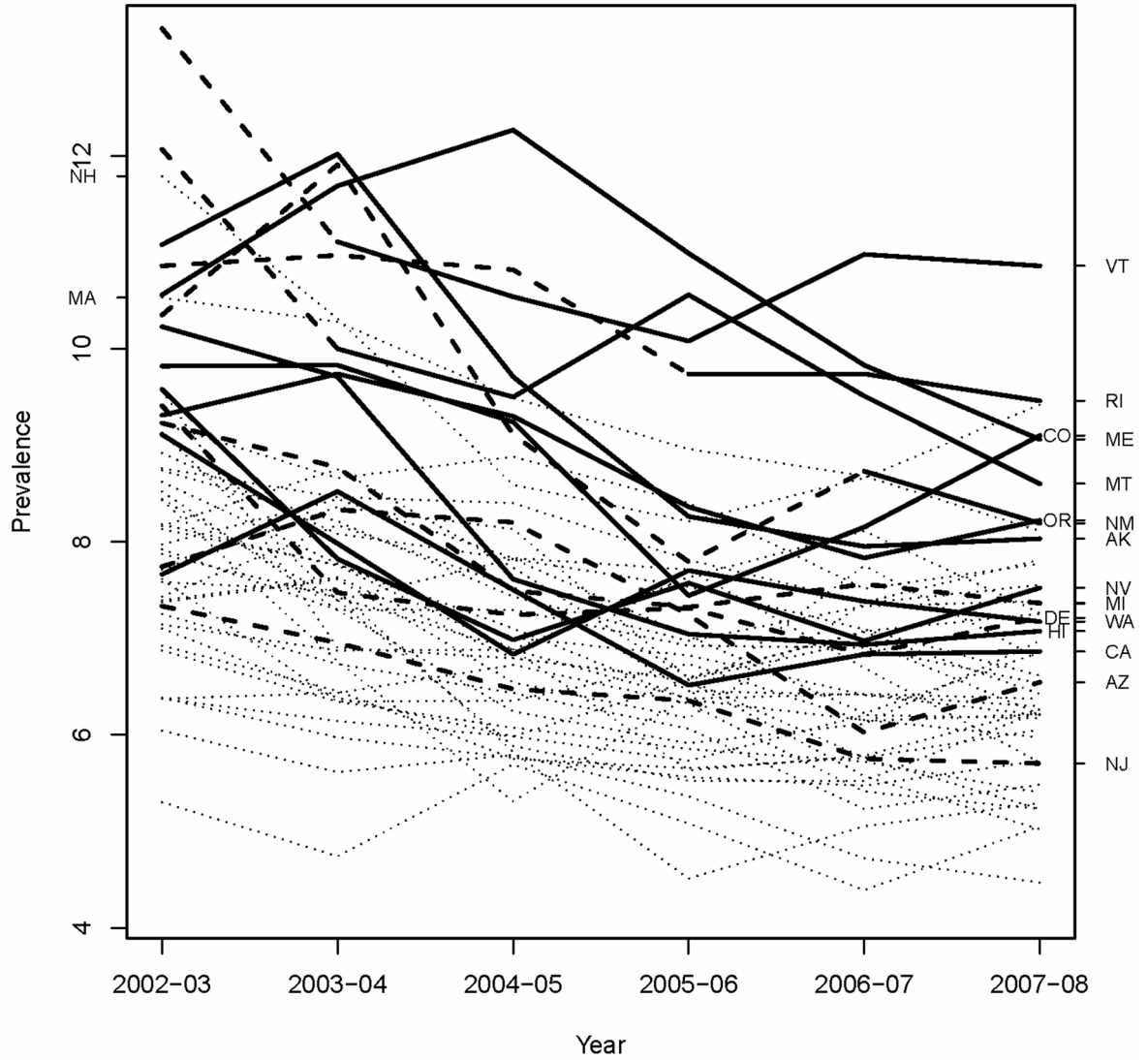## Past Month Marijuana Use among 12−17yr olds

Figure 1.
Prevalence of past month marijuana use among 12 to 17 year olds in states with MML[1] (thick lines: solid after passing law, dashed before passing law) and states without MML (thin dotted lines). State abbreviation labels are noted along the left and right of the figure[2]. [1]Eight states passed medical marijuana laws (MML) before 2002 (California CA in 1996; Oregon OR, Washington WA, and Alaska AK in 1998; Maine ME in 1999; Colorado CO, Nevada NV, and Hawaii HI in 2000) and are represented with solid thick lines from 2002–2008. Five states passed MML during the time period with NSDUH data available 2002–2008 (Montana MT and Vermont VT in 2004; Rhode-Island RI in 2006; New Mexico NM in 2007; Michigan MI in 2008) and 3 additional states passed MML after 2008 (New Jersey NJ and Arizona AZ in 2010; Delaware DE in 2011) and are represented with dashed thick lines before passage and solid thick lines after passage, if applicable (i.e. MI, NJ, AZ, and DE do not have after passage data available due to MML enacted in 2008 or later).

[2]Massachusettes MA and New Hampshire NH are labeled because of their high prevalence among states without MML

Table 1

Yearly comparison of prevalence of marijuana use within the past month and perception of riskiness of marijuana for 12–17 year olds in states having already passed a medical marijuana law (MML) to those without MML in that year.

		Prevalence (%) of marijuana use within past month			
Year	Number of states with MML	Prevalence in States with MML	Prevalence in States w/o MML	t-stat	p-value
2002–03	8	9.67	8.33	−2.19	0.033
2003–04	10	9.84	7.66	−4.30	<.001
2004–05	10	8.95	7.12	−3.94	<.001
2005–06	11	8.57	6.63	−5.19	<.001
2006–07	12	8.40	6.45	−5.34	<.001
2007–08	13	8.27	6.40	−5.58	<.001

		Perceived riskiness of marijuana use (% indicating great risk)			
Year	Number of states with MML	Prevalence in States with MML	Prevalence in States w/o MML	t-stat	p-value
2002–03	8	29.13	33.84	2.85	0.007
2003–04	10	30.82	35.44	3.20	0.002
2004–05	10	30.39	35.13	3.53	<.001
2005–06	11	30.00	35.09	4.22	<.001
2006–07	12	30.02	36.01	4.88	<.001
2007–08	13	29.53	36.17	5.35	<.001