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Period and Cohort Changes in Americans' Support for Marijuana Legalization: Convergence and Divergence across Social Groups

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Abstract

We cast fresh light on how and why Americans' views on marijuana legalization shifted between 1973 and 2014. Results from age-period-cohort models show a strong negative effect of age and relatively high levels of support for legalization among baby boom cohorts. Despite the baby boom effect, the large increase in support for marijuana legalization is predominantly a broad, period-based change in the population. Additional analyses demonstrate that differences in support for legalization by education, region, and religion decline, that differences by political party increase, and that differences between whites and African Americans reverse direction. We conclude by discussing the implications of these findings and by identifying promising directions for future research on this topic.

Keywords: Marijuana, public opinion, social change

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Currently, 25 states and the District of Columbia have passed laws permitting the medical use of marijuana, and 4 states and the District of Columbia have legalized marijuana for recreational use, though considerable friction remains over how to resolve the tensions between these state laws and federal anti-marijuana regulations. There is now an extensive marijuana industry, particularly in Colorado and Washington, with attendant tourism, legal battles over taxation and public consumption, and issues related to production, marketing, and the economics of marijuana more broadly (Gove 2016; Scheuer 2015). Perhaps the slate of legislative changes should not come as a great surprise given trends in public opinion on the subject. According to both Pew and Gallup, a slight majority of Americans have supported the legalization of Marijuana since 2013 (Jones 2015; Motel 2015). This plurality support for legalization nationwide represents a dramatic reversal of fortunes for marijuana since the late 1980s, when there appeared to be a broad national consensus in favor of keeping marijuana illegal. Indeed, at that time less than one-quarter of U.S. adults endorsed legalization in most polls (Jones 2015; Motel 2015).

Despite the significance of this reversal, how this occurred is not well-understood. Although researchers have occasionally examined correlates of pro-legalization views using nationwide surveys, marijuana attitudes have usually been incorporated into broader investigations of social liberalism (e.g., Himmelstein and MacRae 1988; Hoffmann and Miller 1997). Other studies have focused on high school or college students in an effort to gauge conservative or liberal winds (e.g., Hastings and Hoge 1986; Palamar 2014). While researchers have long demonstrated keen interest in patterns and correlates of marijuana use—among adolescents and adults—few if any investigators have undertaken a thorough study of public opinion regarding legalization. This overall neglect of public opinion on marijuana legalization stands in marked contrast to the strong research focus on changes in other social attitudes, such as those involving gender roles, abortion, and homosexuality and same-sex marriage, which continue (quite appropriately) to receive intense scrutiny (Loftus 2001; Sherkat et al. 2011).

In this article, we ask: aside from the overall increase, how has support for marijuana legalization changed? We ask this in two distinct ways. First, has the increase in support occurred more rapidly among some segments of the population than in others? Those who were traditionally less likely to support marijuana legalization, such as women,

the lower classes, and evangelical Protestants, may have diminished in their relative opposition, leading to broader support for legalization across the population. This would comport with a social diffusion perspective on social change and cultural innovations (Rogers 2003). At the same time, new cleavages may have appeared or old ones increased. Here we are particularly focused on politics since research shows considerable party polarization over the past few decades (Bafumi and Shapiro 2009; DiMaggio, Evans, and Bryson 1996). Second, did growth in support for marijuana legalization occur across time periods, reflecting change among the population as a whole, or was it driven by changes across generations, with younger birth cohorts being more likely than older cohorts to support legalization? Much research argues that changing support is at least partially motivated by differences across birth cohorts (e.g., Galston and Dionne 2013; Jones 2015; Nielsen 2010; Motel 2015), though others disagree (e.g., Caulkins et al. 2012). We bring newer techniques for simultaneously estimating period and cohort effects using repeated cross-sectional data to bear on this issue.

In this study we seek to cast fresh light on how and why American public opinion on marijuana legalization shifted over the 1973–2014 period. We use data from the General Social Survey (GSS) and hierarchical age-period-cohort models (Yang and Land 2013), which not only provide estimates of period and cohort changes but also allow for random slopes that are used to estimate changes in key correlates of support for legalization. We derive expectations for changes in the effects of social class, religion, sex, race, political affiliation, and region from extant theoretical and empirical research. The results show that the increase in support for marijuana legalization is predominantly a period-based change, and that baby boom cohorts are relatively supportive of legalization. Models with random slopes reveal robust changes in who supports legalization across time periods—declines in the effects of education, region, and evangelical Protestant affiliation, a large increase in differences between Republicans and Democrats, and a reversal of differences between whites and African Americans. Moreover, we find that differences between men and women are depressed, and income differences are exacerbated, among the interwar cohorts, born between 1915 and the 1930s. We conclude by discussing the implications of these findings for our understanding of the dramatic change in public opinion on marijuana legalization, and by identifying promising directions for future research on this topic.

Period and/or Cohort Change

Social change, such as changes in support for the legalization of marijuana, can take place across periods and/or birth cohorts. A period is a specific point in time, and period effects imply changes among people of all generations from one period to another period. A birth cohort, on the other hand, is a group of people who are born at approximately the same time, or within a specific window of time, and cohort effects are changes across these groups, regardless of age. Shifts in the approval of marijuana legalization may be due to changes in the perspectives of all people over a span of time, or to certain generations adopting particular views on the issue.

The distinction between period and birth cohort change is absolutely pivotal to understanding the processes of social change. Birth cohorts mature within specific historical eras, and consequently encounter distinct socialization experiences (Ryder 1965). These unique socialization influences may leave a lasting imprint on attitudes regarding marijuana and the laws that regulate it, particularly because such views often resist change as people age (Alwin and Krosnick 1991). Indeed, generation-specific trauma, such as warfare and economic recession, as well as the characteristics of a generation, such as size and demographic makeup, are seen as key motivators of social and political change (Edmunds and Turner 2002). Importantly, however, such social change is generally slow, relying on intergenerational population replacement (Inglehart 1990). Rapid changes in society, in reaction to political, legal, and technological changes, for example, may instead result from changes in the population as a whole, or period effects.

In the case of marijuana attitudes, there are obvious benefits to disentangling the complex effects of age, period, and cohort correctly. Specific historical periods, and the events that occur within those periods such as changes in drug laws, popularized cases of drug use and abuse, and problems with the criminal justice system can produce period-based changes in views of marijuana (Nielsen 2010). The sharp increase in support for marijuana legalization since roughly 1990 suggests the possibility of such a period effect (Musgrave and Wilcox 2014). Other rapid changes in social and political perspectives, such as support for homosexuals' rights and same-sex marriage, have been shown to be period-based rather than cohort-based changes

(e.g., Anderson and Fetner 2008; Schwadel and Garneau 2014). Importantly, because period effects often reflect responses to specific political and cultural events, they may be less stable than cohort effects (e.g., Brulle, Carmichael, and Jenkins 2012; O'Brien 2000). Musgrave and Wilcox (2014:90) note this possibility when they conclude that “a more aggressive law-enforcement attitude may portend . . . another U-turn” in public opinion on marijuana.

There are also sound reasons to anticipate that cohorts play a role in changes in views of marijuana. Certain cohorts may feel differently about marijuana laws than other cohorts. The baby boomers, for example, tend to hold distinctive attitudes on a number of social and policy issues (e.g., Cohn and Taylor 2010; Davis 2007); and, according to some researchers, marijuana is one of those issues (e.g., Kandel et al. 2001). Regardless of the unique views of the baby boom generation, it is often argued that growing support for marijuana legalization more broadly occurs across successive birth cohorts, with younger cohorts maturing in more liberal social and political environments. Unfortunately, these conclusions are based on analyses that potentially conflate cohort and age effects by either leaving age out of their models or assuming that age differences indicate cohort effects (e.g., Caulkins et al. 2012; Galston and Dionne 2013; Jones 2015; Motel 2015; Nielsen 2010). Our analysis expands on previous research by employing advanced techniques for disentangling age, period, and cohort effects using repeated cross-sectional data. The hierarchical age-period-cohort models that we employ provide estimates of the effect of each cohort (averaged across periods and controlling for age) and the effect of each period (averaged across cohorts and controlling for age) (Yang and Land 2013). By using this approach, we are able to unravel the effects of age, period, and cohort on attitudes about marijuana legalization.

Period- and Cohort-Specific Correlates of Support for Legalization

In addition to clarifying age, period, and cohort effects, we also investigate the possibility that key predictors of pro-legalization attitudes differ by cohort and period. Social, cultural, and demographic variations by period and/or birth cohort can alter the influence of factors

that affect attitudes about marijuana legalization. Variables that are strongly predictive of attitudes for one period or birth cohort may thus have little bearing on attitudes for other periods or cohorts. In particular, the extant literature suggests the possibility of period and/or cohort variation in the effects of sex, race, social class, religion, political affiliation, and region.

Women are generally less likely than men to support the legalization of marijuana (Nielsen 2010; Palamar 2014), potentially due in part to differences in the perceived risk associated with marijuana (Pacek, Mauro, and Martins 2015) and differences in views of the utility and cost of the enforcement of anti-marijuana laws (Galston and Dionne 2013). Recent research, however, suggests that differences in marijuana use between men and women—and thus possibly also views of marijuana—have declined (Johnson et al. 2015). Convergence in men's and women's attitudes on marijuana would comport with research on changes in sex differences in other social and political attitudes (e.g., Astin 1998; Bolzendahl and Myers 2004; Norris 1996).

Although minority Americans—particularly African Americans and Mexican Americans—have long been popularly associated with marijuana use (Goode 1970; Schlosser 2003; Schroeder 1980), empirical research often finds little difference between whites' and African Americans' support for marijuana legalization (e.g., Galston and Dionne 2013; Nielsen 2010). Recent research, however, indicates that African Americans are now relatively likely to oppose medical marijuana (Tate 2014), see marijuana use as involving a great risk (Pacek et al. 2015), and, at least among young adults, abstain from marijuana use (American Civil Liberties Union 2013). These trends suggest that support for marijuana legalization may have become relatively more common among whites in recent periods and/or birth cohorts.

Research since the 1960s indicates that support for marijuana legalization is disproportionately high among the middle and upper classes (e.g., Caulkins et al. 2012; Goode 1970), despite evidence that marijuana use is more common among the lower classes (Braun et al. 2000). Research on cultural diffusion, however, suggests that novel social and political perspectives often disseminate across the population. Those with high levels of income and education are seen as “innovators” and “early adopters” of cultural innovations, and the lower classes are often “laggards” in the adoption of cultural innovations (Rogers 2003; see also Elias 2000). Consequently, the link between

social class and attitudes regarding legalization may have declined across periods and/or birth cohorts (Musgrave and Wilcox 2014).

Residents of the Pacific, New England, and Mountain Census Divisions are comparatively receptive to pro-legalization views (Caulkins et al. 2012). The Pacific in particular—California, Washington, Oregon, Alaska, and Hawaii—is known for its relatively high rates of marijuana use and cultivation. For instance, three of the four states to legalize recreational marijuana are in the Pacific Division. Although the West Coast has long been receptive to unconventional values and lifestyles (Bainbridge 1989), and known for attracting in-migrants with countercultural sensibilities during the 1960s and 1970s, it is not clear how these patterns have been sustained. Not only has the Pacific population changed demographically (Grieco et al. 2012), but the culture that supports legalization may have diffused to other areas of the country. Previous research shows that other cultural and even legal innovations that first took root in the Pacific, such as hate crime laws, eventually spread to other states (Rogers 2003). This suggests the possibility of declines in the association between living in the Pacific and pro-legalization attitudes (Caulkins et al. 2012).

Although religion has historically been associated with moral and legal positions such as views of marijuana, there are reasons to believe this association has changed along two dimensions. First, evangelical Protestants have been less prone than people from other religious backgrounds to endorse the legalization of marijuana (Hoffmann and Miller 1997), possibly due to religious monitoring (Longest and Vaisey 2008), alignment with the Republican Party (Wald and Calhoun-Brown 2006), and conservative theology that emphasizes the doctrine of original sin and the avoidance of temptation (Hempel and Bartkowski 2008; Sherkat and Ellison 1997). The relative rise in evangelicals' social class (Schwadel 2014a) and their convergence with other Americans on various social perspectives (Farrell 2011), however, suggest potential convergence in marijuana attitudes between evangelical Protestants and other religious affiliates (Hoffmann and Miller 1997; cf. Smith and Johnson 2010). Second, the population of religiously unaffiliated Americans has grown considerably in recent decades; and liberal attitudes such as views of marijuana appear to have encouraged this change (Hout and Fischer 2014; Putnam and Campbell 2010). As the unaffiliated population has grown, however, it has become more heterogeneous and potentially changed in various ways

(Baker and Smith 2009; Voas 2015). For instance, the religiously unaffiliated are no longer more highly educated than other Americans (Schwadel 2014a, 2014b). Changes to the unaffiliated population may have also led to a reduction in the association between religious non-affiliation and support for marijuana legalization.

Finally, it is likely that partisanship has become more relevant. There has been a considerable increase in ideological, issue-driven political polarization in the United States (Bafumi and Shapiro 2009). This is evident from the “striking divergence of attitudes between Democrats and Republicans” (DiMaggio et al. 1996:738). Political party differences have grown across a variety of social and political perspectives, including views of race, abortion, employment, health care, and sexuality (Abramowitz and Saunders 2008; Putnam and Campbell 2010). Some researchers argue that marijuana attitudes are a component of this party polarization, which suggests increasing differences between Democrats and Republicans in their support for legalization (e.g., Musgrave and Wilcox 2014). Such polarization fits with a depiction of the Republican Party as increasingly focused on social conservatism more so than limited government (Miller and Schofield 2008). Conversely, others argue that partisan differences in marijuana attitudes are declining, and that this decline should be particularly evident in differences across birth cohorts (e.g., Gao 2015). In the analyses below, we adjudicate these competing claims as well as potential changes in the effects of race, sex, social class, region, and religion on support for marijuana legalization.

Data

We use data from the 1973–2014 General Social Survey to examine changes in support for the legalization of marijuana. The GSS is a nationally representative survey of noninstitutionalized adults in the United States. The survey has been administered annually or biennially since 1972, generally though not always in-person. The question about legalization of marijuana was added to the GSS in 1973, though it was not included in the 1977, 1982, and 1985 surveys. The GSS response rate ranges between 69 percent and 80 percent, according to American Association for Public Opinion Research Response Rate 5 (AAPOR 2008).

The sample is restricted to those 25 years old and older to avoid limiting variation in higher education. There are 26,441 cases after deleting cases with missing data on the dependent variable and the focal independent variables. Another 134 cases are deleted due to missing data on control variables, resulting in a sample size of 26,307 (see Smith, Marsden, and Hout [2015] for more information on the GSS).

Respondents were asked if they “think the use of marijuana should be made legal or not.” The response options were legal and not legal. We use a dichotomous dependent variable coded one for support for legalization and zero for no support for the legalization of marijuana (see Table 1 for descriptive statistics). Although legalization can be

Table 1. Descriptive statistics.

	<i>Percent (Mean)</i>	<i>Std. Dev.</i>
Support Legalization of Marijuana	27.6	
Female	55.7	
African American	12.8	
Other Race	4.5	
White†	82.6	
Bachelor’s Degree	23.1	
High School Degree†	55.1	
No High School Degree	21.8	
Family Income	(10.376)	.946
Evangelical Protestant	26.3	
No Religious Affiliation	10.6	
Nonevangelical Religious Affiliat†	63.2	
Religious Service Attendance	(3.939)	2.722
Democrat	38.2	
Independent	34.3	
Other Party	1.4	
Republican†	26.0	
Pacific	13.3	
Mountain	6.3	
New England	4.9	
Other Census Divisions†	75.5	
Age ^a	(47.837)	16.028
Married	57.7	
Children in Home	38.7	
Urban	22.0	
Suburban	26.7	
Rural	13.5	
Other Urban†	37.8	

N = 26,307; sample limited to respondents age 25 and older.

† Omitted reference category in regression models.

a. Age-squared and age-cubed included in models when statistically significant ($p < .05$).

enacted in various ways, from allowing only personal use and cultivation to large-scale production and retail sales (Caulkins et al. 2015), this measure does not allow us to assess support for different forms of legalization but instead for legalization in general.

The primary independent variables measure age, race, sex, religion, political party, social class, and region. Age is coded in years of age, centered on the mean of age. Age-squared and age-cubed are included in the models when statistically significant ($p < .05$). Sex is measured with a dummy variable for female respondents, race with dummy variables for African American and other race respondents (white is omitted reference category), and political affiliation with dummy variables for Democrats, Independents, and affiliates of other parties (Republican is omitted reference category). Social class is assessed with a family income variable (in constant dollars, logged to adjust for the skewed distribution) and dummy variables for bachelor's degree and no high school degree (high school degree is omitted reference category). Religious affiliation is measured with dummy variables for no religious affiliation and evangelical Protestant affiliation (Steensland et al. 2000) (omitted reference category is nonevangelical religious affiliate, which includes nonevangelical Protestant, other Christian, and non-Christian religions). We also examine the changing impact of a nine-category measure of frequency of religious service attendance (from never to more than once a week) because evangelicals attend religious services more often than most other Americans, and service attendance is strongly associated with views of marijuana (Galston and Dionne 2013). Region is measured with dummy variables for the Pacific, Mountain, and New England Census Divisions, which have relatively high levels of support for legalization (Caulkins et al. 2012) (omitted reference category is all other divisions, including Middle Atlantic, East North Central, West North Central, South Atlantic, East South Central, and West South Central). The models include controls in the form of dummy variables for marital status, children (under 18) in the home, and urbanity (large urban area, suburb, and rural, with other urban as omitted reference category) as family formation and city size are associated with views of marijuana (Nielsen 2010; Palamar 2014).

Analysis Technique

The extant age-period-cohort (APC) literature suggests conducting model specification tests to ascertain if all three factors are relevant (e.g., Chaves 1991; Firebaugh 1997; Land 2011). To do so, we compare results from partial and full fixed-effects APC binary logistic regression models of support for the legalization of marijuana (see Yang, Fu, and Land 2004). These models include dummy variables for age groups, periods, and cohorts. Birth cohorts are coded in five-year intervals. Respondents born before 1900 and after 1984 are grouped into their own cohorts due to the limited number of respondents at the tail ends of the cohort distribution. Each survey year is a time period. We use five-year age groups to limit the number of variables (note that this coding of age differs from the focal analyses below). The 1991 period, the 1940–44 cohort, and the 55–59 age group are the omitted reference categories. Table 2 reports model fit statistics comparing the partial models to the full fixed-effects APC model. A significant likelihood ratio test indicates that the full APC model provides a better fit. As Table 2 shows, the full APC model fits the data significantly better than each of the reduced models. Thus, an APC approach appears best for understanding changes in support for the legalization of marijuana.

Table 2. Likelihood ratio tests of model fit for full APC model relative to partial models, from binary logistic regression models of support for legalization of marijuana with dummy variables for five-year birth cohorts, single-year periods, and five-year age categories.

	<i>Likelihood Ratio Statistic</i>	<i>Degrees of Freedom</i>
Age Only	1795.374***	42
Period Only	753.833***	30
Cohort Only	740.481***	36
Age and Period	148.941***	18
Age and Cohort	521.464***	24
Period and Cohort	49.178***	12
Age, Period, and Cohort	—	

Omitted reference categories are ages 55–59, period 1991, and cohort 1940–44; sample limited to respondents age 25 and older; N = 26,307.

* $p \leq .05$; ** $p \leq .01$; and *** $p \leq .001$ (two-tailed test)

In conventional APC models, such as the fixed-effect analyses reported in Table 2, “age, time period, and birth cohort are considered same-level factors affecting the outcome of interest” (Yang and Land 2013:18). Recent research, however, suggests that repeated cross-sectional APC data should be viewed as hierarchical data where each respondent is nested in a period by cohort cell (Yang and Land 2103). Research based on respondents nested within social contexts, such as schools or churches, is generally approached from a multilevel perspective due to the likelihood of shared random error within each context (Raudenbush and Bryk 2002). Similarly, shared random error among those born at about the same time or surveyed in close temporal proximity should be incorporated into the analyses. As Yang (2008:211) notes, “Adequate models must take into account this level-2 heterogeneity for valid statistical inference.” Failure to do so may result in underestimated standard errors and increased probability of type I error (Hox and Kreft 1994).

Hierarchical age-period-cohort (HAPC) models take the nested structure of APC data into account by treating periods and cohorts as cross-classified level-2 units of analysis in a multilevel model (Yang and Land 2013). Individuals are the level-1 unit of analysis, and age is modeled as a fixed-effects individual-level variable. A logit link function adjusts for the dichotomous dependent variable. The individual or level-1 equation is as follows:

$$\begin{aligned} & \text{Logit (Support Marijuana Legalization)}_{ijk} \\ &= \beta_{0jk} + \beta_1 A_{ijk} + \beta_2 F_{ijk} + \beta_3 AA_{ijk} + \beta_4 OR_{ijk} + \beta_5 BD_{ijk} + \beta_6 NHS_{ijk} \\ &+ \beta_7 IN_{ijk} + \beta_8 EP_{ijk} + \beta_9 NR_{ijk} + \beta_{10} SA_{ijk} + \beta_{11} D_{ijk} + \beta_{12} I_{ijk} \\ &+ \beta_{13} OP_{ijk} + \beta_{14} P_{ijk} + \beta_{15} M_{ijk} + \beta_{16} NE_{ijk} + \sum_{p=5}^p \beta_p X_p + e_{ijk} \end{aligned}$$

Each individual (i) is nested in both a birth cohort (j) and a period (k), β_{0jk} is the intercept or cell mean for respondents in cohort j and period k , β_1 through β_{16} are the individual-level fixed effects for age, female, African American, other race, bachelor’s degree, no high school degree, income, evangelical Protestant, no religious affiliation, service attendance, Democrat, Independent, other party, Pacific, Mountain, and New England, β_p represents other individual-level fixed effects (i.e., control variables), and e_{ijk} is the individual-level error term.

The level-2 model is as follows:

$$\beta_{ojk} = \gamma_o + u_{oj} + v_{ok}$$

In this equation, γ_o is the model intercept, which is the overall mean of support for marijuana legalization, and u_{oj} and v_{ok} are the residual random effects of cohort and period, respectively. Using these residual random effects, we examine the effect of each cohort (averaged across all periods) and the effect of each period (averaged across all cohorts). A key feature of HAPC models is the ability to incorporate random slopes, for example:

$$\beta_{2jk} = \gamma_2 + u_{2j} + v_{2k}$$

In this equation, γ_2 is an example fixed-effect coefficient for an individual-level variable (e.g., female), u_{2j} is the cohort-specific effect of that variable, and v_{2k} is the period-specific effect.

HAPC models are particularly suited to the current research because they include random intercepts that indicate variation from the overall mean for each period and birth cohort, and they allow for random slopes that specify changes in the effects of independent variables across periods and birth cohorts. Recent research suggests that HAPC models provide reliable results if certain key criteria are met, namely, that there are period effects and that the period, cohort, and outcome variables are not collinear (Reither et al. 2015). Importantly, our results are robust to alternative age, period, and cohort intervals, which is the most serious criticism of the models (Luo and Hodges 2015), and the patterns identified reflect those in age by year and cohort by year trend analyses.¹ All independent variables are centered on their overall means and the models are weighted and conducted in HLM 7.

1. Alternative models with various age, period, and cohort intervals show similar results. For instance, we repeated the entire HAPC analysis (i.e., Tables 3 and 4) with five-year age groups, two-year periods, and eight-year cohorts. The substantive findings are largely unchanged (results available on request). Graphs of age by year and cohort by year change in support for legalization are also indicative of the robust period effects we observe here (available on request).

Results

Age, Period, and Cohort Effects

We assess age, period, and cohort effects on support for the legalization of marijuana with Models 1 and 2 in Table 3. Model 1 includes only age variables while Model 2 includes age, other focal independent variables, and control variables. Recall that period and cohort effects are derived from random level-2 intercepts. The age, period, and cohort effects from Models 1 and 2 are depicted in Figure 1. Age, age-squared, and age-cubed are each significant in Model 1. As the dashed line in Figure 1a shows, age has a strong, negative effect on support for marijuana legalization, with the probability declining from .39 to .10 across the adult life course (Model 1). The effect of age, particularly the high levels of support among younger adults, is partially mediated in Model 2, with the probability of support declining from less than .32 to .10.

The variance components for the period intercept indicate significant variation in support for marijuana legalization across time periods in both Model 1 (.3615) and Model 2 (.2961). As Figure 1b shows, the estimated period effects are similar across the two models. Support for marijuana legalization increased in the mid-1970s but then declined in the early 1980s. The probability of support for legalization remained low through the remainder of the 1980s, averaging under .15 from 1983 to 1990 (both Models 1 and 2). Support for the legalization of marijuana then increased considerably in a relatively linear manner from 1990 to 2014. In 2014, the estimated probability of support for legalization was over .5 in both the partial and full models.

The variance component for the birth cohort intercept is also significant in both Model 1 (.0343) and Model 2 (.0257). Figure 1c suggests that cohorts that fall within the baby boom generation—specifically the 1945 through 1964 cohorts—are disproportionately likely to support the legalization of marijuana. This is particularly evident in the partial model, with an average estimated probability of support of .28 for the 1945 through 1964 cohorts, compared to .22 for the remaining cohorts.

Overall, the results in Table 3 and Figure 1 indicate that the trend of increasing support for marijuana legalization is largely due to period

Table 3. Hierarchical age-period-cohort models of support for legalization of marijuana.

<i>Fixed Effects</i>	<i>Model 1</i>		<i>Model 2</i>	
	<i>b</i>	<i>se</i>	<i>b</i>	<i>se</i>
Intercept	-1.207	.130***	-1.254	.117***
Female			-.283	.034***
African American ^a			-.044	.057
Other Race ^a			-.702	.087***
Bachelor's Degree ^b			.322	.042***
No High School Degree ^b			-.409	.052***
Family Income			.058	.023*
Evangelical Protestant ^c			-.257	.042***
No Religious Affiliation ^c			.334	.055***
Service Attendance			-.162	.007***
Democrat ^d			.468	.047***
Independent ^d			.446	.046***
Other Party ^d			.733	.133***
Pacific ^e			.306	.049***
Mountain ^e			.061	.069
New England ^e			.323	.075***
Age	-.016	.003***	-.013	.003***
Age-Squared ^f	.041	.009***	.015	.010
Age-Cubed ^f	-.002	.000***	-.001	.000*
Married			-.442	.040***
Children in Home			-.166	.041***
Urban ^g			.193	.047***
Suburban ^g			.106	.043*
Rural ^g			-.101	.058
<i>Random Effects</i>	<i>Variance Component</i>		<i>Variance Component</i>	
Period Intercept	.3615***		.2961***	
Cohort Intercept	.0343***		.0257***	

N = 26,307; sample limited to respondents ages 25 and older.

* $p \leq .05$; ** $p \leq .01$; and *** $p \leq .001$ (two-tailed test)

a. White omitted reference category.

b. High School Degree omitted reference category.

c. Nonevangelical Protestant religious affiliate omitted reference category.

d. Republican omitted reference category.

e. Other Census Divisions omitted reference category.

f. Coefficient and standard error multiplied by 100.

g. Other urban omitted reference category.

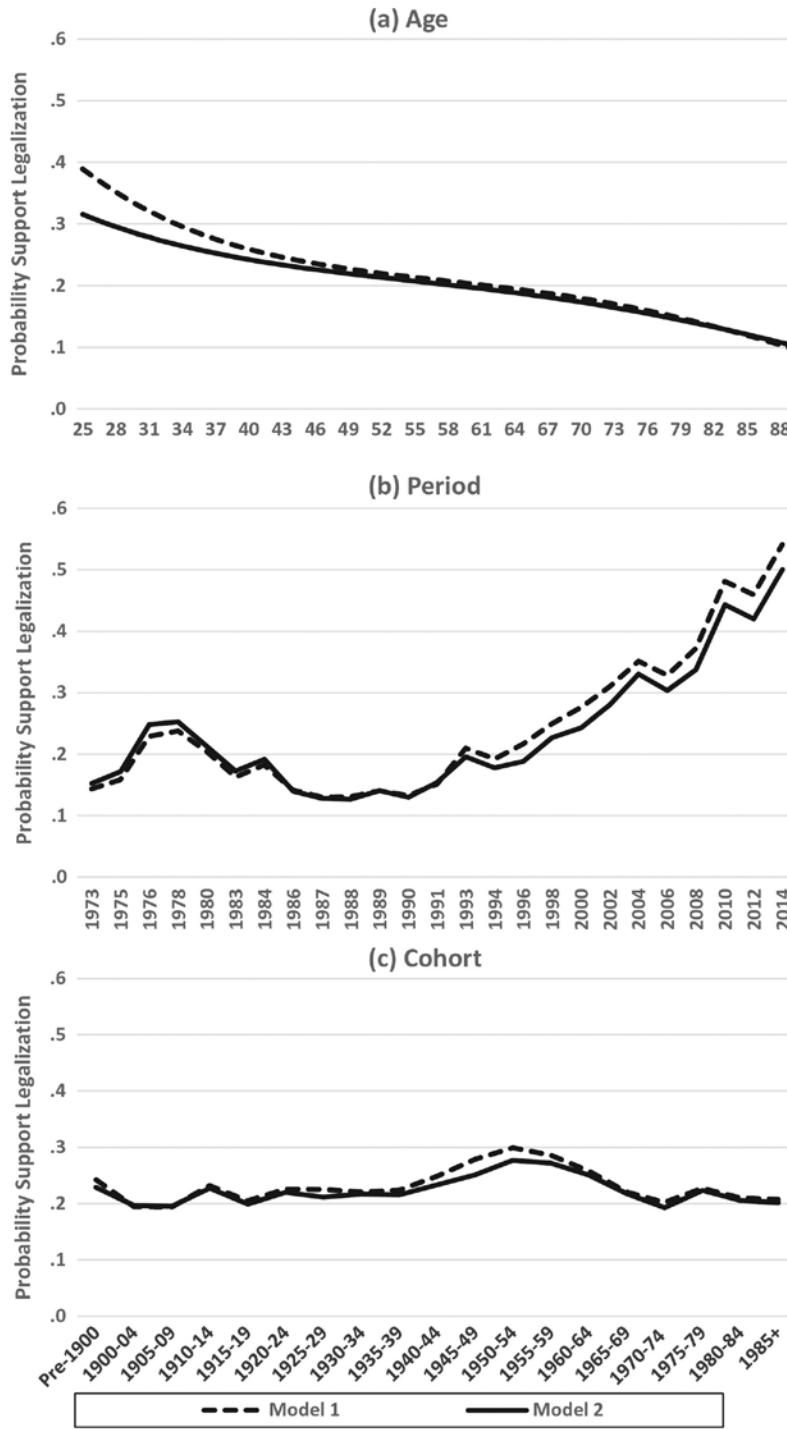


Figure 1. Estimated age, period, and cohort effects on support for legalization of marijuana. Figure graphs results from Models 1 and 2 in Table 3.

effects but there is still considerable across-cohort variation in support for legalization. Among the focal variables, female, other race, no high school degree, evangelical Protestant, and service attendance have negative effects on support for marijuana legalization while bachelor's degree, family income, no religious affiliation, Democrat, Independent, other party, Pacific, and New England have positive effects (Model 2). These effects are often moderate to large. For instance, the odds of supporting legalization are ($e^{.334} =$) 40 percent greater for religious nonaffiliates than for nonevangelical religious affiliates, 60 percent greater for Democrats than for Republicans, and 38 percent greater for the college educated than for those with only a high school degree. However, these are aggregate effects, averaged across all periods and birth cohorts. Next, we turn to how the effects of the focal predictors change across periods and birth cohorts.

Changes in Effects of Sex, Race, Social Class, Religion, Political Party, and Region

We add random slopes to key variables to assess how the effects of those variables change across periods and birth cohorts. The number of periods ($N = 25$) and cohorts ($N = 19$) limit the degrees of freedom, thereby precluding the inclusion of all potentially relevant random slopes in a single model. Consequently, we test for random slopes in batches in Models 3 through 7 in Table 4. Model 8 includes each of the statistically significant random slopes from Models 3 through 7. Across-cohort variation in the effects of bachelor's degree and evangelical Protestant, which were marginally significant in Models 4 and 6, respectively, are no longer significant in Model 8. Each of the other random slopes included in Model 8 remains significant. We examine the substantive impact of these random slopes in Figures 2 through 7, which depict estimated group-specific probabilities across periods and cohorts.

The random cohort slope for female from Model 8 (variance component = .0327) is visually displayed in Figure 2. This figure shows little difference between men and women among those born between 1915 and 1939. In other words, the negative effect of female is relatively small for the latter half of the greatest generation and the bulk

Table 4. Random slopes (variance components) from hierarchical age-period-cohort models of support for legalization of marijuana.

	<i>Model 3</i>	<i>Model 4</i>	<i>Model 5</i>	<i>Model 6</i>	<i>Model 7</i>	<i>Model 8</i>
Period						
Female	.0041					
African American ^a	.0798***					.1067***
Other Race ^a	.0082					
No High School Degree ^b		.0499**				.0588**
Bachelor's Degree ^b		.0337**				.0397**
Family Income		.0021				
Pacific ^e			.0672***			.0646***
Mountain ^e			.0137			
New England ^e			.0450			
Evangelical Protestant ^c				.0646***		.0578***
No Religious Affiliation ^c				.0343*		.0341*
Service Attendance				.0002		
Democrat ^d					.0230*	.0210**
Independent ^d					.0039	
Other Party ^d					.0153	
Birth Cohort						
Female	.0232***					.0327***
African American ^a	.0086					
Other Race ^a	.0509					
No High School Degree ^b		.0011				
Bachelor's Degree ^b		.0322*				.0265
Family Income		.0015*				.0055**
Pacific ^e			.0122			
Mountain ^e			.0086			
New England ^e			.0098			
Evangelical Protestant ^c				.0328*		.0268
No Religious Affiliation ^c				.0137		
Service Attendance				.0004		
Democrat ^d					.0028	
Independent ^d					.0003	
Other Party ^d					.0074	

N = 26,307; sample limited to respondents ages 25 and older; all models include all of the above independent variables as well as age, marital status, children in the home, and urbanity.

* $p \leq .05$; ** $p \leq .01$; and *** $p \leq .001$ (two-tailed test)

a. White omitted reference category.

b. High School Degree omitted reference category.

c. Nonevangelical Protestant religious affiliate omitted reference category.

d. Republican omitted reference category.

e. Other Census Divisions omitted reference category.

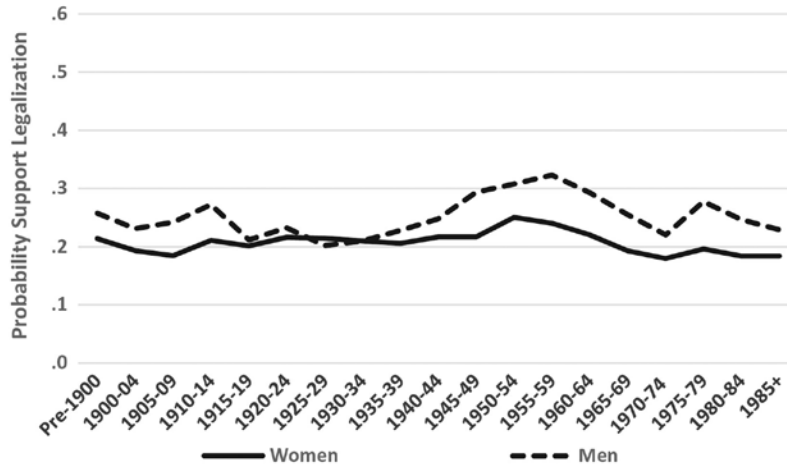


Figure 2. Estimated birth cohort changes in support for legalization of marijuana by sex. Figure graphs results from Model 8 in Table 4.

of the silent generation. The difference in marijuana support between men and women is particularly large among baby boomers. This suggests that the relatively high levels of support for marijuana legalization among baby boomers (see Figure 1b) is disproportionately driven by men.

The results from Model 8 indicate that the effect of African American varies significantly across periods (variance component = .1067). This period variation in the effect of race is shown in Figure 3. African Americans were relatively likely to support marijuana legalization in

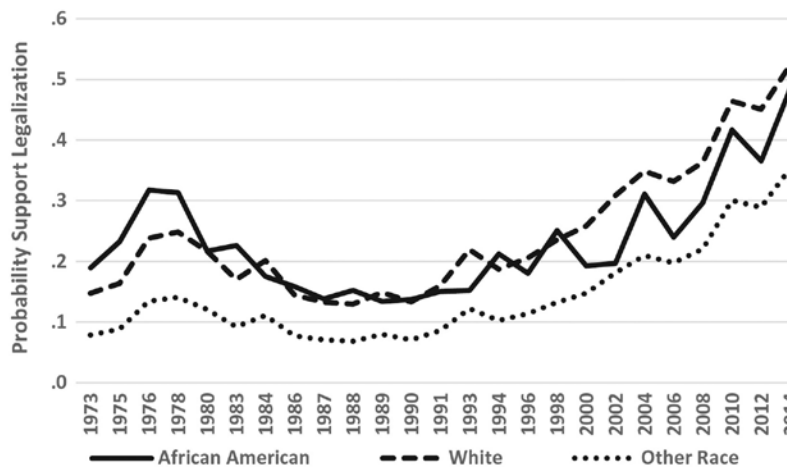


Figure 3. Estimated period changes in support for legalization of marijuana by race. Figure graphs results from Model 8 in Table 4.

the 1970s. Average probability of support for legalization in 1973–78 was more than .26 for African Americans and less than .20 for whites. African Americans and whites reported similar levels of support for legalization in the 1980s and 1990s. In a reversal from the 1970s, African Americans were less likely than whites to support marijuana legalization in the 2000s. Average probability of support for legalization in 2000–2014 was .31 for African Americans and .38 for whites. Although there is considerable growth in support for legalization among all three racial categories in the twenty-first century, whites now appear to be the most supportive of marijuana legalization.

The effects of both bachelor's degree (variance component = .0397) and no high school degree (variance component = .0588) vary significantly across periods in Model 8. Figure 4 shows large educational differences between 1973 and 1980, with the college educated being considerably more likely than those with less education to support legalization. Similar to race, these differences were reduced for much of the 1980s and 1990s. Beginning in the late 1990s, educational differences again grew large, but the primary distinction came to be between those with no high school degree and other Americans. By 2014, there was little difference in the probability of support for those with a bachelor's degree (.55) and those with a high school degree (.54), while the probability of support for legalization was far lower among those with no high school degree (.40).

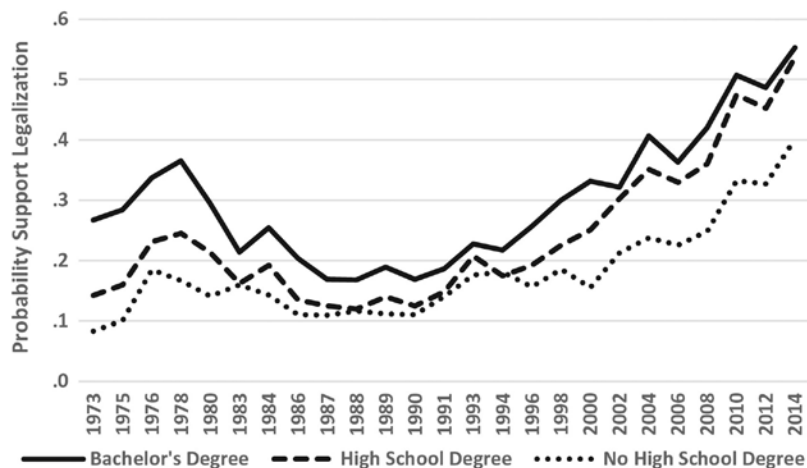


Figure 4. Estimated period changes in support for legalization of marijuana by highest degree earned. Figure graphs results from Model 8 in Table 4.

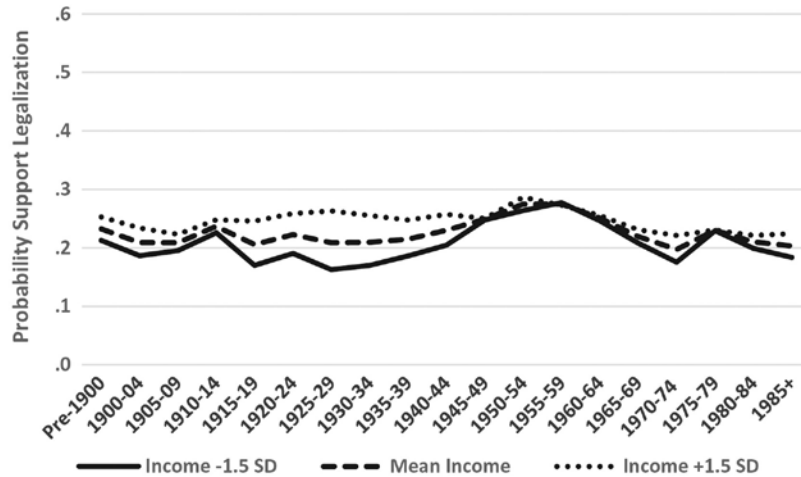


Figure 5. Estimated birth cohort changes in support for legalization of marijuana by family income. Figure graphs results from Model 8 in Table 4.

Across-cohort variation in the effect of family income (variance component = .0055) from Model 8 is depicted in Figure 5. As this figure shows, there are notable income differences in support for marijuana legalization among those born between 1915 and 1939 but relatively small income differences among other birth cohorts. The average difference in the probability of supporting legalization between those 1.5 standard deviations above and below the mean of family income is .08 for the 1915 to 1939 cohorts and less than .03 for the remaining cohorts. Moreover, the results in Figure 5 suggest that the across-cohort variation in support for legalization reported above (see Figure 1b) is disproportionately due to changes among lower-income families.

The effect of Pacific (variance component = .0646) varies across periods in Model 8 in Table 4. This variation is illustrated in Figure 6. Along with living in New England, living in the Pacific Census Division was associated with higher than average support for marijuana legalization in the 1970s, 1980s, and the first half of the 1990s.² From 1973 to 1994, for example, average estimated probability of support for legalization was .24 for those in the Pacific and .16 for those in census

2. Unfortunately, the public version of the GSS does not indicate the specific state respondents live in. We suspect that the Mountain Census Division would appear more supportive of marijuana legalization if Utah could be separated from the remainder of the area.

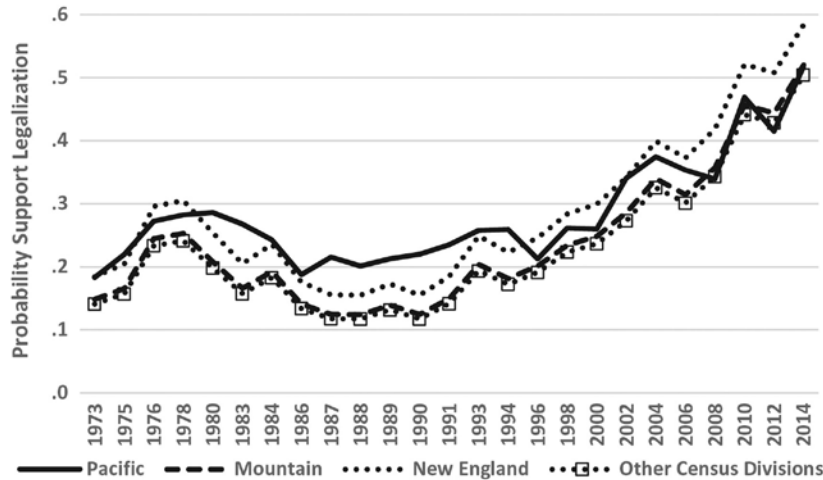


Figure 6. Estimated period changes in support for legalization of marijuana by census division. Figure graphs results from Model 8 in Table 4.

divisions other than the Pacific, Mountain, and New England. This large regional difference in support for marijuana legalization disappeared in more recent periods. In particular, there was no difference between those in the Pacific and those in census divisions other than the Pacific and New England between 2008 and 2014.

Figure 7 depicts period-based variation in the effects of evangelical Protestant (variance component = .0578) and unaffiliated (variance component = .0341) from Model 8. Differences between evangelicals

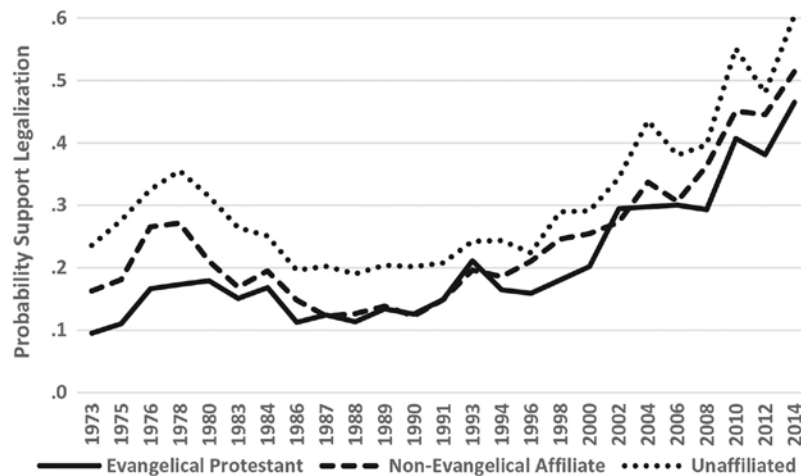


Figure 7. Estimated period changes in support for legalization of marijuana by religious affiliation. Figure graphs results from Model 8 in Table 4.

and other religious affiliates were especially large in the 1970s, with an average probability of support for legalization that was less than .14 for evangelicals and more than .22 for other religious affiliates. This difference disappeared for much of the 1980s but then reemerged in the mid- to late 1990s. Despite fluctuation in the effect of evangelical Protestant after the 1990s, the difference in support for legalization between evangelicals and other religious affiliates has generally been relatively small in the twenty-first century (average difference in probability of support less than .04). For the most part, the unaffiliated are more likely than religiously affiliated Americans to support legalization across periods, though more so in some periods (e.g., 1970s and 1980s) than in others (e.g., 1990s).

Finally, period-based changes in the effect of Democrat (variance component = .0210) from Model 8 in Table 4 are shown in Figure 8. Democrats were more likely than Republicans to support marijuana legalization in each period, but there was a robust increase in the effect of Democrat in the twenty-first century. The average difference in the probability of supporting legalization between Democrats and Republicans was less than .06 in 1973–2000 but grew to .15 in 2002–14. In 2014, estimated probability of support for legalization was .59 for Democrats and .40 for Republicans. Affiliates of other parties are particularly likely to support legalization, which should not be surprising as this category includes both liberal parties such as the Green Party

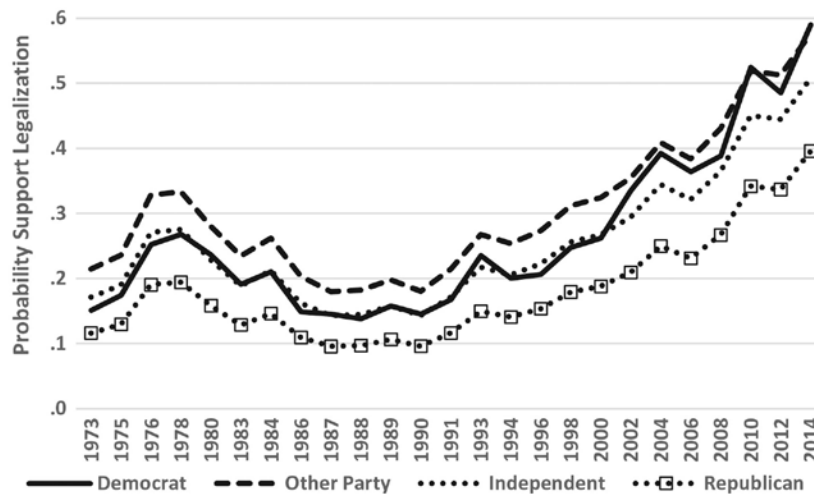


Figure 8. Estimated period changes in support for legalization of marijuana by political party. Figure graphs results from Model 8 in Table 4.

and conservative parties such as the Libertarian Party that may lean toward legalization due to its emphasis on small government. Nonetheless, Democrats are as likely as affiliates of other parties to support legalization in the twenty-first century.

Discussion and Conclusions

We began this study by noting that public opinion polling organizations have reported dramatic increases in levels of popular support for the legalization of marijuana. At the same time, we pointed to a curious neglect in the research literature, as few if any social and behavioral scientists have investigated the dynamics or reasons underlying this substantial opinion shift. Against this backdrop, our study had two main objectives: (a) to disentangle the role of period versus cohort effects in driving the sharp increase in pro-legalization attitudes; and (b) to examine period and cohort variations in the effects of key predictors on marijuana attitudes.

With respect to the first of these issues, we found unambiguous evidence of a dramatic period effect on pro-legalization views, and evidence of smaller cohort variations. It appears that the strong increase in public approval of legalization stems not from changes across successive birth cohorts, but rather it reflects broad-based warming of America's tangled history with marijuana from 1990 to 2014. Perhaps not surprisingly, the primary evidence for cohort-specific patterns involved members of the baby boomer generation, that is, those born between 1945 and 1964. Baby boomers were at the forefront of the countercultural movements of the 1960s and early 1970s, and these direct or vicarious experiences appear to have left a lasting stamp on many of the attitudes and behaviors of baby boomers, making them more progressive on average than those who came earlier and later. Overall, however, the importance of cohort effects was swamped in our analysis by broad-based period effects on support for marijuana legalization. A primary motivation for conducting cohort analyses is to separate age effects from cohort effects (Glenn 2005). Indeed, our results suggest that what some researchers interpret as cohort effects (e.g., Galston and Dionne 2013; Jones 2015; Nielsen 2010; Motel 2015) are instead large differences in support for legalization across the adult life course.

There may be several reasons for the strong period effects we observe. Marijuana has become increasingly widespread and visible in American society. It is now available in nearly every community, neighborhood, and social stratum (Ford and Beveridge 2006), and increasingly large numbers of adults have experimented with marijuana (Galston and Dionne 2013; National Institutes of Health 2015). Marijuana now carries less of a sense of threat (Pacek et al. 2015), which can produce broad, period-based change in support for legalization. Period effects such as we observe with marijuana attitudes may also be influenced by political and cultural phenomena. Indeed, marijuana is not uncommon in movies or on television, and its use has been increasingly popularized by celebrities, musicians, and other elements of popular culture (e.g., Herd 2008). Even U.S. presidents have acknowledged trying marijuana. Moreover, in contrast to earlier periods, marijuana has received good press in some quarters, with many health professionals coming to recognize its benefits for persons coping with serious illness and other debilitating health conditions. At the same time, there are signs of battle fatigue in the war on drugs, especially this drug, due to growing recognition of the social, fiscal, and constitutional costs associated with our largely unsuccessful efforts to regulate the flow and use of marijuana (Provine 2011). Finally, while the advent of legal medical marijuana may be an indicator of a gradual increase in public comfort with the drug, the medical marijuana movement may also be a driver of the period effects observed in the GSS data (Schuermeyer et al. 2014). Any or all of these factors may have contributed to the surge in pro-legalization views among U.S. adults.

In addition to disentangling period and cohort effects on support for marijuana legalization, we also set out to examine whether the effects of key predictors of attitudes toward legalization vary by period or cohort. Several interesting findings emerged from this phase of the analysis. First, there are few meaningful across-cohort changes in the correlates of support for legalization. For the most part, the factors that influenced Americans of one generation on this issue also influenced other generations. The primary exceptions appear to be sex and family income. Unlike other birth cohorts, there is no meaningful difference in support for legalization between men and women born between roughly 1915 and the 1930s. Conversely, differences by family income are particularly large among the same interwar birth cohorts. As Elder (1974) influentially argued, the Great Depression may have

had a lasting impact on those who matured around that time, in this case dampening men's greater likelihood of supporting marijuana legalization but not the relatively high levels of support among Americans who are more well-to-do.

Convergence across periods was evident with region, education, and religion. These changes are key to period-based growth in support for legalization, as the high school-educated, evangelical Protestants, and those outside of the Pacific Census Division caught up to the college-educated, other religious affiliates, and those living in the Pacific area, respectively. These findings comport with research on diffusion that points to the West Coast and especially the highly educated as "innovators" and "early adopters" of cultural innovations (Rogers 2003).

Changes in the composition of the Pacific, college-educated, and evangelical populations may also be relevant here. For instance, there was considerable migration from other parts of the United States to the West Coast in the 1960s and 1970s (Suchan et al. 2007), when many were drawn there because of its openness and tolerance of diverse lifestyles, while the Pacific population was influenced by large numbers of international immigrants in the 1990s and 2000s (Grieco et al. 2012). Similarly, college education has increased rapidly (U.S. Census Bureau 2006). The disappearance of differences in support for legalization between college- and high school-educated Americans could well reflect the strong selectivity into higher education among people who went to college when access was more limited (Wuthnow and Mellinger 1978). This finding contributes to recent research showing declining effects of education on other "liberal" attitudes traditionally associated with higher education (e.g., Pampel and Hunter 2012; Schwadel 2014b). Importantly, however, the least-educated Americans—those without a high school diploma—still report relatively low levels of support for the legalization of marijuana. In regard to evangelical Protestants, they have become more like other Americans in various ways, including in their social class (Schwadel 2014a) and their views of some, but not all, social issues (Farrell 2011). Marijuana legalization appears to be one of those issues. While evangelicals' support for legalization is now more similar to that of other religious affiliates than it was in the 1970s, they are still moderately less likely than other religious affiliates, and considerably less likely than the unaffiliated, to support legalization. Although we found no support for the kind of cohort differences among evangelicals that were forecast by

Hunter (1987) and others, it is possible that closer attention to internal heterogeneity within conservative Protestantism—by education or theological subculture, for example— could illuminate these patterns.

In contrast to education, religion, and region, there was considerable divergence between Democrats' and Republicans' support for legalization. Political differences now dwarf most other social cleavages on the issue. This constitutes yet another component of contemporary political polarization, along with views of homosexuality, abortion, race, and gender roles (Abramowitz and Saunders 2008; Bafumi and Shapiro 2009; DiMaggio et al. 1996). As support for legalization has become a majority opinion, it has also become a particularly non-Republican perspective. Thus the plurality in support is only at the aggregate.

While African Americans were relatively likely to support marijuana legalization in the 1970s (and possibly before), they have been notably less likely than whites to do so in the twenty-first century. These results, as well as research showing relatively high levels of marijuana abstinence among young African Americans (American Civil Liberties Union 2013), represent a reversal from the historic association between nonwhite America and marijuana (Goode 1970; Schlosser 2003). Of course, this does not mean that the popular image of African Americans as marijuana users and supporters of legalization will necessarily follow suit, particularly since African American marijuana users are more likely than white users to be arrested (Nguyen and Reuter 2012).

Although this study has offered an initial investigation of the processes underlying the dramatic shift in public opinion about marijuana legalization, there is more work to be done. Perhaps the first task is to clarify the meaning of our measure of pro-legalization attitudes. One virtue of the GSS survey item is its longevity; the same item has been asked for four decades, and it has also been used by many other polling organizations. However, it will be important to determine exactly what contemporary respondents mean when they answer in the affirmative. For example, are they really expressing support only for medical marijuana? Are respondents actually signaling support for decriminalization? Do they favor the legalization of production only for personal use or do they support a full-scale marijuana industry, and if the latter, would they prefer a regime of regulation and taxation similar to the one used for alcohol? Disentangling these nuanced issues

will be crucial to understanding what the growing support for legalization of marijuana in public opinion polls could actually mean for social policy. Clearly a significant change has occurred in the way in which Americans view marijuana laws since roughly 1990. We have drawn attention to the curious analytical neglect of these substantial shifts in public opinion, even as scholars have focused considerable energy on analyzing patterns and correlates of changes in opinion on other social issues, such as gender roles, abortion attitudes, and homosexuality and gay rights. The magnitude of opinion change on marijuana is more dramatic than most, and it begs for closer investigation in the future. We hope this study sparks further interest in the topic.



The Authors

Philip Schwadel is a Professor of Sociology at University of Nebraska–Lincoln. Before coming to UNL, he received his PhD from the Pennsylvania State University and was a Postdoctoral Researcher with the National Study of Youth and Religion. His research focuses on the intersections between religion, social status, social contexts, and social change. In particular, much of his research examines the associations between social class and religiosity, with particular attention to how social contexts influence these relationships; as well as generational changes in religious and political behaviors and the correlates of religious and political behaviors. His research has been published in *Social Forces*, *Social Science Research*, *Journal for the Scientific Study of Religion*, *Sociology of Religion*, and other reputable, peer-reviewed journals.

Christopher G. Ellison holds a B.A. in Religion (1982) and a Ph.D. in Sociology (1991), both from Duke University. His research centers on several main issues: (1) the implications of religion and spirituality for mental and physical health and mortality risk; (2) religious variations in family life, with particular attention to intimate relationships and childrearing; (3) the role of religious institutions, practices, and values among racial and ethnic minority populations in the United States; (4) the influence of religious factors on political attitudes and policy preferences; and (5) public opinion surrounding issues of race, ethnicity, and immigration in the contemporary United

States. Ellison has published two books and nearly 200 peer-reviewed articles and book chapters on these and other topics; his work has appeared in *American Sociological Review*, *American Journal of Sociology*, *Social Forces*, *Social Science Research*, *Journal for the Scientific Study of Religion*, and a wide range of other journals in sociology, psychology, public health, religious studies, family studies, gerontology, political science, and allied fields.

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