

# Changes in self-reported cannabis use in the United States from 1979 to 2022

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## Abstract

**Background and aims:** Multiple countries are considering revising cannabis policies. This study aimed to measure long-term trends in cannabis use in the United States and compare them with alcohol use.

**Design and setting:** Secondary analysis of United States general population survey data.

**Participants:** The national surveys had a total of 1 641 041 participants across 27 surveys from 1979 to 2022.

**Measurements:** Rates of use reported to the US National Survey on Drug Use and Health and its predecessors are described, as are trends in days of use reported. Four milestone years are contrasted: 1979 (first available data and end of relatively liberal policies of the 1970s), 1992 (end of 12 years of conservative Reagan-Bush era policies), 2008 (last year before the Justice Department signaled explicit federal non-interference with state-level legalizations) and 2022 (most recent data available).

**Findings:** Reported cannabis use declined to a nadir in 1992, with partial recovery through 2008, and substantial increases since then, particularly for measures of more intensive use. Between 2008 and 2022, the per capita rate of reporting past-year use increased by 120%, and days of use reported per capita increased by 218% (in absolute terms from the annual equivalent of 2.3 to 8.1 billion days per year). From 1992 to 2022, there was a 15-fold increase in the per capita rate of reporting daily or near daily use. Whereas the 1992 survey recorded 10 times as many daily or near daily alcohol as cannabis users (8.9 vs. 0.9 M), the 2022 survey, for the first time, recorded more daily and near daily users of cannabis than alcohol (17.7 vs. 14.7 M). Far more people drink, but high-frequency drinking is less common. In 2022, the median drinker reported drinking on 4–5 days in the past month, versus 15–16 days in the past month for cannabis. In 2022, past-month cannabis consumers were almost four times as likely to report daily or near daily use (42.3% vs. 10.9%) and 7.4 times more likely to report daily use (28.2% vs. 3.8%).

**Conclusions:** Long-term trends in cannabis use in the United States parallel corresponding changes in cannabis policy, with declines during periods of greater restriction and growth during periods of policy liberalization. A growing share of cannabis consumers report daily or near daily use, and their numbers now exceed the number of daily and near daily drinkers.

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## KEYWORDS

alcohol, cannabis, daily and near-daily use, drug policy, legalization, prevalence

## INTRODUCTION

Cannabis policies have been or are in flux in many countries [1]. In the United States (US), one can distinguish four periods:

1. Liberalization during the 1970s, with the 1972 publication of the Shafer Commission report [2], 11 states decriminalizing or otherwise reducing penalties, and President Carter appointing a proponent of decriminalization to head the federal Office of Drug Abuse Policy.
2. More conservative policies from 1980 to 1992 under Presidents Ronald Reagan and George Bush Sr., a period sometimes referred to as ‘the Reagan-Bush drug war’ [3].
3. A 15-year period from 1993 to 2008 of state-led liberalization, primarily of ‘medical marijuana’, that was contrary to federal policy.
4. A period of explicit non-interference by the federal government that began in 2009 with Deputy Attorney General David Ogden’s memo instructing US Attorneys that they ‘should not focus federal resources in your states on individuals whose actions are in clear and unambiguous compliance with existing state laws providing for the medical use of marijuana’ [4]. California nearly passed legalization of for-profit production for non-medical use the next year, with 47% voting in favor, and commercial legalization did pass in Colorado and Washington in 2012.

There were myriad other changes at the local, state and federal level in both law and policy. Change has been continual, so these epochs are just signposts, not the only moments of change.

A literature has developed applying difference-in-differences or kindred statistical methods to compare cannabis- and alcohol-related outcomes after versus before a state-level policy change in that state, relative to change over the same period in some control state(s) [5,6]. This work is immensely valuable, but involves certain assumptions (e.g. that the primary effects manifest soon after the policy change and do not spill over into other states) and slices a multi-decade evolution into analytical chunks. As the saying goes, sometimes it can be hard to understand a river only by studying it one bucket at a time.

This article complements those efforts by looking at long-term trends for the United States as a whole, examining days of use not just prevalence and drawing comparisons with alcohol, but makes no attempt to discern causal effects.

## DATA AND METHODS

The data come from univariate tabulations created via the public access web pages of the US national household surveys, called the National Survey on Drug Use and Health (NSDUH) since 2002 and the National Household Survey on Drug Abuse (NHSDA) before then. The current portal, located at <https://datatools.samhsa.gov/>, covers

the NSDUH years; earlier years’ data are available at <https://www.icpsr.umich.edu/web/ICPSR/series/64>. Respondents are weighted by standard sample weights (e.g. ANALWT2 in recent years).

The survey has been run annually since 1990, and four times before then, in 1979, 1982, 1985 and 1988. The original target was the household population age 12 and older in the coterminous United States. The target was expanded in 1991 to the civilian noninstitutionalized population of the 50 states age 12 and older. The expansion added not only residents of Alaska and Hawaii, but also people in noninstitutional group quarters (e.g. college dormitories, civilians on military bases) and homeless people in shelters.

The survey has seen a variety of changes over time with major redesigns in 1999 and 2002. For example, in 1999 the survey switched from paper-and-pencil-interviewing (PAPI) to computer assisted interviewing (CAI), and the sampling was expanded and changed to permit state-specific estimates. There were further changes to sampling in 2002 and a \$30 incentive payment was added. In 2015, there was a substantial questionnaire redesign that affected many drugs, but not directly the questions used here. In 2020 and 2021, there was web-based as well as in-person data collection (because of coronavirus disease 2019 [COVID-19]), and in 2022 questions were added concerning cannabidiol and hemp products.

The Substance Abuse and Mental Health Services Administration (SAMHSA) discourages comparing rates of use before and after the redesigns [7, p. i-2]. Such caution makes sense when trying to assess relatively small changes over a year or a few years that span these discontinuities. However, changes in survey wording or methods that make a 10% or 20% difference in responses are small compared to the much larger changes over the time span examined here. Vertical lines in the time plots between the 1998–1999 and 2001–2002 survey pairs permit readers to judge whether jumps across those discontinuities are driving the long-term trends. The potential size of the effects of COVID-19, the 2020 to 2021 shift to some web-based surveying, and the 2022 question wording changes is harder to judge at this time.

Similarly, we do not clutter the presentation with CIs reflecting sampling variability because they are small compared to changes over time. For example, the point estimate of past-month prevalence increased between 2008 and 2022 by 13 times more than the 0.65 percentage point width of the 2008 CI (increased from 5.82% to 14.58% vs 2008 CI of 5.82%–6.46%).

The primary variables are MJDAY30A, which records answers to the question: ‘Think specifically about the past 30 days, from [DATE-FILL] up to and including today. During the past 30 days, on how many days did you use marijuana or hashish<sup>1</sup> and ALCDAYS, which is the analogous question for ‘one or more drinks of an alcoholic beverage’.

<sup>1</sup>There have been slight variations over time. The 1979 survey asked ‘In the past 30 days, on how many different days did you use marijuana or hash?’

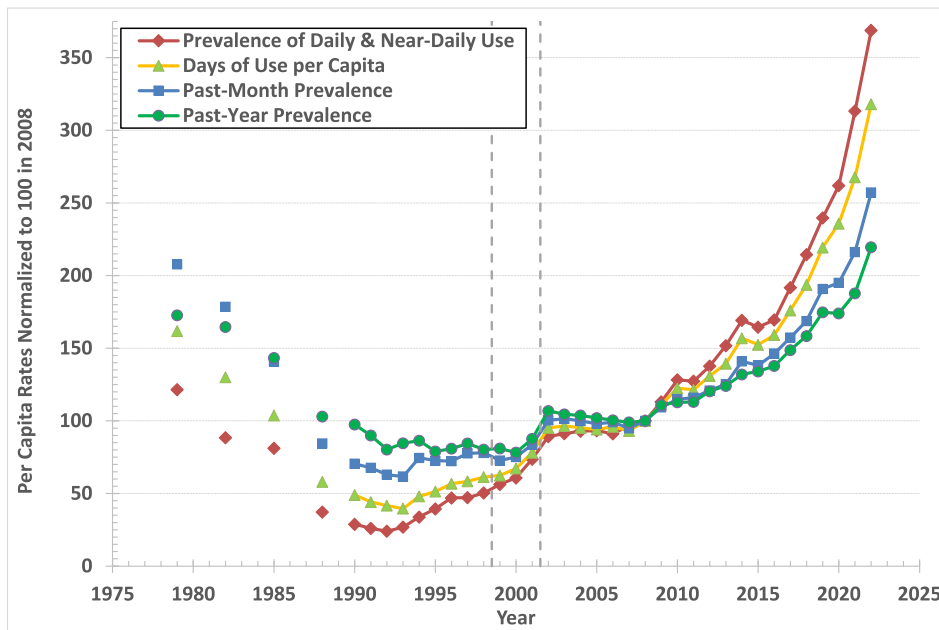
Because of that survey question's wording, the term 'marijuana' is used when describing results, but the more contemporary term 'cannabis' is used in the introduction and discussion sections.

Counts of past-month (PM) users from MJDAY30A are slightly below what is commonly reported for two reasons. First, some (typically ~5%) of respondents who report PM use do not give a valid answer to the MJDAY30A or ALCDAYS question (responses coded as blank, refused, bad data, etc.). Second, the more familiar imputed,

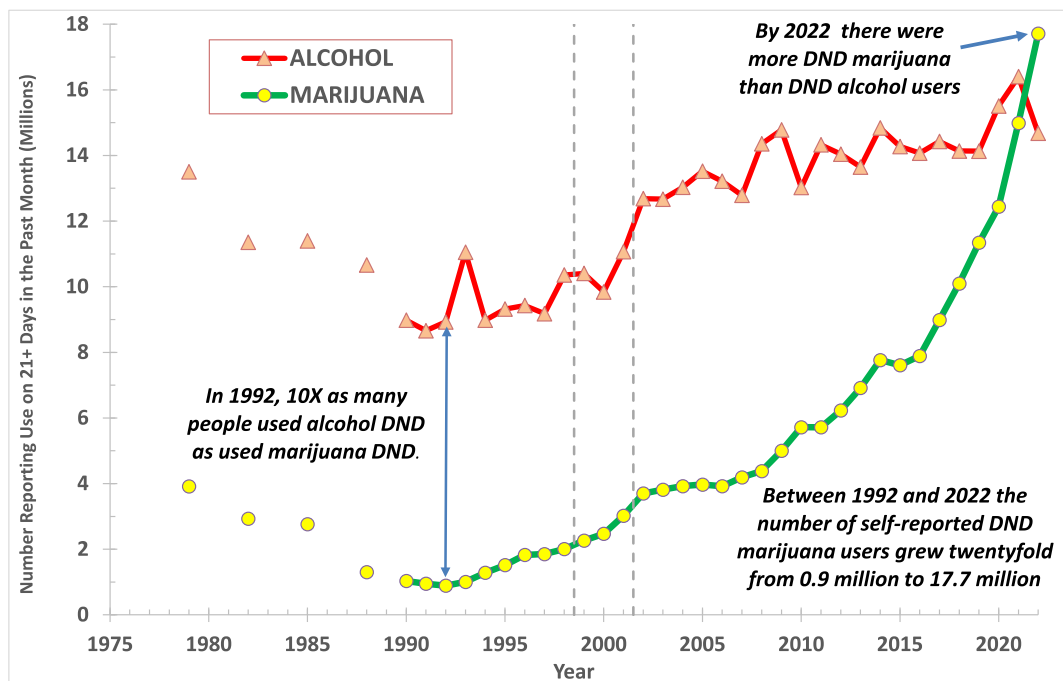
revised IRMJFM variable records 2% to 5% more days of use in the PM, but the variable MJDAY30A is available for all survey years, whereas the IRMJFM variable was not created until 1999. The two produce very similar trends. If one multiplies the number of PM users recorded by MJDAYS30A by 1.03, the mean absolute percentage difference recorded by the two variables is only 0.4%.

Total days of use is a weighted sum of numbers of respondents, weighting by the number of PM days of use they report (as well as

(All indexed to be 100 in 2008; Dashed lines indicate two major survey redesigns)



**FIGURE 1** Four measures of per capita marijuana use reported in United States household surveys. (All indexed to be 100 in 2008; dashed lines indicate two major survey redesigns).



**FIGURE 2** Millions of survey respondents self-reporting 21+ days of use in the past month for both alcohol and marijuana (dashed lines indicate two major survey redesigns).

the sampling weight variable). For example, if three people reported 2 days of use in the past month, and one reported 20 days, that would be a total of  $3 * 2 + 1 * 20 = 26$  days of use reported.

This article makes no attempt to draw causal connections between changes in policy and outcomes and explicitly disavows any such inferences. It seems likely that policy affects use, use affects policy, and omitted variables (e.g. public attitudes toward cannabis) affect both policy and use.

## RESULTS

Figure 1 shows trends since 1979 in per capita rates of past-year, PM and daily or near daily (DND) marijuana use, as well as the total number of days of use reported per capita, with all four lines indexed to 100 in 2008. The index year is arbitrary, but 2008 is convenient because it means the levels in 2022 indicate growth during the period of federal non-interference with legalization of supply.

Figure 1 shows sharp declines during the Reagan-Bush era to a nadir in 1992, a partial recovery between then and 2008, and substantial increases since 2008. Increases are greater, proportionally, for measures of more intense use. For example, between 2008 and 2022, the per capita rate of reporting past-year use increased by 120%, and days of use reported per capita increased by 218% (in absolute terms from the annual equivalent of 2.3 to 8.1 billion days per year). Since the 2022 NSDUH-estimated population 12 and older is 282.0 million, that is, 29 days per person per year, on average.

Growth is most striking for DND use, defined here as reporting use on 21 or more days in the past month.<sup>2</sup> From 1992 to 2022, there was a 15-fold increase in the per capita rate of reporting DND marijuana use (in absolute terms, from 0.9 million to 17.7 million DND users). That was because of a fivefold increase in the number of PM users (from 7.9 to 41.9 million) and a fourfold increase in the proportion of PM users who report DND use (from 11% to 42%).

Figure 2 compares growth in DND marijuana use to contemporaneous changes in DND alcohol use. In 1992, the household survey recorded 10 times as many DND alcohol as DND marijuana users (8.9 vs 0.9 million). Back then, a conversation about DND use of a dependence-inducing intoxicant was essentially a conversation about alcohol use. In the most recent survey, for the first time, NSDUH recorded more DND marijuana than DND alcohol users (17.7 vs 14.7 million).

That change reflects both growth in the number of PM marijuana users and changes in patterns of marijuana use. In 2022, the median drinker reported alcohol use on 4 to 5 days in the PM, whereas the median marijuana user reported use on 15 to 16 days in the PM.

The proportion of PM alcohol users who report using DND has almost always been between 9% and 11%. That was true of marijuana in the early 1990s, but since 2010 more than one third of PM marijuana users reported DND use.

<sup>2</sup>Most people report round numbers of days of use, so DND as defined here is primarily reports of 25 or 30 days of use in the past-month.

**TABLE 1** Changes over time in marijuana and alcohol use as reported in US household surveys.

	1979	1992	Decline 1979–1992	2008	Growth 1992–2008 <sup>a</sup>	2022	Growth 2008–2022	Avg annual rate of growth 2009–2022
<b>Marijuana</b>								
Answered question about PM use days	10.1%	3.1%	-70%	4.9%	59%	12.6%	157%	7.0%
Reported using 21–31 days in PM	1.8%	0.3%	-80%	1.4%	316%	5.3%	269%	9.8%
Proportion of PM users who use DND	17%	11%		30%	140%	42%	218%	8.6%
Total PM days of use reported per capita	1.04	0.27	-74%	0.64		2.03		
Avg days of use per PM user	10.2	8.7		13.1		16.2		
<b>Alcohol</b>								
Answered question about PM use days	47.4%	35.9%	-24%	41.5%	16%	40.4%	-3%	-0.2%
Reported using 21–31 days in PM	6.0%	3.5%	-42%	4.7%	36%	4.4%	-7%	-0.5%
Proportion of PM users who use DND	13%	10%		11%	30%	11%		
Total PM days of use reported per capita	3.93	2.76	-30%	3.59		3.29		
Avg days of use per PM user	8.3	7.7		8.6		8.1		
No. of DND alcohol users per DND marijuana user	3.4	10.0		3.3		0.8		

Abbreviations: Avg, average; DND, daily or near daily; PM, past-month; US, United States.

<sup>a</sup>The period from 1992 to 2008 spans two major redesigns of the household survey. Changes over this interval may be affected by those survey redesigns.

That is still not as high as for cigarettes. The 2022 NSDUH survey finds that 58.7% of PM cigarette smokers smoked ‘daily’—defined as ‘smoked one or more packs of cigarettes per day’ [8]. Therefore, there are more daily cigarette smokers than DND PM marijuana users (24.1 vs 17.7 million).<sup>3</sup> Still, patterns of marijuana consumption have shifted from being like alcohol to being closer to cigarette use. It is also no longer a young person’s drug. In 2022, people 35 and older accounted for (slightly) more days of use than did those under the age of 35.

Table 1 summarizes changes from signpost year to signpost year. Between 2008 and 2022, the prevalence of DND alcohol use fell by 7%, whereas the corresponding prevalence of DND marijuana use grew by 269%.

Far more people drink than use marijuana. Nonetheless, respondents reported almost two-thirds as many days of marijuana use as alcohol use (678 million vs 1096 million per month in 2022), because high-frequency use is more common with marijuana. In 2022, twice as many PM marijuana as alcohol consumers used on 10 + days per month (60% vs 30%). PM marijuana consumers were almost four times as likely to report DND use (42.3% vs 10.9%) and 7.4 times more likely to report daily use (28.2% vs 3.8%).

## LIMITATIONS AND CONCLUSIONS

General population surveys have limitations, although cannabis users are not particularly ‘hard to reach’ [9,10]. Still, the data are self-report, lack validation from biological samples and exclude certain subpopulations that may use at different rates than the rest of the population.

Of particular note, willingness to self-report may have increased as cannabis became normalized, so changes in actual use may be less pronounced than changes in reported use. On the other hand, cannabis product variety exploded after state-legalization. Vapes, dabs, edibles, tinctures,  $\Delta$ -8-tetrahydrocannabinol and other intoxicating products derived from industrial hemp create the possibility that some cannabis users might answer ‘no’ to questions asking only about traditional ‘marijuana and hashish’ [11]. Therefore, measurement error in an indeterminate direction is possible.

Nonetheless, the enormous changes in rates of self-reported cannabis use, particularly of DND use, suggest that changes in actual use have been considerable, and it is striking that high-frequency cannabis use is now more commonly reported than is high-frequency drinking.

The trends mirror changes in policy, with declines during periods of greater restriction and growth during periods of policy liberalization. That does not mean policy drove changes in use. Both could have been manifestations of changes in underlying culture and attitudes. However, whichever way causal arrows point, cannabis use now appears to be on a fundamentally different scale than it was before legalization.

## AUTHOR CONTRIBUTIONS

**Jonathan Caulkins:** Conceptualization; data curation; formal analysis; writing—original draft.

<sup>3</sup>Using the comparable variable CIG30USE, there were 26.5 DND cigarette smokers recorded by the 2022 survey.

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## DECLARATION OF INTERESTS

None.

## DATA AVAILABILITY STATEMENT

All data used here are from publicly available US household survey data. There was no primary data collection.

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