Marijuana Decriminalization, Medical Marijuana Laws, and Fatal Traffic Crashes in US Cities, 2010–2017

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Objectives. To determine the impact of city-level cannabis decriminalization and medical marijuana laws (MMLs) on fatal traffic crashes in US cities.

Methods. Using a census of fatal traffic crashes from the 2010 to 2017 Fatality Analysis Reporting System, we examined MMLs and cannabis decriminalization on fatal crashes by age and sex of driver. We used a Poisson difference-in-differences approach, exploiting temporal and geographic variation in marijuana decriminalization laws.

Results. Cities experienced a 13% increase in fatal crashes involving 15- to 24-year-old male drivers following decriminalization (incidence rate ratio = 1.125; 95% confidence interval = 1.014, 1.249). This effect was immediate and strongest on weekend nights. We found no effect on female drivers or older males. Conversely, we found that MMLs were associated with fewer fatal crashes for both males and females, which was most pronounced in 15- to 24-year-old drivers.

Conclusions. Unlike MMLs, which are associated with fewer fatal crashes, cities experienced a relative increase in fatal crashes involving young male drivers following marijuana decriminalization.

Public Health Implications. MMLs stipulate consumption occurs at home, whereas decriminalization only lessens the penalty for marijuana possession. Therefore, travel incentives of such laws have heterogeneous effects on traffic safety. (*Am J Public Health.* 2020;110:363–369. doi:10.2105/AJPH.2019.305484)

See also Hall and Lane, p. 265.

Marijuana is federally prohibited in the United States. However, since 1996, 33 states and Washington, DC, have passed laws legalizing medical marijuana. Of those 33 states, 20 enacted medical marijuana laws (MMLs) after a 2009 federal memorandum stated that federal funds would not be used to prosecute those in compliance with state MMLs. Following the 2009 Ogden Memorandum,[1] the number of medical marijuana patients and dispensaries increased exponentially and the number of fatal crashes in which marijuana was detected in a driver increased by approximately 50%.[2,3] Although increased drug testing likely contributed to greater marijuana detection in drivers, recent studies found that MMLs are associated with a lower perceived risk of marijuana use among adults.[4,5]

For states that have not enacted an MML, marijuana remains illegal. However, select municipalities in states without MMLs recently began reducing the criminal penalty for marijuana possession. Although many decriminalization laws were passed following the Controlled Substances Act of 1970 and well before states began enacting MMLs, recent decriminalization laws are viewed as a middle ground between prohibition and legalization. Decriminalization became more common within non–MML-adopting states after the issuance of the 2009 Ogden Memorandum, as cities reduced penalties for possession of small amounts of marijuana without contradicting state laws. Because severity of punishment is a cost associated with consumption,[6] decriminalization will reduce the nonpecuniary costs associated with cannabis. Studies examining early decriminalization laws found a positive relationship between cannabis decriminalization and marijuana consumption among young adults.[7,8]

Marijuana is the most commonly used illicit substance in the United States[9] and is the most frequently detected nonalcohol substance in traffic crashes.[10] It impairs the cognitive and psychomotor skills associated with driver-related functions,[11–13] and acute usage increases the risk of motor vehicle collisions.[14,15] Therefore, as more states legalize medical marijuana and municipalities reduce the severity of punishment of cannabis possession, traffic safety may be adversely affected by increased driver impairment.

Even so, recent research examining the impact of marijuana legalization found that MMLs are associated with fewer traffic fatalities in those aged 15 to 24 or 25 to 44 years.[16] An earlier study found similar results and argued that the decline is driven by reductions in alcohol-related crashes.[17] This suggests a substitutability between alcohol and marijuana. However, although MMLs provide legal protection to marijuana

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consumers, the laws also include stipulations that restrict marijuana consumption to a private residence. Thus, the incentives to travel concurrently or shortly after consuming marijuana are diminished. It is not clear whether consumers are substituting away from other substances or away from travel.

Because decriminalization reduces the severity and probability of punishment without directly affecting consumer incentives to travel, we examined and compared the heterogeneous effects of marijuana decriminalization and medical marijuana legalization on fatal traffic crashes. Although there is evidence to suggest individuals are not fully aware of the extent of punishment for marijuana possession,[18] earlier research examining the period after the first wave of state-level marijuana decriminalization bills in the 1970s found that individuals in decriminalized states were aware of their state marijuana laws.[19] Moreover, recent municipality-level decriminalization laws attracted attention from local and national media as well as state-level legislatures whose laws now differed from the local municipality, increasing the likelihood that citizens were aware of the reduced penalty associated with marijuana consumption.

By examining the impact of both decriminalization and MMLs, we were able to disentangle the channels through which marijuana policies and traffic safety are related. We also explored how this relationship varied by age and gender. Because traffic fatality rates and illicit drug use are highest among young drivers, and men are more likely than are women to drive under the influence of drugs or alcohol,[20,21] we expected these demographics to be more responsive to changes in marijuana-related policies. Similarly, because drug and alcohol use is highest on weekend nights,[22] we examined changes in fatal crashes by time of day. This last specification also validated our approach because statistically significant changes in weekday daytime crashes when drug and alcohol use is low are evidence of omitted variables confounding our results.

Last, a significant amount of the literature argues the potential substitutability or complementarity between alcohol and marijuana.[23] Recent articles argued that the substitutability between substances is the mechanism through which traffic safety improves following MML enactment.[16,17] We contribute to this discussion by examining the impact of the different marijuana-liberalizing policies on fatal crashes involving a drunk driver (blood alcohol concentration ≥ 0.08).

METHODS

We obtained traffic fatality data from the Fatality Analysis Reporting System (FARS). The FARS is a census of all fatal motor vehicle crashes that occur on public roads and it includes driver information, crash location, and drug or alcohol presence in drivers. Our outcomes of interest included all fatal traffic crashes by age and gender. Because drug and alcohol use varies over the week, we also considered crashes that occurred on weekend nights and during the day on weekdays. We totaled individual crashes semiannually and aggregated them to the city level. Our sample included all cities with a 2017 population greater than 100 000 that are located in states that had not enacted MMLs or decriminalized marijuana by 2010. Our estimation strategy was to exploit the variation in the reduction of criminal penalties associated with marijuana to examine the impact of marijuana liberalization on fatal crashes. Therefore, we constructed our sample of cities so that all cities in the sample began the period with similar prohibitive laws before cities and states implemented measures to relax these legal constraints. The complete list of cities in our sample is provided in Appendix A (available as a supplement to the online version of this article at http://www.ajph.org).

Because the US marijuana market changed significantly following the 2009 Ogden Memorandum, we limited our analysis to the years 2010 through 2017 ($n = 2496$ semiannual city-level observations) to focus on the postexpansion relationship between marijuana liberalization and traffic safety to provide more relevant information to policymakers.

City Decriminalization Laws

Marijuana-liberalizing policies, such as decriminalization and MMLs, reduce the legal costs associated with marijuana. Decriminalization of cannabis often occurs within states at the city or county level. To capture the impact of a city decriminalizing marijuana on fatal crashes, we omitted cities that had been previously exposed to state-level decriminalization policies. Table 1 provides the cities and dates of marijuana decriminalization that occurred within our sample period. We obtained state-level MML enactment dates from Procon.org.[24]

TABLE 1—Cities with Decriminalization Laws With No Prior Medical Marijuana Laws: United States, 2010–2017

City	Date of Decriminalization
Chicago, IL	August 2012
Springfield, MO	August 2012
St. Louis, MO	June 2013
Milwaukee, WI	June 2015
Miami, FL[a]	July 2015
Hialeah, FL[a]	July 2015
Miami Gardens, FL[a]	July 2015
Pembroke Pines, FL[a]	November 2015
Hollywood, FL[a]	November 2015
Miramar, FL[a]	November 2015
Pompano Beach, FL[a]	November 2015
Davie, FL[a]	November 2015
West Palm Beach, FL[a]	December 2015
Tampa, FL	April 2016
New Orleans, LA	June 2016
Orlando, FL	October 2016
Gainesville, FL[a]	August 2016
Pasadena, TX[a]	March 2017
Houston, TX[a]	March 2017
Dallas, TX[a]	December 2017
Kansas City, MO	April 2017
Atlanta, GA	October 2017
Mesquite, TX[a]	December 2017
Garland, TX[a]	December 2017

Note. Decriminalization dates describe the month when cities in the sample decriminalized marijuana. A city was considered to have decriminalized marijuana if the provisions were in place for the entire calendar month.

[a]City decriminalization results from county decriminalization laws.

Other Variables

Following previous research,[17] we controlled for time-varying local characteristics and changes in state legislation to isolate the effect of marijuana policies on fatal crashes. We included state-level traffic safety laws in the analysis, and these consisted of driver-texting laws, administrative license revocation laws, and per se drugged-driving laws. We obtained law enactment dates from the National Organization for the Reform of Marijuana Laws, Insurance Institute for Highway Safety, Governors Highway Safety Association, and previous literature,[25,26] and we verified these dates through Thomson Reuters Westlaw and the National Conference of State Legislatures.

We collected population and demographic characteristics from intercensal estimates of the US Census Bureau. We obtained city unemployment rates from the Bureau of Labor Statistics. We included state-level per gallon beer tax rates from the Brewers' Almanac to control for the relative price of alcohol, as it may be a complement to or substitute for cannabis.

Model

To estimate the effect of marijuana decriminalization and medical marijuana legalization on fatal traffic crashes, we exploited the temporal and geographic variation in policy changes at the city and state levels using a difference-in-differences approach. The dependent variable was a count of fatal crashes that occurred in a city aggregated semiannually. We included 6-month periods with zero fatal crashes; these constituted approximately 7% of the city-half-year observations in our sample. Because the outcomes were positively skewed, we estimated a Poisson model

$$F_{cst} = \exp\Big(\beta_1 Decrim \times post_{cst} + \beta_2 MML \times post_{st} + X'_{cst}\theta + \alpha_c + \gamma_t + \ln(pop_{ct})\Big) \quad (1)$$

where F_{cst} is a count of fatal crashes in city c in state s in half-year t. We standardized the number of crashes to per capita rates by constraining the coefficient on the natural log of the affected population to 1.[27] This technique is common in Poisson-based regressions and we carried it out using the offset option in Stata version 15 (StataCorp LLC, College Station, TX). We also estimated Equation 1 using a negative binomial approach.

Our results are not sensitive to this alternative specification and are available in Appendix B (available as a supplement to the online version of this article at http://www.ajph.org). City fixed effects were represented by α_c and controlled for time-invariant unobservable city characteristics. We included half-year fixed effects (γ_t) to control for unobservable variables that were constant across cities but varied over time. It is worth noting, the Poisson regression does not require the mean be equal to the variance,[28] and the fixed effects Poisson model does not suffer from incidental parameters.[29] The vector X'_{cst} included city-level unemployment rates to control for macroeconomic conditions, state-level per gallon beer tax to control for the relative price of alcohol, and state-level traffic laws that could affect traffic safety. $Decrim \times post_{cst}$ is equal to 1 if a city decriminalizes marijuana and is equal to zero otherwise. Similarly, $MML \times post_{st}$ is equal to 1 if a state enacts an MML. We did not consider the 6-month period in which MML enactment or decriminalization occurred "treated" in our analysis. We clustered SEs by city.[30]

RESULTS

We present the estimated impact of marijuana decriminalization and medical marijuana legalization on fatal crashes by age and gender in Table 2. Table 2 provides the Poisson-estimated incidence rate ratios (IRRs) on fatal crashes involving 15- to 24-year-old drivers, describes the relationship for crashes involving 25- to 44-year-old drivers, and provides the IRRs for all fatal crashes. The percentage change in fatal crashes is equal to (IRR − 1) × 100. An estimate was statistically significant at the 95% confidence level if 1 does not fall within the upper and lower bounds provided in parentheses. To quantify the magnitude of the percentage changes, the pretreated mean of fatal crash rates for each demographic group is provided under the estimated IRRs.

The results in Table 2 indicate that state-level MMLs were associated with fewer fatal crashes. Cities, on average, experienced a 9% reduction in fatal crashes following the implementation of an MML in their state (IRR = 0.91; 95% confidence interval [CI] = 0.84, 0.98). Although males were involved in more fatal crashes, the results suggested similar decreases in crashes involving male and female drivers. MMLs were also associated with fewer fatal crashes among young drivers (IRR = 0.86; 95% CI = 0.77, 0.97). However, the impact on fatal crashes involving young female drivers was no longer statistically significant.

Unlike the reduction in fatal crashes following MML enactment, there was no evidence of a similar relative decrease in fatal crashes following marijuana decriminalization. In fact, a city experienced a 13% increase in fatal crashes involving young male drivers after a city decriminalized marijuana (IRR = 1.13; 95% CI = 1.01, 1.25). However, the relative increase in fatal crashes following marijuana decriminalization was not statistically significant overall for any other subgroup.

We examined whether the differential effects observed across MMLs and marijuana decriminalization stemmed from differences in alcohol-related crashes. Consistent with state-level studies,[17,31] we found that MMLs were associated with fewer alcohol-related crashes. However, the estimated IRRs associated with marijuana decriminalization were not statistically significant for alcohol-related crashes of any demographic group.

Fatal Crashes by Day and Time

Because drivers are more likely to test positive for alcohol or marijuana on weekend nights,[22] the effects of marijuana policies on fatal crashes should be most evident this time of the week. Moreover, significant effects of marijuana-related policies on weekday daytime crashes would be evidence of omitted variables confounding our results. Therefore, we estimated the effects of MMLs and marijuana decriminalization on fatal crashes by day and time of the week.

The results are presented in Table 3. For each demographic group, we did not find any evidence that marijuana decriminalization or MMLs affect fatal daytime crashes on weekdays. For weekend nights, however, we found that cities experienced fewer fatal

TABLE 2—Poisson-Estimated Incident Rate Ratios (IRRs) of the Effect of Marijuana Policy Changes on Fatal Traffic Crashes by Age and Gender: United States, 2010–2017

	Male, IRR (95% CI)	Female, IRR (95% CI)	All, IRR (95% CI)	BAC ≥ 0.08, IRR (95% CI)
Aged 15–24 y				
Decriminalization	1.13 (1.01, 1.25)	0.89 (0.69, 1.15)	0.97 (0.87, 1.07)	1.01 (0.77, 1.33)
State MML	0.88 (0.78, 1.00)	0.88 (0.68, 1.12)	0.88 (0.77, 0.97)	0.74 (0.52, 1.05)
Pretreated mean[a]	28.04	10.51	19.29	1.66
Aged 25–44 y				
Decriminalization	0.97 (0.88, 1.08)	0.96 (0.80, 1.15)	1.04 (0.91, 1.19)	0.95 (0.79, 1.17)
State MML	0.86 (0.79, 0.94)	0.85 (0.70, 1.03)	0.88 (0.77, 1.01)	0.72 (0.60, 0.87)
Pretreated mean[a]	20.32	9.76	14.91	1.39
All ages				
Decriminalization	1.01 (0.94, 1.10)	1.00 (0.91, 1.11)	1.02 (0.95, 1.10)	0.95 (0.79, 1.15)
State MML	0.91 (0.84, 0.98)	0.89 (0.81, 0.99)	0.91 (0.84, 0.97)	0.72 (0.58, 0.88)
Pretreated mean[a]	10.56	5.91	5.33	0.90

Note. BAC = blood alcohol concentration; CI = confidence interval; MML = medical marijuana law. Each specification includes city and half-year fixed effects, state-level traffic safety laws, and city-level semiannual average unemployment rates.

[a]Pretreated mean of rate of fatal crashes per 100 000 people within the demographic category.

crashes following MML enactment. Conversely, we found that marijuana decriminalization was associated with a relative increase in fatal crashes involving males and young drivers. Decriminalization effects were not statistically significant for female-related crashes of any age group. These results were consistent with the results in Table 2 and suggest MMLs are generally associated with fewer fatal crashes, whereas fatal crashes among young and male drivers increased following marijuana decriminalization.

Marijuana Decriminalization Over Time

To examine the time-varying effects of marijuana decriminalization and ensure that the previous estimated effects on young drivers were not driven by poor comparability between treated and untreated cities before decriminalization, we implemented an event study approach common in policy analysis. The estimated IRRs (and corresponding 95% CIs) on fatal crashes involving young drivers for each period relative to cannabis decriminalization are described in Figure 1. The 12 months before decriminalization are normalized to 1 and each point along the x-axis corresponds to two 6-month periods relative to a city decriminalizing marijuana.

For each subgroup, there were no obvious violations to the parallel trends assumption our difference-in-differences strategy relied on. There were no trends in the predecriminalization IRRs and no point estimate was statistically significant. In the period in which a city decriminalized marijuana, however, there was a temporary increase in fatal crashes involving young male drivers that attenuated to become nonstatistically significant after 6 months of decriminalization. There was no evidence of marijuana decriminalization affecting crashes involving young female drivers and the attenuation was more severe when examining the impact on fatal crashes involving all young drivers.

DISCUSSION

Using a census of fatal traffic crashes aggregated to the city level, we found that cities that are located in states that enacted MMLs experienced fewer fatal crashes following medical marijuana legalization. The relative decline was strongest for 15- to 24-year-old drivers, a demographic group with the highest fatal crash rate among all age cohorts (younger than 80 years) and most likely to operate a vehicle under the influence of alcohol or marijuana.[20,21] On average, fatal crashes involving drivers of this age group decreased by 14% following MML enactment. Relative to the pretreated average rate of fatal crashes, this decrease equates to approximately 2.7 fewer fatal crashes per 100 000 15- to 24-year-old people following state-level medical marijuana legalization. Although our study differs by level of observation and time period, these results are consistent with previous studies.[16,17,31]

Second, we found that the impact of marijuana decriminalization on fatal crashes differed from that of medical legalization. On average, a city experienced 13% more fatal crashes involving 15- to 24-year-old male drivers following city-level marijuana decriminalization (an average of approximately 3.5 more fatal crashes per 100 000 15- to 24-year-old males). However, there was no evidence of changes in fatal crashes among females or older drivers, suggesting that young males responded to marijuana decriminalization differently than did other populations. The increase in fatal crashes involving young drivers was most pronounced immediately after decriminalization before attenuating to nonsignificance in later periods of decriminalization.

The temporary effect on fatal crashes is comparable to the short-term accident reductions following antitexting laws.[25] Similarly, although not statistically significant at conventional levels, Washington State experienced a temporary increase in traffic fatalities after legalizing recreational marijuana.[32] Most similar to our article, Santaella-Tenorio et al. found an immediate relative decrease in traffic fatality rates among those aged 15 to 24 years after MML enactment that was not evident in later years of legalization.[16] Thus, the temporary effects observed here and in related traffic safety literature suggest drivers may initially react to the announcement of city decriminalization laws before reverting back to previous behaviors.

Third, we did not find evidence that either marijuana-related policy affects fatal crashes that occur during the day on weekdays. These null results suggest that our findings are not being confounded by omitted variables. Instead, the effects on fatal crashes are most evident on weekend nights, when drug and alcohol use is highest among drivers.[22]

Fourth, we found that MMLs and marijuana decriminalization had heterogeneous effects on alcohol-related fatal crashes. Although the relative decrease in alcohol-related fatal crashes following medical

TABLE 3—Poisson-Estimated Incidence Rate Ratios (IRRs) of the Effect of Marijuana Policy Changes on Fatal Crashes by Age, Gender, and Time of Week: United States, 2010–2017

	Male, IRR (95% CI)	Female, IRR (95% CI)	All, IRR (95% CI)
Aged 15–24 y			
Change in weekday crashes			
Decriminalization	1.06 (0.90, 1.25)	0.89 (0.69, 1.15)	0.99 (0.85, 1.15)
State MML	0.87 (0.69, 1.11)	0.88 (0.68, 1.12)	0.89 (0.68, 1.16)
Change in weekend night crashes			
Decriminalization	1.43 (1.11, 1.84)	1.29 (0.98, 1.72)	1.37 (1.09, 1.73)
State MML	0.76 (0.62, 0.94)	0.76 (0.59, 0.97)	0.76 (0.63, 0.92)
Aged 25–44 y			
Change in weekday crashes			
Decriminalization	0.91 (0.75, 1.10)	0.93 (0.71, 1.22)	0.92 (0.75, 1.12)
State MML	0.81 (0.66, 1.02)	0.83 (0.61, 1.14)	0.83 (0.65 ,1.05)
Change in weekend night crashes			
Decriminalization	1.26 (1.02, 1.56)	1.05 (0.79, 1.39)	1.18 (0.95, 1.46)
State MML	0.78 (0.66, 0.92)	0.82 (0.66, 1.02)	0.79 (0.67, 0.94)
All ages			
Changes in weekday crashes			
Decriminalization	0.88 (0.76, 1.02)	0.85 (0.66, 1.10)	0.87 (0.74, 1.02)
State MML	0.85 (0.68, 1.06)	1.02 (0.74, 1.40)	0.91 (0.71, 1.17)
Changes in weekend night crashes			
Decriminalization	1.25 (1.02, 1.53)	1.17 (0.90, 1.54)	1.22 (0.10, 1.50)
State MML	0.74 (0.63, 0.87)	0.85 (0.72, 1.00)	0.781 (0.67, 0.91)

Note. CI = confidence interval; MML = medical marijuana law. Each specification includes city and half-year fixed effects, state-level traffic safety laws, and city-level semiannual average unemployment rates.

marijuana legalization was consistent with a substitutability between substances, we did not find evidence of a similar effect following marijuana decriminalization. Because MMLs and decriminalization both reduce the nonpecuniary costs associated with marijuana, the effects of each policy should be qualitatively similar if the results are attributable to changes in alcohol consumption.

Although we cannot eliminate the possibility that the relationship between alcohol and cannabis may differ across decriminalized and conditionally legal environments, the heterogeneous effects on alcohol-related traffic crashes and fatal crashes overall suggest that changes in consumer travel behavior may be the mechanism driving the differing outcomes. Specifically, MMLs dictate that consumption occur in a private residence. Thus, marijuana consumers in MML states, while facing lower costs to consume marijuana (relative to a prohibitive state), now have lower incentives to travel after consumption. Although previous research argues that a substitution away from alcohol is occurring and improving traffic safety,[17] the reduced incentives to travel will also lessen the probability of a crash occurring. It is difficult for researchers to disentangle the mechanisms through which traffic safety is improving.

In a decriminalized environment, however, the legality of the drug has not changed. Instead, decriminalization reduces the severity and probability of punishment without directly affecting consumer incentives to travel. Although MMLs are associated with fewer fatal crashes, the relative reduction in fatal crashes is not evident after marijuana decriminalization. Rather, we found that marijuana decriminalization was associated with increased fatal crashes involving younger drivers, for whom driving under the influence of marijuana or alcohol is more common.[21]

Limitations

The FARS documents all fatal crashes that occur on public roads. However, the data set has limitations. First, fatal crashes constitute a small percentage of total crashes. Therefore, we cannot comment on the relationship between marijuana laws and less severe traffic outcomes. This outcome should be explored in future research.

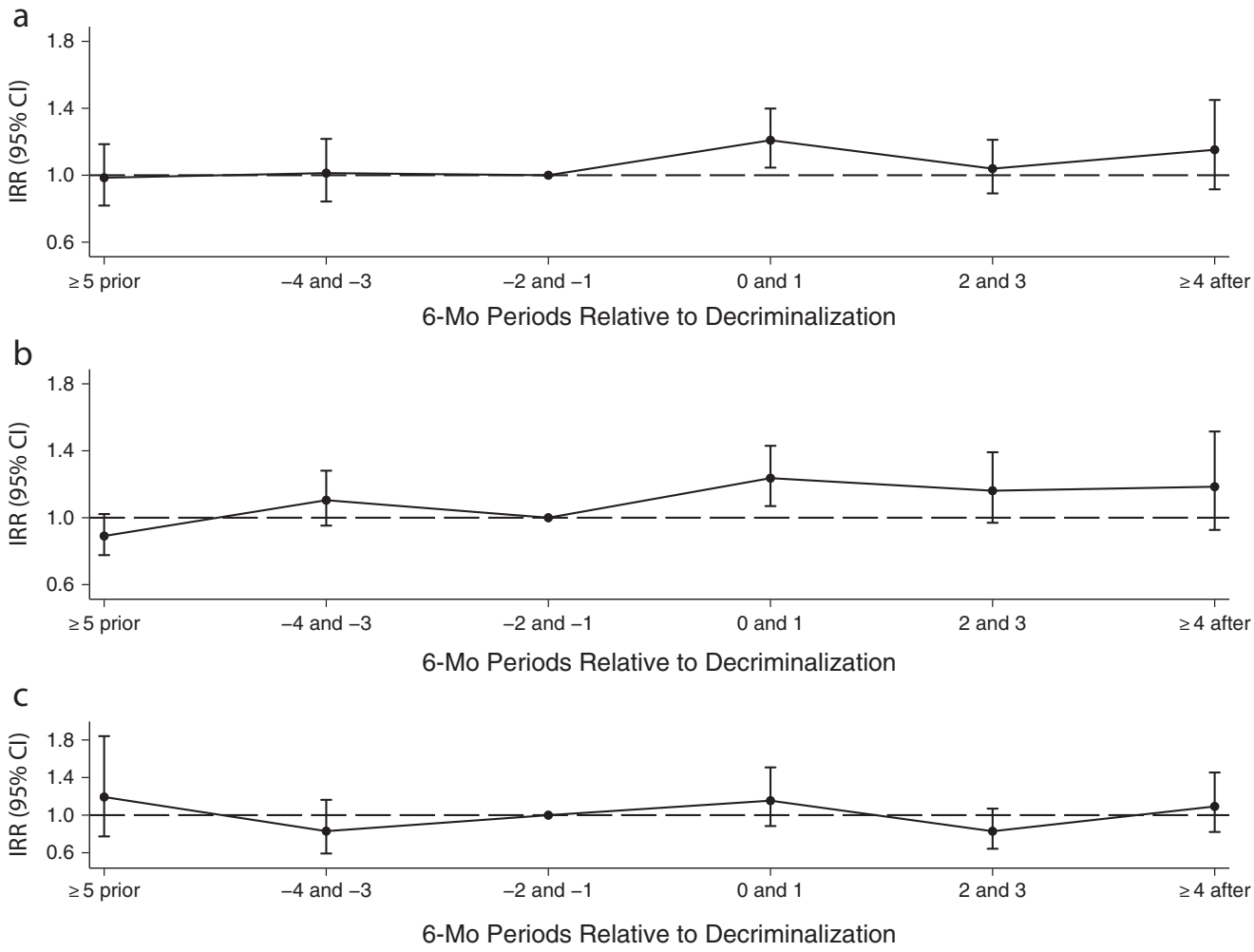
We also did not examine whether these laws affected marijuana presence in drivers. Although these data are available in the FARS, drug detection does not imply driver impairment. In addition, because testing procedures vary by state and over time, it is not reliable in examining changes in marijuana-related impairment in drivers. We addressed this limitation by focusing on total fatal crashes and total crashes that occurred on weekend nights, when substance use is highest.

A second limitation of our study was that we did not explore the impacts of various aspects of marijuana laws. MMLs differ by qualifying medical conditions, restrictions regarding consumption, and quantities of cannabis a person may possess.[3,33] Similarly, marijuana decriminalization is not uniform and can be defined as the de-prioritization of marijuana-related law enforcement or by significantly reducing the penalty associated with marijuana possession. Our analysis relied on the assumption that the relationship between alcohol and cannabis is consistent across legal status. Put differently, we could not rule out changes in alcohol consumption if alcohol is complementary to cannabis in decriminalized marijuana regions but a substitute for cannabis in MML states. However, we only observed alcohol consumption after a fatal crash occurred and cannot directly comment on a possible heterogeneous alcohol–marijuana relationship that differs by the legal status of marijuana.

Third, we used city-level observations because many within-state changes in marijuana policies occur in metropolitan areas, and comparing cities with rural areas could bias the estimates. It is possible that rural areas may be affected differently by changes in marijuana policies than urban areas. We leave this as an avenue for future research.

Public Health Implications

The marijuana market in the United States changed significantly over the past 10 years. As more states continue to implement



Note. CI = confidence interval; IRR = incidence rate ratios (Poisson estimated). The coefficient on the 12-month period before a city decriminalizing marijuana is normalized to 1. Period 0 indicates a city decriminalizes marijuana, and period 1 is the first full 6-mo period of treatment. The 95% CIs are displayed at each point. Periods greater than 2.5 years before or 2 years after decriminalization are combined into bins at –5 periods and +4 periods, respectively.

FIGURE 1—City-Level Time-Varying Marijuana Decriminalization Effects on Fatalities Among Drivers Aged 15–24 Years by (a) All, (b) Males, and (c) Females: United States, 2010–2017

marijuana-liberalizing polices, understanding the unintended consequences of such policies is becoming increasingly important. Although recent research focuses on the implications of legalized medical and recreational marijuana,[32,34] the effects of marijuana decriminalization in states where marijuana use is still prohibited is largely ignored by the literature. Although our findings of fewer fatal traffic crashes following MML enactment are consistent with previous studies,[16,17,31] we provide evidence that marijuana decriminalization has the opposite effect on fatal crashes involving young male drivers that is most pronounced immediately following decriminalization.

Marijuana decriminalization and MMLs relax the prohibitive market constraints and are associated with greater marijuana use.[7,35] Although decriminalization is often argued as a compromise between prohibition and medical marijuana legalization, the 2 marijuana policies do not have similar effects on traffic safety. Thus, from a public health perspective, we must be careful not to assume that the impact of decriminalization will be some intermediate impact between criminalization and medical marijuana legalization or we will miss a critical opportunity to inform policy. Moreover, the heterogeneous effects on traffic safety across marijuana decriminalization and MMLs emphasize a need for caution from generalizing spillover effects from MMLs to recreational use environments. Our findings suggest that reducing the nonpecuniary costs of marijuana through decriminalization without explicitly affecting travel behaviors will have adverse effects on traffic safety. As the United States becomes more permissive toward marijuana, policies should be crafted to discourage travel and limit this effect. AJPH

CONTRIBUTORS

A. C. Cook conceptualized the study and developed the estimation strategy. G. Leung collected and formatted the data. R. A. Smith analyzed the data and wrote the original draft of the article. All authors contributed to the interpretation of the results, helped draft the article, and reviewed and approved the final version of the article.

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CONFLICTS OF INTEREST

None of the authors has a conflict of interest.

HUMAN PARTICIPANT PROTECTION

Institutional review board approval was not needed for this work because it used publicly available, de-identified data.

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