The Opioid Crisis and Support for Marijuana Legalization[*]

Chris Chaky[†]

June 1, 2021

"At a time when Massachusetts is facing a crippling addiction crisis, increasing access to yet another controlled substance undermines the families, individuals, communities, law enforcement officials and health care workers on the front lines of this epidemic every single day," Massachusetts Rep. Joe Kennedy III argued in opposition to the state's marijuana legalization referendum in 2016 (Wade, 2016). During debates in several New England states, many legislators and politicians voiced similar concerns about pursuing marijuana legalization during a steep rise in drug overdose mortality in the region (Bidgood, 2016). For many legislators, the potential risks of marijuana legalization during the opioid crisis were especially worrisome, or were at least perceived to be useful as rhetorical tools.

In light of politicians' concerns, how does the severity of the opioid crisis impact pub-

lic opinion about marijuana? Increased exposure to the harms of drug addiction might increase the salience of perceived risks of marijuana legalization, such as concerns about marijuana being a "gateway drug" to heroin. In this way, places with higher rates of overdose mortality might be less supportive of marijuana legalization. In this paper, I use the 2016 Massachusetts marijuana legalization ballot question, Question 4, as a case to study the relationship between exposure to the opioid crisis and support for drug policy reform. Because of the availability of data from the Massachusetts Department of Health, I am able to use municipal-level opioid overdose mortality rates and opioid-related Emergency Medical Services (EMS) rates to predict municipal-level support for Question 4.

I find that municipal-level overdose mortality predicts increased opposition to marijuana policy reforms. Using alternate ballot outcomes in 2016, I also find that this effect does not extend to other ballot initiatives or presidential voting, suggesting this relationship is unique to drug policy and not a more general trend toward conservative positions. Finally, I use election returns from a 2012 medical marijuana ballot question to conduct a fixed-effects analysis, finding that within-municipality changes in overdose mortality reduce support for marijuana reforms. While the proposal ultimately passed, this finding sheds light on how public health crises can shape public opinion, potentially by raising the salience of the potential risks of new policies. Contrary to policy shifts away from the criminalization of drugs in other aspects of the response to the opioid epidemic (Netherland and Hansen, 2016), exposure to the opioid crisis predicts less support for a key criminal justice reform.

1 Risk Aversion and Marijuana as a "Gateway Drug"

How do voters evaluate the potential effects of new policies? Generally, people tend to place a higher value on potential losses than gains and favor the status quo (Kahneman and Tversky, 1979; Samuelson and Zeckhauser, 1988). In this way, priming individuals to consider the risks of a policy, such as free trade or potential military interventions, is associated with less support for the policy, especially for those who are risk-averse (Ehrlich and Maestas, 2010; Eckles and Schaffner, 2011). Risk-averse individuals are also especially susceptible to messaging that focuses on worst-case scenario outcomes, even if those outcomes are not likely, which tends to increase these individuals' opposition to changes to the status quo (Nadeau, Martin and Blais, 1999).

As some states considered the legalization of the sale and use of marijuana for recreational purposes in the 2010s, considerable political debate focused on the potential risks of the policy. In New Hampshire, Vermont, and Massachusetts, concerns about the impact of marijuana legalization on the opioid crisis were a particularly strong reason for legislative opposition (Bidgood, 2016). Sometimes, these concerns are stated in fairly broad and unspecific terms. New Hampshire Governor Sununu for example, was quoted in 2018 saying, "'When we are dealing with opioids as the single biggest health crisis this state has ever had, you are going to tell me legalizing more drugs is the answer?...Absolutely not" (Taylor, 2019). Elsewhere, opponents of legalization argue that there are simply not enough state resources to address marijuana-related health issues given the resources needed to combat the opioid crisis. For example, legalization opponents in Arizona argued, "Arizona does not need more substance abuse problems–our hands are full enough with the legal and dangerous

products already available" (Reagan, 2016).

A more specific reason cited for opposition to legalization of marijuana has been the concern that marijuana is a "gateway drug" to harder drugs, such as cocaine or heroin, especially for young people. Advocates on both sides of the issue make competing claims about the validity of the gateway drug argument. Supporters of this view point out that the majority of people who use heroin and cocaine began with marijuana; opponents assert that the vast majority of people who use marijuana do not go on to use harder drugs (Lopez, 2016b; *Is Marijuana a Gateway Drug?*, 2020). Research tends to show that a pre-existing propensity toward substance abuse and socialization into networks of illicit substance use explain the correlation between marijuana use and the use of heroin or cocaine (Morral, McCaffrey and Paddock, 2002; Hall and Lynskey, 2005). Other research, however, does suggest that marijuana use among adolescents can shape the brain in ways that prime people for future addiction (Williams, 2020).

Both supporters and opponents link the potential consequences of marijuana legalization to the opioid crisis. Marijuana legalization opponents argue that legalization could increase the availability of marijuana and signal that drug use is acceptable – both of which could increase the use of marijuana and the subsequent risk of more people using more dangerous drugs. In this vein, the former Director of the National Institute on Drug Abuse, Robert DuPont, argued, "Establishing marijuana as a third legal drug will increase the national drug abuse problem, including expanding the opioid epidemic" (DuPont, 2016). Supporters of marijuana legalization, on the other hand, typically reject the "gateway drug" argument, with some advocates arguing that medical or recreational marijuana use could be a safer
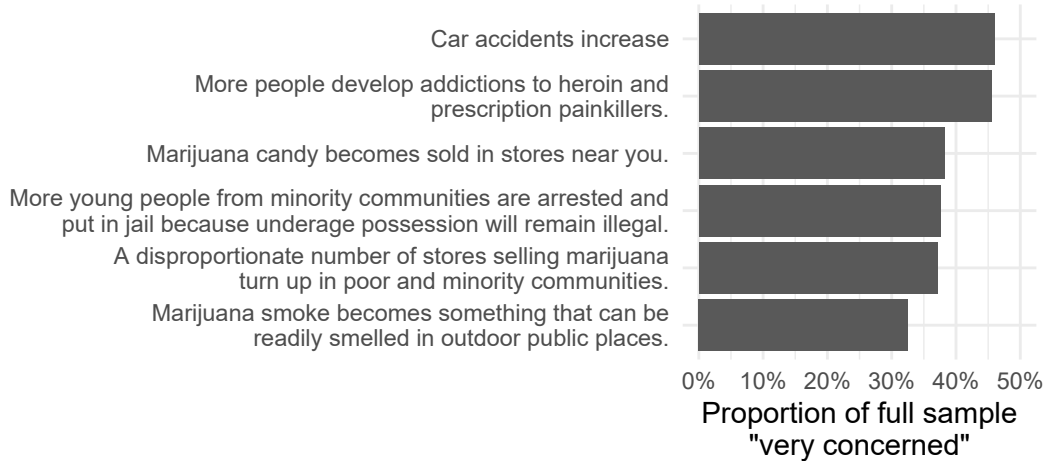
substitute for those who are addicted to more dangerous drugs.[1] In New Hampshire, for example, Rep. Renny Cushing argued that "marijuana in many instances is an exit drug, not a gateway drug" (Taylor, 2019).

Belief in the "gateway drug" effect of marijuana is fairly common among the public, though not a majority view. A 2013 survey by Pew found that 38% of Americans agree that "for most people the use of marijuana leads to the use of hard drugs." More importantly, this concern remains one of the top factors for opposition to marijuana legalization. Figure 1 shows that 46% of respondents in a 2018 Fairleigh poll of New Jersey residents were "very concerned" that marijuana legalization could lead to more addiction to heroin and prescription painkillers, which is tied with car accidents for the most commonly shared concern. Additionally, a 2018 Stockton poll of New Jersey residents asked respondents who opposed legalizing marijuana why they did so. Figure 1 shows that the number one reason, given by 24% of respondents opposed to legalization, is concerns about marijuana use leading to harder drugs.

The "gateway drug" argument could be especially important during a drug crisis, which may make the costs of addiction more salient in the most affected places. Counties experiencing the highest overdose death rates during the opioid crisis, for example, are more likely to receive media coverage about addiction (Hswen et al., 2020). The salience of the opioid crisis in affected communities may make any potential risks of marijuana legalization more important for residents and lead to increased opposition to the reform. In this case, people

---

[1]Some research suggests that marijuana might be an effective tool for reducing opioid addiction (Wiese and Wilson-Poe, 2018). Still, these findings are far from conclusive, as other research suggests marijuana use might actually increase non-medical opioid use (Olfson et al., 2018). Similarly, there does appear to be some evidence that marijuana legalization in Colorado was associated with fewer overdose deaths (Livingston et al., 2017), but others find that this relationship is spurious (Alcocer, 2020).

Potential concerns about marijuana legalization

Car accidents increase	
More people develop addictions to heroin and prescription painkillers.	
Marijuana candy becomes sold in stores near you.	
More young people from minority communities are arrested and put in jail because underage possession will remain illegal.	
A disproportionate number of stores selling marijuana turn up in poor and minority communities.	
Marijuana smoke becomes something that can be readily smelled in outdoor public places.	

0%   10% 20% 30% 40% 50%

Proportion of full sample
"very concerned"

Reasons to oppose marijuana legalization

Leads to harder drugs/gateway drug	
Harmful to health	
Addictive	
Threat to traffic safety	
Other (specify)	
Not needed	
Increased crime	
Economic benefits overblown	
Too hard to regulate	
Hurt children	
Not sure/don't know	
Still a federal crime	
Increased government/social services costs	

0%   10% 20% 30% 40% 50%

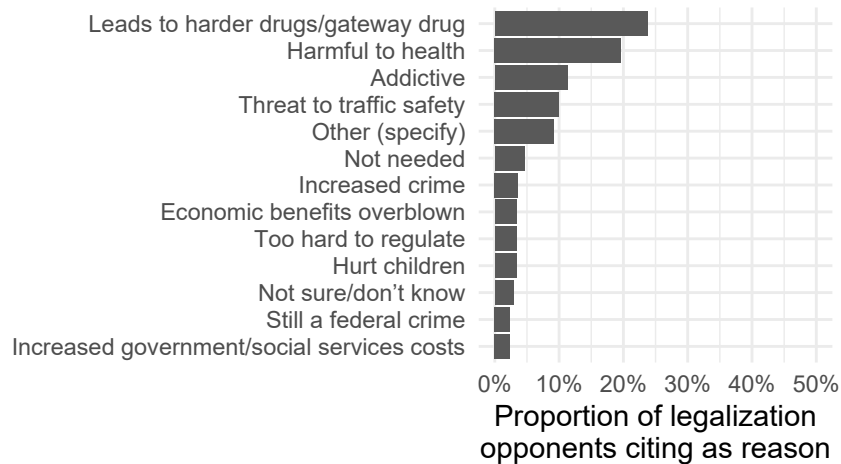Proportion of legalization
opponents citing as reason

Figure 1: Public Support for the "Gateway Drug" Argument

Note: The first panel shows the proportion of the full sample "very concerned" about a set of issues that could arise if marijuana was legalized. Data comes from a January 2018 poll of New Jersey residents conducted by Fairleigh University. The second panel shows the proportion of marijuana legalization opponents citing various reasons for their opposition. Data comes from a March 2018 poll of New Jersey residents conducted by Stockton University.

6

living in areas with disproportionately high substance abuse rates may be more likely to consider the potential risks of marijuana legalization in increasing addiction. This potential for harm may be more important than any potential benefits, increasing opposition to legalization. Geography may also serve as a rough proxy for the probability that someone knows someone affected by the opioid crisis, which could also raise the salience of addiction. Additionally, prior research has shown that context matters for political behavior around drug policy. For example, Republicans living in counties with higher overdose mortality rates are more likely to support legislation to provide treatment for drug addiction (de Benedictis-Kessner and Hankinson, 2019). Proximity to increased social disorder in Boston stemming from homelessness and addiction was associated with higher turnout and vote share for the incumbent mayor, through support for actions taken in response (Brown and Zoorob, 2020). In this paper, then, I test how local opioid overdose mortality affects support for marijuana legalization.

1.1 "Deaths of Despair" and Support for Trump

Support for marijuana legalization may also be linked to the opioid crisis through broader effects on public opinion. A potential mechanism connecting opioid overdose deaths and opposition to marijuana legalization could be a more general association between "deaths of despair" – deaths from drug overdoses, alcohol poisoning, and suicide – and support for Donald Trump in the 2016 presidential election. A few studies have found that counties with higher rates of "deaths of despair" or overdose deaths were associated with increased support for Trump in the 2016 presidential election (Monnat, 2016; Goodwin et al., 2018).

The harms from the opioid crisis, along with long-term economic disadvantage, are thought to have inspired a demand for change, which in 2016 was represented by Donald Trump. Support for Trump might then lead to increased opposition to policies perceived as liberal, such as marijuana legalization. Additionally, in his presidential campaign, Trump advocated for stiffer penalties for drug trafficking and building a wall on the border with Mexico to reduce the supply of heroin (Lopez, 2016a). While he also supported treatment and quickly approving drugs that deter abuse, his emphasis on the criminal justice aspects of drug policy could encourage opposition to marijuana legalization. To explore the extent of the scope of the impact of overdose mortality on public opinion, I test the relationship between opioid overdose mortality and support for Donald Trump.

1.2   Race, Addiction Crises, and Marijuana Policy

Due to the increased salience of addiction, places with higher overdose mortality rates could be less likely to support marijuana legalization. One aspect of the opioid epidemic that differentiates it from prior addiction crises, however, is its perception as a white problem.[2] Many observers point to this perception as a major reason for a policy response that has focused more on restricting prescribing, providing treatment, and increasing the accessibility of anti-overdose drugs, such as naloxone, rather than punishing people who use opioids illegally (Hansen and Netherland, 2016). Indeed, public health problems and drug epidemics in American history have typically been met with support for stricter laws against drug

---

[2]CDC overdose mortality data actually shows that while overdose death rates have been disproportionately concentrated among white and indigenous men from about 2008 on. Rates for Black men have risen sharply since 2015, nearly catching up to white men in 2018. Overdose deaths among women are lower but have also risen; these are more consistently concentrated among white and indigenous women. Overdose mortality rates for Latinx and Asian men and women tend to be the lowest for racial and ethnic groups.

use; rather than responding to a health problem, these laws were often driven by attitudes about the perceived race, ethnicity, and/or religion of drug or alcohol users. 19th-century laws against opium use and the initial criminalization of marijuana in the 20th century were targeted at Chinese and Mexican immigrants, respectively (Meier, 1994; Bonnie and Whitebread, 1999). Support for Prohibition was also partially driven by anti-Irish, anti-German, and anti-Black sentiment (Andrews and Seguin, 2015; Provine, 2011).

Most prominently, the "War on Drugs" as a response to marijuana and heroin use helped accelerate mass incarceration in the 1960s-1970s, and the crack epidemic in the late 1980s and early 1990s was met with harsh sentencing laws aimed at Black Americans (Provine, 2011; Alexander, 2012). Racial prejudice also underlies support for contemporary laws that heavily penalize illicit drug use (Green, Staerklé and Sears, 2006; Hutchings, 2015). In this way, support for legalizing marijuana may have much more to do with beliefs about the racial beneficiaries of the policy, rather than the level of addiction where one lives.

While race is undoubtedly a key component of drug policy preferences, there are also examples of how addiction crises can shape support for criminal justice policies within racial groups. Fortner details how Harlem residents of color, especially mothers, supported stricter drug sentencing in the wake of the community's heroin epidemic in the late 1960s (Fortner, 2015). In *Locking Up Their Own*, Forman (2017) shows how Black opposition derailed and ultimately defeated attempts by Washington, D.C. to decriminalize the possession of marijuana in the 1970s, in large part due to the heroin epidemic concentrated among Black residents. According to Forman, 'The specter of heroin raised the stakes of the "marijuana as a gateway drug" argument: since heroin had destroyed communities so quickly, the thinking went, even the slightest risk that marijuana might lead a user to heroin was not one that

9

policymakers could afford to take' (44). With rates of heroin use and overdoses skyrocketing, many politicians and voters became convinced that reducing criminal punishment for marijuana use was not worth the potential risk of increased addiction, a sentiment which led to the defeat of decriminalization. These examples are relevant for marijuana legalization in the opioid crisis for two reasons. First, they suggest that local addiction crises can raise the salience of broader concerns about drug use, leading to opposition to drug policy reform. These examples of risk aversion within non-white communities also suggest that, in addition to attitudes often rooted in racism, concerns about drug addiction can also motivate opposition to drug policy reform. In other words, the concern about marijuana that pervaded communities dealing with heroin addiction in the 1960s and 1970s could persist today in areas suffering from opioid addiction, potentially leading these areas to be more likely to oppose marijuana legalization, even when the targeted population is now presumed to be white.

2   Case: Marijuana Legalization in Massachusetts

The popularity of the gateway drug argument, risk aversion, and the possible broader effects of the opioid crisis on public opinion lead to the following hypothesis: places with more exposure to the opioid crisis will be less likely to support marijuana legalization. To test this hypothesis, I focus on the 2016 marijuana legalization ballot question in Massachusetts. Election referenda are important for the study of support for marijuana legalization. Out of the 35 states that have legalized marijuana for comprehensive medical use, nearly half (17) of the states did so through voter referendum (NCSL, 2021). For recreational marijuana, the

role of ballot initiatives is even stronger. 12 of the 15 states that have legalized marijuana so far have done so through a voter referendum. Studying voter behavior in initiatives is clearly especially important in this issue area for its policymaking impact. Ballot initiatives about morality issues and civil rights and liberties are also more likely to attract voter attention (Nicholson, 2003). Elites also have an especially important role shaping support for ballot initiatives (Lewkowicz, 2006). Risk-averse individuals may be especially susceptible to elite mobilization in opposition to a ballot referendum (Joslyn and Haider-Markel, 2000). In sum, ballot initiatives are prime opportunities to understand support for marijuana legalization because of their direct policy impact, salience to voters, and tendency to be influenced by elite arguments, such as arguments about risk aversion. More broadly, initiative election results provide the opportunity to study the geography of support for an issue; here, that means the ability to test how local-level exposure to harms from the opioid crisis affects support for marijuana legalization.

On November 8, 2016, Massachusetts held a referendum on the legalization of marijuana for personal use (Galvin, 2016). This ballot question, prompted by an initiative petition, passed with 53.6% of the vote and legalized possession of up to one ounce of marijuana in public and up to ten ounces at home (Bebinger, 2016). I use this Massachusetts election for several reasons. First, the Massachusetts Department of Health provides an array of useful data sources about the opioid crisis. Unlike most states, whose only data available is from the CDC, which is gathered at the county level, or other kinds of public health districts that do not easily map onto geographical units used for surveys or election returns, Massachusetts provides overdose death rates at the municipal level. Municipal-level data provides the benefits of increased statistical power– Massachusetts has 351 municipalities and only 14

11

counties–as well as greater precision when describing local context. The Massachusetts overdose mortality data is also more detailed than many other sources because the state reports opioid-specific mortality, rather than all drug overdose deaths, and municipal-level opioid-related emergency department visits.

Massachusetts also provides an opportunity to leverage over-time changes in opioid overdose mortality and electoral support of marijuana policy. In 2012, Massachusetts voted on legalization of medical marijuana, and the state provides municipal-level opioid overdose mortality rates for 2012. I use this outcome to run a fixed-effects regression to test how within-unit changes in opioid overdose rates affect support for marijuana policy.

Additionally, many Massachusetts elected officials and activists opposed to marijuana legalization used the ongoing opioid crisis to advocate for voting against the ballot measure. Many of the state's most powerful leaders, Republicans and Democrats, actively opposed the ballot initiative, frequently using the opioid crisis as a justification. In an op-ed in the *Boston Globe*, Governor Charlie Baker, a Republican, Attorney General Maura Healey, a Democrat, and Boston Mayor Marty Walsh, also a Democrat, expressed their joint opposition to marijuana legalization, making a gateway drug argument, saying "the science also shows that regular marijuana users – especially those who start at a young age – are more likely to try more dangerous drugs" (Baker, Healey and Walsh, 2016). The op-ed then concludes with the following, "For the past year, our teams have worked tirelessly...to combat the heroin and prescription-drug epidemic that is ravaging our state...We should not be expanding access to a drug that will further drain our health and safety resources" (Baker, Healey and Walsh, 2016). Massachusetts' four Catholic bishops, including Cardinal O'Malley, opposed marijuana legalization in part to due concerns about its effect on the opioid epidemic (LeBlanc,

2016). Others, such as Michelle Lipinski, the principal of North Shore Recovery High School, felt that the timing of legalization was inappropriate, "Right now we're in the middle of the largest opiate crisis that has ever been. Why add another drug? Why right now? Can't we just wait a couple years and see what happens?" (Ruppenthal and Hartley, 2016).

Proponents of marijuana legalization in Massachusetts tended to focus on different aspects of the issue. While Mayor Walsh focused on possible connections between marijuana use and opiate use, Boston City Council President Michelle Wu and Councilor Tito Jackson supported marijuana legalization as an issue of racial and economic fairness, with Wu saying "It just seems ridiculous that kids at Harvard can smoke pot and have incredibly successful careers while blacks and Latinos, particularly men and boys, who are using the same substance are sent to jail" (Klauss, 2016). The official voter guide for the 2016 election also featured the YES on 4 campaign arguing that marijuana legalization would increase safety and regulation of drug use and boost tax revenues, while the opposition side emphasized the dangers of addiction (Galvin, 2016).

The opioid crisis is also likely to be especially salient for Massachusetts voters, since the state has seen one of the highest overdose mortality rates in the country (CDC, 2021a). Indeed, there is survey evidence suggesting this is the case. According to a Harvard School of Public Health/Boston Globe poll in 2015, 71% of residents in Massachusetts viewed the abuse of heroin in the state as an extremely or very serious problem, compared to only 45% nationally (Harvard School of Public Health/Boston Globe, 2015). Similarly, 60% of MA respondents viewed the abuse of strong prescription painkillers as an extremely or very serious problem, compared to only 51% nationally. In a 2016 poll, drugs and opioids ranked second for the most important issue facing Governor Baker, at 13%, trailing only jobs at

16% (SUPRC, 2016b). In addition to local salience, the opioid crisis was also a particularly prominent issue in national politics in 2016. This is important because local context is most likely to matter to political views when the relevant issue is nationally salient (Hopkins, 2018). According to a STAT-Harvard poll fielded in March 2016, 51% of Americans "say the abuse of strong prescription painkillers such as Percocet, OxyContin or Vicodin are an extremely or very serious problem in the state where they live." A similar proportion (53%) identify heroin as an extremely or very serious problem in their state (STAT-Harvard, 2016).

There is also some evidence that the gateway drug argument was relevant to some voters in Massachusetts. A Suffolk poll right before the election asked respondents whether marijuana is a "gateway drug to opioids," finding that 32% agreed with that statement, 53% disagreed, and 14% were unsure (SUPRC, 2016a). While this view is not shared by a majority of voters, this poll does suggest that a substantial portion of Massachusetts voters are at least open to the gateway drug argument. Moreover, survey research suggests that the opioid crisis was a highly salient issue for voters going into this election, with prominent elected officials making arguments about how the crisis should motivate opposition to the ballot question. For these reasons, the Massachusetts marijuana legalization referendum is an ideal case to test whether geographic exposure to the opioid crisis will lead to increased opposition to marijuana reform.

3   Data

The data for opioid overdose mortality rates comes from the Massachusetts Department of Health. Starting in 2015, Massachusetts provides two different measures of overdose

mortality: overdose deaths by residents of a municipality, and overdose deaths that occur within a municipality. These measures are strongly correlated but are not identical, with a correlation of 0.74 in 2016. Figure 2 shows a map of the descriptive data for residence-based overdose deaths per 100,000 by municipality. Both measures of overdose mortality have a high number of zeroes and are distributed with a long right tail.[3] To model this distribution, I use binary and logged continuous versions of the overdose mortality rates. Massachusetts also provides the number of EMS-related incidents by municipality in 2016, though this data does not cover every municipality. EMS rates are also right-skewed, but they are not zero-inflated, so I use a logged measure. For 2012, the only data available is opioid-related overdose deaths located by residence, so I use this measure for the over-time analysis. Election results were obtained from the Massachusetts Secretary of State; Figure 3 shows a map of the election results for Question 4. Data for control variables was obtained from the Census, using county subdivisions that correspond to the municipalities Massachusetts uses to report election results and opioid crisis data.

These measures provide a few different ways to understand the reach of the opioid crisis. First, looking at overdose mortality rates represents the extent to which the most severe outcomes, overdose deaths, have proliferated in a municipality. This measure clearly separates the communities that suffer the most disproportionate burden from the opioid crisis. The binary measure, on the other hand, distinguishes which municipalities had an overdose death in a given year, which represents which municipalities had an occurrence of the worst outcome of the opioid crisis. Within these mortality measures in 2016, I can also distinguish between overdose deaths that occurred for a member of a municipality and those that occur

---

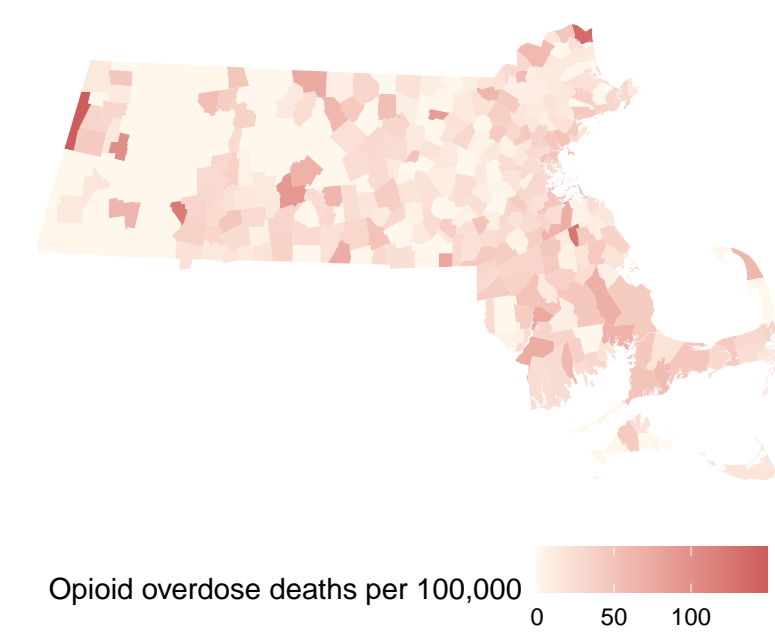[3]See Appendix for distributions.

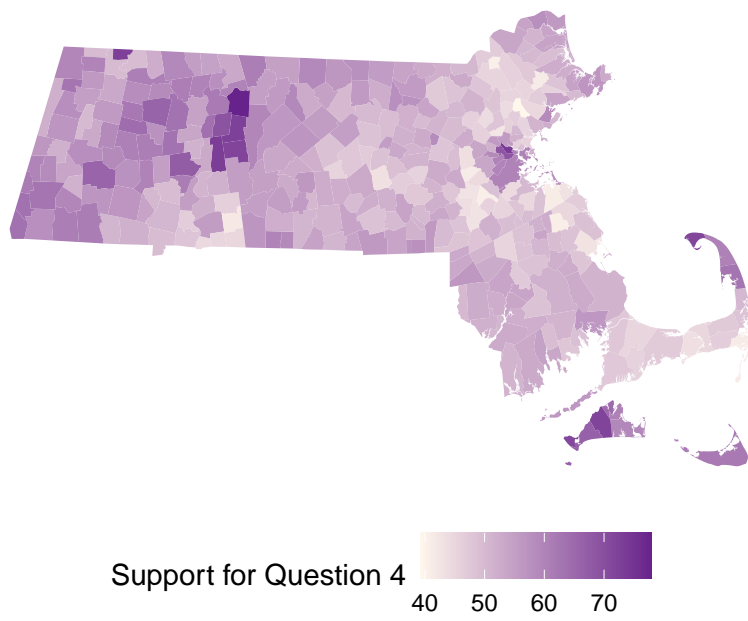**Figure 2:** Opioid Overdose Deaths per 100,000, 2016

Figure 3: Support for Massachusetts Question 4, 2016

within a municipality. While there is not enough data to make strong claims about how these might have different implications, the residence-based measure may suggest that the effect of overdose mortality is about social networks or perhaps the reporting of an event about a community member, while the location-based measure suggests a less social network-based effect. Finally, the EMS measure provides a way to better understand the extent of the opioid crisis in a community, or how much a municipality is struggling with addiction, but the incidents referenced are likely less publicized than overdose mortality.

3.1 Predicting Opioid Crisis Measures

Next, I explore which variables are correlated with the different measures of opioid overdoses. Table 1 presents the results from a regression using contextual variables to predict the binary and logged overdose mortality measures for both the residential and locational overdose mortality data, as well as logged EMS rates, all in 2016. For contextual variables, I use measures that might predict both opioid overdose death rates and support for marijuana legalization, including 2012 Democratic presidential vote share, age, race, gender, median income, education, unemployment rate, population, and population density. A few findings stand out from these results. First, the most consistent predictors of overdose mortality and EMS incidents appear to be previous Democratic vote share, which is negatively associated with overdose measures, and percent female and population density, which are both positively associated with overdose measures. Municipality percent Black, percent 65 or over, and population size are mostly not related to overdose mortality or EMS usage. Percent Latinx is positively associated with location-based overdose mortality rates and EMS incidents.

Percent under 25 and log median household income are both negative associated with EMS incidents but not the mortality measures. The correlation between Democratic vote share and opioid crisis measures suggests some caution when using cross-sectional analyses, which is why I pair the following models of 2016 vote share with a panel fixed-effects model.

Table 1: Predictors of Opioid Crisis Measures

	Residence binary	Residence log	Location binary	Location log	EMS incidents
	(1)	(2)	(3)	(4)	(5)
Prev. Dem. pres. vote share	−0.014**	−0.048**	−0.011**	−0.033**	−0.012**
	(0.003)	(0.010)	(0.003)	(0.010)	(0.005)
Percent Black	0.007	0.031	0.009	0.039*	0.015
	(0.006)	(0.022)	(0.007)	(0.023)	(0.010)
Percent Latinx	0.005	0.022	0.005	0.029**	0.017**
	(0.004)	(0.013)	(0.004)	(0.013)	(0.006)
Percent female	0.023**	0.075**	0.019**	0.063**	0.004
	(0.008)	(0.029)	(0.009)	(0.029)	(0.014)
Percent high school or less	−0.010	−0.038	−0.012	−0.030	0.004
	(0.009)	(0.033)	(0.010)	(0.034)	(0.018)
Percent Bachelor's or more	−0.007	−0.036	−0.005	−0.018	−0.007
	(0.008)	(0.027)	(0.009)	(0.028)	(0.015)
Percent under 25	0.007	−0.009	0.006	0.004	−0.031**
	(0.007)	(0.026)	(0.008)	(0.027)	(0.014)
Percent 65 or over	0.008	0.017	0.001	−0.001	−0.009
	(0.006)	(0.021)	(0.007)	(0.022)	(0.011)
Log median hh. income	−0.012	−0.279	−0.135	−0.710	−0.935**
	(0.141)	(0.501)	(0.157)	(0.505)	(0.284)
Unemployment rate	0.014	0.073*	0.020	0.069	−0.011
	(0.012)	(0.044)	(0.014)	(0.044)	(0.024)
Population per 10,000	0.006	0.021	0.008	0.037	0.012
	(0.007)	(0.024)	(0.007)	(0.024)	(0.011)
Pop. density per 10,000	0.473**	1.599**	0.519**	1.375**	0.461**
	(0.125)	(0.445)	(0.139)	(0.449)	(0.208)
Observations	351	351	351	351	298
Adjusted R^2	0.232	0.219	0.211	0.235	0.391

Note: Results from OLS regression. * indicates $p < 0.10$ and $^{**}p < 0.05$ (two-tailed tests).

4   Analysis

4.1   2016 Cross-Sectional Analysis

Next, I consider the relationship between municipal-level measures of the extent of the opioid crisis and support for marijuana legalization in 2016. To do so, I regress municipal-level support for Question 4 on three different measures of the opioid crisis: overdose deaths located by residence, overdose deaths by location, and EMS incidents.[4] The results are available in Table A1.[5] Column 1 uses binary and logged overdose mortality measured by residence. Here, the coefficient for the binary measure overdose mortality is statistically significant at a $p < 0.05$ level and associated with a 3.9 percentage point reduction in support for Question 4, while the continuous measure is not statistically significant. Column 2 uses the location-based measure of overdose mortality and shows similar results. The binary measure coefficient is significant at a $p < 0.1$ level and associated with a somewhat smaller 2.4 percentage point decline in support for Question 4. The continuous measure is again not statistically significant. Column 3 uses EMS visits, which are also negatively associated with support for Question 4, but this relationship is not statistically significant. Finally, Column 4 uses all of the opioid crisis measures, showing that the residence-based binary measure of overdose mortality is the strongest predictor of opposition to Question 4, though this correlation is no longer statistically significant.[6]

A few additional findings stand out when looking at control variables. First, as expected,

---

[4]Appendix Section 3 shows bivariate relationships between different opioid crisis measures and support for Question 4.

[5]I do not control for crime rates, as this measure is likely post-treatment to the measure of opioid overdoses.

[6]See Appendix Table A2 for models using overdose mortality variables one at a time. In each specification, overdose mortality predicts less support for Question 4.

Table 2: Regression of 2016 Marijuana Legalization Ballot Question on Opioid Crisis Measures

	Dependent variable:			
	Vote for marijuana legalization			
	(1)	(2)	(3)	(4)
Overdose mortality, binary (residence)	−3.876**			−2.338
	(1.487)			(1.589)
Log overdose mortality per 100,000 (residence)	0.306			−0.009
	(0.418)			(0.479)
Overdose mortality, binary (location)		−2.374*		−0.694
		(1.279)		(1.293)
Log overdose mortality per 100,000 (location)		0.161		0.096
		(0.396)		(0.429)
Log opioid-related EMS visits per 100,000			−0.141	0.044
			(0.335)	(0.335)
Previous Democratic presidential vote share	0.358**	0.374**	0.402**	0.380**
	(0.027)	(0.028)	(0.031)	(0.031)
Percent Black	−0.206**	−0.210**	−0.231**	−0.227**
	(0.062)	(0.064)	(0.059)	(0.058)
Percent Latinx	−0.170**	−0.176**	−0.173**	−0.179**
	(0.039)	(0.040)	(0.039)	(0.038)
Percent female	−0.040	−0.070	−0.082	−0.054
	(0.082)	(0.083)	(0.082)	(0.080)
Percent high school or less	−0.091	−0.087	−0.109	−0.136
	(0.094)	(0.096)	(0.103)	(0.100)
Percent Bachelor's or more	−0.046	−0.041	−0.132	−0.138*
	(0.076)	(0.077)	(0.083)	(0.081)
Percent under 25	−0.111	−0.126	−0.154*	−0.141*
	(0.078)	(0.079)	(0.081)	(0.079)
Percent 65 or over	−0.533**	−0.558**	−0.619**	−0.587**
	(0.062)	(0.063)	(0.068)	(0.066)
Percent households with child	−0.244**	−0.251**	−0.328**	−0.293**
	(0.058)	(0.059)	(0.062)	(0.060)
Log median household income	−4.225**	−4.375**	−1.565	−2.379
	(1.626)	(1.664)	(1.920)	(1.875)
Unemployment rate	−0.027	−0.021	−0.053	−0.027
	(0.123)	(0.125)	(0.137)	(0.134)
Population per 10,000	0.010	0.004	0.008	0.019
	(0.066)	(0.068)	(0.062)	(0.060)
Population density per 10,000	−1.643	−2.006	−2.433**	−1.316
	(1.283)	(1.311)	(1.221)	(1.212)
Observations	351	351	298	298
Adjusted R^2	0.674	0.661	0.667	0.687

Note: Results from OLS regression. * indicates $p < 0.10$ and **$p < 0.05$ (two-tailed tests). Vote share is measured from 0-100.

Democratic vote share predicts support for marijuana legalization. Communities with more seniors, a higher percentage of households with children, and higher median incomes (in some specifications) are less likely to support marijuana legalization. This is unsurprising given the patterns of support for marijuana legalization by age (Schwadel and Ellison, 2017). Households with children may be more susceptible to the "gateway drug" argument, which often focuses on danger increased access to marijuana could pose to children.

Interestingly, municipality percent Black and percent Latinx are both negatively associated with support for marijuana legalization. This could be due to Black and Latinx opposition to marijuana legalization, or this could be an example of racial threat, where white residents who live near Black and/or Latinx residents are less likely to support marijuana legalization (Bobo and Hutchings, 1996). To further investigate this finding, I collected crosstabs by race from a few surveys that compare support for Question 4 between white and non-white voters leading up to the election. Table 3 shows that there is no clear pattern. In two surveys, white voters were more supportive of Question 4; in two surveys, non-white voters were more supportive. It is difficult here to interpret the negative relationship between municipal percent Black and Latinx and support for Question 4, seeing as there is not clear evidence that white or non-white voters are disproportionately supportive of marijuana legalization, and preferences for individuals across racial groups may vary by racial context.

Table 3: Selection of Surveys, Massachusetts Question 4

Survey	Date	White Yes	White No	Non-White Yes	Non-White No
SUPRC	5/10/16	41	49	51	29
WBUR/MassINC	9/13/16	50	46	52	45
WBUR/MassINC	10/19/16	55	39	52	47
SUPRC	10/27/16	50	42	47	38

21

4.2 2016 Alternate Outcomes

Next, I use the same model to test the results for two types of alternate outcomes: Trump vote share in 2016 and three additional 2016 ballot questions. The presidential vote share data will test whether the negative relationship between opioid overdose mortality and opposition to marijuana legalization could be driven by a more general conservative trend in these areas. Next, I use three additional ballot questions that were before voters at the same time. Question 1 concerned expanding casino gambling, Question 2 lifting a cap on charter schools, and Question 3 increasing regulations on certain farm animals. I test the effect on these measures to assess whether the effect on marijuana legalization support could be confounded by other contextual variables that predict both opioid overdose mortality and support for marijuana legalization. There is no clear explanation for why exposure to the opioid crisis should be predictive of ballot initiatives concerning gambling, charter schools, or farm animal regulations, so these serve as alternative outcomes. If opioid overdose mortality is associated with unrelated ballot questions, that could suggest other variables are driving the findings, or that overdose mortality could be associated with a broader ideological shift to the right.

Figure 4 shows the coefficients of the binary measure of residence-based opioid overdose mortality for regressions using each of the presidential and ballot questions as outcomes, including the result for Question 4.[7] This analysis shows that opioid overdose mortality is not correlated with any of these outcomes at a statistically significant level except for Question 4. In particular, the relationship with Trump support is nearly zero, suggesting that the relationship between "deaths of despair" and support for Trump was not present

---

[7]Appendix Table A3 shows the complete regression results.
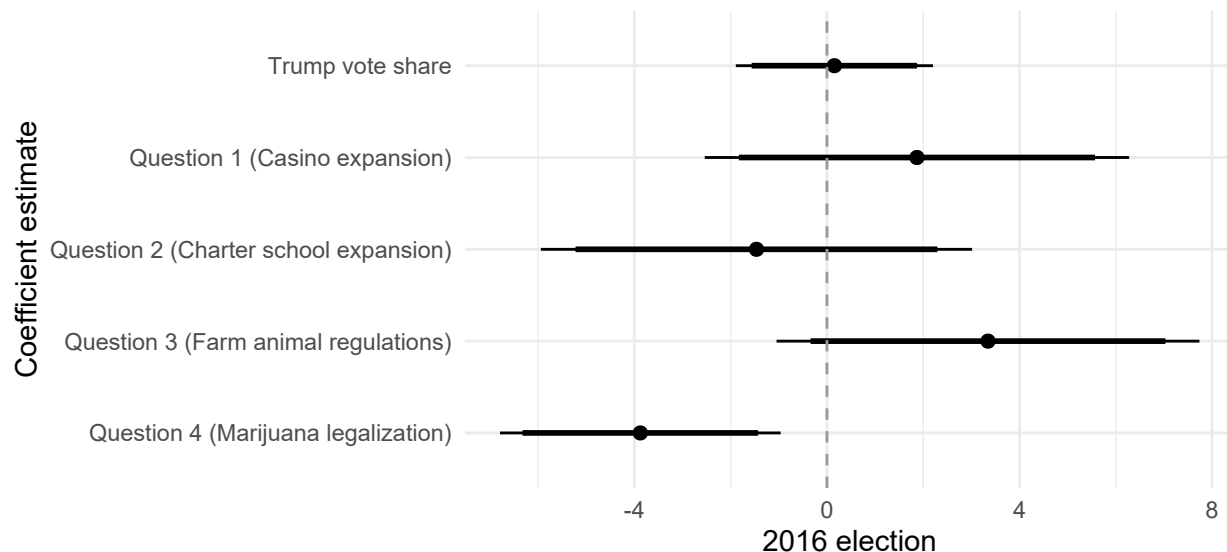
Figure 4: Relationship between Opioid Overdose Mortality and Alternate 2016 Election Outcomes

Note: Points represent OLS coefficients for regressions of different electoral outcomes on a binary measure of opioid overdose mortality, by municipality. Horizontal lines are 90 and 95% confidence intervals. Vote share is measured from 0-100.

within Massachusetts. The coefficients for the other ballot measures are also null, suggesting that this relationship is constrained to marijuana legalization.

4.3   Fixed-Effects Model

To further test the relationship between opioid overdoses and support for marijuana regulation policies, I use both the 2012 ballot question for legalization of medical marijuana and the 2016 ballot question for the legalization of recreational marijuana. By using these two elections, I can better address the possibility of omitted variable bias in cross-sectional models by using a panel fixed-effects regression. This analysis is particularly useful given the correlation of Democratic vote share and overdose mortality rates. Here, I treat the medical marijuana vote in 2012 and the marijuana legalization vote in 2016 as the same dependent variable. The main variable changing over these four years, then, is overdose mortality. This

allows me to test the relationship between within-unit changes in overdose death rates and the change in vote share for marijuana legalization.[8]

Table 4 shows the fixed-effects model combining data from both years. Column 1 uses the binary and logged continuous residence-based overdose mortality rate measures, while Column 2 only uses the logged continuous measure. I control for previous Democratic presidential vote share, other contextual variables, municipal fixed-effects, and year fixed-effects. In Column 1, the coefficient for the binary measure for overdose death rates is statistically significant at the $p < 0.1$ level and is associated with a 1.2 percentage point decline in support for marijuana reform measures. The continuous measure is not statistically significant, but Column 2 shows that when used alone, this measure is significant and negatively associated with support for marijuana reform measures. The results are smaller than the 2016 cross-sectional case, but the same negative relationship between overdose mortality and support for marijuana reforms remains.

I also run the same fixed-effects model using 2012 and 2016 Republican presidential vote share as the dependent variable. This model is another test of the impact of overdose mortality on support for Donald Trump, which will provide some insight as to the uniqueness of the findings regarding marijuana legalization. The results for this regression are presented in Table 4, Columns 3 and 4. In Column 3, I use the binary and logged overdose mortality measures, finding a negative relationship that is not statistically significant. Column 4 uses only the logged overdose mortality rate; here, the relationship between overdose mortality and support for Republican presidential candidates is also negative and not statistically

---

[8]Appendix Section 3 shows the relationship between 2012 and 2016 overdose mortality and support for marijuana ballot questions.

significant. There seems to be no evidence that exposure to the opioid crisis at the municipal level in Massachusetts increased support for Donald Trump – if anything, the relationship goes in the opposite direction.

Table 4: Fixed-Effects Regression of Electoral Outcomes on Residential Overdose Mortality Rates

	Dependent variable:			
	Marijuana ballot questions		Republican pres. vote share	
	(1)	(2)	(3)	(4)
Overdose mortality, binary (residence)	−1.249*		−0.407	
	(0.710)		(1.115)	
Log overdose mortality per 100,000 (residence)	0.130	−0.216**	−0.180	−0.294
	(0.229)	(0.107)	(0.362)	(0.188)
Municipal + Year Fixed Effects	✓	✓	✓	✓
Observations	702	702	702	702
Adjusted R^2	0.919	0.919	0.899	0.899

Note: Results from fixed-effect regressions using 2012 and 2016 data. Standard errors are clustered by municipality. * indicates $p < 0.10$ and **$p < 0.05$ (two-tailed tests). Vote share is measured from 0-100. Coefficients for additional contextual controls for municipal-level prior presidential vote, race, ethnicity, education, age, income, unemployment, population, and population density not presented. See Appendix Tables A4 and A5 for complete results.

4.4   Discussion

Using multiple measures and both cross-sectional and fixed-effects approaches, I find that opioid overdose mortality is associated with opposition to marijuana legalization. In 2016, municipal opioid overdose mortality, measured using either residence or location, predicts less support for Question 4, while not predicting presidential vote share or unrelated ballot initiatives. These findings suggest that exposure to the opioid crisis is associated with opposition to marijuana legalization, but not through conservatism or support for Trump. I also find that using the 2012 medical marijuana ballot measure in a fixed-effects regression results in the same negative relationship between overdose mortality and opposition to marijuana reform. While I am unable to provide direct evidence that "gateway drug" arguments

and risk aversion explain this relationship, the prominence of these reasons for opposition in the political debate and in public opinion, coupled with the lack of an effect on Republican presidential vote share, suggest that these are potential mechanisms.

Going across the different measures, the residence-based measure of overdose mortality is a more consistent predictor of opposition to marijuana legalization than the location-based measure. This finding suggests that there might be a social network effect that the residence-based measure is a proxy for, or that community members care more about negative outcomes for people who live in their community rather than overdoses that happen to occur within municipal boundaries. Either way, overdose mortality is also a stronger predictor of opposition to Question 4 than opioid-related EMS visits. This finding suggests that the high-profile nature of overdose deaths may be more impactful on political views than less publicized statistics covering addiction. Voters may also care more about mortality as an outcome than an emergency department visit.

Interestingly, the binary measure of overdose mortality is the main predictor of decreased support for Question 4. Essentially, this suggests that voters may be more responsive to the presence of a single overdose mortality event, rather than increased overdose mortality rates. In this way, the existence of overdose mortality within a municipality may be sufficient to make salient the potential risks of marijuana legalization. This could be the case because of increased media attention resulting from having had a single fatality, rather than more fatalities or EMS visits, which may be less reported. Alternatively, the binary measure could serve as a crude proxy for the prevalence of addiction in a community more generally, in ways that are not captured by increased numbers of overdose deaths or EMS usage.

While the geographic measures of opioid overdose mortality and vote share provide a

way to understand this relationship, there are also some important limitations. First, municipal boundaries may not correspond to the boundaries people care about and that affect political behavior. The municipalities discussed here vary considerably in geographic area and population size; an overdose death may mean something very different in Boston than it does in Methuen. Additionally, medical marijuana and recreational marijuana are different policies, with medical marijuana typically being much more popular.[9] In order for this to be a problem, however, the difference in support between medical and recreational marijuana would have to vary between municipalities by some omitted variable from the model. I argue instead that both of these questions are examples of a broader policy question about public health and punitive drug policies. Finally, I cannot make strong conclusions about the relationship between racial context and support for Question 4; more research is needed to determine how racial context might influence views about marijuana policy.

5   Conclusion

The association between opioid overdose mortality and opposition to marijuana legalization in Massachusetts is perhaps surprising given the growing popularity of legalization and the historically less punitive policy response to the opioid crisis. These results suggest that even among an issue that has gained national popularity, the geographical concentration of a related harmful outcome, in this case opioid overdose deaths, concerns about the risks of increasing addiction can reduce support for a new policy that might carry some risk. More broadly, this finding raises questions about the extent to which the opioid crisis on its own

---

[9]See Appendix Figure A16.

might inspire a more robust public health response to addiction (Netherland and Hansen, 2016); in this case, higher concentrations of the harms from opioid use were more associated with maintaining the use of the criminal justice system to manage drug use.

What might these findings suggest for the future of marijuana legalization? On one hand, concerns about this policy's impact on the opioid crisis do not seem to be halting the growth in support for marijuana legalization throughout the United States. As of 2021, 16 states have legalized recreational marijuana, including in deeply Republican states such as South Dakota and Montana (DISA, 2021). There are three potential reasons for this trend. First, public support for marijuana legalization has increased linearly over time, driven by generational replacement (Schwadel and Ellison, 2017). Any potential effects of the opioid crisis would operate against this secularly increasing baseline support. Second, the growing number of states with legalized recreational marijuana may reduce the perceived risk. When Massachusetts voted in 2016, the issue was relatively new, and this would the first state in the Northeast to pass legalization. Now, voters can use other states' experiences to inform their political decision-making. Finally, media attention to the opioid crisis has declined since 2018, suggesting that the risks of opioid addiction may be a less salient concern for voters.[10]

That being said, these findings suggest there could be more resistance to reform in states with high overdose mortality rates, especially those that are more conservative; out of the ten states with the highest overdose mortality rates, only Massachusetts and New Jersey have legalized recreational marijuana (CDC, 2021b; DISA, 2021). More broadly, the drop in support for marijuana legalization in the areas most affected by the opioid crisis could also

---

[10]See Vanderbilt media trends in dissertation Ch. 1.

be indicative of other policies that are viewed as having serious risks. While public opinion about criminal justice has changed significantly in recent decades, voters may be wary of policy solutions to the opioid crisis that could increase addiction. Harm reduction policies, such as needle exchanges or safe injection sites, could be similarly interpreted as having the potential to increase the use and abuse of heroin and other opioids, and many may perceive that there is too much of a risk (Tsai et al., 2019). This dynamic could be especially strong in states, counties, and municipalities that are suffering the most from opioid addiction, potentially increasing resistance to the kinds of policies that might be needed to combat the opioid crisis across the country.

References

Alcocer, J. J. 2020. "Exploring the Effect of Colorado's Recreational Marijuana Policy on Opioid Overdose Rates." *Public Health* 185:8–14.

Alexander, Michelle. 2012. *The New Jim Crow: Mass Incarceration in the Age of Colorblindness.* New York, NY: The New Press.

Andrews, Kenneth T. and Charles Seguin. 2015. "Group Threat and Policy Change: The Spatial Dynamics of Prohibition Politics, 1890–1919." *American Journal of Sociology* 121(2):475–510.

Baker, Charlie, Maura Healey and Martin J. Walsh. 2016. "Mass. Should Not Legalize Marijuana." *The Boston Globe* (March 4). https://www.bostonglobe.com/opinion/editorials/2016/03/04/mass-should-not-legalize-marijuana/njYep84wtERutHNIHByu4J/story.html.

Bebinger, Martha. 2016. "Mass. Votes To Legalize Recreational Marijuana." *WBUR* (November 9). https://www.wbur.org/news/2016/11/08/recreational-marijuana-massachusetts-results.

Bidgood, Jess. 2016. "Marijuana Legalization in New England Is Stalled by Opiate Crisis." *The New York Times* (April 19). https://www.nytimes.com/2016/04/20/us/marijuana-legalization-in-new-england-is-stalled-by-opiate-crisis.html.

Bobo, Lawrence and Vincent L. Hutchings. 1996. "Perceptions of Racial Group Competition: Extending Blumer's Theory of Group Position to a Multiracial Social Context." *American Sociological Review* 61(6):951.

Bonnie, Richard J. and Charles H. Whitebread. 1999. *The Marijuana Conviction: A History of Marijuana Prohibition in the United States.* New York: Bookworld Services.

Brown, Jacob R. and Michael Zoorob. 2020. "Resisting Broken Windows." *Political Behavior* .

CDC. 2021*a*. "2016 Drug Overdose Death Rates." https://tinyurl.com/ykj9cvye.

CDC. 2021*b*. "2019 Drug Overdose Death Rates — Drug Overdose." https://www.cdc.gov/drugoverdose/data/statedeaths/drug-overdose-death-2019.html.

de Benedictis-Kessner, Justin and Michael Hankinson. 2019. "Concentrated Burdens: How Self-Interest and Partisanship Shape Opinion on Opioid Treatment Policy." *American Political Science Review* 113(4):1078–1084.

DISA. 2021. "Map of Marijuana Legality by State." *DISA Global Solutions* . https://disa.com/map-of-marijuana-legality-by-state.

DPH, MA. 2018. Number of Opioid-Related Overdose Deaths, All Intents by City/Town: 2013-2017. Technical report Massachusetts Department of Health.

DPH, MA. 2019. MA Opioid-Related EMS Incidents 2013-September 2018. Technical report Massachusetts Department of Health.

DuPont, Robert L. 2016. "Marijuana Has Proven to Be a Gateway Drug." *The New York Times* (April 26). https://www.nytimes.com/roomfordebate/2016/04/26/is-marijuana-a-gateway-drug/marijuana-has-proven-to-be-a-gateway-drug.

Eckles, David L. and Brian F. Schaffner. 2011. "Risk Tolerance and Support for Potential Military Interventions." *Public Opinion Quarterly* 75(3):533–544.

Ehrlich, Sean and Cherie Maestas. 2010. "Risk Orientation, Risk Exposure, and Policy Opinions: The Case of Free Trade." *Political Psychology* 31(5):657–684.

Election Results, 1970-2018. 2019. William Francis Galvin, Secretary of the Commonwealth of Massachusetts. https://electionstats.state.ma.us/.

Forman, James. 2017. *Locking Up Our Own: Crime and Punishment in Black America.* New York: Farrar, Straus and Giroux.

Fortner, Michael Javen. 2015. *Black Silent Majority: The Rockefeller Drug Laws and the Politics of Punishment.* Cambridge, Massachusetts: Harvard University Press.

Galvin, William Francis. 2016. "INFORMATION FOR VOTERS: Massachusetts 2016 Ballot Questions.". Massachusetts Secretary of State. https://tinyurl.com/swk5a338.

Goodwin, James S., Yong-Fang Kuo, David Brown, David Juurlink and Mukaila Raji. 2018. "Association of Chronic Opioid Use With Presidential Voting Patterns in US Counties in 2016." *JAMA Network Open* 1(2):1–11.

Green, Eva G. T., Christian Staerklé and David O. Sears. 2006. "Symbolic Racism and Whites' Attitudes Towards Punitive and Preventive Crime Policies." *Law and Human Behavior* 30(4):435–454.

Hall, Wayne D. and Michael Lynskey. 2005. "Is Cannabis a Gateway Drug? Testing Hypotheses about the Relationship between Cannabis Use and the Use of Other Illicit Drugs." *Drug and Alcohol Review* 24(1):39–48.

Hansen, Helena and Julie Netherland. 2016. "Is the Prescription Opioid Epidemic a White Problem?" *American Journal of Public Health* 106(12):2127–2129.

Harvard School of Public Health/Boston Globe. 2015. "HSPH/Boston Globe Poll: Prescription Painkiller Abuse–Massachusetts and U.S. Attitudes.".

Hlavac, Marek. 2018. *stargazer: Well-Formatted Regression and Summary Statistics Tables.* R package version 5.2.2. http://CRAN.R-project.org/package=stargazer.

Hopkins, Daniel J. 2018. *The Increasingly United States: How and Why American Political Behavior Nationalized.* Chicago: The University of Chicago Press.

Hswen, Yulin, Amanda Zhang, Clark Freifeld and John S Brownstein. 2020. "Evaluation of Volume of News Reporting and Opioid-Related Deaths in the United States: Comparative Analysis Study of Geographic and Socioeconomic Differences." *Journal of Medical Internet Research* 22(7).

Hutchings, Vincent. 2015. "Race, Punishment, and Public Opinion." *Perspectives on Politics* 13(03):757–761.

Is Marijuana a Gateway Drug? 2020. Drug Policy Alliance. https://drugpolicy.org/marijuana-gateway-drug.

Joslyn, Mark R. and Donald P. Haider-Markel. 2000. "Guns in the Ballot Box: Information, Groups, and Opinion in Ballot Initiative Campaigns." *American Politics Quarterly* 28(3):355–378.

Kahneman, Daniel and Amos Tversky. 1979. "Prospect Theory: An Analysis of Decision under Risk." *Econometrica* 47(2):263–291.

Klauss, Kyle Scott. 2016. "City Council President Opposes Marty Walsh on Legalization." *Boston Magazine* (August 3). https://www.bostonmagazine.com/news/2016/08/03/city-council-president-wu-legalization/.

LeBlanc, Steve. 2016. "Physicians, Catholic Bishops Come out against Marijuana Ballot Question." *The Berkshire Eagle* (October 5). https://www.berkshireeagle.com/archives/physicians-catholic-bishops-come-out-against-marijuana-ballot-question/article_5de3ca78-5817-53bb-9d19-5e6a1e48ce9c.html.

Lewkowicz, Michael A. 2006. "The Effectiveness of Elite Cues as Heuristics in Proposition Elections." *American Politics Research* 34(1):51–68.

Livingston, Melvin D., Tracey E. Barnett, Chris Delcher and Alexander C. Wagenaar. 2017. "Recreational Cannabis Legalization and Opioid-Related Deaths in Colorado, 2000–2015." *American Journal of Public Health* 107(11):1827–1829.

Lopez, German. 2016*a*. "Clinton Wants a Public Health Response to the Opioid Crisis. Trump Wants More of the Old Drug War." *Vox* (September 21). https://www.vox.com/2016/9/21/12973740/trump-clinton-opioid-heroin-epidemic.

Lopez, German. 2016*b*. "Is Marijuana a Gateway Drug? Here's What the Research Says." *Vox* (April 29). https://www.vox.com/2016/4/29/11528410/cannabis-gateway-drug-theory.

MassGIS. 2017. "MassGIS Data: Community Boundaries (Towns) from Survey Points." https://docs.digital.mass.gov/dataset/massgis-data-community-boundaries-towns-survey-points.

Meier, Kenneth J. 1994. *The Politics of Sin: Drugs, Alcohol, and Public Policy.* Armonk, N.Y: M.E. Sharpe.

Monnat, Shannon M. 2016. Deaths of Despair and Support for Trump in the 2016 Presidential Election. Technical report. The Pennsylvania State University Department of Agricultural Economics Research Brief.

Morral, Andrew R., Daniel F. McCaffrey and Susan M. Paddock. 2002. "Reassessing the Marijuana Gateway Effect." *Addiction* 97(12):1493–1504.

Nadeau, Richard, Pierre Martin and Andre Blais. 1999. "Attitude towards Risk-Taking and Individual Choice in the Quebec Referendum on Sovereignty." *British Journal of Political Science* 29(3):523–539.

NCSL. 2021. "State Medical Marijuana Laws." National Conference of State Legislatures. https://www.ncsl.org/research/health/state-medical-marijuana-laws.aspx.

Netherland, Julie and Helena B. Hansen. 2016. "The War on Drugs That Wasn't: Wasted Whiteness, "Dirty Doctors," and Race in Media Coverage of Prescription Opioid Misuse." *Culture, Medicine, and Psychiatry* 40(4):664–686.

Nicholson, Stephen P. 2003. "The Political Environment and Ballot Proposition Awareness." *American Journal of Political Science* 47(3):403–410.

Olfson, Mark, Melanie M. Wall, Shang-Min Liu and Carlos Blanco. 2018. "Cannabis Use and Risk of Prescription Opioid Use Disorder in the United States." *The American journal of psychiatry* 175(1):47–53.

Provine, Doris Marie. 2011. "Race and Inequality in the War on Drugs." *Annual Review of Law and Social Science* 7(1):41–60.

Reagan, Michelle. 2016. "Arguments Filed in Support of the Regulation and Taxation of Marijuana Act.". Arizona Secretary of State. https://tinyurl.com/2ztuzpcv.

Ruppenthal, Alex and Ethan Hartley. 2016. "Battle Growing to Stop Legalization of Marijuana in Massachusetts." *Wicked Local* (May 26). https://www.wickedlocal.com/article/20160525/NEWS/160528116.

Samuelson, William and Richard Zeckhauser. 1988. "Status Quo Bias in Decision Making." *Journal of Risk and Uncertainty* (1):7–59.

Schwadel, Philip and Christopher G. Ellison. 2017. "Period and Cohort Changes in Americans' Support for Marijuana Legalization: Convergence and Divergence across Social Groups." *The Sociological Quarterly* 58(3):405–428.

STAT-Harvard. 2016. Americans' Attitudes About Prescription Painkiller Abuse. Technical report Harvard T.H. Chan School of Public Health and STAT. https://cdn1.sph.harvard.edu/wp-content/uploads/sites/94/2016/03/STAT-Harvard-Poll-Mar-2016-Prescription-Painkillers.pdf.

SUPRC. 2016*a*. Massachusetts General Election and Statewide Issues: October 27, 2016. Technical report Suffolk University Political Research Center. https://tinyurl.com/3xsfu4wu.

SUPRC. 2016*b*. Massachusetts Statewide Issues: May 10, 2016. Technical report Suffolk University Political Research Center. https://tinyurl.com/2f22uafj.

Taylor, Kate. 2019. "Legalize Pot? Amid Opioid Crisis, Some New Hampshire Leaders Say No Way." *The New York Times* (February 21). https://www.nytimes.com/2019/02/20/us/weed-opioids-new-hampshire.html.

Tsai, Alexander C., Mathew V. Kiang, Michael L. Barnett, Leo Beletsky, Katherine M. Keyes, Emma E. McGinty, Laramie R. Smith, Steffanie A. Strathdee, Sarah E. Wakeman and Atheendar S. Venkataramani. 2019. "Stigma as a Fundamental Hindrance to the United States Opioid Overdose Crisis Response." *PLoS medicine* 16(11):1–10.

U.S. Census Bureau. 2019*a*. "American Community Survey 2012 (5-Year Estimates).". Prepared by Social Explorer. Accessed September 29, 2019.

U.S. Census Bureau. 2019*b*. "American Community Survey 2016 (5-Year Estimates).". Prepared by Social Explorer. Accessed January 7, 2019.

Wade, Christian M. 2016. "Moulton Supports Legalized Pot." *The Salem News* (September 23). https://www.salemnews.com/news/state_news/moulton-supports-legalized-pot/article_424f3246-2ecf-5ec9-b451-fc520e963a71.html.

WBUR/MassINC. 2016*a*. "Massachusetts Statewide Poll of 502 Likely Voters in November 2016 General Election." https://d279m997dpfwgl.cloudfront.net/wp/2016/10/Crosstabs-2016-10-WBUR-MA-General-2.pdf.

WBUR/MassINC. 2016*b*. "Massachusetts Statewide Poll of 506 Likely Voters in November 2016 General Election." https://d279m997dpfwgl.cloudfront.net/wp/2016/09/Crosstabs-2016-09-WBUR-MA-Ballot-Questions.pdf.

Wiese, Beth and Adrianne R. Wilson-Poe. 2018. "Emerging Evidence for Cannabis' Role in Opioid Use Disorder." *Cannabis and Cannabinoid Research* 3(1):179–189.

Williams, Arthur Robin. 2020. "Cannabis as a Gateway Drug for Opioid Use Disorder." *The Journal of Law, Medicine & Ethics* 48(2):268–274.

Appendix

1 Massachusetts Ballot Questions Text Summaries

1.0.1 2016: Question 4, Legalization, Regulation, and Taxation of Marijuana

Do you approve of a law summarized below, on which no vote was taken by the Senate or the House of Representatives on or before May 3, 2016?

The proposed law would permit the possession, use, distribution, and cultivation of marijuana in limited amounts by persons age 21 and older and would remove criminal penalties for such activities. It would provide for the regulation of commerce in marijuana, marijuana accessories, and marijuana products and for the taxation of proceeds from sales of these items.

The proposed law would authorize persons at least 21 years old to possess up to one ounce of marijuana outside of their residences; possess up to ten ounces of marijuana inside their residences; grow up to six marijuana plants in their residences; give one ounce or less of marijuana to a person at least 21 years old without payment; possess, produce or transfer hemp; or make or transfer items related to marijuana use, storage, cultivation, or processing.

The measure would create a Cannabis Control Commission of three members appointed by the state Treasurer which would generally administer the law governing marijuana use and distribution, promulgate regulations, and be responsible for the licensing of marijuana commercial establishments. The proposed law would also create a Cannabis Advisory Board of fifteen members appointed by the Governor. The Cannabis Control Commission would adopt regulations governing licensing qualifications; security; record keeping; health and safety standards; packaging and labeling; testing; advertising and displays; required inspections; and such other matters as the Commission considers appropriate. The records of the Commission would be public records.

The proposed law would authorize cities and towns to adopt reasonable restrictions on the time, place, and manner of operating marijuana businesses and to limit the number of marijuana establishments in their communities. A city or town could hold a local vote to determine whether to permit the selling of marijuana and marijuana products for consumption on the premises at commercial establishments.

The proceeds of retail sales of marijuana and marijuana products would be subject to the state sales tax and an additional excise tax of 3.75%. A city or town could impose a separate tax of up to 2%. Revenue received from the additional state excise tax or from license application fees and civil penalties for violations of this law would be deposited in a Marijuana Regulation Fund and would be used subject to appropriation for administration of the proposed law.

Marijuana-related activities authorized under this proposed law could not be a basis for adverse orders in child welfare cases absent clear and convincing evidence that such activities had created an unreasonable danger to the safety of a minor child.

The proposed law would not affect existing law regarding medical marijuana treatment centers or the operation of motor vehicles while under the influence. It would permit property owners to prohibit the use, sale, or production of marijuana on their premises (with an exception that landlords cannot prohibit consumption by tenants of marijuana by means

other than by smoking); and would permit employers to prohibit the consumption of marijuana by employees in the workplace. State and local governments could continue to restrict uses in public buildings or at or near schools. Supplying marijuana to persons under age 21 would be unlawful.

The proposed law would take effect on December 15, 2016.

1.0.2   2012: Question 3, Medical Use of Marijuana

Do you approve of a law summarized below, on which no vote was taken by the Senate or the House of Representatives on or before May 1, 2012?

This proposed law would eliminate state criminal and civil penalties for the medical use of marijuana by qualifying patients. To qualify, a patient must have been diagnosed with a debilitating medical condition, such as cancer, glaucoma, HIV-positive status or AIDS, hepatitis C, Crohn's disease, Parkinson's disease, ALS, or multiple sclerosis. The patient would also have to obtain a written certification, from a physician with whom the patient has a bona fide physician-patient relationship, that the patient has a specific debilitating medical condition and would likely obtain a net benefit from medical use of marijuana.

The proposed law would allow patients to possess up to a 60-day supply of marijuana for their personal medical use. The state Department of Public Health (DPH) would decide what amount would be a 60-day supply. A patient could designate a personal caregiver, at least 21 years old, who could assist with the patient's medical use of marijuana but would be prohibited from consuming that marijuana. Patients and caregivers would have to register with DPH by submitting the physician's certification.

The proposed law would allow for non-profit medical marijuana treatment centers to grow, process and provide marijuana to patients or their caregivers. A treatment center would have to apply for a DPH registration by (1) paying a fee to offset DPH's administrative costs; (2) identifying its location and one additional location, if any, where marijuana would be grown; and (3) submitting operating procedures, consistent with rules to be issued by DPH, including cultivation and storage of marijuana only in enclosed, locked facilities.

A treatment center's personnel would have to register with DPH before working or volunteering at the center, be at least 21 years old, and have no felony drug convictions. In 2013, there could be no more than 35 treatment centers, with at least one but not more than five centers in each county. In later years, DPH could modify the number of centers.

The proposed law would require DPH to issue a cultivation registration to a qualifying patient whose access to a treatment center is limited by financial hardship, physical inability to access reasonable transportation, or distance. This would allow the patient or caregiver to grow only enough plants, in a closed, locked facility, for a 60-day supply of marijuana for the patient's own use.

DPH could revoke any registration for a willful violation of the proposed law. Fraudulent use of a DPH registration could be punished by up to six months in a house of correction or a fine of up to $500, and fraudulent use of a registration for the sale, distribution, or trafficking of marijuana for non-medical use for profit could be punished by up to five years in state prison or by two and one-half years in a house of correction.

The proposed law would (1) not give immunity under federal law or obstruct federal enforcement of federal law; (2) not supersede Massachusetts laws prohibiting possession,

cultivation, or sale of marijuana for nonmedical purposes; (3) not allow the operation of a motor vehicle, boat, or aircraft while under the influence of marijuana; (4) not require any health insurer or government entity to reimburse for the costs of the medical use of marijuana; (5) not require any health care professional to authorize the medical use of marijuana; (6) not require any accommodation of the medical use of marijuana in any workplace, school bus or grounds, youth center, or correctional facility; and (7) not require any accommodation of smoking marijuana in any public place.

The proposed law would take effect January 1, 2013, and states that if any of its part were declared invalid, the other parts would stay in effect.
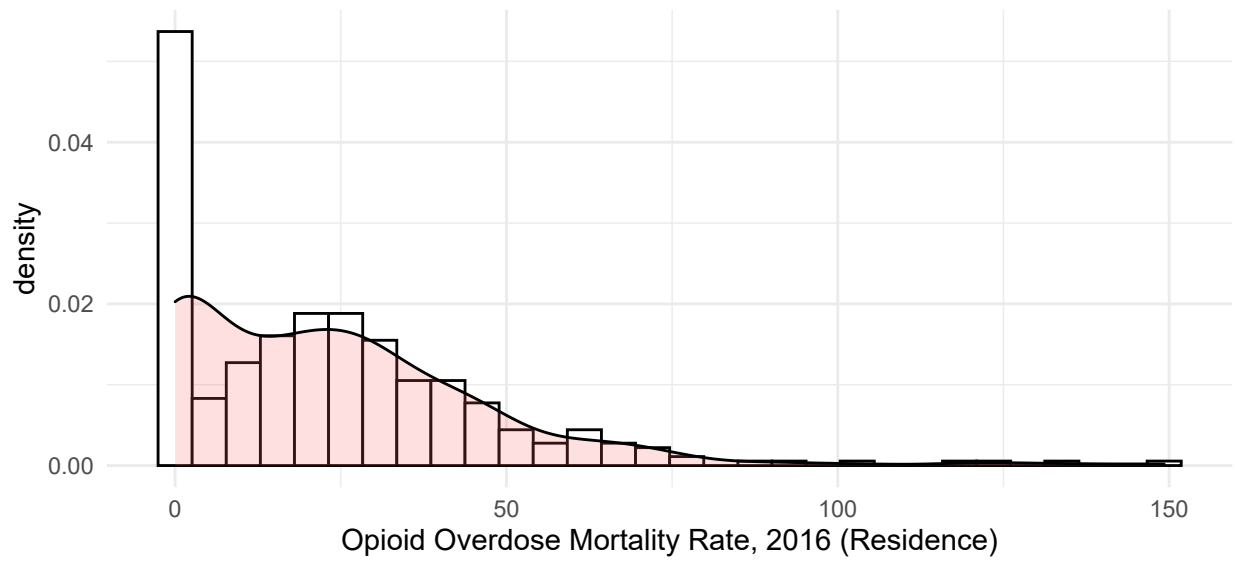
2 Descriptive Data

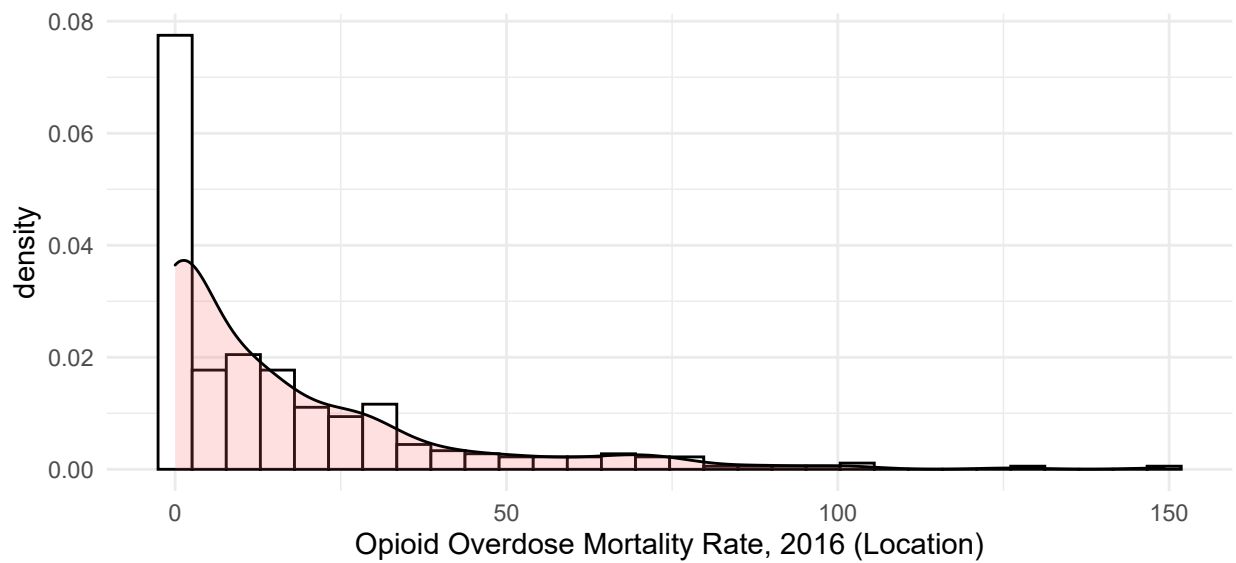**Figure A1:** Density Plot, MA Opioid Overdose Death Rate (Residential), 2016

Figure A2: Density Plot, MA Opioid Overdose Death Rate (Locational), 2016
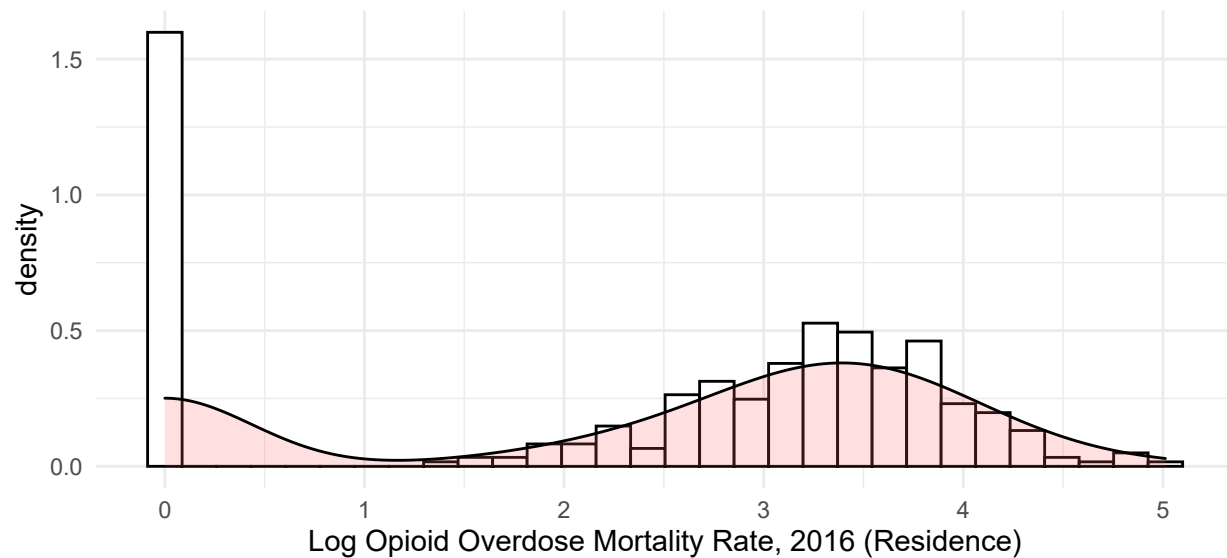
Figure A3: Density Plot, MA Log Opioid Overdose Death Rate (Residential), 2016
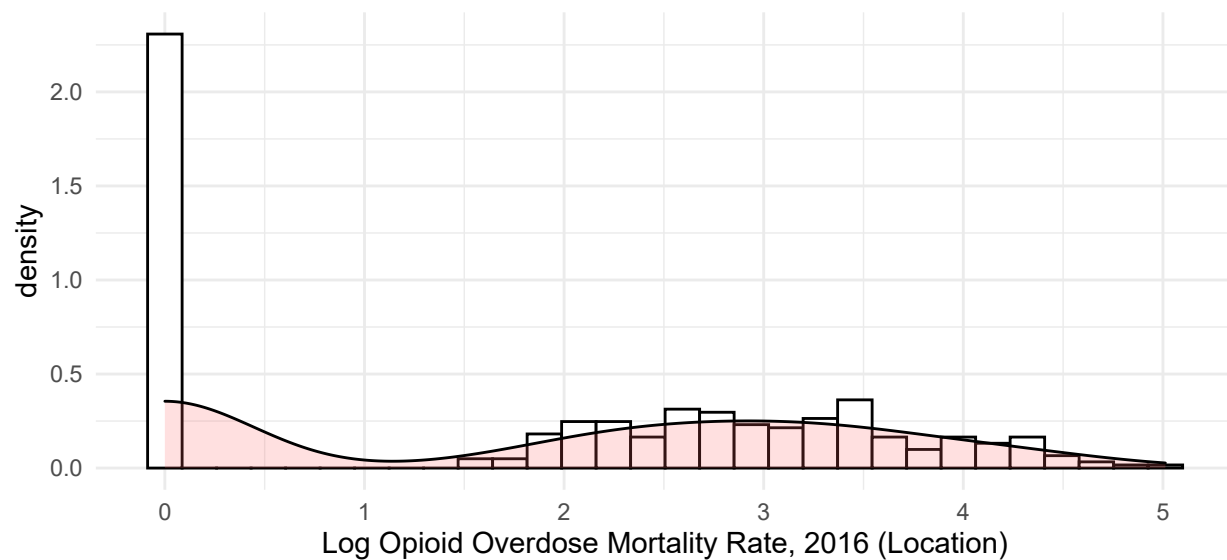

Figure A4: Density Plot, MA Log Opioid Overdose Death Rate (Locational), 2016
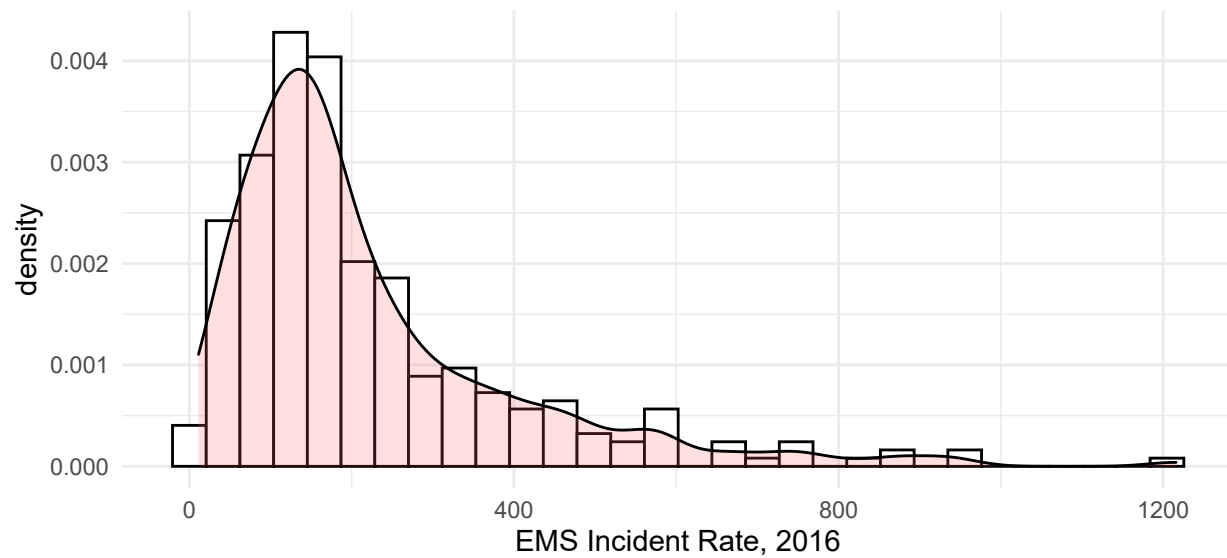
Figure A5: Density Plot, MA Opioid-Related EMS Incidents, 2016

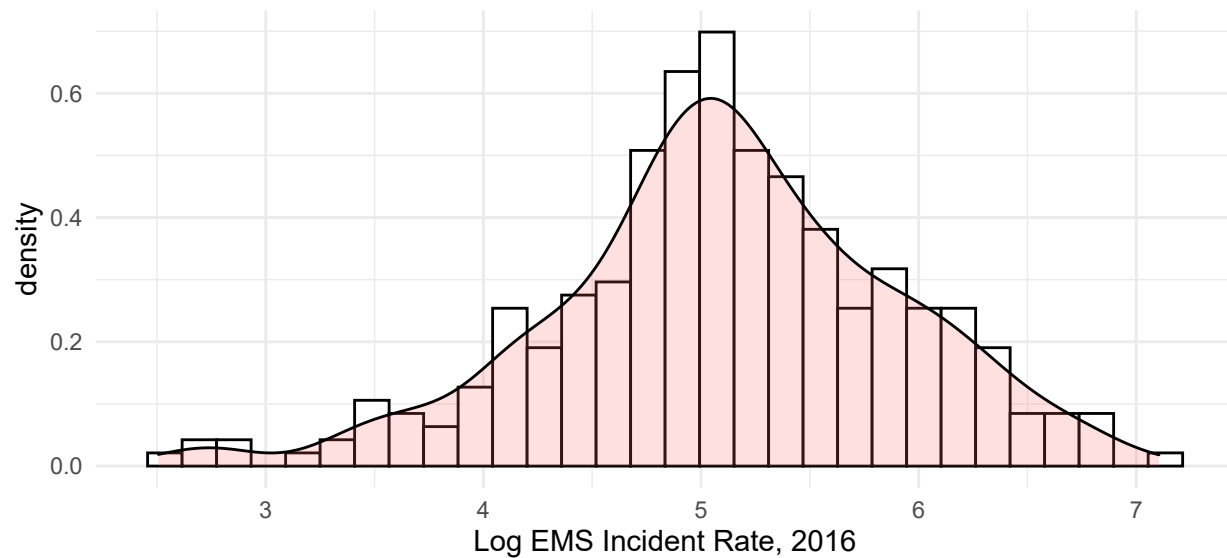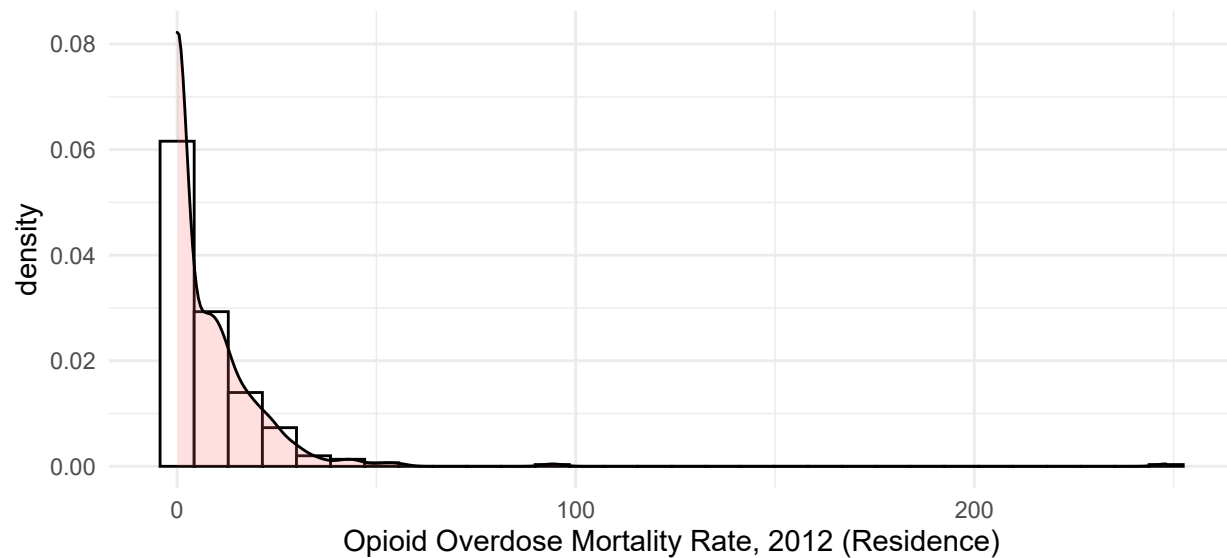**Figure A6:** Density Plot, Log MA Opioid-Related EMS Incidents, 2016

Figure A7: Density Plot, MA Opioid Overdose Death Rate (Residential), 2012

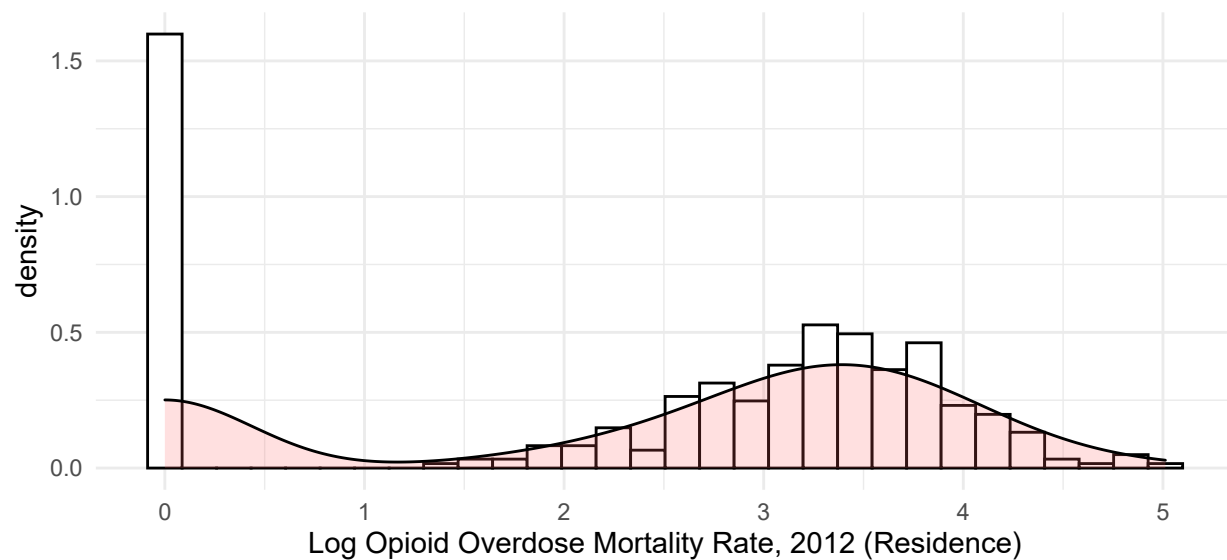**Figure A8:** Density Plot, Log MA Opioid Overdose Death Rate (Residential), 2012
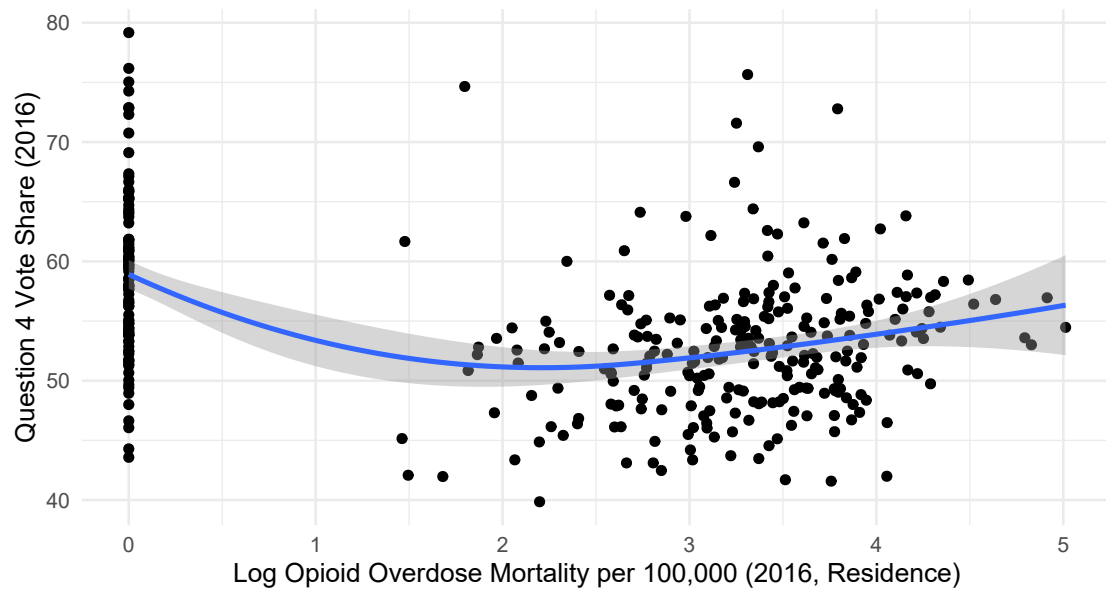
Figure A9: Log Overdose Mortality and Support for Question 4 (Residence)

3   Bivariate Relationships
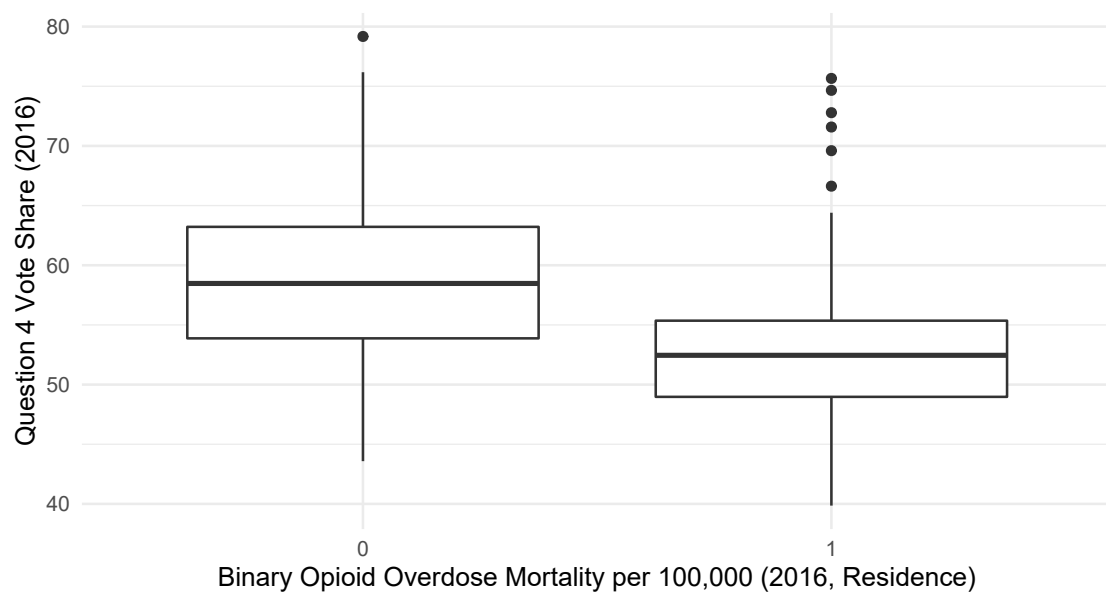
Figure A10: Binary Overdose Mortality and Support for Question 4 (Residence)

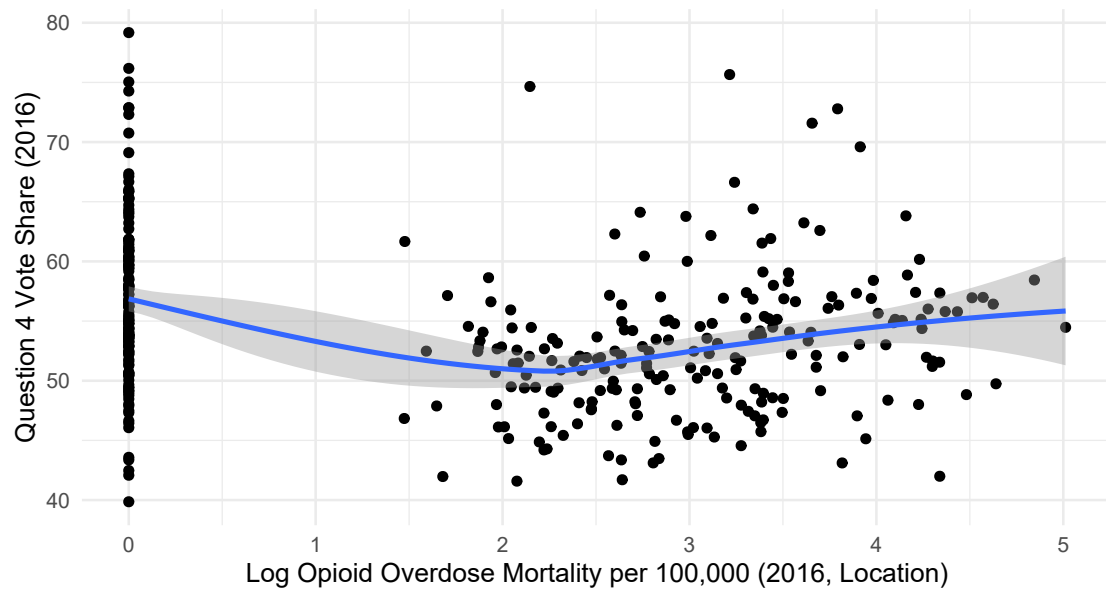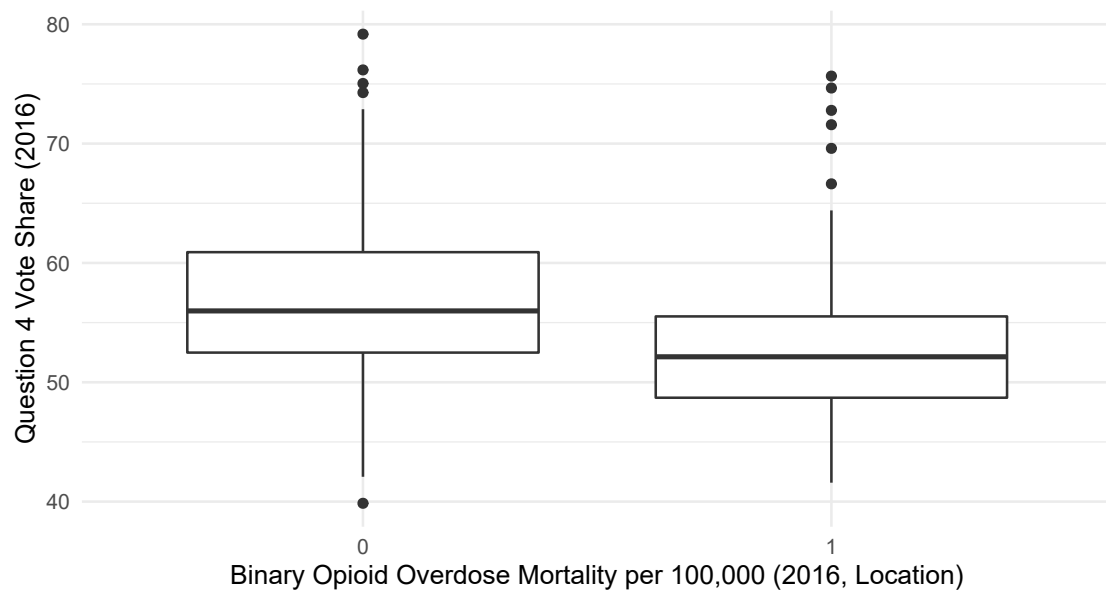**Figure A11:** Log Overdose Mortality and Support for Question 4 (Location)

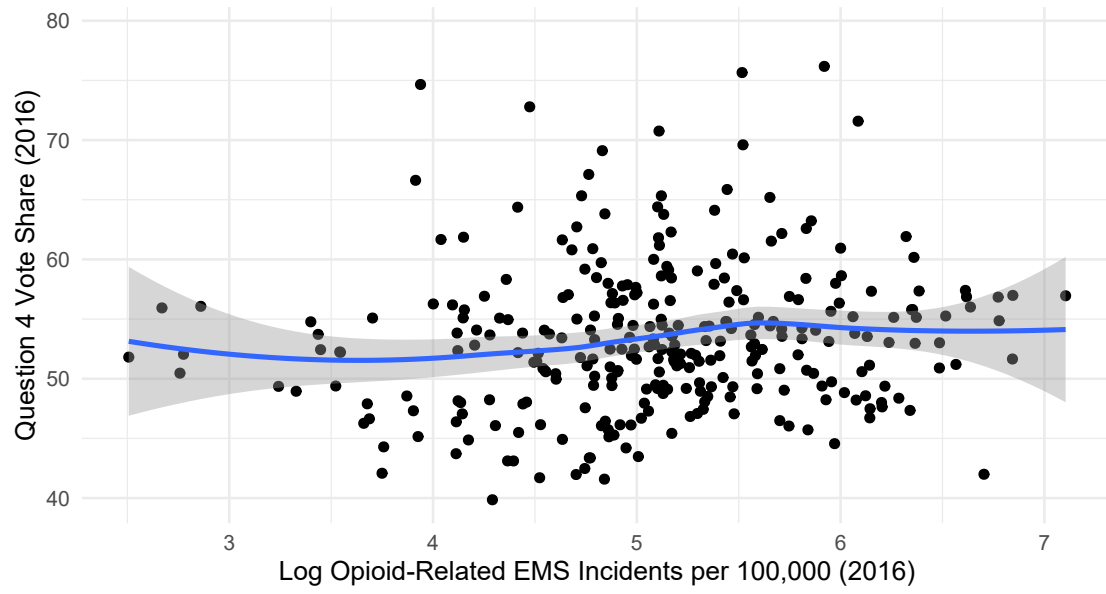**Figure A12:** Binary Overdose Mortality and Support for Question 4 (Location)

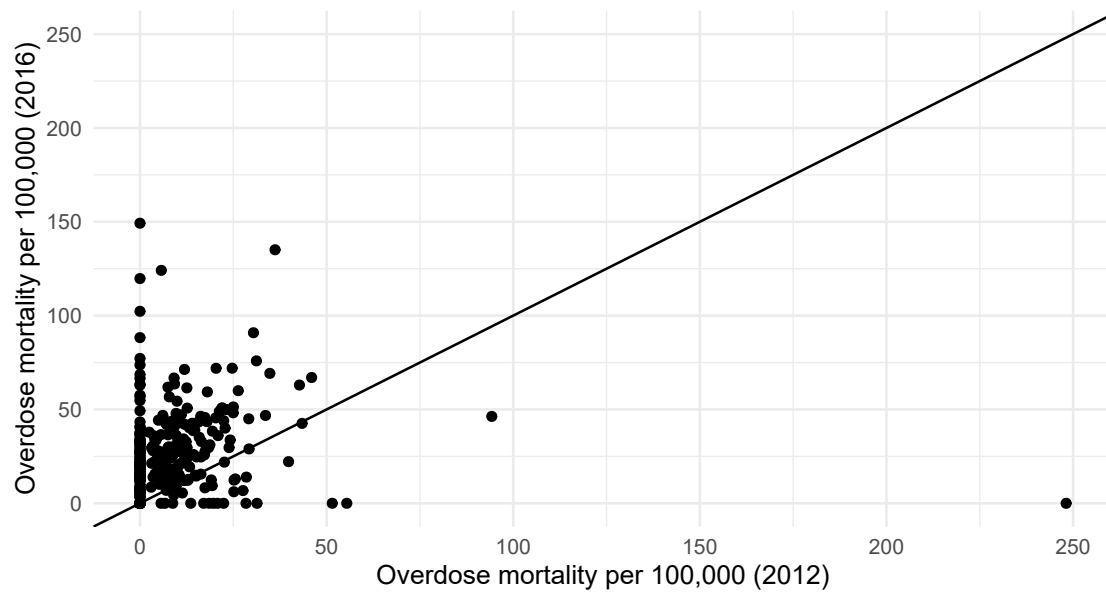**Figure A13:** Log EMS Incidents and Support for Question 4 (Residence)

Figure A14: Overdose Mortality Rates, 2012 and 2016
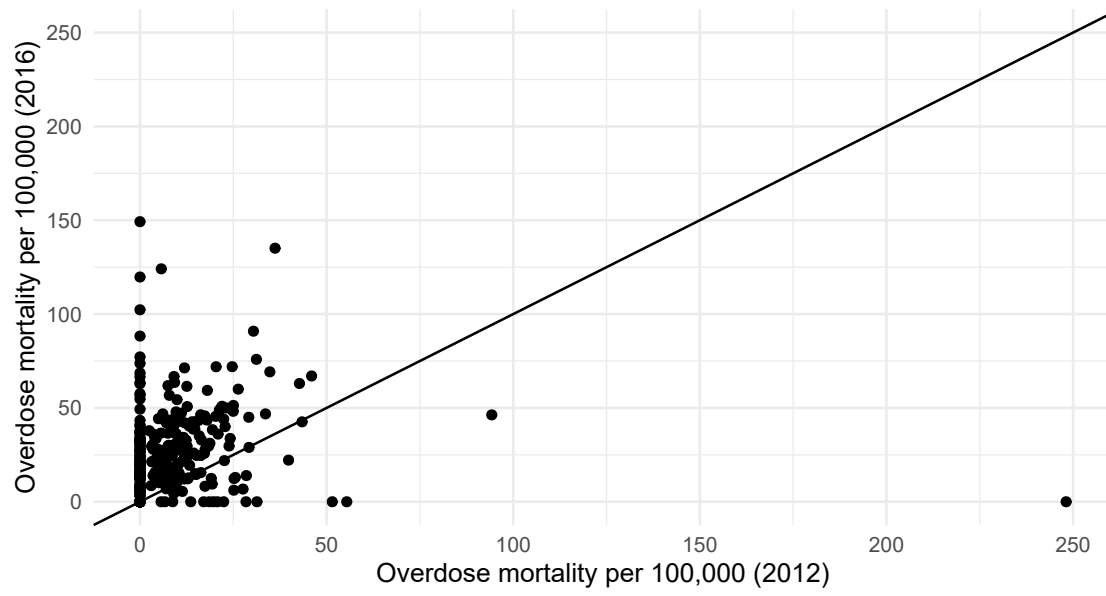
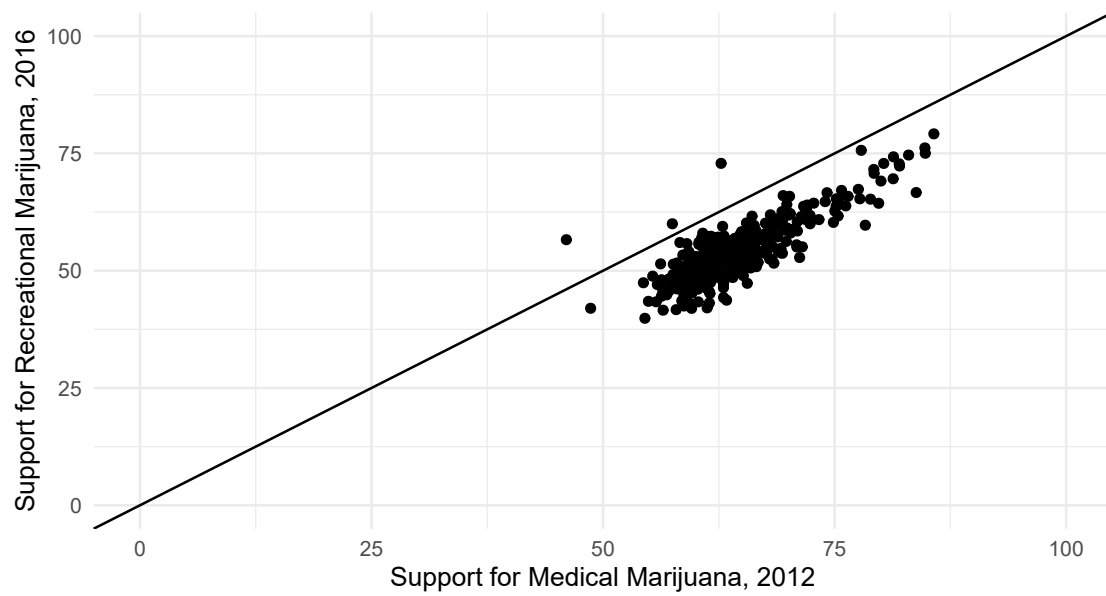**Figure A15:** Overdose Mortality Rates, 2012 and 2016

Figure A16: Vote Share by Municipality, 2012 and 2016 Marijuana Questions

4   Alternative Regression Models

Table A1: Regression of 2016 Marijuana Legalization Ballot Question on Opioid Crisis Measures

	Dependent variable:			
	Vote for marijuana legalization			
	(1)	(2)	(3)	(4)
Overdose mortality, binary (residence)	−3.876**			−2.338
	(1.487)			(1.589)
Log overdose mortality per 100,000 (residence)	0.306			−0.009
	(0.418)			(0.479)
Overdose mortality, binary (location)		−2.374*		−0.694
		(1.279)		(1.293)
Log overdose mortality per 100,000 (location)		0.161		0.096
		(0.396)		(0.429)
Log opioid-related EMS visits per 100,000			−0.141	0.044
			(0.335)	(0.335)
Previous Democratic presidential vote share	0.358**	0.374**	0.402**	0.380**
	(0.027)	(0.028)	(0.031)	(0.031)
Percent Black	−0.206**	−0.210**	−0.231**	−0.227**
	(0.062)	(0.064)	(0.059)	(0.058)
Percent Latinx	−0.170**	−0.176**	−0.173**	−0.179**
	(0.039)	(0.040)	(0.039)	(0.038)
Percent female	−0.040	−0.070	−0.082	−0.054
	(0.082)	(0.083)	(0.082)	(0.080)
Percent high school or less	−0.091	−0.087	−0.109	−0.136
	(0.094)	(0.096)	(0.103)	(0.100)
Percent Bachelor's or more	−0.046	−0.041	−0.132	−0.138*
	(0.076)	(0.077)	(0.083)	(0.081)
Percent under 25	−0.111	−0.126	−0.154*	−0.141*
	(0.078)	(0.079)	(0.081)	(0.079)
Percent 65 or over	−0.533**	−0.558**	−0.619**	−0.587**
	(0.062)	(0.063)	(0.068)	(0.066)
Percent households with child	−0.244**	−0.251**	−0.328**	−0.293**
	(0.058)	(0.059)	(0.062)	(0.060)
Log median household income	−4.225**	−4.375**	−1.565	−2.379
	(1.626)	(1.664)	(1.920)	(1.875)
Unemployment rate	−0.027	−0.021	−0.053	−0.027
	(0.123)	(0.125)	(0.137)	(0.134)
Population per 10,000	0.010	0.004	0.008	0.019
	(0.066)	(0.068)	(0.062)	(0.060)
Population density per 10,000	−1.643	−2.006	−2.433**	−1.316
	(1.283)	(1.311)	(1.221)	(1.212)
Observations	351	351	298	298
Adjusted R^2	0.674	0.661	0.667	0.687

Note: Results from OLS regression. * indicates $p < 0.10$ and **$p < 0.05$ (two-tailed tests). Vote share is measured from 0-100.

Table A2: Regression of 2016 Marijuana Legalization Ballot Question on Alternate Opioid Crisis Measures

	Dependent variable:			
	Vote for marijuana legalization			
	(1)	(2)	(3)	(4)
Overdose mortality, binary (residence)	−2.860**			
	(0.533)			
Log overdose mortality per 100,000 (residence)		−1.894**		
		(0.490)		
Overdose mortality, binary (location)			−0.712**	
			(0.151)	
Log overdose mortality per 100,000 (location)				−0.518**
				(0.152)
Previous Democratic presidential vote share	0.357**	0.374**	0.361**	0.378**
	(0.027)	(0.028)	(0.028)	(0.028)
Percent Black	−0.204**	−0.208**	−0.202**	−0.204**
	(0.062)	(0.063)	(0.063)	(0.064)
Percent Latinx	−0.168**	−0.173**	−0.166**	−0.166**
	(0.039)	(0.040)	(0.039)	(0.040)
Percent female	−0.040	−0.069	−0.051	−0.071
	(0.082)	(0.083)	(0.082)	(0.083)
Percent high school or less	−0.092	−0.086	−0.089	−0.076
	(0.094)	(0.096)	(0.095)	(0.096)
Percent Bachelor's or more	−0.050	−0.041	−0.056	−0.039
	(0.076)	(0.077)	(0.076)	(0.077)
Percent under 25	−0.120	−0.127	−0.143*	−0.133*
	(0.077)	(0.079)	(0.078)	(0.079)
Percent 65 or over	−0.536**	−0.558**	−0.549**	−0.563**
	(0.062)	(0.063)	(0.063)	(0.064)
Percent households with child	−0.246**	−0.251**	−0.255**	−0.257**
	(0.058)	(0.059)	(0.058)	(0.059)
Log median household income	−4.266**	−4.413**	−4.294**	−4.439**
	(1.623)	(1.659)	(1.639)	(1.670)
Unemployment rate	−0.019	−0.019	−0.005	−0.020
	(0.122)	(0.125)	(0.123)	(0.125)
Population per 10,000	0.010	0.007	0.007	0.011
	(0.066)	(0.067)	(0.067)	(0.068)
Population density per 10,000	−1.644	−2.038	−1.901	−2.334*
	(1.282)	(1.307)	(1.290)	(1.303)
Observations	351	351	351	351
Adjusted R^2	0.674	0.662	0.668	0.658

Note: Results from OLS regression. * indicates $p < 0.10$ and $^{**}p < 0.05$ (two-tailed tests). Vote share is measured from 0-100.

Table A3: Regression of Alternate Ballot Outcomes on Opioid Crisis Measures

	Trump vote	Q1 (Casino)	Q2 (Charters)	Q3 (Farm animals)
	Dependent variable:			
	(1)	(2)	(3)	(4)
Overdose mortality, binary	0.154	1.869	−1.464	3.345
	(1.044)	(2.249)	(2.285)	(2.240)
Log overdose mortality per 100,000	−0.187	0.352	0.574	0.281
	(0.294)	(0.633)	(0.643)	(0.630)
Previous Dem. pres. vote share	−0.795**	−0.282**	−0.222**	−0.061
	(0.019)	(0.042)	(0.042)	(0.041)
Percent Black	−0.263**	0.029	0.272**	0.158*
	(0.044)	(0.094)	(0.096)	(0.094)
Percent Latinx	−0.155**	0.001	0.266**	0.083
	(0.027)	(0.059)	(0.060)	(0.059)
Percent female	−0.015	−0.014	0.147	0.107
	(0.057)	(0.123)	(0.125)	(0.123)
Percent high school or less	−0.026	0.208	0.264*	0.077
	(0.066)	(0.142)	(0.144)	(0.141)
Percent Bachelor's or more	−0.541**	−0.386**	0.416**	0.179
	(0.053)	(0.115)	(0.116)	(0.114)
Percent under 25	−0.281**	−0.116	0.199*	0.332**
	(0.055)	(0.119)	(0.120)	(0.118)
Percent 65 or over	−0.074*	−0.322**	0.320**	0.257**
	(0.044)	(0.094)	(0.096)	(0.094)
Percent households with child	−0.050	−0.041	0.015	−0.227**
	(0.041)	(0.088)	(0.089)	(0.087)
Log median household income	−0.647	1.237	3.506	6.204**
	(1.141)	(2.457)	(2.497)	(2.448)
Unemployment rate	0.057	0.491**	0.316*	0.125
	(0.086)	(0.185)	(0.188)	(0.185)
Population per 10,000	0.031	0.098	0.016	−0.001
	(0.046)	(0.100)	(0.102)	(0.100)
Population density per 10,000	1.101	0.738	−2.617	4.015**
	(0.901)	(1.939)	(1.970)	(1.932)
Observations	351	351	351	351
Adjusted R^2	0.947	0.658	0.280	0.294

Note: Results from OLS regression. * indicates $p < 0.10$ and
**$p < 0.05$ (two-tailed tests). Vote share is measured from 0-100.

Table A4: Fixed-Effects Regression of Marijuana Ballot Questions on Residential Overdose Mortality Rates

	Dependent variable:	
	Vote for marijuana ballot question	
	(1)	(2)
Overdose mortality, binary (residence)	−1.249*	
	(0.710)	
Log overdose mortality per 100,000 (residence)	0.130	−0.216**
	(0.229)	(0.107)
Previous Democratic presidential vote share	0.540***	0.561***
	(0.098)	(0.097)
Percent Black	0.058	0.057
	(0.124)	(0.125)
Percent Latinx	0.100	0.101
	(0.080)	(0.081)
Percent female	−0.119	−0.125*
	(0.075)	(0.074)
Percent high school or less	−0.180	−0.181
	(0.137)	(0.137)
Percent Bachelor's or more	−0.291**	−0.293**
	(0.124)	(0.124)
Percent under 25	−0.067	−0.070
	(0.104)	(0.105)
Percent 65 or over	0.012	0.003
	(0.110)	(0.111)
Percent households with child	−0.126**	−0.131**
	(0.056)	(0.056)
Log median household income	−0.767	−0.952
	(1.752)	(1.732)
Unemployment rate	−0.137	−0.143
	(0.103)	(0.104)
Population per 10,000	0.396	0.422
	(0.506)	(0.486)
Population density per 10,000	−0.105	3.433
	(20.027)	(20.444)
Fixed Effects	Municipality + Year	Municipality + Year
Observations	702	702
Adjusted R²	0.919	0.919
Note:		*p<0.1; **p<0.05; ***p<0.01

Table A5: Fixed-Effects Regression of Republican Vote Share on Residential Overdose Mortality Rates

	Dependent variable:	
	Republican vote share	
	(1)	(2)
Overdose mortality, binary (residence)	−0.407	
	(1.115)	
Log overdose mortality per 100,000 (residence)	−0.180	−0.294
	(0.362)	(0.188)
Previous Democratic presidential vote share	1.821***	1.828***
	(0.149)	(0.148)
Percent Black	−0.283	−0.284
	(0.272)	(0.272)
Percent Latinx	−0.321*	−0.320*
	(0.163)	(0.163)
Percent female	−0.281**	−0.283**
	(0.115)	(0.114)
Percent high school or less	−0.385**	−0.386**
	(0.173)	(0.173)
Percent Bachelor's or more	−0.263	−0.263
	(0.177)	(0.176)
Percent under 25	−0.195	−0.196
	(0.154)	(0.154)
Percent 65 or over	0.070	0.067
	(0.137)	(0.137)
Percent households with child	−0.171*	−0.173*
	(0.100)	(0.100)
Log median household income	−4.176	−4.237
	(3.653)	(3.645)
Unemployment rate	−0.123	−0.125
	(0.154)	(0.154)
Population per 10,000	−0.105	−0.097
	(1.880)	(1.864)
Population density per 10,000	−137.895***	−136.740***
	(34.008)	(33.799)
Fixed Effects	Municipality + Year	Municipality + Year
Observations	702	702
Adjusted R^2	0.899	0.899
Note:		*p<0.1; **p<0.05; ***p<0.01