Examining the Mental Health Impact of the Legalization of Recreational Cannabis: A Comparative Analysis of Massachusetts and Rhode Island

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As mental health gains prominence in public health discourse, scientific literature on the relationship between recreational cannabis use and mental health outcomes remains mixed. How does the legalization of recreational cannabis affect mental health-related hospitalizations, and how do these outcomes vary across diagnoses and subpopulations? While cannabis use has been linked to disorders such as psychosis and depression, it has also demonstrated therapeutic and stress-relieving effects. Despite ongoing debate, much of the existing scientific and economic literature is inconclusive, outdated, or lacking nuance. This study compiles results across seven mental health classification groups, finding that the legalization of recreational marijuana—particularly the start of sales in 2019—was associated with a highly statistically significant reduction of approximately 75 psychosis-related hospitalizations per 100,000 people in Massachusetts relative to Rhode Island ($p<0.01$). Using a differences-in-differences regression, this study observes parallel pre-treatment trends that provide a strong preliminary case for further causal research on the mental health impact of cannabis legalization.

Introduction

Since California's legalization of medical marijuana in 1996, 24 states plus Washington, D.C. have legalized recreational marijuana as of January 2024. Public support has grown in tandem, with nearly 90% of U.S. adults supporting some form of legal marijuana use (Pew Research Center 2024). Alongside this policy shift, researchers studied legalization's effects on crime, public safety, and increasingly, public health. Yet, whether recreational legalization worsens or alleviates mental health outcomes remains unclear. While the CDC links cannabis use to higher risks of psychosis, schizophrenia, and suicide (National Academies 2017), marijuana is also associated with benefits such as pain and stress relief (APA 2018).

Using a Differences-in-Differences methodology, this study evaluates whether Massachusetts' legalization of recreational marijuana—enacted in 2016 and implemented through retail sales in 2019—affected mental health-related hospitalizations compared to Rhode Island, which did not legalize recreational use during the study period (2008–2021). To claim causality, parallel trends before the treatment (legalization) should be observed between the control group (Rhode Island) and treatment group (Massachusetts). Recreational marijuana laws (RMLs) are studied over medical marijuana laws (MMLs) for their broader impact and unique relevance for studying public health impacts. Hospitalization data offer an additional perspective to existing survey-based studies.

Results indicate that the 2019 retail rollout of recreational cannabis corresponded to a significant decrease of ~75 psychosis hospitalizations per 100,000 residents in Massachusetts compared to in Rhode Island. These preliminary results highlight the need for more robust research into possible causal effects of legalization.

This paper includes a literature review, description of the research design and identification strategy, results with robustness checks, discussion of methodological limitations, and policy implications.

Scope and Limitations of Research

Massachusetts and Rhode Island are adjacent states with broadly comparable healthcare infrastructure, age distributions, and socioeconomic characteristics, which allow for more confidence in attributing outcome differences to legalization policy. However, given the limited number of aggregate observations, findings should be interpreted with caution. Standard errors clustered at the state level could reduce the statistical significance of observed effects, and this small sample size limits the strength of causal claims.

This analysis is restricted to hospitalization data, which captures only the most severe mental health outcomes. While this ensures objectivity and data quality, it excludes less severe cases and may be an imperfect proxy for mental health. Additionally, co-use with other substances and delayed mental health responses are not accounted for. Potential spillover effects further complicate interpretation; Rhode Island residents could have accessed marijuana in Massachusetts, potentially biasing estimates downward. The presence of illegal markets before and after legalization may also attenuate treatment effects.

Given these constraints, results should be viewed as preliminary and exploratory. The evidence suggests a possible association between legalization and reduced hospitalization rates for psychoses, but more robust research, with larger samples and stronger identification strategies, is needed to draw firm conclusions.

Literature Review

In this literature review, a range of studies within the past ten years are reviewed to inform this study. This section synthesizes **(1)** cannabis's effects on mental health from a medical perspective, and **(2)** existing work that examines the impacts of legalization on mental health outcomes. Gaps in the literature are noted throughout.

Cannabis's medical effects on mental health are still hotly debated. On one hand, some claim that it helps to relieve stress. Studies conducted by the American Psychological Association found that mental health patients using cannabis for medical purposes had "largely improved cognitive performance, reduced clinical symptoms and anxiety-related symptoms as well as a reduced use of conventional medications, including opioids, benzodiazepines, and other mood stabilizers and antidepressants" (APA 2018, p. 2). On the other hand, researchers observe that cannabis use increases the severity and probability of developing mental health disorders. Marconi et al. demonstrates that higher levels of cannabis use increase the risk of psychotic outcomes. Although "a causal link cannot be unequivocally established, there is sufficient evidence to justify harm reduction prevention programs" (Marconi 2016, p. 8).

Reflecting these mixed medical interpretations, existing literature on legalization and mental health has also proven quite mixed. Most studies focus on MMLs, which are limited in accessibility, and often use extreme outcome variables like suicide rates. Bartos et al. (2020) and Anderson et al. (2014) found a "strong negative relationship" between MMLs and suicide. However, suicide remains an imperfect proxy for mental health. Grucza et al. (2015) challenged these findings using individual-level data, finding no statistical relationship after controlling for covariates.

Singer et al. (2020) expanded the scope to RMLs, concluding that "adverse mental health outcomes do not follow cannabis liberalization at the state level," though the benefits may primarily affect young populations. Yet, Borbely et al. (2022) found no average effect of RMLs on mental health. This study relied on the outcome variable "days of bad mental health" in the past thirty days—data collected through surveys conducted via landlines and cell phones. This methodology introduces selection bias, as it excludes individuals without regular phone access and relies on subjective, self-reported measures. Similarly, Elser et al. (2023) found no significant aggregate change in psychosis-related outcomes, but noted statistically significant increases in certain subgroups. However, Elser's dataset includes only insured individuals, which may skew representativeness over time.

Recent contributions highlight persistent gaps. With the rise of RMLs, Anderson and Grucza's findings are due for an update. Many studies still rely on extreme or narrow outcomes. Beyond suicides, various other outcomes could be of interest, from self-reported mood to medically verifiable hospitalization data. Furthermore, the use of suicide as a proxy assumes that all diagnoses are equally affected by legalization. To obtain more targeted results, work remains to be done in differentiating legalization effects on specific disorders. Perhaps these limitations contribute to differing significance levels across studies, as incorrectly aggregating variables tends to bias results toward insignificance as divergent effects cancel each other out.

Given inconclusive and contradictory findings, outdated scopes, extreme proxies, and unrepresentative sampling methods, this paper aims to **(1)** add to the growing literature on the public health implications of RMLs and **(2)** highlight differential effects of cannabis legislation on different diagnoses and subgroups. Improving upon Borbely's study, objective hospitalization data rather than survey data is used. This study segments interpretation of mental health outcomes to allow for more targeted policy implications, using hospitalization data drawn from a representative sample—regardless of payer status. There is little existing scholarship that quantitatively assesses RML effects on nuanced subgroups to this extent.

Research Methods and Data Analysis

This section outlines the analytical approach used in the study. It begins by justifying the use of a Differences-in-Differences (DID) design and its key assumptions, followed by an evaluation of Massachusetts and Rhode Island as comparable case studies. The section then describes the treatment, control, and outcome variables, along with their data sources. Finally, it presents the tested regressions and corresponding hypotheses. The following section discusses the results, their implications, and key technical limitations.

a) DID Regression Design

To estimate the impact of recreational marijuana legalization on mental health outcomes, this study draws on the methodology of Differences-in-Differences (DID). This approach compares changes in hospitalization rates over time between a "treatment" group—Massachusetts, which legalized recreational use, and a "control" group—Rhode Island, which did not. By tracking trends before and after legalization in both states, the DID method helps isolate the effect of the policy, assuming that both states followed similar trends before the law changed.

b) Comparing Massachusetts (Treatment Group) and Rhode Island (Control Group)

First, it would be necessary to examine a variety of demographic characteristics of Massachusetts and Rhode Island to evaluate whether they are "true comparisons." Although it is difficult, if not impossible, to find groups with identical characteristics outside of RMLs, Massachusetts and Rhode Island proved to be quite similar in political leanings, age distribution, healthcare provision, and proportion of college students despite some differences in racial demographics and religion.

Politically, both Massachusetts and Rhode Island lean very Democratic. House and Senate representatives from both Massachusetts and Rhode Island have been Democratic-affiliated since 1992 (Ballotpedia 2024). This might suggest similarities in state-specific policies, despite inevitable nuances that should ideally be further controlled for. This paper assumes that this can help (to some extent) with controlling for potential policy-related confounders, such as Covid-19 response and statewide economic policies.

Massachusetts and Rhode Island have similar age distributions as of the most recent 2021 Census Data. Rhode Island's population skews slightly older, but the relative distribution seems quite similar with percentages differing by less than 1 percent. Massachusetts has a higher median household income of $99,858 ± $1,355, while Rhode Island's median falls at $84,972 ± $2,566, but both states share similar poverty rates.

Importantly regarding healthcare provision and quality, both states expanded Medicaid under the Affordable Care Act, providing similar healthcare access and mental health treatment availability. They rank second and third for best healthcare in the United States, behind Minnesota (Forbes 2023, para. 10-11). Massachusetts has the second-highest number of primary care physicians (23.34 per 10,000 state residents) and the lowest percentage of

residents who lack health insurance coverage (2.50%). Rhode Island boasts the highest number of primary care physicians (25.89 per 10,000 state residents) and the fourth-lowest percentage of residents who lack health insurance coverage (4.34%). This is an important criterion, as similar insurance adoption and healthcare availability minimizes institutional confounding variables (e.g., underreporting of diagnoses due to a lack of hospitals).

However, Massachusetts and Rhode Island have varied racial composition. Compared to Massachusetts, Rhode Island has a slightly higher, slightly lower, and notably higher proportion of white, black, and Hispanic residents, respectively as of 2021 Census data. Therefore, controlling for race and ethnicity would help make the results more robust. This study controlled for % White, % Black, and % Hispanic in the regressions.

In conclusion, while Massachusetts and Rhode Island may differ in terms of race, they are overall good comparisons. While other unconsidered confounding factors may exist, this study attempts to control for race to minimize demographics-induced differences.

c) Variables and Data

This subsection discusses the treatment, control, and outcome variables in depth. This study's outcome variable is "rate of hospitalization discharges" for each diagnosis, as specified below. The treatment variables are **(1)** 2017, the first effective year of RML implementation in Massachusetts (RMLs were passed in late-2016) and **(2)** 2019, the start of sale year for recreational marijuana in Massachusetts (start of sale began in late-2018). The regressions account for different racial/ethnic demographics by including control variables for the percentage of white, black, and Hispanic/Latino people based on data from the U.S. Census Bureau's official American Community Survey (ACS), an annual demographics survey program. All data sources are officially released data from the U.S. government.

The two treatment variables are binary indicators of **1)** whether RMLs were effectively legalized in Massachusetts and **2)** whether recreational cannabis is being sold in Massachusetts. Drawing from state legislation archives, the regressions accounted for a staggered legalization timeline in Massachusetts, with legalization entering effect on December 15, 2016, and recreational sales starting on November 20, 2018. Due to both changes occurring towards the end of the year, treatment points are set at 2017 (effective legalization date) and 2019 (start of recreational sales). Rhode Island passed MMLs on January 3, 2006, and only passed RMLs on May 25, 2022, after the hospitalization dataset time frame of 2008-2021. As stated before, this study operates on the informed assumption that MMLs are not widely accessible, as strict medical requirements and physician recommendations are required to access medical marijuana in Massachusetts and Rhode Island (refer to section "Scope and Limitations of Research"). Therefore, this paper assumes that Rhode Island's earlier passage of MMLs had negligible effects on mental health hospitalization rates and that RMLs, once introduced, become the main source of cannabis consumption for both recreational and dual users. This mitigates challenges of differentiating medical, recreational, and dual use – RMLs are much more widely accessible, regardless of ability to obtain medical marijuana.

The outcome variable is segmented by diagnosis to illuminate differential effects between conditions. To improve upon existing literature that uses subjective survey data and unquantifiable personal outcome variables such as "bad mental health days" (Borbely et al (2022), this paper measures "hospitalization discharge rates per 100,000 people," as the final outcome variable to compare the different population sizes of Massachusetts and Rhode Island. Raw hospitalization discharge numbers were drawn from the U.S. Department of Health and Human Services before being combined with corresponding state population data from the U.S. Census Bureau's ACS. Integrating these two data sources, hospitalization discharge rates were calculated as such: **Hospitalization Discharge Rate = Total Hospitalization Discharge Number/ Total Population**, per year, per diagnosis.

Hospitalization data was retrieved from the U.S. Agency for Healthcare Research and Quality (AHRQ), an official database maintained by the U.S. Department of Health and Human Services. The database's Healthcare Cost and Utilization Project (HCUPnet) aggregates longitudinal data on hospital inpatient stays. State-specific data contains all inpatient care records in forty-two participating states, including inpatient discharge records.

This dataset is comprehensive and credible. Data on Massachusetts was provided by the Massachusetts Center for Health Information and Analysis (an agency of the Commonwealth of Massachusetts), and data on Rhode Island was provided by the Rhode Island Department of Health. Information is recorded "regardless of payer." This study selected only diagnoses numbers listed under the "Mental Diseases & Disorders" category on the official U.S. Department of Health and Human Services website (US. Department of Health and Human Services).

Adopting the Department of Health and Human Service's "Mental Diseases & Disorders" classification, this study analyzes hospitalization discharge rates for Diagnosis Related Groups (DRGs) of:

- Acute Adjustment Reaction & Psychosocial Dysfunction;
- Depressive Neuroses;
- Neuroses Except Depressive
- Disorders of Personality and Impulse Control;
- Organic Disturbances & Intellectual Disability;
- Psychoses; and
- Behavioral and Developmental Disorders.

Each of these DRGs are "umbrella" classifications for more specific symptoms. It is a system used by Medicare to categorize "all patients, regardless of payer." and determine how much a hospital is paid for treating them. Medicare's payment to the hospital under the MS-DRG system is calculated based on the patient's "principal diagnosis, up to 24 additional diagnoses, and up to 25 procedures performed during the stay" (Centers for Medicare and Medicaid Services 2024, para. 7). Patients are unlikely to be "double-counted," or sorted into two DRGs at once, as patients are only reimbursed for the primary DRG they are sorted into for accurate reimbursement of hospital fees.

d) Hypothesis Testing and Regression

Finally, hypothesis testing empirically assesses the impact of RMLs on mental health outcomes between the two states. The two test hypotheses are:

H_0 (null): Recreational legalization *does not* statistically significantly affect hospitalization rates of X diagnosis, where X corresponds to each of the diagnoses listed above.

H_a (alternative): Recreational legalization *does* statistically significantly affect hospitalization rates of X diagnosis.

Lastly, four regressions for each diagnosis were ran:

- Regression (1) examines the impact of the 2017 treatment, without controlling for race.
- Regression (2) examines the impact of the 2019 treatment, without controlling for race.
- Regression (3) examines the impact of the 2017 treatment, controlling for race.
- Regression (4) examines the impact of the 2019 treatment, controlling for race.

Results and Discussion

a) Primary Analysis per Diagnosis: Baseline Regression and Controls

This section discusses the study's results. Borders of each regression table are color-coded for interpretive convenience, with green indicating statistical significance ($p < 0.05$) in all four regressions and parallel pre-treatment trends, orange indicating statistical significance for one or more regressions and no parallel pre-treatment trends, and gray indicating no statistical significance in any regression and no parallel pre-treatment trends. All figures are included in the Appendix. For the following analyses, a coefficient is deemed "statistically significant" at a p-value of 0.05 or lower.

Results for Neuroses Except Depressive; Disorders of Personality and Impulse Control; and Behavioral and Developmental Disorders were not statistically significant for any of the regressions. Results for Acute Adjustment Reaction & Psychosocial Dysfunction; Depressive Neuroses; Organic Disturbances & Intellectual Disability; and Psychoses were statistically significant for one or more regressions, though all failed to meet the parallel trends condition. This makes a weak case for causation.

For Psychoses, however, the parallel trend assumption seems to hold after 2014. As shown in Figure 5, the distance between the black and red lines appears consistent across time until after the first post-2017 treatment. This fulfills a key criterion for causal analysis through DID regressions. Furthermore, outcomes for psychoses are statistically significant in all but one regression. Most notably, post-2019 recreation sales corresponded to a statistically significant decrease in 60.04 hospital discharges per 100,000 people at the $p < 0.05$ level and an even larger statistically significant decrease in 74.92 hospital discharges per 100,000 people at the $p < 0.01$ level after controlling for race. The increase in statistical significance after controlling for potential confounders seems to suggest that the legalization of recreational cannabis possibly caused a decrease in about 75 Psychoses hospitalizations per 100,000 individuals after recreational sales started in 2019.

One potential explanation of this relationship is that access to recreational marijuana may alleviate symptoms in individuals with psychotic disorders, perhaps due to self-medication effects or reduced reliance on substances with higher psychosis risks, such as alcohol or synthetic drugs (American Psychological Association 2018, p. 2). Surprisingly, however, some medical research has found a positive association between cannabis use and symptoms of psychosis. A literature review published in 2020 finds that "the scientific literature indicates that psychotic illness arises more frequently in cannabis users compared to non-users, and cannabis users have an earlier onset of psychotic illness compared to non-users. Cannabis use was also associated with increased relapse rates, more hospitalizations and pronounced positive symptoms in psychotic patients" (Hasan 2020, p. 1).

b) Discussion of Results for Psychoses

Parallel trends after 2014 for Psychoses could be associated, at least in part, with the implementation of the Affordable Care Act (ACA), which was signed into law on March 23, 2010, but not fully implemented until January 1, 2014. The ACA expanded Medicaid eligibility and prohibited insurance companies from denying coverage due to preexisting conditions, increasing accessibility of health insurance (US Department of Health and Human Services 2022, para. 2). Very importantly, the ACA "requires coverage of mental health and substance use disorder services as one of ten essential health benefit (EHB) categories in non-grandfathered individual and small group [insurance] plans" (US Department of Health and Human Services 2014, para. 43). Additionally, the ACA is widely accredited for strengthening the Mental Health Parity and Addiction Equity Act (MHPAEA) of 2008, a previously unenforced federal law that prohibited health insurers from "imposing less favorable benefit limitations on [mental health or substance use disorder (MH/SUD)] benefits" (Centers for Medicare and Medicaid Services 2024, para. 1). For these two reasons, it is plausible that the full implementation of the ACA in 2014 **1)** increased affordability of healthcare in general, **2)** increased insurance coverage rates of MH/SUD, and **3)** enforced equal allocation of benefits among mental and physical healthcare insurance. These effects could explain the parallel trends in Massachusetts and Rhode Island starting from 2014, as the ACA democratized insurance coverage and healthcare access nationally. The ACA could have **1)** generated greater awareness of mental healthcare and **2)** decreased both actual and perceived healthcare costs for everyone regardless of payer or state of residency.

Qualitative parallel trends after 2014, paired with strong and statistically significant corroboration, especially after the ACA, suggests a potential negative causal effect. Yet, more research should be conducted to test this result alongside different control variables beyond race/ethnicity. As discussed in the following "Limitations in Methodology and Data" section, using relatively few control variables due to few data points limits confidence that this relationship is truly causal. As more comprehensive datasets are discovered and more controls are tested in future studies, the results of this study could perhaps serve as a step towards incrementally proving causation.

Limitations in Methodology and Data

This study makes several assumptions, as mentioned throughout this paper. **1)** It assumes that hospitalization discharges are a close proxy for true hospitalization counts. **2)** While Massachusetts and Rhode Island share many demographic similarities, they are not identical comparisons. It also assumes that similar political leanings between Massachusetts and Rhode Island minimize policy-related differences, **3)** that Rhode Island's earlier passage of MMLs had negligible effects on mental health hospitalization rates, and **4)** that RMLs, once introduced, become the main source of consumption for both recreational and dual users. These assumptions, if challenged, could challenge the generalizability of these results.

There are several technical limitations to this study that highlight opportunities for further research. Most notably, hospitalization data is only publicly available at the state-year level. This raises challenges regarding statistical power and the feasibility of the results, especially given the relatively large estimated effects. Perhaps clustering standard errors at the state level would reduce the significance of the findings, warranting cautious interpretation.

The study controls for race but does not include other potential confounders due to data limitations. The absence of more granular hospitalization and census data (e.g., monthly or quarterly) restricts the ability to include additional controls without further diminishing statistical power. Ideally, the analysis would incorporate controls for variables such as age, education, urbanization, religion, profession, and healthcare access, as well as factors like insurance coverage and state-level healthcare policies. This limitation underscores the importance of experts with granular hospitalization data access to study this topic. Without richer data or more frequent observations, the conclusions of this study remain tentative.

Lastly, it is argued by some that cannabis acts as a "gateway" substance, so the results of this study could be informed by further studies examining the effect of recreational legalization on other mental health-associated predictors, such as alcohol, opioid, and tobacco consumption.

Conclusions and Policy Implications

By employing credible and objective state-level longitudinal hospitalization data, this paper expands upon emerging literature regarding RMLs as opposed to MMLs. It also quantitatively evaluates outcomes segmented by diagnosis and demographic group, offering a more nuanced investigation of mental health effects as caused by RMLs. Ultimately, results show a statistically significant decrease in psychosis hospitalizations both immediately after RMLs became effective in 2017 and after recreational sales began in 2019. While still a long way from definitively proving causation, these findings suggest that more research should be done to further refine this model and inch towards investigating true causal effects.

Thus, recreational cannabis as it affects psychosis should continue to be researched. Studying alternative outcomes (e.g., therapy visit rates) could complement existing findings and provide a broader view of how RMLs affect psychosis-related healthcare.

Policymakers could consider utilizing recreational cannabis as a supplementary tool for mental health interventions, particularly for conditions like psychosis. They could also bolster drug education programs, increase access to mental health resources to encourage greater utilization. Policymakers should fund more careful tracking of the therapeutic effects of cannabis, contributing to an ever-growing conversation between medicine, policy, and public health.

Mental health is often a secondary consideration in drug policy debates. The findings of this paper suggest that mental health should play a more central role. Given the profound impact of mental health on individuals and communities, integrating it into policy frameworks is essential.

Appendix:

Figure 1 displays how hospitalization rates have changed over time in both Massachusetts and Rhode Island. "Legalization Status" on the y-axis is a binary variable, with 0 indicating *not recreationally legalized* and 1 indicating *recreationally legalized*. The red vertical line indicates the first full effective implementation year of Massachusetts RMLs (2017). The blue vertical line indicates the first full year of legal recreational sales in Massachusetts (2019). Massachusetts's (treatment group) timeline is indicated by the red dotted line, and Rhode Island's (control group) timeline is indicated by the black solid line.

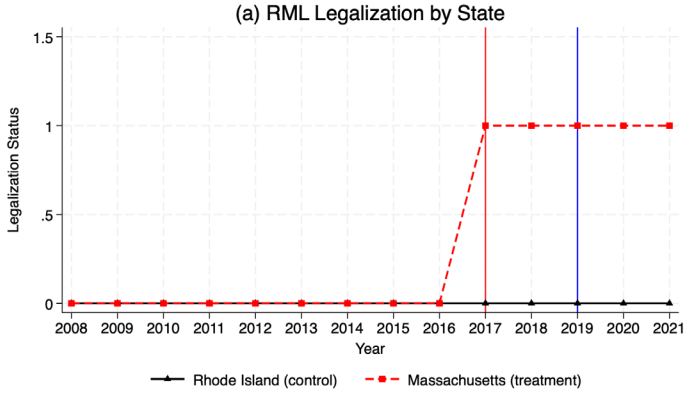

Figure 1. Treatment Timeline: Legalization Status

In **Figure 2b** (and **Figures 3b-8b** below), the regression results are presented in four columns: Columns 1 and 3 show regressions for the period post-2017 (after RML implementation), with and without control variables, while Columns 2 and 4 display regressions for the

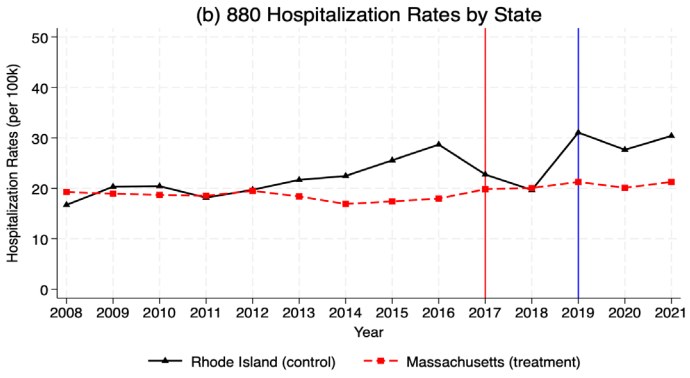

Figure 2a. Acute Adjustment Reaction & Psychosocial Dysfunction

VARIABLES	(1) No Controls	(2) No Controls	(3) Control Race	(4) Control Race
Massachusetts	-3.117**		-2.632	
	(1.285)		(3.247)	
PostTreatment	4.780*		-1.771	
	(2.476)		(3.169)	
DID	-2.680		-0.616	
	(2.511)		(3.810)	
Massachusetts2		-2.779**		-2.617
		(1.091)		(1.526)
PostTreatment2		8.235***		6.176**
		(1.392)		(2.724)
DID2		-6.041***		-4.507*
		(1.467)		(2.469)
percwhite			-76.03**	-18.57
			(30.59)	(14.40)
percblack			141.9	42.42
			(230.5)	(63.08)
perchispanic			116.6*	50.04
			(56.03)	(47.76)
Constant	21.52***	21.47***	59.18***	27.45***
	(1.252)	(1.047)	(13.29)	(8.164)
Observations	28	28	22	22
R-squared	0.487	0.687	0.699	0.753

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Figure 2b. Acute Adjustment Reaction & Psychosocial Dysfunction

period post-2019 (after the start of legal recreational sales), also with and without controls. The variable "Massachusetts" represents the treatment group, where 1 denotes Massachusetts and 0 represents Rhode Island. "PostTreatment" is a binary variable indicating the years following the implementation of the RMLs (2017) and the start of recreational sales (2019). The "DID" interaction term measures the treatment effect of recreational legalization. Additionally, the control variables "percwhite", "percblack", and "perchispanic" account for the racial and ethnic composition of Massachusetts and Rhode Island.

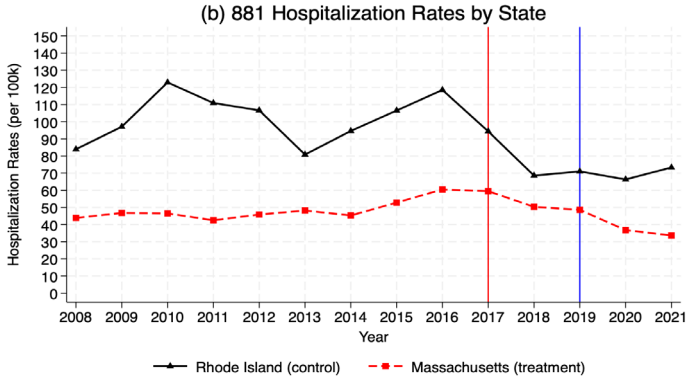

Figure 3a. Depressive Neuroses

VARIABLES	(1) No Controls	(2) No Controls	(3) Control Race	(4) Control Race
Massachusetts	-54.39***		-35.19***	
	(5.264)		(10.17)	
PostTreatment	-27.72***		-29.36**	
	(6.930)		(10.72)	
DID	25.45***		41.58***	
	(8.499)		(8.297)	
Massachusetts2		-49.33***		-51.97***
		(5.462)		(14.55)
PostTreatment2		-28.41***		-21.63
		(5.440)		(15.81)
DID2		18.79**		16.01
		(7.008)		(15.63)
percwhite			253.6**	60.41
			(109.4)	(142.4)
percblack			-1,042*	-97.59
			(536.8)	(494.1)
perchispanic			333.4*	-113.1
			(175.0)	(348.8)
Constant	102.4***	98.62***	-79.42	73.55
	(4.922)	(5.134)	(54.67)	(104.0)
Observations	28	28	22	22
R-squared	0.854	0.836	0.898	0.826

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Figure 3b. Depressive Neuroses

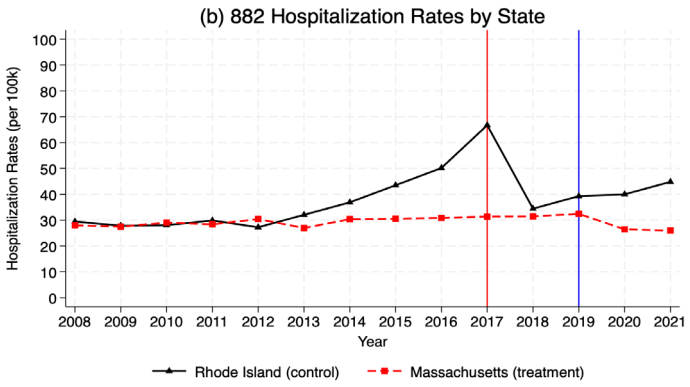

Figure 4a. Neuroses Except Depressive

VARIABLES	(1) No Controls	(2) No Controls	(3) Control Race	(4) Control Race
Massachusetts	-4.785*		11.78	
	(2.785)		(7.840)	
PostTreatment	11.16*		6.155	
	(6.120)		(13.05)	
DID	-10.73		0.331	
	(6.281)		(7.408)	
Massachusetts2		-7.399*		16.69
		(3.834)		(11.49)
PostTreatment2		4.434		-7.268
		(4.100)		(8.536)
DID2		-5.679		13.81
		(4.517)		(13.13)
percwhite			119.1	79.90
			(128.1)	(105.1)
percblack			-703.8	-693.2
			(478.9)	(460.2)
perchispanic			340.7	555.0*
			(196.8)	(262.8)
Constant	33.89***	36.92***	-63.16	-60.12
	(2.740)	(3.801)	(79.20)	(90.52)
Observations	28	28	22	22
R-squared	0.430	0.266	0.550	0.568

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Figure 4b. Neuroses Except Depressive

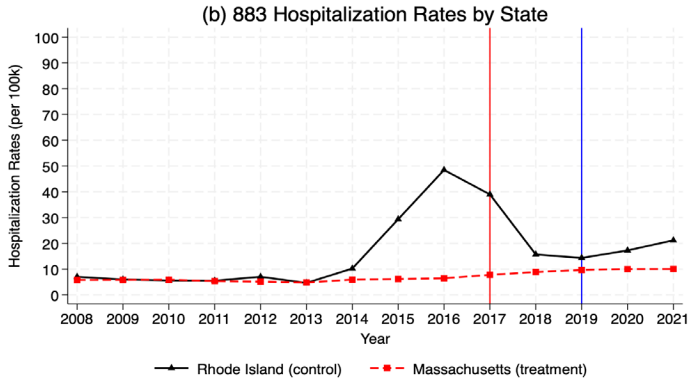

Figure 5a. Disorders of Personality and Impulse Control

VARIABLES	(1) No Controls	(2) No Controls	(3) Control Race	(4) Control Race
Massachusetts	-8.050		10.20	
	(5.134)		(12.77)	
PostTreatment	7.725		-1.822	
	(6.737)		(16.18)	
DID	-4.146		8.483	
	(6.752)		(11.40)	
Massachusetts2		-10.04**		13.41
		(4.825)		(12.06)
PostTreatment2		1.359		-17.01
		(5.117)		(12.47)
DID2		2.380		23.42
		(5.132)		(14.49)
percwhite			74.39	5.945
			(139.2)	(112.6)
percblack			-745.0	-681.9
			(587.2)	(472.7)
perchispanic			435.3	598.7**
			(366.1)	(261.7)
Constant	13.77**	16.23***	-56.74	-27.37
	(5.131)	(4.811)	(101.6)	(95.77)
Observations	28	28	22	22
R-squared	0.279	0.216	0.398	0.489

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Figure 5b. Disorders of Personality and Impulse Control

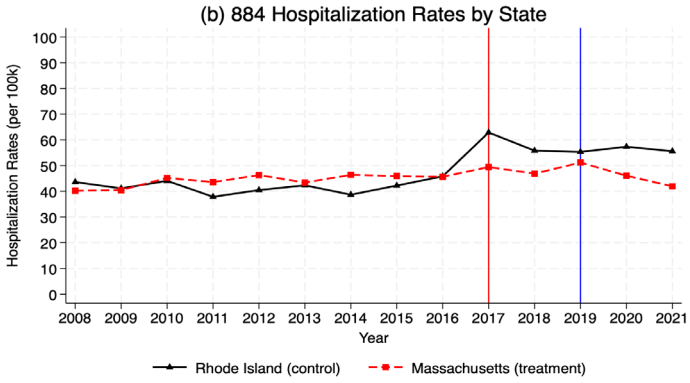

Figure 6a. Organic Disturbances & Intellectual Disability

VARIABLES	(1) No Controls	(2) No Controls	(3) Control Race	(4) Control Race
Massachusetts	2.317*		10.40***	
	(1.193)		(2.114)	
PostTreatment	15.58***		14.62***	
	(1.618)		(2.872)	
DID	-12.60***		-9.451***	
	(2.371)		(2.413)	
Massachusetts2		-0.138		17.73**
		(2.516)		(7.030)
PostTreatment2		11.09***		3.685
		(2.430)		(4.442)
DID2		-9.548**		3.453
		(3.496)		(7.447)
percwhite			70.76**	77.84
			(28.94)	(67.04)
percblack			-225.1*	-331.0
			(127.5)	(280.7)
perchispanic			133.1**	405.7**
			(48.90)	(147.5)
Constant	41.79***	44.98***	-19.66	-53.65
	(0.870)	(2.366)	(15.99)	(56.51)
Observations	28	28	22	22
R-squared	0.817	0.319	0.893	0.623

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Figure 6b. Organic Disturbances & Intellectual Disability

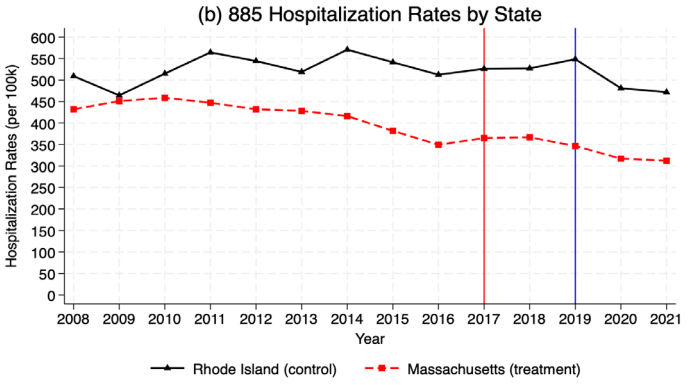

Figure 7a. Psychoses

VARIABLES	(1) No Controls	(2) No Controls	(3) Control Race	(4) Control Race
Massachusetts	-104.9***		-131.2***	
	(16.31)		(29.35)	
PostTreatment	-15.75		21.16	
	(18.01)		(25.08)	
DID	-64.51**		-50.95*	
	(24.32)		(27.47)	
Massachusetts2		-115.0***		-122.3***
		(15.08)		(24.23)
PostTreatment2		-26.24		78.99***
		(23.16)		(15.87)
DID2		-60.04**		-74.92***
		(27.75)		(13.91)
percwhite			762.9**	1,312***
			(339.1)	(203.2)
percblack			-238.6	-1,535*
			(2,104)	(854.0)
perchispanic			-680.8	-887.8**
			(465.2)	(413.1)
Constant	526.7***	526.7***	27.51	-306.4**
	(11.05)	(9.044)	(152.1)	(130.9)
Observations	28	28	22	22
R-squared	0.842	0.828	0.930	0.950

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Figure 7b. Psychoses

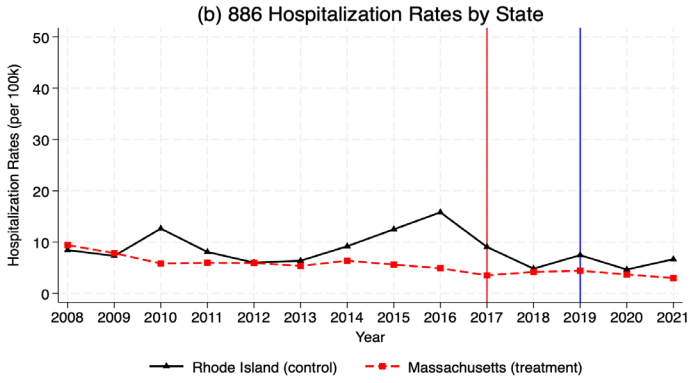

Figure 8a. Behavioral and Developmental Disorders

VARIABLES	(1) No Controls	(2) No Controls	(3) Control Race	(4) Control Race
Massachusetts	-3.229**		-0.709	
	(1.226)		(2.772)	
PostTreatment	-3.063**		-4.395	
	(1.384)		(2.764)	
DID	0.462		3.286	
	(1.484)		(2.419)	
Massachusetts2		-3.202***		-1.537
		(1.143)		(2.273)
PostTreatment2		-2.854**		-0.633
		(1.262)		(3.003)
DID2		0.648		1.453
		(1.407)		(2.708)
percwhite			18.30	36.50**
			(21.33)	(12.81)
percblack			-136.4	-160.7**
			(131.4)	(74.01)
perchispanic			75.51	14.48
			(62.55)	(58.29)
Constant	9.595***	9.112***	-6.430	-12.05
	(1.129)	(1.025)	(13.55)	(8.305)
Observations	28	28	22	22
R-squared	0.496	0.407	0.611	0.510

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Figure 8b. Behavioral and Developmental Disorders

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