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MEDICAL CANNABIS AVAILABILITY AND MENTAL HEALTH: EVIDENCE FROM NEW YORK'S MEDICAL CANNABIS PROGRAM

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New York BRFSS data used in this analysis may be requested from the New York State Department of Health at https://www.health.ny.gov/statistics/brfss/. We thank the New York Department of Health for sharing those data. We have provided dispensary data as a supplement to this article. Drake and Nagy were supported by the National Institute on Drug Abuse (NIDA) under award K01DA051761. We are grateful to Dr. Catherine Maclean for her helpful feedback. The views expressed herein are those of the authors and do not necessarily reflect the views of the National Bureau of Economic Research.

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ABSTRACT

Evidence on cannabis legalization's effects on mental health remains scarce, despite both rapid increases in cannabis use and an ongoing mental health crisis in the United States. We use granular geographic data to estimate medical cannabis dispensary availability's effects on self-reported mental health in New York state from 2011 through 2021 using a two-stage difference-in-differences approach to minimize bias introduced from the staggered opening of dispensaries. Our findings rule out that medical cannabis availability had negative effects on mental health for the adult population overall. We also find that medical cannabis availability reduced past-month self-reported poor mental health days by nearly 10%—3.37 percentage points—among adults 65 and above. These results suggest medical cannabis access has positive health impacts for older populations, likely through pain relief.

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New York licensed medical cannabis dispensary data used in Drake et al. (2024) is available at https://github.com/cdrake219/NYdisp/tree/main

1. Introduction

How consumers respond to differences in firm location is a classic topic in economics (Hotelling 1929; Debreu 1959; Starrett 1974). A substantial literature examines how consumers' distance from health care firms influences the firm from which they receive medical care (McGuire, Kreif, and Smith 2021; Grabowski et al. 2013; McClellan, McNeil, and Newhouse 1994) and how location affects downstream health outcomes (Avdic, Lundborg, and Vikström 2024; Bertoli and Grembi 2017; Kessler and McClellan 2000; Lu and Slusky 2016; Slusky 2017; Lu and Slusky 2019; Ellison et al. 2021; Card, Fenizia, and Silver 2023). Shorter distances between consumers and products lower the non-monetary costs of products to consumers, which increase use and then has a greater potential impact on downstream outcomes. Understanding these downstream effects is of particular importance as newer therapeutics with mixed evidence of efficacy become more widely available to consumers.

One such case of particular importance is the distribution of legal cannabis through licensed dispensaries and its effects on mental health. Cannabis use continues to surge as nearly 40 states have passed medical cannabis laws (ProCon.org 2024). An estimated 62 million Americans—22% of the population aged 12 and older—used cannabis in 2022, nearly doubling from 11% in 2010. Cannabis use decreases with age, ranging from 37% among persons aged 18 to 34 to 8% among persons aged 65 and over in 2022, though recent increases in use have occurred across age groups (Substance Abuse and Mental Health Services Administration 2023).

The clinical literature suggests cannabis use may exacerbate depressive and mood disorders (National Academies of Sciences, Engineering, and Medicine 2017). However, cannabis is often used and promoted as a wellness product to treat mental health conditions. Roughly 50% and 34% of medical cannabis consumers reported using it to treat and anxiety and depression (Kosiba, Maisto, and Ditre 2019). That rapid increases in cannabis use are occurring amidst a rapidly worsening mental health crisis exacerbated by the COVID-19 pandemic (McGinty et al. 2020; Mehra et al. 2023) increases the need for evidence on how cannabis availability affects mental health.

In this paper, we examine how mental health is affected by medical cannabis dispensary availability in the context of New York's medical cannabis program. Our analysis takes place prior to recreational cannabis legalization. Nearly all states with medical cannabis laws require consumers to purchase medical cannabis at licensed medical cannabis dispensaries (ProCon.org

2024), limiting access to consumers with the ability to travel to dispensaries. Consumers' access therefore does not just depend just on the state in which they live, but also where they live in that state.

We have two key findings. First, we can rule out that medical cannabis availability causes meaningful increases in self-reported poor mental health among the adult population overall. Second, we find that medical cannabis availability has meaningful and robust positive effects on self-reported mental health among persons aged 65 and above, who experience 3.48 percentage point decrease in having self-reported past-month poor mental health days, a roughly 10% decrease from a baseline of 36.3%. While these findings suggest positive mental health effects of medical cannabis availability, the positive effects are concentrated among the portion of the age distribution least likely to use cannabis. Roughly 2.29% of New Yorkers aged 65 and above reported using cannabis in 2015—the year before New York opened its first medical dispensaries. About twice as many, 4.49%, did so in 2019 (Substance Abuse and Mental Health Services Administration 2023). High stigma surrounding cannabis use among this population, however, may lead to underestimates of older adults' cannabis use (Dahlke et al. 2024), which helps to explain the relatively large magnitude of our findings.

This study integrates two streams of emerging cannabis economics literature by using refined geographic measures to examine cannabis availability's effects on mental health. Three prior studies (Borbely et al. 2022; Sabia, Swigert, and Young 2017; Nicholas and Maclean 2019), to our knowledge, have examined cannabis legalization's effects on mental health, though they rely on state variation in cannabis laws to identify cannabis availability's effects rather than sub-state variation in dispensary variation, as we do. Other recent studies have used sub-state geographic variation in dispensary availability to examine other health outcomes (Wang et al. 2022; Smith 2020; Conyers and Ayres 2020; Ambrose, Cowan, and Rosenman 2021).

2. Background

The federal government criminalized the possession and sale of cannabis with the Marihuana Tax Act of 1937 (Dufton 2017). California was the first state to legalize medical cannabis in 1996. Few other states followed until the 2009 Ogden Memorandum, which deprioritized federal enforcement of cannabis law. As of May 2024, 38 states have legalized medical cannabis—nearly three million Americans possessed licenses to use medical cannabis by 2020 (Boehnke et al. 2022)—and 24 states have legalized recreational cannabis (ProCon.org 2024). Medical cannabis only increases cannabis use once a state opens dispensaries (Hollingsworth, Wing, and Bradford 2022).

New York implemented its medical cannabis program in 2016. New Yorkers over age 21 with a qualifying medical condition had to obtain a license to purchase medical cannabis. Unlike some other states, New York did not allow at-home cultivation of medical cannabis. New York's qualifying medical conditions were typical of medical cannabis programs, including chronic pain and post-traumatic stress disorder but notably excluding anxiety (ProCon.org 2024). The program enrolled over 100,000 persons by 2019 and over 150,000 by 2021 (New York State Department of Health 2022; 2019).

New York legalized recreational cannabis on March 31, 2021. The sale of recreational cannabis became legal in 2022. Unlicensed recreational cannabis dispensaries proliferated throughout New York when recreational cannabis sales became legal in 2022, making it impossible to establish a spatial relationship between cannabis availability and health outcomes (Southall 2024). For these reasons, we end our study period in 2021. Cannabis delivery services, another potential threat to our study design, did not become available until 2023 (Southall 2023).

3. Methods

3.1. Data

Our primary data are the 2011-2021 New York Behavioral Risk Factor Surveillance System (BRFSS) (New York Department of Health 2024). The BRFSS is a nationally coordinated, state-administered telephone survey that collects data on health, health-related risk behaviors, and respondents' sociodemographic characteristics. Importantly for this study, the New York BRFSS data report respondents home ZIP codes, which are not available in the national BRFSS data. We include all BRFSS respondents with non-missing ZIP codes and responses to mental health-related questions.

We also use data on listings of New York medical cannabis dispensaries obtained from the New York Department of Health (New York Office of Cannabis Management 2024). These data list all medical cannabis dispensaries operating in New York, but they do not list the dates those dispensaries opened. We conducted an extensive review of local media sources to identify dispensaries' opening dates. We provide the New York Department of Health data with opening dates and sources in the supplementary appendix. Importantly for our study design, we found no evidence that any medical cannabis dispensaries closed during the study period, though they did sometimes change ownership.

We used Microsoft's BingMaps application programming interface to convert BRFSS respondents' five-digit ZIP codes and dispensaries' addresses to longitude-latitude coordinates (Microsoft 2024). BingMaps identifies the most central point in each ZIP code that is located on a road. We then calculated drive times between each ZIP code and dispensary, again using BingMaps. These drive time calculations consider the built environment, including road structure, speed limits, stop signs and traffic lights, and congestion. We calculate drive times at 9AM on a Wednesday to simulate a standard commute.

3.2. Measures

Our primary outcomes examine self-reported mental health. The BRFSS surveys mental health by asking, "Now thinking about your mental health, which includes stress, depression, and problems with emotions, for how many days during the past 30 days was your mental health not good?" (New York Department of Health 2024). We use these questions to construct three measures of mental health, per prior studies (Slabaugh et al. 2017; Cree et al. 2020; Taylor 2000; Liu et al. 2018): (1) an indicator that identifies whether respondents reported any past-month poor mental health days; (2) the number of past-month poor mental health days; and (3) an indicator for whether respondents reported *frequent mental distress*, which corresponds to 14 or more days of poor mental health.

Our treatment is an indicator for whether respondents had an open medical cannabis dispensary within a 30-minute drive by the start of the quarter-year in which they were surveyed. This measure identifies whether medical cannabis was available within a standard commute time (U.S. Census Bureau 2021). We examine other drive time thresholds in sensitivity analyses. Prior research found that medical cannabis laws only increase cannabis laws when they are accompanied with open medical dispensaries (Hollingsworth, Wing, and Bradford 2022), indicating that our classification of ZIP codes near dispensaries as "treated" and far away ZIP codes as "comparisons" is valid.

3.3. Empirical Strategy

While we employ a two-way fixed effects (TWFE) approach, our preferred specification is a two-stage difference-in-differences (2SDID) approach because of the staggered implementation of medical cannabis dispensary openings across New York.

We estimate self-reported mental health for respondent i in ZIP code z in quarter-year t in our TWFE specification such that

$$MH_{izt} = \beta D_{zt} + \theta_z + \tau_t + \epsilon_{izt}, \tag{1}$$

where D_{zt} is an indicator for a medical dispensary being open within a 30-minute drive of ZIP code z in year t; θ_z and τ_t are ZIP code and quarter-year fixed effects; and ϵ_{izt} is a county-clustered error term. We cluster standard errors at the county level because of likely spatial correlation among adjoining ZIP codes affected by dispensary openings (Slusky 2017; Lu and Slusky 2019; 2016). We also include a vector of respondent-level sociodemographic characteristics included in the BRFSS in some specifications.

A Bacon decomposition (Goodman-Bacon 2021) shows only 6% of the two-by-two comparisons comprising our overall TWFE estimate are problematic, indicating that an approach robust to staggered implementation is necessary.

In the first stage of the 2SDID approach (Gardner 2022; Powell 2022), we estimate our outcome for all untreated observations, from which we create residualized fixed effects. In the second stage, we estimate our outcome using the whole sample with the residualized fixed effects from the first stage. We estimate this model using a generalized method of moments approach such that:

$$MH_{izt}|(D = 0) = \theta_z + \tau_t + \mu_{izt} \tag{1}$$

$$MH_{izt} = \beta D_{zt} + \hat{\theta}_z + \hat{\tau}_t + \omega_{izt}. \tag{2}$$

Our treatment coefficient β is identified under the parallel trends assumption. Here, that assumption requires that BRFSS self-reported mental health responses in ZIP codes with 30-minute medical cannabis dispensary availability would have evolved similarly to ZIP codes without dispensary availability in a counterfactual state where they had not been treated. The 2SDID approach does not require additional identifying assumptions, though it does explicitly use the parallel trends assumption in its use of residualized fixed effects from untreated observations. We lend support to the parallel trends assumption and examine dynamics in treatment effects by estimating event study analogs of our TWFE and 2SDID approaches.

4. Results

4.1. Descriptive Statistics

Our sample consists of 180,539 respondent-quarter-years in 1,982 ZIP codes in all 62 New York counties from 2011 to 2021, after eliminating 20,133 (10.0%) observations with missing mental (4,764) health outcomes and/or ZIP codes (15,806). The BRFSS oversamples older adults: 33.3% of our sample is aged 65 and above. Approximately 33.7% of the sample reported some past-month poor mental health days in 2015, the year prior to treatment, with a mean of 3.52 days and 10.8% reporting frequent mental distress. National Survey on Drug Use and Health data indicate that 15% of adult New Yorkers used cannabis in 2015—the year before medical cannabis implementation—and increased to 17% in 2019 (Substance Abuse and Mental Health Services Administration 2023).

Appendix Figure 1 shows there were not large differences in outcomes between treatment and comparison groups in the 12 quarter-years prior to treatment. Appendix Table 1 reports differences in outcomes and sociodemographic characteristics in 2015, the year preceding treatment. Differences by age and sex are relatively small in magnitude. Those by race and ethnicity are not, suggesting sub-analyses by race and ethnicity may be inappropriate.

4.2. Baseline Results

Table 1 shows results from TWFE and 2SDID models with and without covariates. Having any self-reported past-month poor mental health days is negatively associated with 30-minute medical cannabis dispensary availability in all specifications. While the magnitudes of estimates are large (-1.54 to -4.92 percentage points (pp)), they are only significant for the 2SDID specification without covariates, which estimates a 2.31 (95% CI = -4.25 to -0.37) percentage point decrease ("intent-to-treat") in having any poor mental health days. Pre-trends tests support the parallel trends assumption. While we prefer 2SDID to TWFE, we are hesitant to conclude that medical cannabis availability decreases poor mental health days because of the smaller magnitude and lack of significance in the 2SDID results with covariates. However, given the 2SDID with covariates 95% confidence interval, -3.36 to 0.28, we can rule out that medical cannabis availability causes meaningful increases in having past-month self-reported mental health days. We estimate negative but noisy associations between medical cannabis availability and number of days of cannabis use and ≥14 days of past-month cannabis use.

4.3. Stratified Results

We proceed by stratifying our results by age, sex, and race and ethnicity for our 2SDID specifications with and without covariates in Table 2 and Appendix Table 3, respectively. We find that medical cannabis availability affects a 3.37pp (95% CI = -6.09 to -0.65) decrease in any poor mental health days among respondents aged 65 and above. Results are similar with covariates. We do not observe other significant associations between medical cannabis availability and mental health for other outcomes or other demographic groups. Most estimates are negative but noisy. Appendix Table 3 reports pre-trends tests for all demographic subgroups, which are not significant in most cases, including respondents aged 65 and above.

4.4. Robustness Checks

We vary the drive time availability threshold in Appendix Table 4. Results are consistent at 25, 30, and 35 minutes. We also exclude Manhattan from our sample in Appendix Table 5 because Manhattan residents use public transit more than the rest of the state. Our results are consistent in magnitude to our original findings, though the 2SDID estimate for the whole sample without covariates is no longer statistically significant, further suggesting this finding should be interpreted cautiously.

5. Discussion

In this study, we evaluate the geographic availability of medical cannabis' impact on self-reported mental health in New York state. We have two key findings. First, we can rule out that medical cannabis availability had meaningful negative effects on self-reported mental health among the adult population overall. This finding is broadly consistent with prior literature (Borbely et al. 2022; Sabia, Swigert, and Young 2017). However, some prior studies have found negative mental health effects for younger adults (Wang et al. 2022; Borbely et al. 2022). Our findings do not rule out such negative effects; rather, our estimates for younger adults are imprecise because younger adults are underrepresented in the BRFSS.

Our second key finding is that medical cannabis availability affected a 3.48 percentage point decrease in persons aged 65 and above reporting having any past-month poor mental health days, a nearly 10% decrease from a baseline of 36.3%. We did not find other significant effects on other measures of self-reported mental health or among different demographic subgroups. Collectively, these results suggest medical cannabis availability has limited mental health effects on the population at large, with considerable mental health benefits for older adults.

Pain relief is the likely mechanism through which medical cannabis availability reduces poor mental health days among older adults. Cannabis is effective for treating chronic neuropathic pain—the most common reported reason for medical cannabis use, the most common qualifying condition for medical cannabis licenses, and an especially prevalent condition among older adults (National Academies of Sciences, Engineering, and Medicine 2017; Nunberg et al. 2011; Boehnke et al. 2022; Nahin 2015). Prior studies are consistent with a pain relief mechanism. They have found that: (1) cannabis legalization reduces opioid prescribing and use among older adults, suggesting cannabis may increasingly be used as a substitute for pain relief (Bao et al. 2023; Bradford et al. 2018; Bradford and Bradford 2018); and (2) cannabis legalization reduces pain and increases work capacity among older adults (Sabia, Swigert, and Young 2017; Nicholas and Maclean 2019; Abouk et al. 2023).

Our finding that self-reported poor mental health days decrease by 3.37pp among persons aged 65 and above is large. Cannabis use among persons 65 and above did roughly double from the year before the state implemented medical cannabis to four years after, from 2.29% in 2015 to 4.49% in 2019 (Substance Abuse and Mental Health Services Administration 2023). Yet this increase is insufficient to accommodate such a relatively large effect—how might such an increase be possible? One explanation is that cannabis use is underreported among older persons due to stigma surrounding cannabis use, which is strongest among older populations (Dahlke et al. 2024). Another explanation is selection—older adults that stand to the most from medical cannabis tend to enroll in medical cannabis programs. There also may be intra-family spillover effects: People with a partner that benefits from cannabis use may experience improved mental health due to the partner's improved wellbeing, and/or begin using cannabis themselves but not report it because they do not have a medical cannabis license. The confidence interval of our estimate also leaves room for considerably smaller effects. We note our finding is consistent with prior literature finding improved mental health among older adults after cannabis legalization (Nicholas and Maclean 2019; Sabia, Swigert, and Young 2017; Borbely et al. 2022).

Our results demonstrate that cannabis firms' locations have a large effect on whether consumers experience downstream effects of introducing medical cannabis into a market. As states continue to regulate the locations of cannabis dispensaries, they should consider how nearby populations will be affected by cannabis availability. Such considerations are especially important given several states' efforts to advance health equity by supporting opening dispensaries in minority communities (Kilmer 2019).

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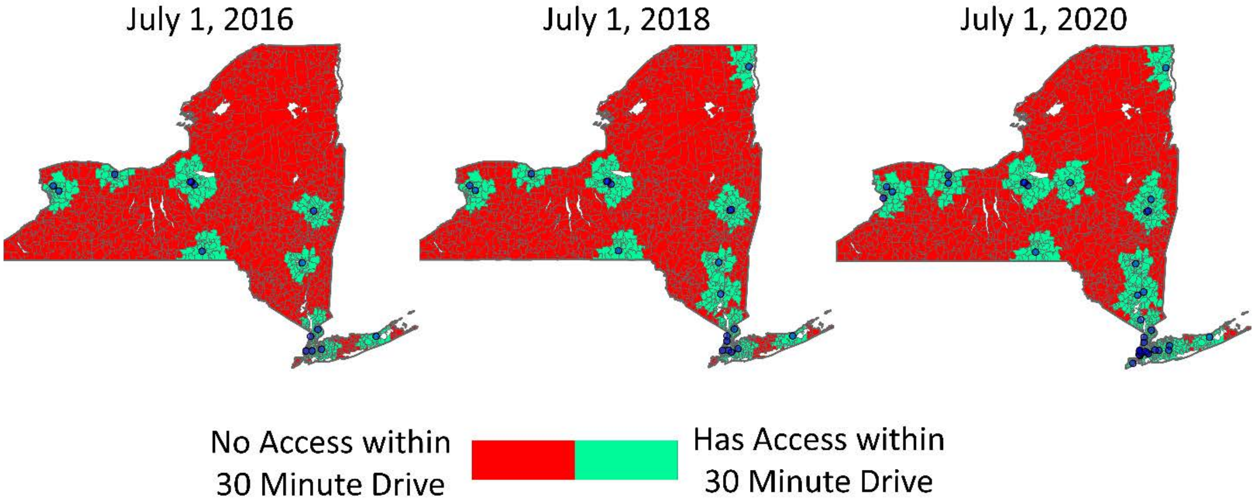
Figure 1. 30-Minute Medical Cannabis Dispensary Availability in New York State on July 1st in 2016, 2018, and 2020



Notes: Blue dots represent medical cannabis dispensaries. Car-based drive times are calculated from the geographic center of each ZIP code using Microsoft's Bing Maps application programming interface, which accounts for road structure, speed limits, traffic lights, stop signs, congestion, etc.

Table 2. Baseline Regression Results

Outcome or Model Property	Model (N = 180,539)			
	TWFE, No Covariates (1)	TWFE with Covariates (2)	2SDID, No Covariates (3)	2SDID with Covariates (4)
Self-Reported Mental Poor Mental Outcomes				
Any (0/1)	-4.92 (2.62)	-4.04 (2.77)	-2.31* (0.99)	-1.54 (0.93)
Count (#)	-0.56 (0.39)	-0.48 (0.4)	-0.20 (0.16)	-0.11 (0.15)
$\geq$2 Weeks (%)	-1.77 (1.6)	-1.58 (1.65)	-0.36 (0.62)	-0.09 (0.61)
F-Tests of Pre-Trends				
Any (0/1)	-3.16 (2.69)	-3.07 (2.87)	-0.02 (0.03)	-0.02 (0.03)
Count (#)	-0.40 (0.41)	-0.41 (0.41)	0.00 (0.00)	0.00 (0.00)
$\geq$2 Weeks (%)	-1.48 (1.68)	-1.52 (1.71)	-0.01 (0.02)	-0.01 (0.02)
Model Properties				
Covariates		X		X
Specification	TWFE	TWFE	Gardner	Gardner
Fixed Effects	ZIP code, quarter-year	ZIP code, quarter-year	ZIP code, quarter-year	ZIP code, quarter-year
Clustering	County	County	County	County

Notes: Two-way fixed effects (TWFE) models are estimated using ordinary least squares; two-stage differences-in-differences is estimated per Gardner (2021). We use survey weights in all models and cluster standard errors at the county level. See methods for a description of covariates.

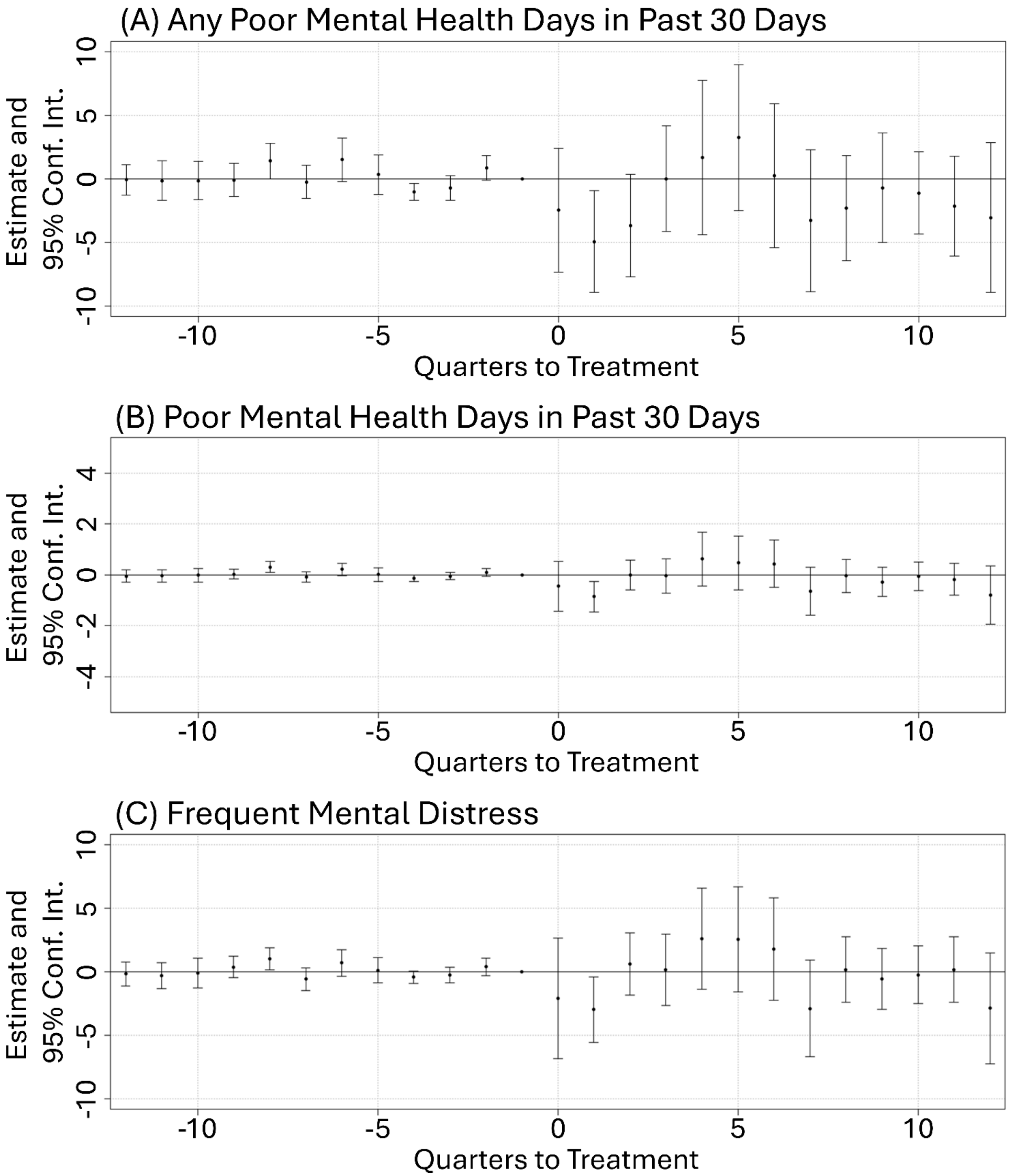
* p < 0.05 ** p < 0.01 *** p < 0.001

Table 3. Stratified Subgroup Analyses for 2SDID Model

	Self-Reported Poor Mental Health Days in Past 30 Days Outcome		
Subgroup	Any Days	Number of Days	$\geq$2 Weeks
A. Models without Covariates			
Age Group			
18-24	-1.15 (4.24)	-0.82 (0.65)	-2.36 (3.04)
25-34	-1.77 (3.04)	0.20 (0.56)	1.12 (2.28)
35-44	-0.60 (2.79)	0.13 (0.44)	1.14 (1.78)
45-54	-2.35 (2.12)	-0.09 (0.36)	-0.32 (1.4)
55-64	0.34 (1.77)	-0.10 (0.34)	-0.66 (1.28)
65+	-3.37* (1.39)	-0.39 (0.23)	-0.79 (0.9)
Sex			
Female	-2.91* (1.29)	-0.39 (0.23)	-0.94 (0.91)
Male	-2.1 (1.42)	-0.05 (0.22)	0.05 (0.89)
Race & Ethnicity			
Non-Hispanic White	0.27 (1.07)	0.13 (0.17)	0.61 (0.68)
Non-Hispanic Black	0.44 (5.92)	-0.23 (1.29)	1.04 (5.5)
Other	-6.53 (3.44)	-0.58 (0.68)	0.23 (2.76)
B. Models with Covariates			
Age Group			
18-24	-0.40 (4.30)	-0.69 (0.63)	-2.13 (2.98)
25-34	-1.33 (2.88)	0.18 (0.52)	0.99 (2.16)
35-44	-1.26 (2.76)	-0.10 (0.43)	0.45 (1.77)
45-54	-2.17 (2.03)	-0.07 (0.34)	-0.46 (1.33)
55-64	0.77 (1.67)	0.05 (0.32)	-0.04 (1.24)
65+	-3.48* (1.38)	-0.40 (0.23)	-0.90 (0.90)
Sex			
Female	-2.06 (1.19)	-0.31 (0.21)	-0.72 (0.87)
Male	-1.18 (1.4)	0.07 (0.22)	0.42 (0.89)
Race & Ethnicity			
Non-Hispanic White	0.57 (0.99)	0.18 (0.16)	0.74 (0.65)
Non-Hispanic Black	1.36 (5.92)	-0.25 (1.17)	0.72 (5.06)
Other	-5.04 (3.42)	-0.64 (0.67)	-0.12 (2.71)

* $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$

Appendix Figure 1. Event Study of Baseline Gardner Regression



Appendix Table 1. Comparison of Sample Means between Treatment and Comparison Groups

Characteristic	Pre-Treatment Mean (2015Q1-2015Q4) Mean (SD) Treated by 2018Q3 (N = 741)	Not Treated by 2018Q3 (N = 691)	Difference (SE)
Self-Reported Poor Mental Health Days Within the Past 30 Days			
Any (%)	33.2	36.2	2.98 (.01)
Count (#)	3.70	3.70	0.00 (.24)
≥2 Weeks (%)	11.6	11.5	-0.09 (.01)
Sociodemographic Characteristics (%)			
Age			
18-24	44.3	45.6	1.30 (.04)
25-34	37.3	40.9	3.61 (.03)
35-44	36.7	38.5	1.86 (.02)
45-54	36.0	36.4	0.43 (.02)
55-64	31.0	32.9	1.92 (.02)
65+	21.6	26.3	4.70 (.01)
Female	38.0	39.2	1.28 (.01)
Race & Ethnicity			
Non-Hispanic White	32.9	36.7	3.74 (.01)
Non-Hispanic Black	22.3	34.2	12.00 (.04)
Other	42.0	36.5	-5.46 (.03)
Has Children	34.7	37.1	2.43 (.02)
Unemployed	52.0	51.0	-0.97 (.02)
Student	53.6	47.6	-6.01 (.05)
Retired	22.2	26.3	4.06 (.01)
Income ≥ $50K	27.4	33.8	6.44 (.01)
≥ Some College	33.1	35.7	2.59 (.01)
Married	28.0	30.3	2.27 (.01)
Uninsured	27.6	37.4	9.86 (.03)

Notes: Sample sizes refer to unique ZIP codes. Respondent-level differences are calculated using bivariate linear regressions with county-clustered error terms.

Appendix Table 2. Full Results for TWFE, Gardner Models with Covariates

	Model	
	TWFE	2SDID
Dispensary Availability within 30 Minutes		
Treated	-4.04 (2.77)	-3.85 (7.04)
Leads (F-Test)	-3.07 (2.87)	-2.80 (2.93)
Sociodemographic Characteristics		
Age		
18-24	--	--
25-34	-2.74* (1.09)	-1.65 (1.57)
35-44	-6.71*** (1.15)	-4.18* (1.68)
45-54	-8.60*** (1.13)	-6.77*** (1.59)
55-64	-13.19*** (1.15)	-10.97*** (1.58)
65+	-20.33*** (1.24)	-18.41*** (1.68)
Female	8.01*** (0.44)	8.08*** (0.60)
Race & Ethnicity		
Non-Hispanic White	--	--
Non-Hispanic Black	-6.53*** (0.81)	-5.47*** (1.34)
Other	-4.55*** (0.69)	-2.64** (0.98)
Has Children	-0.77 (0.53)	0.13 (0.82)
Unemployed	16.15*** (0.70)	17.78*** (1.03)
Student	5.15*** (1.31)	6.26** (1.93)
Retired	-1.75** (0.62)	-0.60 (0.86)
Income ≥ $50K	-0.30 (0.50)	-1.87* (0.73)
≥ Some College	1.45** (0.49)	0.16 (0.71)
Married	-7.79*** (0.49)	-7.20*** (0.68)
Uninsured	-2.31** (0.86)	-1.29 (1.22)

* $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$

Appendix Table 3. F-Tests of Stratified Subgroup Analyses for 2SDID Model

	Self-Reported Poor Mental Health Days in Past 30 Days Outcome		
Subgroup	Any Days	Number of Days	≥2 Weeks
	A. Without Covariates		
Age Group			
18-24	-1.15 (4.24)	-0.82 (0.65)	-2.36 (3.04)
25-34	-1.77 (3.04)	0.20 (0.56)	1.12 (2.28)
35-44	-0.60 (2.79)	0.13 (0.44)	1.14 (1.78)
45-54	-2.35 (2.12)	-0.09 (0.36)	-0.32 (1.40)
55-64	0.34 (1.77)	-0.10 (0.34)	-0.66 (1.28)
65+	-3.37* (1.39)	-0.39 (0.23)	-0.79 (0.90)
Sex			
Female	-2.91* (1.29)	-0.39 (0.23)	-0.94 (0.91)
Male	-2.10 (1.42)	-0.05 (0.22)	0.05 (0.89)
Race & Ethnicity			
Non-Hispanic White	0.27 (1.07)	0.13 (0.17)	0.61 (0.68)
Non-Hispanic Black	0.44 (5.92)	-0.23 (1.29)	1.04 (5.50)
Other	-6.53 (3.44)	-0.58 (0.68)	0.23 (2.76)
	B. With Covariates		
Age Group			
18-24	-0.40 (4.30)	-0.69 (0.63)	-2.13 (2.98)
25-34	-1.33 (2.88)	0.18 (0.52)	0.99 (2.16)
35-44	-1.26 (2.76)	-0.10 (0.43)	0.45 (1.77)
45-54	-2.17 (2.03)	-0.07 (0.34)	-0.46 (1.33)
55-64	0.77 (1.67)	0.05 (0.32)	-0.04 (1.24)
65+	-3.48* (1.38)	-0.40 (0.23)	-0.90 (0.90)
Sex			
Female	-2.06 (1.19)	-0.31 (0.21)	-0.72 (0.87)
Male	-1.18 (1.40)	0.07 (0.22)	0.42 (0.89)
Race & Ethnicity			
Non-Hispanic White	0.57 (0.99)	0.18 (0.16)	0.74 (0.65)
Non-Hispanic Black	1.36 (5.92)	-0.25 (1.17)	0.72 (5.06)
Other	-5.04 (3.42)	-0.64 (0.67)	-0.12 (2.71)

* $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$

Appendix Table 4. Results with Different Drive Time Thresholds for 2SDID Model without Covariates

	Model		
	(1)	(2)	(3)
Self-Reported Mental Poor Mental Outcomes			
Any (0/1)	-2.12* (0.94)	-2.31* (0.99)	-2.16* (1.06)
Count (#)	-0.19 (0.15)	-0.20 (0.16)	-0.24 (0.17)
≥2 Weeks (%)	-0.57 (0.59)	-0.36 (0.62)	-0.59 (0.66)
F-Tests of Pre-Trends			
Any (0/1)	0.01 (0.03)	-0.02 (0.03)	-0.02 (0.02)
Count (#)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
≥2 Weeks (%)	0.00 (0.02)	-0.01 (0.02)	-0.01 (0.01)
Drive Threshold (Minutes)	25	30	35

* $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$

Appendix Table 5. Baseline Regression Results Excluding Manhattan

Outcome or Model Property	Model (N = 180,539)			
	TWFE, No Covariates (1)	TWFE with Covariates (2)	2SDID, No Covariates (3)	2SDID with Covariates (4)
Self-Reported Mental Poor Mental Outcomes				
Any (0/1)	-3.92 (2.81)	2.53* (1.00)	-1.80 (0.93)	-3.92 (2.81)
Count (#)	-0.44 (0.41)	-0.19 (0.16)	-0.11 (0.15)	-0.44 (0.41)
≥2 Weeks (%)	-1.44 (1.69)	-0.39 (0.63)	-0.16 (0.62)	-1.44 (1.69)
F-Tests of Pre-Trends				
Any (0/1)	-2.77 (2.92)	-0.02 (0.03)	-0.02 (0.03)	-2.77 (2.92)
Count (#)	-0.36 (0.42)	0.00 (0.00)	0.00 (0.00)	-0.36 (0.42)
≥2 Weeks (%)	-1.31 (1.75)	-0.01 (0.02)	-0.01 (0.02)	-1.31 (1.75)
Model Properties				
Covariates		X		X
Specification	TWFE	TWFE	Gardner	Gardner
Fixed Effects	ZIP code, quarter-year	ZIP code, quarter-year	ZIP code, quarter-year	ZIP code, quarter-year
Clustering	County	County	County	County

* $p < 0.05$ ** $p < 0.01$ *** $p < 0.001$