The Effect of Access to Mental Health Care on Health behaviors

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Abstract

Mental illnesses have been the most common health condition in America. According to CDC's report, about 20% of adults experience a mental illness each year, which is equivalent to over 50 million people in the United States. This study explores the relationship between mental health and health behaviors by focusing on the effects of the number of mental health providers on risky health behaviors and preventive health behaviors of adults younger than 65 years old using data from the 2006-2013 waves of the Behavioral Risk Factor Surveillance System (BRFSS). The analysis shows that better access to office-based mental health providers has positive effects on health and health behaviors evidenced by less drinking, more exercise, and reduced probability of obesity. There is no evidence of a significant effect of improved access to mental health care on preventive health behaviors like routine checkups and taking flu shots.

1 Introduction

Mental illnesses affect a significant portion of the American population, with approximately 20% of adults experiencing a mental illness each year, which equates to over 50 million individuals in the United States. However, only 27.7% of mental healthcare needs were met (*Mental Health Care Health Professional Shortage Areas (hpsas)*, 2022), which is largely due to limited availability and affordability to the mental healthcare system (2013). Limited affordability (Coombs et al., 2021) and availability (Deza, Maclean and Solomon, 2022*a*) are the most commonly cited barriers to access. Mental health conditions are more common when any barriers to access exist (Coombs et al., 2021). Mental illnesses can also cause changes in health behaviors as people experiencing mental illnesses may be less motivated to take care of their own health. Conditions such as bipolar disorder and major depression cause severe emotional and cognitive disruptions, resulting in difficulties in social activities. A growing literature has shown that severe mental illnesses are related to risky health behaviors evidenced by behaviors associated with HIV transmission (Carey, Carey and Kalichman, 1997; Cournos, McKinnon and Rosner, 2001; Lyon, 2001; McKinnon, Cournos and Herman, 2002; Otto-Salaj and Stevenson, 2001). Individuals who have mental health conditions have a higher tendency to smoke compared to the general population in the US, with a frequency of two to three times more depending on the clinical diagnosis (Gfroerer et al., 2013). Those diagnosed with severe mental illnesses such as major depressive disorder (Crum et al., 2013; Grant and Harford, 1995) and schizophrenia (Drake and Mueser, 2002) are also more prone to participate in alcohol abuse activities. Efforts have been made in past decades to improve access to mental healthcare in terms of both availability and affordability. At the same time, improved access to mental healthcare could influence preventive and risky health behaviors in various pathways and the effect could be both positive and negative.

First of all, as people experiencing mental illnesses may be less motivated and lose interest in exercise or other things, better information and treatment due to improved access to mental health care could lead to healthier behaviors. For example, smoking cessation drugs may significantly reduce the proportion of people smoking. Improvement in mental health conditions may also cause people to be more socially active, which may translate to more exercise or less alcohol consumption. Alternatively, improved access to mental health care may have an impact on risky and preventive health behaviors through income effects (Courtemanche

et al., 2018). Improved financial security associated with the diagnosis and treatment of mental health disorders can influence health behaviors as consumers have more money to spend. However, it can affect health behaviors in both positive and negative ways. It could translate to positive outcomes when consumers spend more on healthy food, gym membership, or preventive healthcare. On the other hand, it could lead to worsening outcomes when consumers spend more on alcohol and cigarettes. The net effect of access to mental health care is ambiguous.

This study aims to estimate the effects of access to mental health care on risky health behaviors and preventive health behaviors of adults younger than 65 years old using the 2006-2013 waves of the Behavioral Risk Factor Surveillance System (BRFSS) data. The survey data provides measures of risky health behaviors including drinks, binge drinking, smoking, and exercise. Preventive health behaviors examined by this study include routine checkups and flu shots. Two different measures of access to mental health care are examined in this study.

First, as a measure of access to mental health care, the number of office-based mental health providers is used in this study. The variation in the number of mental health providers at the county level is used to identify the effect of mental health providers on health behaviors. As a result, Using a two-way fixed effects model, we found significant effects of improved access to mental health providers on drinks and exercise. An additional office-based mental health provider per 10,000 population decreases 0.088 drinks in 30 days while one drink is defined as a 12-ounce beer, a 5-ounce glass of wine, or a drink with one shot of liquor. Better access to mental health providers also leads to a higher probability of engaging in exercise activities and a reduced probability of obesity. However, we found no effect on preventive health care including routine checkups and flu shots.

Second, there was a federal-level mental health care reform during the study period which improved access to mental health care by reducing financial barriers. Mental health coverage laws have only been implemented relatively recently while mental health is just as important as physical health. Many adults who have experienced mental illnesses report being unable to afford the necessary treatment, with 42% stating that they faced financial barriers. To help reduce the financial barriers for individuals that may not be able to afford mental health care, the federal government, as well as state governments, have put significant efforts in promoting mental health parity. The 2008 Mental Health Parity and

Addiction Equity Act (MHPAEA) that aims to reduce the financial barrier for insured individuals by requiring insurance coverage for mental health conditions to be at least as generous as insurance coverage for other medical conditions was one of the most significant changes in mental health parity at the federal level. Though, in 1996, the Mental Health Parity Act (MHPA) required that large group health plans should not put more restrictive annual or lifetime dollar limits on mental health benefits than such limits on physical health benefits, MHPAEA provided more protection such as parity on co-payment and coinsurance rate. Besides requirements at the federal level, each state may have its own state parity law. The variation in state parity law and the implementation of MHPAEA are used to identify the effect of the reduced financial barrier on risky and preventive health behaviors described previously. Using a DID model, we found that better financial access to mental health care leads to less consumption of alcohol.

The rest of the paper proceeds as follows. Section 2 discusses the legislative background of MHPAEA and state parity laws. Section 3 provides a review of existing literature. Section 4 describes the data used in this analysis. Section 5 and 6 provides the empirical model used in this study and a discussion of the results. Heterogeneity and reverse causality analysis are reported in section 7. Section 8 discusses the results of robustness checks and finally, a conclusion is in section 9.

2 Background

Despite the growing recognition of the importance of mental health, access to mental health services has historically been limited due to a lack of insurance coverage. To address this issue, states and the federal government began enacting mental health insurance laws in the mid-1990s and early 2000s aiming to ensure equal coverage for mental health services. At the state level, these state parity laws varied significantly in their strength and scope. Equal coverage of mental health care may be mandated in some states while coverage of mental health care may be optional or health plans may have different mental health benefits from physical health benefits in terms of co-payment, co-insurance rate, deductibles, and non-financial treatment limitations such as the number of visits. The state parity laws also vary in their scope as some states may apply the laws to large group insurance only or some states may have a more limited list of mental illnesses to be covered. Based on the

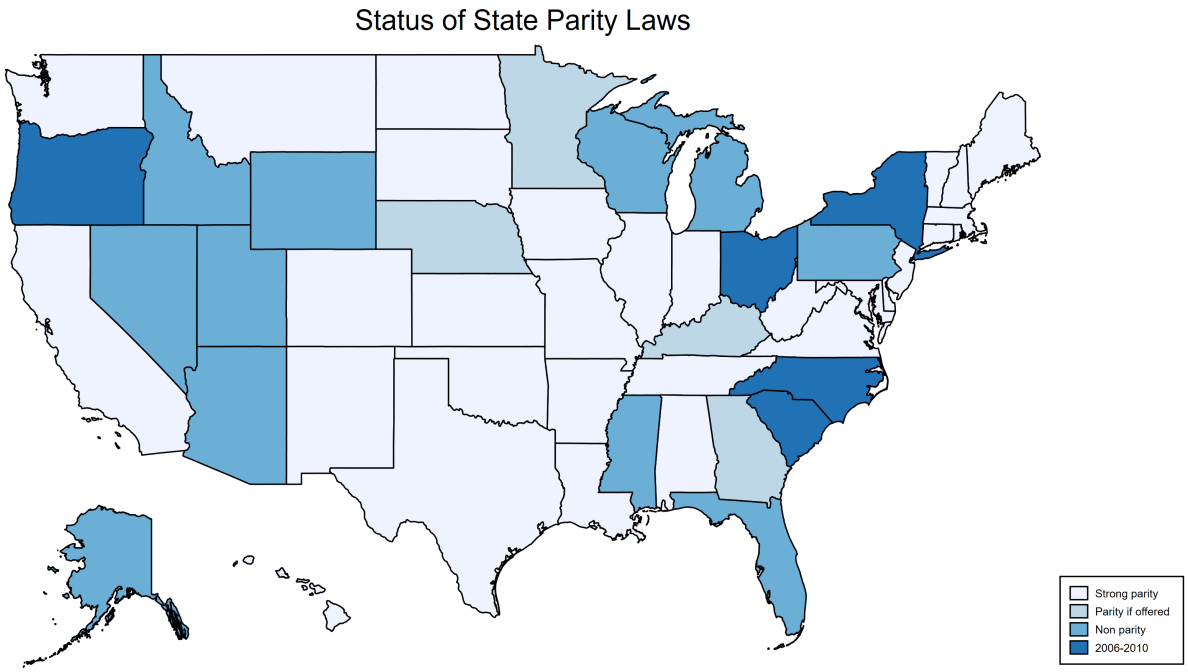

Figure 1: Status of State Parity Laws

strength and scope, state parity laws can be categorized into three groups including strong parity, parity if offered, and non-parity.

Some states recognize that mental health conditions are not a choice, but rather a medical condition that requires treatment, just like physical health conditions. These states enacted the strongest parity laws which are categorized into the strong parity group. Being in the strong parity group requires that coverage of mental health care must be included in a health plan and the coverage or benefits of mental health care cannot be more restrictive than that of physical health care. Some states enacted weaker parity laws that require equal coverage of mental health services only if they are included in a health plan. In those states, the laws allow health plans to not cover mental health at all. In this study, those states are categorized into parity if offered group. Both strong parity and parity of offered groups are considered as having better access to mental health care. The difference is that the coverage of mental health care is mandated in strong parity states and optional in parity if offered states. The last group, non-parity, includes states that have even weaker parity laws that allow more restrictive mental health benefits than physical health benefits no matter whether the coverage is mandated or not, and states that have no requirement on financial benefits of mental health care in terms of co-payment, co-insurance rate, deductible, etc. at all.

By Jan. 2006, Alaska, Arizona, the District of Columbia, Florida, Idaho, Michigan, Mississippi, Nevada, New York, North Carolina, Ohio, Oregon, Pennsylvania, South Carolina, Utah, Wisconsin, and Wyoming are considered in the non-parity group. Some states in the group including New York, North Caroline, Ohio, Oregon, South Carolina, and the District of Columbia enacted stronger state parity laws after 2006 before the federal Mental Health Parity and Addiction Equity Act (MHPAEA), making them change from non-parity states to strong parity of parity if offered. Figure 1 visualizes the types of state parity laws in a map. In addition to state efforts in promoting equal coverage of mental health care, the federal government also made efforts to ensure mental health parity. The most comprehensive federal law that requires mental health parity was the 2008 Mental Health Parity and Addiction Equity Act (MHPAEA) which amended the earlier Mental Health Parity Act (MHPA) of 1996, before the Patient Protection and Affordable Care Act (ACA). The MHPAEA that is generally effective in 2010 prohibits group health plans from imposing less favorable benefit limitations on mental health or substance use disorder benefits than on medical or surgical benefits. Before the MHPAEA, MHPA only required equal benefits of mental health care in terms of lifetime dollar limits and annual dollar limits. The MHPAEA expands the financial requirement of mental health parity to co-payments, co-insurance, deductibles, etc. in addition to lifetime dollar limits and annual dollar limits. On top of that, MHPAEA also requires that terms of treatment limitations in health plans that apply to mental health or substance use disorders benefits cannot be more restrictive than the terms that apply to substantially all medical or surgical benefits.

However, despite the stronger requirements, it is important to note that the MHPAEA does not mandate the inclusion of mental health benefits in health insurance plans. Therefore, the MHPAEA is considered parity if offered type in terms of strength. There are also exemptions. The parity requirements established by MHPAEA don't apply to individual or small group insurance where a small group is commonly defined as employers that have 50 or fewer employees.

Based on the state parity laws and MHPAEA in 2008, non-parity states change from non-parity to parity if offered by complying with MHPAEA. States that had strong parity laws or parity if offered type state laws don't need to make changes to comply with MHPAEA, which allows us to divide states into treatment and control groups and use the difference-in-differences method to study the effect of mental health parity on behavioral health out-

comes.

3 Literature Review

3.1 Health Behaviors

There has been extensive research focusing on access to healthcare and health behaviors, but previous research examined the effect of broad health insurance coverage on health behaviors. The findings are mixed. Some studies find positive outcomes of health behaviors. The Massachusetts insurance reform and Medicaid expansion had positive effects on the utilization of certain types of preventive care (Kolstad and Kowalski, 2012; Simon, Soni and Cawley, 2017) and well-patient checkups (Courtemanche et al., 2018). Some other studies found no significant effects on risky health behaviors (Simon, Soni and Cawley, 2017; Courtemanche et al., 2018; Courtemanche and Zapata, 2014). There are also studies showing worsening outcomes due to moral hazard or income effects. Dave and Kaestner found that Medicare coverage variation resulted in unhealthier behaviors in terms of drinking and smoking among older adults while Barbaresco, Courtemanche and Qi also found that the 2010 ACA Dependent Coverage Mandate increased probabilities of risky drinking among young adults. This study contributes to the literature by separately estimating the effect of mental health coverage on health behaviors instead of the effect of broad health insurance.

3.2 Access to Mental Healthcare

Many studies of the effect of access to mental health care have also been done but most of them focus on diagnosis and mental health conditions. Harris, Carpenter, and Bao (2006) studied the effect of state parity laws on mental health care utilization and found that the probability of using any mental health care increased by 20% to 40% for the lower distress and middle distress groups. No effect for the upper distress group. Li and Ma (2020) studied the effect of MHPAEA on children's health and found that mental health care utilization increased by 2.8 percentage points. (relative effect 43%) and the diagnosis of certain types of mental illness increased. Other than utilization and diagnosis, the effects of access to

mental health care on suicide rate (Lang, 2013), crime rate (Deza, Maclean and Solomon, 2022*b*; Deza, Lu and Maclean, 2022), and labor market outcomes (Andersen, 2015; Cseh, 2008) are also studied. This is the first study that examines the outcomes of risky and preventive health behaviors using changes in access to mental health care.

This study focuses on the effect of physical access to mental health providers, which is an under-explored area of research. It makes a valuable contribution to the existing literature that investigates the relationship between access to healthcare and health behaviors, but unlike most studies that concentrate on the impact of changes in broad insurance coverage which has a direct effect on preventive care prices, this study delves into the indirect and spillover effects of mental health care access on both preventive and risky health behaviors. Additionally, this study also contributes to the literature that estimates the effect of access to mental health care by examining outcomes of health behaviors. On top of that, most other studies center on healthcare reforms that target financial access to healthcare, but this study adds a new measurement of physical access by examining the influence of the number of local mental health providers.

Moreover, this study underscores the need for a holistic approach to healthcare that recognizes the interconnectedness of mental and physical health, and the importance of addressing both in order to promote overall health. Changes in health behaviors could have significant social and economic benefits, as healthier behaviors could improve people's work performance and overall well-being. Overall, this study provides important insights into the complex interplay between access to mental health care and health behaviors, which can inform policy decisions aimed at improving public health outcomes.

4 Data

The study utilized annual survey data from The Behavioral Risk Factor Surveillance System (BRFSS) to examine mental health conditions, health behaviors, utilization of health care, and preventive care among U.S. residents. BRFSS is a comprehensive telephone survey conducted across all 50 states in the United States, as well as the District of Columbia and U.S. territories. The data collected includes demographic information of respondents, as well as health-related risk behaviors such as smoking and drinking, spanning multiple years. This

allows for an analysis of changes in respondents' health behaviors over time.

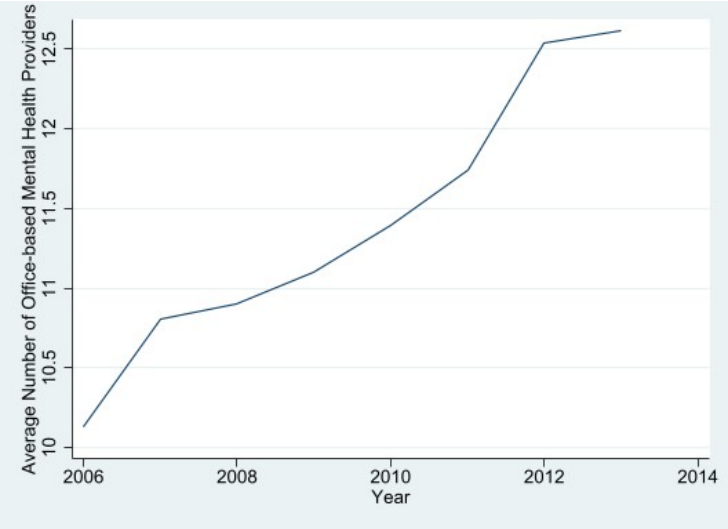

Figure 2: Trend of Average Number of Office-based Mental Health Providers

Besides demographic characteristics, the study also controls for employment and the number of mental health providers at the county level. The unemployment rate used in this study comes from the Labor Force Data by County from the U.S. Bureau of Labor Statistics. On top of that, County Business Patterns (CBP) data that has the number of mental health providers is combined with population estimates from the Census Bureau to estimate the density of mental health providers in each county. The number of mental health providers is provided by the number of the establishment of physician and non-physician mental health offices while an establishment is a physical location where mental health treatment or services are conducted. In this data set, the numbers of physician mental health offices are given under the North American Industry Classification System (NAICS) code 631112 (Offices of Physicians, Mental Health Specialists), and the numbers of non-physician offices are given under NAICS code 631330 (Offices of Mental Health Practitioners (except Physicians)). Figure 2 visualizes changes in the number of office-based mental health providers from 2006 to 2013. The number of office-based mental health providers has been increasing during this period. The variation in the number of mental health providers at the county level is used as a measurement of changes in access to mental health providers to study the effect on health behaviors. The primary analysis sample used in this study pooled data for adults younger than 65 years old from the year 2006 to the year 2013 with 182,580 observations. Table 1 shows the summary statistics of major variables that we use in this study. The first

column shows the means of those variables in the primary analysis sample. Independent variables that are used in this study include controls for gender, educational attainment, race, unemployment rate, and mental health provider density. The outcomes that the study checks on include routine checkup which is a binary variable showing whether a respondent received a routine checkup in the past year, drinks in the last 30 days where one drink is defined as a 12-ounce beer, a 5-ounce glass of wine, or a drink with one shot of liquor, times of binge drinking measured by having five or more drinks on one occasion for males or having four or more drinks on one occasion for females, stopped smoking measured by trying to quit smoking for one day or longer during past 12 months, exercise which is a binary variable of doing physical activity or exercise except their jobs during the past 30 days, flu shot indicating having a seasonal flu vaccine or not during the past 12 months, and obesity if a body mass index is greater than 30.

Besides the physical access to mental health providers, the effect of improved financial access to mental health care as a result of mental health parity laws is also analyzed using the BRFSS data. Starting in 2010, ACA Dependent Coverage Mandate allows young adult dependents younger than 26 years old to remain on their parent's private health insurance. This mandate increased the insurance coverage rate for young adults, which may bias the estimated effect of MHPAEA on behavioral health outcomes. To disentangle the effect of MHPAEA from the effect of the ACA Dependent Coverage Mandate, I restricted the sample to individuals that are 30-64 years old for the main results. States including New York, North Caroline, Ohio, Oregon, South Carolina, and the District of Columbia that enacted strong parity or parity if offered type laws after 2006 and before the federal Mental Health Parity and Addiction Equity Act (MHPAEA) are excluded from the sample. The primary sample has 133,600 observations.

Columns 2 to columns 4 in Table 1 show the summary statistics of variables used in this analysis. The second column shows the means of those variables in the control group which includes states that had strong parity or parity if offered laws before 2010. The third column shows the means of dependent and independent variables in the treatment group which includes states that were considered the non-parity group before 2010 and would be affected by the implementation of MHPAEA in 2010. Column 4 shows the t-test results between the control and the treatment group. Variables used in this study are the same as defined previously. Out of the sample, there are 74,821 observations in the pre-treatment period

before 2010.

Table 1: Summary Statistics

	(1)	(2)	(3)	(4)
	(Full sample)	Control group	Treatment group	Difference
male	0.478	0.463	0.464	-0.00121
	(0.00117)	(0.00211)	(0.00362)	(0.00419)
highschool	0.433	0.401	0.454	-0.0529***
	(0.00116)	(0.00207)	(0.00361)	(0.00413)
college	0.552	0.583	0.534	0.0495***
	(0.00116)	(0.00209)	(0.00362)	(0.00415)
black	0.103	0.0765	0.0997	-0.0232***
	(0.000711)	(0.00113)	(0.00217)	(0.00231)
asian	0.00625	0.00731	0.00163	0.00568***
	(0.000184)	(0.000360)	(0.000293)	(0.000641)
other	0.0590	0.0589	0.0463	0.0126***
	(0.000551)	(0.000996)	(0.00152)	(0.00193)
unemployment rate	6.963	5.642	5.941	-0.299***
	(0.00664)	(0.00996)	(0.0211)	(0.0211)
MHP	0.914	0.910	0.775	0.135***
	(0.00151)	(0.00262)	(0.00415)	(0.00510)
checkup	0.580	0.602	0.583	0.0189***
	(0.00116)	(0.00207)	(0.00358)	(0.00412)
drinks	3.171	2.906	3.127	-0.221***
	(0.00749)	(0.0120)	(0.0247)	(0.0252)
binge drinks	2.320	2.085	2.311	-0.226***
	(0.0124)	(0.0217)	(0.0398)	(0.0439)
stop smoking	0.570	0.544	0.547	-0.00234
	(0.00116)	(0.00211)	(0.00361)	(0.00418)
exercise	0.727	0.722	0.706	0.0155***
	(0.00104)	(0.00190)	(0.00331)	(0.00378)
flu shot	0.265	0.273	0.237	0.0359***
	(0.00103)	(0.00189)	(0.00309)	(0.00370)
obesity	0.234	0.228	0.225	0.00254
	(0.000991)	(0.00178)	(0.00303)	(0.00352)
N	182580	55831	18990	74821

b coefficients; se in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

5 The Empirical Model and Results

5.1 Physical access to office-based mental health providers

The following two-way fixed effects model is used to study the effect of the number of office-based mental health providers on risky and preventive health behaviors.

$$Outcomes_{\mathrm{i,c,s,t}} = \beta_0 + \beta_1 MHP_{\mathrm{i,c,s,t-1}} + \beta_2 X_{\mathrm{i,c,s,t}} + \lambda_{\mathrm{s}} + \gamma_{\mathrm{s,t}} + \epsilon_{\mathrm{i,c,s,t}}$$

In this research, I studied the effect on different outcomes including obesity, drinks in the last 30 days, binge drinks, stopping smoking or not in the past 12 months, routine checkup, exercise, and flu shot while i indicates a respondent, c stands for a county in state s and t indicates the year. MHP is the number of office-based mental health providers in county c and state s with a one-year lag. X is a vector of control variables including individual-level characteristics (gender, race, education attainment) and county-level characteristics (unemployment rate). The model is estimated with state fixed effects λ_{s} and state-by-year fixed effects $\gamma_{\mathrm{s,t}}$. $\epsilon_{\mathrm{i,c,s,t}}$ is the error term.

The changes in the number of office-based mental health providers over time are used to identify the treatment effect. To address possible reverse causality, the number of office-based mental health providers is lagged by one year. One assumption of the identification is that changes in the number of mental health providers are exogenous. Changes in the health behaviors examined in this study and changes in the number of offices may have unobserved confounders. For example, the number of offices and behaviors like drinking and smoking may be both related to the local economic environment. A negative shock may cause people to be more stressed and increase the use of tobacco or alcohol while the number of offices also respond to the shock by opening or closing. To address potential confounding factors, state fixed-effects are included in the analysis to control for time-invariant observable characteristics of states that may be related to both health behaviors and access to mental health providers. In addition, state-by-year fixed effects are included to account for time-varying state-specific or national-level changes. For example, the variation in state parity laws that affect coverage of mental health care and national mental health care reform resulting from the Mental Health and Addiction Parity Act of 2010. Causal effects are implied with the assumption that MHP is not correlated with the error term conditional on

those control variables, state-fixed effects, and state-by-year fixed effects.

5.2 Financial access to mental health care

As another measure of access to mental health care, variation in implementing mental health parity laws is used to study the effect on health behaviors, as well. In this part of the study, the Difference-in-differences (DID) method is adopted to examine the effect of improved financial access to mental health care on obesity, risky health behavior, and preventive health care. Following the DID method, I generated the control and treatment groups and the pre and post-treatment periods. The control group consists of states that had strong parity or parity if offered laws in the pre-period. The treatment group includes states that had no such laws in the pre-period. Pre and post-periods are defined based on the implementation of MHPAEA in 2010.

$$Outcomes_{\mathrm{it}} = \beta_0 + \beta_1 treatment_{\mathrm{it}} + \beta_2 post_{\mathrm{t}} + \gamma post_{\mathrm{it}} * treatment_{\mathrm{t}} + \theta X_{\mathrm{it}} + \epsilon_{\mathrm{it}}$$

Outcomes: the same outcomes defined previously.
treatment: treatment dummy variable which is 1 for individuals who reside in a treatment state as defined above.
post: Dummy variable which is 1 for the year 2010 and beyond.
post*treatment: Interaction term that captures the effect.
X: A vector of control variables including gender, race, education, unemployment rate, and density of mental health providers.
ϵ_{it}: Unobserved error

6 Results

6.1 Results of improved physical access

The theory behind the study is that improved access is related to mental health while mental health conditions can affect various behaviors. Given studies show that the number of office-based mental health providers is negatively related to any mental illness (AMI) diag-

Table 2: Effects of office-based mental healthcare providers on health behaviors

	(1) checkup	(2) drinks	(3) binge drinks	(4) stop smoking	(5) exercise	(6) flu shot	(7) obesity
MHP	0.00248	-0.0883***	-0.0233	0.00389	0.0151***	0.00144	-0.0132***
	(0.00337)	(0.0204)	(0.0227)	(0.00249)	(0.00281)	(0.00247)	(0.00280)
male	-0.0981***	1.136***	1.553***	-0.0344***	0.0199***	-0.0424***	0.00332
	(0.00395)	(0.0258)	(0.0316)	(0.00297)	(0.00344)	(0.00420)	(0.00369)
highschool	-0.0234**	-0.557***	-0.486***	-0.0133	0.126***	-0.0263***	-0.0485***
	(0.0109)	(0.113)	(0.148)	(0.0153)	(0.00803)	(0.00948)	(0.0119)
college	0.0268**	-1.084***	-1.014***	0.00909	0.234***	0.0433***	-0.0619***
	(0.0125)	(0.114)	(0.149)	(0.0157)	(0.00888)	(0.0104)	(0.0123)
black	0.114***	-0.330***	-0.515***	0.131***	-0.0606***	-0.0161***	0.123***
	(0.00721)	(0.0411)	(0.0485)	(0.00625)	(0.00513)	(0.00476)	(0.00592)
asian	0.0144	1.512***	0.432*	0.107***	-0.00934	0.00245	0.117***
	(0.0128)	(0.461)	(0.216)	(0.0102)	(0.0107)	(0.00991)	(0.0389)
other	0.0154***	0.546***	-0.0968*	0.0633***	-0.0275***	-0.00189	0.0400***
	(0.00553)	(0.0698)	(0.0535)	(0.00617)	(0.00467)	(0.00762)	(0.00860)
unemployment rate	0.000346	0.0160*	0.00381	0.000448	-0.00409***	-0.00340***	0.00428***
	(0.00110)	(0.00951)	(0.0114)	(0.000849)	(0.000878)	(0.00124)	(0.00107)
N	182580	182580	182580	182580	182580	182580	182580

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

nosed (Deza, Maclean and Solomon, 2022*b*), we build on the evidence and study the effect on health behaviors. Using data on diagnosed AMI in adults, they found that an additional ten offices in a county could reduce AMI by 0.1%.

Table 2 shows the two-way fixed-effects regression results for the effects of office-based mental health providers on obesity, risky health behaviors, and preventive health care. The results show that office-based mental health providers have a negative relationship with obesity. An additional office-based mental health provider per 10,000 population decreases the probability of obesity by 1.32 percentage points, which is about a 5.64% decrease relative to the sample mean. This could be the effect of treatment of mental health disorders such as depression and anxiety. Both depression and anxiety have been linked to obesity. This may be due to several factors, such as changes in physical activity levels, increased appetite, and changes in metabolism. The results show evidence that improved physical access has a beneficial effect on obesity. Reducing the probability of obesity brings a host of benefits to an individual's health. Even a modest weight loss of 5% to 10% of total body weight can lead to improvements in blood pressure, cholesterol, and blood sugars, all of which decrease the risk of chronic diseases related to obesity. For preventive health behaviors, we found no effect on routine checkups and flu shots, but there is a positive effect on doing exercise measured by doing any physical activities except their jobs. An additional office-based mental health provider per 10,000 population increases the proportion of adults that exercise in

the past 30 days by 1.51 percentage points which is a 2.07% relative effect. For risky health behaviors, improved physical access to mental health providers reduces overall drinks where one drink is defined as a 12-ounce beer, a 5-ounce glass of wine, or a drink with one shot of liquor. An additional office-based mental health provider per 10,000 population decreases overall drinks by 0.088 which is a 2.78% relative effect. However, there is no significant effect on binge drinking or attempts to stop smoking.

One potential threat to the identification strategy is reverse causality. In the study, we used the lagged number of office-based mental health providers which partially addresses the concern of reverse causality. To test for reverse causality, we formally conducted a local event study following (Deza, Maclean and Solomon, 2022*b*). A local event is defined as an increase in the number of mental health providers in the fourth year during a local event period. The event period that we selected in this study is 6 years. During the event period, a treatment group is defined as counties that had no changes in the number of office-based mental health providers over the first three years and an increase in the number of office-based mental health providers in the fourth year and equal or more number of offices at the last two years compared to the number in first three years. The control group is defined as counties that had no changes in the number of mental health providers over the entire event period. For example, the first local event occurs in 2009 within the event period from the year 2006 to the year 2011 following the design. In this event group, counties that experienced no change in the number of offices are in the comparison group. Counties that have the same number of offices at relative period t=-3, t=-2, and t=-1, and more offices at relative period t=0, and equal or more number of offices at t=1 and t=2 compared to the number of offices in t=-3 are considered the treatment group. Based on the design, there are three local event groups that have local events in the years 2009, 2010, and 2011 respectively. For each event group, the time is aligned by the relative period so that t=0 is the local event time in each group. Then the data of local event groups are stacked to form the local event study data set. Results are shown in figure 3 in the appendix. It shows that there is no pre-trend except for exercise. However, given the local event study has a much smaller sample size than the study of the baseline model, it does not necessarily mean reverse causality between exercise and the number of mental health providers. Using the lagged number of office based mental health providers makes it less concerning.

6.2 Results of improved financial access

Table 3: Effects of Financial Access to Mental Healthcare on Health Behaviors

	(1) No controls	(2) With controls
checkup	-0.0173	-0.0195
	(0.0135)	(0.0143)
drinks	-0.183***	-0.187***
	(0.0403)	(0.0395)
binge drinks	-0.0879	-0.0855
	(0.0599)	(0.0590)
stop smoking	0.0144	0.0122
	(0.00962)	(0.00756)
exercise	0.00857	0.0104
	(0.00704)	(0.00667)
flu shot	-0.00580	-0.00479
	(0.00731)	(0.00769)
obesity	0.000470	-0.00156
	(0.00411)	(0.00385)
N	133600	133600

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

We examined the effect of improved financial access to mental health care on health behaviors in the context of MHPAEA using the DID method. Table 3 shows the results of regressions from the DID model on routine checkups, drinks, binge drinks, stop smoking, exercise, flu shot, and obesity. For each outcome in table 3, we estimated a parsimonious model that only controls for treatment, post-period, and the interaction term, and a model that adds controls for individual demographic characteristics and unemployment rate. The first column shows the estimated interaction term between the treatment dummy and the post dummy without any other control variables while the second column shows the etimates with control variables including gender, race, educational attainment, and unemployment rates. The estimated coefficients of the interaction term treat*post capture the effects of MHPAEA on the outcomes shown in different rows. Based on the results, we find significant effects on drinks. The results suggest that people in the treatment states are drinking less after MHPAEA compared to the control states. People in the treatment states are expected to have 0.183 to 0.187 fewer drinks after MHPAEA relative to states that had strong parity laws or parity-if-offered laws before 2010, which is about 6.3% to 6.43% relative to the

mean of the control group in the pre-period. Based on the results, we don't see significant effects of more generous coverage of mental health care on other risky health behaviors or preventive health behaviors. Comparing the effects of improved financial access to mental healthcare to the effects of physical access to mental healthcare, physical access to mental healthcare seems to have broader effects.

The DID models have an important assumption of parallel trends in the pre-treatment periods. To examine the trends in the outcome variables including routine checkups, drinks in the last 30 days, binge drinks, stopped smoking, exercise, flu shot, and obesity, an event study is used to analyze the pre-treatment trends. The results are shown in table 9 in the appendix. The event study shows that the trend in binge drinks, flu shots and obesity may not be parallel, so the interpretation of the DID results on those outcomes needs caution. However, the parallel trend test doesn't affect the interpretation of effects on drinks since the trends are parallel evidenced by the event study results.

7 Heterogeneity

7.1 Mental health providers

In this section, we examine the heterogeneous effects on health behaviors by physician offices and non-physician offices. There may be heterogeneous effects because the two types of offices treat mental health conditions differently although they both engage in the diagnosis and treatment of mental illnesses. Physicians, who are medical doctors, have completed medical school and residency training in psychiatry, which enables them to diagnose mental illnesses and prescribe psychotropic medications such as antidepressants, antipsychotics, and mood stabilizers. They may also provide counseling and therapy, but their expertise lies in medical treatment. Therefore, they are more likely to focus on pharmacotherapy and may be quicker to prescribe medication than non-physician providers. Non-physician mental healthcare providers, such as psychologists, social workers, and licensed counselors, typically rely on counseling, therapy, and non-pharmacological interventions such as cognitive-behavioral therapy (CBT), interpersonal therapy (IPT), and family therapy to treat mental illnesses. They are also more likely to provide wrap-around services, such as connecting

Table 4: Heterogeneous Effects of Physician and Non-physician office-based mental health providers on health behaviors

	(1) checkup	(2) drinks	(3) binge drinks	(4) stop smoking	(5) exercise	(6) flu shot	(7) obesity
physician MHP	0.00366	-0.0904**	-0.00663	0.0153**	0.0183**	0.00492	-0.0201***
	(0.00650)	(0.0417)	(0.0676)	(0.00595)	(0.00691)	(0.00572)	(0.00583)
nonphysician MHP	0.00178	-0.0871***	-0.0332	-0.00288	0.0132***	-0.000621	-0.00903**
	(0.00524)	(0.0284)	(0.0427)	(0.00396)	(0.00420)	(0.00459)	(0.00374)
male	-0.0981***	1.136***	1.553***	-0.0344***	0.0199***	-0.0424***	0.00333
	(0.00395)	(0.0258)	(0.0316)	(0.00297)	(0.00344)	(0.00420)	(0.00369)
highschool	-0.0234**	-0.557***	-0.486***	-0.0133	0.126***	-0.0263***	-0.0485***
	(0.0109)	(0.113)	(0.148)	(0.0153)	(0.00803)	(0.00948)	(0.0119)
college	0.0268**	-1.084***	-1.014***	0.00899	0.234***	0.0432***	-0.0619***
	(0.0125)	(0.114)	(0.149)	(0.0157)	(0.00888)	(0.0104)	(0.0123)
black	0.114***	-0.330***	-0.516***	0.131***	-0.0607***	-0.0162***	0.123***
	(0.00720)	(0.0414)	(0.0487)	(0.00626)	(0.00519)	(0.00472)	(0.00593)
asian	0.0144	1.512***	0.432*	0.106***	-0.00937	0.00242	0.117***
	(0.0128)	(0.461)	(0.216)	(0.0102)	(0.0107)	(0.00992)	(0.0389)
other	0.0154***	0.546***	-0.0970*	0.0632***	-0.0276***	-0.00193	0.0401***
	(0.00555)	(0.0697)	(0.0535)	(0.00617)	(0.00467)	(0.00762)	(0.00859)
unemployment rate	0.000347	0.0160*	0.00382	0.000457	-0.00409***	-0.00340***	0.00427***
	(0.00110)	(0.00951)	(0.0114)	(0.000844)	(0.000878)	(0.00123)	(0.00107)
N	182580	182580	182580	182580	182580	182580	182580

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

patients with community resources, to support their overall well-being. Though the health cares that they provide have overlaps, different preference or treatment may lead to different effects on health behaviors.

Separate measurements of mental health providers are used in this part to explore the heterogeneous effect. Instead of having the aggregate measure of office-based mental health providers, the number of physician offices and the number of non-physician offices at the county level are used. The same as the baseline model, we also control for state fixed and state-by-year fixed effects, and the number of offices lagged by one year. Results are reported in table 4. We found similar effects on drinks. Both physician and non-physician offices are negatively related to total drinks and the magnitudes of effects are pretty close. While an additional physician office per 10,000 population decreases 0.090 drinks, an additional non-physician office per 10,000 population decreases 0.087 drinks. In the baseline model, we found no effect on stopping smoking while physician offices have a significant effect on smoking. As discussed above, physician offices may be more likely to prescribe smoking cessation drugs, which may cause the difference. An additional physician office per 10,000 population increases the probability of attempting to quit smoking by 1.53 percentage points, which is a 2.68% relative effect. Both physician and non-physician offices

Table 5: Effects of office-based mental health providers with other types of providers

	(1) checkup	(2) drinks	(3) binge drinks	(4) stop smoking	(5) exercise	(6) flu shot	(7) obesity
MHP	0.00294	-0.0878***	-0.0283	0.00429*	0.0157***	0.000727	-0.0135***
	(0.00314)	(0.0198)	(0.0234)	(0.00252)	(0.00281)	(0.00248)	(0.00285)
outpatient MHP	0.000843	0.0855**	-0.0582	0.00333	-0.00135	0.00425	0.00450
	(0.00594)	(0.0398)	(0.0571)	(0.00524)	(0.00546)	(0.00581)	(0.00625)
residential MHP	-0.00631	-0.0277	0.0821	-0.00631	-0.00810	0.00856	0.00318
	(0.00678)	(0.0332)	(0.0514)	(0.00385)	(0.00618)	(0.00617)	(0.00632)
male	-0.0981***	1.136***	1.553***	-0.0344***	0.0199***	-0.0424***	0.00333
	(0.00395)	(0.0258)	(0.0315)	(0.00297)	(0.00345)	(0.00420)	(0.00370)
highschool	-0.0235**	-0.556***	-0.486***	-0.0133	0.126***	-0.0262***	-0.0485***
	(0.0109)	(0.113)	(0.148)	(0.0153)	(0.00802)	(0.00948)	(0.0119)
college	0.0268**	-1.083***	-1.014***	0.00910	0.234***	0.0433***	-0.0619***
	(0.0124)	(0.114)	(0.149)	(0.0157)	(0.00888)	(0.0104)	(0.0123)
black	0.114***	-0.329***	-0.518***	0.132***	-0.0604***	-0.0164***	0.123***
	(0.00723)	(0.0412)	(0.0489)	(0.00623)	(0.00513)	(0.00466)	(0.00597)
asian	0.0144	1.514***	0.431*	0.107***	-0.00932	0.00247	0.117***
	(0.0128)	(0.461)	(0.215)	(0.0102)	(0.0107)	(0.00990)	(0.0389)
other	0.0154***	0.546***	-0.0966*	0.0633***	-0.0276***	-0.00182	0.0400***
	(0.00553)	(0.0696)	(0.0534)	(0.00616)	(0.00467)	(0.00763)	(0.00859)
unemployment rate	0.000309	0.0151	0.00474	0.000388	-0.00411***	-0.00340***	0.00425***
	(0.00109)	(0.00951)	(0.0113)	(0.000843)	(0.000867)	(0.00122)	(0.00110)
N	182580	182580	182580	182580	182580	182580	182580

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

have significantly beneficial effects on exercise and obesity. However, physician offices have a larger impact on obesity, which may be indirect evidence that medication treatment may be more effective in treating certain mental health disorders. We run a t-test for each regression to test whether the differences between the coefficients of physician MHP and non-physician MHP are statistically significant, the results show significant heterogeneous effects on smoking and obesity with the p values at 0.034 and 0.044 respectively.

We also explored the effects of other types of mental health providers including the number of outpatient and residential mental health and substance abuse centers following the two-way fixed effects model. The results are reported in table 5. Adding the number of outpatient and residential mental health providers as additional controls, we found comparable effects of office-based mental health providers on drinks, exercise, and obesity. Residential and outpatient mental health providers have no significant effects on risky health behaviors or preventive health care except that outpatient MHP increases drinking behaviors. The comparable and robust results show the importance of office-based mental health providers in this study.

7.2 Gender heterogeneity

Table 6: Gender Heterogeneous effects of office-based mental health providers

	(1) checkup	(2) drinks	(3) binge drinks	(4) stop smoking	(5) exercise	(6) flu shot	(7) obesity
Male#MHP	-0.00724*	-0.104***	-0.0944**	0.00782**	0.000188	-0.00283	-0.0120***
	(0.00420)	(0.0261)	(0.0454)	(0.00342)	(0.00306)	(0.00448)	(0.00315)
Male	-0.104***	1.503***	1.589***	-0.0368	-0.00445	-0.0135	0.00313
	(0.0272)	(0.208)	(0.337)	(0.0250)	(0.0211)	(0.0171)	(0.0219)
MHP	0.00588	-0.0379*	0.0224	0.000233	0.0152***	0.00293	-0.00771**
	(0.00385)	(0.0220)	(0.0250)	(0.00272)	(0.00330)	(0.00375)	(0.00329)
N	182580	182580	182580	182580	182580	182580	182580

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

In this section, we explore gender heterogeneity. Women are more likely to experience depression and anxiety disorders than men. In contrast, men are more likely to experience substance abuse and addiction, conduct disorders, and personality disorders. There are differences in how men and women respond to mental health treatment. For instance, some studies have suggested that women may be more responsive to psychotherapy, while men may benefit more from medication-based treatments (Kornstein and Schneider, 2001). Women may also be more likely to seek out social support and engage in self-care practices, while men may be more resistant to seeking help due to social stigma. In this section, the effects of physical access to mental health providers for males and females are estimated by adding interaction terms between gender and other control variables. The results of the effect on risky health behaviors, preventive health care, and obesity are reported in table 6. Based on the results, the effects for females are captured by the estimated coefficients of office-based mental health providers (MHP). The findings are consistent with the main results from the baseline model but with different magnitudes of the effects. Improved physical access to mental health providers has effects on obesity and exercise, and drinks in positive ways. We do find heterogeneous effects which are captured by the interaction term between gender and office-based mental health providers. The results show that the effects of mental health providers on drinks, stop smoking and obesity are significantly larger for males. With an additional office-based mental health provider, males decrease total drinks by 0.104 drinks more than females, and the decreased probability of obesity for males is 1.2 percentage points higher than that for females. While there is no significant effect of office-based mental health providers on smoking for females, the probability of attempting to stop smoking increases 0.782 percentage points more than that for females. The effect

on exercise is not significantly different between males and females. Though the results show heterogeneous effects on binge drinks and checkups, we don't find significant effects on those behaviors in the baseline model or in the subsample of females.

8 Robustness Checks

8.1 Control for Non-mental Health Providers

Table 7: Robustness Check: Adding Control For Non-mental Health Providers

	(1) checkup	(2) drinks	(3) binge drinks	(4) stop smoking	(5) exercise	(6) flu shot	(7) obesity
MHP	0.00155	-0.0860***	-0.0102	0.00438	0.0124***	0.00360	-0.00968***
	(0.00364)	(0.0219)	(0.0259)	(0.00308)	(0.00314)	(0.00310)	(0.00294)
OHP	0.000388	-0.000977	-0.00543	-0.000202	0.00110*	-0.000895	-0.00144**
	(0.000616)	(0.00400)	(0.00581)	(0.000528)	(0.000568)	(0.000578)	(0.000598)
N	182580	182580	182580	182580	182580	182580	182580

Standard errors in parentheses
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

One may argue that the effects on obesity, drinking, and exercise may be caused by other non-mental health care providers such as primary doctors' offices. In addition to the main analysis of physical access to mental healthcare, we add control for other non-mental health providers at the county level. The model and sample used in this analysis are the same as those used in the main analysis. We add one-year lagged data of the number of other non-mental health providers per 10,000 population to the main analysis and the results are shown in table 7. We find that other non-mental healthcare providers also have impacts on obesity. But based on the robustness check, adding the control for other non-mental health providers doesn't change the effects that we found in the main analysis. Improved physical access to mental healthcare still has beneficial effects on drinking, smoking and obesity and the effects are comparable.

8.2 States with Strong Parity Laws vs Treatment

In addition to the main analysis of financial access to mental healthcare, states that had weaker mental health parity laws (parity if offered type) are excluded from the sample to check the robustness of alternative definitions of parity status. The sub-sample used in this

analysis consists of only states that had strong parity laws and states that were non-parity type, while the strong parity group is the control group. The results are shown in table 8. We found comparable results to the main analysis. The effect on drinking is robust and there still are no effects on other preventive or risky health behaviors.

Table 8: Effects of Financial Access to Mental Healthcare on Health Behaviors Excluding Parity-if-Offered States

	(1) No controls	(2) With controls
checkup	-0.0198	-0.0208
	(0.0134)	(0.0139)
drinks	-0.169***	-0.167***
	(0.0406)	(0.0388)
binge drinks	-0.0743	-0.0683
	(0.0624)	(0.0606)
stop smoking	0.0127	0.0108
	(0.00973)	(0.00761)
exercise	0.00977	0.0106
	(0.00727)	(0.00681)
flu shot	-0.00588	-0.00567
	(0.00732)	(0.00761)
obesity	0.00114	-0.000703
	(0.00430)	(0.00416)
N	121384	121384

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

9 Conclusion

In conclusion, the study finds that the availability of office-based mental health providers has beneficial effects on health evidenced by obesity and positive effect on exercise, with more adults engaging in physical activities except for their jobs. In terms of preventive care evidenced by routine checkups and flu shots, we found no significant effect. For risky health behaviors, we found better physical access to mental healthcare is associated with fewer drinks indicating that improved physical access to mental health providers reduces drinking behaviors. However, we found no significant effect on other risky health behaviors such as binge drinking. Physician offices of mental health providers have a positive effect on at-

tempts to quit smoking. The study also examines the effects of improved financial access to mental health care in the context of MHPAEA using the DID method. The results show that after the implementation of MHPAEA, people in the treatment states are drinking less. However, there is no significant effect of more generous coverage of mental health care on other preventive care or risky health behaviors.

Out of the four different types of mental health providers, the variation of office-based mental health providers drives the effect on the outcomes examined in this study. The heterogeneous effects on obesity by physician offices and non-physician offices evidence that physician offices may have a larger impact on health behaviors. There are also heterogeneous effects between males and females. There are generally larger effects for males.

This study provides the first study on the effect of physical access to mental health care measured by office-based mental health providers on risky health behaviors, preventive health care, and health outcome evidenced by obesity. It shows that improved access to mental health care has positive effects on health behaviors. Improved access is related to healthier behaviors evidenced by less drinking, more exercise, and reduced probability of obesity.

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Appendix

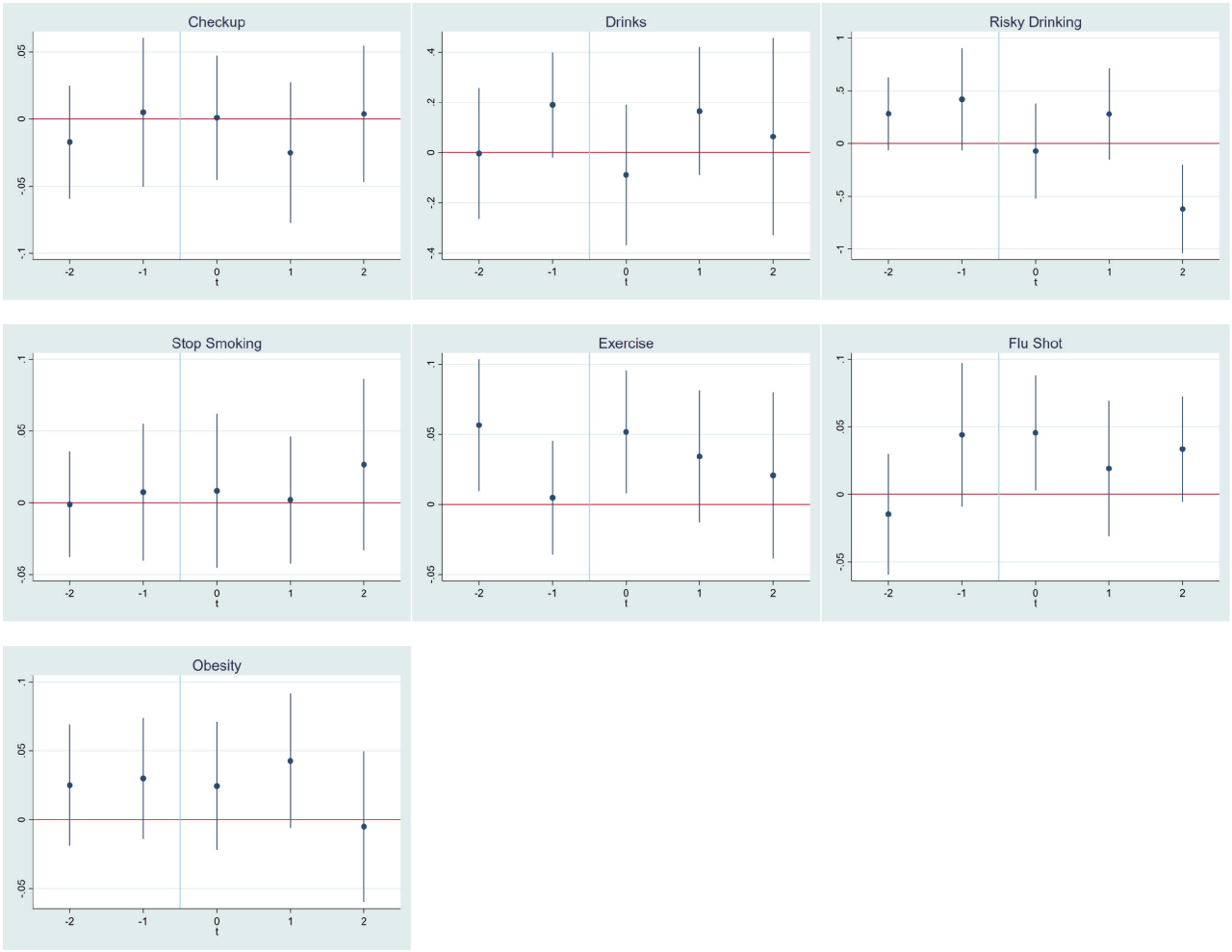

Figure 3: Trends by the Local Event Study

Table 9: Event Study Results of Effects of Financial Access to Mental Healthcare

	(1) checkup	(2) drinks	(3) binge drinks	(4) stop smoking	(5) exercise	(6) flu shot	(7) obesity
				Panel A: Without control variables			
treatment	-0.0220	0.169*	0.433**	-0.0000255	-0.0148	-0.0262**	-0.00733
	(0.0204)	(0.0912)	(0.163)	(0.0150)	(0.0165)	(0.0119)	(0.0103)
2006.year#treatment	0.00840	0.0591	-0.263	0.0102	0.00148	0.0126	0.00219
	(0.0137)	(0.132)	(0.162)	(0.0119)	(0.00997)	(0.00908)	(0.0114)
2007.year#treatment	0.0153	0.0403	-0.306*	-0.00860	-0.00746	-0.0280**	-0.00397
	(0.0160)	(0.0852)	(0.154)	(0.0159)	(0.0109)	(0.0106)	(0.00968)
2008.year#treatment	-0.0153	0.100	-0.185	0.0160	-0.00337	-0.0103	0.0259**
	(0.0114)	(0.0706)	(0.167)	(0.0154)	(0.0139)	(0.00904)	(0.0122)
2010.year#treatment	-0.0225**	-0.121*	-0.270**	0.00751	-0.00290	-0.0160*	0.00311
	(0.0111)	(0.0674)	(0.104)	(0.0114)	(0.0105)	(0.00949)	(0.00928)
2011.year#treatment	-0.0178	-0.102	-0.119	0.0226**	0.0124	-0.0274**	0.00924
	(0.0152)	(0.0807)	(0.140)	(0.00903)	(0.0110)	(0.0110)	(0.0101)
2012.year#treatment	-0.00420	-0.162*	-0.479***	0.0222*	0.0150	-0.00951	0.00424
	(0.0159)	(0.0873)	(0.134)	(0.0131)	(0.0130)	(0.0100)	(0.00722)
2013.year#treatment	0.221***	0.863	-0.532	0.0189	0.0345	0.0902	-0.0160
	(0.0786)	(0.993)	(1.138)	(0.144)	(0.0467)	(0.0581)	(0.0397)
				Panel B: With control variables			
treatment	-0.0260	0.153*	0.432***	-0.00239	-0.00765	-0.0133	-0.0112
	(0.0199)	(0.0825)	(0.154)	(0.0129)	(0.0151)	(0.0120)	(0.00907)
2006.year#treatment	0.0112	0.0669	-0.278	0.0115	0.00139	0.00488	0.00268
	(0.0150)	(0.122)	(0.171)	(0.00984)	(0.0123)	(0.00965)	(0.00894)
2007.year#treatment	0.0179	0.0613	-0.309**	-0.00677	-0.00753	-0.0366***	-0.00265
	(0.0169)	(0.0765)	(0.152)	(0.0131)	(0.0124)	(0.0104)	(0.00830)
2008.year#treatment	-0.0141	0.0939	-0.199	0.0157	-0.00112	-0.0127	0.0247**
	(0.0116)	(0.0641)	(0.164)	(0.0136)	(0.0141)	(0.00952)	(0.0106)
2010.year#treatment	-0.0235**	-0.118**	-0.264***	0.00737	-0.00168	-0.0160*	0.00294
	(0.0107)	(0.0580)	(0.0978)	(0.0106)	(0.0115)	(0.00941)	(0.00840)
2011.year#treatment	-0.0187	-0.119	-0.136	0.0211**	0.0131	-0.0256**	0.00692
	(0.0154)	(0.0710)	(0.127)	(0.00821)	(0.0112)	(0.0102)	(0.0103)
2012.year#treatment	-0.00473	-0.147*	-0.467***	0.0225*	0.0140	-0.0130	0.00489
	(0.0160)	(0.0785)	(0.140)	(0.0121)	(0.0136)	(0.0113)	(0.00779)
2013.year#treatment	0.237***	0.803	-0.673	0.0294	0.0149	0.0775	-0.00742
	(0.0790)	(0.897)	(1.123)	(0.149)	(0.0512)	(0.0488)	(0.0395)
N	133600	133600	133600	133600	133600	133600	133600

Standard errors in parentheses

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$