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Mental Health is Wealth Too: Did the Affordable Care Act Medicaid Expansion Improve Mental Health Outcomes?

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By

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ABSTRACT

The ongoing COVID-19 pandemic has greatly exacerbated mental health, which has long been a growing problem in the United States; poor mental health not only jeopardizes the well-being of Americans but also has severe implications for America's economy. Not only do mental health conditions have significant costs of treatment, but the absenteeism, presenteeism, early retirement, and mortality stemming from poor mental health also severely impact productivity. One health policy that could alleviate this problem is Medicaid expansion. The Affordable Care Act gave states the choice to expand Medicaid eligibility for individuals with incomes up to 138% of the federal poverty level. The resulting increases in health coverage, utilization, and outcomes have been comprehensively examined by the literature; however, the association of Medicaid expansion with mental health outcomes has only been tangentially explored. This paper uses panel data from the Behavioral Risk Factor Surveillance System, American Community Survey, and Wide-ranging Online Data for Epidemiological Research database to analyze differences in mental health outcomes between expansion and non-expansion states. Utilizing difference-in-differences regression models, I intend to estimate the effects of Medicaid expansion on depression prevalence, suicides, and accidental drug overdose deaths. This study finds that Medicaid expansion was associated with a significant increase in deaths from unintentional overdose and depression prevalence. The link between expansion and suicides is found to be inconclusive. These results hold widespread implications for mental health policy in the United States.

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CHAPTER ONE

INTRODUCTION

I. Mental Health in the United States

While much of the focus of the United States healthcare system has been on addressing physical chronic conditions such as diabetes or cancer, mental illness has always been a critical and growing threat to the health and well-being of Americans. From 2017 to 2018, the number of adults with mental illness increased by 19%—a staggering addition of 1.5 million people (Mental Health America, 2021). The ongoing COVID-19 pandemic has further exacerbated mental illness to levels never seen before. Emotional distress caused by loved ones suffering through the disease, stress resulting from lost opportunities caused by the pandemic, and social isolation imposed by quarantine have had major adverse impacts on the mental health of Americans. From June 2019 to June 2020, adults reported increased levels of mental illness, substance use, and suicidal ideation (Czeisler et al., 2020). Furthermore, the prevalence of anxiety disorder tripled and the prevalence of depressive disorder quadrupled. The problem of mental illness is not only limited to adults; in fact, adolescents and older children are disproportionately affected by mental health conditions. In 2017, over one-fifth of Americans aged 9-17 years had a diagnosable mental health condition, with the most common being anxiety, mood, attention, and behavioral disorders (Committee on Adolescent Health Care, 2017). Two prevalent mental disorders in the US are Major Depressive Disorder (MDD), also known as depression, and substance use disorder (SUD).

Depression is both prevalent and deadly in the US. In 2017, 17.3 million adults, 7.1% of all adults, had at least one major depressive episode (National Institute of Mental Health, 2021a). In that same year, over 3.2 million adolescents aged 12-17, 13.3% of all adolescents, had at least

one major depressive episode. Depression, in turn, increases the risk of suicide—in fact, "Depression and [SUD]s, mostly alcohol, are the most prevalent diagnoses among suicide victims" (Brådvik, p. 1, 2018). Deaths from suicide are also far-reaching across the US. In 2019, suicide was the tenth leading cause of death overall (National Institute of Mental Health, 2021b). While suicides are *a* leading cause of death, drug overdoses are *the* leading cause of accidental death, with opioids being the most common drug (Schiller et al., 2021).

Drug overdose rates have steadily increased since 1999, recently skyrocketing in the mid-2010s because of the widespread misprescription and abuse of opioids. In 2019, 70,000 Americans died from a drug overdose with 40,000 dying from synthetic opioid misuse alone (National Institute on Drug Abuse, 2021). Other major drugs involved in the overdose epidemic are psychostimulants (e.g. methamphetamine), prescription opioids, benzodiazepines, and antidepressants. The rising prevalence of depression and SUDs has greatly exacerbated rates of suicide and drug overdose, respectively, in the US. The worsening state of mental health in the US does not bode well for its economy either.

II. Economic Impact of Mental Disorders in the United States

The growing crisis of mental health in the United States is of paramount concern to economists because its direct negative effect on health outcomes has subsequent widespread impacts on the American economy. The massive economic costs of mental disorders on populations are both direct and indirect. While direct costs, costs that arise from treatment for mental disorders in the healthcare system, are relatively easy to quantify, indirect costs, costs that result from income losses and lost production, are much more difficult to measure (Trautmann et al., 2016). For example, direct costs such as medical bills for hospitalization or medications are

much more obvious than indirect costs that include the potential loss of productivity resulting from work absence, early retirement, and even mortality.

Nevertheless, direct costs are only the tip of the iceberg when estimating the total economic impact of mental disorders. Costs of treatment are proportionally lower compared to the substantial losses that stem from lack of productivity and the resulting inhibition of economic growth (Trautmann et al., 2016). Mental disorders are the leading causes of absenteeism, presenteeism, sick leave, work accidents, unemployment, and early retirement (Pinheiro et al., 2017). Greenberg et al. (2003) found that in 2000, the indirect costs of absenteeism, presenteeism, and unemployment caused by depression in the US were 51.5 billion dollars, comprising 62% of the total economic costs and over 5% of the country's GDP at the time. Furthermore, In 1995, the total economic costs of substance abuse were estimated to be 428.1 billion dollars, approximately 5.6% of the country's GDP at the time. Clearly, mental illness is a major impediment to economic growth; poor mental health leaves a huge indirect burden on economic output. Thus, it is imperative to economists that mental illness be addressed. Recent health legislation has given hope with regards to alleviating the current mental health crisis.

III. History of Medicaid and Importance of Health Insurance

In 1965, President Lyndon B. Johnson signed the Social Security Amendments, establishing two major healthcare programs that have since revolutionized the United States healthcare system: Medicare and Medicaid. While both programs aim to provide health insurance to groups of underserved individuals, they are funded by different governmental sources. Medicare provides insurance primarily to elderly Americans aged 65 and older as well as a small subset of younger Americans that have a qualifying disability status. This program

derives most of its funding from the federal government, mostly in the form of payroll taxes (Centers for Medicare and Medicaid Services, 2021a). In contrast, Medicaid, which mainly provides insurance to low-income Americans, is jointly funded by federal and state governments. Specifically, the federal government pays a calculated percentage of Medicaid expenditures to each state so that it can fund and manage its own unique version of Medicaid (Centers for Medicare and Medicaid Services, 2021b).

Health insurance coverage is important to health outcomes because it has critical implications for health service utilization. Freeman et al. (2008) conducted a systematic review of just under 10,000 studies on empirical relationships between health insurance, utilization, and outcomes, discovering that greater health insurance coverage consistently resulted in higher utilization; greater utilization subsequently resulted in better outcomes. More specific to the realm of mental health, mental health parity laws are legislation that requires equal treatment of mental health conditions in insurance plans compared to physical conditions, with the intended effect of increasing insurance coverage for patients with mental conditions. Research has shown that these laws increase mental health care utilization 12 months after enactment (Harris et al., 2006 as cited in Lang, 2010). There is not much research that has explored the effect of mental health service utilization specifically on mental health outcomes. Nevertheless, we can assume that the same causal relationship between utilization and outcomes applies to mental health conditions as well.

Medicaid's expansion of health insurance coverage holds positive implications for mental health service utilization and outcomes. One recent major amendment to Medicaid, its expansion under the Affordable Care Act (ACA), intends to increase coverage of Americans to an even greater degree.

IV. Affordable Care Act and Medicaid Expansion

Signed by President Barack Obama in 2010 and fully implemented in 2014, the ACA represented the US healthcare system's most significant reform since the Social Security Amendments by greatly expanding health insurance coverage and overhauling market regulations for health insurance purchases (Centers for Medicare and Medicaid Services, 2021c). 20% of adults were uninsured in 2010 compared to 12% in 2016 (Collins et al., 2019). Furthermore, gaps in coverage have decreased since the enactment of the ACA: 57% of adults had a coverage gap of at least a year in 2012 compared with 31% of adults in 2018.

Perhaps the most controversial provision of the ACA was its expansion of eligibility for citizens and legal residents with income up to 138% of the federal poverty line. In fact, the Supreme Court ruled that forcing every state to implement Medicaid expansion was unnecessarily coercive and allowed states to decide whether or not they wanted to expand or continue at pre-ACA eligibility levels (*National Federation of Independent Business v. Sebelius*, 2011). Despite 12 states not having expanded Medicaid eligibility as of October 2021, numerous studies conducted on the remaining 38 states have found that Medicaid expansion was associated with significant increases in coverage, health service utilization, quality of care, and Medicaid spending (Kaiser Family Foundation, 2021; Mazurenko et al., 2018). These effects have subsequently led to better health outcomes overall for the residents of states that have expanded. For example, one study found that expanding Medicaid eligibility resulted in a higher probability of having low or mild psychological stress for low-income parents (McMorrow et al., 2016). Another study found that increased Medicaid spending on antidepressants was associated with

reductions in suicides for both adults and youth (Cueller & Markowitz et al., 2006). It is evident that Medicaid expansion is associated with more favorable mental health outcomes.

V. Contribution and Organization of this Paper

. While the current literature has deeply explored the effect of Medicaid expansion on health outcomes, it does not extensively cover the effect of mental health outcomes, specifically mortality that results from poor mental health. These studies instead look at outcome variables correlated with mental health, mainly the access and utilization of mental health care after Medicaid expansion. Using data from the Centers for Disease Control and Prevention (CDC) as well as the United States Census Bureau, this paper aims to investigate whether or not mental illness mortality has changed in the states that have participated in Medicaid expansion. If Medicaid expansion is ultimately beneficial to the US economy, it should lead to lower suicide and drug overdose rates in the states that have expanded. Specifically, I would like to explore how the outcome variables of depression prevalence, suicides, and drug overdose deaths are affected by the predictor variable of state participation in Medicaid expansion. All three outcome variables will be analyzed at the state level. The findings of this paper could potentially provide another strong reason in the argument for states to adopt Medicaid expansion.

This paper will first review current existing literature on the effect of Medicaid expansion on mental health care access, mental health utilization, and mental health outcomes. Next, data, variable definitions, and econometric equations used for analysis will be described. Difference-in-differences analyses will then be conducted. Following the analysis will be a presentation of the results and a discussion of the findings. Lastly, the paper will draw conclusions, explain possible implications, and give suggestions for future research.

CHAPTER TWO

REVIEW OF MEDICAID EXPANSION AND MENTAL HEALTH OUTCOMES

This chapter provides a review of the current literature regarding the effect of Medicaid expansion on access to mental health care and subsequent mental health outcomes. The chapter will begin by describing the various determinants of mental health in order to explain the associations between Medicaid expansion, mental health access and utilization, and eventual mental health outcomes.

I. Determinants of Mental Health

One of the most critical determinants of an individual's mental health is their access to mental health care. Due to the difficulty in observing and characterizing mental illness relative to physical ailments, disorders involving mental health have long been faced with ignorance and stigma. It was not until the 20th century, when many unfounded superstitions involving mental illness were cast aside in lieu of scientific thought, that mental health care began advancing rapidly in the United States (Foerschner, 2010). In recent years, access to mental health care has increased, leading a growing number of people to seek treatment for mental illness. In 2018, there were 55.7 million physician office visits and 4.9 million emergency department visits concerning mental disorders (National Center for Health Statistics, 2021). However, in general, access to healthcare has still been limited by Americans who are involuntarily uninsured. This is because of the unique third-party payer system of the United States healthcare system, where exorbitant medical costs have made it necessary for patients to enroll in insurance in order to receive treatment, health insurance is critical for access to healthcare. Although Medicaid provides insurance to over 71 million low-income Americans, a substantial proportion of low-

income families still earn too much to be eligible for coverage, especially in states that have not opted into Medicaid expansion (Centers for Medicare and Medicaid Services, 2020). This coverage gap is of serious concern because it hinders access to care, which leads to lower health service utilization and worse health outcomes.

Aside from access to healthcare, the quality of care received is also an important determinant of mental health. A common economic method used to evaluate both the cost and quality of different medical interventions is cost-effectiveness analysis, which calculates the incremental cost-effectiveness ratio (ICER) of distinct methods of treatment. ICERs measure the cost of a particular treatment relative to the quality-adjusted life-years (QALYs) which is a measurement of both the quantity and quality of life lived (one QALY is equal to one year with perfect health). Studies on the cost-effectiveness of primary care for depression have found that it is generally very cost-effective. Although the interventions used in these studies vary in cost and levels of intensity, all ICERs calculated between them fall in a narrow range from 10 to 35 dollars per depression-free day or 3,650 to 12,775 dollars per QALY gained (Schulberg, 1996; Coulehan, 1997; Lave et al., 1998; Simon et al., 2001). This range is lower than that of treatments for existing physical conditions, which have ICERs mostly ranging from 10,000 to 50,000 dollars per QALY gained (Cohen et al., 2008). When assessing the cost-effectiveness of treatments for substance use disorders (SUDs), the literature almost solely explores treatments for opioid use disorders. Fairley et al. (2021) found that most common treatments for opioid use disorder were highly cost-effective, with methadone-only treatment costing 16,000 dollars per QALY gained, methadone treatment combined with overdose education and naloxone distribution costing 22,000 dollars per QALY gained, and buprenorphine treatment combined with overdose education, naloxone distribution, and contingency management costing 42,000

dollars per QALY gained. In general, the relatively low ICERs of mental health interventions compared to those of physical health interventions demonstrates the lower cost and higher quality of mental health care. However, the access, cost, and quality of mental health care can be greatly impacted by socioeconomic and demographic factors, leading to indirect negative effects on the mental health outcomes of Americans.

The social determinants of mental health describe the social, economic, and physical environments of individuals, variable at each stage of life, that affect their mental health. Public health experts reason that social determinants act by producing certain environmental stressors. The persistence of these stressors chronically activates major neurosomatic stress pathways, triggering adverse physiological responses in the brain and eventually leading to mental disorders (Fisher & Baum, 2010). While the literature has explored a myriad of social determinants that have been shown to affect mental health, determinants with the strongest and most consistent associations with poor mental health for individuals include low income, low education, unemployment, unmarried, female sex, and discrimination based on race, sex, sexual orientation, and employment (Alegría et al., 2018; Compton & Shim, 2015; Coombs, 1991; Sederer, 2016; Shim et al., 2014; Silva et al., 2016). Various social determinants of mental health can not only have a direct physiological impact on the mental well-being of individuals, but can also affect the care determinants of mental health: access, cost, and quality of mental health care. Unemployment and income limit access to healthcare when health insurance cannot be afforded, even despite Medicaid's existence (Pharr et al., 2012). Stigma and discrimination, especially against mental illness, may also limit access and quality of care. For example, language-based discrimination and negative attitudes toward professional mental health services were associated with a lower likelihood of Chinese Americans seeking out professional mental health treatment

(Spencer & Chen, 2004). Overall, both the social and medical determinants of mental health must be addressed when studying mental health outcomes because they all affect an individual's mental well-being.

II. Impact of Medicaid Expansion on Access and Utilization of Mental Health Care

As of April 2021, over 75.4 million Americans are enrolled in Medicaid. This represents a 36.1% increase compared with the baseline of 55.4 million Americans in December 2013, right before states began expanding their Medicaid programs (Centers for Medicare and Medicaid Services, 2021d; Snyder et al., 2014). Even before the ACA Medicaid expansion, previous expansions of Medicaid eligibility were shown to significantly improve health coverage and access to care. McMorrow et al. (2016) explored the effect of previous non-ACA expansions of Medicaid eligibility from 1997 to 2009. They found that for every 100 percentage point increase in the income threshold for eligibility, there was a 10.5 percentage point increase in the proportion of low-income parents with Medicaid. The positive effect of the ACA Medicaid expansion on health insurance enrollment is directly observed in Courtmanche et al. (2016). Using difference-in-differences analysis, they found that full implementation of the ACA increased the percentage of insured individuals by 5.9 percentage points in states that opted into Medicaid expansion compared with an increase of only 2.9 percentage points in states that did not opt in. Furthermore, a systematic review of 304 studies exploring the effect of Medicaid expansion on access to care found that three-quarters of the analyses reported increased coverage among all potentially eligible individuals, even when controlling for major social determinants of health including race/ethnicity, age, marital status, and income (Mazurenko et al., 2018). Evidently, Medicaid expansion has greatly improved general health insurance coverage since its

implementation. This trend not only applies to those with physical illness, but also to individuals with mental health disorders.

More specific to the realm of mental health, a few studies have explored the effect of Medicaid expansion on access to care for patients with mental disorders. Blazoski & Maio (2021) found that Medicaid expansion was associated with an increase in the coverage of individuals with mental health disorders and SUDs. Fry & Sommers (2018) found that Medicaid expansion was associated with a significant decrease in the proportion of depressed adults that were uninsured. However, it should be noted that the sample size of this study was relatively small at 5,000 respondents and there was a low survey response rate of 22% which could be subject to nonresponse bias. With regards to Medicaid expansion's impact on access to treatments for SUDs, the evidence generally supports that the effect is positive. Sharp et al. (2018) found that prescriptions of buprenorphine and naltrexone, two common treatments for opioid use disorder, skyrocketed by more than 200% after states opted into Medicaid expansion. Another study found that states that opted into expansion had 78.2 more prescriptions per year for naloxone, used to treat opioid overdose, compared with states that did not opt in (Frank & Fry, 2019). However, it is unclear if an increase in the use of naloxone could be due to a worsening of the United States opioid epidemic, which would increase the likelihood of opioid overdose and subsequent administration of naloxone.

By improving health coverage, one could argue that Medicaid expansion has also increased the utilization of mental health services. The literature has generally supported this trend. Han et al. (2020) used a difference-in-differences approach on data collected from the Medical Expenditures Panel Survey from 2007 to 2015, finding that yearly outpatient visits for mental health conditions increased by 0.513 visits per person in states that expanded. However,

this increase was only limited to Hispanics and Non-Hispanic Whites—there was no change in outpatient visits observed among Non-Hispanic Blacks. Furthermore, there was no significant change in the number of mental health-related hospital stays, emergency department visits, or prescription fills and no significant increase in the number of users of outpatient mental care, which demonstrates that Medicaid expansion may have not had a significant contribution to mental health care access. In contrast, another study conducted a year later using the Healthcare Cost and Utilization Project's Fast Stats Database found that Medicare expansion was associated with a slight but significant increase of 0.35 non-Medicare emergency department visits by adults with mental disorders per 1,000 people (Jayawardhana, 2021). Compared to Han et al., this study also observed a larger time period, from 2006 to 2019, which bolsters the accuracy of its findings. The literature provides conflicting results on the effect of expansion on the utilization of common treatments for SUDs. Wen et al. (2017) found that Medicaid expansion was associated with a 70 percent increase in buprenorphine prescriptions covered by Medicaid. Furthermore, Grooms & Ortega (2019) found that expansion was associated with a substantial increase in Medicaid-covered SUD treatment admissions. While these two studies support that expansion has increased utilization of SUD treatments, Creedon & Cook (2016) caution that the link between access and utilization of care is not always guaranteed. They found that increases in mental health treatment for Hispanics and Asians were not significantly greater than what was to be expected given earlier trends in mental health treatment. In contrast to the studies described above, they also found that there were no significant changes in the treatment of substance use disorders. However, this study was conducted during the beginning of Medicaid expansion and the more-recent studies described previously have found marked increases in the utilization of mental health care. Overall, the literature supports that Medicaid expansion increases not just

general health coverage, but mental health coverage as well. This will likely improve mental health outcomes as more Americans will have access to and utilize treatment for mental disorders.

III. Impact of Medicaid Expansion on Mental Health Outcomes

The major health variables described previously in this review (mental health care coverage, access, and utilization) all have a close and positive association with mental health outcomes. The few studies that have explored the relationship between Medicaid expansion and mental health outcomes have overwhelmingly shown it to be positive. Studies investigating general mental health have found that expansion was associated with lower psychological distress, fewer poor mental health days, and a lower likelihood of reporting declines in mental health for individuals with low income (Blazoski & Maio, 2021; McMorrow et al., 2016, McMorrow et al., 2017).

With regards to Medicaid expansion's effect on the outcomes concerning more specific mental illnesses, Baicker et al. (2013) conducted a randomized, controlled study that found Medicaid coverage to decrease the probability of a positive screening for depression. Thus, we may infer that Medicaid expansion, which results in higher Medicaid coverage, will decrease an individual's probability of depression. The literature has also found that Medicaid expansion was associated with 1.2 fewer suicide deaths per 100,000 people (Austin et al., 2021). However, this study had a relatively small sample size of 8 Medicaid expansion states and 7 non-expansion states. Furthermore, although it did control for race, it did not take the other major social determinants of mental health such as employment, income, and marital status into account, which could cause omitted variable bias. Practically all of the literature looking at the effect of

Medicaid expansion on SUD overdose mortality have only studied deaths from opioids; their findings are conflicting. One study found that counties in expansion states were associated with a 6 percent lower rate of opioid overdose deaths relative to the rate in counties of non-expansion states. Specifically, expansion states had an 11 percent lower rate of death involving heroin, and a 10% lower rate of death involving synthetic opioids other than methadone (Kravitz-Wirtz et al., 2020). However, there was also an 11% increase in methadone-related overdose deaths in expansion states. In contrast, Averett et al. (2019) found that Medicaid expansion had no significant effect on opioid deaths. While Yan et al. (2020) found that expansion was associated with a 1.9 percent reduction in mortality not due to drug overdose, it found that drug overdose deaths actually rose more sharply in expansion versus non-expansion states. It seems that the United States opioid epidemic is to blame, as it could blunt the mortality benefit of Medicaid expansion. Even though the impact of Medicaid expansion on SUD outcomes is unclear, the literature has demonstrated that expansion is associated with better outcomes for depression.

Whereas the literature has provided context for the effect of Medicaid expansion on mental health trends, including its generally positive association with access to mental health care, utilization of mental health care, and mental health outcomes, this paper uniquely and more specifically explores the impact of expansion on variables concerning mental illness mortality from mental disorders. It aims to evaluate mental health outcome variables that are closely associated with, but not exactly, the variables that have been extensively explored in the literature.

CHAPTER THREE

OVERVIEW OF DATA SOURCES

I. Behavioral Risk Factor Surveillance System

This study partly uses data taken from the 2011-2020 Behavioral Risk Factor Surveillance System (BRFSS) which is managed by the CDC and administered by the health departments of individual states. Data on mental illness prevalence, specifically depression prevalence, is taken from this survey.

BRFSS obtains data through yearly, individual-level, cross-sectional health-related telephone surveys that are administered in all 50 states, the District of Columbia, and three United States territories. Respondents answer questions on health-related risk behaviors, use of chronic health services, and use of preventive health services (Centers for Disease Control and Prevention, 2014). Data collected from surveys is then weighted using the iterative proportional fitting methodology, also known as raking. This method enables the introduction of demographic variables such (e.g. marital status, level of education) into the statistical weighing process to reduce the likelihood of bias and increase the representativeness of estimates.

II. American Community Survey

This study also uses data taken from the 2010-2019 American Community Survey (ACS) administered by the United States Census Bureau. Data taken from this survey include sex, marital status, employment status, education level, income, and the race/ethnicity of Americans at the individual level and aggregated to the state level.

Every year, the ACS is sent to a sample of random addresses, about 3.5 million, in the 50 states, District of Columbia, and Puerto Rico (United States Census Bureau, 2021a). Each

address has a 1 in 480 chance of being selected, and no address is selected more than once every five years. Data is collected by internet, mail, telephone interviews, and in-person interviews. Ultimately, about 95 percent of all households surveyed respond (United States Census Bureau, 2021b). The survey gathers demographic, economic, and social characteristics of Americans. The United States Census Bureau aggregates individual responses to the ACS into estimates at many geographic levels, including states, counties, cities, and congressional districts. 1-year estimates, which will be used in this paper, are available for areas with populations of at least 65,000 people.

III. CDC Wonder

Data on mental health mortality (suicides, drug overdoses) is taken from the CDC's Wide-ranging Online Data for Epidemiological Research (WONDER) database.

The specific aspect of the database that was used is the Underlying Cause of Death category, which contains county-level national mortality and population data from 1999-2020. This data will be aggregated to the state level. Data on mortality is collected from death certificates of United States residents, which include information about a single underlying cause of death as well as demographic data. An underlying cause of death is defined by the World Health Organization as "the disease or injury which initiated the train of events leading directly to death, or the circumstances of the accident or violence which produced the fatal injury", and is selected from conditions entered by a physician on the cause of death section of a death certificate (World Health Organization, 2021 as cited in Centers for Disease Control and Prevention, 2021). Mortality data is coded as "suppressed" when it is sub-national and fewer

than 10 individuals (for confidentiality reasons). When the death count is fewer than 20, mortality data is coded as “unreliable”.

CHAPTER FOUR

ECONOMETRIC METHOD

I. Econometric Model

This study employs a difference-in-differences regression model to investigate the effect of Medicaid expansion on mental health outcomes. The quasi-experimental design of this technique compares the panel data from treatment and control groups to estimate the effect of a specific intervention on population outcomes. In this paper, the treatment group consists of counties in states that opted into Medicaid expansion and the control group consists of counties in states that did not participate in the expansion. The model enables us to infer causality for the effect of a policy intervention. The model will be used to study the state-level dependent variables of suicides, deaths from accidental overdose, and depression prevalence.

Model: $y_{ist} = \beta_0 + \delta_1 \text{EXPANDED}_{st} + \beta_1 \text{COVERAGE}_{ist} + \beta_2 \text{FEMALE}_{ist} + \beta_3 \text{MARRIED}_{ist} + \beta_4 \text{EMPLOYED}_{ist} + \beta_5 \text{EDUCATION}_{ist} + \beta_6 \text{INCOME}_{ist} + \beta_7 \text{BLACK}_{ist} + \beta_8 \text{ASIAN}_{ist} + \beta_9 \text{OTHER}_{ist} + \mu_s + \lambda_t + \varepsilon_{ist}$

Where y_{ist} is the outcome for state s in year t, μ_s represents state fixed effects that control for differences between states, λ_t represents year fixed effects that control for differences between years, and ε_{icst} is the error term. The coefficient of interest is δ_1, which estimates the effect of Medicaid expansion on mental health outcomes in an expansion state after expansion has been implemented in that state. We estimate four specifications for each dependent variable—Specification 1 does not include state or year fixed effects, Specification 2 includes

only state fixed effects, Specification 3 includes only year fixed effects, and Specification 4 includes both state and year fixed effects.

II. Variable Definitions

Dependent Variables:

Suicides	State-level variable - the average number of suicides per 100,000 population in a state per year
Overdoses	State-level variable - the average number of unintentional overdose deaths per 100,000 population in a state per year
Depression prevalence	State-level variable - the percentage of individuals with depression in a state per year

Independent Variables:

EXPANDED	Equals 1 if Medicaid expansion is in effect in a particular state during a particular year and 0 otherwise
COVERAGE	Percentage of individuals covered under health insurance other than Medicaid in a state
FEMALE	Percentage of population in a state that is female
MARRIED	Percentage of population in a state that is married

EMPLOYED	Percentage of population in a state that is employed
EDUCATION	
9	Percentage of population in a state whose highest educational attainment is less than 9th grade
HS	Percentage of population in a state whose highest educational attainment is graduating high school
C	Percentage of population in a state whose highest educational attainment is some college with no degree
INCOME	
10	Percentage of population in a state whose income in past year was less than or equal to $9,950
12	Percentage of population in a state whose income in past year was $9,951 to $40,525
22	Percentage of population in a state whose income in past year was $40,526 to $86,375
24	Percentage of population in a state whose income in past year was $86,376 to $164,925
32	Percentage of population in a state whose income in past year was $164,926 to $209,425
35	Percentage of population in a state whose income in past year was $209,426 to $523,600

BLACK	Percentage of population in the state that is black
ASIAN	Percentage of population in the state that is Asian or a Pacific Islander
OTHER	Percentage of population in the state that is a race/ethnicity that is not white, black, or Asian

III. Variable Explanations

The EXPANDED dummy variable differentiates whether or not the data pertains to the time after a state has opted into Medicaid expansion. Thus, the coefficient on EXPANDED (δ_1) isolates the effect of Medicaid expansion implementation. Because some states have opted into Medicaid expansion during times of the year other than January 1, this is accounted for by coding the number of days after the beginning of the year which expansion was implemented in such states as a fraction of EXPANDED. For example, New Hampshire implemented Medicaid expansion on August 15, 2014. Because this is 226 days after January 1, 2014, the value of EXPANDED for New Hampshire in 2014 would be coded as (365-226)/365 or 0.381 since the policy was only in effect for 38.1% of the year.

The literature has shown that access to healthcare is a critical determinant of mental health. Thus, COVERAGE controls for this by describing the proportion of individuals covered by health insurance. Other non-healthcare-related determinants of mental health include social determinants, which have also been extensively explored in the literature. Income, level of education, employment status, marital status, sex, and race/ethnicity have all been shown to affect mental health (Alegría et al., 2018; Compton & Shim, 2015; Sederer, 2016; Shim et al., 2014; Silva et al., 2016). Thus, variables measuring these determinants are included in the

regression model to control for their effects on the outcomes. Specific variables of EDUCATION describe the highest level of educational attainment of an individual. Specific variables of INCOME describe the income earned by an individual in the last 12 months. FEMALE, MARRIED, and EMPLOYED, control for sex, marital status, and employment status, respectively. BLACK, ASIAN, and OTHER are variables that control for the effect of race/ethnicity on the outcomes.

CHAPTER FIVE

DATA SELECTION, DESCRIPTION, AND LIMITATIONS

I. Selection of the Sample

Three state-level samples were used in this study to estimate overdoses, suicides, and depression prevalence, respectively. The samples measuring suicides and depression prevalence are each comprised of all 50 states and the District of Columbia. The sample measuring overdoses is comprised of 49 states and the District of Columbia. The only state not included is Wyoming, as there was insufficient data on overdoses in Wyoming. All samples contain data over a 9-year period from 2011 to 2019. All data management was conducted through Stata BE. The sample was first produced as a raw data extract using the Integrated Public Use Microdata Series (IPUMS). ACS individual 1-year estimate data on the demographic variables of interest were obtained from IPUMS, recoded in accordance with my variable definitions, and aggregated into state-level averages. Yearly county-level data on overdoses and suicides were obtained from CDC Wonder, recoded, appended, and merged with the ACS data to create our final samples for overdoses and suicides. Yearly individual-level data on depression prevalence were obtained from the CDC website, recoded, appended, and merged with the ACS data to create our final sample for depression prevalence.

II. Descriptive Statistics

Table 1 presents the descriptive statistics for the sample measuring overdoses. There were an average of 21 deaths from unintentional overdose per 100,000 population per state per year from 2011 to 2019. Overdoses ranged from as little as 1.7 deaths to as high as 150 deaths per 100,000 population. Table 2 presents the descriptive statistics for the sample measuring

overdoses. There were an average of 16 suicides per 100,000 population per state per year from 2011 to 2019. Suicides ranged from as little as 4.3 deaths to as high as 61 deaths per 100,000 population. Table 3 presents the descriptive statistics for the sample measuring overdoses. On average, the depression prevalence per state per year was 19% from 2011 to 2019. Depression prevalence ranged from as little as 0% to as high as 50% among the states.

All three samples have very similar descriptive statistics for the demographic variables measured. For each sample, the average proportion of individuals in each state who are female is 48%. The average proportion who are married is approximately 58%, while the average proportion who are employed is about 94%. The average proportion who are covered under health insurance other than Medicaid is approximately 80%. Among the various dummy variables for education, most individuals received at least a college education (about 32% of individuals had some college education with no degree). Among the various dummy variables for income, the highest proportion of individuals (about 42%) earned an income in the 12% tax bracket ($9,951 to $40,525).

III. Limitations of the Data

For the ACS data, individuals who were neither employed nor unemployed (i.e. not the labor force) were dropped as they did not fit the EMPLOYED variable definition. For the CDC Wonder data, counties in which the number of overdoses or suicides were too low and coded as "unreliable" or "suppressed" were dropped in their respective samples. The nonrandom filtering out of some observations may have caused the data from my samples to be less representative of the actual United States population since missing observations were disproportionately distributed among states.

CHAPTER SIX

REGRESSION OF MENTAL HEALTH OUTCOMES ON MEDICAID EXPANSION

Each of the three estimated regressions contains four specifications. Specification 1 does not contain state or year fixed effects. Specification 2 contains only state fixed effects. Specification 3 contains only year fixed effects. Specification 4 contains both state and year fixed effects.

I. Effect of Medicaid Expansion on Overdoses

Estimates from the difference-in-differences regression on the effects of Medicaid expansion on deaths from unintentional overdose are presented in Table 4. Controlling for sex, marital status, employment status, healthcare insurance coverage status, race, educational attainment, and income level, expansion had a significantly positive effect on overdoses in all four specifications. However, the inclusion of state fixed effects, year fixed effects, and both state and year fixed effects lessened the degree to which expansion led to an increase in overdoses. The coefficient on overdoses, 5.3, is greatest when both state and year fixed effects are omitted from the model. When including both state and year fixed effects, there were about 3.1 more overdose deaths in states that had implemented Medicaid expansion compared to states that did not. Overall, 49% of the variation in unintentional overdose deaths can be explained from our full specification containing both state and year fixed effects (Specification 4).

II. Effect of Medicaid Expansion on Suicides

Estimates from the difference-in-differences regression on the effects of Medicaid expansion on suicides are presented in Table 5. Controlling for sex, marital status, employment status, healthcare insurance coverage status, race, educational attainment, and income level,

expansion had a slightly positive but insignificant effect on suicides in all four specifications. The inclusion of state fixed effects, year fixed effects, and both state and year fixed effects also lessened the degree to which expansion led to an increase in suicides. When including both state and year fixed effects, there were less than 0.1 more suicides per 100,000 population in states that had implemented Medicaid expansion compared to states that did not. Overall, 39% of the variation in unintentional overdose deaths can be explained from our full specification containing both state and year fixed effects (Specification 4).

III. Effect of Medicaid Expansion on Depression Prevalence

Estimates from the difference-in-differences regression on the effects of Medicaid expansion on deaths from unintentional overdose are presented in Table 6. Controlling for sex, marital status, employment status, healthcare insurance coverage status, race, educational attainment, and income level, expansion had a barely significant and slightly positive effect on depression prevalence when including both state and year fixed effects (Specification 4). The inclusion of state fixed effects, year fixed effects, and both state and year fixed effects increased the degree to which expansion led to an increase in overdoses. When including both state and year fixed effects, the depression prevalence in expansion states was approximately 1.4% higher than the depression prevalence in states that did not expand. Overall, 57% of the variation in unintentional overdose deaths can be explained from our full specification containing both state and year fixed effects (Specification 4).

CHAPTER SEVEN

CONCLUSIONS

I. Findings

Surprisingly, Medicaid expansion had a generally negative effect on mental health outcomes. This effect is most obvious when deaths from accidental overdose are regressed on Medicaid expansion—I found that expansion states had higher overdose rates than non-expansion states. It is likely that the worsening of the United States opioid epidemic, in which drug overdoses more than tripled between 1999 and 2017, is the main reason behind this result. My estimate for overdoses is similar to the results of Yan et al. (2020), who found that while Medicaid expansion led to a reduction in mortality not due to drug overdose, drug overdose deaths increased more in expansion states than non-expansion states. However, my findings also contrast with Averett et al. (2019) who found that Medicaid expansion did not have a significant effect on deaths from opioid use. Yan et al. speculated that because Medicaid expansion did not cause a reduction in deaths until drug overdose deaths were excluded, the opioid epidemic likely played a role in mitigating the mortality benefit of Medicaid expansion. Overall, I speculate that the opioid epidemic caused the effect of Medicaid expansion on overdoses to be positive in two ways. First, it caused the number of overdose deaths during my study period of 2011-2019 to skyrocket, reducing the expected negative effect of Medicaid expansion on overdose deaths. Second, by increasing the availability of health resources to the low-income, Medicaid expansion likely increased the prescription of substances with the potential for abuse such as opioids. These substances would be more likely to be abused by the demographic covered by Medicaid because people with lower income are more likely to report having problems related to their substance abuse compared to individuals with higher income (Baptiste-Roberts & Hossain, 2018). This is

supported by another study that found that, while Medicaid expansion decreased mortality from heroin and synthetic opioids other than methadone, it led to an increase in methadone-related deaths (Kravitz-Wirtz et al., 2020). Methadone is a major treatment for opioid addiction, so Medicaid expansion may have exacerbated the substance abuse problems of low-income individuals in states that expanded by increasing the prescription of methadone and other opioids.

Medicaid expansion did not have a significant effect on suicides. The opioid epidemic may be part of the reason for this because substance use disorders are associated with a significantly increased risk of suicide (Bohnert et al., 2017). Thus, the worsening of the opioid epidemic may have dampened the expected negative impact of Medicaid expansion on suicides. Furthermore, mental health insurance mandates have been shown to be ineffective at improving suicide rates (Klick & Markowitz, 2006), although the true reasons why are still unclear. Hence, even an increase in health coverage associated with Medicaid expansion may not have any significant effect on suicides.

While we would expect a decrease in depression prevalence to be associated with Medicaid expansion, I found the opposite to be true. Medicaid expansion was actually associated with a significant increase in depression prevalence. Because the increase is very slight, I believe that this estimation is not the result of an increase in depression prevalence, but rather an increase in the number of diagnoses for depression. By enabling more people to access mental health services, Medicaid expansion likely increased the number of diagnoses for depression when in reality the actual number of people with depression may have not changed much. Thus, while it appears that Medicaid expansion exacerbated depression prevalence, expansion may have simply been associated with an increase in screening for depression instead.

Finally, using an estimation of a statistical life-year, $129,090 (Lee et al., 2009) per quality-adjusted life-year, and the 2019 life expectancy of 78.8 years (Arias et al., 2019), we can calculate the approximate value of a statistical life to be $10,172,292. This value is important to understand the approximate economic cost brought on by the implementation of Medicaid expansion, as is the 2019 United States population of 328.3 million (United States Census Bureau, 2021c). For overdoses, which increased by 3.113 deaths per 100,000 population, this translates to about 10,220 deaths in the United States in 2019. The total cost of Medicaid expansion brought on by overdose deaths was a monumental ten trillion dollars. However, this estimation is not quite accurate in that it assumes that all people who overdosed died at birth, which is highly unlikely in the real world. Still, there is a significant economic cost brought on by expansion's negative effect on mental health outcomes. We can also calculate the cost brought on by the decreased life expectancy of those with depression, which has been estimated to be 8.5 years shorter than the average life expectancy (Gilman et al., 2017). With our estimate of 0.0135 people with depression prevalence per 100,000 population and the United States population in 2019, we approximate the United States depression prevalence to be a surprisingly small 44 people. However, the years of life lost from those with depression associated with Medicaid expansion is calculated to be 377 years. Ultimately, the economic cost of depression prevalence associated with Medicaid expansion implementation is calculated to be almost fifty million dollars, a not-insignificant amount. Overall, our estimations of the economic cost on the United States economy brought on by poorer mental health outcomes associated with Medicaid expansion implementation demonstrate that a total of over ten trillion dollars were lost in 2019 as a result of Medicaid expansion implementation.

II. Policy Implications

While Medicaid expansion has been proven to improve physical health outcomes, its implementation appears to be largely ineffective at combating mental illness. Because expansion has been shown to exacerbate overdoses, likely by increasing the prescription of opioids, expansion states should consider enacting stricter laws regarding the prescription of controlled substances to counteract the increase in substance abuse brought on by expansion. Although my analysis did not find a positive effect of Medicaid expansion on depression prevalence, it seems that a beneficial increase in depression screening resulted from expansion. Lawmakers should consider expanding Medicaid benefits to include screening for a variety of mental illnesses so that more people with mental illness may be properly diagnosed and subsequently treated. Since the effect of Medicaid expansion on suicides was inconclusive, it seems that health insurance legislation is ineffective at addressing suicides. Lawmakers should instead look towards restructuring the contents of health insurance plans so that they cover more treatments for mental illness when seeking to prevent suicides.

III. Suggestions for Future Research

Due to the myriad of counties that had overdose and suicide counts low enough to be coded as “unreliable” or “suppressed”, our data on these two dependent variables are clouded by the omission of counties whose populations are not large enough to provide precise counts on the two variables. Thus, it is necessary to obtain accurate, state-level data on suicides and overdoses so that a more random and less biased sample may be used to elucidate the effect of Medicaid expansion on mental health mortality. Additionally, the overdose rate, suicide rate, and rate of depression of populations in the United States comprise only three variables out of the plethora

that exists. Future research should investigate other metrics of mental health outcomes for United States citizens—these can include data on the prevalence of other mental disorders such as bipolar disorder or schizophrenia. Finally, because the link between health legislation and mental health outcomes has not yet been widely explored, we should seek to analyze the link between other health legislation (i.e. the Coronavirus Aid, Relief, and Economic Security Act) and mental health outcomes to see if such legislation is truly effective at alleviating mental illness. Finally, the calculated economic costs of ACA Medicaid expansion implementation stemming from its association with poorer mental health outcomes should be compared to the estimated economic costs of other health policies in order to further elucidate the efficacy of expansion relative to other current United States healthcare policies.

As treatments against chronic illness are revolutionized day by day, it is up to the United States healthcare system to shift its focus onto the ever-present yet insidious problem of poor mental health. Only then will we have hope to prevent an immeasurable number of deaths and greatly bolster the micro and macroeconomy of the United States.

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TABLES

Table 1. Descriptive statistics for overdoses

Variable	Mean	Standard Deviation	Minimum	Maximum
Dependent Variable				
Overdoses	21.207	14.427	1.74	149.54
Independent Variables				
FEMALE	.48	.01	.438	.531
MARRIED	.572	.024	.331	.654
EMPLOYED	.938	.021	.873	.974
COVERAGE	.805	.042	.642	.888
BLACK	.099	.069	.003	.402
ASIAN	.047	.047	.006	.504
OTHER	.06	.049	.012	.342
EDUCATION9	.025	.013	.005	.07
EDUCATIONHS	.256	.044	.098	.379
EDUCATIONC	.317	.031	.132	.401
INCOME10	.142	.022	.095	.205
INCOME12	.42	.047	.189	.531
INCOME22	.295	.026	.217	.376

INCOME24	.105	.033	.041	.284
INCOME32	.014	.007	.001	.055
INCOME35	.022	.006	.01	.065
INCOME37	.003	.004	0	.017
EXPANDED	.446	.495	0	1
Observations	**4115**			

Notes: Counties with overdose rates that were unreliable or suppressed were excluded from the dataset. Refer to Chapter 4 for variable definitions.

Table 2. Descriptive statistics for suicides

Variable	Mean	Standard Deviation	Minimum	Maximum
Dependent Variable				
Suicides	16.087	6.32	4.26	61.24
Independent Variables				
FEMALE	.479	.01	.438	.531
MARRIED	.574	.026	.331	.654
EMPLOYED	.937	.022	.873	.978
COVERAGE	.802	.044	.642	.888
BLACK	.099	.072	.002	.402
ASIAN	.047	.052	.003	.504
OTHER	.063	.05	.012	.342
EDUCATION9	.026	.013	.005	.07
EDUCATIONHS	.254	.041	.098	.379
EDUCATIONC	.322	.032	.132	.417
INCOME10	.143	.022	.095	.205
INCOME12	.423	.047	.189	.543
INCOME22	.293	.026	.217	.376
INCOME24	.104	.033	.04	.284

INCOME32	.013	.007	.001	.055
INCOME35	.021	.006	.006	.065
INCOME37	.002	.004	0	.017
EXPANDED	.388	.485	0	1
Observations	**4508**			

Notes: Counties with overdose rates that were unreliable or suppressed were excluded from the dataset. Refer to Chapter 4 for variable definitions.

Table 3. Descriptive statistics for depression prevalence

Variable	Mean	Standard Deviation	Minimum	Maximum
Dependent Variable				
Depression Prevalence	.19	.039	0	.5
Independent Variables				
FEMALE	.479	.014	.438	.531
MARRIED	.576	.043	.331	.654
EMPLOYED	.939	.022	.873	.978
COVERAGE	.807	.049	.642	.888
BLACK	.085	.087	.002	.402
ASIAN	.042	.069	.003	.504
OTHER	.067	.063	.012	.342
EDUCATION9	.021	.01	.005	.07
EDUCATIONHS	.26	.044	.098	.379
EDUCATIONC	.329	.043	.132	.417
INCOME10	.143	.022	.095	.205
INCOME12	.426	.056	.189	.543
INCOME22	.298	.029	.217	.376
INCOME24	.099	.038	.04	.284

INCOME32	.012	.008	.001	.055
INCOME35	.02	.006	.006	.065
INCOME37	.002	.004	0	.017
EXPANDED	.403	.489	0	1
Observations	**459**			

Notes: Refer to Chapter 4 for variable definitions.

Table 4. Effect of Medicaid expansion on deaths from unintentional overdose

	(1)	(2)	(3)	(4)
EXPANDED	**5.270*** **	**4.379*** **	**3.129*** **	**3.113*** **
	(0.000)	**(0.000)**	**(0.000)**	**(0.001)**
FEMALE	43.31	129.3	77.57*	57.54
	(0.240)	(0.072)	(0.029)	(0.427)
MARRIED	-76.01***	-68.51	-12.06	-42.28
	(0.000)	(0.143)	(0.335)	(0.396)
EMPLOYED	193.4***	-52.15	-49.56	80.26
	(0.000)	(0.253)	(0.117)	(0.143)
COVERAGE	-40.59***	-27.96	-32.24*	-40.83
	(0.001)	(0.146)	(0.012)	(0.121)
BLACK	-37.25***	-114.0**	-57.61***	-131.9**
	(0.000)	(0.004)	(0.000)	(0.001)
ASIAN	-4.653	42.61	6.561	-81.62
	(0.563)	(0.624)	(0.413)	(0.356)
OTHER	-37.27***	-83.78	-46.65***	-164.7***
	(0.000)	(0.070)	(0.000)	(0.000)
EDUCATION9	-145.9***	198.4	-183.0***	343.0**
	(0.000)	(0.072)	(0.000)	(0.003)
EDUCATIONHS	122.2***	-316.5***	78.13***	-205.9***
	(0.000)	(0.000)	(0.000)	(0.000)
EDUCATIONC	-63.62***	-175.0**	-128.9***	-27.87
	(0.000)	(0.001)	(0.000)	(0.616)
INCOME10	33.99	-404.3*	253.7**	-510.3**
	(0.700)	(0.011)	(0.004)	(0.003)
INCOME12	13.45	-247.5	102.1	-587.1***
	(0.874)	(0.099)	(0.219)	(0.000)

INCOME22	-106.2	-249.9	-21.00	-541.6***
	(0.209)	(0.084)	(0.800)	(0.000)
INCOME24	136.8	-438.6*	228.6*	-640.9**
	(0.138)	(0.010)	(0.011)	(0.000)
INCOME32	-914.9***	-529.3*	-820.3***	-667.2**
	(0.000)	(0.028)	(0.000)	(0.006)
INCOME35	782.6***	142.3	466.6***	-62.22
	(0.000)	(0.000)	(0.000)	(0.001)
State Fixed Effects	No	Yes	No	Yes
Year Fixed Effects	No	No	Yes	Yes
Observations	4115			
R-squared	0.318	0.476	0.371	0.490

Notes: P-values are presented in parentheses (* p<0.05, ** p<0.01, *** p<0.001). Specification 1 does not contain state or year fixed effects. Specification 2 contains state fixed effects only. Specification 3 contains year fixed effects only. Specification 4 contains both state and year fixed effects. The values in the table represent regression coefficients for each independent variable.

Table 5. Effect of Medicaid expansion on suicides

	(1)	(2)	(3)	(4)
EXPANDED	**0.197**	**0.205**	**-0.0557**	**0.0728**
	(0.413)	**(0.537)**	**(0.838)**	**(0.864)**
FEMALE	-102.2***	-7.168	-88.29***	-7.066
	(0.000)	(0.022)	(0.001)	(0.085)
MARRIED	-35.36***	-45.71*	-18.54***	-36.79
	(0.000)	(0.022)	(0.001)	(0.085)
EMPLOYED	-1.963	-18.66	-52.78***	-28.25
	(0.853)	(0.343)	(0.000)	(0.224)
COVERAGE	-8.110	8.878	-3.389	9.815
	(0.087)	(0.274)	(0.522)	(0.406)
BLACK	-13.33***	6.145	-17.49***	8.691
	(0.000)	(0.731)	(0.000)	(0.648)
ASIAN	-22.07***	-15.10	-19.67***	-27.52
	(0.000)	(0.672)	(0.000)	(0.447)
OTHER	14.46***	-36.58	14.30***	-43.94*
	(0.000)	(0.061)	(0.000)	(0.031)
EDUCATION9	-134.4***	-60.90	-138.4***	-34.95
	(0.000)	(0.212)	(0.000)	(0.498)
EDUCATIONHS	-12.27*	-24.20	-23.88***	-14.65
	(0.013)	(0.247)	(0.000)	(0.527)
EDUCATIONC	7.143	-2.154	-11.14	0.935
	(0.229)	(0.923)	(0.078)	(0.968)
INCOME10	157.8***	86.48	227.5***	81.49
	(0.000)	(0.218)	(0.000)	(0.276)
INCOME12	305.8***	115.7	361.0***	104.3

	(0.000)	(0.079)	(0.000)	(0.135)
INCOME22	207.5***	117.3	256.2***	102.2
	(0.000)	(0.066)	(0.000)	(0.123)
INCOME24	357.5***	136.7	415.3***	124.2
	(0.000)	(0.068)	(0.000)	(0.112)
INCOME32	-166.1*	101.1	-149.7*	118.5
	(0.022)	(0.342)	(0.039)	(0.274)
INCOME35	346.8***	85.91	308.6***	84.11
	(0.000)	(0.145)	(0.000)	(0.161)
State Fixed Effects	No	Yes	No	Yes
Year Fixed Effects	No	No	Yes	Yes
Observations	4508			
R-squared	0.297	0.385	0.308	0.387

Notes: P-values are presented in parentheses (* p<0.05, ** p<0.01, *** p<0.001). Specification 1 does not contain state or year fixed effects. Specification 2 contains state fixed effects only. Specification 3 contains year fixed effects only. Specification 4 contains both state and year fixed effects. The values in the table represent regression coefficients for each independent variable.

Table 6. Effect of Medicaid expansion on depression prevalence

	(1)	(2)	(3)	(4)
EXPANDED	**0.00842**	**0.00333**	**0.00545**	**0.0135***
	(0.071)	**(0.525)**	**(0.289)**	**(0.045)**
FEMALE	-0.0997	-0.664	-0.0486	-0.605
	(0.656)	(0.102)	(0.824)	(0.139)
MARRIED	-0.146*	-0.293	-0.0497	-0.442
	(0.049)	(0.219)	(0.502)	(0.087)
EMPLOYED	0.658***	0.671*	0.0228	0.477
	(0.001)	(0.024)	(0.917)	(0.136)
COVERAGE	-0.305***	-0.250	-0.173*	0.0761
	(0.000)	(0.067)	(0.047)	(0.681)
BLACK	-0.0722*	-0.552*	-0.110***	-0.545*
	(0.021)	(0.025)	(0.001)	(0.027)
ASIAN	-0.0312	0.362	0.0283	0.320
	(0.397)	(0.435)	(0.449)	(0.491
OTHER	-0.192**	-0.199	-0.164**	-0.125
	(0.001)	(0.484)	(0.005)	(0.666)
EDUCATION9	-0.727**	-0.955	-0.922***	-0.840
	(0.003)	(0.223)	(0.000)	(0.299)
EDUCATIONHS	-0.0856	-0.718*	-0.194*	-0.765*
	(0.323)	(0.015)	(0.028)	(0.013)
EDUCATIONC	-0.200*	-0.706*	-0.331**	-0.794**
	(0.045)	(0.015)	(0.001)	(0.008)
INCOME10	2.541**	2.157	2.782***	2.423*
	(0.001)	(0.067)	(0.000)	(0.045)
INCOME12	2.063**	1.794	2.241**	2.170
	(0.006)	(0.110)	(0.002)	(0.059)

INCOME22	1.964**	1.793	2.031**	2.129
	(0.008)	(0.104)	(0.005)	(0.057)
INCOME24	2.168**	1.550	2.256**	1.943
	(0.006)	(0.197)	(0.003)	(0.109)
INCOME32	1.124	0.271	1.412	0.893
	(0.373)	(0.862)	(0.252)	(0.568)
INCOME35	1.964*	0.148	1.269	0.252
	(0.049)	(0.896)	(0.195)	(0.823)
State Fixed Effects	No	Yes	No	Yes
Year Fixed Effects	No	No	Yes	Yes
Observations	459			
R-squared	0.240	0.552	0.300	0.573

Notes: P-values are presented in parentheses (* p<0.05, ** p<0.01, *** p<0.001). Specification 1 does not contain state or year fixed effects. Specification 2 contains state fixed effects only. Specification 3 contains year fixed effects only. Specification 4 contains both state and year fixed effects. The values in the table represent regression coefficients for each independent variable.