The Effects of ACA Medicaid Expansion for Childless Adults Living with a Depressive Disorder on Disparities in Access to Health Care and Health Status

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Abstract

Approximately 1 in 5 adults suffer from a mental illness in the United States and low-income adults represent a particularly vulnerable group. Research indicates that the Affordable Care Act Medicaid expansions led to coverage gains and improvements in access to care for low-income childless adults. However, less research has focused on Medicaid expansion effects by race and other demographic characteristics for individuals with depressive disorders. Using data from the Behavioral Risk Factor Surveillance System (BRFSS) for 2011-2018, we estimated difference-in-differences (DD) models that exploit the quasi-experimental nature of Medicaid expansions implemented on a state-by-state basis. We estimate the effects of Medicaid expansion on measures of health care access and health status and find that Medicaid expansion contributes to a decrease in the uninsured rate and improvements in access to care for low-income individuals living with a depressive disorder. We do not find a differential impact of Medicaid expansion by race, but our research highlights factors that further disadvantage individuals with depressive disorders from obtaining health insurance and accessing care. In general, we find that Medicaid expansion has a greater impact for employed adults, and certain racial subgroups—namely, individuals of color living with a chronic disease and Whites and Blacks without a high school degree—experience a smaller impact from Medicaid expansion on decreasing the uninsured rate and improving health care access.

I.   **Introduction**

According to a national survey conducted by the Substance Abuse and Mental Health Services Administration, more than 47 million people, or about 1 in 5 American adults, suffer from a mental illness.[1] Within this group, individuals with incomes below the Federal Poverty Level (FPL) are particularly vulnerable, with over 26 percent experiencing a mental illness. In the past year, over 11 million, or 4.7 percent of American adults, experienced a severe impairment as a result of a major depressive episode (MDE). The rate is greater among low-income individuals: nearly 8 percent of adults with incomes less than the FPL experienced an MDE that caused a severe impairment. Depression is also commonly associated with chronic physical disorders and has shown to worsen prognoses for conditions like angina, arthritis, asthma, and diabetes.[2,3,4]

Despite the clear negative impact of mental disorders, a staggering 57 percent of adults with mental illness did not receive any mental health services in 2019.[5] For example, about one-third of all low-income adults with an MDE did not receive treatment for depression. This unmet need may be due to one or more of the many barriers to receiving mental health treatment, which include stigma and lack of awareness. For individuals with unmet mental health needs, almost 40 percent cite an inability to afford care. These statistics suggest that increasing access to health care may help close the gap between mental health care need and treatment for millions of Americans living with mental illness. Recent estimates place the economic burden of depression in the United States (U.S.) between $210 billion and $288 billion in direct costs and loss of productivity.[6,7]

Although encompassing many different reforms, the Patient Protection and Affordable Care Act (ACA) of 2010 outlined mental health as one of the essential health benefits insurance plans must cover. It also encouraged state expansions of the Medicaid program, a federally-funded program, administered by each state to provide health care coverage to low-income individuals. One of the central goals of the ACA was to expand access to health care by increasing the number of Americans with health insurance. As a result of the ACA, 14.5 million individuals gained coverage through Medicaid or the Children's Health Insurance Program (CHIP) between 2013 and 2015.[8] The ACA sought to expand Medicaid coverage nationwide, but in 2012, the Supreme Court ruled that participation in Medicaid expansion was voluntary and should be decided at the state level. Following the ruling, some states opted to expand Medicaid, while others did not. As of May 2020, 36 states and the District of Columbia have expanded Medicaid (either prior to or following the ACA), while 14 states have not expanded Medicaid.

While efforts to reduce stigma and increase awareness of mental illness continue, our research builds on the idea that increasing access to care by expanding health insurance eligibility may be an important strategy for addressing unmet mental health needs and overall access to health care. First, we explore whether Medicaid expansion decreases the probability of not having health insurance and the probability of citing common barriers to accessing health care, such as not having a usual source of care, not receiving an annual checkup, and forgoing care due to cost. Second, we explore whether Medicaid expansion leads to improved health outcomes as measured by overall health status, number of days in poor physical and mental health, and number of days with limited activity due to poor health. Our secondary research question asks whether and how the relationship between state Medicaid expansion and the probabilities of not having health insurance and facing barriers to receiving health care are moderated by racial group, education level, employment status, gender, and/or having a chronic health condition. We hypothesize that living in a Medicaid expansion state is associated with increased access to care and improved health outcomes for individuals living with a depressive disorder. We also expected these gains in access and health

outcomes to vary by racial group and individual-level characteristics, such as employment status and education level, given known access barriers to care for persons of color and past research on depression and employment.[9,10,11]

Our research suggests that Medicaid expansion leads to a decrease in the probability of having no insurance and positively improves access to care for low-income childless adults living with a depressive disorder. We find that the uninsured rate decreases by an additional 14 percentage points for low-income childless adults with a depressive disorder after Medicaid expansion in expansion states compared to non-expansion states. This same population experiences a 4.3 percentage point decrease in the rate of having no usual source of care, a 5.7 percentage point decrease in the rate of having unmet care needs due to cost, and a 6.7 percentage point decrease in the rate of having no annual check-ups. We do not find a statistically significant differential effect of Medicaid expansion on these insurance and access outcomes of interest for Blacks, Hispanics, and individuals of another race as compared to Whites.

We do find that Medicaid expansion has a greater impact for individuals with certain characteristics. Our results indicate that the effect of Medicaid expansion on reducing the uninsured rate is greater for employed adults than unemployed adults by an additional 9.8 percentage points. We also find that the impact of Medicaid expansion on reducing the rate of having unmet care needs due to cost is greater for females than males by 7.5 percentage points. When we further subdivide our analysis by both race and individual-level characteristics, our results indicate that Medicaid expansion has a greater impact on decreasing the uninsured rate for White married adults, employed adults of any race, and Blacks without a chronic disease. We hypothesize, and believe future researchers should assess, if these gains in insurance coverage lead to increased preventive health utilization for these populations, thus leading to potential decreased health care costs and improved health outcomes. We also find that Medicaid expansion has a greater effect on decreasing the rate of having no usual source of care for Whites with a high school degree, and has a greater effect on decreasing the rate of having unmet care needs due to cost for Black and Hispanic females and Blacks with a high school degree. Lastly, Medicaid expansion has a greater impact on decreasing the rate of having no annual check-up for White married adults, Hispanics without a chronic disease, and single Hispanic adults. This suggests that Medicaid expansion has a greater impact on improving insurance rates and access to care for certain racial subgroups, and other racial subgroups may be at a disadvantage for enrolling in Medicaid and taking advantage of health insurance to improve health care access.

In the next section, we discuss the history of mental health-focused legislation and provide an overview of the research assessing mental health and general health access gains from Medicaid expansion. Section III discusses our data and methodologies, and Section IV explains the results of our difference-in-differences (DD) model. Section V concludes the paper and details the policy implications and limitations of our research.

II.   Background

Over the last three decades, the U.S. passed various mental health parity laws and recently included language in the ACA to improve access to care for individuals seeking mental health treatment. For example, the ACA expanded mental health coverage by requiring that most individual and small employer health insurance plans, including all plans offered through the Health Insurance Marketplace, cover mental health and substance use disorders.[12] However, a review of the literature finds that past parity laws have been relatively ineffective in improving insurance coverage and health care access. In an analysis of national survey data from 1996-1998,

Pacula and Sturm (2000) found no statistically significant relationship between state parity legislation and its impact on insurance coverage for its intended beneficiaries.[13] Additionally, Young et. al (2001) found that among individuals with depressive or anxiety disorders, receiving appropriate care was influenced by demographic factors and not by presence or type of insurance.[14] However, they observed that among individuals with depressive or anxiety disorders, those with more years of education were more likely to have physician contact compared to individuals without medical insurance.

In 2010, the ACA mandated an expansion of Medicaid eligibility to all adults living at or below 138% of the FPL beginning in 2014. However, state participation is optional following the Supreme Court ruling on National Federation of Independent Business v. Sebelius. Since then, numerous studies have examined the enrollment rates among those newly eligible for public insurance in states that expanded coverage as compared to non-expansion states.[15,16,17,18,19] These studies have shown that coverage increased more among eligible individuals in expansion states relative to non-expansion states. However, few studies have looked specifically at how the rate of coverage differs among individuals with and without depressive disorders, and have focused more on differences by racial group.

First, Sommers et. al (2015) found the largest gains in insurance coverage were among eligible Black and Latino individuals, but expansion did not improve existing racial disparities in regular source of care or affordability of needed care. In their follow-up paper, Sommers et. al (2017) examined post-ACA racial and economic disparities in affordability of care, perceived quality of care, and access to timely outpatient care.[20] They found that while the ACA reduced these disparities, a large gap between ethnic groups still remains and access to insurance coverage only explains 10-25% of the perceived disparities in affordability, quality, and access. Second, Lipton et al. (2019) used 2014 expansion data and found larger gains in coverage among Hispanics and Blacks relative to Whites after the implementation of the ACA.[21] Coverage increases were larger in expansion states compared with non-expansion states across most racial and ethnic groups. Similarly, Manuel (2017) used secondary National Health Interview Survey (NHIS) data from 2006-2014 to document health care use among racial and ethnic groups and found that Whites had the greatest gains in access and use, while Hispanic individuals saw no significant changes before and after health care reform.[22]

Lee and Porell (2018) use data from the Behavioral Risk Factor Surveillance System (BRFSS) from 2011 to 2016 to examine racial and ethnic disparities in take-up rates, access, and health outcomes among those newly eligible for Medicaid. They find that while expansion reduced the average uninsured rate, the coverage gap remained unchanged for Black and Hispanic adults after ACA Medicaid expansion. Eligible Hispanic adults faced only modest gains in insurance coverage and while Blacks experienced a larger impact in uninsured rates, they still saw less favorable health outcomes compared to their White counterparts. Using the same BRFSS data, Winkelman et. al (2018) measured the effect of Medicaid expansion on health care access for individuals with and without chronic conditions. They found that expansion was associated with improvements in access to care for all adults as well as a reduction in depression diagnoses.[23]

Taken together, the literature indicates varying and sometimes conflicting findings on the impact of ACA Medicaid expansions on health care access and health outcomes, particularly with regard to racial and ethnic disparities. In addition, there is a gap in the literature examining how Medicaid expansion impacts individuals with a depressive disorder. Our research seeks to add to the literature by expanding the analysis of Medicaid expansion through 2018, thereby increasing the post-expansion period, as well as by including education, employment status, and other factors

into the analysis when analyzing racial and ethnic disparities. We are guided by the theory that Medicaid expansions will lead to increased health insurance coverage, which in turn will improve access to care, such as having a regular source of care. Consequently, increased access to care may lead to improvements in health outcomes, such as a reduction in the number of days in poor mental health. This theory is based in part on existing research, most notably the 2008 Oregon Health Insurance Experiment, which found that expanding Medicaid increased treatment of depression and reduced its prevalence.[24]

III.   Data and Methods

To analyze the effects of Medicaid expansion, our primary data source is the Behavioral Risk Factor Surveillance System (BRFSS), collected by state health departments for the Centers for Disease Control and Prevention (CDC). BRFSS is an annual national cross-sectional telephone survey of community-resident households in the U.S. that is conducted monthly over landline and cellular telephones. The cellular telephone surveys comprise about 20% of each state's sample.[25] BRFSS collects data from U.S. residents regarding their health-related risk behaviors, chronic health conditions, and use of preventive services with more than 400,000 adult interviews each year.[26] BRFSS is used in health care reform and ACA Medicaid expansion research because of its large sample size and data on health, access to care, and health behaviors.[27]

We use 2011-2018 BRFSS data, which provides three years of data pre-ACA Medicaid expansion and five years post-expansion. We do not utilize data prior to 2011 because changes were made to the survey methodology in 2011. For example, weighting protocols were implemented to ensure the data are representative of the population on a number of demographic characteristics.[28] This could result in changes between 2010 and 2011 estimates that are unrelated to real trends.

Additionally, we include state-level control variables for 2011-2018 that are specified from data from six sources. These include the Rhode Island Department of Labor and Training annual state unemployment files, Federal Reserve Bank of St. Louis annual per capita personal income by state files, U.S. Census Bureau Annual Estimates of the Resident Population and State Population by Characteristics files, American Hospital Association Annual Survey files, Bureau of Labor Statistics Occupational Employment Statistics Survey files, and the Americans for Democratic Action (ADA) voting record files.

Our study sample consists of nonpregnant childless adult U.S. residents between the age of 18 and 64 with incomes less than 100% of the FPL.[†] We focus on this population because poor childless adults were generally ineligible for Medicaid prior to 2014, so this sub-population is likely most affected by ACA Medicaid expansion.[29] For example, as shown in **Figure 1**,[30] adults

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[†] Because the BRFSS income variable is categorical (e.g., <$10,000, $10,000-$15,000, $15,000-$20,000, etc.), we follow Lee and Porell (2018)'s methodology and use the top value of the income range to classify respondents' incomes relative to their FPL. This may exclude some individuals with reported incomes below FPL, but ensures that all adults with reported incomes above the FPL are excluded. The FPL is calculated from household size and poverty income thresholds defined by the U.S. Department of Health and Human Services. We calculate household size by summing the number of adults in a household. BRFSS did not ask cell-phone respondents for the number of adults in their household from 2011 to 2013. Therefore, we impute the number of adults using a Poisson regression for all cell-phone respondents across the 2011-2018 data with the number of adults in the household as our dependent variable and the following independent variables: number of children, sex, age, marital status, education level, race, employment status, and income category. We then predict the number of adults in the household and replace this imputed value for cell-phone respondents in 2011-2013 before constructing the survey respondent's income as a percentage of the FPL. An indicator variable for whether the respondent's household size was imputed is included as a control variable in our regression analysis.

with incomes above 100% of the FPL are eligible for subsidies to purchase Marketplace insurance in states that have not expanded Medicaid. Childless adults with incomes below 100% of the FPL in these states are ineligible for subsidies and Medicaid coverage. Therefore, we restrict our sample to childless adults with incomes less than 100% of the FPL to estimate the effects of the offer to enroll in Medicaid and obtain insurance coverage by comparing individuals living in expansion states with individuals living in non-expansion states who are ineligible for Medicaid coverage. All further reductions in sample size are due to missing data for survey respondents for the following variables, which we utilize as controls in our difference-in-differences models: gender, age, marital status, education, race/ethnicity, employment, income, tobacco use, and chronic disease status. This results in a sample of 72,251 respondents, with approximately 41% reporting a depressive disorder. Following the methodology of Lee and Porell (2018), the final estimation sample sizes reported in our results tables vary slightly because of differences in missing data among our outcome variables.

Methods

This paper employs a difference-in-differences (DD) research design to estimate the impact of ACA Medicaid expansions on access and health outcomes for individuals living with a depressive disorder in treated and untreated states, or expansion and non-expansion states. Our treated group consists of states that expanded Medicaid to childless adults up to 138% of the FPL after January 2014, and the untreated group consists of states that did not expand Medicaid and whose childless adult population with incomes of less than 100% of the FPL experience a health insurance coverage gap. This group provides the counterfactual for estimating outcomes if ACA Medicaid expansion was not implemented. We estimate linear probability models of the following form:

$$Y_{ist} = \beta_0 + \beta_1 Expansion_{st} + \lambda_t + \gamma_s + \beta_2 X_{ist} + \beta_3 X_{st} + \varepsilon_{ist}, \tag{1}$$

where Y_{ist} is the outcome for individual i in state s with a survey date in year t. $Expansion_{st}$ is an indicator variable equal to 1 for individuals residing in an expansion state in the month during or in a month after Medicaid expansion became effective in that state, and 0 otherwise. λ_t are annual time fixed effects from 2011 through 2018, and γ_s are state fixed effects. X_{ist} is a vector of demographic, socioeconomic, and health risk factors of individual respondents (e.g., age, gender, education) and X_{st} is a vector of state time-varying contextual environmental factors that may influence outcomes (e.g., physician supply, per capita income, etc.). As explained in more detail in the Appendix, we estimated our models as a robustness check without these state-level control variables to help rule out the possibility that these controls are affected by Medicaid expansion and may bias our estimated impact of expansion. We find similar results when including and excluding these state-level controls, so we chose to include them in our main models because we believe they are theoretically important variables and may cause omitted variables bias if omitted.

The coefficient of interest is β_1, which gives the DD estimate of the effect of Medicaid expansion on our outcomes of interest. Specifically, it captures average changes in outcomes among individuals in Medicaid expansion states after expansion relative to non-expansion states that did not expand Medicaid, controlling for individual-level characteristics, differences between states, and nationwide changes. This implies a very specific assumption required for unbiased estimates of the effect of Medicaid expansion: the trends, across time, of outcomes in our expansion and non-expansion states are identical in the absence of Medicaid expansion. If

expansion states had not expanded Medicaid, expansion and non-expansion states would have had the same change from 2011 to 2018 in each of the outcomes. We discuss this parallel trends assumption in Section IV.

We also explore the differential effects of Medicaid expansion by race and present results that include interactions between our main $Expansion_{st}$ treatment indicator variable and race indicator variables:

$$Y_{ist} = \beta_0 + \beta_1 Expansion_{st} + \beta_2 Expansion_{st} * Black_{ist} + \beta_3 Expansion_{st} * Hispanic_{ist} + \beta_4 Expansion_{st} * Other\ Race_{ist} + \lambda_t + \gamma_s + \beta_2 X_{ist} + \beta_3 X_{st} + \varepsilon_{ist}, \qquad (2)$$

These regressions provide an empirical estimate of the differential effect of Medicaid expansion on our outcomes of interest for Blacks, Hispanics, and individuals of another race compared to Whites.

Building on this model, we also examine the differential effects of Medicaid expansion by individual-level characteristics that we believe are associated with our outcomes of interest and may moderate disparities in access for individuals living with a depressive disorder. For our entire sample, and separately for Whites, Blacks, and Hispanics, living with a depressive disorder, we estimate regressions of the following form:

$$Y_{ist} = \beta_0 + \beta_1 Expansion_{st} + \beta_2 Expansion_{st} * Z_{ist} + \lambda_t + \gamma_s + \beta_2 X_{ist} + \beta_3 X_{st} + \varepsilon_{ist}, \qquad (3)$$

where Z_{ist} is an indicator variable depending on the model for: having a chronic disease; not having a high school degree; or being female, married, or unemployed. These indicator variables are also included in X_{ist}, our vector of demographic, socioeconomic, and health risk factors of individual respondents.

We construct eight outcome indicators of access and self-assessed health status from the survey questions in BRFSS. As shown in **Table 1**, we specified insurance status and three access outcomes: no usual source of care, unmet care needs due to cost, and no annual check-up in the past year. We also specified four health status outcomes: an indicator variable for fair or poor health status, and counts of how many of the past 30 days a respondent was not in good physical health, not in good mental health, or limited their usual activities due to poor physical or mental health.

The $Expansion_{st}$ indicator variable in Equations (1)-(3) distinguishes which states expanded Medicaid and when expansion occurred. The District of Columbia and 12 states that expanded Medicaid to childless adults before ACA Medicaid expansion in 2014 are excluded from our analysis because of limited pre-expansion data to examine trends as well as differences in Medicaid eligibility across states that expanded early. Furthermore, Lee and Porell (2018) performed sensitivity analyses of the exclusion of early Medicaid expansion states in their analysis using BRFSS data and found that their empirical results were robust to this change. For all of these reasons, we chose to restrict our analysis to the states that expanded Medicaid after 2014 or have yet to expand Medicaid. Thus, the 19 states that formally expanded Medicaid after January 1, 2014 and by December 2018 are assigned to the group of expansion states. The 19 states that have not expanded Medicaid as of December 2018 are assigned to the group of non-expansion states. **Figure 2** illustrates the breakdown of states by expansion and non-expansion. We compare the no early expansion states with the non-expansion states in our analysis, which are the blue and orange states displayed on the map in **Figure 3**.

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Individual-level control variables specified in the model include age, gender, race (non-Hispanic Whites, non-Hispanic Blacks, Hispanics, and individuals of another race), education status (having or not having a high school degree), marital status, employment status, tobacco use, chronic disease status, and an indicator variable for imputed household size. A full table of these individual-level control variables is specified in **Table 2**.

Annual time fixed effects control for national trends and state fixed effects control for the effects of time-invariant state-level factors. Because individual insurance, access, and health outcomes may be influenced by broader geographic environmental variables,[31] we specify other state-level time-varying geographic environmental variables as control variables. These include: an indicator of state political ideology from senator voting records on a range of legislative issues to serve as a proxy for political climate; physicians and hospital beds per 1,000 capita to capture the impact of health care provider supply on health care service utilization; and per capita income, unemployment rate, and racial composition variables because of the relationship between socioeconomics and racial population mix and individual health.

Summary statistics

In 2013, characteristics of our study sample in Medicaid expansion states are mostly comparable to the characteristics of respondents in non-expansion states. As shown in **Table 3**, after weighting cases by the BRFSS final survey weights, at a 95 percent significance level, there are no statistically significant differences between the two groups of states in terms of: gender; distribution across age groups; or high school degree attainment. There are, however, significant differences in race, with respondents in expansion states about 10 percentage points less likely to be White, 3 percentage points more likely to be Black, and 8 percentage points more likely to be Hispanic. Respondents in expansion states are also 4 percentage points more likely to be married. There are no differences in employment status; in both expansion and non-expansion states, roughly 70 percent of respondents are unemployed, about one-quarter are employed for wage, and the remainder are self-employed. In both groups of states, about 56 percent of respondents have a chronic disease, and about one-third have a depressive disorder.

Expansion states and non-expansion states included in our analysis are also comparable across various state-level indicators in 2013. Both groups of states have average unemployment rates around 7 percent and average per capita income levels of about $42,000. In contrast to the between-group differences in race/ethnicity found in our survey sample, racial and ethnic makeup do not differ significantly between the two groups of states, according to census data. This discrepancy may be due to the effect of non-response bias on representativeness of the BRFSS sample.[32,33] Expansion states and non-expansion states are comparable on some indicators of health care availability, such as the number of hospital beds and number of physicians per 1,000 population. However, the two groups of states differ in a measure of political climate; on a 100-point scale of agreement with liberal policies, the average expansion state has a rating 35 points higher than the average non-expansion state.

IV.   Results

We begin by estimating DD models of the form shown in Equation (1) from pooled data from 2011-2018. We adjust the standard errors of our coefficient estimates by clustering at the state level and weigh cases by the BRFSS final survey weights because the error terms are likely correlated within states across time periods since Medicaid expansion decisions are made at the state level. As shown in **Table 4**, we estimate DD models for the entire study sample in Model 1

and separately for individuals with and without a depressive disorder in Models 2 and 3, respectively. We report the estimated coefficient, β_1, on the *Expansion$_{st}$* indicator variable for each of the three models specified with eight different outcome variables.

We find that for our samples consisting of all low-income childless adults and low-income childless adults with and without a depressive disorder, Medicaid expansion leads to a decrease in the probability of having no insurance, no usual source of care, unmet care needs due to cost, and no annual check-up. For our population of interest—individuals with a depressive disorder in Model 2—we find that the uninsured rate, rate of having no usual source of care, rate of unmet care needs due to cost, and rate of having no annual check-ups decreased by an additional 13.9 percentage points ($p < .01$), 4.3 percentage points ($p < .05$), 5.7 percentage points ($p < .05$), and 6.7 percentage points ($p < .05$), respectively, in expansion states relative to non-expansion states. For individuals without a depressive disorder in Model 3, there is also a statistically significant decrease in these four rates. However, the decrease in the uninsured rate and rates of having no usual source of care and no annual check-up are larger in magnitude in the model including only individuals without a depressive disorder. In addition, our results provide little evidence that among the population of individuals living with a depressive disorder, those living in Medicaid expansion states experienced a statistically significant greater decrease in rates of self-reported fair or poor health status, the number of days with poor mental health, and the number of days with health-related activity limitations as compared to those living in non-expansion states.

Table 5 presents our DD estimates from Equation (2) for our sample of low-income childless adults living with a depressive disorder to explore the impact of Medicaid expansion by race. We find that there is no statistically significant difference in the effect of Medicaid expansion on our insurance and access outcomes of interest for Blacks, Hispanics, and individuals of another race as compared to Whites. In terms of our measures of health status, our regression estimates indicate that there is a statistically significant difference in the effect of Medicaid expansion on the number of poor physical health days for Hispanics and individuals of another race as compared to Whites. Specifically, among childless adults living with a depressive disorder, Whites had a larger decrease in the number of poor physical health days as compared to Hispanics by 1.69 days, and individuals of another race had a larger decrease in the number of poor physical health days as compared to Whites by 3.16 days in expansion states versus non-expansion states after ACA Medicaid expansions.

Next, we explored whether the effects of Medicaid expansion are moderated by certain individual-level characteristics. **Table 6** presents our estimates from Equation (3) for our entire sample of low-income childless adults living with a depressive disorder and we display the coefficients on our *Expansion$_{st}$* indicator variable and its interactions with individual-level characteristics for each of our four measures of health care access. We find that the effect of Medicaid expansion on reducing the uninsured rate is greater for employed adults than unemployed adults by an additional 9.8 percentage points. We also find that the impact of Medicaid expansion on reducing the rate of having unmet care needs due to cost is greater for females than males by 7.5 percentage points.

Although we found no statistically significant difference in the effect of Medicaid expansion on our insurance and access outcomes by race, we explored whether certain racial subgroups are differentially impacted by Medicaid expansion. **Table 7** presents our estimates from Equation (3) separately for Whites, Blacks, and Hispanics. We find that the effect of Medicaid expansion is greater for Blacks without a chronic disease in reducing the probability of having no insurance and for Hispanics without a chronic disease in reducing the probability of having no

annual check-up. The larger decline in the probability of having no insurance and no annual check-up for these two groups is 18.6 percentage points and 15.2 percentage points, respectively. We also find that the impact of Medicaid expansion on reducing the probability of having unmet care needs due to cost is greater for Black and Hispanic females than males. Furthermore, we find a differential impact of Medicaid expansion by education level. Whites with a high school degree experience an additional 5.3 percentage point decrease in the probability of having no usual source of care, and Blacks with a high school degree experience an additional 16.8 percentage point decrease in the probability of having unmet care needs due to cost. The impact of Medicaid expansion is also moderated by marital status with White married individuals experiencing a greater decline in the probability of having no insurance and no annual check-up. We find that married Hispanics are actually more likely than non-married Hispanics to have no annual check-up after Medicaid expansion.

Thus, our empirical results suggest that Medicaid expansion has a greater impact on improving insurance rates and access to care for certain racial subgroups. Some of the disadvantaged subgroups that experience a smaller impact from Medicaid expansion are Blacks and Hispanics living with a chronic disease; Whites and Blacks without a high school degree; single Whites; married Hispanics, and unemployed Whites, Blacks, and Hispanics. These groups may be at a disadvantage for enrolling in Medicaid, and perhaps taking advantage of the benefits of having insurance coverage to reduce the likelihood of having no usual source of care, unmet care needs due to cost, and no annual check-up.

Are these findings driven by pre-Medicaid expansion trends?

The key identifying assumption for valid estimates of ACA Medicaid expansion impacts with DD models is that the trends in outcomes would not differ between expansion and non-expansion states in the absence of "treatment," or Medicaid expansion. Specifically, any deviations from pre-expansion trends should be induced by Medicaid expansion. Therefore, **Table 8** and **Appendix Tables 2 and 3** test for parallel trends by presenting the same DD estimates for Equations (1) - (3) after forcing treatment status to be two years earlier. For example, if a state expanded Medicaid in January 2014 and we ordinarily identify treatment for that state beginning in January 2014, treatment will now begin in January 2012. As presented in **Table 8**, the DD estimates for Equation (1) are much smaller in magnitude as compared to those presented in **Table 4** and only three estimates across the 24 regressions are statistically significant. **Appendix Tables 2 and 3** display similar trends of small DD estimates in magnitude and few, if any, statistically significant estimates. Thus, we believe that these regressions are reasonably robust in supporting the parallel trends assumption for our population of interest: low-income childless adults living with a depressive disorder.

Homogeneity of groups

As described earlier, prior to Medicaid expansion in 2014, there are few significant differences between states that expanded Medicaid and those that did not. The exceptions include differences in racial makeup, marital status, and political climate. However, in 2018, expansion states and non-expansion states differ in other characteristics as well. As shown in **Table 9**, our study sample in expansion states is about 6 percentage points less likely to be unemployed and 6 percentage points more likely to be employed for wage. They are also about 6 percentage points less likely to have recently used tobacco and about 5 percentage points less likely to have a depressive disorder. These differences challenge the assumption that the two groups are similar in

composition, and they should be taken into consideration when interpreting the results of our analysis.

V.   Discussion

Our difference-in-differences results suggest that Medicaid expansion positively improves access to health insurance coverage and health care for childless adults living with a depressive disorder between the ages of 18 and 64 with incomes less than 100% of the FPL. This population was ineligible for public health insurance prior to Medicaid expansion. We find that decreases in expansion states exceeded decreases in non-expansion states on a number of measures; specifically, we find decreases of an additional 13.9 percentage points ($p < .01$) in the uninsured rate, 4.3 percentage points ($p < .05$) in the rate of having no usual source of care, 5.7 percentage points ($p < .05$) in the rate of having unmet care needs due to cost, and 6.7 percentage points ($p < .05$) in the rate of having no annual check-ups. We do not find a statistically significant difference in the effect of Medicaid expansion on these insurance and access outcomes of interest for Blacks, Hispanics, and individuals of another race as compared to Whites. Thus, health insurance coverage and access to health care increase by a larger increment in expansion states than in non-expansion states for all racial/ethnic groups.

We also find that some individuals experience a greater impact of Medicaid expansion. Across our entire sample, our results indicate that Medicaid expansion has a greater effect on reducing the uninsured rate for employed adults and reducing the rate of having unmet care needs due to cost for females. When separating our analysis by race, we find that Medicaid expansion has a greater impact on improving insurance rates and access to care for certain racial subgroups. Taken together, our results suggest that unemployed adults of any race, individuals of color living with a chronic disease, and Whites and Blacks without a high school degree are at a disadvantage for enrolling in Medicaid and taking advantage of health insurance to increase health care access. More research should be done to identify the particular barriers to access for these groups and strategies to encourage Medicaid enrollment, especially in expansion states, where increased eligibility yields benefits that are not yet distributed equitably.

Although we are unable to make inferences on actual mental health care utilization as a result of Medicaid expansion using the BRFSS data, we see reductions in barriers to health care access for individuals with a depressive disorder in expansion states. This suggests that the offer to enroll in public health insurance, e.g., Medicaid, may contribute to a decrease in the number of low-income adults without health insurance and improve access to health care, such as an increased probability of having an annual routine checkup. By gaining health insurance coverage through Medicaid, it is possible that low-income adults with a depressive disorder may also experience gains in access to mental health care services in addition to having a usual source of care, an annual check-up, and being less likely to have unmet care needs due to cost.

By better connecting low-income adults with a depressive disorder to the health care system through Medicaid, it is plausible that this group will be screened for mental health disorders at a higher rate and treated accordingly, whether through a primary care provider or a referral to another provider or specialist. We suspect that gaining health insurance coverage and improving point-of-contact with the health care system may also have positive impacts on both physical and mental health. Further research can dive deeper into exploring the impact of Medicaid expansion on mental health care access and both self-reported health and health outcomes measured through health insurance claims data, to determine whether providing health insurance is a promising strategy for reducing barriers to mental health care and improving mental health outcomes among

low-income individuals. Additionally, policymakers should focus on the differential behaviors, for example, differential rates of having no usual source of care of unmet care needs due to cost, across racial subgroups. For example, our results indicate that married Hispanics are less likely than non-married Hispanics to have an annual check-up after Medicaid expansion. Determining why certain racial subgroups do not utilize preventive health screenings at similar rates may hold key insights into improving health outcomes. Health officials responsible for Medicaid programs by state should ensure they are targeting subgroups that are not utilizing preventive health care, to ensure that population health is better managed and state and federal Medicaid funds are being spent optimally.

Furthermore, we recognize that some states are in the process of implementing Medicaid expansions or are considering ballot initiatives to expand coverage. By increasing coverage and access, states can begin to reduce the economic burdens and loss of productivity that stem from depression. This research adds to existing literature documenting the benefits of offering the opportunity to enroll in public health insurance for vulnerable populations.

Limitations

There are several limitations in this study that should be acknowledged. First, our main data source, BRFSS, does not provide any indication of insurance type. We only know whether an individual is insured or uninsured. Therefore, we do not know whether individuals living in a state that expanded Medicaid actually enrolled in Medicaid after expansion. Second, the treatment of Medicaid expansion was not randomly assigned and we treat ACA Medicaid expansion as a quasi-experiment. However, there may be unobserved confounding factors that influence our outcomes of interest other than Medicaid expansion. Third, our study relies on self-reports of having a depressive disorder, as well as self-reports of access and health status, which are used as our outcomes of interest. This may bias some of our results. For example, it may be difficult for people to recall the last time they visited a doctor, meaning that our outcome measure of not having an annual checkup in the past year may be incorrect. Thus, our impact estimate of Medicaid expansion may appear higher or lower than it would be had our dependent variable been measured using non-self-reported, claims data. Fourth, survey respondents may report having a depressive disorder even if they were not diagnosed by a physician, so our study sample may include individuals who do not fit the criteria for having a clinically-diagnosed, depressive disorder. These individuals may respond differently to Medicaid expansion than our population of interest. Fifth, disabled adults without children were categorically eligible for Medicaid in all states prior to ACA Medicaid expansion. However, BRFSS does not provide a mechanism for identifying disabled individuals in the data, so our study may include individuals who are already insured through Medicaid. Finally, as previously discussed, individuals in expansion and non-expansion states are not necessarily similar in composition in 2013 and 2018, so it is possible that these characteristic differences bias some of our Medicaid expansion impact estimates. The BRFSS survey does not ask survey respondents if they have moved recently. Thus, without controlling for individuals who moved to expansion states after the ACA was passed, our Medicaid expansion impact estimates could be biased due to selection into treatment. Despite these limitations, we believe our research adds to the knowledge base concerning the impact of Medicaid expansion on access to health care for the vulnerable group of low-income
childless adults living with a depressive disorder.

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Tables and Figures

Figure 1: Gap in Coverage for Adults in States that Do Not Expand Medicaid Under the ACA
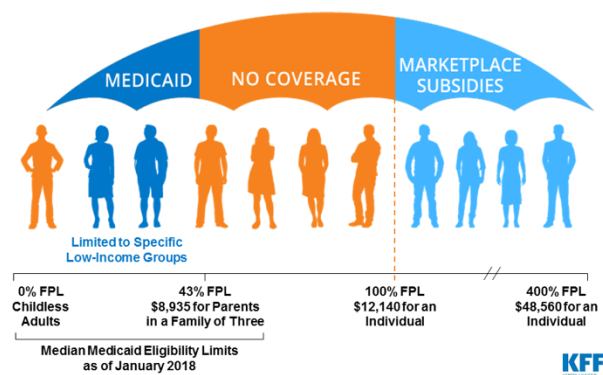
Source: Garfield, R., Orgera, K., & Damico, A. (2019, October 2). The Coverage Gap: Uninsured Poor Adults in States that Do Not Expand Medicaid. Retrieved November 20, 2019, from https://www.kff.org/medicaid/issue-brief/the-coverage-gap-uninsured-poor-adults-in-states-that-do-not-expand-medicaid/.

Figure 2: Classification of Expansion and Non-Expansion States

Expansion decision in 2014	Expansion States (32 states including D.C)	Non-Expansion States (19 states)
No early expansion	Alaska[1], Arizona, Arkansas, Illinois, Indiana[1], Kentucky, Louisiana[1], Maryland, Montana[1], New Hampshire[1], Nevada, New Mexico, Michigan[1], North Dakota, Ohio, Oregon, Pennsylvania[1], Rhode Island, West Virginia	Alabama, Florida, Georgia, Idaho, Kansas, Maine, Mississippi, Missouri, Nebraska, North Carolina, Oklahoma, South Carolina, South Dakota, Tennessee, Texas, Utah, Virginia, Wisconsin, Wyoming
Full early expansion[2]	Delaware, District of Columbia, Massachusetts, New York, Vermont	
Partial early expansion[3]	California, Connecticut, Hawaii, Minnesota	
Limited early expansion[4]	Colorado, Iowa, New Jersey, Washington	

Source: Authors created based on classification of expansion states by Kaestner et al. 2015; Dworsky & Eibner (2016).
Note. [1]Michigan (4/1/2014), New Hampshire (8/15/2014), Pennsylvania (1/1/2015), Indiana (2/1/2015), Alaska (9/1/2015), Montana (1/1/2016), Louisiana (7/1/2016) had adopted the Medicaid expansion later than January 2014. [2]Delaware, District of Columbia, Massachusetts, New York, and Vermont have provided childless adult with income at or above 100% FPL with full coverage equivalent with ACA Medicaid expansion before 2014. [3]California, Connecticut, Hawaii, and Minnesota have provided more limited coverage through 1115 waiver or ACA Medicaid coverage for childless adults with much lower income threshold before 2014. [4]Colorado, Iowa, New Jersey, Washington provided childless adults with a limited coverage.

Source: Lee, H., & Porell, F. W. (2018). The Effect of the Affordable Care Act Medicaid Expansion on Disparities in Access to Care and Health Status. Medical Care Research and Review, 1077558718808709.
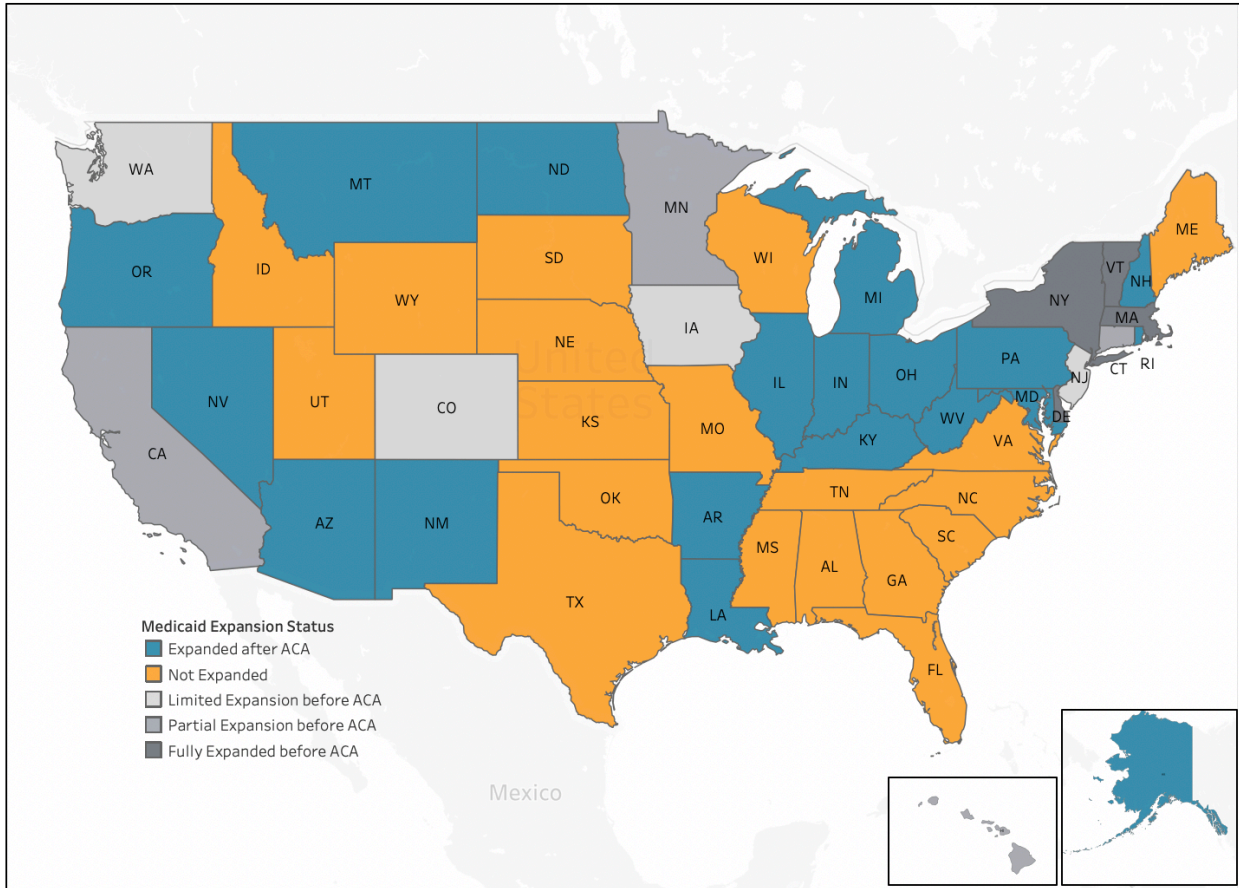
Figure 3: Medicaid Expansion Status as of December 2018

Table 1: Variable Specification for Outcomes

Outcomes	Coding	Questionnaire
No insurance	1 = yes; 0 = no	Do you have any kind of health care coverage, including health insurance, prepaid plans such as HMOs, or government plans such as Medicare, or Indian Health Service?
No usual source of care	1 = yes; 0 = no	Do you have one person you think of as your personal doctor or health care provider?
Unmet care needs due to cost	1 = yes; 0 = no	Was there a time in the past 12 months when you needed to see a doctor but could not because of cost?
No annual check-up	1 = check-up within a year; 0 = no annual check-up within a year	About how long has it been since you last visited a doctor for a routine checkup?
Fair or poor health status	1 = fair or poor; 0 = excellent / very good / good	Would you say that in general your health is excellent / very good / good / fair / poor?
Poor physical health days	Number of days	Now thinking about your physical health, which includes physical illness and injury, for how many days during the past 30 days was your physical health not good?
Poor mental health days	Number of days	Now thinking about your mental health, which includes stress, depression, and problems with emotions, for how many days during the past 30 days was your mental health not good?
Days with health-related activity limitation	Number of days	During the past 30 days, for about how many days did poor physical or mental health keep you from doing your usual activities, such as self-care, work, or recreation?

Table 2: Variable Specification for Covariates

Variable	Coding
Age	Number of years
Female	1 = female; 0 = male
White	1 = yes; 0 = no
Black	1 = yes; 0 = no
Hispanic	1 = yes; 0 = no
Other Race	1 = multiracial or other race, non-Hispanic; 0 = no
No High School Degree	1 = did not graduate high school; 0 = no
Married	1 = married; 0 = divorced, widowed, separated, never married, or member of an unmarried couple
Self-employed	1 = yes; 0 = no
Employed for Wage	1 = yes; 0 = no
Unemployed	1 = out of work for more than 1 year or less than 1 year, homemaker, student, retired, or unable to work; 0 = no
Tobacco Use	1 = have smoked at least 100 cigarettes in entire life; 0 = no
Chronic Disease Status	1 = heart attack, angina or coronary heart disease, stroke, asthma, skin cancer, cancer, chronic obstructive pulmonary disease (COPD), arthritis, kidney disease, and/or diabetes; 0 = no

Table 3: Survey Respondent Characteristics and State Indicators (2013)

Demographics and State-Level Indicators (2013)				
	All States	Non-Expansion States	Expansion States	Difference
Individual Demographics				
Age Group				
18-24	0.226	0.232	0.221	-0.011
25-34	0.157	0.165	0.151	-0.013
35-44	0.117	0.118	0.115	-0.003
45-54	0.258	0.251	0.263	0.013
55-64	0.243	0.234	0.249	0.015
Female	0.507	0.490	0.520	0.030*
Race/Ethnicity				
White	0.545	0.601	0.500	-0.100***
Black	0.227	0.212	0.240	0.028*
Hispanic	0.161	0.115	0.198	0.083***
Other	0.067	0.073	0.062	-0.010
No High School Degree	0.296	0.286	0.304	0.018
Married	0.166	0.143	0.185	0.043***
Employment Status				
Self-employed	0.066	0.066	0.065	-0.001
Employed for Wage	0.243	0.231	0.253	0.022
Unemployed	0.691	0.703	0.682	-0.021
Tobacco Use	0.523	0.542	0.509	-0.033*
Chronic Disease Status	0.554	0.558	0.552	-0.006
Depressive Disorder Indicator	0.350	0.365	0.338	-0.028*
Observations	11,683	6,608	5,075	
State-Level Indicators				
Unemployment Rate	6.8	6.3	7.2	0.916
Per Capita Income (USD)	41,945	41,292	42,598	1,306
Percent White	0.831	0.821	0.840	0.019
Percent Black	0.126	0.143	0.108	-0.035
Percent Hispanic	0.108	0.101	0.115	0.013
Number of Hospital Beds[a]	2.8	2.9	2.7	-0.237
Number of Physicians[a]	1.8	1.7	1.9	0.248
Congressional Voting Record[b]	39.0	21.6	56.4	34.9***
Observations	38	19	19	

Note: Individual demographics data are from Behavioral Risk Factor Surveillance System (BRFSS). State-level indicator data are from Rhode Island Department of Labor and Training, Federal Reserve Bank of St. Louis, U.S. Census Bureau Annual Estimates, American Hospital Association Annual Survey, Bureau of Labor Statistics Occupational Employment Statistics Survey, and Americans for Democratic Action (ADA).

[a] Per 1,000 population

[b] Legislator's ideology rating is measured by the ADA scores on congressional voting records on a wide range of legislative issues for each U.S. senator from each state. Each state rating was produced by averaging senator's ratings from each state.

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

Table 4: Effects of Medicaid Expansion on Multiple Outcomes for Poor Childless Adults With and Without a Depressive Disorder

	Insurance	Access to Care			Health Status			
	(1) No Insurance	(2) No usual source of care	(3) Unmet care needs due to cost	(4) No annual check-up	(5) Fair or poor health status	(6) Poor physical health days	(7) Poor mental health days	(8) Days with health-related activity limitation
Model 1: All Individuals	-0.148*** (0.017)	-0.056*** (0.012)	-0.042*** (0.009)	-0.067*** (0.018)	-0.022 (0.011)	-0.581 (0.310)	-0.586** (0.204)	-1.022*** (0.245)
Model 2: Individuals with a depressive disorder, only	-0.139*** (0.026)	-0.043** (0.013)	-0.057** (0.017)	-0.067** (0.020)	-0.016 (0.014)	-1.035* (0.410)	-0.774 (0.398)	-0.411 (0.297)
Model 3: Individuals without a depressive disorder, on	-0.157*** (0.015)	-0.066*** (0.013)	-0.033* (0.015)	-0.069*** (0.019)	-0.024 (0.013)	-0.289 (0.299)	-0.321 (0.262)	-1.390*** (0.355)
Observations (Model 1)	71,853	71,894	71,959	70,982	71,910	70,196	70,511	52,709

Note. Columns 1 to 8 display difference-in-difference estimates of the effect of Medicaid expansion on eight outcomes of interest. Models 2 and 3 include estimates when our sample from Model 1 is restricted to individuals with and without a depressive disorder, respectively. All regressions control for age, gender, race, education, marital status, employment status, chronic disease status, tobacco use, imputed household size, state-fixed effects, and year-fixed effects. We also control for state-year variables including the number of hospital beds and physicians per 1,000 population, unemployment rate, per capita income, racial/ethnic composition, and Senate voting records. Standard errors are in parentheses and are clustered at the state level.
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 5: Effects of Medicaid Expansion by Race on Multiple Outcomes for Poor Childless Adults With a Depressive Disorder

	Insurance	Access to Care			Health Status			
	(1) No Insurance	(2) No usual source of care	(3) Unmet care needs due to cost	(4) No annual check-up	(5) Fair or poor health status	(6) Poor physical health days	(7) Poor mental health days	(8) Days with health-related activity limitation
Expansion	-0.133*** (0.030)	-0.033 (0.016)	-0.059** (0.020)	-0.065* (0.025)	-0.010 (0.015)	-0.904* (0.439)	-0.981* (0.400)	-0.573 (0.294)
Expansion*Black	-0.037 (0.029)	-0.038 (0.026)	0.000 (0.043)	0.013 (0.031)	0.000 (0.033)	-0.502 (0.823)	0.805 (0.462)	0.620 (0.637)
Expansion*Hispanic	0.008 (0.059)	-0.031 (0.026)	0.024 (0.042)	-0.061 (0.043)	-0.015 (0.038)	1.690* (0.661)	2.117 (1.515)	1.185 (1.532)
Expansion*Other Race	-0.011 (0.045)	-0.007 (0.035)	0.007 (0.048)	0.018 (0.036)	-0.065 (0.050)	-3.155* (1.285)	-2.025 (1.798)	-0.828 (0.897)
Observations	29,762	29,743	29,756	29,325	29,722	28,998	28,989	26,858
F-statistics and p-values Testing Exclusion of Groups of Variables:								
Race interactions = 0	0.627 (0.602)	0.897 (0.452)	0.122 (0.947)	1.043 (0.385)	0.839 (0.481)	3.387 (0.028)	8.224 (0.000)	1.150 (0.342)

Note. Columns 1 to 8 display difference-in-difference estimates of the differential effect of Medicaid expansion by race on eight outcomes of interest. All regressions control for age, gender, race, education, marital status, employment status, chronic disease status, tobacco use, imputed household size, state-fixed effects, and year-fixed effects. We also control for state-year variables including the number of hospital beds and physicians per 1,000 population, unemployment rate, per capita income, racial/ethnic composition, and Senate voting records. Standard errors are in parentheses and are clustered at the state level. The F-test at the bottom of the table tests for the joint significance of the three interaction terms included in the model.

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

Table 6: Effects of Medicaid Expansion by Individual-Level Characteristics on Multiple Outcomes for Poor Childless Adults With a Depressive Disorder

Effects of Medicaid Expansion by Individual-Level Characteristics on Multiple Outcomes for Poor Childless Adults With a Depressive Disorder

	Insurance		Access to Care			
	(1) No Insurance		(2) No usual source of care		(3) Unmet care needs due to cost		(4) No annual check-up	
Model 1: Chronic Disease								
Expansion	-0.167***	(0.042)	-0.077**	(0.028)	-0.047	(0.026)	-0.079*	(0.038)
Expansion*Chronic Disease	0.038	(0.033)	0.046	(0.030)	-0.013	(0.029)	0.016	(0.040)
Model 2: Gender								
Expansion	-0.139***	(0.027)	-0.053	(0.027)	-0.012	(0.020)	-0.076**	(0.027)
Expansion*Female	0.000	(0.017)	0.018	(0.027)	-0.075**	(0.023)	0.014	(0.020)
Model 3: Education								
Expansion	-0.141***	(0.025)	-0.050***	(0.013)	-0.067***	(0.017)	-0.074***	(0.018)
Expansion*No High School Degree	0.006	(0.019)	0.022	(0.021)	0.033	(0.024)	0.022	(0.036)
Model 4: Marital Status								
Expansion	-0.138***	(0.026)	-0.042**	(0.014)	-0.052*	(0.020)	-0.062**	(0.020)
Expansion*Married	-0.007	(0.025)	-0.004	(0.021)	-0.029	(0.043)	-0.031	(0.025)
Model 5: Employment Status								
Expansion	-0.220***	(0.036)	-0.084*	(0.031)	-0.076**	(0.027)	-0.088*	(0.038)
Expansion*Unemployed	0.098***	(0.019)	0.051	(0.034)	0.024	(0.025)	0.026	(0.031)

Note. Columns 1 to 4 display difference-in-difference estimates of the differential effect of Medicaid expansion by individual-level characteristics on four outcomes of interest. Models 1 to 5 include our main Expansion indicator variable and an interaction with the individual-level characteristic specified in the first column. All regressions control for age, gender, race, education, marital status, employment status, chronic disease status, tobacco use, imputed household size, state-fixed effects, and year-fixed effects. We also control for state-year variables including the number of hospital beds and physicians per 1,000 population, unemployment rate, per capita income, racial/ethnic composition, and Senate voting records. Standard errors are in parentheses and are clustered at the state level.

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

Table 7: Effects of Medicaid Expansion by Race and Individual-Level Characteristics on Multiple Outcomes for Poor Childless Adults With a Depressive Disorder

Effects of Medicaid Expansion by Race and Individual-Level Characteristics on Multiple Outcomes for Poor Childless Adults With a Depressive Disorder

| | Insurance | | | Access to Care | | | | | | | | |
| | (1) No Insurance | | | (2) No usual source of care | | | (3) Unmet care needs due to cost | | | (4) No annual check-up | | |
	A) White	B) Black	C) Hispanic	A) White	B) Black	C) Hispanic	A) White	B) Black	C) Hispanic	A) White	B) Black	C) Hispanic
Model 1: Chronic Disease												
Expansion	-0.125* (0.056)	-0.279** (0.080)	-0.218 (0.109)	-0.051 (0.033)	-0.155 (0.078)	-0.085 (0.078)	-0.045 (0.037)	-0.135 (0.091)	0.029 (0.087)	-0.021 (0.037)	-0.132 (0.085)	-0.282** (0.082)
Expansion*Chronic Disease	-0.003 (0.050)	0.186** (0.063)	0.071 (0.070)	0.011 (0.029)	0.135 (0.084)	0.093 (0.088)	-0.033 (0.037)	0.081 (0.082)	-0.029 (0.066)	-0.044 (0.034)	0.082 (0.092)	0.152* (0.058)
Model 2: Gender												
Expansion	-0.123*** (0.033)	-0.125* (0.049)	-0.210* (0.095)	-0.045 (0.032)	-0.037 (0.058)	-0.027 (0.062)	-0.056* (0.022)	0.030 (0.056)	0.098 (0.079)	-0.060 (0.040)	-0.052 (0.039)	-0.214* (0.085)
Expansion*Female	-0.007 (0.018)	-0.025 (0.037)	0.075 (0.050)	0.003 (0.026)	-0.029 (0.061)	0.013 (0.081)	-0.023 (0.021)	-0.181** (0.065)	-0.166* (0.065)	0.010 (0.023)	-0.031 (0.040)	0.071 (0.068)
Model 3: Education												
Expansion	-0.130*** (0.031)	-0.130* (0.048)	-0.194* (0.085)	-0.058** (0.020)	-0.061 (0.041)	-0.017 (0.052)	-0.064** (0.022)	-0.140** (0.046)	-0.048 (0.065)	-0.058 (0.033)	-0.070 (0.046)	-0.196*** (0.054)
Expansion*No High School Degree	0.010 (0.025)	-0.023 (0.036)	0.063 (0.054)	0.053* (0.025)	0.019 (0.050)	-0.007 (0.081)	-0.019 (0.027)	0.168** (0.061)	0.144 (0.105)	0.013 (0.036)	-0.000 (0.054)	0.051 (0.073)
Model 4: Marital Status												
Expansion	-0.120*** (0.030)	-0.142** (0.044)	-0.189* (0.093)	-0.045* (0.018)	-0.048 (0.038)	-0.011 (0.051)	-0.059* (0.023)	-0.082 (0.053)	0.002 (0.072)	-0.042 (0.034)	-0.078 (0.039)	-0.200** (0.069)
Expansion*Married	-0.046* (0.022)	0.018 (0.049)	0.090 (0.055)	0.014 (0.022)	-0.039 (0.065)	-0.044 (0.060)	-0.069 (0.043)	0.056 (0.095)	0.029 (0.068)	-0.075** (0.025)	0.056 (0.080)	0.112* (0.054)
Model 5: Employment Status												
Expansion	-0.178*** (0.047)	-0.300*** (0.077)	-0.263* (0.117)	-0.069 (0.038)	-0.117 (0.067)	-0.041 (0.066)	-0.078* (0.039)	-0.182* (0.077)	0.026 (0.094)	-0.054 (0.043)	-0.038 (0.079)	-0.273* (0.116)
Expansion*Unemployed	0.062* (0.026)	0.186** (0.058)	0.133* (0.055)	0.032 (0.037)	0.073 (0.082)	0.030 (0.056)	0.010 (0.037)	0.125 (0.071)	-0.025 (0.077)	-0.000 (0.026)	-0.037 (0.074)	0.137 (0.092)

Note. Columns 1 to 4 display difference-in-difference estimates of the differential effect of Medicaid expansion by race and individual-level characteristics on four outcomes of interest. Models 1 to 5 include our main Expansion indicator variable and an interaction with the individual-level characteristic specified in the first column. All regressions control for age, gender, education, marital status, employment status, chronic disease status, tobacco use, imputed household size, state-fixed effects, and year-fixed effects. We also control for state-year variables including the number of hospital beds and physicians per 1,000 population, unemployment rate, per capita income, racial/ethnic composition, and Senate voting records. Standard errors are in parentheses and are clustered at the state level.

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

Table 8: Parallel Trends Test – Equation (1)

Effects of Medicaid Expansion on Multiple Outcomes for Poor Childless Adults With and Without a Depressive Disorder

| | Insurance | Access to Care | | | Health Status | | | |
	(1) No Insurance	(2) No usual source of care	(3) Unmet care needs due to cost	(4) No annual check-up	(5) Fair or poor health status	(6) Poor physical health days	(7) Poor mental health days	(8) Days with health-related activity limitation
Model 1: All Individuals	-0.054** (0.017)	-0.016 (0.018)	-0.012 (0.014)	-0.017 (0.019)	-0.005 (0.012)	-0.292 (0.257)	-0.030 (0.341)	-0.215 (0.372)
Model 2: Individuals with a depressive disorder, only	-0.036 (0.030)	-0.031 (0.023)	-0.003 (0.017)	-0.006 (0.024)	-0.007 (0.021)	-1.482* (0.560)	-0.175 (0.567)	0.068 (0.437)
Model 3: Individuals without a depressive disorder, only	-0.059*** (0.015)	-0.005 (0.024)	-0.015 (0.018)	-0.020 (0.019)	-0.006 (0.014)	0.306 (0.240)	-0.131 (0.306)	-0.548 (0.452)
Observations (Model 1)	71,853	71,894	71,959	70,982	71,910	70,196	70,511	52,709

Note. Columns 1 to 8 display difference-in-difference estimates of the effect of Medicaid expansion on eight outcomes of interest. Models 2 and 3 include estimates when our sample from Model 1 is restricted to individuals with and without a depressive disorder, respectively. All regressions control for age, gender, race, education, marital status, employment status, chronic disease status, tobacco use, imputed household size, state-fixed effects, and year-fixed effects. We also control for state-year variables including the number of hospital beds and physicians per 1,000 population, unemployment rate, per capita income, racial/ethnic composition, and Senate voting records. Standard errors are in parentheses and are clustered at the state level.

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

Table 9: Survey Respondent Characteristics and State Indicators (2018)

Demographics and State-Level Indicators (2018)			
	All States	Non-Expansion States	Expansion States	Difference
Individual Demographics				
Age Group				
18-24	0.260	0.237	0.276	0.039*
25-34	0.134	0.148	0.124	-0.025
35-44	0.112	0.106	0.116	0.011
45-54	0.219	0.232	0.210	-0.022
55-64	0.275	0.277	0.274	-0.003
Female	0.504	0.512	0.499	-0.013
Race/Ethnicity				
White	0.512	0.563	0.478	-0.084***
Black	0.224	0.210	0.233	0.023
Hispanic	0.189	0.143	0.220	0.077***
Other	0.075	0.084	0.068	-0.015
No High School Degree	0.280	0.275	0.284	0.010
Married	0.192	0.169	0.207	0.038**
Employment Status				
Self-employed	0.065	0.068	0.064	-0.004
Employed for Wage	0.255	0.220	0.280	0.060**
Unemployed	0.679	0.713	0.657	-0.056**
Tobacco Use	0.466	0.498	0.444	-0.055**
Chronic Disease Status	0.555	0.568	0.546	-0.022
Depressive Disorder Indicator	0.349	0.380	0.328	-0.052**
Observations	8,043	4,384	3,659	
State-Level Indicators				
Unemployment Rate	3.9	3.5	4.3	0.774**
Per Capita Income (USD)	49,515	48,606	50,423	1,818
Percent White	0.824	0.816	0.832	0.016
Percent Black	0.130	0.147	0.113	-0.033
Percent Hispanic	0.118	0.110	0.125	0.015
Number of Hospital Beds[a]	2.1	2.2	2.0	-0.178
Number of Physicians[a]	1.9	1.8	2.0	0.212
Congressional Voting Record[b]	32.7	17.5	47.9	30.4**
Observations	38	19	19	

Note: Individual demographics data are from Behavioral Risk Factor Surveillance System (BRFSS). State-level indicator data are from Rhode Island Department of Labor and Training, Federal Reserve Bank of St. Louis, U.S. Census Bureau Annual Estimates, American Hospital Association Annual Survey, Bureau of Labor Statistics Occupational Employment Statistics Survey, and Americans for Democratic Action (ADA).

[a] Per 1,000 population

[b] Legislator's ideology rating is measured by the ADA scores on congressional voting records on a wide range of legislative issues for each U.S. senator from each state. Each state rating was produced by averaging senator's ratings from each state.

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

Appendix

Robustness check: treatment assignment

As previously mentioned, we assign treatment status on a state-by-state basis according to the month in which ACA Medicaid expansion becomes effective. However, because there may be a lag in which some individuals are eligible for Medicaid, but have not yet enrolled, we perform robustness checks with six-month and twelve-month lags in treatment assignment. Specifically, we re-run our main results from Equations (1) - (3) after delaying treatment to begin six months after and twelve-months after Medicaid becomes effective in that state, respectively. Our results show similar effects of ACA Medicaid expansion whereby individuals in treatment states experience larger and statistically significant declines in rates of uninsurance, having no usual source of care, having unmet care needs due to cost, and having no annual check-up after Medicaid expansion as compared to individuals in non-expansion states. We similarly do not find differential effects of Medicaid expansion by race from Equation (2), but do find similar differential effects of Medicaid expansion by certain individual-level characteristics that are consistent with our estimates without a treatment assignment lag from Equation (3). Thus, our results with and without treatment assignment lag are reasonably robust and validate our decision to present our main results without a lag in Tables 4 - 7.

Robustness check: state-level controls

In our main models, we specified state-level time-varying geographic environmental variables as control variables. These include: an indicator of state political ideology; physicians and hospital beds per 1,000 capita; and per capita income, unemployment rate, and racial composition variables. However, we recognized that these state-level controls may be affected by Medicaid expansion, which could bias our impact estimate of expansion. Therefore, we ran our main three models without these state-level controls and find that our empirical results are very similar when we include or exclude these state-level controls. Our estimates with the state-level controls are sometimes larger and sometimes smaller in absolute value, but the magnitudes are comparable. Therefore, we believe that our empirical results are robust and we present our main results with state-level controls.

Robustness check: homogeneity

As previously mentioned, respondents in expansion states differed from those in non-expansion states in race/ethnicity and employment status (**Table 9**). One possible explanation for heterogeneity between the two groups is that individuals in expansion states receive treatment for mental illness at higher rates and are more likely to self-report as not having a depressive disorder. This would lead them to be excluded from our analyses of individuals with a depressive disorder. If this theory were true, and if receiving treatment varies with individual characteristics, this could possibly lead to differences in the composition of populations with depressive disorders between the two groups of states. To test this possibility, we conducted difference-in-differences analyses using stable individual characteristics, namely age, gender, and race/ethnicity, as dependent variables and expansion as an independent variable (**Appendix Table 1**). We found no statistically significant effects on race/ethnicity, gender, or the majority of age groups, suggesting that expansion did not differentially affect the demographic composition of individuals with depressive disorder.

Appendix Table 1: Homogeneity Test

Effects of Expansion on Stable Individual Characteristics

	Age Group								
	(1) 18-24		(2) 25-34		(3) 35-44		(4) 45-54		(5) 55-64
Expansion	-0.007	(0.017)	-0.013	(0.015)	0.007	(0.013)	-0.013	(0.016)	0.026* (0.014)
Observations	29,866		29,866		29,866		29,866		29,866

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

Effects of Expansion on Stable Individual Characteristics (continued)

	Gender		Race/Ethnicity						
	(6) Female		(7) White		(8) Black		(9) Hispanic		(10) Other
Expansion	0.000	(0.024)	-0.024	(0.017)	0.006	(0.013)	0.008	(0.009)	0.011 (0.009)
Observations	29,866		29,866		29,866		29,866		29,866

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

Appendix Table 2: Parallel Trends Test – Equation (2)

Effects of Medicaid Expansion by Race on Multiple Outcomes for Poor Childless Adults With a Depressive Disorder

	Insurance		Access to Care						Health Status						
	(1) No Insurance		(2) No usual source of care		(3) Unmet care needs due to cost		(4) No annual check-up		(5) Fair or poor health status		(6) Poor physical health days		(7) Poor mental health days		(8) Days with health-related activity limitation
Expansion	-0.017	(0.031)	-0.020	(0.024)	0.004	(0.023)	-0.004	(0.024)	-0.005	(0.024)	-1.379*	(0.646)	-0.265	(0.510)	-0.158	(0.490)
Expansion*Black	-0.075**	(0.024)	-0.028	(0.027)	-0.017	(0.040)	0.015	(0.022)	0.003	(0.029)	-0.687	(0.932)	0.242	(0.761)	0.648	(0.741)
Expansion*Hispanic	-0.053	(0.064)	-0.056	(0.030)	-0.041	(0.040)	-0.065	(0.032)	0.015	(0.041)	1.367	(0.741)	1.885	(1.196)	1.802	(1.032)
Expansion*Other Race	-0.020	(0.044)	-0.024	(0.049)	-0.023	(0.043)	0.005	(0.047)	-0.056	(0.059)	-1.302	(1.134)	-1.454	(1.228)	-0.427	(1.022)
Observations	29,762		29,743		29,756		29,325		29,722		28,998		28,989		26,858	

Note. Columns 1 to 8 display difference-in-difference estimates of the differential effect of Medicaid expansion by race on eight outcomes of interest. All regressions control for age, gender, race, education, marital status, employment status, chronic disease status, tobacco use, imputed household size, state-fixed effects, and year-fixed effects. We also control for state-year variables including the number of hospital beds and physicians per 1,000 population, unemployment rate, per capita income, racial/ethnic composition, and Senate voting records. Standard errors are in parentheses and are clustered at the state level.

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

Appendix Table 3: Parallel Trends Test – Equation (3)

Effects of Medicaid Expansion by Race and Individual-Level Characteristics on Multiple Outcomes for Poor Childless Adults With a Depressive Disorder

	Insurance						Access to Care											
	(1) No Insurance						(2) No usual source of care						(3) Unmet care needs due to cost						(4) No annual check-up					
	A) White		B) Black		C) Hispanic		A) White		B) Black		C) Hispanic		A) White		B) Black		C) Hispanic		A) White		B) Black		C) Hispanic	
Model 1: Chronic Disease																								
Expansion	0.007	(0.040)	-0.068	(0.075)	-0.382**	(0.088)	-0.024	(0.038)	-0.084	(0.062)	-0.208	(0.139)	0.042	(0.031)	-0.064	(0.079)	-0.162	(0.081)	0.030	(0.025)	-0.016	(0.068)	-0.178*	(0.071)
Expansion*Chronic Disease	-0.007	(0.031)	0.090	(0.067)	0.191**	(0.064)	0.018	(0.021)	0.078	(0.065)	0.170	(0.096)	-0.027	(0.026)	0.098	(0.078)	0.004	(0.059)	-0.041	(0.027)	0.031	(0.071)	0.113	(0.069)
Model 2: Gender																								
Expansion	-0.006	(0.038)	0.026	(0.064)	-0.315**	(0.066)	-0.017	(0.039)	-0.006	(0.061)	-0.107	(0.089)	0.020	(0.035)	0.139	(0.077)	-0.102	(0.079)	-0.001	(0.026)	0.035	(0.060)	-0.151*	(0.070)
Expansion*Female	0.013	(0.023)	-0.048	(0.043)	0.131*	(0.052)	0.011	(0.027)	-0.037	(0.058)	0.039	(0.066)	0.003	(0.019)	-0.209**	(0.071)	-0.110*	(0.049)	0.001	(0.022)	-0.045	(0.049)	0.103	(0.064)
Model 3: Education																								
Expansion	0.003	(0.030)	0.015	(0.055)	-0.248**	(0.081)	-0.030	(0.033)	-0.008	(0.048)	-0.093	(0.116)	0.028	(0.034)	-0.026	(0.051)	-0.187**	(0.061)	0.006	(0.023)	0.029	(0.038)	-0.140*	(0.059)
Expansion*No High School Degree	-0.003	(0.019)	-0.049	(0.048)	0.002	(0.061)	0.066**	(0.022)	-0.054	(0.044)	0.017	(0.067)	-0.019	(0.024)	0.078	(0.055)	0.064	(0.107)	-0.021	(0.032)	-0.059	(0.053)	0.100	(0.054)
Model 4: Marital Status																								
Expansion	0.008	(0.031)	-0.014	(0.052)	-0.250**	(0.063)	-0.012	(0.031)	-0.032	(0.042)	-0.080	(0.097)	0.029	(0.034)	0.005	(0.050)	-0.158	(0.080)	0.008	(0.027)	0.000	(0.039)	-0.100	(0.064)
Expansion*Married	-0.044	(0.023)	0.072	(0.057)	0.030	(0.059)	0.006	(0.021)	0.021	(0.076)	-0.047	(0.048)	-0.048	(0.035)	-0.001	(0.074)	-0.011	(0.074)	-0.053*	(0.023)	0.042	(0.052)	0.026	(0.059)
Model 5: Employment Status																								
Expansion	-0.024	(0.042)	-0.115	(0.091)	-0.376**	(0.090)	0.022	(0.040)	-0.081	(0.054)	-0.062	(0.120)	0.031	(0.044)	-0.070	(0.085)	-0.193*	(0.083)	0.019	(0.040)	0.013	(0.067)	-0.143	(0.093)
Expansion*Unemployed	0.032	(0.034)	0.129	(0.068)	0.177**	(0.061)	-0.041	(0.035)	0.060	(0.060)	-0.033	(0.060)	-0.011	(0.030)	0.088	(0.084)	0.047	(0.055)	-0.024	(0.031)	-0.008	(0.079)	0.063	(0.068)

Note. Columns 1 to 4 display difference-in-difference estimates of the differential effect of Medicaid expansion by race and individual-level characteristics on four outcomes of interest. Models 1 to 5 include our main Expansion indicator variable and an interaction with the individual-level characteristic specified in the first column. All regressions control for age, gender, education, marital status, employment status, chronic disease status, tobacco use, imputed household size, state-fixed effects, and year-fixed effects. We also control for state-year variables including the number of hospital beds and physicians per 1,000 population, unemployment rate, per capita income, racial/ethnic composition, and Senate voting records. Standard errors are in parentheses and are clustered at the state level.

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