Expanding public health insurance improves hypertension treatment: Evidence from ACA Medicaid expansion, 2007-2019

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Abstract

Existing research has found that state Medicaid expansion through the Affordable Care Act has improved health insurance coverage and financial protections for low-income Americans. Yet less is known about the extent of meaningful improvements in health or the mechanisms through which these may operate. Using nationally representative data from 2007-19, I examined changes in the diagnosis and treatment of hypertension among non-elderly adults residing in states that expanded Medicaid, compared to residents of states that did not expand Medicaid. I estimated the average effect of Medicaid expansion and its impacts on childless adults earning below 400%, below 138%, and below 100% of the FPL. Medicaid expansion was associated with a 3% increase in the treatment of hypertension among those diagnosed with the condition. This impact was present across the age distribution of non-elderly adults and was at least as large for Black Americans as for whites. A back of the envelope calculation suggests that, by 2019, over 2.2 million hypertensives gained coverage through Medicaid expansion, of whom more than 1.5 million began taking blood pressure-lowering medication.

President Obama signed the Patient Protection and Affordable Care Act (ACA) into law on March 23, 2010. It contained several elements designed to expand insurance coverage, including the expansion of Medicaid to adults below 138% of the Federal Poverty Level (FPL)(Mazurenko, Balio, Agarwal, Carroll, & Menachemi, 2018) and subsidies to make purchasing private insurance more affordable for Americans earning between 100% and 400% of the FPL (Liu, Gotanda, Khullar, Rice, & Tsugawa, 2021). After several states challenged the legality of expanding Medicaid, the Supreme Court ruled that it must be optional for states (Rosenbaum & Westmoreland, 2012). Twenty-five states and the District of Columbia expanded Medicaid as designed in early 2014, with others following suit in the ensuing years ("Status of State Action on the Medicaid Expansion Decision," 2022). I exploit the incomplete expansion of Medicaid and variation in expansion timing to estimate the policy's causal impacts.

While these sweeping changes to the American health insurance market led to substantially higher rates of health insurance coverage (McMorrow, Long, Kenney, & Anderson, 2015), it remains less clear whether the policy change led to meaningful improvements in *health*. Initial research on the effects of the ACA has documented several areas of impact, including a reduction in uninsured hospital stays (Nikpay, Buchmueller, & Levy, 2016) and medical debt sent to collections (Kluender, Mahoney, Wong, & Yin, 2021) and an increase in the provision of preventive care and cancer screenings (Simon, Soni, & Cawley, 2017). Other research has identified improvements in self-rated health (Courtemanche, Marton, Ukert, Yelowitz, & Zapata, 2018) and higher rates of diabetes diagnosis (Wherry & Miller, 2016). No substantial impacts on labor supply or evidence of moral hazard have materialized (Levy, Buchmueller, & Nikpay, 2018; Simon et al., 2017). Gruber and Sommers conclude that the ACA has increased both health insurance coverage and the consumption of health care, alongside what they refer to as "suggestive but more limited evidence on improved health outcomes" (Gruber & Sommers, 2019, p. 1028).

To investigate whether the ACA has improved health, we might examine impacts on morbidity—such as the management of chronic diseases or hospitalizations from heart attacks or strokes— or mortality. On these topics, early findings are encouraging, though the picture is far from clear. One study documented that Medicaid recipients filled more diabetes and "cardioprotective" prescriptions in expansion states (Ghosh, Simon, & Sommers, 2017). Medicaid expansion states also saw a reduction in deaths from cardiovascular causes (2019). However, mortality files cannot shed light on whether changes stem from, for example, improvements in disease prevention (pharmacologic or otherwise); increases in healthcare consumption (e.g., visits to the emergency department); or increases in the duration or quality of care provided (relative to an uninsured hospital stay). More research is needed to identify the mechanisms through which these impacts have operated.

This study asks whether there are signs of improved chronic disease management in Medicaid expansion states, examined here through rates of taking medication to treat hypertension. The theory of change I envision is that cardiovascular diseases may come to be better managed, or even prevented, through improved access to primary care rather than to emergent care. I examine this proposed association in the outpatient setting, via nationally representative survey data.

Background on hypertension

Hypertension, defined in adults as blood pressures of at least 130 mm Hg for Systolic Blood Pressure (SBP) or 80 mm Hg for Diastolic Blood Pressure (DBP) (Whelton et al., 2018), affects more than one in four American adults (Fang, Gillespie, Ayala, & Loustalot, 2018; Gillespie, Hurvitz, & (CDC), 2013). While prevalence increases with age, the majority of people diagnosed with hypertension are below the age of 65 (Mensah & Brown, 2007). Blood pressure is measured at most clinic visits and antihypertensive medication often prescribed by a primary care provider (PCP), making hypertension treatment a suitable measure to evaluate the impacts of expanding access to primary care It is worth noting that expanding eligibility for health insurance; expanding health insurance coverage; and expanding health insurance use are not equivalent. I elaborate on this in the Theory of Change section and, throughout the document, endeavor to use the most specific terminology that is appropriate. In some places, I use the term "access" to refer to the ability to have a healthcare-related need met, though a lack of access may arise from a variety of sources (i.e., this term is used more generally than any reference to eligibility or insurance status). .

Elevated blood pressure is quite responsive to treatment This paper focuses on primary hypertension, which is more responsive to treatment than hypertension that co-occurs with other chronic disease.. Yet below half of individuals with primary hypertension achieve blood pressure control (Cutler et al., 2008; Law, Morris, & Wald, 2009). Moreover, hypertension control is proportionally less common among adults below the age of 40 than those 60 and older (Yoon, Fryar, & Carroll, 2015). Low rates of control are understood to stem in part from lack of awareness of high blood pressure and difficulty accessing treatment due to insurance or cost-related barriers (Carey, Muntner, Bosworth, & Whelton, 2018; Cutler et al., 2008). Even for those who have insurance and access to a PCP, achieving blood pressure control can require consistent follow-up for medication management (Milani, Lavie, Bober, Milani, & Ventura, 2017).

Untreated and uncontrolled hypertension are particularly concerning for progression to cardiovascular disease (CVD) and complications like heart attacks and strokes, which together form the most expensive disease in the US (Mensah & Brown, 2007; Thom et al., 2006). Hypertension is associated with higher risk of both all-cause mortality and death from cardiovascular diseases, compared to those with normal blood pressure or controlled hypertension (Gu, Dillon, Burt, & Gillum, 2010; Zhou, Xi, Zhao, Wang, & Veeranki, 2018).

There is also evidence that mortality risk increases linearly with increasing systolic blood pressure in hypertensives (Gu et al., 2010), underscoring the importance of initiating treatment soon after diagnosis. It is estimated that a 10 mm Hg reduction in the blood pressure of individuals with hypertension can reduce mortality from both cardiovascular causes (by 25%) and strokes (by 40%) (Law et al., 2009).

Racial disparities

In the US, the persistence of racial disparities in health is central to any conversation about improving access to healthcare. Lacking health insurance is one source of racial disparity in healthcare access and quality (Fiscella & Sanders, 2016). But expanding health insurance alone may not be sufficient to eliminate disparities in health outcomes and it is reasonable to hypothesize that these disparities could blunt the benefits of the ACA despite clear increases in healthcare access (Ayanian, Landon, Newhouse, & Zaslavsky, 2014; Engelhardt, Hisle-Gorman, Gorman, & Dobson, 2018). Racial disparities can emerge at multiple points along the path from disease risk to treatment. For instance, Black Americans experience higher blood pressure than whites and are, on average, diagnosed with hypertension earlier in life (Chobanian et al., 2003; Joint National Committee on Prevention, 1997; Vasan et al., 2001), whereas white-Hispanic racial disparities more often emerge in lower levels of awareness and delayed treatment (Cutler et al., 2008). Remediating these health disparities will require correctly determining where unmet needs arise.

Method

I use data from the Behavioral Risk Factor Surveillance System (BRFSS), a large cross-sectional telephone survey conducted by the CDC and state governments. Questions related to blood pressure are asked every other year; responses from 2007 through 2019 (odd years) are examined here.

Measures

Primary Outcomes. Respondents are asked if they have ever been told that they have high blood pressure or hypertension. Those who answer “yes” are then asked whether they are currently taking medication for their high blood pressure. This question about hypertension treatment, the more clinically relevant of the two, is the primary outcome for this study. Change on this measure would offer evidence that expanding health insurance led to change in the provision of primary care and in the treatment of chronic disease.

Secondary outcomes. In order for Medicaid expansion to improve hypertension management in the primary care setting That is, not via increased williingness to visit an Emergency Department or better care delivered in the inpatient context., eligible individuals need to gain access to and be able to use their new health insurance. To confirm these mechanisms are indeed present, I examine several impacts in the BRFSS dataset: whether a person reports that they have insurance, whether they have one or more providers they consider their personal doctor (Morgan et al., 2019), and whether a cost barrier prevented accessing needed care within the past year.

Additional measures. I include respondent-reported demographic information: age, sex, education level, ethnoracial group, household size, income level, marital status, whether any children under 18 reside in the household, and employment status. Household income as a proportion of the FPL is estimated based on annual federal guidelines, computed from reported household size and annual income. I obtain each state's quarterly unemployment rate (seasonally adjusted) from the Bureau of Labor Statistics.

Estimation samples. All analyses are conducted for four estimation samples, which differ primarily in the degrees of income restriction applied to each. Sample 1 estimates the impact of the policy change on the population of nonelderly adults residing in expansion states. It conveys how outcomes of interest changed, on average, in states that expanded Medicaid, relative to those that did not.

Two additional restrictions are applied to the remaining 3 estimation samples. First, they exclude households with children, as adults without children were the primary population affected by Medicaid expansion through the ACA. Second, they are successively restricted based on household income: Sample 2 includes those with household income below 400% of the FPL. This sample includes individuals in expansion states who became eligible for Medicaid (those earning up to 138% of the FPL) as well as all who became eligible for Marketplace subsidies (those earning between 100% and 400% of the FPL). Sample 3 is restricted to those earning below 138% of the FPL and Sample 4 to those earning below 100% of the FPL. Each sample's pre-expansion means appear in online appendix Figure S2 To access the Appendix, click on the Details tab of the article online..

Analytic approach

Difference in differences. I begin with a difference-in-differences (DD) analysis that compares nonelderly adults between states that expanded Medicaid and those that did not, both before and after the expansion was implemented. My preferred specification looks only at states that implemented the policy in the first five quarters after expansion was enacted under the ACA That is, between January 1, 2014 and March 31, 2015. Any state that received a wavier to implement Medicaid expansion before this date is also considered an immediate-expansion state (see . for more information about expansion dates).Five other states have expansion dates that fall after March of 2015 and before the end of the data collection period; another five states have expanded Medicaid after 2019 and before the time of this writing.. These initial expansion states implemented the policy as described in the legislation; they also have equivalent "post" periods in which to measures the policy's impacts. This DD estimation strategy regresses outcomes of interest *Y* for individual *i* residing in state *s* during time *t* on indicators for whether the state of residence is treated (*Treat*) and whether period *t* falls in the post period (*Post*).

$$Y_{ist} = \beta_1 Treat_s + \beta_2 Post_t + \beta_3 Treat * Post_{st} + X_i + \eta u_{st} + \varsigma_s + \lambda_t + \varepsilon_{ist} \tag{1}$$

The causal effect of Medicaid expansion on each outcome of interest is estimated with β_3. A vector of individual covariates X_i includes respondent sex, ethnoracial group, age, education level, household size, marital status, whether any children under age 18 reside in the household, and whether the respondent is employed Data definitions and descriptive statistics for all covariates can be found in Appendix B. While respondent income was considered as a covariate, it was significantly associated with the likelihood of taking medication to treat blood pressure in just one of four estimation samples (Sample 1) and, as a result, was not retained in final models.. η_{st} accounts for the seasonally-adjusted unemployment rate in state *s* at time *t.* Finally, models include state fixed-effects ς and time (quarter-year) fixed-effects λ_t.

Triple-difference. Because the DD approach simply contrasts treated and nontreated states before and after the policy change, the estimated effect of the policy could be influenced by other changes arising in treated states during the post-expansion period. One way to improve the accuracy of the estimate is to add a contrast within treated states, such as by distinguishing between eligible and ineligible populations. Here, I do this with a triple-difference (DDD) model that compares those age-eligible for Medicaid expansion with those 65 and older, whose eligibility for Medicaid was unaffected by the ACA (and the majority of whom qualify for Medicare; Lohr, 1990). This approach additionally ensures results are not biased by any state-varying changes in the management of hypertension that may have unfolded during this period. The DDD specification includes the full adult age distribution and employs the indicator variable *age-eligible,* set to 1 for respondents below the age of 65:

$$Y_{ist} = \beta_1 Treat_s + \beta_2 Post_t + \beta_3 Treat * Post_{st} + \beta_4 Treat * Post * Age\_elig_{ist} + X_i + \eta u_{st} + \varsigma_s + \lambda_t + \varepsilon_{ist} \quad (2)$$

β_4 estimates the causal impact of the policy change on the outcome of interest. One notable difference between elderly and non-elderly adults is that average household income and poverty rates are lower among the elderly than the nonelderly; for this reason, results for the lower income samples should be interpreted with caution.

Event study. I examine whether the policy's impacts arise immediately or phase in over time using the event study method. Models are specified by subtracting the quarter in which each BRFSS survey was conducted from the quarter in which a state expanded Medicaid. I group the resulting measure of *quarters since expansion* into bins that span eight quarters (two years). The reference category includes the eight quarters prior to Medicaid expansion, such that the first treated ("lag") period includes the quarter in which a state expanded Medicaid and the seven quarters thereafter (see Appendix table S12). The event study model is estimated as follows:

$$Y_{ist} = \sum \gamma L_{\tau}(t - \tau_0) + X_i + \eta u_{st} + \varsigma_s + \lambda_t + \varepsilon_{ist} \tag{3}$$

This specification includes only nonelderly adults. The event study approach allows me to include as "treated" all interviews that occurred in an expansion state, from the date of expansion through the end of the data collection period. Respondents in states that never expanded Medicaid during the study period are considered non-expansion or "control" states in every period.

Results

Evaluation of parallel trends

Descriptive statistics for expansion and non-expansion states are provided in Online Appendix Table S2. Mean values for the diagnosis and treatment of hypertension are depicted quarterly in Online Appendix Figure S1. Both plots show that expansion states had slightly lower levels of hypertension diagnosis and treatment than their non-expansion counterparts prior to the expansion of Medicaid. To confirm that the time trend does not differ between the two, I regressed each outcome on an indicator for survey year, an indicator for immediate expansion status (see Appendix Table S1 for more information about expansion dates), and the interaction between expansion years and 2015 expansion status. Results, presented in Online Appendix Table S3 confirmed that, while levels of hypertension diagnosis and treatment were significantly lower in expansion states than non-expansion states, the two groups were not trending differently in the pre-expansion period. These findings are reassuring regarding the absence of divergent pre-trends.

Policy impacts on healthcare access and consumption

In states that expanded Medicaid, nonelderly adults in all estimation samples reported increases in both health insurance coverage and having a PCP. Experiencing a cost-related barrier to care in the past 12 months declined for adults without children living below 400% of the FPL (samples 2-4). Effects were larger for lower income samples (see Table 1). Lastly, I did not detect an effect of Medicaid expansion on the diagnosis of hypertension in the full population at any income level.

Considering whether effects were heterogenous by ethnoracial group, I find that Black Americans residing in Medicaid expansion states and earning below 400% of the FPL reported *larger* impacts than the full sample on having health insurance, having a PCP, and experiencing cost-related barriers to care (see Online Appendix Table S4 for full results from subgroup analyses). Lower-income Hispanic Americans also experienced increases in health insurance coverage (Sample 4 only; an 11.6 percentage point or 22 percent increase) and in having a PCP (a 7 percentage point or 14 percent increase in Samples 3 and 4), but reported no change experiencing cost-related barriers to healthcare.

Hispanic Americans are the only ethnoracial group that experienced a significant increase in the diagnosis of hypertension following Medicaid expansion; among this group, those earning below 400% of the FPL (samples 2 through 4) reported a significant increase in hypertension (5.1 to 7.5 percentage points or 18 to 27 percent increases). An apparent increase in the incidence of hypertension has implications for how we interpret any impacts on its treatment in this population As the question about hypertension treatment is asked only of those who have been diagnosed, observing a substantial change in the rate of diagnosis suggests a shift in the population to which the medication question is posed. For example, new cases of hypertension as well as those falling just above the threshold for diagnosis may be managed differently than ongoing cases; initial recommendations often prioritize making changes in diet or other lifestyle strategies, before proceeding to a pharmacological course of treatment. We may, therefore, expect medication rates to decline in the face of new diagnoses..

Difference-in-differences

My core DD model estimates the impacts of Medicaid expansion on the likelihood of taking medication to treat hypertension, among nonelderly adults who reside in Medicaid expansion states and have hypertension. Overall, I observe a significant, 1.6 percentage point (2 percent) increase in hypertension treatment. Coefficients are slightly larger for lower income samples, approximately 2.2 percentage points (3 percent) in Samples 2 and 3. These findings are presented in Table 2, columns 1 and 2.

The DD specification is also estimated separately for each ethnoracial group of interest, with results presented in Table 2, columns 3-10 As estimates for white adults are quite similar to those for the full sample, they are shown in tables but not discussed in text.. For Black adults residing in Medicaid expansion states, the impacts estimated for Samples 2 through 4 are slightly larger, though less precisely estimated, than those estimated across all ethnoracial groups. The increase is statistically distinguishable from zero only in Sample 2, with a coefficient of 3.3 percentage points (4 percent).

Treatment of hypertension does not increase among Hispanic adults. Point estimates for the two higher-income samples are comparable in size to those estimated across all ethnoracial groups (approximately 2.5 percentage points) but not significantly different from zero. Estimates for the lower-income samples have negative coefficients and wide confidence intervals.

Triple-difference

I augment findings from DD models with a triple-difference specification that compares nonelderly adults with those 65 and older, who were unlikely to be affected by Medicaid expansion due to their age-related eligibility for Medicare. Results for the DDD specification are presented in Table 3, columns 1 and 2. For nonelderly adults residing in Medicaid expansion states, compared to older adults in the same states, I estimate a significant, 1.8 percentage point (3 percent) increase in the likelihood of hypertension treatment. The estimate for Sample 2 (below 400% of FPL) is a significant 2.9 percentage point (4 percent) increase. Those for Samples 3 and 4 are smaller than in the DD specification and not statistically significant.

Among Black adults, significant effects of Medicaid expansion are detected for all income-restricted estimation samples (samples 2 through 4); these coefficients are at least 20% larger than the corresponding estimates in the DD specification. In contrast, no effects of Medicaid expansion on hypertension treatment are detected for Hispanic adults.

Event Study method

Finally, I turn to results from an Event Study specification that estimates the policy's impacts for eight-quarter periods leading up to and following policy implementation (see Online Appendix Table S5 for details on event timing and characteristics). Expansion effects are estimated for three pre-treatment and three post-treatment periods. Results are depicted in Figure 1, with a plot for each estimation sample.

Panels A and B of Figure 1 depict a fairly flat pre-period with a significant increase in the hypertension treatment during the second and third periods after expansion (that is, two to five years post-expansion; full results appear in Appendix Table S6). In Sample 1, the coefficient for the second and third post period are each approximately 2.0 percentage points. For Samples 2 and 3, a significant increase in hypertension treatment did not emerge until the third post period (four to five years post-expansion), with treatment effects estimated to be 3.8 and 4.4 percentage points, respectively. For Sample 4, estimates are similar in size to those of Sample 3, but less precisely estimated and not significantly different from zero.

Robustness tests

Expansion timing. When I omit those states that partially or fully expanded Medicaid prior to 2014, the estimated effects of Medicaid expansion are slightly larger for samples earning below 400% of the FPL (Online Appendix Tables S7-S12). Findings were also robust to several approaches to handling the states that expanded Medicaid after the beginning of 2015, consistent with the benefits extending to states that expanded Medicaid via ballot measure or after electing a Democrat governor (Online Appendix Table S13).

Alternate sample specifications

To investigate whether the impacts observed are primarily driven by private plans obtained on the Marketplace, I repeat DD and DDD analyses in a sample with estimated household income between 138% and 400% of the FPL This sample contains everyone from Sample 2 who is not also included in Sample 3. I am effectively decomposing Sample 2 into two mutually exclusive categories: the original Sample 3 and this new sample. (see Online Appendix tables S15-S16). Estimates were slightly smaller in the Marketplace-only sample but not substantially different from those associated with gaining Medicaid eligibility.

Specificity analyses established that impacts for adults ages 50-64 were comparable to, but not larger than, those observed for the full age distribution, confirming that the effects observed were not unique to those in middle or later adulthood (Online Appendix Tables S17-S18). Additional falsification checks confirmed that effects were smaller and not statistically distinguishable from zero for adults with children residing in the household (shown in Appendix tables S19-S21).

Discussion

This study set out to investigate whether, in the six years following the expansion of Medicaid through the ACA, individuals residing in Medicaid expansion states experienced meaningful improvements in chronic disease treatment, not just access to care. In addition to impacts on healthcare access and consumption, I observed an increase in the likelihood of taking medication to treat hypertension. As there was not a population increase in the rate of hypertension diagnosis, these results suggest that Medicaid expansion served as a critical vehicle to get hypertension treatment to those who need it. A back of the envelope calculation suggests that, if ten million Americans gained health insurance through Medicaid expansion by 2019, approximately 2.26 million (22.6%; Table 1) of them would be expected to have hypertension (though most likely knew of this diagnosis before gaining insurance). Approximately 69% (Table 2), or 1.54 million, would be expected to initiate antihypertensive medication in response to this diagnosis. These impacts would be far larger if all states had expanded Medicaid during this period.

Effects by income level. Overall, the estimated effects of Medicaid expansion tended to be larger for those with lower income levels, suggesting impacts were driven by Medicaid expansion to adults without children earning below 100% of the FPL. Nonetheless, some of the benefits observed in Medicaid expansion states may be due to impacts on individuals between 100% and 400% of the FPL, who were eligible for subsidized access to non-public health insurance via the Marketplace.

Timing of effects. Event study results show that the effects of the policy change were not immediate. It took at least two years after Medicaid expansion for effects to be detected in the higher-income samples—and at least four years for effects to be detected among those income-eligible for Medicaid. This delay is not without precedent; impacts on several other measures of healthcare access and self-rated health have been identified only three or more years after the expansion of Medicaid (2018).

Effects by ethnoracial group. The effects of Medicaid expansion varied somewhat by ethnoracial group. Benefits to Black Americans were estimated to be at least as large as those for whites. While there is insufficient evidence to determine whether this policy change narrowed racial disparities, it did not disproportionately benefit whites in expansion states. These results underscore the importance of attention to the “coverage gap” facing adults without children in non-expansion states, many of whom are Black adults residing in southern states that did not expand Medicaid In contrast, Hispanic adults see a significant increase in diagnosis of hypertension, whereas the overall rate of hypertension treatment among those diagnosed with hypertension remains unchanged.(Garfield, Orgera, & Damico, 2021).

The pattern of findings for Hispanic Americans diverged from results for other ethnoracial groups. The ACA clearly conferred some benefits to this group, as low-income Hispanic adults residing in expansion states reported large increases in having a primary care provider (13-15% increases) and in reporting a diagnosis of hypertension (15-20% increases). However, while diagnosis with hypertension increased among Hispanic adults living below the FPL (from 28% to 36% following Medicaid expansion), the rate of treatment remained approximately 65% in both time periods. That is, while the *rate* of hypertension treatment did not change, Medicaid expansion was associated with a net increase in the number of Hispanic Americans being treated for hypertension.

Limitations and future directions

As with any large-scale survey, the BRFSS draws on self-report of hypertension history, making it subject to misremembering or to desirability bias. Additionally, a longer follow-up period will be needed to determine whether impacts persist and to examine whether trajectories differ between immediate- and late-expansion states.

Conclusion

In this paper, I establish that ACA Medicaid expansion increased the treatment of hypertension among nonelderly adults without children in the US. This finding is consistent with increased access to primary care being one mechanism through which Medicaid expansion operates. It suggests that cardiovascular health may be meaningfully improved in adults who gained health insurance through the ACA, which could, in turn, reduce the burden of healthcare costs, productivity loss, and premature mortality.

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Tables

Table 1. DD results: Impact of Medicaid expansion on healthcare access and consumption

	Sample 1		Sample 2	
	Pre-expansion mean	Estimate	Pre-expansion mean	Estimate
	(1)	(2)	(3)	(4)
Has insurance	0.827	0.012*	0.720	0.039***
	(0.341)	(0.006)	(0.410)	(0.009)
N =		1,972,668		481,545
Has primary	0.773	0.017*	0.715	0.028**
	(0.375)	(0.008)	(0.403)	(0.009)
N =		1,973,352		481,463
Cost barrier in past year	0.159	-0.007+	0.249	-0.022***
	(0.348)	(0.004)	(0.411)	(0.005)
N =		1,975,161		481,751
Ever diagnosed with hypertension	0.226	-0.002	0.311	0.009
	(0.448)	(0.004)	-0.484	(0.008)
N =		1,975,707		482,171

$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 1, Panel 2

	Sample 3		Sample 4	
	Pre-expansion mean (5)	Estimate (6)	Pre-expansion mean (7)	Estimate (8)
Has insurance	0.622	0.069**	0.624	0.082**
	(0.465)	(0.020)	(0.467)	(0.025)
N =		143,722		79,450
Has primary	0.644	0.036*	0.631	0.036*
	(0.436)	(0.014)	(0.439)	(0.016)
N =		143,772		79,489
Cost barrier in past year	0.337	-0.044***	0.340	-0.047***
	(0.469)	(0.010)	(0.468)	(0.012)
N =		143,823		79,526
Ever diagnosed with hypertension	0.332	0.000	0.323	0.006
	(0.494)	(0.009)	(0.496)	(0.010)
N =		144,016		79,636

[+] $p < 0.10$,[*] $p < 0.05$, [**] $p < 0.01$, [***] $p < 0.001$

Table 2. DD Results: Impact of ACA Medicaid Expansion on hypertension treatment

	Full sample		White, non-Hispanic		Black, non-Hispanic	
	Pre-expansion mean	Estimate	Pre-expansion mean	Estimate	Pre-expansion mean	Estimate
	(1)	(2)	(3)	(4)	(5)	(6)
Sample 1	0.672	0.016**	0.693	0.010	0.723	0.006
	(0.434)	(0.005)	(0.431)	(0.006)	(0.394)	(0.013)
N =		578,432		435,679		76,644
Sample 2	0.710	0.022***	0.724	0.009	0.751	0.033**
	(0.417)	(0.006)	(0.417)	(0.007)	(0.374)	(0.012)
N =		193,187		138,603		31,388
Sample 3	0.679	0.023*	0.676	0.019*	0.727	0.029
	(0.430)	(0.011)	(0.434)	(0.008)	(0.387)	(0.021)
N =		64,681		41,165		13,345
Sample 4	0.669	0.031	0.662	0.028	0.716	0.049
	(0.432)	(0.020)	(0.437)	(0.017)	(0.393)	(0.033)
N =		35,744		21,683		8,043

$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 2, Panel 2

	Other race, non-Hispanic		Hispanic, any race	
	Pre-expansion mean	Estimate	Pre-expansion mean	Estimate
	(7)	(8)	(9)	(10)
Sample 1	0.628	0.044+	0.537	0.025
	(0.455)	-0.024	(0.476)	(0.017)
N =		33,740		38,572
Sample 2	0.653	0.090*	0.632	0.023
	(0.439)	(0.034)	(0.447)	(0.021)
N =		12,011		13,504
Sample 3	0.647	0.097*	0.654	-0.015
	(0.450)	(0.043)	(0.440)	(0.034)
N =		5,213		6,103
Sample 4	0.605	0.119*	0.669	-0.031
	(0.455)	(0.058)	(0.435)	(0.072)
N =		3,113		3,604

$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 3. DDD Results: Impact of Medicaid expansion on hypertension treatment in nonelderly, compared to elderly, adults

	Full sample		White, non-Hispanic		Black, non-Hispanic	
	Pre-expansion mean (1)	Estimate (2)	Pre-expansion mean (3)	Estimate (4)	Pre-expansion mean (5)	Estimate (6)
Sample 1	0.672	0.018*	0.693	0.008	0.723	0.038+
	(0.434)	(0.007)	(0.431)	(0.007)	(0.394)	(0.021)
N =		1,174,460		947,949		126,041
Sample 2	0.710	0.029**	0.724	0.011	0.751	0.056**
	(0.417)	(0.009)	(0.417)	(0.008)	(0.374)	(0.015)
N =		486,287		384,734		58,999
Sample 3	0.679	0.017	0.676	0.006	0.727	0.065*
	(0.430)	(0.012)	(0.434)	(0.014)	(0.387)	(0.027)
N =		132,374		90,608		24,223
Sample 4	0.669	0.021	0.662	-0.010	0.716	0.086*
	(0.432)	(0.021)	(0.437)	(0.024)	(0.393)	(0.038)
N =		63,472		39,712		13,786

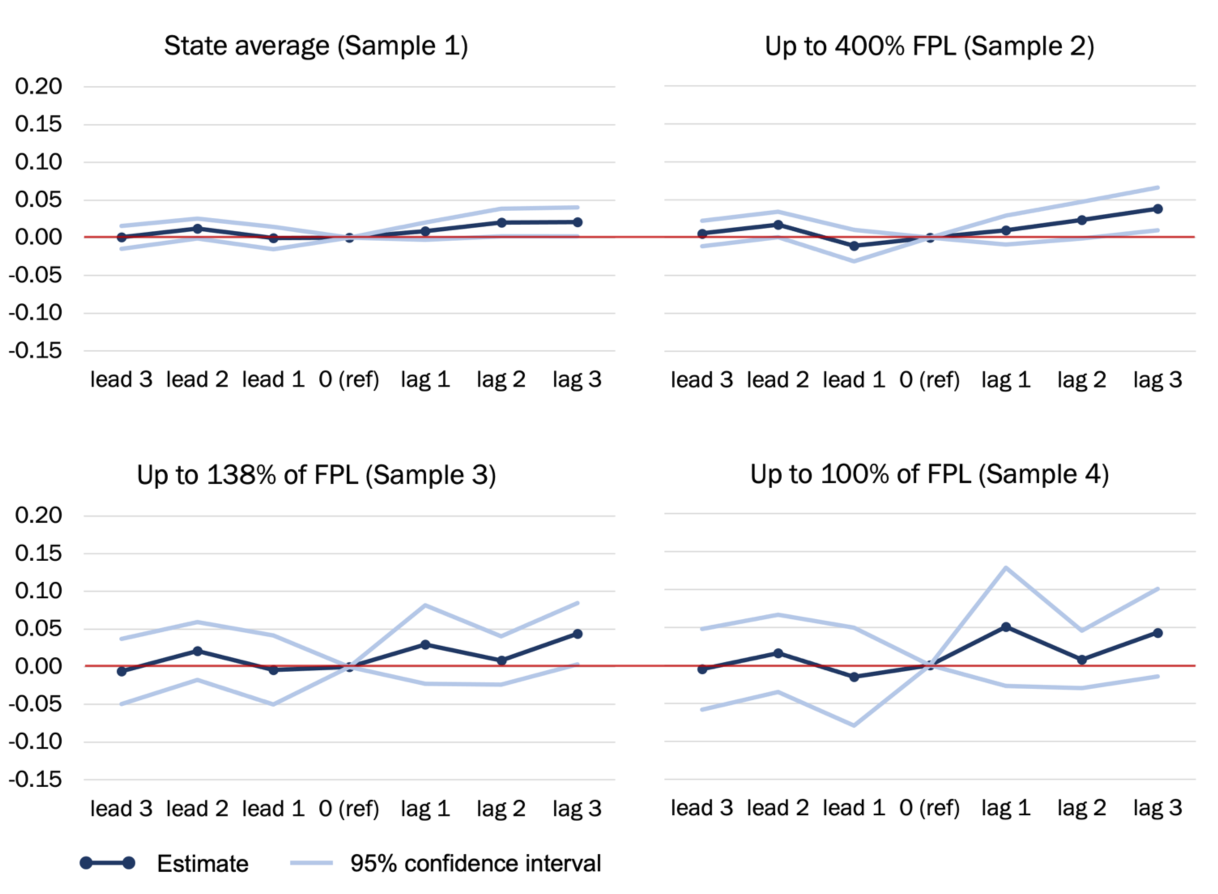
$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 3, Panel 2

	Other race, non-Hispanic		Hispanic, any race	
	Pre-expansion mean	Estimate	Pre-expansion mean	Estimate
	(7)	(8)	(9)	(10)
Sample 1	0.628	0.056*	0.537	0.033
	(0.455)	(0.023)	(0.476)	(0.023)
N =		55,286		57,010
Sample 2	0.653	0.116**	0.632	0.032
	(0.439)	(0.041)	(0.447)	(0.021)
N =		23,432		24,357
Sample 3	0.647	0.074	0.654	-0.053
	(0.450)	(0.051)	(0.440)	(0.038)
N =		9,082		10,961
Sample 4	0.605	0.159*	0.669	-0.051
	(0.455)	(0.071)	(0.435)	(0.093)
N =		5,002		6,432

$^{+}$ $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Figure 1. Event study results: Change in the treatment of hypertension in each two-year period since the policy change



Note. The data source is BRFSS data from 2007-2019. This figure plots estimated change in the likelihood of taking medication for hypertension before and after the quarter in which each state expanded Medicaid. Here, expansion states are identified by quarter of expansion, so any state that expanded Medicaid at least one quarter before the data collection period ended appears in the "lag" periods (expansion dates detailed in Online Appendix Table S1). The upper plots depict impacts on Sample 1 (top left) and Sample 2 (top right), with income-eligible samples depicted at the bottom left (Sample 3) and bottom right (Sample 4).