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RESEARCH ARTICLE

Role of Subsidized Coverage Eligibility in Medication Adherence Among Patients With Hypertension and Diabetes: Evidence From the NHIS 2011–2018

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Introduction: The subsidized insurance provision under the Affordable Care Act is an important instrument for health insurance coverage among middle-income nonelderly individuals. However, unlike the health impacts of the Medicaid expansion under the Affordable Care Act, the impact of subsidized insurance is relatively less explored in extant literature. This study aims to assess the role of subsidized coverage eligibility in medication adherence among nonelderly patients with hypertension and diabetes in the U.S.

Methods: Using pooled data from 8 rounds (2011–2018) of the National Health Interview Survey, we estimated a difference-in-differences model to examine the change in medication adherence among study participants with a household income of 150%–399% of the Federal Poverty Line compared with that among their counterparts with a household income of ≥400% of the Federal Poverty Line during pre– and post–Affordable Care Act periods. We also performed event study analysis and falsification tests to check the validity of our quasi-experimental design. Analyses were conducted in 2022.

Results: Medication adherence in the treatment group increased by 4.5 percentage points (95% CI=2.8, 6.2) during the post–Affordable Care Act periods, whereas the increase was only 1.8 percentage points (95% CI=0.6, 3.0) in the control group. Results of the difference-in-differences model suggest that because of the subsidized insurance under the Affordable Care Act, medication adherence in the treatment group increased by 3.1 percentage points (95% CI=1.0, 5.2) during the post–Affordable Care Act periods, compared with that in the control group. This increase was attributable to the improved insurance coverage, which increased by 6.8 percentage points (95% CI=5.3, 8.4) in the treatment during the post–Affordable Care Act periods.

Conclusions: Our analyses generate evidence that middle-income individuals with hypertensive or diabetic conditions, who were eligible for the subsidized coverage, benefited from this provision of the Affordable Care Act.

INTRODUCTION

Hypertension and diabetes are major risk factors for heart disease and other cardiovascular diseases.[1] Heart disease, among other cardiovascular diseases, is the leading cause of mortality in the U.S.[2] Medication adherence is critical to the well-being of patients with hypertension and

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diabetes, and nonadherence may lead to adverse cardiovascular events.[3,4] This study aims to assess the role of the Affordable Care Act (ACA)'s health insurance subsidy component on medication adherence among nonelderly (aged 18−64 years) patients with hypertension and diabetes in the U.S.

The ACA of 2010, which took effect in 2014, had the goal of nearly universal insurance coverage in the U.S.[5] The ACA aimed to achieve this goal using a multipronged approach, including insurance market reforms, insurance mandate, subsidy for insurance, and Medicaid expansion. The subsidized coverage component of the ACA provides a sliding scale subsidy in the form of a premium tax credit to individuals with incomes between 100% and 400% of the Federal Poverty Line (FPL) on plans purchased from HealthCare.gov and state-run marketplaces. However, individuals with incomes between 100% and 400% of FPL who qualify for any other affordable insurance are not eligible for the subsidized coverage. For example, individuals covered by an employer-sponsored plan, provided public coverage, or claimed as dependent on another individual's plan are not eligible for the subsidized coverage. In expansion states, this covers individuals aged 18–64 years between 138% and 400% of FPL because expansion states have Medicaid coverage for people with incomes between 0% and 138% of FPL. In nonexpansion states, the subsidy applies to those aged 18–64 years with incomes between 100% and 400% of FPL. The supreme court made the Medicaid expansion component of the ACA optional for states. To date, 39 states, including the District of Columbia, have expanded Medicaid, and 12 have not.[6] However, the other components of the ACA, including the insurance market subsidy, were applied in all of the U.S. beginning in 2014.

The subsidized coverage provision of the ACA has affected millions of Americans over the years. An estimated 18 million Americans were eligible for federal premium subsidy in March 2021, and roughly half of them bought coverage using the subsidy. Moreover, the American Rescue Plan Act extended the eligibility for subsidized coverage and increased the amount of subsidy for those who are eligible. This has increased the number of people eligible for subsidy by 20%, from 18.1 million to 21.8 million.[7] As such, the subsidized coverage provision of the ACA is one of the most consequential health policies currently in place in the U.S. Therefore, understanding the health impacts associated with the subsidized coverage component has important policy implications.

A large strand of literature examines various health impacts associated with the Medicaid expansion under the ACA.[8,9] Literature also finds a positive impact of health insurance on healthcare utilization in terms of primary care and preventive care,[10] visits to providers,[11] and inpatient hospital admission.[12] Studies further suggest that Medicaid eligibility expansion decreased the gap in diabetes medication.[13] However, the impact of subsidized coverage under the ACA is less visited, and the few studies that explored subsidized coverage were limited in assessing the coverage gains.[14,15] This study intends to fill this gap by examining the change in medication adherence among subsidized coverage–eligible patients with hypertension and diabetes before and after ACA implementation. Furthermore, it aims to assess how the impact was mediated through health insurance coverage gains.

METHODS

Study Sample

The pooled data from 8 rounds (2011−2018) of the National Health Interview Survey (NHIS) was included. The NHIS is a cross-sectional household interview survey that is conducted annually in a face-to-face format. Households in the NHIS are selected for interview on the basis of a geographically clustered sampling framework. It covers a broad range of health topics on the civilian non-institutionalized population in the U.S.[16] The study sample was comprised of patients with hypertension and diabetes who were prescribed medication by a doctor or other health professional during the past 12 months preceding the survey. A respondent was determined to be hypertensive if ever told they have hypertension or high blood pressure by a doctor or other health professional or if currently taking any prescribed medication for high blood pressure. A respondent was determined to be diabetic if ever told by a doctor or a health professional they have diabetes or if currently taking insulin or diabetic pills to lower blood sugar. Around 23.2% and 7.4% of nonelderly respondents in the pooled NHIS sample were hypertensive and diabetic, respectively.

To exploit the change in health insurance coverage because of the subsidized coverage provision of the ACA, the study sample was confined to respondents aged 18−64 years with household income ≥150% of the FPL threshold. Of note, the NHIS did not report state identifiers, and hence we could not determine whether respondents lived in an expansion or nonexpansion state. The NHIS also did not report a continuous ratio of household income to the poverty threshold but rather reported categories such as 100%−124%, 125%−149%, and so forth. Therefore, the study was constrained to consider respondents with household income ≥150% of the FPL threshold, for whom there were no overlaps in Medicaid and subsidized coverage in either expansion or nonexpansion states. Observations for which income, medication adherence, and sociodemographic covariates were not available were excluded from the analyses. Thus, the sample includes 29,913 observations (Figure 1).

Publicly available anonymized secondary data were used for the analysis. Oral consent was obtained from respondents before the interview. The survey contents and methods were approved by the Research Ethics Review Board of the National Center for Health Statistics.[16] Analyses were conducted in 2022.

Measures

Medication nonadherence was defined as experiencing any or all the following: (1) skipping medication, (2) taking less medication, or (3) delaying filling a prescription during the past 12 months to save money. Respondents answered yes or no to the questions

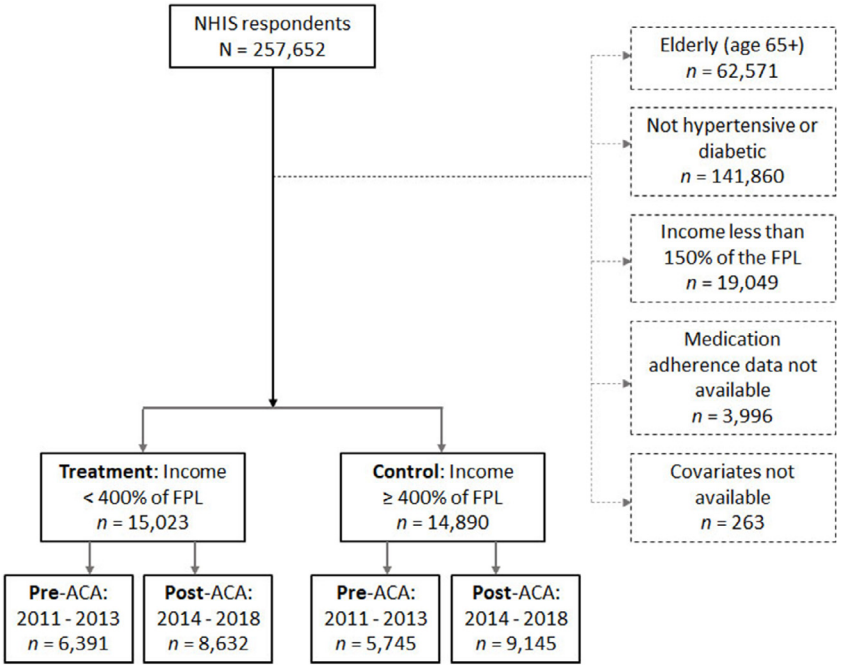

Figure 1. Study sample.
ACA, Affordable Care Act; FPL, Federal Poverty Line.

about whether they experienced certain conditions. *Medication adherence* was defined as experiencing none of the 3 conditions.

Statistical Analysis

An intention-to-treat analysis was conducted by estimating the following linear probability model entailing a difference-in-differences specification:

$$Adherence_{i,t} = \beta_0 + \beta_1 Treat_i + \sum_{t=2}^{7} \gamma_t Year_t + \beta_3 (Treat_i \times Post_t) + X_{i,t}\beta_4 + \varepsilon_{i,t} \quad (1)$$

where, $Adherence_{i,t}$ and $Treat_i$ are 2 binary variables respectively indicating medication adherence of respondent i in year t and whether respondent i's household income is <400% of FPL. $Year_t$ is the survey year-fixed effect, and $Post_t$ is a binary variable that takes the value 1 if the observations are from post-ACA period (i.e., years 2014−2018) and 0 if they are from pre-ACA period (i.e., years 2011−2013). The coefficient of interest β_3 is the coefficient of the interaction between $Treat_i$ and $Post_t$, which captures the differences in medication adherence between the treatment and the control group in pre- and post-ACA periods.

X is a vector of covariates that include sex, race and ethnicity, educational attainment, marital status, employment status, whether health insurance is offered at workplace, self-reported health status, and region-fixed effects. We reported estimates of β_3 with and without having X in the model. Estimates were obtained using complex survey weights, and analyses were performed using Stata 17.0 software.

To assess the mediating impact of insurance coverage on medication adherence, we re-estimated Equation (1), including a binary variable $IC_{i,t}$ that indicates whether Respondent i had insurance coverage or not. If the estimate of β_3 became smaller and/or statistically insignificant after the inclusion of $IC_{i,t}$ in the model, it would suggest that the change in medication adherence was channeled through the change in insurance coverage. In addition, to assess the extent of first-order effect, that is, the increase in insurance coverage in the treatment group because of the subsidized coverage eligibility, we estimated Equation (1) with health insurance coverage as the outcome variable.

In the intention-to-treat analysis, β_3 can be interpreted as the causal impact of the health insurance subsidy component of the ACA under the assumption that if this component did not occur, medication adherence of individuals with hypertension and diabetes in households above and below 400% of FPL would have trended similarly. This counterfactual claim cannot be tested directly because the subsidized coverage provision was implemented nationally at the same time. However, it is possible to test whether medication adherence of respondents in households above and below 400% of FPL trended similarly before ACA, that is, during the years before 2014. In other words, it is possible to test for a parallel pretrend of medication adherence between the 2 income groups before 2014. This was done by conducting an event study analysis.

To check the validity of the results, 2 falsification tests were performed by considering 2 false treatment and control groups. The first group comprised individuals with hypertension and diabetes, aged ≥65 years. This group of individuals is not covered by the subsidized coverage provision of the ACA because of their age, and hence there should not be any impact of subsidized coverage on their medication adherence. *Treatment in this group* was defined as the original design, that is, respondent's household income being <400% of FPL.

The second group comprised individuals with hypertension and diabetes with an income ≥400% of FPL. This group was the control group in the original design and was not eligible for subsidized coverage provision because of exceeding the income threshold. Treatment in this group was arbitrarily defined as individuals with income <500% of FPL, and *control* was defined as individuals with income ≥500% of FPL. We estimated Equation (1) for both groups, in which no impact of subsidized coverage is expected. A relatively small and statistically insignificant estimate of β_3 in these groups therefore will indicate the validity of our results.

We also estimated Equation (1) for subgroups by mutually nonexclusive and mutually exclusive hypertension and diabetes morbidity groups. Mutually nonexclusive groups were as follows: (1) individuals with hypertension and (2) individuals with diabetes. Mutually exclusive groups were as follows: individuals with (1) hypertension only, (2) diabetes only, and (3) both hypertension and diabetes. Furthermore, as a sensitivity analysis, we estimated Equation (1) for subgroups, excluding 1 or 2 regions (i.e., Northeast, Midwest, South, and West) at a time.

RESULTS

Overall medication adherence among 29,986 individuals with hypertension and diabetes in our sample during the pre-ACA period was 85.1%, which increased to 88.6% during the post-ACA period. Whereas adherence in the control group increased by 1.8 percentage points (pp), it increased by 4.5 pp (p<0.001) in the treatment group. Insurance coverage in the study population increased from 89.6% in the pre-ACA period to 94.4% in the post-ACA period. The increase in coverage was only 1.4 pp in the control group, whereas it was 7.9 pp (p<0.001) in the treatment group. Table 1 shows the sociodemographic characteristics of the treatment and control groups in pre- and post-ACA periods.

The main results are presented in Table 2. Each column in this table is generated from a version of Equation (1). Model I, which does not account for any of the covariates included in X, shows that being in the treatment group led to a 2.7 pp (p=0.012) increase in medication adherence. Model II, which accounts for all the covariates included in vector X and region-fixed effect, is the preferred model. Estimates of Model II suggest that being in the treatment group led to a 3.2 pp (p=0.003) increase in medication adherence in the post-ACA period.

Models III and IV mirror Models I and II but add 1 additional variable—a binary variable indicating insurance coverage. We estimated these 2 models to assess whether the increase in medication adherence operated through the channel of higher insurance coverage. Indeed, the study finds that the addition of insurance in Models III and IV led to a smaller and insignificant estimate of β_3, the treatment effect, than in Models I and II. These results are consistent with a scenario where health insurance subsidy leads to more insurance coverage, which in turn leads to better medication adherence.

Table 1. Descriptive Statistics by Treatment and Control Groups and Before and After the Period

Characteristics	Share (%)			
	Treatment Income 150 to <400% of FPL		Control Income ≥400% of FPL	
	Before 2011–2013	After 2014–2018	Before 2011–2013	After 2014–2018
Medication adherence	77.82	82.30	92.09	93.89
	(41.55)	(38.17)	(27.00)	(23.95)
Health insurance coverage	82.81	90.73	96.17	97.48
	(37.73)	(29.00)	(19.19)	(15.68)
Morbidity category				
Hypertension only	70.10	67.62	76.20	73.86
	(45.79)	(46.79)	(42.59)	(43.94)
Diabetes only	9.86	11.06	8.97	10.04
	(29.82)	(31.37)	(28.57)	(30.05)
Hypertension and diabetes	20.04	21.31	14.83	16.11
	(40.03)	(40.95)	(35.54)	(36.76)
Sex				
Male	50.27	49.17	57.76	57.26
	(50.00)	(50.00)	(49.40)	(49.47)
Female	49.73	50.83	42.24	42.75
	(50.00)	(50.00)	(49.40)	(49.47)

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Table 1. Descriptive Statistics by Treatment and Control Groups and Before and After the Period (*continued*)

Characteristics	Share (%)			
	Treatment Income 150 to <400% of FPL		Control Income ≥400% of FPL	
	Before 2011–2013	After 2014–2018	Before 2011–2013	After 2014–2018
Race/ethnicity				
White	65.17	62.71	78.34	75.53
	(47.65)	(48.36)	(41.2)	(42.99)
Black	16.92	16.51	10.21	10.29
	(37.5)	(37.13)	(30.27)	(30.38)
Asian	3.62	3.84	4.60	6.29
	(18.69)	(19.21)	(20.96)	(24.27)
Hispanic	13.45	15.74	6.19	7.13
	(34.12)	(36.42)	(24.09)	(25.73)
Other	0.83	1.20	0.67	0.77
	(9.06)	(10.87)	(8.15)	(8.73)
Education				
Less than high school diploma	13.23	12.27	3.44	3.16
	(33.89)	(32.82)	(18.21)	(17.48)
High school graduate	34.03	31.88	19.21	18.32
	(47.38)	(46.6)	(39.4)	(38.69)
Some college	36.46	36.56	32.23	31.24
	(48.14)	(48.16)	(46.74)	(46.35)
College graduate	16.27	19.29	45.13	47.28
	(36.92)	(39.46)	(49.77)	(49.93)
Marital status				
Never married	13.71	15.86	8.99	8.53
	(34.40)	(36.54)	(28.60)	(27.94)
Married	59.34	54.08	73.68	74.87
	(49.12)	(49.84)	(44.04)	(43.38)
Living with partner	7.24	7.77	4.90	5.16
	(25.92)	(26.77)	(21.59)	(22.11)
Widowed/divorced/separated	19.71	22.29	12.43	11.45
	(39.78)	(41.62)	(33.00)	(31.84)
Employed				
Yes	61.83	64.09	80.03	81.98
	(48.58)	(47.98)	(39.98)	(38.44)
No	38.17	35.91	19.97	18.02
	(48.58)	(47.98)	(39.98)	(38.44)
Insurance offered at workplace				
Yes	44.65	45.84	68.09	68.95
	(49.72)	(49.83)	(46.62)	(46.27)
No	55.35	54.16	31.92	31.05
	(49.72)	(49.83)	(46.62)	(46.27)
Self-reported health status				
Excellent	11.20	9.29	17.57	15.81
	(31.54)	(29.03)	(38.06)	(36.48)
Very good	26.51	24.61	37.72	39.22
	(44.14)	(43.08)	(48.47)	(48.83)
Good	36.62	39.30	33.53	33.62

(*continued on next page*)

Table 1. Descriptive Statistics by Treatment and Control Groups and Before and After the Period (*continued*)

Characteristics	Share (%)			
	Treatment Income 150 to <400% of FPL		Control Income ≥400% of FPL	
	Before 2011–2013	After 2014–2018	Before 2011–2013	After 2014–2018
	(48.18)	(48.84)	(47.21)	(47.24)
Fair	19.60	20.61	9.38	9.65
	(39.7)	(40.45)	(29.16)	(29.52)
Poor	6.06	6.20	1.80	1.71
	(23.87)	(24.11)	(13.3)	(12.96)
Region				
Northeast	14.19	14.33	19.97	18.18
	(34.9)	(35.04)	(39.98)	(38.57)
Midwest	23.35	24.66	23.48	22.31
	(42.31)	(43.1)	(42.39)	(41.63)
South	42.12	42.60	36.56	38.59
	(49.38)	(49.45)	(48.16)	(48.68)
West	20.34	18.42	20.00	20.93
	(40.26)	(38.76)	(40)	(40.68)
Observations	6,391	8,632	5,745	9,145

Note: Estimates were obtained using complex survey weights. SDs are in parenthesis.
FPL, Federal Poverty Line.

Models V and VI, for which health insurance coverage was the outcome variable, suggest that health insurance coverage in the treatment group in the post-ACA period increased by 6.8 pp ($p<0.001$).

Next, we explored how the effect of subsidized coverage changed over the years using an event study specification. For this, we estimated a version of Equation (1) where we interact the treatment variable with each year.

Table 2. Results of the Difference-in-Differences Estimation

Variables	Medication adherence				Insurance coverage	
	Model I: not adjusted for other covariates	Model II: adjusted for other covariates[a]	Model III: adjusted for insurance coverage only	Model IV: adjusted for insurance coverage and other covariates	Model V: not adjusted for other covariates	Model VI: adjusted for other covariates
Treat × post	**0.027***	**0.031****	0.014	0.019	**0.066*****	**0.068*****
	(0.005, 0.048)	(0.010, 0.052)	(−0.007, 0.036)	(−0.002, 0.040)	(0.050, 0.082)	(0.053, 0.084)
Treat	**−0.143*****	**−0.101*****	**−0.118*****	**−0.085*****	**−0.134*****	**−0.091*****
	(−0.159, −0.126)	(−0.118, −0.084)	(−0.134, −0.101)	(−0.102, −0.068)	(−0.147, −0.121)	(−0.104, −0.077)
Health insurance			**0.187*****	**0.181*****		
			(0.161, 0.213)	(0.155, 0.207)		
Constant	**0.902*****	**0.894*****	**0.722*****	**0.730*****	**0.961*****	**0.913*****
	(0.887, 0.917)	(0.860, 0.929)	(0.692, 0.753)	(0.687, 0.772)	(0.950, 0.972)	(0.885, 0.940)
Observations	29,913	29,913	29,913	29,913	29,913	29,913
Year-fixed effect	Yes	Yes	Yes	Yes	Yes	Yes

Note: Boldface indicates statistical significance (***$p<0.001$, **$p<0.01$, *$p<0.05$).
Estimates were obtained using complex survey weights. The 95% CIs are in parenthesis.
[a]Other covariates include age, sex, race/ethnicity, educational attainment, marital status, employment status, whether health insurance is offered at workplace, self-reported health status, and region-fixed effects.

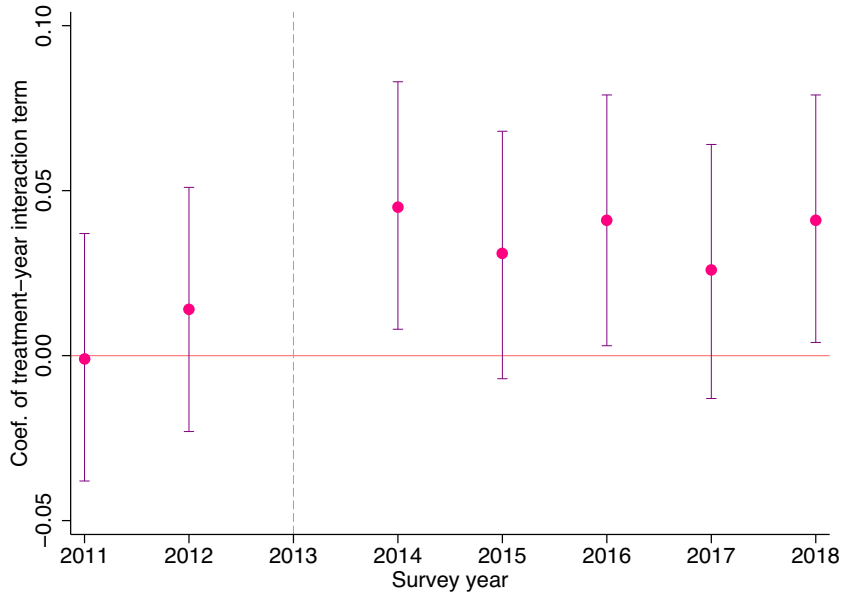

Figure 2. Event study analysis. The coefficient estimates of the interaction term of year dummies and treatment indicator are plotted against respective years.
Coef., coefficient.

Figure 2 shows the result of this event study analysis. There are 2 points of note here. First, it shows that the pre-2014 effects of the policy were statistically indistinguishable from zero, which serves as an indirect test for the validity of this study's identification strategy. Second, a positive effect of the policy on medication adherence was observed in all post-2013 years, with statistically significant results in 2014, 2016, and 2018, and no indication that the adherence effect slowed down in recent years.

Table 3 shows the results from our 2 falsification tests. We used the general method outlined in Equation (1) in both tests. Because individuals aged ≥65 years are covered by Medicare, the insurance subsidy provision of ACA does not apply to them. So, a method that accurately estimates the impacts of the subsidized coverage provision of ACA should not find an effect on individuals who are aged ≥65 years. Both unadjusted and adjusted estimates of the treatment effect for the group aged ≥65 years were considerably smaller and not

Table 3. Results of the Falsification Tests

Variables	Falsification test with age ≥65 years		Falsification test with FPL of ≥400	
	Not adjusted for other covariates	Adjusted for other covariates[a]	Not adjusted for other covariates	Adjusted for other covariates
Treat × post	0.010	0.010	0.015	0.018
	(−0.004, 0.023)	(−0.004, 0.024)	(−0.012, 0.043)	(−0.009, 0.045)
Treat	**−0.049*****	**−0.044*****	**−0.068*****	**−0.050*****
	(−0.060, −0.037)	(−0.056, −0.032)	(−0.089, −0.047)	(−0.071, −0.029)
Constant	**0.972*****	**0.755*****	**0.919*****	**0.906*****
	(0.961, 0.983)	(0.710, 0.801)	(0.901, 0.936)	(0.865, 0.948)
Observations	24,517	24,517	13,820	13,820
Year-fixed effect	Yes	Yes	Yes	Yes

Note: Boldface indicates statistical significance (***$p<0.001$, **$p<0.01$, *$p<0.05$).
Estimates were obtained using complex survey weights. The 95% CIs are in parenthesis.
[a]Other covariates (not reported here) include age, sex, race/ethnicity, educational attainment, marital status, employment status, whether health insurance is offered at workplace, self-reported health status, and region-fixed effects.
FPL, Federal Poverty Line.

Table 4. Results of the Difference-in-Differences Estimation by Hypertension and Diabetes Subgroups

Model components	Mutually nonexclusive		Mutually exclusive		
	Hypertension	Diabetes	Hypertension only	Diabetes only	Hypertension and diabetes
Treat × post	**0.033****	**0.045***	**0.025***	0.016	**0.063***
	(0.011, 0.055)	(0.005, 0.086)	(0.002, 0.048)	(−0.051, 0.083)	(0.013, 0.112)
Treat	−**0.103*****	−**0.125*****	−**0.092*****	−**0.085****	−**0.147*****
	(−0.121, −0.085)	(−0.157, −0.092)	(−0.111, −0.073)	(−0.141, −0.029)	(−0.187, −0.106)
Constant	**0.904*****	**0.820*****	**0.910*****	**0.823*****	**0.821*****
	(0.868, 0.941)	(0.734, 0.906)	(0.872, 0.947)	(0.692, 0.954)	(0.702, 0.939)
Observations	27,059	8,376	21,529	2,854	5,522
Year-fixed effect	Yes	Yes	Yes	Yes	Yes

Note: Boldface indicates statistical significance (***p<0.001, **p<0.01, *p<0.05).
Estimates were obtained using complex survey weights. The 95% CIs are in parenthesis.
[a]Other covariates include age, sex, race/ethnicity, educational attainment, marital status, employment status, whether health insurance is offered at workplace, self-reported health status, and region-fixed effects.

statistically significant, indicating the validity of this study's analytic design.

In the second falsification test, we confined the sample to a group earning ≥400% of FPL. Non-elderly individuals in this income threshold are not eligible for the subsidized coverage under ACA. Those who were between 400% and 499% of FPL were falsely defined as the treatment group, and those who were ≥500% of FPL served as the control group. Because these are false treatment and control groups, a valid method should not find any effect of the subsidized coverage in this specification. Indeed, we did not find any significant treatment effect in this setting.

Table 5. Difference-in-Differences Estimator by Regional Subgroups

Regional subgroups	Medication adherence		Insurance coverage	
	Unadjusted	Adjusted[a]	Unadjusted	Adjusted
Excluding Northeast	**0.027***	**0.030***	**0.063*****	**0.066*****
	(0.003, 0.050)	(0.007, 0.054)	(0.045, 0.081)	(0.049, 0.083)
Excluding Midwest	**0.027***	**0.032***	**0.071*****	**0.073*****
	(0.002, 0.052)	(0.007, 0.056)	(0.053, 0.089)	(0.056, 0.091)
Excluding South	**0.031***	**0.037****	**0.075*****	**0.075*****
	(0.004, 0.057)	(0.012, 0.063)	(0.053, 0.096)	(0.054, 0.096)
Excluding West	0.023	**0.027***	**0.059*****	**0.062*****
	(−0.000, 0.047)	(0.003, 0.050)	(0.041, 0.077)	(0.044, 0.079)
Excluding South and West	0.024	0.03	**0.062*****	**0.064*****
	(−0.007, 0.055)	(−0.001, 0.061)	(0.036, 0.088)	(0.039, 0.090)
Excluding Midwest and West	0.023	**0.027***	**0.059*****	**0.062*****
	(−0.000, 0.047)	(0.003, 0.050)	(0.041, 0.077)	(0.044, 0.079)
Excluding Midwest and South	**0.027***	**0.031****	**0.066*****	**0.068*****
	(0.005, 0.048)	(0.010, 0.052)	(0.050, 0.082)	(0.053, 0.084)
Excluding Northeast and West	0.023	0.025	**0.053*****	**0.058*****
	(−0.004, 0.050)	(−0.002, 0.052)	(0.033, 0.074)	(0.038, 0.077)
Excluding Northeast and South	**0.027***	**0.030***	**0.063*****	**0.066*****
	(0.003, 0.050)	(0.007, 0.054)	(0.045, 0.081)	(0.049, 0.083)
Excluding Northeast and Midwest	0.027	**0.030***	**0.067*****	**0.072*****
	(−0.002, 0.056)	(0.002, 0.059)	(0.047, 0.087)	(0.052, 0.091)

Note: Boldface indicates statistical significance (***p<0.001, **p<0.01, *p<0.05).
Estimates were obtained using complex survey weights. The 95% CIs are in parenthesis.
[a]Other covariates include age, sex, race/ethnicity, educational attainment, marital status, employment status, whether health insurance is offered at workplace, self-reported health status, and region-fixed effects.

Table 4 presents the results by mutually nonexclusive and mutually exclusive hypertensive and diabetic morbidity groups. Other than the diabetes-only subgroup, a positive and statistically significant treatment effect (ranging from 2.5 pp to 6.3 pp) was observed across the subgroups. Finally, the results of the sensitivity analysis by excluding regions are presented in Table 5. Insurance coverage in the treatment group increased in all the 10 subgroups. An increase in medication adherence for the treatment group was statistically significant for 8 of 10 subgroups. The results thus showed strong evidence of medication adherence in the subsidized coverage–eligible study population during the post-ACA periods.

DISCUSSION

This study estimated the impact of the health insurance subsidy provision of ACA on the medication adherence of patients with hypertension and diabetes. Given the availability of data, an intention-to-treat effect was estimated, which in this case signifies that participants were considered part of the treatment group on the basis of their eligibility for subsidies, regardless of whether they signed up for or used health insurance coverage during the study period. The study found a 3.2 pp increase in medication adherence because of the policy. The study also found evidence consistent with insurance coverage being a pathway through which the subsidized coverage affected medication adherence. We explored the dynamic effect of the policy on medication adherence over time using an event study model and found that the effect is consistent over the years and has not been slowing down over time.

The validity of our difference-in-differences identification strategy was examined using an event study analysis and 2 different falsification tests on groups that should not be affected by the policy. The event study showed parallel pretrends, and the 2 falsification tests did not show any statistically significant treatment effect, suggesting the validity of this study's quasi-experimental design.

A related study reported attenuation of financial strain, in the form of medication affordability, among nonelderly individuals with a household income of 0%−124% and 125%−199% of FPL during the post-ACA period.[17] This group of individuals had overlapping Medicaid and subsidized coverage eligibility on the basis of income and state of residence. In our analysis, we solely focused on the subsidized coverage feature of the ACA by confining our sample to individuals with a household income ≥150% of FPL. Our results are also consistent with the findings of the Medicaid expansion literature that reports improvements in access to medications, prescription utilization, and medication adherence among low-income individuals in the post-ACA period.[18,19] Although about 40% of the coverage gains from ACA implementation were found attributable to exchange premium subsidies,[20] documentation of the health impact of subsidized coverage in extant literature has been limited. Our study contributes to the ACA literature by examining how the subsidized coverage under the ACA improved medication adherence in nonelderly individuals with hypertension and diabetes.

Limitations

However, this study is subject to some limitations. The medication adherence information in the NHIS was self-reported and not confirmed by medical records. The type of medication or the reason why it was prescribed are both unknown. Our findings were also subject to the presumption that any potential impact of the ACA, other than the subsidized coverage, was similar across the treatment and control groups conditional on the various control variables in our preferred model. We do not think that this is an unreasonable assumption given that the included controls for various sociodemographic attributes as well as self-reported health status to account for the differences in the 2 groups. The strengths of this study, by contrast, are that we utilized a nationally representative sample and used a quasi-experimental design that is validated by event study analysis and falsification tests.

CONCLUSIONS

The ACA is a multifaceted and evolving law that entails various provisions and features targeted toward ensuring better health outcomes for the U.S. population.[14] Since its enactment, the ACA as a whole or its certain components faced many political obstacles and policy challenges that often cast uncertainties in its existence and functionality.[21] The subsidized coverage component of the ACA was updated as part of the American Rescue Plan Act as recently as March 2021.[22] It is therefore critical to assess the health impacts associated with distinct provisions of the ACA, so that policymakers and stakeholders may make informed decisions. This study examined how the subsidized coverage provision under the ACA impacts medication adherence in non-elderly individuals with hypertension and diabetes in the U.S. Our findings generate evidence that middle-income individuals, eligible for the subsidized coverage, benefited from this provision of the ACA.

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CREDIT AUTHOR STATEMENT

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