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Three-Year Impacts Of The Affordable Care Act: Improved Medical Care And Health Among Low-Income Adults

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ABSTRACT Major policy uncertainty continues to surround the Affordable Care Act (ACA) at both the state and federal levels. We assessed changes in health care use and self-reported health after three years of the ACA's coverage expansion, using survey data collected from low-income adults through the end of 2016 in three states: Kentucky, which expanded Medicaid; Arkansas, which expanded private insurance to low-income adults using the federal Marketplace; and Texas, which did not expand coverage. We used a difference-in-differences model with a control group and an instrumental variables model to provide individual-level estimates of the effects of gaining insurance. By the end of 2016 the uninsurance rate in the two expansion states had dropped by more than 20 percentage points relative to the nonexpansion state. For uninsured people gaining coverage, this change was associated with a 41-percentage-point increase in having a usual source of care, a \$337 reduction in annual out-of-pocket spending, significant increases in preventive health visits and glucose testing, and a 23-percentage-point increase in "excellent" self-reported health. Among adults with chronic conditions, we found improvements in affordability of care, regular care for those conditions, medication adherence, and self-reported health.

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The Affordable Care Act (ACA) has produced the largest gains in insurance coverage in nearly fifty years,¹ but the results of the 2016 election left it with an uncertain future. Although the initial attempt to partially repeal the law fell short in March 2017, a revised bill passed the House in early May, and Senate debate is pending. Estimates are that as many as twenty million Americans have obtained insurance under the ACA,² with more than half via Medicaid and the remainder largely from health insurance Marketplaces.³ Meanwhile, several states that have not yet expanded Medicaid are in the midst of a renewed debate over this possibility.⁴ Understanding the impact of the ACA's coverage expansion on medical care and health is critical to

evaluating future policy efforts related to the law.

National studies of the full nonelderly population have detected improvements in trends in coverage, satisfaction with insurance, and access to care.^{5,6} Research specifically comparing populations in Medicaid expansion versus non-expansion states has shown important clinical changes for these populations, including increased primary care visits,⁷ improved blood pressure control and Pap testing rates,⁸ and improved self-reported health status.^{9,10} However, published analyses have been limited to using data from 2014 or 2015.¹¹ Since insurance expansions extend their reach gradually,¹² updated analyses with more recent data could provide valuable insights.

Meanwhile, patients with chronic medical

conditions such as hypertension, depression, or diabetes may have the most to gain from coverage expansion. These conditions affect nearly half of all Americans—disproportionately those who have gained coverage under the ACA.¹³ Given the high costs of care for this group¹⁴ and the public health implications of these conditions,¹⁵ there is much policy interest in whether expanding coverage improves quality of care and health in this population.

Our objective was to assess ongoing changes in health care use and self-reported health among low-income adults, including those with chronic conditions, after three full years of the ACA's coverage expansion. Using survey data from three states collected through the end of 2016, we provide timely evidence of the law's ongoing impact on patient care.

Study Data And Methods

STUDY DESIGN We conducted a difference-in-differences analysis, which compares pre- versus post-expansion outcomes in two expansion states, with one non-expansion state as the control group. Our study states were Kentucky, which expanded coverage to low-income adults via Medicaid beginning in 2014; Arkansas, which used federal Medicaid funding to provide private insurance from the health insurance Marketplace to low-income adults beginning in 2014; and Texas, which did not expand coverage to low-income adults. Thus, our study captures elements of both private Marketplace insurance expansion and Medicaid expansion under the ACA; for brevity, we refer below to “ACA expansions” to describe Kentucky's Medicaid expansion and Arkansas's “private option” approach. In sensitivity analyses, we tested for differences between these two approaches.

We selected Texas as a comparison state for Kentucky and Arkansas because it is a nonexpansion state in the same census region that had a similarly restrictive set of Medicaid eligibility criteria before implementation of the ACA (Texas covered parents only up to 26 percent of poverty as of 2012, compared to 17 percent for Arkansas and 59 percent in Kentucky, versus the national median of 81 percent).¹⁶ Our study design relied on the assumption that if not for Medicaid expansion, trends in coverage and other outcomes would have been similar across these three states. Data from the Census Bureau show that coverage trends for our study population were similar in all three states during the period 2010–13 (see online Appendix Figure 1),¹⁷ offering support for this assumption.

For our primary difference-in-differences model, we identified the expansion effects sepa-

rately for each year of expansion—2014, 2015, and 2016—all compared to the pre-expansion 2013 data. This approach allowed us to trace out differential changes over time. We also tested a model that pooled 2015–16 together to increase statistical power.

We then conducted an instrumental variables analysis, to estimate individual-level changes in health care outcomes for uninsured people who acquired coverage under the ACA. We repeated this analysis among the subset reporting at least one chronic condition. The instrumental variables approach uses a quasi-experimental source of variation in a key predictor to identify the treatment effect of that predictor;¹⁸ in our case, the variation was the state ACA expansion policy, and the key predictor of interest was having health insurance. This approach builds on the underlying quasi-experimental design of our difference-in-differences model but provides more directly interpretable estimates of patient-level outcomes, similar to the local average treatment effect estimated using an instrumental variables model in the Oregon Health Insurance Experiment.¹⁹ This approach does not change the causal inference for our study, which still relies on the assumption that in the absence of the ACA expansion, trends in our outcomes would have been similar in Texas and the expansion states.

One key assumption for an instrumental variables analysis is that the instrument has a significant relationship with the predictor of interest; here, the state expansion decisions clearly had large effects on insurance coverage. The other key assumption is that the instrument (state expansion) affects outcomes only via the predictor of interest (insurance coverage). While this seems plausible in our case, other potential aspects of coverage expansions might affect access to care and health, even among people who did not gain insurance. For instance, there could be positive spillovers of expansion via better funding to safety-net institutions,²⁰ which would bias our instrumental variables estimates upward. There also could be negative spillovers via reduced health system capacity to care for populations that already had coverage when the expansions took place,²¹ which would have the opposite effect on our estimates. In addition, some people might not have gone from uninsured to insured but simply switched types of coverage because of expansion. These influences are likely swamped by the individual-level effects of gaining insurance, but they are nonetheless potential sources of bias.

DATA We contracted with a research firm to conduct a random-digit-dialing telephone survey from November to December each year, from 2013 to 2016. The survey sample contained US

Individual-level estimates indicate that people who gained coverage saw large, policy-relevant changes.

citizens ages 19–64, with family incomes below 138 percent of the federal poverty level—the ACA’s Medicaid expansion eligibility threshold. The survey was available in Spanish and English, and the sample included cellphone and landline users. Each year we recruited a new sample split equally across our three study states. Annual sample sizes ranged from 2,209 to 3,011, for an overall total of 10,885. The study was exempted from review by the Harvard T.H. Chan School of Public Health’s Institutional Review Board since the investigators had access to de-identified data only.

The overall response rate was 22 percent, which compares favorably to response rates of several other surveys that have been used to evaluate the ACA.^{22–24} Previous research demonstrates that the use of population weighting in random-digit-dialing telephone surveys can mitigate nonresponse bias and produce estimates similar to those from government surveys.^{25–27} Accordingly, our analyses were weighted to demographic targets for low-income adults in our study states based on age, sex, education, marital status, race/ethnicity, geographic region, population density, and cellphone use. Our survey has been previously validated against two large government-sponsored sources: the American Community Survey, conducted by the Census Bureau, and the Behavioral Risk Factor Surveillance System, conducted by the Centers for Disease Control and Prevention. In that validation, we compared estimates for low-income adults in our three study states for coverage and several measures of access to care in our survey and the government data sets. We found moderate-to-strong correlations and a range of absolute differences in estimates consistent with analogous differences between various federal surveys.^{9,22}

STATISTICAL ANALYSIS For each outcome, we estimated a linear regression model including binary indicators for each year and state, plus interaction terms between “expansion state” and

each post-expansion year (2014, 2015, and 2016). These interaction terms captured the changes attributable to coverage expansion for each year of the expansion, compared to the nonexpansion state. All models adjusted for age, sex, race/ethnicity, education, family size, income, urban versus rural residence, and state. Regression equations are in the Appendix Methods.¹⁷

Our study outcomes spanned seven domains: health insurance (uninsured, Medicaid, and private insurance, in which each individual was assigned a primary type of insurance [see the Appendix Methods],¹⁷ as well as any coverage changes within twelve months); access to care (having a personal doctor, usual location of care, difficulty obtaining primary care and specialty appointments, and reasons for emergency department [ED] use); affordability (skipping needed care or medications due to cost, trouble with medical bills, and medical out-of-pocket spending); utilization (outpatient, ED, and inpatient care in the prior twelve months); preventive care (receipt of a checkup, cholesterol test, or glucose test in the prior twelve months); quality of care (cholesterol and glucose testing for high-risk patients, regular care for chronic conditions, and self-rated quality of care); and health status (self-reported health on a five-point scale²⁸ and a two-item depression score²⁹).

We then examined the same outcomes (other than coverage) in an instrumental variables analysis. We used a two-stage least-squares regression,³⁰ in which the first stage predicted the likelihood of a person having any health insurance as a function of state expansion decisions and the year, using the difference-in-differences model described above (see Appendix Table 1).¹⁷ The second stage then provided an estimate of the impact of gaining insurance from the ACA expansion on individual-level health care outcomes. This method also has the advantage of using all four years of data simultaneously to produce a single estimated policy effect from expansion.

We used Stata 14.0 for all analyses. All regression models used county-level robust clustered standard errors to account for the nonindependence of observations within the same state and county.

SENSITIVITY AND SUBGROUP ANALYSES We repeated our instrumental variables analysis for the subset of respondents who reported having been diagnosed with any of nine chronic conditions: hypertension, coronary artery disease, stroke, asthma/chronic obstructive pulmonary disease (COPD), kidney disease, diabetes, depression, cancer (other than skin cancer), or substance abuse. We also tested whether the

prevalence of these conditions changed in association with expansion status.

We conducted several sensitivity analyses. We tested the impact of pooling 2015 and 2016 expansion state data together to increase statistical power. To account for multiple hypothesis testing within each domain or family of outcomes, we estimated “family-wise” p values using a step-down bootstrapping approach similar to other recent analyses.^{11,31} We also tested a spatial correlation model described below.

Finally, we repeated our primary model with the expansion states divided into Kentucky’s Medicaid expansion versus Arkansas’s private option. This produced separate estimates for expansion effects in Arkansas and Kentucky.

LIMITATIONS Our analysis had several limitations. First, our study examined only three states. This means that our results might not generalize to the nation as a whole. It also affected our estimation of standard errors and the possibility of idiosyncratic changes in any given state exerting an outsize influence on our findings. In studies with a larger number of states, the use of state-clustered standard errors can limit this risk, but standard methods to estimate correlation within states are biased when there are only three states.³² Instead, we used county-level clustering to estimate standard errors as in our previous work with this data set,⁹ and we also present results using spatial correlation across counties similar to other health care analyses using small numbers of states.³³ Our main findings were similar under both alternatives.

Second, as discussed earlier, the response rate for random-digit-dialing telephone surveys like ours is lower than that for government interview surveys. However, we believe that the trade-off of timeliness and the ability to design our own comprehensive survey outweighed those concerns, particularly given the previous validation of our survey instrument.⁹

Other limitations are inherent to our study’s quasi-experimental design, which helps control for secular trends and takes advantage of a non-expansion state as a comparator but is still subject to unmeasured confounders that vary over time across states. Our instrumental variables analyses produced estimates with fairly wide confidence intervals, which means that the exact magnitudes of change should be interpreted cautiously. Finally, our data are all self-reported, which may be subject to errors in memory and other biases. However, our findings in several domains are consistent with ACA studies using nonsurvey data such as pharmacy claims,^{34,35} lab results,³⁶ and community health center reports.⁸

Our results offer insights into alternative state approaches to coverage expansion.

Study Results

Exhibit 1 presents descriptive statistics by state for our full sample and for those with chronic conditions. Respondents in Texas were disproportionately Latino and urban compared to those in Arkansas and Kentucky. Chronic conditions affected 69 percent in Arkansas, 72 percent in Kentucky, and 55 percent in Texas. Changes in disease prevalence between 2013 and 2016 by state were nonsignificant for all but kidney disease, which showed a small decline in expansion states (–2.2 percentage points, $p = 0.06$) (Appendix Table 2).¹⁷ People with chronic conditions were older and less likely to be male or Latino. Among those with a condition, the mean number of conditions ranged from 2.0 to 2.3 by state, with depression, hypertension, asthma/COPD, and diabetes the most common (Exhibit 1).

Exhibit 2 presents the percentages of respondents in each state that were uninsured during the period 2013–16. The three states began with similar pre-ACA uninsurance rates of approximately 40 percent among low-income adults in 2013. The rate dropped steeply in 2014 in Kentucky and Arkansas and declined more gradually in 2015 and 2016. Meanwhile, the rate fell moderately in 2014 in Texas and then plateaued. By the end of the study period, the uninsurance rate was 7.4 percent in Kentucky, 11.7 percent in Arkansas, and 28.2 percent in Texas.

Exhibit 3 presents regression-based estimates for differential changes in our study outcomes, comparing expansion to nonexpansion states (Appendix Table 3 presents unadjusted mean values for each outcome in each year, by state).¹⁷ Compared to the nonexpansion state, the coverage expansion to low-income adults in the expansion states was associated with an increase in coverage of 14.0 percentage points in 2014, 22.9 percentage points in 2015, and 20.7 percentage points in 2016 (all $p < 0.01$). By 2016, in our main model, the expansions had led to signifi-

EXHIBIT 1
Characteristics of the study sample in three states, 2013–16

Variable	Full sample (N = 10,885)			Adults with chronic conditions (N = 7,734)		
	Arkansas (n = 3,623)	Kentucky (n = 3,639)	Texas (n = 3,623)	Arkansas (n = 2,666)	Kentucky (n = 2,825)	Texas (n = 2,243)
Female	57%	56%	58%	60%	61%	62%
Age (years)						
19-34	41%	39%	46%	34%	31%	33%
35-44	19	20	18	19	21	18
45-54	16	17	16	19	19	20
55-64	23	24	20	28	29	29
Race/ethnicity						
White non-Latino	66%	84%	36%	66%	85%	41%
Latino	4	2	40	3	1	32
Black non-Latino	25	11	19	26	11	22
Other	5	3	5	5	3	4
Education						
Less than high school diploma	20%	25%	23%	22%	28%	25%
High school graduate	47	43	40	49	44	40
Some college/college graduate	33	32	38	29	28	35
Family income (percent of poverty)						
Under 50%	32%	33%	30%	33%	35%	32%
50%–100%	36	36	37	37	36	36
101%–138%	25	23	25	24	22	24
Don't know/refused	7	7	8	6	7	8
Married or living with a partner	41%	42%	40%	40%	40%	37%
Family size (number)	2.9	2.9	3.2	2.8	2.7	3.0
Rural	56%	55%	14%	58%	57%	15%
Chronic conditions						
Hypertension	37%	39%	28%	54%	54%	52%
Coronary artery disease	8	11	6	12	16	12
Stroke	5	6	4	7	8	8
Asthma/COPD	26	31	18	37	43	32
Kidney disease	2	4	2	4	5	4
Diabetes	15	17	14	22	23	26
Depression	41	46	32	60	64	57
Cancer	5	6	3	7	8	6
Substance abuse	4	5	4	6	7	7
≥1 condition	69	72	55	100	100	100
Mean no. of conditions	1.4	1.6	1.1	2.1	2.3	2.0

SOURCE Authors' analysis of data from a telephone survey of US citizens ages 19-64 with family incomes below 138 percent of the federal poverty level, conducted each year from 2013 to 2016. **NOTES** The table reflects pooled estimates for the years 2013–16. Arkansas and Kentucky expanded coverage to low-income adults under the Affordable Care Act, and Texas did not.

cant increases in multiple measures of access to care and affordability, including having a personal doctor and reductions in cost-related delays in both care and medication use. Expansion was associated with a decline in difficulty paying medical bills but an increase in difficulty obtaining appointments with specialists in 2016.

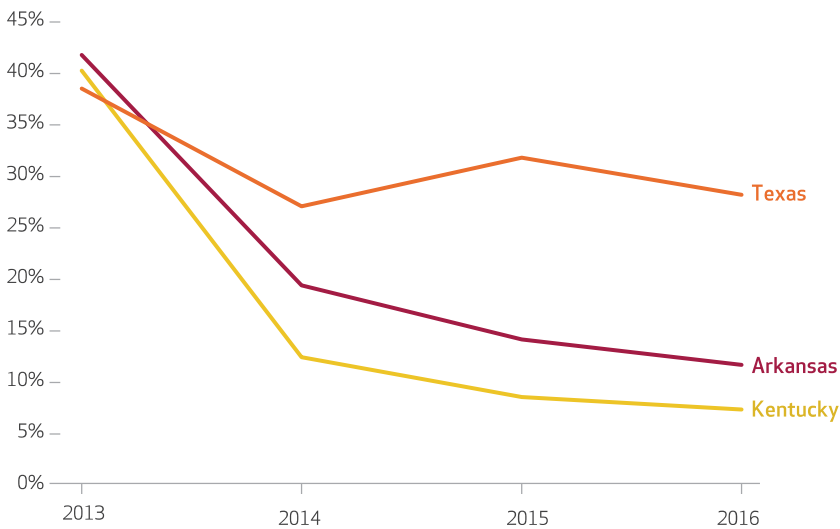
Exhibit 3 also presents changes in utilization and preventive care. Coverage expansion in the expansion states in 2015 and 2016 was associated with a significantly reduced likelihood of any ED visits and an increased likelihood of a check-up within the prior twelve months, but no significant changes in hospitalizations. Our two measures of clinical screening tests—glucose

screening and cholesterol monitoring—significantly increased in association with coverage expansion in 2015 or 2016, respectively. Perceived quality of care showed some improvement in 2015 (for example, a reduction in “fair/poor quality of care”) that did not persist in 2016. Finally, coverage expansion led to improvements in self-reported health (for “excellent,” $p < 0.05$ in 2015; for both “excellent” and “fair/poor,” $p < 0.10$ in 2016).

Appendix Tables 4 and 5 present sensitivity analyses for our difference-in-differences model.¹⁷ When we used bootstrapped family-wise p values that accounted for multiple variables within each domain of outcomes, we continued

EXHIBIT 2

Percentage of low-income adults without health insurance in three states, 2013–16



SOURCE Authors' analysis of data from a telephone survey of 10,885 US citizens ages 19–64, with family incomes below 138 percent of the federal poverty level, conducted each year from 2013 to 2016. **NOTES** The survey was conducted in November–December of each year with a new sample, divided evenly among the three states. Arkansas and Kentucky expanded coverage to low-income adults under the Affordable Care Act, and Texas did not.

to find significant changes in 2016 for outcomes related to coverage, access, affordability, and prevention ($p < 0.05$) and quality ($p < 0.10$), but not for utilization and self-reported health. Pooling 2015–16 data together strengthened the statistical significance of some 2016 findings such as private insurance gains, having a usual source of care, out-of-pocket spending, and excellent self-reported health; outcomes in five of seven domains were significant at $p < 0.05$ and in the other two at $p < 0.10$ using family-wise p values. Difficulty obtaining an appointment to see a specialist was no longer significant in the pooled model. In models using spatially correlated standard errors, several estimates were affected by the lack of weighting (which was not feasible with this method), but overall this approach yielded precision similar to that of the main model, which provides support for our primary method using county-level clustering.

Exhibit 4 presents individual-level estimates of changes in these outcomes for patients acquiring insurance, using our instrumental variables model. For the full sample, we estimated that expansion led to significant changes, including a 41-percentage-point increase in having a usual source of care among those gaining coverage, a \$337 reduction in medical out-of-pocket spending, a 28-percentage-point reduction in the likelihood of any ED visits, and a 25-percentage-point increase in glucose testing. The proportion in excellent health increased by nearly 23 per-

centage points.

Exhibit 4 also shows instrumental variables results for adults with chronic conditions. While out-of-pocket spending and cholesterol and glucose testing among high-risk patients (those with diabetes, stroke, hypertension, or heart disease) did not change significantly, we otherwise found similar results for most outcomes as in the full sample, including a 51-percentage-point decrease in skipping medications because of cost and a 20-percentage-point increase in excellent health. In a question asked only of this subgroup, we estimated a 56-percentage-point increase in obtaining regular care for chronic conditions.

Comparisons of the 2016 effects of private (Arkansas) versus public (Kentucky) insurance approaches (Appendix Table 6) showed no significant differences for most outcomes.¹⁷ As expected, health insurance types differed, with more private coverage gains in Arkansas and more Medicaid in Kentucky. The only other significant difference was a greater decline in “fair/poor quality of care” in Arkansas compared to Kentucky. Both expansions were associated with significant improvements in numerous outcomes compared to Texas, including access to a personal doctor and medications, trouble with medical bills, checkups and cholesterol testing, and self-reported health.

Discussion

In our analysis of survey data from low-income adults in three states, we note three key contributions to the growing body of research on the ACA. First, we provide the earliest published estimates using data through the law's third year of expansion (2016), allowing us to document the expansion's changing impact on health care outcomes over time. Second, we use an instrumental variables model to produce individual-level estimates of the ACA's coverage impacts, showing large improvements in self-reported health and other outcomes directly relevant to patients. Third, we document benefits in numerous previously unstudied outcomes for adults with chronic conditions—a vulnerable and high-cost population.

Our four years of data indicate that the ACA's coverage expansion to low-income adults was associated with significant improvements in access to primary care and medications, affordability of care, preventive visits, screening tests, and self-reported health. Though coverage gains in the two expansion states were largest in the first two years, with little additional change in 2016, the time course was more variable for access and utilization measures. Some changes were present in 2014 or 2015, while other changes such

EXHIBIT 3
Year-by-year changes in health care outcomes after the Affordable Care Act's coverage expansion in expansion states, compared to nonexpansion

Outcome	2014 expansion	2015 expansion	2016 expansion
COVERAGE			
Uninsured	-14.0***	-22.9***	-20.7***
Medicaid	9.5***	12.2***	17.6***
Private insurance	7.7**	8.5**	5.9*
Coverage change within past year	5.8*	1.2	1.9
ACCESS TO CARE			
Has a personal doctor	7.6*	12.1***	16.7***
Usual source of care ^a	3.8	10.4***	6.8
Trouble obtaining primary care appointment	3.6	0.1	2.1
Trouble obtaining specialist appointment	2.5	1.1	6.4**
ED is usual location of care ^a	-5.1*	-5.9***	-3.7
ED visit because office visit unavailable	4.9**	5.0*	3.5
AFFORDABILITY			
Cost-related delay in care	-4.3	-18.4***	-12.8***
Skipped medication due to cost	-9.9***	-12.0***	-10.5***
Trouble paying medical bills	-8.9***	-14.1***	-10.9***
Annual out-of-pocket medical spending	-\$33	-\$88**	-\$62*
UTILIZATION			
Any office visits in past year	2.3	2.7	4.3
Any ED visits in past year	-1.8	-5.8**	-6.6**
Number of office visits in past year	0.51	0.66**	0.60
Number of ED visits in past year	-0.12	-0.09	0.13
Any hospitalization in past year	-1.6	1.9	2.9
PREVENTION			
Checkup in past year	6.9*	16.0***	11.1**
Cholesterol check in past year	-1.1	1.4	9.9***
Glucose check in past year	2.2	6.3**	4.3
QUALITY OF CARE			
Cholesterol check in high-risk patients ^b	2.3	1.1	2.7
Glucose check in those with diabetes ^c	4.5	11.1**	6.3
Regular care for chronic condition ^d	11.3**	11.5**	11.2**
Excellent quality of care	4.1	1.3	2.0
Fair/poor quality of care	-2.5	-7.3**	-2.3
HEALTH STATUS			
Excellent self-reported health	2.4	5.0**	5.1*
Fair/poor self-reported health	0.6	-3.7	-6.0*
Positive depression screen (PHQ2 ≥ 2) ^e	2.0	-6.9*	-1.8

SOURCE Authors' analysis of data from a telephone survey of US citizens ages 19-64, with family incomes below 138 percent of the federal poverty level, conducted each year from 2013 to 2016. **NOTES** The sample contained 10,885 adults (minus item nonresponse for each specific outcome), except where otherwise noted below. Results show differences-in-differences estimates for two expansion states (Arkansas and Kentucky) versus the nonexpansion state (Texas), by year. All analyses adjusted for sex, age, race/ethnicity, marital status, family size, education, income, urban versus rural residence, county annual unemployment rate, state, and year. All estimates are reported as percentage-point changes for binary outcomes, other than number of office and emergency department (ED) visits and out-of-pocket spending. ^aUsual source of care was grouped into 3 categories: those reporting an office-based usual source of care, those without any usual source of care, and those using the ED as the usual source of care. ^bSample limited to patients reporting heart disease, stroke, diabetes, or hypertension ($n = 5,611$). ^cSample limited to patients reporting a history of diabetes ($n = 2,213$). ^dSample limited to patients reporting at least one of the following conditions: hypertension, heart attack/coronary artery disease, stroke, asthma/chronic obstructive pulmonary disease (COPD), kidney disease, diabetes, depression, cancer, and substance abuse ($n = 7,734$). ^ePHQ2 is a two-item mental health screening questionnaire with total scores ranging from 0 to 6; see Note 29 in text. * $p < 0.10$ ** $p < 0.05$ *** $p < 0.01$

as increased cholesterol testing and reduced fair/poor health did not become evident until 2016.

Individual-level estimates indicate that people who gained coverage saw large, policy-relevant

changes. The average newly covered adult experienced savings of \$337 per year in out-of-pocket medical spending, a 41-percentage-point increase in the likelihood of having a usual source of care, and a 23-percentage-point increase in

EXHIBIT 4

Instrumental variables analysis: individual-level change per person gaining insurance under the Affordable Care Act

Outcome	Effect of any insurance	
	Full sample	Adults with chronic conditions ^a
ACCESS TO CARE		
Has a personal doctor	62.1 ^{***}	40.9 [*]
Usual source of care ^b	41.1 ^{**}	20.0
Trouble obtaining primary care appointment	3.3	-6.5
Trouble obtaining specialist appointment	13.7	25.1 [*]
ED is usual location of care ^b	-23.1 ^{**}	-0.9
ED visit because office visit unavailable	20.2	29.8
AFFORDABILITY		
Cost-related delay in care	-74.7 ^{***}	-74.6 ^{***}
Skipped medication due to cost	-52.3 ^{***}	-50.8 ^{**}
Trouble paying medical bills	-58.6 ^{***}	-66.6 ^{***}
Annual out-of-pocket medical spending	-\$337 ^{**}	-\$361
UTILIZATION		
Any office visits in past year	14.7	-8.2
Any ED visits in past year	-27.6 ^{**}	-29.5 [*]
Number of office visits in past year	2.86 [*]	2.68
Number of ED visits in past year	-0.05	-0.06
Any hospitalization in past year	10.5	18.0
PREVENTION		
Checkup in past year	64.7 ^{***}	56.8 ^{**}
Cholesterol check in past year	20.2	15.7 ^c
Glucose check in past year	25.4 ^{**}	92.0 ^d
QUALITY OF CARE		
Regular care for chronic condition	— ^e	55.9 ^{***}
Excellent quality of care	9.7	31.5
Fair/poor quality of care	-29.8	-27.2
HEALTH STATUS		
Excellent self-reported health	22.7 ^{**}	20.4 ^{**}
Fair/poor self-reported health	-20.6	-38.3 [*]
Positive depression screen (PHQ2 ≥ 2) ^f	-21.9	-31.5

SOURCE Authors' analysis of data from a telephone survey of US citizens ages 19–64, with family incomes below 138 percent of the federal poverty level, conducted each year from 2013 to 2016.

NOTES The sample contained 10,885 adults (minus item nonresponse for each specific outcome), except where otherwise noted below. Results show local average treatment effect from gaining coverage via expansion in two states that expanded coverage (Arkansas and Kentucky), compared one nonexpansion state (Texas) using two-stage least squares instrumental variables regression. All analyses adjusted for sex, age, race/ethnicity, marital status, family size, education, income, urban versus rural residence, state, and year. All estimates are reported as percentage-point changes for binary outcomes, other than number of office and emergency department (ED) visits and out-of-pocket spending. COPD is chronic obstructive pulmonary disease. ^aSample limited to patients ($n = 7,734$ adults) reporting at least one of the following conditions: hypertension, heart attack/coronary artery disease, stroke, asthma/chronic obstructive pulmonary disease (COPD), kidney disease, diabetes, depression, cancer, and substance abuse. ^bUsual source of care was grouped into 3 categories: those reporting an office-based usual source of care, those without any usual source of care, and those using the ED as the usual source of care. ^cSample limited to patients reporting heart disease, stroke, diabetes, or hypertension ($n = 5,611$). ^dSample limited to patients reporting a history of diabetes ($n = 2,213$). ^eQuestion not asked of this group. ^fPHQ2 is a two-item mental health screening questionnaire with total scores ranging from 0 to 6; see Note 29 in text. ^{*} $p < 0.10$ ^{**} $p < 0.05$ ^{***} $p < 0.01$

the likelihood of being in excellent health. The validity of these estimates is supported by their similarity to those from the instrumental variables analyses in the randomized Oregon Health

Insurance Experiment, which showed an average reduction of \$390 in medical debt, a 34-percentage-point increase in having an office-based usual source of care, and a 13-percentage-point change in the share reporting excellent, very good, or good health.³¹

These latter results are particularly noteworthy given policy interest in the ACA's impact on health status. For context, prior research indicates that a self-reported health rating of fair or poor confers a mortality risk two to ten times higher than that of people in the healthiest category.²⁸ Our finding of improved self-reported health is consistent with results in the Oregon study and other pre-ACA Medicaid expansions,³⁷ though the evidence on similar changes under the ACA has been more mixed.^{6,10,11,38} In part, this likely reflects differences in sample frame and timing. Studies that have not found significant changes in self-reported health after the Medicaid expansion have typically used only one or two years of post-expansion data and have studied expansion-related coverage gains on the order of 3–8 percentage points.^{6,11,38} Here we assessed three full years of post-expansion data and studied a population experiencing a much larger coverage change of over 20 percentage points.

Adults with chronic conditions—often called “preexisting conditions” in the current policy debate—saw numerous improvements in both access to and quality of care, including more checkups, improved adherence to medications, higher rates of regular care for chronic disease, and—perhaps as a consequence of these changes—improved self-reported health. These findings build on a previous study using national data through 2014 that showed gains in two access measures for adults with chronic conditions (having a checkup and no cost-related delays in care).³⁹ However, our study included a much richer set of outcomes and two additional years of data.

We detected an increased rate of difficulty obtaining specialist appointments in 2016 in the expansion states, particularly in Kentucky. This is consistent with a recent national study that found an increase in appointment wait times after expansion,⁷ as well as some studies showing greater barriers in Medicaid to specialty care than primary care.⁴⁰ However, in part this may also reflect that patients without coverage are less likely to attempt to make appointments with specialists; thus, coverage expansion may increase the share who try but experience difficulties in doing so, even as their overall access to care has improved.

Our results also offer insights into alternative state approaches to coverage expansion. With increased interest under the Trump administra-

tion in state flexibility and innovation, we found that a private insurance expansion via Marketplace coverage (as in Arkansas) and a Medicaid expansion (as in Kentucky) produce similar benefits across most study outcomes. Consistent with prior comparisons,⁴¹ the results imply that coverage expansion is quite important for patients, but the type of coverage obtained is less critical.

Conclusion

Over three years of coverage expansion in two states, the ACA was associated with statistically

significant and clinically relevant improvements for low-income adults' access to care, use of preventive services, and self-reported health. Among those with chronic conditions, coverage expansion was linked to improved medication adherence, more regular communication with physicians, and improved perceived health status. As policy makers debate the ACA's future and additional states consider whether to expand Medicaid, our findings demonstrate the benefits associated with coverage expansion for two particularly vulnerable populations: low-income adults and those with chronic conditions. ■

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