

Coverage and Access for Americans With Chronic Disease Under the Affordable Care Act

A Quasi-Experimental Study

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Background: Half of Americans have at least 1 chronic disease. Many in this group, particularly racial/ethnic minorities, lacked insurance coverage and access to care before the Patient Protection and Affordable Care Act (ACA) was enacted.

Objective: To determine whether the ACA has had an effect on insurance coverage, access to care, and racial/ethnic disparities among adults with chronic disease.

Design: Quasi-experimental policy intervention.

Setting: Nationally representative, noninstitutionalized sample in the United States.

Patients: 606 277 adults aged 18 to 64 years with a chronic disease.

Intervention: Implementation of ACA provisions on 1 January 2014.

Measurements: Self-reported insurance coverage, having a checkup, having a personal physician, and not having to forgo a needed physician visit because of cost.

Results: After the ACA was implemented, insurance coverage increased by 4.9 percentage points (95% CI, 4.4 to 5.4), not hav-

ing to forgo a physician visit increased by 2.4 percentage points (CI, 1.9 to 2.9), and having a checkup increased by 2.7 percentage points (CI, 2.2 to 3.4). Having a personal physician did not change (0.3 percentage points [CI, -0.2 to 0.8]). All outcomes varied considerably by state, and coverage increased more in states that expanded Medicaid. Although racial/ethnic minorities had greater improvements in some outcomes, approximately 1 in 5 black and 1 in 3 Hispanic persons with a chronic disease continued to lack coverage and access to care after ACA implementation.

Limitation: The study examined data from only the first year of the ACA's major coverage expansion provisions.

Conclusion: Although the ACA increased coverage and access for persons with chronic disease, substantial gaps remain, particularly for minorities and those in Medicaid nonexpansion states.

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The prevalence of chronic disease in the United States rose steadily in the past decade, and half of adults now have at least 1 chronic medical condition (1). The burden on physical and social functioning, mental health, and bodily pain is substantial (2), as is its economic impact (3). Access to health care is important to control chronic diseases and prevent complications (4–6). Yet, millions of patients with chronic disease are uninsured (7), leading to major barriers to accessing needed medical care (8, 9) and contributing to high rates of emergency department and hospital use (10, 11). The burden of chronic disease falls particularly on racial and ethnic minorities, who are less likely than whites to achieve control of these diseases (12), largely because of differences in access to quality health care (13).

The Patient Protection and Affordable Care Act (ACA) aimed to reduce the number of uninsured Americans, improve access to care, and reduce racial and

ethnic disparities in these outcomes (14, 15). The law's main coverage provisions are the creation of health insurance marketplaces (exchanges) that offer subsidized insurance, an individual insurance mandate, and a Medicaid expansion for adults with incomes up to 138% of the federal poverty level. These provisions took effect on 1 January 2014 (16). Several studies conducted in the first 18 months of the ACA's primary reforms found that for the U.S. population as a whole, the ACA resulted in increases in health insurance coverage, with smaller improvements noted for health care access (17–19). In addition, such improvements were greater among racial and ethnic minorities. Previous studies also showed that improvements were somewhat larger in states participating in the Medicaid expansion (18, 20). However, for adults with chronic medical conditions, who potentially have the most to gain from these reforms, little is known about the extent to which the ACA increased coverage or access to care. The objectives of this study were to assess whether, for this population with high health care needs, the ACA was associated with expanded insurance coverage and access to care, whether preexisting racial and ethnic disparities in these outcomes declined after ACA implementation, and whether these outcomes varied by state Medicaid expansion status.

See also:

Web-Only
Supplement

METHODS

Data and Study Population

We used data from the Behavioral Risk Factor Surveillance System (BRFSS), a state-based telephone survey of the U.S. civilian, noninstitutionalized population conducted yearly by state health departments and the Centers for Disease Control and Prevention (21). The BRFSS collects data on health conditions, access to care, health insurance coverage, and demographic characteristics for the adult population of each state. Data are collected from more than 500 000 adults annually through the use of random-digit dialing survey methodology (21) (see the **Supplement** [available at Annals.org] for details of the BRFSS methodology, including the survey design and sampling strategy). Median response rates for the years studied ranged from 46% to 49% (22). The Cambridge Health Alliance Institutional Review Board reviewed and approved the study protocol.

The ACA's first open enrollment period began on 1 October 2013, but the individual mandate and insurance obtained through insurance marketplaces, including Medicaid, became effective on 1 January 2014. Therefore, we considered the 2 preceding years, 2012 to 2013, to be the pre-ACA cohort and 2014, the last year for which data were available in the BRFSS at the time of our analysis, to be the post-ACA cohort. We did not examine the years before 2012 because an alternative sampling methodology used at that time prevented direct comparisons with data from 2012 onward. In addition, we focused on changes occurring after the first open enrollment period rather than other elements of the ACA, such as the provisions allowing persons younger than 26 to stay on their parents' insurance and the early expansion of Medicaid in some states, starting in 2011 (23). Lastly, as in previous research, we considered the final quarter of 2013 to be a "washout period" because of potential respondent uncertainty regarding whether insurance obtained through marketplaces during that time was active (20); we did not include it in the analysis.

The study population was adults aged 18 to 64 years who reported having at least 1 chronic disease. Chronic disease was defined as any self-reported chronic condition asked about in the BRFSS survey: coronary artery disease (heart attack, angina, or coronary heart disease), stroke, asthma, chronic obstructive pulmonary disease, depression, chronic kidney disease (not including infection or kidney stone), cancer (excluding skin cancer), arthritis (including rheumatoid arthritis, lupus, or osteoarthritis), or diabetes (not including prediabetes or gestational diabetes).

Study Variables

The primary outcomes were the proportions of respondents having insurance coverage, having a personal physician, having had a routine checkup in the past 12 months, and forgoing a needed physician visit because of cost (to facilitate comparisons, we report this variable as the inverse, that is, not having to forgo a physician visit because of cost). The primary indepen-

dent variable was pre- versus post-ACA implementation. We also had information on respondent age, sex, income, marital status, education, and race/ethnicity. Race/ethnicity was classified by the BRFSS as non-Hispanic white (hereafter referred to as "white"), Hispanic, non-Hispanic black (hereafter referred to as "black"), or other (see the **Supplement** for detailed definitions of all variables).

Statistical Analysis

For each of the 4 outcomes, we estimated the unadjusted and adjusted percentage point change on the absolute scale from the pre- to post-ACA periods, both overall and stratified by state. Adjusted estimates were derived from multivariable logistic regression models that controlled for marital status, income, sex, employment status, education, and race. To obtain percentage point changes from logit models, we calculated predictive marginal effects at representative values by using the method of Korn and Graubard (24, 25).

We also used this modeling approach to estimate adjusted changes in each outcome separately for white, black, and Hispanic adults (excluding race/ethnicity as a model covariate). Then, to assess whether preexisting racial disparities in these outcomes diminished after the ACA, we estimated pre- to post-ACA changes in black-white and Hispanic-white disparities by using difference-in-differences modeling, with whites as the reference group (26–28). We also used this approach to estimate changes in each outcome separately for those residing in Medicaid expansion and nonexpansion states and to determine whether changes were greater in expansion than nonexpansion states. Nonexpansion states served as the reference group.

We also sought to understand whether potentially greater gains seen among minorities than whites for coverage were the result of similar improvements across all (or most) states or simply because of large gains in the limited number of states in which large minority populations reside. To do this, we examined post-ACA coverage changes in quintiles of states defined by the size of the black or Hispanic population.

We also calculated the unadjusted magnitude of the gaps in coverage and access that remained in the post-ACA period. These calculations were performed for the overall study population as well as stratified by racial/ethnic subgroups. In addition, for each outcome, we examined the unadjusted racial/ethnic breakdown in Medicaid expansion and nonexpansion states.

Lastly, acquisition of new insurance after the ACA went into effect in January 2014 likely increased during the first year. Thus, our main analyses, which effectively averaged effects over the entire first year, may have obscured larger changes in the latter part of the year. To examine the magnitude of potential differences between the earlier and latter parts of 2014, we compared each outcome in the first half of the year (January to June) with the last half of the year (July to December), both for the overall population and stratified by

Table 1. Unadjusted and Adjusted Changes in Health Insurance Coverage Among U.S. Residents With Chronic Disease After ACA Implementation, by State

Variable	Unadjusted Coverage (95% CI), %		Change in Coverage, percentage points*	
	Before ACA	After ACA	Unadjusted	Adjusted (95% CI)
Medicaid expansion states				
West Virginia	76.6 (75.1 to 77.8)	88.6 (86.9 to 90.2)	12.0	12.7 (10.0 to 15.5)
Illinois	80.8 (79.1 to 82.5)	89.1 (86.7 to 91.1)	8.3	11.7 (8.6 to 14.8)
Kentucky	77.9 (76.6 to 79.1)	89.3 (87.4 to 91.0)	11.4	11.6 (10.5 to 12.6)
Nevada	73.3 (71.1 to 75.5)	85.7 (82.0 to 88.7)	12.4	11.0 (6.3 to 15.7)
Rhode Island	82.9 (81.5 to 84.2)	91.3 (89.2 to 93.1)	8.4	10.2 (7.1 to 13.2)
Oregon	77.2 (75.6 to 78.6)	89.5 (87.2 to 91.4)	12.3	9.7 (8.0 to 11.5)
Arkansas	71.9 (70.0 to 73.8)	85.7 (82.8 to 88.2)	13.8	9.5 (7.5 to 11.4)
New Mexico	77.1 (75.9 to 78.3)	85.4 (83.0 to 87.6)	8.3	8.7 (5.8 to 11.6)
Washington	80.8 (79.7 to 81.8)	89.0 (87.2 to 90.6)	8.2	8.7 (6.3 to 11.0)
Colorado	80.8 (79.7 to 81.8)	88.4 (86.9 to 89.7)	7.6	7.1 (5.1 to 9.1)
Maryland	86.0 (84.8 to 87.1)	92.4 (90.2 to 94.1)	6.4	6.8 (4.2 to 9.4)
Michigan	83.3 (82.3 to 84.2)	89.0 (87.3 to 90.4)	5.7	6.3 (4.1 to 8.6)
North Dakota	86.1 (84.6 to 87.4)	92.0 (90.1 to 93.5)	5.9	6.3 (3.4 to 9.3)
Arizona	78.9 (76.8 to 81.0)	85.9 (83.9 to 87.8)	7.0	5.4 (4.0 to 6.8)
Minnesota	87.7 (86.7 to 88.6)	92.5 (91.4 to 93.5)	4.8	5.3 (3.6 to 7.0)
Delaware	87.7 (86.3 to 89.0)	91.7 (89.1 to 93.7)	4.0	4.8 (1.5 to 8.0)
New Jersey	82.7 (81.7 to 83.7)	87.6 (86.0 to 89.1)	4.9	4.7 (2.7 to 6.7)
California	81.9 (80.9 to 82.8)	85.9 (84.1 to 87.6)	4.0	4.6 (2.4 to 6.9)
Iowa	87.0 (85.8 to 88.1)	91.4 (89.6 to 92.9)	4.4	4.6 (2.3 to 6.9)
Vermont	89.1 (87.9 to 90.1)	93.1 (91.7 to 94.3)	4.0	4.2 (2.0 to 6.3)
Connecticut	88.5 (87.4 to 89.4)	92.2 (90.5 to 93.7)	3.7	4.0 (1.8 to 6.1)
Ohio	82.7 (81.7 to 83.7)	87.2 (85.2 to 89.0)	4.5	3.8 (1.4 to 6.2)
Hawaii	90.0 (88.8 to 91.1)	93.1 (91.4 to 94.4)	3.1	2.8 (0.6 to 5.0)
New Hampshire	82.6 (81.2 to 84.0)	85.5 (83.3 to 87.5)	2.9	2.6 (0 to 5.3)
Massachusetts	93.2 (92.6 to 93.9)	95.1 (94.0 to 96.0)	1.9	2.5 (1.1 to 4.1)
New York	86.0 (84.7 to 87.2)	87.8 (85.6 to 89.6)	1.8	2.1 (-0.4 to 4.6)
District of Columbia	91.9 (90.1 to 93.3)	90.1 (85.6 to 93.3)	-1.8	1.4 (0 to 2.9)
Average	82.8 (82.4 to 83.1)	88.5 (87.9 to 89.0)	5.7	5.6 (5.1 to 6.1)
Medicaid nonexpansion states				
Montana	77.5 (76.3 to 78.7)	84.4 (82.0 to 86.5)	6.9	6.9 (3.9 to 9.8)
Tennessee	77.0 (75.1 to 78.8)	82.3 (79.4 to 84.8)	5.3	6.3 (2.7 to 10.0)
Wisconsin	84.9 (83.2 to 86.4)	91.1 (89.0 to 92.9)	6.2	6.0 (3.0 to 9.0)
Oklahoma	78.2 (76.9 to 79.4)	83.6 (81.7 to 85.4)	5.4	5.6 (3.3 to 7.9)
Missouri	80.3 (78.9 to 81.6)	85.7 (83.4 to 87.7)	5.4	5.2 (2.4 to 8.1)
South Carolina	75.1 (73.9 to 76.3)	80.1 (78.2 to 81.9)	5.0	4.9 (2.6 to 7.2)
Utah	80.4 (79.4 to 81.4)	85.5 (84.2 to 86.7)	5.1	4.8 (3.2 to 6.5)
Alaska	81.1 (79.3 to 82.7)	83.2 (79.9 to 86.0)	2.1	4.7 (2.8 to 6.7)
North Carolina	75.9 (74.6 to 77.0)	81.4 (79.4 to 83.2)	5.5	4.6 (2.1 to 7.0)
Florida	73.2 (71.8 to 74.5)	78.6 (76.4 to 80.7)	5.4	4.4 (1.7 to 7.2)
Indiana	78.1 (76.9 to 79.3)	83.4 (81.5 to 85.0)	5.3	4.4 (2.2 to 6.6)
Mississippi	71.7 (70.2 to 73.1)	77.5 (74.2 to 80.5)	5.8	4.4 (0.7 to 8.0)
Kansas	79.6 (78.7 to 80.4)	83.9 (82.4 to 85.3)	4.3	4.3 (2.5 to 6.0)
Alabama	77.7 (76.3 to 79.1)	83.6 (81.7 to 85.5)	5.9	3.8 (2.3 to 5.2)
Wyoming	75.3 (73.6 to 76.9)	79.8 (76.1 to 83.0)	4.5	3.8 (0 to 7.6)
Nebraska	81.9 (81.0 to 82.8)	85.4 (83.9 to 86.9)	3.5	3.7 (2.0 to 5.5)
Texas	70.7 (69.2 to 72.0)	73.7 (71.4 to 75.9)	3.0	3.7 (1.1 to 6.3)
Georgia	73.6 (72.1 to 75.1)	75.8 (72.9 to 78.5)	2.2	3.0 (1.6 to 5.8)
Louisiana	73.6 (71.9 to 75.3)	76.7 (74.4 to 78.8)	3.1	2.7 (0.9 to 4.6)
South Dakota	85.0 (83.4 to 86.4)	87.9 (84.8 to 90.5)	2.9	2.4 (-1.0 to 5.7)
Pennsylvania	86.4 (85.5 to 87.2)	89.0 (87.3 to 90.5)	2.6	2.3 (0.3 to 4.3)
Virginia	81.7 (80.4 to 83.0)	84.1 (82.2 to 85.9)	2.4	1.5 (0.1 to 2.9)
Maine	86.8 (85.9 to 87.7)	86.4 (84.5 to 88.0)	-0.4	-0.6 (-2.5 to 1.3)
Idaho	76.5 (74.6 to 78.3)	78.0 (74.9 to 80.8)	1.5	-0.7 (-4.0 to 2.5)
Average	77.0 (76.6 to 77.3)	81.2 (80.6 to 81.8)	4.2	4.3 (3.8 to 4.7)
Adjusted difference in difference for expansion states	1.3 (1.1 to 1.5)	-	-	-

ACA = Patient Protection and Affordable Care Act.

* Positive values indicate improvement (increase) in health coverage after ACA implementation, whereas negative values indicate a worsening (decline) in health coverage.

individual state and Medicaid expansion status, by using chi-square tests.

For all analyses, we used survey weights provided by the BRFSS to account for the complex sample design; all estimations were performed by using Stata, version 11 (StataCorp).

Role of the Funding Source

This study had no external funding.

RESULTS

Sample

We analyzed data on 606 277 adults aged 18 to 64 years (464 348 pre- and 141 929 post-ACA) with at least 1 chronic disease; patient characteristics are shown in Supplement Table 1 (available at Annals.org). Pre- and post-ACA populations were demographically similar.

State-Level Changes in Coverage and Access

Insurance coverage increased in nearly all states, but with substantial state-level heterogeneity (Table 1). Adjusted state-level coverage gains ranged from a high of 12.7 percentage points (95% CI, 10.0 to 15.5) in West Virginia to a low of -0.7 percentage points (CI, -4.0 to 2.5) in Idaho. On average, the gains were greater in Medicaid expansion (average adjusted percentage point increase, 5.6 [CI, 5.1 to 6.1]) than nonexpansion states (average adjusted percentage point increase, 4.3 [CI, 3.8 to 4.7]), with a relative 1.3-percentage point (CI, 1.1 to 1.5) greater increase in expansion states (difference-in-differences estimate). The average coverage rate in expansion states was higher than in nonexpansion states before and after ACA implementation. In expansion states, an average of 82.8% (CI, 82.4% to 83.1%) of the study population was insured before and 88.5% (CI, 87.9% to 89.0%) after the ACA. Coverage in nonexpansion states averaged 77.0% (CI, 76.6% to 77.3%) before and 81.2% (CI, 80.6% to 81.8%) after the ACA, 7.3 percentage points lower than in Medicaid expansion states before the ACA. We also observed considerable state-level variation in post-ACA coverage rates, ranging from 95.1% (CI, 94.0% to 96.0%) in Massachusetts to 73.7% (CI, 71.4% to 75.9%) in Texas.

We found smaller improvements but similar state-level patterns of heterogeneity for 2 of the 3 access measures: not having to forgo a needed physician visit because of cost and having a checkup (Supplement Tables 2 and 3, available at Annals.org). In addition, residents of Medicaid expansion states improved slightly more than those in nonexpansion states for not having to forgo a physician visit (0.3 percentage points [CI, 0.1 to 0.5]); however, for having a checkup, we found no difference on the basis of state Medicaid expansion status. We found no change in having a personal physician in either Medicaid expansion or nonexpansion states (Supplement Table 4, available at Annals.org).

Changes in Coverage and Access Overall and by Race/Ethnicity

In the ACA's first year, insurance coverage increased for the total U.S. population with chronic disease by 4.9 percentage points (CI, 4.4 to 5.4) in adjusted analyses (Table 2). Two of the 3 measures of access to care also improved: not having to forgo a physician visit increased by 2.4 percentage points (CI, 1.9 to 2.9) and having a routine checkup increased by 2.7 percentage points (CI, 2.2 to 3.4) in adjusted analyses. We found no change in the percentage of individuals who had a personal physician (change, 0.3 percentage point [CI, -0.2 to 0.8]).

We also observed improvements in these outcomes (except having a personal physician) in all racial and ethnic groups (Table 2). When we examined whether preexisting racial/ethnic disparities changed after the ACA, the picture was mixed. In adjusted analyses, we found a 1.7-percentage point (CI, 1.5 to 1.9) increase in coverage among blacks relative to whites and a 3.4-percentage point (CI, 3.1 to 3.8) increase among Hispanics relative to whites. We also found that both blacks and Hispanics had slightly greater improvement than whites in not having to forgo a physician visit (0.6 [CI, 0.5 to 0.8] and 0.9 [CI, 0.7 to 1.1] percentage points, respectively). However, no statistically significant changes were observed regarding disparities in having a personal physician. For having a checkup, we found a slightly smaller improvement for blacks than

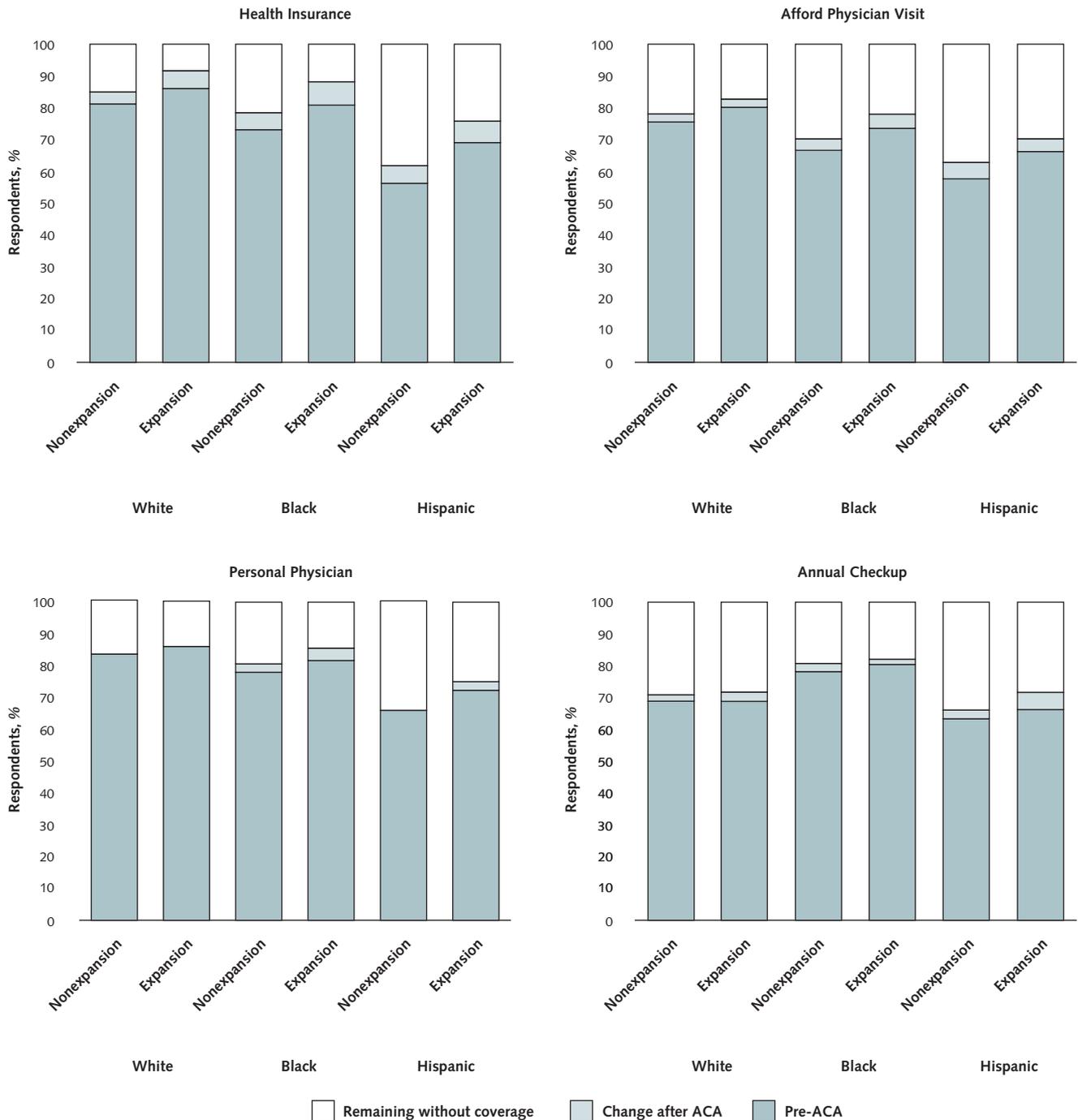
Table 2. Changes in Health Insurance Coverage and Access to Health Care for U.S. Residents With Chronic Disease After ACA Implementation, by Race/Ethnicity*

Outcome	Adjusted Change in Coverage	Adjusted Change in Disparities
Insurance coverage		
Overall	4.9 (4.4 to 5.4)	NA
White	4.2 (3.8 to 4.6)	Reference
Black	5.9 (5.3 to 6.5)	1.7 (1.5 to 1.9)
Hispanic	7.7 (6.9 to 8.4)	3.4 (3.1 to 3.8)
Personal physician		
Overall	0.3 (-0.2 to 0.8)	NA
White	0.3 (-0.2 to 0.7)	Reference
Black	0.3 (-0.2 to 0.8)	0.1 (-0.1 to 0.2)
Hispanic	0.4 (-0.2 to 0.9)	0.2 (-0.1 to 0.4)
Afford physician visit		
Overall	2.4 (1.9 to 2.9)	NA
White	2.2 (1.7 to 2.7)	Reference
Black	2.8 (2.2 to 3.4)	0.6 (0.5 to 0.8)
Hispanic	3.1 (2.4 to 3.8)	0.9 (0.7 to 1.1)
Checkup in past year		
Overall	2.7 (2.2 to 3.4)	NA
White	2.8 (2.3 to 3.4)	Reference
Black	2.2 (1.8 to 2.6)	-0.6 (-0.9 to -0.5)
Hispanic	3.0 (2.4 to 3.6)	0.2 (0.1 to 0.2)

ACA = Patient Protection and Affordable Care Act; NA = not applicable.

* Values are percentages (95% CIs). These values represent changes in predictive margins calculated from logistic regression models that controlled for age, employment status, education, marital status, income, and sex. Models for the overall population were also controlled for race/ethnicity.

Figure. Unadjusted percentage of respondents reporting health insurance and access outcomes, showing the pre-ACA percentage, change after ACA implementation, and percentage remaining without coverage or access in Medicaid expansion and nonexpansion states.



ACA = Patient Protection and Affordable Care Act.

whites (−0.6 percentage point [CI, −0.9 to −0.5]) and no change in disparities for Hispanics compared with whites (0.2 percentage point [CI, 0.1 to 0.2]). We also found that gains for black and Hispanic respondents were the result of gains in most states rather than in a few states with large minority populations (data not shown).

Remaining Gaps in Coverage and Access

Despite improvements after ACA implementation, large proportions of adults with chronic disease continued to lack coverage or access. Overall, after the ACA took effect, nationally 14.9% (CI, 14.6% to 15.3%) of persons with chronic disease continued to lack insurance, 22.8% (CI, 22.4% to 23.2%) had to forgo a physi-

cian visit, 18.1% (CI, 17.7% to 18.6%) did not have a personal physician, and 27.6% (CI, 27.2% to 28.1%) did not have a checkup. In addition, we found that the persistent lack of coverage and access after ACA implementation was particularly great among racial minorities, despite their greater gains as a result of the ACA. Approximately one fifth of blacks had persistent post-ACA gaps, ranging from 17.5% (CI, 16.2% to 18.7%) lacking coverage to 26.8% (CI, 25.4% to 28.2%) forgoing a physician visit. Approximately one third of Hispanics had persistent post-ACA gaps, ranging from 29.7% (CI, 28.1% to 31.3%) lacking coverage to 32.9% (CI, 31.3% to 34.6%) forgoing a physician visit. In addition, these racial and ethnic post-ACA gaps were more marked in Medicaid nonexpansion states (Figure); for example, among Hispanic respondents in nonexpansion states, 38.1% (CI, 35.4% to 40.8%) continued to lack insurance, 37.6% (CI, 34.9% to 40.1%) had to forgo a needed physician visit because of cost, 36.1% (CI, 33.4% to 38.8%) did not have a personal physician, and 33.7% (CI, 31.2% to 36.3%) did not have a routine checkup.

Lastly, we found statistically significant but small increases for each outcome in the second half of 2014 compared with the first half (Table 3). For insurance coverage, we also found moderate variation among individual states (Supplement Table 5, available at Annals.org).

DISCUSSION

In this early analysis of a large nationally representative cohort of adults with chronic disease, we found improvements in insurance coverage, not having to forgo a physician visit because of cost, and having a routine checkup. We found no improvement in having a personal physician. The pre-ACA racial/ethnic disparities in insurance coverage and not having to forgo a physician visit improved for both black and Hispanic respondents, whereas disparities in the proportion of persons who had a personal physician did not change. Having a checkup was slightly improved for Hispanics compared with whites, whereas a small decline for this outcome was seen in blacks. Insurance coverage and having a routine checkup improved to a greater degree in Medicaid expansion than nonexpansion states. However, the proportion of adults with chronic illness who still lacked insurance or faced access barriers after implementation of the ACA's major coverage provisions remained substantial, particularly for racial and ethnic minorities and for persons residing in states that did not expand Medicaid.

Our study adds to the early literature on the effect of the ACA's major reforms. Only 1 previous study examined the ACA's effect on persons with chronic diseases (20). Somewhat similar to our findings, a subgroup analysis in that study observed a 7.7-percentage point increase in coverage overall, with somewhat lesser improvements in several access measures. However, that study was limited by a low response rate (5% to 10%, depending on study year), and it did not exam-

Table 3. Unadjusted Comparison of Health Insurance and Access Outcomes Between the First and Second Half of 2014

Outcome	First 6 mo (95% CI), %	Second 6 mo (95% CI), %	Difference, percentage points
Health insurance	84.3 (83.8-84.9)	85.7 (85.1-86.3)	1.4
Afford physician	76.8 (76.2-77.4)	77.5 (76.9-78.1)	0.7
Personal physician	81.5 (80.9-82.1)	82.2 (81.6-82.8)	0.7
Annual checkup	71.9 (71.2-72.5)	72.8 (72.2-73.5)	0.9

ine the ACA's effect on preexisting racial and ethnic disparities or the differential effects of state Medicaid expansion among adults with chronic disease.

Our findings suggest that the ACA's major coverage expansion starting in January 2014 resulted in meaningful improvements in coverage and access for Americans with chronic disease. However, these improvements seem modest relative to the proportion of adults who still lack insurance or face access barriers, problems that are widespread among racial and ethnic minorities and among persons residing in states that did not expand Medicaid. Although the ACA was not designed to achieve universal coverage, many lawmakers argued that it would come close. Our findings highlight the substantial hurdles that must be overcome in the future to optimize coverage and access and to eliminate disparities among those with chronic disease.

The reasons for continued barriers to coverage and access to care among persons with chronic disease likely are multifactorial. Our results are consistent with a growing body of literature suggesting that states' refusal to participate in the ACA's Medicaid expansion is a substantial barrier to coverage and access, especially for vulnerable populations (15). A second factor is that millions of Hispanic persons in the United States are ineligible for public medical coverage because of their immigration status. As with other public insurance programs, under the ACA undocumented immigrants are not eligible for Medicaid or marketplace plans; they also are exempt from the ACA's mandate that individuals maintain coverage. A third factor is that copayments, high deductibles, and other out-of-pocket medical costs likely discourage persons with chronic disease from seeking care. In addition, out-of-pocket costs generally are higher in exchange-purchased than employer-sponsored plans (8, 29), and many marketplace plans have narrow provider networks (30) that may limit access to health care practitioners. Lastly, as more persons have become insured, the number of physicians available may not have met the increased demand for care, which might account for our finding that increases in insurance were not matched by gains in having a personal physician. The ACA augmented Medicaid payments for primary care services provided by primary care physicians to encourage greater access, but this practice ended after 2014. In the absence of additional policy interventions to augment the primary care workforce, access to primary care physicians may continue to be limited.

Our study had several limitations. First, our data source, the BRFSS, is a self-reported telephone survey. It excludes the institutionalized population and those without telephones, which may limit the generalizability of our results. Study interviewers also could not contact all study-eligible households (the response rate for study years ranged from 46% to 49%), possibly leading to nonresponse bias, although our use of survey weights provided by the BRFSS to account for nonresponse likely mitigated this problem. In addition, estimates for most variables from the BRFSS were shown to closely match estimates from the National Health Interview Survey, which is conducted door to door (31). Moreover, the BRFSS self-reports on chronic conditions are not verified, nor is information available on illness severity, which might influence the degree of need for access to care. We also likely underestimated the effect of the ACA as a whole, as some more minor provisions of the law (notably the extension of dependent coverage to age 26) were implemented between 2010 and 2012. However, given the low prevalence of chronic disease in younger populations, this may not have greatly affected our results. In addition, a few states expanded Medicaid before 2014, so we likely underestimated the relative importance of Medicaid expansion in the overall change in our coverage and access outcomes.

Our analyses of pre- to post-ACA changes in coverage and access for the overall adult population did not use a control group, because all states were affected by the ACA reforms. Hence, it is possible that our results were influenced by unmeasured secular trends in factors affecting our study outcomes. Our models examining differential changes by race/ethnicity and Medicaid expansion status used a more robust design (difference-in-differences analyses) and were less likely to be confounded by secular trends. Finally, to provide timely analyses of the ACA's effect on persons with chronic disease, we examined BRFSS data for only the first year of the ACA (at the time of the study, the only available post-ACA year), which may not fully reflect the ACA's effect in subsequent years. A strength of the study is its large sample size, which provided adequate numbers of racial/ethnic minorities to achieve sufficient power to detect relatively small differences in our disparities analyses.

The extent to which additional improvements will be seen in subsequent years is uncertain. We found a small upward trend in coverage and access in the second half of 2014, and other national data suggest that the overall U.S. population of nonelderly adults had continued but diminishing gains in coverage from 2013 into the first quarter of 2016. By 1 estimate, the percentage of uninsured persons declined by 5.8% between 2013 and 2014, 1.7% between 2014 and 2015, and 0.9% between 2015 and the first quarter of 2016. These percentages suggest that modest additional decreases in the uninsured rate in years after 2014 have occurred among the population with chronic disease. However, the Congressional Budget Office projects that under the ACA, the percentage of nonelderly

adults who lack insurance will not decline further after 2016 (32), with approximately 10% of this population remaining uninsured through 2026. Studies using data from additional post-ACA years as they become available should clarify the ultimate effect of health reform on persons with chronic disease. The large remaining gaps raise concerns about the ability of the ACA to provide adequate coverage and access for this population.

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References

1. Ward BW, Schiller JS, Goodman RA. Multiple chronic conditions among US adults: a 2012 update. *Prev Chronic Dis.* 2014;11:E62. [PMID: 24742395] doi:10.5888/pcd11.130389
2. Stewart AL, Greenfield S, Hays RD, Wells K, Rogers WH, Berry SD, et al. Functional status and well-being of patients with chronic conditions. Results from the Medical Outcomes Study. *JAMA.* 1989;262:907-13. [PMID: 2754790]
3. Bodenheimer T, Chen E, Bennett HD. Confronting the growing burden of chronic disease: can the U.S. health care workforce do the job? *Health Aff (Millwood).* 2009;28:64-74. [PMID: 19124856] doi:10.1377/hlthaff.28.1.64
4. Hoffman C, Paradise J. Health insurance and access to health care in the United States. *Ann N Y Acad Sci.* 2008;1136:149-60. [PMID: 17954671]
5. Zhang X, Bullard KM, Gregg EW, Beckles GL, Williams DE, Barker LE, et al. Access to health care and control of ABCs of diabetes. *Diabetes Care.* 2012;35:1566-71. [PMID: 22522664] doi:10.2337/dc12-0081
6. Christopher AS, McCormick D, Woolhandler S, Himmelstein DU, Bor DH, Wilper AP. Access to care and chronic disease outcomes among Medicaid-insured persons versus the uninsured. *Am J Public Health.* 2016;106:63-9. [PMID: 26562119] doi:10.2105/AJPH.2015.302925
7. Wilper AP, Woolhandler S, Lasser KE, McCormick D, Bor DH, Himmelstein DU. A national study of chronic disease prevalence and access to care in uninsured U.S. adults. *Ann Intern Med.* 2008;149:170-6. [PMID: 18678844]
8. Hwang W, Weller W, Ireys H, Anderson G. Out-of-pocket medical spending for care of chronic conditions. *Health Aff (Millwood).* 2001;20:267-78. [PMID: 11816667]
9. Parikh PB, Yang J, Leigh S, Dorjee K, Parikh R, Sakellarios N, et al. The impact of financial barriers on access to care, quality of care and vascular morbidity among patients with diabetes and coronary heart disease. *J Gen Intern Med.* 2014;29:76-81. [PMID: 24078406] doi:10.1007/s11606-013-2635-6
10. McWilliams JM. Health consequences of uninsurance among adults in the United States: recent evidence and implications. *Mil-*

- bank Q. 2009;87:443-94. [PMID: 19523125] doi:10.1111/j.1468-0009.2009.00564.x
11. Solberg LI, Maciosek MV, Sperl-Hillen JM, Crain AL, Engebretson KI, Asplin BR, et al. Does improved access to care affect utilization and costs for patients with chronic conditions? *Am J Manag Care.* 2004;10:717-22. [PMID: 15521163]
 12. McWilliams JM, Meara E, Zaslavsky AM, Ayanian JZ. Differences in control of cardiovascular disease and diabetes by race, ethnicity, and education: U.S. trends from 1999 to 2006 and effects of medicare coverage. *Ann Intern Med.* 2009;150:505-15. [PMID: 19380852]
 13. Lillie-Blanton M, Hoffman C. The role of health insurance coverage in reducing racial/ethnic disparities in health care. *Health Aff (Millwood).* 2005;24:398-408. [PMID: 15757923]
 14. U.S. Department of Health and Human Services. Strategic goal 1: strengthen health care. 2016. Accessed at www.hhs.gov/about/strategic-plan/strategic-goal-1 on 1 November 2016.
 15. Clemans-Cope L, Kenney GM, Buettgens M, Carroll C, Blavin F. The Affordable Care Act's coverage expansions will reduce differences in uninsurance rates by race and ethnicity. *Health Aff (Millwood).* 2012;31:920-30. [PMID: 22566430] doi:10.1377/hlthaff.2011.1086
 16. The Henry J. Kaiser Family Foundation. Health reform implementation timeline. 2016. Accessed at <http://kff.org/interactive/implementation-timeline> on 1 November 2016.
 17. Shartz A, Long SK, Anderson N. Access to care and affordability have improved following Affordable Care Act implementation; problems remain. *Health Aff (Millwood).* 2016;35:161-8. [PMID: 26674536] doi:10.1377/hlthaff.2015.0755
 18. McMorro S, Long SK, Kenney GM, Anderson N. Uninsurance disparities have narrowed for black and Hispanic adults under the Affordable Care Act. *Health Aff (Millwood).* 2015;34:1774-8. [PMID: 26378026] doi:10.1377/hlthaff.2015.0757
 19. Carman KG, Eibner C, Paddock SM. Trends in health insurance enrollment, 2013-15. *Health Aff (Millwood).* 2015;34:1044-8. [PMID: 25947173] doi:10.1377/hlthaff.2015.0266
 20. Sommers BD, Gunja MZ, Finegold K, Musco T. Changes in self-reported insurance coverage, access to care, and health under the Affordable Care Act. *JAMA.* 2015;314:366-74. [PMID: 26219054] doi:10.1001/jama.2015.8421
 21. Centers for Disease Control and Prevention. About the Behavioral Risk Factor Surveillance System (BRFSS). 2014. Accessed at www.cdc.gov/brfss/about/about_brfss.htm on 1 November 2016.
 22. Centers for Disease Control and Prevention. BRFSS combined landline and cell phone weighted response rates by state, 2011. 2013. Accessed at www.cdc.gov/brfss/annual_data/2011/response_rates_11.htm on 1 November 2016.
 23. The Henry J. Kaiser Family Foundation. States getting a jump start on health reform's Medicaid expansion. The Kaiser Commission on Medicaid and the Uninsured. 2012 Accessed at <http://kff.org/health-reform/issue-brief/states-getting-a-jump-start-on-health> on 2 March 2016.
 24. Williams R. Using the margins command to estimate and interpret adjusted predictions and marginal effects. *Stata J.* 2012;12:308-31.
 25. Graubard BI, Korn EL. Predictive margins with survey data. *Biometrics.* 1999;55:652-9. [PMID: 11318229]
 26. Woolridge J. *Econometric Analysis of Cross-Section and Panel Data.* Cambridge, MA: MIT Pr; 2002.
 27. McCormick D, Hanchate AD, Lasser KE, Manze MG, Lin M, Chu C, et al. Effect of Massachusetts healthcare reform on racial and ethnic disparities in admissions to hospital for ambulatory care sensitive conditions: retrospective analysis of hospital episode statistics. *BMJ.* 2015;350:h1480. [PMID: 25833157] doi:10.1136/bmj.h1480
 28. Dimick JB, Ryan AM. Methods for evaluating changes in health care policy: the difference-in-differences approach. *JAMA.* 2014;312:2401-2. [PMID: 25490331] doi:10.1001/jama.2014.16153
 29. Thorpe KE, Allen L, Joski P. Out-of-pocket prescription costs under a typical Silver Plan are twice as high as they are in the average employer plan. *Health Aff (Millwood).* 2015;34:1695-703. [PMID: 26438746] doi:10.1377/hlthaff.2015.0323
 30. Blumenthal D, Abrams M, Nuzum R. The Affordable Care Act at 5 years. *N Engl J Med.* 2015;372:2451-8. [PMID: 25946142] doi:10.1056/NEJMp1503614
 31. Nelson DE, Powell-Griner E, Town M, Kovar MG. A comparison of national estimates from the National Health Interview Survey and the Behavioral Risk Factor Surveillance System. *Am J Public Health.* 2003;93:1335-41. [PMID: 12893624]
 32. Congressional Budget Office. *Federal Subsidies for Health Insurance Coverage for People under Age 65: 2016-2026.* Washington, DC: Congressional Budget Office; 2016.

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