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ABSTRACT Previous research has demonstrated large gains in insurance coverage associated with the Affordable Care Act's (ACA's) Medicaid expansion in 2014. We used detailed federal survey data through 2015 to analyze more recent changes in coverage for low-income adults after the expansion. We found that the uninsurance rate fell in both expansion and nonexpansion states but that it fell significantly more in expansion states. By 2015 the post-ACA uninsurance rate for low-income adults had fallen by 7.5 percentage points more in expansion than in nonexpansion states, a difference that was similar (about 6.8 percentage points) in adjusted regression models. Private coverage increased in nonexpansion states, but significantly less than Medicaid coverage increased in expansion states. Rates of private coverage did not appear to decline in expansion states. Finally, Medicaid expansion was associated with significantly improved quality of health coverage, as reported by low-income adults.

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Under the Affordable Care Act (ACA), millions of low-income adults in states that expanded eligibility for Medicaid became newly eligible for the program, while others became eligible for income-based tax credits to purchase private insurance in 2014. As states consider whether to continue or initiate Medicaid expansion and Congress continues to weigh ACA repeal, replacement, or modification, it is especially important to evaluate information on its effects to date. Previous evidence suggests that in 2014, the first year of the implementation of the ACA's Medicaid expansion, coverage increases among low-income adults were greater in states that expanded Medicaid, compared to those that did not.¹ We used federal survey data to examine changes in coverage through 2015, the expansion's second year.

While some previous studies have assessed the impact of Medicaid expansion in 2015, they have typically done so using rapid-turnaround

surveys with low response rates.²⁻⁴ We used high-quality household interview data to assess changes in coverage through 2015 and to decompose the overall coverage changes into changes in both public and private coverage. We also examined coverage changes by respondents' sex, parental status, race/ethnicity, age range, and residence (urban versus rural area).

We found that uninsurance rates fell in 2014 in both expansion and nonexpansion states but that coverage gains were larger in expansion states. Coverage gains from expansion were even larger in 2015. By 2015 the uninsurance rate had fallen by about 7.5 percentage points more in expansion compared to nonexpansion states—a difference that was very similar to the difference (about 6.8 percentage points) in models that adjusted for factors described below and in the online Appendix.⁵ Relative increases in Medicaid coverage in expansion states continued to grow in 2015. Private coverage increased in nonexpansion states, but significantly less

than Medicaid coverage did in expansion states. Rates of private coverage did not appear to decline in expansion states.

Study Data And Methods

DATA SOURCE, SAMPLE, AND OUTCOMES Our data for 2008–15 came from the National Health Interview Survey (NHIS), a nationally representative health survey of the US civilian noninstitutionalized population conducted by the National Center for Health Statistics. The NHIS is a repeated cross-sectional survey that uses a multistage area probability design to select a sample of households. It collects information on a wide variety of health topics, including insurance coverage. We analyzed data from a restricted-use version of the survey that included respondents' state of residence, which allowed us to determine whether each respondent lived in a state that expanded Medicaid in 2014 or 2015.

We analyzed health insurance coverage in four categories: no insurance, Medicaid or the Children's Health Insurance Program (CHIP), and private coverage (either group or nongroup). We also analyzed health insurance quality using answers to a question asked of one adult per household: "In regard to your health insurance or health care coverage, how does it compare to a year ago? Is it better, worse, or about the same?"

We limited our sample to respondents ages 19–64 whose family incomes were at or below 138 percent of the federal poverty level—the income level used to define the target population for the ACA Medicaid expansion. We also limited our sample to US citizens and noncitizens who had been in the United States for at least five years, to exclude recently arrived noncitizens (who are generally ineligible for Medicaid). Our sample consisted of 97,224 low-income adults who responded to the NHIS in the period 2008–15 and lived in states that expanded Medicaid in 2014 or in states that did not expand Medicaid in either 2014 or 2015. There was a subsample of 46,254 respondents for the question about changes in the quality of health insurance coverage.

STATISTICAL ANALYSIS Our study used a difference-in-differences approach: We examined changes in outcomes in the period 2014–15 compared to the period 2008–13 for Medicaid expansion states versus nonexpansion states.

Our main model focused on comparing states that expanded Medicaid in 2014 to states that did not expand Medicaid in either 2014 or 2015. (A list of states by expansion status is in the Appendix.)^{5,6} For states that expanded Medicaid in 2014, we assessed the effects of the expansion in both the first year (2014) and the second year

(2015). Our variables of interest were indicator variables for 2014 and 2015 and interactions between these two variables and an indicator variable for a state's having expanded Medicaid in 2014. (For additional details about our statistical model, see the Appendix.)⁵ For the uninsurance rate outcome, we estimated an additional model that included states that expanded Medicaid in 2015. For this model with a sample size of 101,705 low-income adults (including those living in 2015 expansion states), we report effects only in 2015.

Following previous studies, we used linear probability models for ease of interpretation.⁷ Sample weights available from the National Center for Health Statistics were used to produce nationally representative estimates. All models used robust standard errors clustered at the state level.⁸

Our study design rests on the assumption that trends in outcomes would not have differed between expansion and nonexpansion states absent the ACA. To test whether coverage trends were diverging based on expansion status before 2014, we used data for 2008–13 to estimate each outcome as a function of a linear quarterly time trend interacted with an indicator for Medicaid expansion status. Control variables (such as age and sex) that are listed in the Appendix were also included.⁵ The significance of the coefficient for the interaction term served as a test of the difference in outcome trends between expansion and nonexpansion states before 2014.⁹ The results indicated that trends in insurance status before 2014 were similar for states that subsequently expanded and those that did not expand, which suggests that divergent trends between these two groups of states beginning in 2014 were likely due to the implementation of the ACA Medicaid expansion.

Finally, since eligibility for public insurance among nonelderly nondisabled adults had previously been limited in most states to certain groups (for example, parents and pregnant women), we expected that Medicaid expansion might have had stronger effects on some subgroups (such as men and childless adults) whose members were less likely than others were to be eligible for Medicaid before the expansion. Accordingly, we conducted subgroup analyses for the uninsurance rate to assess whether the Medicaid expansions had larger effects on some subgroups than on others. Specifically, we estimated models with full interactions between the covariates and each subgroup variable. We present results for 2015 by sex, parental status (defined as being a parent to at least one child younger than age eighteen in the household), race/ethnicity (non-Hispanic white, non-Hispanic black,

Hispanic, and non-Hispanic Asian or other race), age range (ages 19–35 versus ages 36–64), and residence in a metropolitan area or in another area. All analyses were conducted using Stata, version 14.0.

LIMITATIONS Our analysis had important limitations. First, despite our quasi-experimental design, we cannot conclusively attribute causality to our findings because of the observational nature of the data. In particular, although we present estimates for changes in insurance status for both expansion and nonexpansion states, we are more confident in our estimates of the differences between these two groups of states than in our estimates for each group, since other events around the time that the ACA expansion was implemented could have influenced insurance coverage for both groups of states.

Second, the questions on insurance status and family income in the NHIS do not use the same timing. Insurance status is measured at the time of the survey. Questions about family income refer to self-reported income for the previous calendar year. To the extent that family income fluctuated from year to year, our sample of adults with incomes of no more than 138 percent of poverty may be imprecise.

Third, as is the case in most surveys, income measurement in the NHIS is subject to error and does not map directly to how income is used to determine Medicaid eligibility.¹⁰ Taken together, these limitations mean that our sample likely included some adults who were not actually eligible for Medicaid in expansion states and excluded some adults who were eligible.

Study Results

CHANGES IN THE UNINSURANCE RATE Consistent with previous evidence,¹ Exhibit 1 shows that the percentage of low-income adults who were uninsured was higher in nonexpansion states than the percentage in expansion states even before 2014. Trends in this rate were fairly flat, which led to a steady difference in the uninsurance rate between the two groups of states. For instance, in 2013 the difference in the uninsurance rate was nearly 12 percentage points, with about 35 percent of low-income adults uninsured in states that subsequently expanded Medicaid compared to nearly 47 percent in nonexpansion states.

Beginning in 2014 the uninsurance rate declined in both groups of states, with the decline steeper in expansion states. The previous 12-percentage-point gap in the uninsurance rate for low-income adults widened to a gap of about 16 percentage points in 2014 and to one of about 19 percentage points in 2015. From 2013 to 2015 the uninsurance rate fell 18.2 percentage points

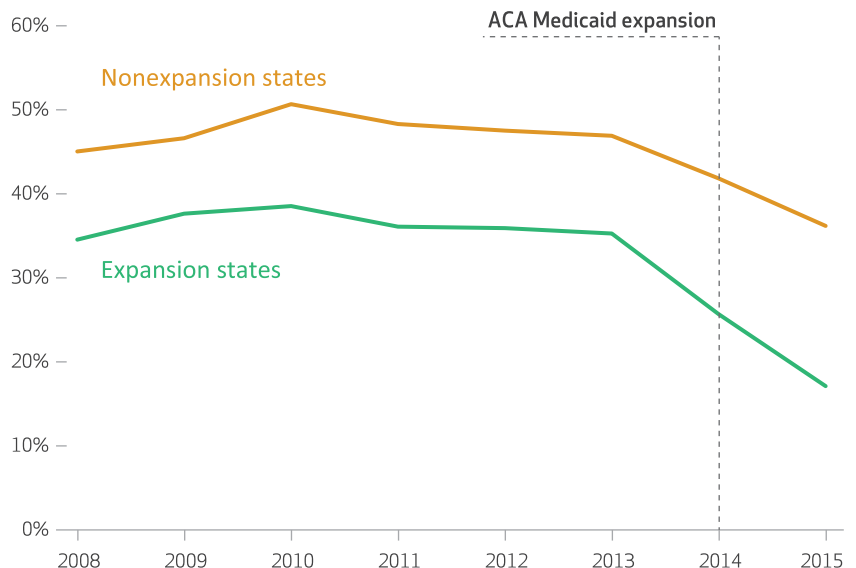
in expansion states and 10.7 percentage points in nonexpansion states—a difference of 7.5 percentage points.

Consistent with the trends shown in Exhibit 1, the regression estimates from our difference-in-differences model demonstrate that the percentage of low-income adults who were uninsured decreased in both expansion and nonexpansion states in both 2014 and 2015, but decreased more rapidly in expansion states (Exhibit 2). In 2015 the regression-adjusted decline in the uninsurance rate was about 6.8 percentage points greater in expansion compared to nonexpansion states (compared to the unadjusted estimate of 7.5 percentage points). This was larger than the difference of 4.6 percentage points for 2014 alone. The difference between the two years was significant at the 10 percent level.¹¹

CHANGES IN INSURANCE COVERAGE BY TYPE OF COVERAGE When we examined changes in coverage for low-income adults by source, we found that Medicaid or CHIP coverage increased 7.3 percentage points more in expansion compared to nonexpansion states in 2014 (Exhibit 2). This difference grew to 13.9 percentage points in 2015. As expected, Medicaid coverage increased only slightly in nonexpansion states in either year. The small increase was probably due to

EXHIBIT 1

Percentages of low-income nonelderly adults in Medicaid expansion and nonexpansion states who were uninsured, 2008–15



SOURCE Authors' analysis of data for 2008–15 from the National Health Interview Survey (NHIS).
NOTES The sample consisted of 97,224 respondents to the NHIS ages 19–64 who had family incomes of up to 138 percent of the federal poverty level and who lived in an expansion state (defined as a state that expanded eligibility for Medicaid in 2014) or a nonexpansion state (defined as a state that did not expand eligibility in either 2014 or 2015). Five states and the District of Columbia expanded Medicaid under the Affordable Care Act (ACA) before 2014, and we considered them to be expansion states. Sample weights were used to produce nationally representative estimates.

EXHIBIT 2

Changes in 2014 and 2015 in insurance status for low-income adults in Medicaid expansion and nonexpansion states

	2014 (percentage-point change relative to 2008-13)			2015 (percentage-point change relative to 2008-13)		
	Expansion states	Nonexpansion states	Difference	Expansion states	Nonexpansion states	Difference
2014 EXPANSION STATES COMPARED TO NONEXPANSION STATES						
(1) Uninsured	-10.48***	-5.92***	-4.56**	-17.96*** ^a	-11.20*** ^a	-6.77*** ^c
SE	(1.67)	(1.28)	(1.82)	(1.75)	(1.78)	(2.00)
(2) Medicaid or CHIP	9.14***	1.88***	7.26***	15.81*** ^a	1.95*	13.86*** ^a
SE	(1.94)	(0.82)	(1.88)	(2.45)	(1.15)	(2.25)
(3) Private						
All private	2.09**	4.47***	-2.38**	2.92**	10.10*** ^a	-7.18*** ^a
SE	(0.95)	(0.75)	(1.08)	(1.34)	(1.36)	(1.58)
Individual market	1.95***	3.12***	-1.17*	2.79***	6.70*** ^a	-3.91** ^b
SE	(0.35)	(0.53)	(0.60)	(0.61)	(1.48)	(1.57)
Other private	0.14	1.35**	-1.21	0.13	3.40*** ^c	-3.26**
SE	(0.88)	(0.55)	(0.99)	(1.05)	(0.92)	(1.27)
(4) Coverage better than the year before	6.21***	1.42	4.79***	4.41***	2.30**	2.11*
SE	(1.28)	(1.15)	(1.32)	(1.25)	(1.06)	(1.12)
2014 AND 2015 EXPANSION STATES COMPARED TO NONEXPANSION STATES						
(5) Uninsured	— ^d	— ^d	— ^d	-17.35***	-11.40***	-5.96***
SE	— ^d	— ^d	— ^d	(1.65)	(1.80)	(2.03)

SOURCE Authors' analysis of data for 2008-15 from the National Health Interview Survey. **NOTES** The sample size for rows 1-3 is 97,224, as indicated in the text. The sample size for row 4 is 46,254, as also indicated in the text. The sample size for row 5 is 101,705; it includes the three states that expanded Medicaid in 2015. Estimates were obtained from linear probability regression models that included controls for respondents' age, sex, race/ethnicity, education, marital status, employment status, residence inside or outside of a metropolitan area, and citizenship status; a linear quarterly time trend; and state fixed effects. Models also included 2014 and 2015 dummy variables and the interaction between these variables and state Medicaid expansion status (expansion and nonexpansion states are defined in the Notes to Exhibit 1). Sample weights were used to produce nationally representative estimates, and standard errors were clustered at the state level. Asterisks are used to denote the significance of the estimate overall. Superscripts a, b, and c indicate that the 2015 estimate to the left of the superscript is significantly different from the analogous estimate for 2014 at the specified level. CHIP is Children's Health Insurance Program. ^a $p < 0.01$ ^b $p < 0.05$ ^c $p < 0.10$ ^d2014 estimates for models that include states that did not expand Medicaid until 2015 are not shown. ** $p < 0.05$ *** $p < 0.01$

the welcome mat (or woodwork) effect—that is, an increase in participation in Medicaid among adults who were already eligible for the program (as a result of publicity about the ACA expansion, increased enrollment efforts, or other factors).¹²

Private insurance (primarily nongroup coverage) increased in both expansion and nonexpansion states in 2014 and 2015. The gains in expansion states could be due either to other factors changing in 2014 that affected both groups of states or to imprecise income measurements in the NHIS that incorrectly reported some individuals as having incomes below 138 percent of poverty when in fact they had higher incomes and thus were eligible for subsidized coverage in the health insurance Marketplaces rather than Medicaid.

We did not observe any significant decreases in private coverage in expansion states. This implies that increases in Medicaid coverage in expansion states came from low-income adults who would have otherwise been uninsured,

not from people who dropped private coverage to sign up for Medicaid. In other words, we did not observe any direct crowd-out of private insurance as a result of the Medicaid expansion.

As expected, we found that the increase in private coverage was considerably larger in nonexpansion states, compared to expansion states, in both 2014 and 2015. The increase in private coverage in nonexpansion states is likely primarily attributable to adults with incomes of 100-138 percent of poverty—who would have been eligible for subsidized Marketplace coverage in nonexpansion states but not in expansion states (where they qualified for Medicaid instead). We found some evidence for this in sensitivity analyses by income.¹³

In terms of the quality of coverage, we found that, compared to low-income adults in nonexpansion states, those in expansion states were significantly more likely to report that their health insurance coverage was better than the year before in both 2014 and 2015. Specifically,

we estimated a difference-in-differences effect of about 5 percentage points in 2014, which declined to about 2 percentage points in 2015. The decline in this point estimate could be due to the fact that people who gained coverage in 2014 would presumably report that their coverage had improved in 2014 but not in 2015. However, the estimated improvement in quality of coverage was not significantly different for 2015, compared to 2014.

SUBGROUP ANALYSIS OF CHANGES IN THE UNINSURANCE RATE When we examined changes in the uninsurance rate by subgroup in 2015

(Exhibit 3), we found that the largest difference was between parents and childless adults. In 2015 Medicaid expansion was associated with an 11.3-percentage-point decline in the uninsurance rate for childless adults in expansion states, compared to those in nonexpansion states. Meanwhile, the difference-in-differences estimate for parents was a decline of 0.6 percentage point, which was not significant. Our results indicate that childless adults, who were less likely to be eligible for Medicaid before the ACA compared to parents, were particularly likely to gain insurance in expansion states under the ACA.

EXHIBIT 3

Uninsurance rates for low-income adults in Medicaid expansion and nonexpansion states in 2015 compared to 2008–13, among selected subgroups

Subgroup	2008–13 mean (percent)		Regression estimates of changes in uninsurance rate as of 2015 (percentage points)		
	(1) Expansion state	(2) Nonexpansion state	(3) Expansion state	(4) Nonexpansion state	(5) Difference
Parent (ref)	34.98	51.99***	–13.36***	–13.06***	–0.60
SE	(2.82)	(3.46)	(1.85)	(2.00)	(2.00)
Childless adult	37.41	44.46**	–20.88*** ^a	–9.58*** ^c	–11.30*** ^a
SE	(3.05)	(1.85)	(2.18)	(2.11)	(2.67)
Male (ref)	43.00	52.71***	–20.76***	–11.50***	–9.26***
SE	(2.73)	(2.20)	(1.66)	(1.39)	(1.97)
Female	30.74	43.49***	–15.77 ^a	–11.09***	–4.68** ^a
SE	(2.65)	(2.56)	(2.07)	(2.41)	(2.23)
Resident of metro area (ref)	36.26	47.82***	–17.22***	–10.82***	–6.40***
SE	(3.18)	(2.50)	(1.92)	(2.03)	(2.31)
Resident of other area	36.90	46.92***	–22.03***	–11.14***	–10.89***
SE	(2.30)	(2.13)	(2.80)	(2.14)	(2.67)
Ages 19–35 (ref)	37.89	49.57***	–17.48***	–11.83***	–5.65**
SE	(2.73)	(2.83)	(2.27)	(1.77)	(2.24)
Ages 36–64	34.90	45.70***	–18.58***	–10.74***	–7.83***
SE	(2.85)	(2.08)	(1.77)	(2.46)	(2.50)
Non-Hispanic white (ref)	30.05	40.35***	–19.11***	–12.49***	–6.62***
SE	(1.69)	(1.51)	(2.18)	(2.42)	(2.41)
Non-Hispanic black	28.48	42.62***	–16.83***	–12.96***	–3.86*
SE	(2.09)	(1.07)	(2.29)	(1.57)	(2.14)
Hispanic	51.02	67.55***	–17.06***	–7.48*** ^c	–9.58***
SE	(2.74)	(2.59)	(1.76)	(1.87)	(2.29)
Non-Hispanic Asian or other race	32.80	48.48***	–14.07*** ^c	–5.42	–8.64
SE	(2.90)	(3.90)	(2.79)	(5.82)	(5.94)

SOURCE Authors' analysis of data for 2008–15 from the National Health Interview Survey. **NOTES** The samples of expansion and nonexpansion states are defined in the Notes to Exhibit 1. States that expanded Medicaid in 2015 were excluded from this analysis. *Parental status* was defined as being a parent to at least one child younger than age eighteen in the household. Estimates in columns 3–5 were obtained from linear probability regression models (explained in the Notes to Exhibit 2). Mean uninsurance rates for 2008–13 are provided in columns 1 and 2, for comparison to columns 3–5. To test for the significance of differences between subgroups, pooled models with interactions between all covariates and the subgroup variables were estimated. Sample weights were used to produce nationally representative estimates, and standard errors (the numbers in parentheses) were clustered at the state level. Asterisks are used to denote the significance of the estimate overall. Superscripts a and c indicate that the estimate to the left of the superscript is significantly different from the analogous estimate for the reference group at the specified level. ^a $p < 0.01$ ^p $p < 0.10$ ^{**} $p < 0.05$ ^{***} $p < 0.01$

The difference-in-differences estimate for men was significantly larger than that for women: Medicaid expansion was associated with a 9.3-percentage-point drop in the uninsurance rate for men in expansion compared to nonexpansion states but with a 4.7-percentage-point drop for women. This result indicates that Medicaid expansion helped narrow a preexisting disparity in coverage (between men and women), but only in expansion states.

The uninsurance rate also appeared to decrease more after Medicaid expansion in rural areas compared to urban areas, although this difference was not significant. Similarly, expansion was associated with larger gains in coverage for adults ages 36–64 than for those ages 19–35 and for Hispanics than for whites, but these differences were not significant.

Discussion

Using high-quality, nationally representative government survey data, we found that the Medicaid expansion's effects on coverage among low-income adults continued to increase in 2015. The magnitude of the estimated improvement in the uninsurance rate after Medicaid expansion was similar in regression-adjusted models to the improvement in simple graphical analyses, which adds credibility to our results.

The results indicate that the benefits of Medicaid expansion identified in other research, such as improved access to care, quality of care, and self-reported health,^{1,14,15} are likely to grow substantially over time as enrollment grows. Although previous work has reported changes in insurance status in 2015 typically using data from polling or from Internet or phone surveys,^{2–4,16} our study uses a gold-standard federal government survey to analyze coverage changes for low-income adults; it is the first to analyze coverage effects for subgroups of adults.

The differential decline in the uninsurance rate in expansion states was mainly attributable to an increase in public coverage, as would be expected with expanded Medicaid eligibility. We found no decline in private coverage in expansion states, which suggests that new Medicaid eligibility did not lead people to drop private coverage to enroll in Medicaid. This is consistent with one analysis of the ACA's effects using census data¹⁷ but differs from the results of another recent study.¹⁸

We did find a greater increase in private non-group coverage in nonexpansion states, compared to expansion states. To the extent that this was due to the existence of Marketplace subsidies in nonexpansion states for people with family incomes of 100–138 percent of poverty, this differential change in private coverage would be fundamentally different than the traditional notion of crowd-out, in which public coverage expansion leads directly to a reduction in private insurance.¹⁹ Distinguishing between those patterns of effects has important policy implications. However, since both types of coverage gains (Medicaid in expansion states and subsidized Marketplace coverage in nonexpansion states) stem directly from the ACA, they would likely both be reversed were the law to be repealed.

Our subgroup analyses indicated that Medicaid expansion produced its largest coverage gains among men and childless adults. This presumably reflects the fact that these groups were less likely than others to be eligible for Medicaid in most states before the ACA's Medicaid expansion. Whether improvements in access to care are also more concentrated in these groups is a worthwhile subject for future research.

Finally, part of the debate over state-level Medicaid expansion and federal consideration of ACA repeal focuses on the quality of Medicaid coverage, and our findings offer insights into this question. Our results show that not only did the Medicaid expansion increase coverage rates in 2014 and 2015, but it also improved the perceived quality of insurance coverage among low-income adults. This is valuable evidence, consistent with other analyses of Medicaid expansion,^{1,18,19} that the ACA has produced important benefits for consumers.

Conclusion

Research on the effects of the Medicaid expansions as well as other provisions of the ACA will be critical to understanding the potential impacts of any future congressional consideration of ACA repeal, replacement, or modification, as well as state decisions to continue or initiate Medicaid expansions. Our findings offer new evidence that the ACA continues to produce large increases in coverage and improved quality of health insurance for millions of Americans. ■

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in this article are those of the authors and do not necessarily represent the views of the Department of Health and Human Services (HHS) or the Agency for Healthcare Research and Quality

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NOTES

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- 5 To access the Appendix, click on the Appendix link in the box to the right of the article online.
- 6 Five states (California, Connecticut, Minnesota, New Jersey, and Washington) and the District of Columbia expanded Medicaid under the ACA before 2014, and we considered them to be expansion states. Estimates of the effects of the ACA's Medicaid expansion on uninsurance rates in 2014 and 2015 are provided for these five states and the District of Columbia alone, and for the states that expanded Medicaid in 2014 alone, in Appendix Exhibit B (see Note 5).
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- 8 Bertrand M, Duflo E, Mullainathan S. How much should we trust differences-in-differences estimates? *J Econ*. 2004;119(1):249–75.
- 9 For example, for the uninsurance rate outcome, the *p* value for the interaction between Medicaid expansion status and the linear quarterly trend was 0.62.
- 10 Department of Health and Human Services, Office of the Assistant Secretary for Planning and Evaluation. Data sources for Modified Adjusted Gross Income (MAGI) conversions [Internet]. Washington (DC): ASPE; 2013 Feb 4 [cited 2017 Mar 24]. (Issue Brief). Available from: <https://aspe.hhs.gov/basic-report/data-sources-modified-adjusted-gross-income-magi-conversions>
- 11 As explained in Note 6, estimates of the 2014 and 2015 effects of the ACA's Medicaid expansion on the uninsurance rate are provided for only the early expansion states and for only the states that expanded in 2014 in Appendix Exhibit B (see Note 5). Estimates in the Appendix exhibit for early expansion states alone are similar to the estimates in Exhibit 2 for all expansion states. This is consistent with evidence from the item cited below in this note that the effects of early expansion were small. Estimates in the Appendix exhibit for 2014 expansion states, excluding early expansion states, are smaller than those in Exhibit 2 for all expansion states, although the differences are small. See Sommers BD, Arntson E, Kenney GM, Epstein AM. Lessons from early Medicaid expansions under health reform: interviews with Medicaid officials. *Medicare Medicaid Res Rev*. 2013;3(4):E1–19.
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