

# Did Medicaid slow declines in access to health care during the great recession?

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## Abstract

**Objective:** We examine whether broadened access to Medicaid helped insulate households from declines in health coverage and health care access linked to the 2007-2009 Great Recession.

**Data Source:** 2004-2010 Behavioral Risk Factor Surveillance System (BRFSS).

**Study Design:** Flexible difference-in-difference regressions were used to compare the impact of county-level unemployment on health care access in states with generous Medicaid eligibility guidelines versus states with restrictive guidelines.

**Data Collection/Extraction Methods:** Nonelderly adults (aged 19-64) in the BRFSS were linked to county unemployment rates from the Bureau of Labor Statistics' Local Area Unemployment Statistics Program. We created a Medicaid generosity index by simulating the share of a nationally representative sample of adults that would be eligible for Medicaid under each state's 2007 Medicaid guidelines using data from the 2007 Current Population Survey's Annual Social and Economic Supplement.

**Principal Findings:** A percentage point (PPT) increase in the county unemployment rate was associated with a 1.3 PPT (95% CI: 0.9-1.6,  $P < .01$ ) increase in the likelihood of being uninsured and a 0.86 PPT (95% CI: 0.6-1.1,  $P < .01$ ) increase in unmet medical needs due to cost in states with restrictive Medicaid eligibility guidelines. Conversely, a one PPT increase in unemployment was associated with only a 0.64 PPT ( $P < .01$ ) increase in uninsurance among states with the most generous eligibility guidelines. Among states in the fourth quartile of generosity (ie, most generous), rises in county-level unemployment were associated with a 0.68 PPT ( $P < .10$ ) increase in unmet medical needs due to cost—a 21% smaller decrease relative to states with the most restrictive Medicaid eligibility guidelines.

**Conclusions:** Increased access to Medicaid during the Great Recession mitigated the effects of increased unemployment on the rate of unmet medical need, particularly for adults with limited income.

## KEYWORDS

determinants of health, Great Recession, health care access, Medicaid, state health policy, unemployment

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## 1 | INTRODUCTION

The 2007-2009 Great Recession increased unemployment in the United States (US),<sup>1</sup> which reduced employer-sponsored health insurance (ESHI) coverage from 63.4% of adults in 2007 to 58.6% in 2010.<sup>2</sup> Employment and health insurance coverage in the US are highly linked,<sup>3</sup> and this period was also associated with pronounced declines in access to care, reduced health care utilization, and increased health disparities due to recession-linked job loss.<sup>4-8</sup> At the peak of the Great Recession, household earnings of low-income households fell by almost a fifth<sup>9</sup>; this particular recession was marked by increased economic vulnerability, and financially insecure households relied on safety net social welfare programs to stabilize some of their household finances.<sup>10</sup>

Medicaid, which provides health insurance coverage for low-income Americans, is an integral part of the social safety net. Medicaid improves access to health care for low-income and medically needy populations.<sup>11</sup> However, we know little about how Medicaid can stabilize health care access during periods of joblessness and heightened economic insecurity. In this study, we exploit the timing of the Great Recession and cross-sectional variation of states' Medicaid eligibility guidelines to determine the extent that Medicaid coverage stabilizes health care access during times like during the Great Recession.

Employing an empirical strategy used by Benitez et al,<sup>12</sup> we determine whether Medicaid coverage attenuated the adverse effects (ie, declines in health care access and health care services utilization) of job losses linked to the Great Recession. While Medicaid is considered a countercyclical program, recent research found recession-linked Medicaid enrollment was concentrated in states with comparatively broader Medicaid eligibility guidelines.<sup>11</sup> We build on this work to determine whether Medicaid can protect health care access during the Great Recession. We hypothesize that state Medicaid programs with broader eligibility guidelines offset health insurance coverage (ie, private nongroup and employer-sponsored) losses due to job loss. We use plausibly exogenous income shocks to identify the impact of Medicaid eligibility on health care access.

## 2 | METHODS

### 2.1 | Data sources and study population

We used data from the 2004-2010 waves of the Behavioral Risk Factor Surveillance System (BRFSS).<sup>13</sup> The BRFSS is a large, nationally representative, population-based survey conducted by the Centers for Disease Control and Prevention in partnership with state and local public health agencies. Our analytical sample included more than 1.5 million nonelderly adults aged 19 to 64 years. In the 2004-2010 BRFSS, county-level identifiers were included for 83%-92% of the sample's respondents in each year. County identifiers were unavailable for Alaska, so our results are limited to all the remaining states and the District of Columbia. We linked BRFSS data

### What is Known on this Topic

- The Great Recession of 2007-2009 was associated with sharp increases in unemployment-linked health insurance coverage loss and declines in access to health care.
- Medicaid is known to improve access to care for low-income persons; however, few studies offer insights into how Medicaid may affect the economic hardships created by economic downturns.

### What This Study Adds

- Broader access to Medicaid was associated with smaller declines in health care access linked to rising unemployment.
- Households likely transitioning to Medicaid because of an unemployment-linked loss of private coverage could stabilize access to needed health care during the Great Recession.
- Results suggest that the Medicaid expansion might be helpful in absorbing the sudden negative health impacts for future economic crises.

to county-year unemployment rates obtained from the Bureau of Labor Statistics' Local Area Unemployment Statistics (LAUS).<sup>9</sup>

### 2.2 | Dependent variables

The key outcome variables came from the BRFSS's health care access module and indicated whether the respondent had: (a) health insurance coverage at the time of the interview; (b) an unmet medical needs due to cost within the past 12 months; (c) a usual source of care at the time of the interview; and (d) a routine checkup within the last year. We focused on these outcomes because they are sensitive to changes of employment status.

### 2.3 | Medicaid generosity

Our study exploited two key levels of variation: (1) heterogeneity across county-level unemployment shocks during the Great Recession and (2) baseline differences in Medicaid eligibility guidelines across states at the onset of the recession.

We drew inspiration from methodologies of previous studies that used changes in simulated Medicaid eligibility to estimate the effects of several Medicaid and Children's Health Insurance Program (CHIP) expansions.<sup>4-7,14</sup> Using each state's 2007 income and categorical eligibility guidelines, we simulated the share of a common, nationally representative sample of nonelderly adults that would be eligible for Medicaid in each state. Each state's 2007 upper-income limits and categorical eligibility guidelines (eg, if the state

has eligibility provisions for childless adults) were obtained from the Kaiser Family Foundation's Medicaid reports.<sup>8,15</sup> We used the 2007 eligibility guidelines from each state because these were the guidelines in place just prior to the downturn being declared a recession by the National Bureau of Economic Research.<sup>11</sup> This created an index that allowed us to compare states' Medicaid eligibility guidelines in a way not driven by differences in demand for health care or underlying health status across states. A state's position on this index indicated how restrictive (ie, lower values) or generous (ie, higher values) it was relative to other states. We then applied the approach used in a related study to examine the relationship between Medicaid generosity and recession-linked Medicaid enrollment.<sup>12</sup> The Medicaid generosity index leveraged the cross-sectional variation in states' Medicaid eligibility guidelines to serve as a proxy measure for access to Medicaid.

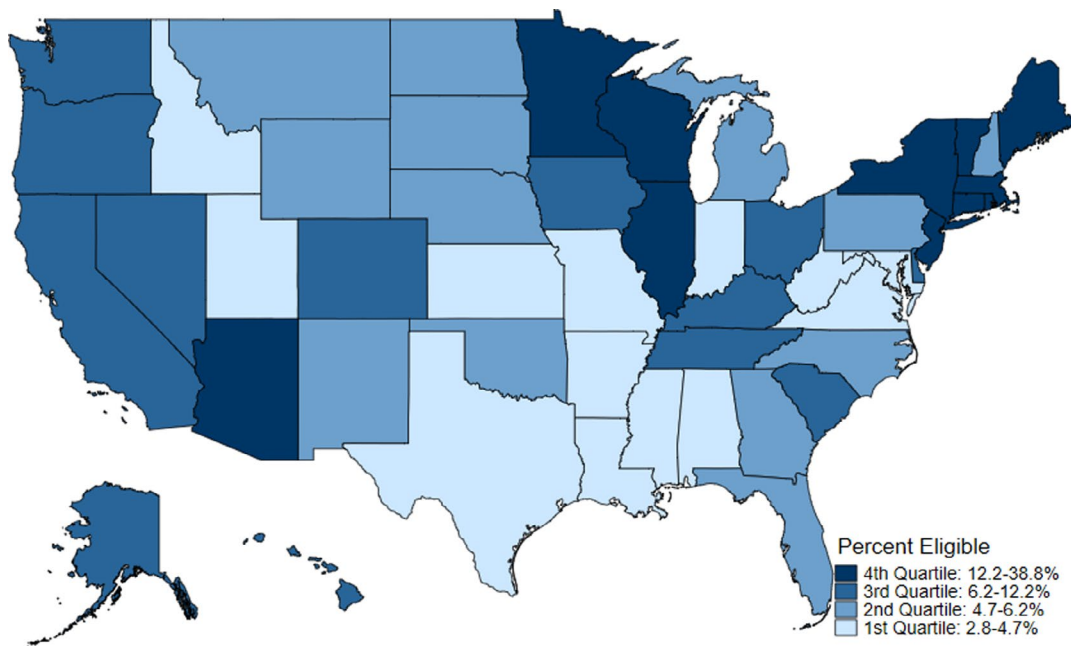
We collapsed the index values into four categories (ie, quartiles along our index) reflecting the level of generosity of their Medicaid eligibility guidelines. Please note that this generosity measure refers to generosity along eligibility guidelines (ie, the share of the simulation population with eligibility) rather than the breadth of services provided. States with the least generous Medicaid eligibility guidelines were in the 1st (2.8%-4.7% eligible) and 2nd (4.7%-6.2% eligible) quartiles. States with more generous guidelines were in the 3rd (6.2%-12.2% eligible) and 4th quartiles (12.2%-38.8% eligible). Figure 1 displays heterogeneity across state Medicaid generosity.

Table 1 provides a qualitative overview of each group (ie, quartile of Medicaid generosity) with respect to their Medicaid program

characteristics. The upper-income limits for parents were higher among states with higher levels of simulated eligibility. States in the third and fourth quartiles of generosity were more likely to have provisions for childless adults than the less generous states. Sixteen of the 24 states with comparatively more generous guidelines had Medicaid eligibility provisions for childless adults in place prior to the Great Recession. Among those states, eight had enrollment caps for childless adults and seven required premiums. Only one state in highest level of generosity required a premium for childless adults as a condition for Medicaid enrollment.

## 2.4 | Empirical approach

Our approach leveraged differences in Medicaid eligibility guidelines and changes in local economic conditions around the timing of the 2007-2009 Great Recession. We applied a flexible difference-in-difference regression approach allowing for changes in local (ie, unemployment rate at the county level) economic conditions to affect changes in our outcomes of interest differently in states with more generous or expansive Medicaid eligibility guidelines, relative to states with restrictive guidelines. Job losses linked to the Great Recession varied in intensity both across states and within states (ie, between counties within the same state),<sup>16</sup> so we leverage a strategy that accounts for this heterogeneity in exposure to the economic declines linked to the Great Recession. Equation 1 is the primary regression specification to test our hypotheses:



**FIGURE 1** United States map by States' Relative Level of Medicaid Generosity, 2007. This figure represents variation in the share from a common, nationally representative sample of nonelderly adults aged 19-64 that would have been eligible (ie, with simulated eligibility) for Medicaid under each state's eligibility guidelines in 2007. States with the most generous programs were those in the highest quartile (12.2%-38.8% eligible), while those with the most restrictive program guidelines were those in the lowest quartile (2.8%-4.7% eligible). Source: Author's own analysis of the 2007 (Calendar Year 2006) Current Population Survey's Annual Social and Economic Supplement [Color figure can be viewed at [wileyonlinelibrary.com](http://wileyonlinelibrary.com)]

TABLE 1 Medicaid program characteristics by level of generosity, 2007

	Income limit for parents (income as %FPL)	Medicaid enrollment provisions for childless adults			
		Provisions for childless adults	Income limit for employed (income as %FPL)	Enrollment caps for childless adults	Premium requirement
First quartile					
Alabama	26	No	0	No	No
Arkansas	18	Yes	200	Yes	Yes
Idaho	42	Yes	185	Yes	Yes
Indiana	26	No	0	No	No
Kansas	34	No	0	No	No
Louisiana	20	No	0	No	No
Maryland	37	Yes	116	No	No
Mississippi	32	No	0	No	No
Missouri	39	No	0	No	No
Texas	28	No	0	No	No
Utah	47	Yes	150	Yes	Yes
Virginia	31	No	0	No	No
West Virginia	35	No	0	No	No
Total	31.9	30.8%	50.1	23.1%	23.1%
Second quartile					
Florida	56	No	0	No	No
Georgia	53	No	0	No	No
Michigan	61	Yes	35	Yes	No
Montana	60	Yes	400	Yes	Yes
Nebraska	59	No	0	No	No
New Hampshire	55	No	0	No	No
New Mexico	63	Yes	200	No	Yes
North Carolina	52	No	0	No	No
North Dakota	63	No	0	No	No
Oklahoma	50	Yes	200	Yes	Yes
Pennsylvania	59	Yes	200	Yes	Yes
South Dakota	56	No	0	No	No
Wyoming	55	No	0	No	No
Total	57.1	38.5%	79.6	30.8%	30.8%
Medicaid enrollment provisions for childless adults					
	Income limit for parents (income as %FPL)	Provisions for childless adults	Income limit for employed (income as %FPL)	enrollment caps for childless adults	Premium requirement
Third quartile					
California	106	Yes	200	No	Yes
Colorado	66	No	0	No	No
Delaware	106	Yes	100	No	No
Hawaii	100	Yes	100	Yes	No
Iowa	89	Yes	200	No	Yes

(Continues)

TABLE 1 (Continued)

	Income limit for parents (income as %FPL)	Medicaid enrollment provisions for childless adults			
		Provisions for childless adults	Income limit for employed (income as %FPL)	enrollment caps for childless adults	Premium requirement
Kentucky	64	Yes	300	No	Yes
Nevada	94	No	0	No	No
Ohio	90	No	0	No	No
Oregon	100	Yes	100	Yes	Yes
South Carolina	100	No	0	No	No
Tennessee	80	Yes	\$55 000 annual income	Yes	Yes
Washington	76	Yes	200	Yes	Yes
Total	89.2	66.7	110	33.3%	50.0%
Fourth quartile					
Arizona	200	Yes	100	No	No
Connecticut	191	No	0	No	No
District of Columbia	207	Yes	50	Yes	No
Illinois	191	No	0	No	No
Maine	206	Yes	100	Yes	No
Massachusetts	133	Yes	0	Yes	No
Minnesota	275	Yes	75	No	No
New Jersey	133	Yes	100	Yes	No
New York	150	Yes	78	No	No
Rhode Island	191	No	0	No	No
Vermont	191	Yes	150	No	Yes
Wisconsin	191	No	0	No	No
Total	188.3	66.7	54.4	33.3%	8.3%

Note: Alaska did not have any data for 2007 within the Medicaid Waiver Dataset.

Source: Authors' own analysis of Medicaid eligibility guidelines obtained from the Kaiser Family Foundation and the Medicaid Waiver Dataset developed by Burns, Dague, and Kasper.<sup>21</sup>

$$Y_{icst} = \alpha + \beta \text{Unemployment}_{icst} + \sum_{j=2}^4 \gamma_j \left( \text{Generosity}_s^j \times \text{Unemployment}_{icst} \right) + \Gamma X_{icst} + \theta_a + \mu_s + \tau_t + \varepsilon_{icst} \tag{1}$$

$Y_{icst}$  is the outcome associated with individual  $i$  of county  $c$  within area  $a$  from state  $s$  at year  $t$ . Our key indicator to capture fluctuations in local economic conditions was county-level unemployment— $\text{Unemployment}_{icst}$ . The county's unemployment rate was the key source of exposure to the severity of the recession and the smallest level of geography in these years of the BRFSS data. Using county-level economic shocks provided more precise estimates of the effects of the fluctuating economic conditions when compared with using state-level measures.<sup>17</sup>

$\beta$  was how much the outcome changes in response to a one percentage point increase in the county's unemployment rate in the lowest (ie, least generous) quartile.  $\gamma_j$  is our policy parameter associated with  $\text{Generosity}_s^j \times \text{Unemployment}_{icst}$ . This interaction between the state's relative level of Medicaid generosity and local unemployment indicated how much the states in the higher

quartiles (ie, quartile  $j = 2, 3, 4$ ) deviated from the pattern observed among states with the most restrictive guidelines (ie, quartile  $j = 1$ ). We hypothesized that states with comparatively more generous programs should have an incrementally larger protective effect compared to states with less generous programs, thus suggesting a dose-response relationship. For example, we expect that a rise in unemployment would be correlated with increases in reporting as uninsured or having an unmet medical need due to cost—in which case the sign on  $\beta$  will likely be positive (ie,  $\beta \geq 0$ ). More generous eligibility guidelines for Medicaid enhance access to the program. Such added accessibility leads to increased enrollment among persons affected by income losses, not limited to job loss. If enhanced access to Medicaid—created by more generous eligibility guidelines—was protective, the sign on  $\gamma$  would be negative (ie,  $\gamma_j < 0$ ). Such a finding would suggest declines in health

**TABLE 2** Baseline means of outcomes and demographic characteristics by Generosity of Medicaid Eligibility Guidelines

	Full sample	Less generous			More generous		
		All	1st Quartile (least generous)	2nd Quartile	All	3rd Quartile	4th Quartile (most generous)
Age	40.7	40.8	40.5	41.1	40.7	40.4	41.0
Sex							
Male	50.4	50.2	50.2	50.3	50.6	50.9	50.1
Female	49.6	49.8	49.8	49.7	49.4	49.1	49.9
Married	62.1	64.0	65.0	63.0	60.6	60.7	60.6
Race/Ethnicity							
White, Non-Hispanic	66.5	69.1	67.8	70.3	64.3	60.6	68.7
Black, Non-Hispanic	10.4	13.2	13.6	12.8	8.1	6.7	9.8
Other, Non-Hispanic	7.7	6.2	5.9	6.4	8.9	9.8	7.9
Hispanic (any race)	15.4	11.5	12.7	10.5	18.6	22.8	13.6
Parental status							
1+ Child in Household	50.9	50.8	52.2	49.5	51.0	51.9	49.9
Childless adult	49.1	49.2	47.8	50.5	49.0	48.1	50.1
Education							
<High School Completion	9.5	8.4	9.2	7.7	10.3	13.0	7.3
High School Diploma/GED	25.7	27.2	26.4	28.0	24.4	24.8	23.9
Some College/Technical School	27.6	28.1	27.6	28.6	27.3	27.5	26.9
BA/BS+	37.2	36.3	36.8	35.7	38.0	34.7	41.9
Income							
HH Income <\$20 000	15.3	14.6	15.1	14.1	16.0	18.6	12.9
HH Income \$20 000-49 999	34.2	36.2	35.1	37.2	32.4	33.2	31.5
HH Income \$50 000+	50.5	49.2	49.8	48.7	51.6	48.2	55.5
Unemployed	5.6	5.3	5.2	5.3	5.9	5.8	6.0
Rurality							
Rural County	11.6	15.6	14.4	16.7	8.3	8.9	7.6
Urban County	88.4	84.4	85.6	83.3	91.7	91.1	92.4
Geographic Region							
Northeast	19.8	10.7	0.0	20.3	27.3	0.0	59.6
Midwest	20.4	19.6	20.9	18.4	21.1	12.8	30.9
South	34.0	64.0	72.6	56.2	9.0	15.9	1.0
West	25.8	5.8	6.5	5.1	42.5	71.3	8.6
N	809 580	412 803	171 198	241 605	396 777	210 915	185 862

Note: States' relative level of Medicaid generosity was based on the fraction of a nationally representative sample from the 2007 (calendar year 2006) Current Population Survey's Annual Social and Economic Supplement with simulated Medicaid eligibility. States in the "More Generous" category had simulated eligibility shares equal to or above 6.2%. States in the "Less Generous" category had simulated eligibility shares below 6.2%. All statistics presented above are weighted to reflect the complex sampling strategy of the Behavioral Risk Factor Surveillance System.

Source: Authors' own analysis of the 2004-2007 Behavioral Risk Factor Surveillance System.

coverage and access to health care associated with worsening economic conditions may be attenuated in states with generous Medicaid guidelines.

$X_{i,t}$  were the person-level controls consisting of age, race/ethnicity, gender, and number of children within the household. Our regressions included state-level fixed effects ( $\sigma_j$ ) to account for time-invariant characteristics of states. Year fixed effects ( $\tau_t$ ) control for changes in the outcomes' levels correlated with time. We did not

include separate dummy variables for each state's level of generosity (ie, Generosity<sub>*s*</sub> = 2nd, 3rd, or 4th quartile) as they would be collinear with the state fixed effects— $\mu_s$ . In addition to state effects, we included dummy variables to indicate the counties' metropolitan statistical area (MSA)— $\theta_a$ . Counties within the same MSA may respond similarly to common shocks, such as rising unemployment. Counties occupying the same MSA but on different sides of a state border would be exposed to different comparative access to Medicaid.<sup>12</sup>

Because we are using county-level economic indicators, we allowed for residents within an MSA to have differing levels of downturn during the Great Recession.

Our approach deviates from the more standard difference-in-differences-based approach. In the standard approach, we would compare changes in the levels of the outcomes between states with generous Medicaid eligibility guidelines against states with restrictive guidelines at two time points—before and after the Great Recession. However, there was no clear pre- or postrecession period as some may have entered into their own downturns prior to December 2007, and some states and locales were still experiencing downturns well past summer 2009.<sup>13,18-20</sup> By interacting local unemployment with the generosity of the states' eligibility guidelines, we allow changes in the outcome to be responsive to changes in employment shocks (eg, mass layoffs, firm exits, or firm closures) at the county level over the entire study period. This approach is our way to determine whether differential access to Medicaid is associated with differential reductions in access to health care as local economic conditions change.

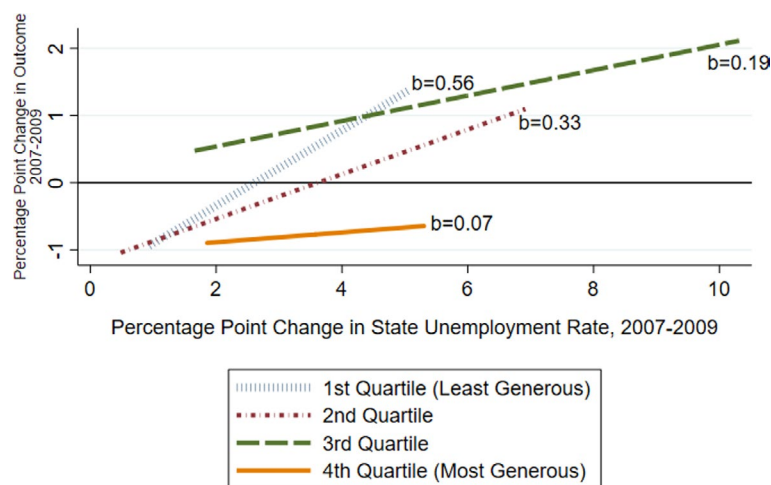
## 2.5 | Sensitivity analyses

In addition to using our full analytical sample, we performed separate regressions for parents and childless adults. At the time, few states had provisions extending Medicaid eligibility to childless adults, so including them in our analyses could attenuate our results. However, using the Medicaid Waiver database developed by Burns et al, we accounted for the timing of state policy changes that could alter Medicaid access for childless adults.<sup>21</sup> These Medicaid policy changes vary across states and by year. To control for their implementation, we include dummy variables to indicate that a state has

incorporated a change to Medicaid regarding eligibility for childless adults. Prior research suggests a small uptake in recession-linked Medicaid enrollment among childless adults was concentrated within states with more generous Medicaid guidelines affecting eligibility.<sup>12</sup> For example, if states adopted such provisions as those indicated in Table 1, then the variable is “switched on” (ie, equals one) for the years when the law is in effect. However, the variable is “switched off” (ie, equals zero) for all years if states never adopt provisions or until states adopt Medicaid eligibility guidelines for childless adults.

Rising unemployment could understate the impact of the Great Recession if it does not account for changes in levels (ie, full-time versus part-time) of workforce participation.<sup>22</sup> As a sensitivity check, we use changes in the annual county poverty rate and median income as economic indicators in place of the local unemployment rate. The Great Recession had stark increases in unemployment, but wage losses were also due to reductions in work intensity. Shifts from full-time (eg,  $\geq 35$  hours workweeks) to part-time would create declines in household income that would not be reflected in the unemployment rate. In regressions using poverty as the key economic indicator, the coefficients should take on the same direction as regression coefficients using unemployment in the economic indicator. Rises in poverty will be correlated with declines in health care access, and declines in median income will correspond to declines in access as well.

As another specification check, we revisited our framework described in Equation (1), and we included Medicaid generosity interacted with the county's current unemployment rate in addition to the previous three previous years. While health insurance coverage and employment status could change simultaneously, declines in access stemming from the job loss may not occur immediately after the job loss. Additionally, households may not immediately enroll in Medicaid after becoming unemployed and uninsured.



**FIGURE 2** Absolute changes in health insurance coverage status by generosity of State's Medicaid Eligibility Guidelines, 2007-2009. States' relative level of Medicaid generosity was based on the fraction of a nationally representative sample from the 2007 (calendar year 2006) Current Population Survey's Annual Social and Economic Supplement with simulated Medicaid eligibility. The first quartile is the least generous group of states, while states in the fourth quartile have the most generous eligibility guidelines for Medicaid. The unadjusted fitted trend lines reflect changes in coverage status at the state level and are survey-weighted to account for the complex sampling strategy of the BRFSS. Source: Authors' own analysis of the 2007-2009 Behavioral Risk Factor Surveillance System [Color figure can be viewed at [wileyonlinelibrary.com](http://wileyonlinelibrary.com)]

**TABLE 3** Effect of county economic conditions on access to care moderated by Generosity of States' Medicaid Eligibility Guidelines, 2004-2010

	Uninsured			Unmet medical need due to cost		
	Full sample	Parents only	Childless adults	Full sample	Parents only	Childless adults
Panel A. County unemployment rate						
County unemployment rate	1.25*** [0.91, 1.58]	1.28*** [0.80, 1.76]	1.18*** [0.90, 1.45]	0.86*** [0.61, 1.11]	0.85*** [0.53, 1.16]	0.84*** [0.62, 1.06]
Unemployment × 2nd Quartile	-0.40* [-0.81, 0.0100]	-0.46 [-1.09, 0.17]	-0.32** [-0.63, -0.0097]	-0.055 [-0.27, 0.16]	-0.023 [-0.34, 0.29]	-0.077 [-0.29, 0.14]
Unemployment × 3rd Quartile	-0.40*** [-0.67, -0.13]	-0.53** [-0.95, -0.10]	-0.24 [-0.54, 0.071]	-0.076 [-0.29, 0.13]	-0.044 [-0.35, 0.26]	-0.10 [-0.33, 0.12]
Unemployment × 4th Quartile (most generous)	-0.61*** [-0.89, -0.32]	-0.66*** [-1.12, -0.21]	-0.51*** [-0.82, -0.19]	-0.18* [-0.40, 0.036]	-0.22 [-0.55, 0.11]	-0.12 [-0.36, 0.11]
Panel B. County poverty rate						
County poverty rate	0.43*** [0.35, 0.50]	0.50*** [0.39, 0.61]	0.33*** [0.25, 0.41]	0.31*** [0.21, 0.41]	0.38*** [0.23, 0.54]	0.23*** [0.18, 0.28]
Poverty × 2nd Quartile	-0.17*** [-0.30, -0.051]	-0.22** [-0.40, -0.042]	-0.12* [-0.24, 0.0037]	-0.10* [-0.21, 0.011]	-0.18* [-0.36, 0.00086]	-0.023 [-0.12, 0.078]
Poverty × 3rd Quartile	-0.044 [-0.18, 0.094]	-0.062 [-0.24, 0.11]	-0.030 [-0.22, 0.16]	0.018 [-0.12, 0.15]	-0.032 [-0.22, 0.16]	0.066 [-0.081, 0.21]
Poverty × 4th Quartile (most generous)	-0.36*** [-0.60, -0.11]	-0.48*** [-0.83, -0.13]	-0.22** [-0.38, -0.052]	-0.21** [-0.37, -0.042]	-0.33*** [-0.55, -0.10]	-0.082 [-0.21, 0.042]
Panel C. Median household income (\$1000s)						
County median income	-0.23*** [-0.28, -0.17]	-0.26*** [-0.33, -0.19]	-0.18*** [-0.21, -0.15]	-0.18*** [-0.24, -0.12]	-0.22*** [-0.30, -0.14]	-0.13*** [-0.17, -0.096]
Income × 2nd Quartile	0.018 [-0.10, 0.14]	0.038 [-0.10, 0.18]	-0.00097 [-0.12, 0.12]	0.0032 [-0.076, 0.082]	0.038 [-0.064, 0.14]	-0.034 [-0.12, 0.050]
Income × 3rd Quartile	0.039 [-0.031, 0.11]	0.069* [-0.012, 0.15]	0.019 [-0.053, 0.091]	0.057 [-0.049, 0.16]	0.079 [-0.040, 0.20]	0.040 [-0.070, 0.15]
Income × 4th Quartile (most generous)	0.13*** [0.052, 0.22]	0.18*** [0.066, 0.30]	0.085*** [0.033, 0.14]	0.089** [0.016, 0.16]	0.15*** [0.050, 0.24]	0.031 [-0.028, 0.090]
Mean of outcome	17.1	17.8	16.5	15.7	16.8	14.6
Observations	1 508 401	643 278	865 123	1 508 401	643 278	865 123
	Usual source of care			Regular checkup		
	Full sample	Parents only	Childless adults	Full sample	Parents only	Childless adults
Panel A. County unemployment rate						
County unemployment rate	-0.48*** [-0.71, -0.26]	-0.50*** [-0.78, -0.22]	-0.45*** [-0.69, -0.20]	-0.31 [-0.83, 0.21]	-0.20 [-0.89, 0.48]	-0.46** [-0.90, -0.013]
Unemployment × 2nd Quartile	0.14 [-0.15, 0.42]	0.077 [-0.27, 0.43]	0.19 [-0.077, 0.45]	0.053 [-0.68, 0.79]	-0.12 [-1.06, 0.83]	0.24 [-0.34, 0.82]
Unemployment × 3rd Quartile	0.19 [-0.043, 0.41]	0.15 [-0.11, 0.42]	0.21* [-0.038, 0.45]	0.14 [-0.61, 0.89]	0.12 [-0.84, 1.07]	0.17 [-0.42, 0.77]
Unemployment × 4th Quartile (most generous)	0.24** [0.014, 0.46]	0.16 [-0.091, 0.40]	0.30** [0.057, 0.55]	0.28 [-0.44, 1.00]	0.097 [-0.80, 1.00]	0.48 [-0.16, 1.12]
Panel B. County poverty rate						

(Continues)



TABLE 1 (Continued)

	Usual source of care			Regular checkup		
	Full sample	Parents only	Childless adults	Full sample	Parents only	Childless adults
County Poverty Rate	-0.30*** [-0.42, -0.18]	-0.32*** [-0.43, -0.21]	-0.27*** [-0.41, -0.12]	-0.097 [-0.29, 0.099]	-0.11 [-0.40, 0.19]	-0.097* [-0.20, 0.0051]
Poverty × 2nd Quartile	0.17** [0.023, 0.32]	0.11 [-0.038, 0.26]	0.23*** [0.061, 0.40]	0.15 [-0.21, 0.52]	0.20 [-0.33, 0.72]	0.12 [-0.092, 0.33]
Poverty × 3rd Quartile	0.12 [-0.055, 0.30]	0.21** [0.027, 0.39]	0.052 [-0.15, 0.25]	-0.039 [-0.31, 0.24]	-0.046 [-0.40, 0.30]	-0.032 [-0.32, 0.25]
Poverty × 4th Quartile (most generous)	0.15** [0.030, 0.27]	0.16** [0.037, 0.27]	0.15* [-0.026, 0.33]	0.20* [-0.039, 0.43]	0.18 [-0.20, 0.55]	0.22** [0.050, 0.40]
Panel C. Median household income (\$1000s)						
County Median Income	0.13*** [0.038, 0.21]	0.13*** [0.055, 0.21]	0.12** [0.019, 0.22]	0.082** [0.014, 0.15]	0.11** [0.010, 0.20]	0.060*** [0.016, 0.10]
Income × 2nd Quartile	-0.043 [-0.15, 0.061]	-0.040 [-0.14, 0.059]	-0.048 [-0.16, 0.064]	-0.090 [-0.25, 0.068]	-0.13 [-0.33, 0.071]	-0.051 [-0.17, 0.072]
Income × 3rd Quartile	-0.032 [-0.12, 0.061]	-0.071 [-0.16, 0.017]	0.00064 [-0.10, 0.10]	0.035 [-0.054, 0.12]	-0.028 [-0.15, 0.092]	0.11* [-0.00049, 0.22]
Income × 4th Quartile (most generous)	-0.051 [-0.14, 0.040]	-0.054 [-0.14, 0.030]	-0.051 [-0.16, 0.058]	-0.12*** [-0.20, -0.032]	-0.16** [-0.28, -0.030]	-0.084** [-0.15, -0.013]
Mean of outcome	78.4	77.1	79.8	64.2	61.6	67.0
Observations	1 505 905	642 242	863 663	936 265	389 327	546 938

Note: \*P < .10, \*\*P < .05, \*\*\*P < .01. All regressions are weighted to reflect the survey's complex sampling strategy, and standard errors robust to clustering at the state level were used to construct the 95% confidence intervals. In each regression, we control for age group (19-24 [reference category], 25-29, 30-34, 35-39, 40-44, 45-49, 50-54, 55-59, 60-64); race/ethnicity (Non-Hispanic White [reference category], Non-Hispanic Black, Non-Hispanic Other, Hispanic [any race]); gender; residence in a rural county; and the number of own children in the household (ie, 0 [reference group], 1, 2, 3, or more). We include area (ie, Metropolitan Statistical Area) as well as state-level fixed effects. We also include year fixed effects and the share of the state's workforce belonging to a union. To control for other factors that may affect Medicaid enrollment and coverage status, we include time-varying state-specific variables with respect to Medicaid eligibility guidelines. We include: the upper-income limit for Medicaid eligibility, if the state has a provision allowing for the enrollment of childless adults, if the state implemented or had in place an enrollment cap or froze new enrollments for childless adults, and if childless adults were required to pay a monthly premium as a condition for Medicaid eligibility. We also include state-year-specific controls for if and when a state expanded Medicaid eligibility through a Health Insurance Flexibility and Accountability (HIFA) demonstration. The quartile of generosity was determined based on the share of adults from the common sample that would have had simulated Medicaid eligibility based on each state's 2007 eligibility guidelines.

Source: Authors' own analysis of the 2004-2010 Behavioral Risk Factor Surveillance System.

All analyses were implemented using Stata version 15.1. All estimates were weighted to reflect the complex sampling strategy of the BRFSS, and we used standard errors robust to clustering at the state level to construct our 95% confidence intervals.<sup>23,24</sup> Each regression was fit using a linear probability model so that the coefficients were interpretable as policy parameters. For example, changes in levels of the outcome will be associated with a one percentage point (PPT) change in the level of unemployment or poverty. In regressions where median income was the economic indicator used, the change in the outcome corresponds to a \$1000 increase in the county's median household income. For consistency, county median incomes were converted to 2010 dollars using the Consumer Price Index's Inflation Calculator.<sup>25</sup>

### 3 | RESULTS

#### 3.1 | Descriptive analyses

Table 2 provides an overview of the states based on their levels of generosity. The states with less generous eligibility guidelines have a larger share of Black residents and are predominantly in southern region of the US.

Figure 2 presents the heterogeneity in the association between rising unemployment and net coverage loss between states based on our categorization (ie, quartiles) of Medicaid generosity. The fitted regression lines reflect the slopes from a bivariate regression of the change in coverage status between 2007 and 2009 at the state

level regressed on changes in unemployment over the same period. Flatter slopes suggest more protection from coverage disruption due to elevated access to Medicaid. While quartiles 3 and 4 have different starting points (ie, intercepts for baseline coverage), their slopes are flatter relative to the lower quartiles.

To supplement our key graphical analysis, Appendix S1: Figure A1 presents trends in our outcomes of interest—solely as a function of time—by levels of Medicaid generosity. Consistent with a cross-sectional comparison of high and low generosity states, residents in states with generous Medicaid programs had lower levels of uninsurance and residents foregoing or delaying medical care because of costs. This gap existed throughout the study period, and we observed small changes in our key outcomes coinciding with the onset and end of the recession. In Appendix S1: Figure A2, we show the net change in the fraction of people without health insurance was smaller in states with more generous program eligibility between 2007 and 2009.

### 3.2 | Regression results

Table 3 presents the marginal effects of changes in local unemployment, poverty, and median income at the county level on health care access. Changes in local unemployment rates are associated with changes in insurance and household consumption of medical care. Panel A's results present the link between rising unemployment and changes in the outcomes. A one PPT increase in county-level unemployment increased rates of uninsurance (1.25 PPT,  $P < .01$ ) and cost-related unmet medical needs (0.86 PPT,  $P < .01$ ); the change reduced access in terms of a regular source of care ( $-0.48$  PPT,  $P < .01$ ), but had little impact on obtaining a checkup ( $-0.31$  PPT,  $P > .10$ ). Focusing on changes in coverage status, a ratio greater than 1:1 between local unemployment rates and the uninsured rate plausibly reflected that changes in job status affect the coverage status of dependents in addition to displaced workers.

Our findings suggest a monotonic relationship regarding state Medicaid guidelines and their impact on coverage stability in the presence of economic downturn. Being in a state with more generous Medicaid guidelines was associated with a one-third (3rd quartile,  $-0.40$  PPT,  $P < .01$ ) to one-half (4th quartile,  $-0.61$  PPT,  $P < .01$ ) reduction in the strength of the association between rising unemployment and being without coverage. The marginal effect of a change in unemployment on unmet medical need was reduced by one-fifth, though this association was marginally statistically significant at the  $P < .10$  level. More generous guidelines among the 4th quartile (most generous) reduced the marginal effect of unemployment by half (0.24 PPT,  $P < .05$ ), and this effect was concentrated among childless adults.

In panels B and C of Table 3, we observe similar patterns between worsening economic climate and our outcomes. Rising poverty is associated with increased uninsurance. The incline is not as steep in states in the 2nd and 4th quartiles of generosity, relative to the least generous quartile of states. Among states in the least

generous quartile of states, a PPT increase in poverty was associated with a 0.43 PPT ( $P < .01$ ) in reporting as uninsured, a 0.31 PPT ( $P < .01$ ) increase in experiencing an unmet medical need due to cost, and a 0.30 PPT ( $P < .01$ ) reduction in having a usual care source. Conversely, among states in the most generous quartile, a PPT increase in poverty was associated with a 0.07 PPT ( $0.43 - 0.36 = 0.07$  PPT,  $P < .01$ ) and a 0.10 PPT ( $0.31 - 0.21 = 0.10$ ,  $P < .05$ ) increase in unmet medical needs due to cost.

### 3.3 | Sensitivity analyses

In Appendix S1: Tables A1 and A2, we present event-study analyses of the interaction between the year and the level of generosity of the state. This analysis allows us to assess the parallel trends assumption normally required for valid inference with more traditional difference-in-difference analyses; in our application, we do not find evidence of substantial differences in unemployment or uninsurance trends prior to 2007.

As an additional specification check, we used "own" unemployment status as the dependent variable for the regression specifications used to derive our main results (see Appendix S1: Table A3). This analysis demonstrated that people were generally not more likely to become voluntarily employed if they knew they would more readily qualify for Medicaid coverage. This finding is consistent with more recent analyses of the impact of the Affordable Care Act's (ACA) Medicaid expansions on labor force attachment.<sup>26</sup>

The effects of Medicaid in multiple subpopulations during this economic downturn were comparable to those observed in the aggregate analysis. Appendix S1: Tables A4-A8 provide subgroup analyses by race, gender, age group, education, and rural/urban residence. Comparatively larger coverage losses occurred among Blacks and Hispanics relative to Whites, males, those with limited education (ie, up to a high school diploma and some college/technical school), young adults under age 27, and residents of more urban settings. We view these additional results with some caution as some of the smaller sample sizes limited our statistical power, and the findings are mixed across groups. There is little consistent evidence across population substrata of a dose-response relationship between Medicaid eligibility generosity and its ability to attenuate the adverse health care access effects of job loss. The protective effects appear most pronounced among women, younger adults aged 27-44, and residents of urban areas.

Appendix S1: Table A9 features regressions with county-level fixed effects among counties observed in each year of the study period. The restricted sample included just over 1.3 million people. While the magnitude of the main effect of unemployment is changed for each of the outcomes, the findings are qualitatively similar to our key findings from Table 3. Our preferred model specification utilized state and MSA effects, even though our economic indicators (ie, unemployment, poverty, median income) are at the county level. Including county fixed effects would have allowed us to control for the influence of unique, yet time-invariant, county attributes on

access to care. The BRFSS does not sample every county each year in all states, and some counties may have relatively small samples in the years they are included. Of the 3142 US counties, 2381 were within our sample. Only 972 counties are in all seven years of the analytical file, from 2004 to 2010. We did not find evidence from this specification that would change our main conclusions.

In Appendix S1: Table A10, we include additional an analysis that interacted Medicaid generosity with lagged unemployment. We performed these sensitivity tests to determine whether the residual effects of unemployment from past years were correlated with current employment status, coverage status, and access to health care. We found changes in coverage and access were most closely linked to changes in current employment rates after including three years of lagged unemployment.

## 4 | DISCUSSION

Our study explored Medicaid's potential to act as a viable safety net program for households becoming uninsured due to job loss. Previous work suggests relatively generous Medicaid eligibility guidelines facilitated Medicaid's use in offsetting private coverage loss due to unemployment during the Great Recession.<sup>11</sup> Consistent with existing research, we found rises in recession-linked unemployment were associated with declines in access to care; we also found evidence that Medicaid mitigated some of these declines in access. Our work demonstrates Medicaid's role as a safety net program during the Great Recession.

Households affected by sudden job loss bear the burden of financing medical needs out of pocket. For households with limited financial reserves, delaying or forgoing needed medical care could worsen future health outcomes. For households with urgent medical needs, the financial shock of a job loss could be compounded by the financial strain of medical debt. State policies increased access by providing non-employer-sponsored health coverage for vulnerable households. The stability in coverage created by this access was subsequently associated with protections from delaying needed medical care due to cost.

Although our study has several strengths, there are also several weaknesses. Health insurance coverage is coarsely measured within the BRFSS (ie, health insurance coverage of "any kind" at the time of the interview). As a point-in-time survey, our estimates using the BRFSS reflect net changes in coverage status and access over the study period. Although we do not observe individual Medicaid enrollment status, our findings demonstrated Medicaid's protection against health care access risks were stronger in states with increasingly more generous eligibility guidelines.

The share of adults enrolled in Medicaid increased by about 17% (from 7% at baseline) between 2007 and 2009; the percentage of adults on Medicaid increased by 33% among states with generous eligibility guidelines.<sup>12</sup> We extended this work by determining whether greater access to Medicaid coverage mitigated expected adverse effects of the recession on access to care. Generosity in

a state's Medicaid eligibility guidelines promotes accessibility of the program to people losing coverage due to a job loss. Because Medicaid expansions implemented under the ACA allow broader access and are more comprehensive than pre-ACA Medicaid expansions,<sup>27-29</sup> access stability could be even greater for incidentally low-income households.

The reductions in net coverage loss appeared proportional to the generosity of the guidelines. However, we do not have strong evidence of protection from financial barriers of seeking care. One reason for this is that private plans reimburse more generously than Medicaid, and the BRFSS does not allow us to examine transitions between private coverage to Medicaid and the subsequent changes in access to care. This area of inquiry would benefit from future longitudinal studies. While states' eligibility guidelines determine household access to Medicaid as a safety net plan, important factors such as plan alignment or changes in Medicaid participation among the local health care workforce could affect Medicaid's ability to act as a safety net. Households transitioning from private coverage to Medicaid may incur costly out-of-pocket expenses to maintain access to preferred providers if those providers do not accept Medicaid. The Great Recession's impact on provider participation in Medicaid is unclear, but lower reimbursement rates relative to private coverage and Medicare have generally been associated with low participation rates among office-based physicians.<sup>30-32</sup> However, new Medicaid enrollees with established connections to a physician or other office-based health care professional may experience more continued access than do people without such connections.<sup>33</sup>

We cannot infer the financial value (eg, protection from burden of out-of-pocket health expenses) that added access to Medicaid coverage created for families affected by income losses. However, it is plausible the value is larger for households with costly medical needs.

## 5 | CONCLUSIONS

Increased access to Medicaid during the Great Recession mitigated some effects of unemployment on the rate of unmet medical need, particularly for adults affected by job loss. This study builds on existing studies of how state Medicaid policies may moderate the dynamics between job loss and coverage status.<sup>12,26,34</sup> States whose Medicaid programs were more readily able to absorb (ie, due to more expansive eligibility criteria) individuals and families affected by economic downturns or mass layoffs from a large firm closure showed lower rates of unmet medical need due to financial constraints. Our results suggest more research is warranted to understand Medicaid's potential role as an insurer for households temporarily affected by job loss. Households in states that expanded may be better able to retain regular access to care during an economic downturn than would households in nonexpansion states.

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#### SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section.

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