By Paul R. Shafer, David M. Anderson, Rebecca Whitaker, Charlene A. Wong, and Brad Wright

Association Of Unemployment With Medicaid Enrollment By Social Vulnerability In North Carolina During COVID-19

ABSTRACT The COVID-19 pandemic precipitated an unemployment crisis in the US that surpassed the Great Recession of 2007–09 within the first three months of the pandemic. This article builds on the limited early evidence of the relationship between the pandemic and health insurance coverage, using county-level unemployment and Medicaid enrollment data from North Carolina, a large state that did not expand Medicaid. We used linear and county fixed effects models to assess this relationship, accounting for county-level social vulnerability, physical and virtual access to Medicaid enrollment, and COVID-19 case burden. Using data from January 2018 through August 2020, we estimated that the passthrough rate—the share of unemployed people who gained Medicaid coverage—was approximately 15 percent statewide but higher in more socially vulnerable counties. This low passthrough rate during a period of increased unemployment resulting from the COVID-19 pandemic means that Medicaid was unable to completely fulfill its countercyclical role, in which it grows to meet greater need during periods of widespread economic hardship, because of North Carolina's stringent Medicaid eligibility criteria. Working toward greater adoption of Medicaid expansion may help ensure that the US is better prepared for the next crisis by ensuring access to health insurance coverage.

Paul R. Shafer (pshafer@bu
.edu) is an assistant professor
in the Department of Health
Law, Policy, and Management
at the Boston University
School of Public Health, in
Boston, Massachusetts.

David M. Anderson is a
research associate at the
Duke-Margolis Center for
Health Policy, Duke University,
in Durham, North Carolina.

Rebecca Whitaker is a
managing associate at the
Duke-Margolis Center for
Health Policy, Duke University.

Charlene A. Wong is an
associate professor of
pediatrics and public policy at
Duke University, the Children's
Health and Discovery
Initiative, and the Duke-
Margolis Center for Health
Policy.

Brad Wright is an associate
professor in the Department
of Family Medicine and
codirector of the Health Care
Economics and Finance
Program, Cecil G. Sheps
Center for Health Services
Research, University of North
Carolina at Chapel Hill, in
Chapel Hill, North Carolina.

The COVID-19 pandemic began in early 2020 and had claimed more than 500,000 lives in the United States by February 2021.[1] Public health measures to limit the spread of the virus resulted in large segments of the economy shutting down. The resulting unemployment crisis surpassed that of the Great Recession of 2007–09 by just the third month of the pandemic.[2–6] This unemployment crisis led to "intersecting US epidemics" of COVID-19 and the loss of employer-sponsored health insurance coverage, which covers most Americans younger than age sixty-five.[7–9] People who find themselves unexpectedly unemployed and uninsured may look to Medicaid as an option. Because Medicaid is the source of health insurance for tens of millions of low-income Americans,[10] understanding how the pandemic-induced economic crisis affected Medicaid coverage is critical.

Early projections estimated that up to forty-three million people would lose their employer coverage during the pandemic, with twenty-three million people potentially gaining Medicaid eligibility and up to twelve million people becoming uninsured.[11–14] However, coverage losses were lower than projected, particularly for employer coverage, and Medicaid expansion following passage of the Affordable Care Act (ACA) has been important for maintaining coverage by limiting how many people transition from employer-sponsored health insurance to

being uninsured.[15–18] For example, the change in probability of being uninsured between March–April and May 2020 among adults in families with a job loss was more than four times higher in states that did not expand Medicaid (+3.8 percentage points) than in states that did (+0.7 percentage points).[19]

COVID-19 has disproportionately affected historically marginalized populations who already face higher barriers to health care access. Racism and social disadvantage are contributing to amplifying prepandemic disparities in social drivers of health.[20–27] The social safety net, including Medicaid, is intended to adapt to meet current needs by serving a countercyclical role, in which it grows to meet greater need during periods of widespread economic hardship.[28,29] However, political and budgetary pressures can leave programs underfunded or inaccessible to many, often in systematically racist ways,[30–34] despite evidence that Medicaid coverage reduces mortality and narrows health disparities.[35,36] Physical access to social service agencies has been historically correlated with population density and has been slow to adjust to population shifts associated with gentrification, although informal networks and information sharing about the social safety net are stronger in marginalized communities.[37–42] Limited English proficiency, low health insurance literacy, and the digital divide may also compound disparities in coverage and access to care during public health and economic crises;[43,44] this manifested during the COVID-19 pandemic as enrollment assistance was forced to move online and the use of telehealth expanded.[45]

Passthrough rates, which capture the share of unemployed people who gain Medicaid eligibility or coverage, are often used after crises to study how the state policy environment affected Medicaid. A lower passthrough rate would mean that unemployed workers are generally not eligible for or enrolling in Medicaid, whereas a higher passthrough rate means that more of them can get covered. Unemployment more than doubled during the 2007–09 Great Recession, providing insights into the relationship between unemployment and health insurance coverage.[33,46–49]

One recent study used data from the Current Population Survey to estimate passthrough rates of newly unemployed workers into Medicaid coverage based on state Medicaid program generosity, using a median split of simulated eligibility as a share of nonelderly and nondisabled adults in each state.[33] That study estimated an 11 percent passthrough rate in states with restrictive Medicaid programs versus a 57 percent rate in more generous states. These differences were borne out by a 15 percent greater increase in Medicaid enrollment in more generous states from before the Great Recession to its peak compared with enrollment in more restrictive states.[33] Another study, using 2004–10 data from the Survey of Income and Program Participation, focused instead on the dose response of coverage to unemployment. The researchers found a dose-response relationship between the state unemployment rate and the probability of having health insurance coverage of any kind, but only for adult men (a 1.7-percentage-point reduction in probability of any coverage per 1-percentage-point increase in the state unemployment rate).[48] Since then, Children's Health Insurance Program eligibility has expanded and the ACA has been passed, with both commercial health insurance market reforms and Medicaid expansion now extending eligibility in most states up to 138 percent of the federal poverty level for working-age adults.[50–52]

Thus far, the limited national evidence available from the COVID-19 pandemic has not established a clear relationship between rising unemployment and Medicaid enrollment at the state level.[53] This may be partially due to maintenance-of-effort requirements in the Families First Coronavirus Recovery Act (FFCRA) of 2020 and the Coronavirus Aid, Relief, and Economic Security (CARES) Act of 2020 that prevented the usual disenrollment patterns from happening.[54,55] State-level aggregation also ignores social context and the more granular geographies that strongly influence Medicaid enrollment (for example, differences in county Medicaid agencies' capacity and service quality). Unemployment and changes in Medicaid enrollment are also unequally distributed across a state, creating a potential attribution bias that obscures the relationship.[56]

North Carolina is the ninth most populous state (as of 2019) and the third most populous Medicaid nonexpansion state.[52,57,58] North Carolina has very restrictive Medicaid eligibility requirements for nondisabled adults with low income limits (41 percent of the federal poverty level) for parents and guardians and no eligibility for childless adults.[59] Thus, studying North Carolina can increase understanding of how Medicaid enrollment responded to the pandemic-induced economic crisis in a nonexpansion state in which the uninsurance rate rose to approximately 20 percent in May 2020.[60] A prior study established a positive association between county-level unemployment and Medicaid enrollment in the state during the pandemic[61] but did not measure the relationship or account for potential confounders. We built on this study using county-level data on unemployment,

Medicaid enrollment, and social vulnerability from North Carolina to estimate the relationship between unemployment and Medicaid enrollment and to explore the extent to which social context influences this relationship.

Study Data And Methods

DATA Our study used two primary data sources to capture monthly county-level unemployment and Medicaid enrollment in North Carolina, as well as several auxiliary data sources that provided important context. We obtained monthly county-level unemployment from the North Carolina Department of Commerce Local Area Unemployment Statistics and Medicaid enrollment from the North Carolina Medicaid Division of Health Benefits for the period of January 2018 through August 2020.[62,63] These measures were converted into county-level unemployment and Medicaid enrollment rates per 10,000 residents using county-level population (as of July 1, 2019) from the Census Bureau Population Estimates Program.[64] We collapsed Medicaid enrollment into both a county-month total across all enrollment pathways and five mutually exclusive and exhaustive categories by enrollment pathway: aged (age sixty-five or older), blind, disabled, or dual-eligible (both Medicaid and Medicare) enrollees (adults or children); pregnant women and enrollees with Breast and Cervical Cancer Program eligibility; income-eligible adults; income-eligible children; and immigrants and refugees.

We also obtained data on county-level social vulnerability, access to social service agencies, and COVID-19 case burden to contextualize the relationship between unemployment and Medicaid enrollment across the state. We used the 2018 county-level Social Vulnerability Index for North Carolina from the Centers for Disease Control and Prevention (CDC), which incorporates fifteen different measures capturing variation in race, ethnicity, English proficiency, educational attainment, housing, transportation, income, employment, disability, and family composition.[65] To avoid double-counting unemployment, we recalculated the Social Vulnerability Index while excluding its unemployment measure. We hand-collected the number of social service agency locations in each county, using a list of county Medicaid agencies from the North Carolina Department of Health and Human Services,[66] and converted this to a rate per 10,000 residents to capture variation in physical access to Medicaid enrollment resources. Similarly, we obtained the county broadband internet penetration rate for 2020 from BroadbandNow, derived from data published by the Federal Communications Commission, National Telecommunications and Information Administration, and other sources, to capture variation in virtual access to Medicaid enrollment resources.[67] We used daily county-level COVID-19 case data, published by the *New York Times*,[68] to create a lagged county-month cumulative COVID-19 case rate per 10,000 residents through the end of the prior month, as local conditions could affect the intensity with which newly unemployed people seek health insurance coverage.

STATISTICAL ANALYSIS We began with descriptive analysis, using graphs and heat maps to show trends in Medicaid enrollment over time and variation in the unemployment burden during the COVID-19 pandemic across the state. Next, we examined bivariate correlations between unemployment and Medicaid enrollment rates both before COVID-19 (January 2018–February 2020) and during COVID-19 (March–August 2020). We did this for total Medicaid enrollment and the five enrollment pathway categories defined above, also stratifying by county-level social vulnerability. We used the CDC Social Vulnerability Index to group North Carolina's 100 counties into quartiles by social vulnerability, with higher quartiles representing greater social vulnerability, for assessing its relationship with both the level of Medicaid enrollment and the responsiveness of enrollment to changes in unemployment. We incorporated a time dimension to the correlation analysis to identify when the strongest relationship exists between changes in unemployment and Medicaid enrollment (that is, contemporaneously, after one month, after two months, and after three months). We found no evidence of a strong timing relationship in the correlations and therefore used the contemporaneous (unlagged) unemployment rate for the rest of our analysis.

Finally, we assessed the relationship of changes in the county-month unemployment rate on Medicaid enrollment, using a linear regression model that adjusted for county-level social vulnerability, physical and virtual access to Medicaid enrollment, and COVID-19 case burden and a county fixed effects model. These models allowed us to describe the passthrough rate of unemployment to Medicaid enrollment, representing the magnitude of the association between county-level unemployment and Medicaid enrollment (average marginal effect). For example, if Medicaid enrollment rose by 3 residents per 10,000 for an increase of 10 residents per 10,000 in unemployment, the passthrough rate would be 30 percent. We clustered standard errors at the county level, as Medicaid enrollment is correlated over time based on differences in social service agency capacity, efficiency, and

availability of enrollment assistance.

LIMITATIONS Our results should be interpreted in the context of some limitations. First, as an analysis of county-level aggregated data, we must consider the potential ecological fallacy. Without person-level data on employment, income, family structure, Medicaid enrollment, and other potential coverage sources, we could not ensure that the county-level relationships we observed were translatable to individuals, nor could we ensure that county-level social vulnerability reflected actual enrollment of historically marginalized groups in those counties. Also, unemployment-induced coverage loss occurs only when jobs include offers of employer-sponsored insurance, and these jobs are not distributed equally through a county, particularly in counties with higher social vulnerability. Given the nonrandom nature of unemployment and no other coincident expansions of coverage, we believe that the ecological fallacy is not a significant concern here; however, the association between unemployment and Medicaid enrollment may vary within counties, and a subcounty analysis (that is, ZIP code or census tract) may yield different results.

Second, we did not observe new Medicaid enrollment, only changes in total enrollment, which means that new enrollment was partially offset by others dropping out of Medicaid. However, during the COVID-19 pandemic, this concern is minimized because Medicaid eligibility redetermination has been paused since March 2020 as a result of the FFCRA and CARES Act.[54,55] In addition, counties will have different natural disenrollment rates based on their population and labor-market characteristics; however, provided that those differences were plausibly time-invariant during our study period, our county fixed effects should have accounted for this unobserved variation.

Third, we focused only on Medicaid coverage, which provides an incomplete picture of the relationship between pandemic-related unemployment increases and changes in health insurance coverage. People in less socially vulnerable counties who become unemployed may have higher probabilities of access to spousal coverage or higher incomes that would make them ineligible for Medicaid but that provide greater ability to afford other private coverage options, such as through the ACA Marketplace.

Study Results

The total share of state population enrolled in Medicaid in North Carolina was stable pre-COVID-19, ranging from 19.4 percent to 19.8 percent between January 2018 and February 2020 (exhibit 1), rising to 21.2 percent by August 2020 after the onset of the COVID-19 pandemic in March 2020. The quartiles by county-level social vulnerability demonstrate the expected gradient in terms of share of population covered by Med-

EXHIBIT 1

Monthly Medicaid enrollment as a share of county population in North Carolina, by social vulnerability quartile, January 2018–August 2020
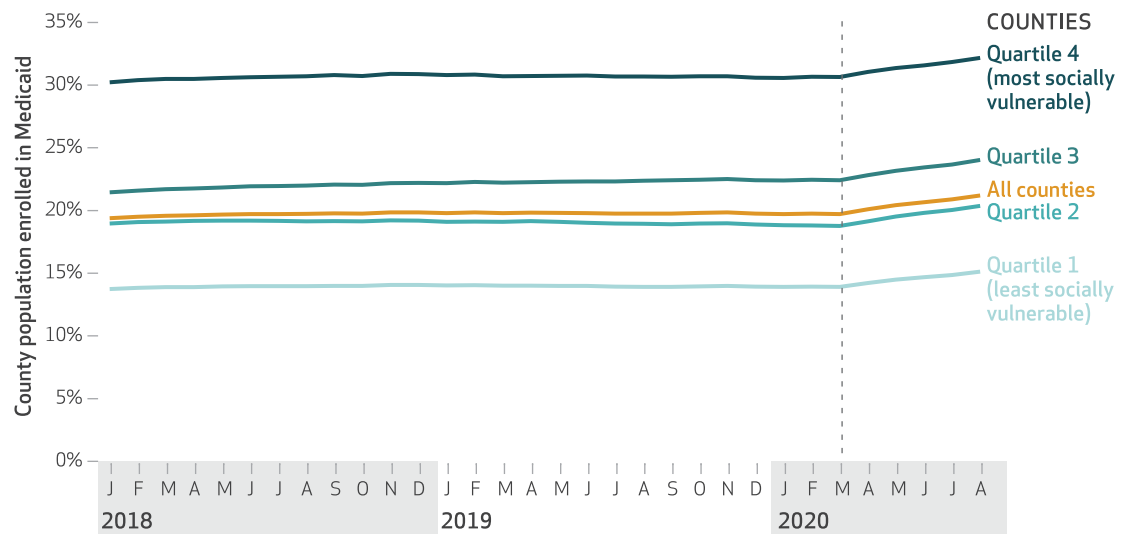
SOURCE Authors' analysis of Medicaid enrollment data obtained from the North Carolina Department of Health and Human Services and county-level social vulnerability from the Centers for Disease Control and Prevention Social Vulnerability Index. **NOTE** The dashed line indicates the onset of the COVID-19 pandemic in the US in March 2020.

icaid, with the lowest quartile having 13.9 percent of its population enrolled in February 2020 and with 18.8 percent, 22.4 percent, and 30.7 percent of the population enrolled in the second, third, and highest quartiles, respectively. The three highest quartiles all experienced increases of 1.5–1.6 percentage points in share of population enrolled in Medicaid from February to August 2020, whereas the lowest quartile saw a 1.2-percentage-point increase.

Unemployment in North Carolina rose by nearly 140,000 between February and August 2020, but the burden of unemployment from the COVID-19 pandemic was unequally distributed in counties across the state (exhibit 2). Urban and suburban counties generally experienced greater percentage decreases in employment during the first three months of the pandemic than rural counties.[69] The correlation between the county-level unemployment and Medicaid enrollment rates per 10,000 residents changed from pre-COVID-19 to during COVID-19 (exhibit 3). Overall, this correlation dropped from approximately 0.35 pre-COVID-19 to approximately zero during COVID-19. Also, the correlations varied considerably during COVID-19 by quartile of county-level social vulnerability. The most socially vulnerable counties displayed a significant correlation between their unemployment and Medicaid enrollment rates during COVID-19 (highest quartile: 0.3051), whereas the three lowest quartiles did not. We also mapped the correlation between unemployment and Medicaid enrollment rate at the county level during COVID-19, seeing little overlap between where the unemployment burden was highest

(exhibit 2) and the strength of the correlation between unemployment and Medicaid (online appendix exhibit A1),[70] which strengthens our argument that social vulnerability is an important confounder. The strength of the correlation between unemployment and Medicaid also overlaps well with county-level social vulnerability (appendix exhibit A2),[70] appearing strongest in areas with high concentrations of marginalized people.

The enrollment pathway–specific correlations demonstrate an additional layer of variation in the relationship between unemployment and Medicaid enrollment (appendix exhibits A3–A7).[70] Income-eligible adults (appendix exhibit A5) and children (appendix exhibit A6) showed a similar correlation pattern to total enrollment (exhibit 3).[70] However, the relationship between unemployment and Medicaid enrollment was less pronounced during COVID-19 for aged, blind, disabled, and dual-eligible enrollees (appendix exhibit A3); pregnant women and enrollees with Breast and Cervical Cancer Program eligibility (appendix exhibit A4); and immigrants and refugees (appendix exhibit A7).[70] These enrollment pathways serve considerably different population sizes (appendix exhibit A8) and thus vary in their relative contribution to total enrollment.[70]

Our regression analysis using county fixed effects that accounted for time-invariant differences between counties estimated that the statewide average passthrough rate of unemployment to total Medicaid enrollment was approximately 14.6 percent (exhibit 4; appendix exhibit A9, model 2).[70] We found that the three highest coun-

EXHIBIT 2

Change in the county-level total unemployment rate per 10,000 residents in North Carolina, February–August 2020

- 150.1 to 224.7
- 100.1 to 150.0
- 50.1 to 100.0
- 0.1 to 50.0
- −218.8 to 0.0
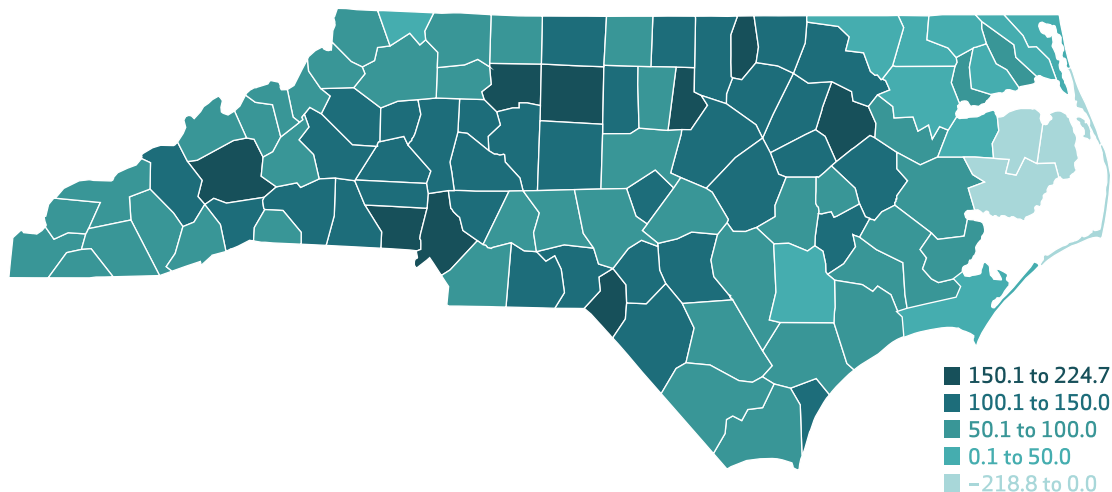
SOURCE Authors' analysis of unemployment data from the North Carolina Department of Commerce.

EXHIBIT 3

Bivariate correlation between county-level total unemployment and Medicaid enrollment rates per 10,000 residents in North Carolina, by quartile of social vulnerability, before and during the COVID-19 pandemic

	Lag of total unemployment rate			
	0 months	1 month	2 months	3 months
Pre-COVID-19 (Jan 2018–Feb 2020)				
All counties	0.3502****	0.3548****	0.3605****	0.3655****
By quartile of CDC SVI				
4 (high)	0.4363****	0.4385****	0.4427****	0.4508****
3	0.1631****	0.1642****	0.1645****	0.1703****
2	0.3538****	0.3460****	0.3341****	0.3401****
1 (low)	−0.0919**	−0.0903**	−0.0922**	−0.0949**
During COVID-19 (Mar–Aug 2020)				
All counties	0.0021	−0.0108	−0.0435	−0.0541
By quartile of CDC SVI				
4 (high)	0.3051****	0.2779***	0.2039**	0.1695
3	0.1164	0.1548*	0.1608	0.1997*
2	−0.0081	0.0201	0.0220	0.0581
1 (low)	−0.0430	−0.0333	−0.0396	−0.0261

SOURCE Authors' analysis of Medicaid enrollment data obtained from the North Carolina Department of Health and Human Services, unemployment data from the North Carolina Department of Commerce, and county-level social vulnerability from the Centers for Disease Control and Prevention (CDC) Social Vulnerability Index (SVI). *$p < 0.10$ **$p < 0.05$ ***$p < 0.01$ ****$p < 0.001$

ty-level social vulnerability quartiles using the CDC Social Vulnerability Index (second quartile, 16.4 percent; third quartile, 17.1 percent; highest quartile, 15.1 percent) had substantially higher passthrough rates than the lowest quartile (10.0 percent). The estimated passthrough rate for income-eligible adult enrollment (13.3 percent) was similar to our estimate for all enrollees but nearly zero for the other four enrollment pathways, ranging from −0.2 percent to 0.9 percent (exhibit 4; appendix exhibits A10–A14).[70] This latter result is unsurprising, as diagnosis-

or disability-based eligibility would not be expected to be responsive to short-term economic conditions and eligibility for children was already more generous. Our adjusted linear model for total enrollment (appendix exhibit A9, model 1)[70] implied a statewide average passthrough rate of 82 percent ($p < 0.001$) (data not shown). This is unrealistically high, indicating substantial unobserved confounding, which led us to focus on the results of the county fixed effects model.

EXHIBIT 4

Passthrough rates of county-level total unemployment to Medicaid enrollment in North Carolina, by type of Medicaid enrollment pathway and quartile of social vulnerability, January 2018–August 2020

		Enrollment pathway category				
	All enrollees	Aged, blind, disabled, dual-eligible enrollees	Pregnant women and enrollees with Breast and Cervical Cancer Program eligibility	Income-eligible adults	Income-eligible children	Immigrants and refugees
Overall	14.6%****	0.9%**	−0.2%***	13.3%****	0.4%	0.2%****
By quartile of CDC SVI						
4 (high)	15.1***	0.3	−0.5	18.5****	−3.9	0.2
3	17.1****	1.4*	−0.3	13.4****	2.3	0.3**
2	16.4****	1.6***	−0.2	12.5****	2.3*	0.3**
1 (low)	10.0****	0.5	−0.4***	8.9****	0.8	0.2**

SOURCE Authors' analysis of Medicaid enrollment data obtained from the North Carolina Department of Health and Human Services, unemployment data from the North Carolina Department of Commerce, and county-level social vulnerability from the Centers for Disease Control and Prevention (CDC) Social Vulnerability Index (SVI). **NOTE** These rates represent average marginal effects and marginal effects by county-level social vulnerability quartile of the unemployment rate on the applicable Medicaid enrollment rate from model 2 in online appendix exhibits A9–A14 (see note 70 in text), multiplied by 100 for interpretation as a percentage (passthrough rate). *$p < 0.10$ **$p < 0.05$ ***$p < 0.01$ ****$p < 0.001$

> **Working toward greater adoption of Medicaid expansion may help ensure that the US is better prepared for the next crisis.**

Discussion

Our results show that variation in county-level unemployment was associated with changes in Medicaid enrollment but that the passthrough rate (people taking up Medicaid coverage after becoming unemployed) was fairly low (approximately 15 percent). A stronger relationship between rising unemployment and Medicaid enrollment during COVID-19 was found in more socially vulnerable counties, and enrollment of adults through income-based pathways was the most responsive to county-level changes in the unemployment rate. Although many newly unemployed people may be able to enroll in subsidized Marketplace coverage or a spouse's employer-based plan, North Carolina's adult uninsurance rate spiked to a projected 20 percent during the early months of the COVID-19 pandemic.[60] This rising gap in insurance coverage has implications both for access to care during the pandemic and for the ensuing health impacts resulting from reductions in treatment of non-COVID-19 health care needs and the mental health and economic fallout resulting from this crisis.[71–73]

This low passthrough rate from unemployment to Medicaid during a period of increased unemployment means that Medicaid was unable to completely fulfill its countercyclical role during the COVID-19 pandemic in North Carolina, growing to meet greater need during periods of widespread economic hardship,[28,29] based on the lack of Medicaid expansion and low prevailing eligibility based on income for parents and caregivers (41 percent of the federal poverty level) and childless adults (never eligible based on income alone).[59] Recent research has shown that Medicaid participation rates are similar across expansion and nonexpansion states, with eligibility criteria being the key driver of differences in enrollment between them.[74] Our results are comparable with evidence from the Great Recession that found a similarly low passthrough rate (11 percent) in states with restrictive Medicaid programs.[33] Now, however, Medicaid expansion states may counterintuitively have even lower passthrough rates than we estimated simply because many more low-income working families were already enrolled in Medicaid before the pandemic.

Communities with higher social vulnerability should not be disproportionately harmed by natural and economic disasters, yet they have been unequally disadvantaged as a result of the higher rates of COVID-19 infection and deaths and higher levels of unemployment that they are experiencing during the pandemic.[20–27] The stronger relationship between unemployment and Medicaid coverage in more socially vulnerable counties during the pandemic reveals that the intended countercyclicality of the program worked to an extent.[28,29] Maintenance-of-effort requirements likely also played a role in maintaining coverage, avoiding the usual churn in the program and the administrative burdens of redetermination that are disproportionately borne by those with the least ability to meet them.[75,76] It will be important to monitor how the uninsurance rate and coverage disparities change when the maintenance-of-effort requirements expire, anticipated to be late 2021 or early 2022, after the end of the public health emergency.[77]

Conclusion

The broad question of how to protect Americans from the precarity of dependence on employers for access to health insurance coverage has been laid bare by the COVID-19 pandemic. Working toward greater adoption of Medicaid expansion and other proposals, such as permanent enhancement of Marketplace subsidies in the American Rescue Plan Act, may help ensure that the US is better prepared for the next crisis by ensuring access to affordable health insurance coverage. ■

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