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Double vulnerability? Examining the effect of living in nonmetropolitan areas within non-expansion Medicaid states on health status among working-age adults in the United States, 2022–2024

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ABSTRACT

Objective: To examine whether living in nonmetropolitan areas within a state that has not expanded Medicaid is associated with poor/fair self-reported health status among working-age adults in the United States.
Methods: We analyzed data from the 2022–2024 Current Population Survey (n = 220, 601, ages 25–64). Self-reported health was dichotomized as having reported poor/fair or good/very good/excellent health status. We produced a four-level measure of the overlap between residential and policy contexts indicating whether the respondent lived in a metropolitan or nonmetropolitan area within a state that had or had not expanded Medicaid coverage by 2023. Multilevel logistic regression models were fit to examine the association between our measure of residence-policy overlaps and poor/fair self-reported health status while accounting for individual and state-level characteristics.
Results: About 3.7 % of respondents resided in nonmetropolitan areas within non-expansion states. Approximately 11.4 % of respondents reported poor/fair self-reported health, with respondents living in nonmetropolitan areas within non-expansion states having the highest rates of poor/fair self-reported health status (18.1 %). Living in a nonmetropolitan area within non-expansion states was associated with higher odds of poor/fair self-reported health status for the overall population and by sex.
Conclusion: In this nationally representative and racially diverse sample, we found that individuals residing in nonmetropolitan areas in non-expansion Medicaid states were more likely to report poor/fair self-reported health status. This effect was present for the majority of the population subgroups. Our findings underscore the double vulnerability faced by populations living in these residence-policy overlaps and the need for targeted interventions.

1. Introduction

Health and mortality disparities for rural residents are well-established in the United States (Cosby et al., 2019; Jensen et al., 2020). Past studies have found that people residing in rural or nonmetropolitan areas exhibit worse physical or mental health status (Monnat & Pickett, 2011; Rhubart & Monnat, 2022; Trivedi et al., 2013), higher prevalence of smoking (Doogan et al., 2017), obesity (Befort et al., 2012), chronic conditions (Sparks, 2011), and multimorbidity (Boersma et al., 2020; Rhubart et al., 2023). Past research has also found that rural areas have higher mortality rates (Cosby et al., 2019; Rhubart & Santos-Lozada, 2023). An emerging and growing body of scholarship has started to emphasize and accentuate the role of structural factors, such as policy contexts, in shaping these disparities (Montez et al., 2020; Montez & Grumbach, 2023). Policy contexts studied through enacted state policies have been a focal point in understanding these types of disparities due to the profound impact macro-structural level factors have on life expectancy and adult mortality (Montez & Grumbach, 2023).

In 2010, the Affordable Care Act (ACA) was enacted to address disparities in access to care, improve health outcomes, and mitigate rising healthcare costs (Rhubart et al., 2021). This national policy sought to accomplish these objectives by expanding public and private health insurance coverage and dealing with insurance coverage disparities

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(Rhubart, 2017). By doing this, the government expected this policy to reduce healthcare costs at the individual and national level (Obama, 2016). The expansion also extended Medicaid eligibility to specific populations, such as lower-income and non-disabled childless adults (Lee & Porell, 2020). While this was conceptualized and enacted as a national policy, a challenge to the legality of this law contained in the 2012 Supreme Court case, *National Federation of Independent Business v. Sebelius,* led to a ruling by the US Supreme Court indicating that states could not be forced to participate in Medicaid expansion under the penalty of losing Medicaid funding (Goodman, 2017). By 2023, ten states had yet to implement this expansion.

As of 2020, about 46 million people, or 13.8 % of the population, live in nonmetropolitan or rural areas (Davis et al., 2023), and approximately 93.5 million people, or 28 % of the population, live within non-expansion states (U.S. Census Bureau, 2022). The health of those living at this residence-policy overlap warrants attention as they are exposed to two contextual influences that shape health status. These contextual influences are well-studied. For example, in past studies, women have been diagnosed with chronic conditions and report poorer overall health compared to men, especially within rural areas (Sparks, 2011). Another study found that rural disparities exist since emerging adulthood concerning levels of physiological dysregulation among US adults (Santos-Lozada et al., 2023). Concerning states or state-policy environments, a growing body of work finds issues like electoral democracy erosion (Montez et al., 2023), state-policy polarization (Montez et al., 2020), and multidimensional measures of state-level policy influences (Kemp et al., 2022) to be associated with health and mortality. However, work on these influences has remained mostly separated from one another, and this has prompted calls for a multilevel-multidimensional analysis of rural health in the US (Jensen et al., 2020). A recent study approached the rural-urban context and the effect of Medicaid expansion and found that the latter did not benefit urban and rural areas similarly concerning mortality rates (Mueller et al., 2024). These findings, particularly the study by Mueller and colleagues (2024), accentuate the need for analyses that consider how the residence-policy overlap is shaping health status across the nation.

To date, most studies dealing with the ACA expansion have focused on insurance coverage and related-disparities, such as access to care, healthcare costs, and patient outcomes (Lee & Porell, 2020; Mazurenko et al., 2018). Despite the well-established nonmetropolitan disparities and emerging consensus on the role of policy contexts, most studies continue examining these two independently. Only a few studies have approached the issue of subjective population well-being and have done so within a time window close to the implementation of the expansion (Kobayashi et al., 2019; Mewes and Giordano 2017). The study by Kobayashi and colleagues (2019), tracked the outcomes until 2016, and found no difference in subjective well-being. The article by Mewes and Giordano (2017) did not approach population well-being as an outcome. Rather, it used poor/fair self-reported health as a determinant of generalized trust and found its deleterious association to have weakened following the implementation of the ACA. However, none of these studies have explored whether these associations or effects differed based on living in nonmetropolitan areas.

The limited literature on this subject does not yields any insights concerning the possible interaction between these residential contexts regarding self-reported health status. It may be possible that those residing in this residence-policy overlap are exposed to a double vulnerability concerning their health. To address this gap, the present study explores the interaction between residing in a nonmetropolitan area and a non-expansion state on individual poor/fair self-reported health status. Given the well-established disparities experienced by those living within these residential contexts, we hypothesize that individuals residing in nonmetropolitan areas within non-expansion states will be more likely to report poor/fair health status than those residing in metropolitan areas within expansion states.

2. Double vulnerability

2.1. Nonmetropolitan or rural residence

We argue that people living in nonmetropolitan areas within states that have yet to implement the expansion of Medicaid face a double vulnerability. The more proximate level of vulnerability comes from living in a nonmetropolitan area. Research continuously shows that people living in nonmetropolitan areas exhibit worse health and mortality (Cosby et al., 2008; Rhubart et al., 2023). Nonmetropolitan areas tend to exhibit higher rates of obesity, metabolic syndrome, chronic conditions, and risky behaviors such as smoking and substance misuse (Doogan et al., 2017; Trivedi et al., 2013) and a host of other dynamics that shape this disparity (Higgins, 2021). Further, disparities have been found as early as in adolescence (Monnat & Rigg, 2016) and young adulthood (Santos-Lozada et al., 2023). At the contextual level, and major drivers of these factors and disparities, we find lower access to care and healthcare facilities (Glover et al., 2004; Laditka et al., 2009), have experienced decline in jobs (Glasgow & Brown, 2012), and historically higher poverty rates (Li & Zhang, 2024; Thiede et al., 2018). Altogether, these factors and their complex interrelations place people residing in nonmetropolitan areas at a disadvantaged position concerning their health and well-being.

2.2. Medicaid expansion

However, aforementioned patterns and influences are not independent from broad health policy environments. Whether a state has or has not expanded Medicaid has tremendous repercussions to the level of access individuals living within states have to health insurance, (Courtemanche et al., 2017), can reshape health behaviors, and has been found to influence access to care through funding streams to medical facilities (Han et al., 2017). A systematic review on the issue of health care access in the rural US has found that individual and contextual characteristics shape the rural disparity in healthcare access (Douthit et al., 2015). They identify that living within context of constrained access to care and with limited financial resources, like those existing in rural areas, are magnified when they interact with lack of medical staff, lower access to transportation, and lack of information. Studies conducted on the matter of how the expansion of Medicaid influenced health-seeking behaviors found that under the new policy: working-age men were more likely to seek preventive healthcare (Reynolds & Fisher, 2020), increased use of contraceptive methods (Darney et al., 2020), improvements in maternal mortality (Eliason, 2020) and several other areas of healthcare delivery (Mazurenko et al., 2018). Mazurenko and colleagues (2018) also conclude that there was very little evidence to the fact that the expansion had negative consequences concerning health care delivery. These pieces of evidence point to the strong influence of health policy contexts concerning individual health and well-being.

More broadly, changes were also observed at the organizational-level. A study conducted in 2016 found that in states where the Medicaid expansion was implemented observed increases in Medicaid-covered discharges (Kaufman, Reiter, et al., 2016). By examining a series of organization-level outcomes Kaufman and colleagues (2016) conclude that the financial impacts of the Medicaid expansion may be different for hospitals in urban and rural areas. For instance, the same study suggests that rural hospitals observed an increase in revenue helping sustain their operations within the states that had implemented the expansion. Thus, hospitals where the expansion was not implemented could be at higher risk of continuing to operate under the pre-ACA conditions. These effects are not isolated from broader contexts, a recent study found that a hospital closure is associated with declines in jobs in the healthcare sector (Chatterjee et al., 2022). Thus, these closures, which have been mainly concentrated in rural areas (Kaufman, Thomas, et al., 2016), have broader implications for access to care for the population served by them and broad health services areas

(McCarthy et al., 2021). The issue of rural hospital closures is not new to the United States, as evidenced by a vast body of work that spans over three decades (Mayer et al., 1987); however, the significant change brought about by the ACA has consistently been proven to influence health services. By not implementing the Medicaid expansion, states are denying much needed influx of funds to their health care systems and placing them at a disadvantaged position when compared to their counterparts operating within states that have implemented it. Thus, health policy contexts impact rural disparities through a series of levels of influence ranging from: 1) providing access to health insurance, 2) lowering the objective and perceived barriers to care, 4) reshaping individual health and health-seeking behaviors, 4) and by providing a lifeline to healthcare institutions, among others.

We argue that the residence-policy overlap, that is, living in a nonmetropolitan area within a state that has not implemented the Medicaid expansion places individuals in a "double vulnerability" concerning their health status.

3. The current study

The purpose of this study is to test whether living in nonmetropolitan areas within states that have yet to expand Medicaid is associated with self-reported health among working-age adults in the United States. Thus far, the study of disparities based on nonmetropolitan residence and the effect of state-level Medicaid expansion have remained relatively independent. We contribute to research scholarship by testing the interaction of both residential contexts to capture the concept of double vulnerability and its effect in health status. Our main hypothesis is guided by the concept of double vulnerability. We hypothesize that persons living in nonmetropolitan areas within states that have yet to expand Medicaid will have increased probability of rating their health status as poor/fair than their counterparts living in other residence-policy overlaps. We test these for the overall population and by sex, to explore whether differences emerge. This last step is crucial given that past scholarship has shown that men and women have different levels of reporting health and well-being, with women reporting worse health (Lego et al., 2020).

4. Materials and methods

4.1. Study design and data collection

This retrospective study used data from the 2022–2024 Current Population Survey (CPS), which was accessed through IPUMS (Flood et al., 2023). The CPS is a monthly household survey conducted jointly by the US Census Bureau and the Bureau of Labor Statistics. We used the Annual Social and Economic Supplement (ASEC), which was collected in March and incorporates respondents from other months to oversample for members of the armed services and Hispanic adults. Our analytic sample consisted of 220,601 respondents aged 25–64 years, with information for all variables considered in our study. Our weighted population total is 168,889,902 people, which is consistent to the estimates of the population aged 25–64 years produced by the US Census Bureau for the same period. To determine whether a state had expanded Medicaid coverage or not by 2022, we accessed data from the Kaiser Family Foundation (KFF, 2024). KFF monitors whether states have adopted Medicaid expansion and provides additional information, including the date of approval/implementation and detailed tracking of state-level dynamics concerning the expansion. This study was deemed non-human research by the Institutional Review Board at the INSTITUTION (STUDY00023272).

4.2. Measures

4.2.1. Individual-level characteristics

4.2.1.1. Self-reported health (SRH). Our primary outcome of interest is self-reported health (SRH). SRH constitutes a valuable measure used extensively in the health literature to evaluate population health and well-being, and it has been argue that it constitutes a valid measure of health regardless of the factors people use to rate their health (Jylha, 2009). In the ASEC, SRH is collected as a five-level categorical variable with the following levels: Excellent, Very Good, Good, Fair and Poor. We produced a dichotomous variable indicating whether respondents reported their health status as: fair or poor, following the standard operationalization of this variable (Thompson, 2017).

4.2.1.2. Nonmetropolitan residence. The CPS includes information on residential context based on the location of the household. Residence in metropolitan areas included respondents who lived in a principal city, or within a metropolitan area; residence in nonmetropolitan areas included respondents who lived outside the metropolitan area as delineated by the US Census Bureau. We created a dichotomous variable indicating whether the respondents were classified as living in a metropolitan area (reference) or a nonmetropolitan area (Bennett et al., 2019). While the literature on this subject is shifting from this dichotomous measure into a more continuous approach (Bennett et al., 2019; Walker & Brown, 2022), it also recognized that such data may not be available to researchers. Indeed, we face this constraint and are precluded from examining these effects using more detailed measures.

4.2.1.3. Demographic and socioeconomic characteristics. We controlled for demographic and socioeconomic characteristics known to be associated with self-reported health. Differences by age and sex (Zajacova et al., 2017), race/ethnicity (Woo & Zajacova, 2017) and educational attainment (Zajacova & Siddiqi, 2022) have been found concerning self-reported health. We include these in our models to account for their independent associations and their potential influence in our association of interest. Within our models, we incorporated these variables as follows: for age (25–35, 36–45, 46–55, 56–64 years), sex (male or female), race and ethnicity (Hispanic, non-Hispanic Asian, non-Hispanic Black/African American, non-Hispanic White, non-Hispanic Other) and educational attainment (Below High School, High School or GED, Associate's or Technical Degree, Some College, and College or more). We also controlled for health insurance coverage, measured as a dichotomous variable indicating whether the respondent was covered by health insurance in the last year. Given that we are using three years of the CPS-ASEC, we include a variable indicating whether the interview was conducted in 2022, 2023, or 2024 to account for potential period effects.

4.2.2. State-level covariates

State-level Medicaid expansion by 2022 was measured as a dichotomous variable indicating whether a state had expanded Medicaid (reference, n = 40 out of 50) or not (n = 10 out of 50, hereafter non-expansion). By 2022, the following states had yet to enact the expansion of Medicaid: Alabama, Florida, Georgia, Kansas, Mississippi, South Carolina, Tennessee, Texas, Wisconsin, and Wyoming (KFF, 2024). Respondents were assigned into one of these groups based on their residence at the moment of the interview. Within our models we account for this by controlling for state-level fixed effect based on expansion or non-expansion. The overlap between residential and policy contexts was captured by estimating a cross-level interaction between living in nonmetropolitan areas and living within a state that has or has not expanded Medicaid. Finally, we incorporated two state-level measures to account for health environments (see Fig. 1). We incorporated Hospital Rates and Hospital Bed Rates within our multi-level models. To

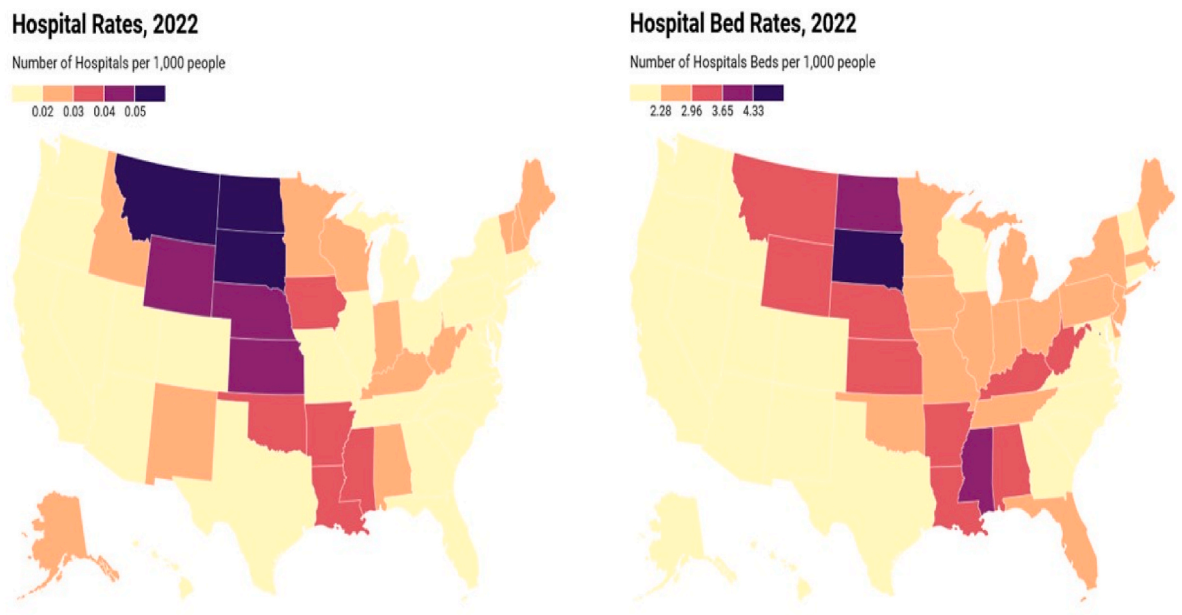

Fig. 1. Hospital and Hospital Bed Rates by state for 2022 based on KFF (2022) data.

calculate these measures, we obtained counts of hospitals operating within each state and total beds available within these institutions (KFF, 2022), respectively. We matched these data with population estimates produced by the US Census Bureau and calculated the rate per 1000 people. These measures were incorporated within our statistical models as the logarithm of the rates.

4.3. Analytic strategy

Our study is divided into two sections: descriptive analysis and regression analyses. First, we calculated descriptive statistics for the variables included in our analysis, which we present as weighted means with corresponding standard deviations (Table 1). For these statistics, we stratified the results based on each residence-policy overlap. Then, we fit a series of hierarchical linear models (HLM) with individuals nested within state of residence at the moment of interview. Given that

Table 1
Overall and Residence-Policy Overlap-Stratified Means/Proportions of variables included in our analysis, Current Population Survey, United States, 2022–2024, n = 220,601.

Characteristic	Overall	Metropolitan, Expansion	Metropolitan, Non-Expansion	Nonmetropolitan, Expansion	Nonmetropolitan, Non-Expansion
Poor/Fair Self-Reported Health	11.4 %	10.7 %	10.8 %	15.0 %	18.1 %
Age Group					
25–35	29.0 %	29.5 %	29.1 %	26.3 %	25.9 %
36–45	25.4 %	25.3 %	26.1 %	24.5 %	23.7 %
46–55	23.5 %	23.4 %	23.6 %	23.4 %	23.9 %
56–64	22.2 %	21.8 %	21.3 %	25.8 %	26.4 %
Gender					
Female	50.3 %	50.2 %	50.7 %	49.6 %	50.3 %
Male	49.7 %	49.8 %	49.3 %	50.4 %	49.7 %
Race/Ethnicity					
Non-Hispanic Asian	7.0 %	8.9 %	5.1 %	1.0 %	0.5 %
Non-Hispanic Black/African American	12.7 %	11.5 %	17.5 %	4.1 %	19.2 %
Hispanic	19.0 %	18.8 %	25.0 %	7.9 %	7.7 %
Non-Hispanic Other	2.6 %	2.7 %	1.6 %	4.6 %	1.4 %
Non-Hispanic White	58.8 %	58.0 %	50.8 %	82.5 %	71.3 %
Education Status					
Below High School	8.0 %	7.9 %	8.0	8.7 %	10.2 %
High School/GED	27.1 %	25.3 %	27.2	36.3 %	38.9 %
Associates Arts/Tech Degree	10.8 %	10.0 %	11.1	14.3 %	13.1 %
Some College	14.0 %	13.6 %	14.2	15.1 %	16.0 %
College+	40.1 %	43.2 %	39.5 %	25.6 %	21.9 %
Health Insurance Coverage					
Had any insurance in last year	89.4 %	91.5 %	84.2 %	90.5 %	84.2 %
Number of Hospital per 1000 people	0.015	–	–	–	–
Hospital Bed Rates per 1000 people	2.35 beds	–	–	–	–
Survey Year	33.3 %	33.4 %	33.1 %	33.3 %	32.5 %
2022	33.3 %	33.2 %	33.3 %	33.2 %	34.3 %
2023	33.4 %	33.4 %	33.6 %	33.6 %	33.1 %
2024					
Percent in Sample (%)		63.9 %	24.3 %	8.2 %	3.7 %

we are analyzing a dichotomous outcome, we specified these models to follow a logistic distribution, which is the equivalent of a logistic regression. To test for the double vulnerability, we focus on the cross-level interaction between nonmetropolitan residence and Medicaid non-expansion (Table 2). Our HLM models are fit by accounting for individual-level characteristics (detailed in section 3.4.1) and state-level controls (see section 3.4.2), so that individuals are nested within their state of residence. We fit models for the overall population and stratified by sex. Results are presented as adjusted odds ratios (ORs) and corresponding 95 % confidence intervals (CIs). Hypothesis tests were two-sided, with a significance level of 0.05. To illustrate the double vulnerability, we also present the predicted probabilities of poor/fair self-reported health based on the interaction derived from these regression models (Fig. 2). All statistical analyses were conducted using STATA MP 18.5 (StataCorp, 2023) and adjusted for survey weights by employing the *svyset* command. Additional information is presented in the Supplemental Appendix.

Table 2
Overall and Sex-Stratified Hierarchical Linear Models of Poor/Fair SRH, Current Population Survey, United States, 2022–2024, n = 220,601.

	Overall (Model 1)		Female (Model 2)		Male (Model 3)	
Nonmetropolitan Residence	1.231	a	1.208	a	1.253	a
(Individual-level)	(1.17–1.30)		(1.12–1.30)		(1.16–1.36)	
Non-expansion	0.984		0.972		0.997	
(State-level)	(0.95–1.03)		(0.92–1.03)		(0.94–1.06)	
Nonmetro*Non-expansion						
Cross-level Interaction	1.188	a	1.216	a	1.160	*
	(1.09–1.30)		(1.08–1.37)		(1.02–1.32)	
Age (reference = 25–35 years)						
36-45 years	1.269	a	1.288	a	1.248	a
	(1.21–1.34)		(1.20–1.38)		(1.16–1.35)	
46-55 years	1.846	a	1.904	a	1.786	a
	(1.76–1.94)		(1.78–2.03)		(1.66–1.92)	
56-64 years	2.729	a	2.582	a	2.903	a
	(2.60–2.86)		(2.42–2.75)		(2.71–3.11)	
Sex (reference = Female)						
Male	0.888	a	- -		- -	
	(0.86–0.92)					
Race/ethnicity (reference = non-Hispanic White)						
Non-Hispanic Asian/ Pacific Islander	0.858	a	0.802	a	0.932	
	(0.80–0.92)		(0.73–0.88)		(0.84–1.04)	
Non-Hispanic Black	1.383	a	1.425	a	1.331	a
	(1.32–1.45)		(1.34–1.52)		(1.24–1.43)	
Hispanic	0.903	a	0.927	*	0.878	a
	(0.86–0.95)		(0.87–0.97)		(0.82–0.94)	
Non-Hispanic Other	1.584	a	1.519	a	1.659	a
	(1.45–1.73)		(1.35–1.71)		(1.46–1.88)	
Educational attainment (reference = High School Diploma/GED)						
Less than High School	1.668	a	1.797	a	1.560	a
	(1.58–1.76)		(1.67–1.93)		(1.45–1.68)	
Associate/Tech Degree	0.707	a	0.780	a	0.628	a
	(0.67–0.75)		(0.73–0.84)		(0.58–0.68)	
Some College	0.848	a	0.925	*	0.776	a
	(0.81–0.89)		(0.87–0.99)		(0.72–0.83)	
College or more	0.374	a	0.392	a	0.357	a
	(0.36–0.39)		(0.37–0.42)		(0.33–0.38)	
Health insurance coverage (reference = No health insurance last year)						
Coverage this last year	1.189	a	1.211	a	1.167	a
	(1.13–1.26)		(1.12–1.31)		(1.08–1.26)	
Year of Interview (reference = 2022)						
2023	0.964		0.960		0.969	
	(0.93–1.00)		(0.91–1.01)		(0.91–1.03)	
2024	0.985		1.005		0.965	
	(0.95–1.02)		(0.95–1.06)		(0.91–1.02)	
State-level healthcare access measures						
Hospital Rates per 1000 (z-scored)	1.021		1.041	*	1.002	
	(1.00–1.05)		(1.01–1.08)		(0.97–1.04)	
Hospital Bed Rates per 1000 (z-scored)	1.023		1.009		1.038	
	(1.00–1.05)		(0.97–1.05)		(1.00–1.08)	
Intercept	0.094	a	0.089	a	0.088	a
	(0.004)		(0.005)		(0.005)	
Number of observations	220,601		113,907		106,694	

[a] $p < .01$, $*p < .05$.

5. Results

5.1. Sample characteristics

Descriptive statistics for the analytic sample are presented in Table 1. Of 220,601 respondents, we found that 11.4 % reported poor/fair SRH overall. Approximately 3.7 % resided in nonmetropolitan areas within non-expansion states, and 8.2 % resided in nonmetropolitan areas within expansion states. Further, 63.9 % lived in metropolitan areas within expansion states, while 24.3 % lived in metropolitan areas within non-expansion states. Among these residence-policy overlaps, we found a higher percentage of poor/fair SRH among those living within nonmetropolitan areas/non-expansion states (18.1 %). This rate is higher than those observed for their counterparts living in metropolitan areas/expansion states (10.7 %), metropolitan areas/non-expansion states (10.8 %), and nonmetropolitan areas/expansion states (15.0 %). The mean age was 44.1 years. Regardless of expansion status, individuals residing in metropolitan areas are younger than those living in nonmetropolitan areas. For each residence-policy overlap, self-reported sex was about equally distributed, and no differences were found in self-reported sex distribution across the residence-policy overlaps. In comparison to the national racial/ethnic profile, we found higher percentages of non-Hispanic White adults residing in nonmetropolitan areas. Further, non-Hispanic Black/African American adults were found at higher rates in nonmetropolitan areas within non-expansion states. Furthermore, a higher percentage of Hispanic adults resided in metropolitan areas within non-expansion states. Differences were found in the educational attainment profile within the residence-policy overlaps. For metropolitan areas, we found higher rates of people with a college degree or higher for both expansion and non-expansion states (43.2 % and 39.5 %, respectively). On the other hand, within nonmetropolitan areas, we found a higher concentration of the population having a High School Diploma/GED or lower in both expansion and non-expansion states (45.0 % and 49.2 %, respectively). For health insurance, about 89 % of respondents reported being covered, with lower rates observed in non-expansion states. Approximately a third of the sample comes from each year of the data.

State-level Hospital and Hospital Bed Rates are shown in Fig. 1. The figure shows that state-level variation exists in terms of these two important measures of access to care. Relevant to the proposed study and justifying our consideration of these as controls, we find that the numerous states that have yet to expand Medicaid are in the mid or high categories for these measures. By incorporating these measures within our models, we control for the potential influence of health environments on self-reported health status.

5.2. Regression analyses

Table 2 presents the results from our overall and sex-stratified hierarchical linear models. We focus on the cross-level interaction between an individual living in a nonmetropolitan area and living within a non-expansion state. This cross-level interaction captures the double vulnerability that is the foci of this study. Model 1 includes the association for the overall population. In this model, we found a significant cross-level interaction. This indicates that respondents who lived in nonmetropolitan areas within non-expansion states are more likely to report poor/fair self-reported health than their counterparts living in other residence-policy overlaps, even when accounting for potential covariates. In our examination of whether this effect varied by sex we found results consistent with those derived from Model 1. Women residing in nonmetropolitan areas within non-expansion states were more likely to report poor/fair self-reported health than their

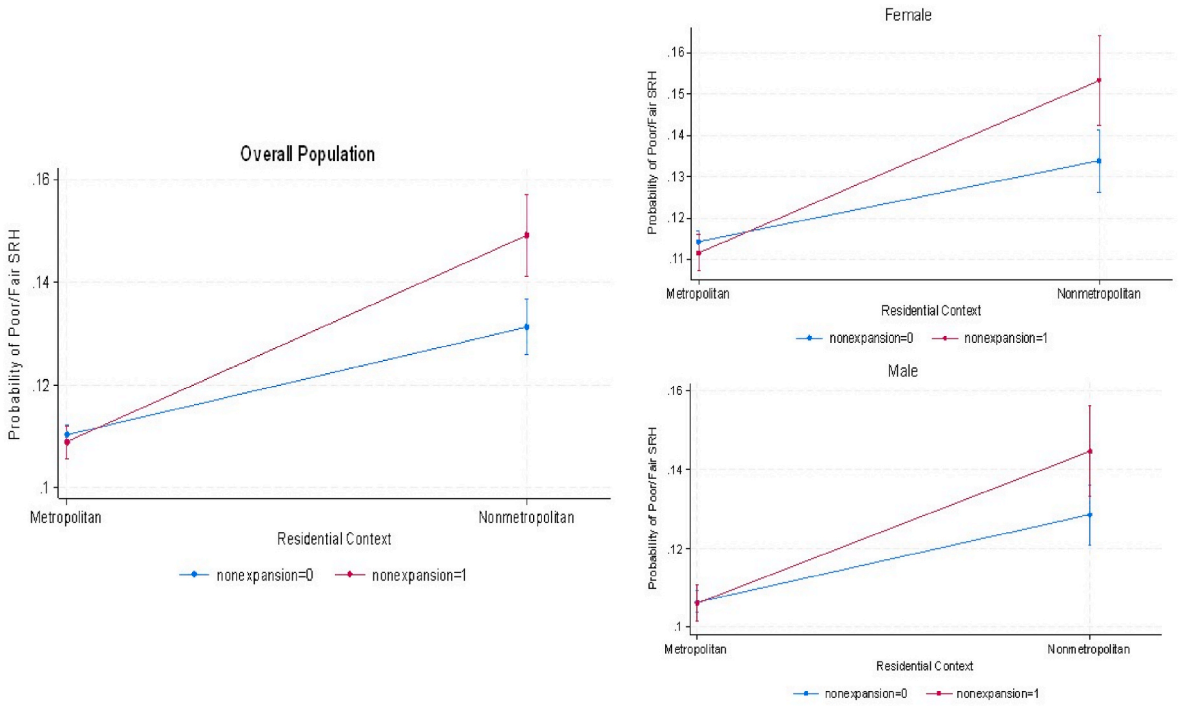

Fig. 2. Predicted probabilities derived from the cross-level interaction between nonmetropolitan residence and living within a non-expansion state.

counterparts living in other residence-policy overlaps (Model 2). This was significant at the highest level of significance considered in the study. Males residing in nonmetropolitan areas within non-expansion states were also more likely to report poor/fair self-reported health than their counterparts living in other residence-policy overlaps (Model 3). We must note that the double vulnerability is slightly weaker, but still significant, in Model 3.

In Fig. 2 we present predicted probabilities for poor/fair self-reported health for the overall population and by sex. These are predicted probabilities from each HLM presented in Table 2, specifically those associated with the cross-level interaction of nonmetropolitan residence and living within a non-expansion state. Fig. 2 shows that a larger difference exists concerning self-reported health among respondents living in nonmetropolitan areas, with those living within non-expansion states exhibiting higher probability of reporting poor/fair SRH than their counterparts who live in expansion states. This is also true for respondents living in metropolitan areas. The two smaller panels show the patterns for females (upper panel) and males (lower panel). We find patterns consistent with those observed within the overall population. For both females and males, we find that respondents living in nonmetropolitan areas within non-expansion states being at higher probability of reporting poor/fair self-reported health when compared to their counterparts living in expansion states and to those living in metropolitan areas. The double vulnerability is more evident within the female subsample (upper panel).

Further, we found support for the well-established association between our covariates and outcome within our empirical models. Male respondents were less likely to report poor/fair when compared to females (Model 1). Respondents in older age groups were at higher and increasing likelihood of reporting poor/fair, that is the likelihood was greater in older groups. Concerning race/ethnicity, we found non-Hispanic Asian/Pacific Islanders and Hispanic respondents exhibiting lower likelihood of reporting poor/fair self-reported health than non-Hispanic white respondents. On the other hand, non-Hispanic Black and non-Hispanic Other respondents were more likely to report poor/fair self-reported health when compared to the reference group. Higher levels of educational attainment were associated with lower likelihood of reporting poor/fair self-reported health. We found no significant differences based on year of interview. Finally, state-level healthcare access measures were not associated with the likelihood of reporting poor/fair self-reported health. These associations were consistent between the overall population and in the sex-stratified models, a few exceptions that do not impact the conclusions presented in our analysis.

6. Sensitivity analyses

We performed a series of validations for the associations discussed in this article. First, we tested whether the double vulnerability was a result of differences in age composition. Supplemental Fig. 1 shows that the double vulnerability is present across every age group. Second, we tested whether the operationalization of self-reported health impacted our results. We did this by operationalizing self-reported health using the original semi-continuous variable. We found the results to be consistent with those shown in the main models (see Supplemental Table 2). Finally, we also performed a series of validations regarding different approaches such as logistic regression models, measuring residence-policy overlap as a categorical variable, and found our results to be consistent with those shown in the main analysis. As mentioned, these results are presented in the Supplemental Appendix.

7. Discussion

This is one of the first studies to examine the interaction between residential and policy contexts and their association with health status. We study the interaction between metropolitan/nonmetropolitan residence and state-level Medicaid expansion concerning health status among working-age adults in the US. We focus on working-age adults because this is the group that benefited the most from the expansion and this is in line with past studies on the matter (Eliason, 2020; Reynolds & Fisher, 2020). We hypothesized that people living in nonmetropolitan areas within non-expansion states would report worse health than their counterparts living in other residence-policy overlaps. The significant cross-level interaction observed in all three models lends support to the hypothesis of a double vulnerability. We found no differences among

those who live in metropolitan areas based on whether the Medicaid expansion has been enacted. Regardless of expansion status, we found that respondents living in nonmetropolitan areas being more likely to report poor/fair self-reported health than their counterparts. This is consistent with past scholarship that finds a nonmetropolitan disadvantage in health outcomes (Rhubart et al., 2023; Rhubart & Monnat, 2022). The fact that those in nonmetropolitan areas, regardless of the policy environment as measured by Medicaid expansion, fare worse than metropolitan residents underscore the need to continue addressing rural health disparities in the US.

There have been continuous and growing calls to address rural health disparities (Jensen et al., 2020) and increasing attention to state policy contexts (Montez & Grumbach, 2023); our findings lend support to these calls by estimating the joint influence of residence and policy contexts. We found evidence that these two operate jointly to exacerbate disparities in health status for the overall population and by sex. Our study brings together these two bodies of scholarship by recognizing their combined influence on health. Given these findings, population health scholarship and health policies should consider the role of policy in magnifying rural health disparities, as well as other disparities found in scholarship. This consideration would bring attention to the *double vulnerability* people may experience in the aforementioned structural contexts.

While the analysis with the full sample indicates a male disadvantage in terms of poor/fair SRH, the sex-stratified models indicate both men and women in non-metropolitan areas were more likely to report poor/fair SRH compared to men or women in metropolitan areas. This is illustrated in our visualization of differences in probabilities of reporting poor/fair self-reported health. Living in a non-metropolitan area within non-expansion states places both men and women at a higher disadvantage than any other residential-policy overlap. This warrants attention towards addressing issues related to low population size, under- and/or disinvestment in rural health care and other health promoting resources, and the larger impact the policy environment might have in reducing some of these barriers to better health.

Are the association between the covariates those expected based on the population health scholarship? The simple answer is yes. Though, some interesting findings emerged, which highlights various avenues for future research. We found men and people in older age groups being more likely of reporting poor/fair self-reported health, which is consistent with past scholarship that has examined these associations (Zajacova et al., 2017). The patterns by race/ethnicity are to some extent consistent with our expectations based on well-established scholarship. For example, non-Hispanic Black respondents were more likely to report poor/fair self-reported health. This finding is consistent with associations and patterns observed in past studies (Thompson, 2017). The finding for the non-Hispanic other group is also consistent with past scholarship on this matter. We note two deviations from past scholarship concerning the association between race/ethnicity and health status. These being the associations found for non-Hispanic Asian/Pacific Islanders and Hispanic respondents. Past scholarship has found that these two groups tend to report higher levels of poor/fair self-reported health than their non-Hispanic white counterparts (Gandhi et al., 2020; Kandula et al., 2007; Viruell-Fuentes et al., 2011). Our findings deviate from these patterns as both groups report poor/fair self-reported health at lower levels than the reference group. Our working hypothesis concerning the deviation from the associations found for non-Hispanic Asian/Pacific Islanders and Hispanic adults is that the majority of studies that find a disadvantage in self-reported health for these groups include people in midlife (20–64 years) and those in later stages of adulthood (65 years and older). We suggest that this deviation from the well-established association warrants examination in future studies.

Our final two covariates are educational attainment and health insurance coverage. We found that higher educational attainment is associated with a lower likelihood of reporting poor/fair self-reported health, which is in line with past scholarship on this matter (Zajacova & Siddiqi, 2022). Finally, past evidence suggests that having a health insurance constituted a health advantage. However, these studies were conducted before the implementation of the ACA. Given that the ACA and the Medicaid expansion removed barriers to health insurance, such as the exclusion of people with preexisting conditions and expanding coverage to more people through changes in the poverty thresholds used to determine eligibility, it may be possible that this pattern is more reflective of the inclusion of population that were previously not able to obtain a health insurance. We see this as a highly meritorious area that warrants attention in future scholarship.

From a policy perspective, we believe the persistent rural disparities continues to be an issue that required attention. While state-level policy expansion was not directly associated with health status, the cross-level interaction does points towards expansion operating by exacerbating rural disparities within the US. Additional attention and perhaps policy efforts, are needed to address the disparities caused by health policy contexts. We must ask whether the Medicaid expansion was enough to mitigate disparities? The answer is complex, while the results of this policy are well-established disparities still exist in the nation. A systematic review on the subject completed by Douthit and colleagues (2015) issues a set of recommendations: 1) to address rural population needs the policies must be tailored the population needs, 2) implementation of healthcare reform should incorporate essential partnerships with local stakeholders and 3) representation of rural communities and their needs at state- and national-levels. By examining the scholarship on rural healthcare access in the US, they conclude that rather than one policy reform; what is needed is an "ongoing program of reform" that seeks: 1) to improve service provision, 2) promotes rural healthcare through recruitment, training and development of the workforce, 3) increases health insurance and 4) promotes the engagement in health promotion for rural residents. The persistent rural disparity, and the magnification of this disparity based on health policy contexts, lend support to the idea that this needs to be a continuous process.

Further research could explore the complex interplay between residential contexts and health status through an intersectional lens (Homan et al., 2021) to further examine the effects of structural barriers to better health outcomes for residents in non-metropolitan areas. However, such pursuits are beyond the scope of this study. Studying whether these patterns hold when effects are examined within age groups, race/-ethnicity, educational attainment, or other characteristics could further shed light on whether different groups experience the double vulnerability concerning their health similarly; an emerging line of work has started to recognize an area that needs to be addressed (Miller & Vasan, 2021). Furthermore, an in-depth investigation towards the effect of **when** Medicaid expansion was implemented by state on health status could offer an explanation for the presence of worse outcomes within these residence-policy overlaps. It is possible that post-expansion there is a period where no changes are observed at the population-level, due to the time it takes for the policy to be rolled out.

8. Limitations

This study has several limitations we must note. First, we need to recognize that many measures are employed in health scholarship to capture rural contexts (Bennett et al., 2019; Hall et al., 2006). Our measure is only one of the many variables available and used to capture residential context, and studies that used more detailed measures continue showing a rural disparity (Walker & Brown, 2022). We are limited in our ability to implement any other measures due to using the public-use CPS, which suppresses many of the county level identifiers needed to merge our data with any other measures employed in this line of work. We are confident in our findings given that the rural disadvantage persists in past scholarship, regardless of which measure is employed. Second, and related to the first point, we are using the

publicly available CPS, thus our residence-policy overlap measure does not fully capture the heterogeneity of nonmetropolitan areas. This has been discussed in the measures section and in the first point. We note the issue of rural heterogeneity in the US. That is, rural areas may differ or reflect distinct historical, social and socioeconomic contexts (Klotter, 1980). For example, rural areas in the South, West or the Appalachian region have notably different historical legacies, socioeconomic characteristics, and economic structure and issues related to health access. Past work has found that the rural South exhibits worse mortality than other rural areas (Miller & Vasan, 2021) and heterogeneity in rural opioid-related mortality (Rigg et al., 2018). Further, recent work by Slack and Monnat (2024) has provided a comprehensive overview of these matters, underscoring the importance of considering rural heterogeneity in future work (Slack & Monnat, 2024). Third, this analysis is based on cross-sectional data, thus causality cannot be inferred. Fourth, whether a state has expanded Medicaid may be more indicative of a broader health policy context. Examining how various state-level policies and the states' responsibility for health mandates within these residence-policy overlaps could further inform the effects observed in our results. To account for potential state-level influences we account for two state-level measures of access to care. Finally, our health measure is collected through self-report and may be subject to bias. Further research is needed to determine whether this finding holds when objective health measures are employed.

9. Conclusion

In this multi-level analysis of a nationally representative sample of working-age adults in the US, we found that people residing in nonmetropolitan areas within states that have yet to implement the Medicaid expansion report poor/fair health status at higher rates than their counterparts living in other residence-policy overlaps. In particular, we find that people living in nonmetropolitan areas exhibit worse health than those living in metropolitan areas; however, this disparity is magnified within non-expansion states. Our findings highlight that residential setting and policy context may lead to double vulnerability for residents in these areas. By addressing this double vulnerability, we can take steps to preserve population health and well-being.

CRediT authorship contribution statement

Michael D. Segovia: Writing – review & editing, Writing – original draft, Methodology, Investigation, Formal analysis, Data curation. **P. Johnelle Sparks:** Writing – review & editing, Methodology. **Alexis R. Santos-Lozada:** Writing – review & editing, Writing – original draft, Supervision, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization.

Ethics approval

This study was deemed non-human research by the Institutional Review Board at the Pennsylvania State University (STUDY00023272).

Relationships

There are no additional relationships to disclose.

Patents and intellectual property

There are no patents to disclose.

Other activities

There are no additional activities to disclose.

Financial disclosure statement

The authors have no financial interests to disclose.

Declaration of competing interest

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.ssmph.2025.101798.

Data availability

All data are available through IPUMS CPS. Data user agreement precludes storage of data in a repository. All code is available upon request.

References

Befort, C. A., Nazir, N., & Perri, M. G. (2012). Prevalence of obesity among adults from rural and urban areas of the United States: Findings from NHANES (2005-2008). *The Journal of Rural Health, 28*(4), 392–397. https://doi.org/10.1111/j.1748-0361.2012.00411.x

Bennett, K. J., Borders, T. F., Holmes, G. M., Backes Kozhimannil, K., & Ziller, E. (2019). What is rural? Challenges and implications of definitions that inadequately encompass rural people and places. *Health Affairs, 38*(12), 1985–1992. https://doi.org/10.1377/hlthaff.2019.00910

Boersma, P., Black, L. I., & Ward, B. W. (2020). Prevalence of multiple chronic conditions among US adults, 2018. *Preventing Chronic Disease, 17*, Article E106. https://doi.org/10.5888/pcd17.200130

Chatterjee, P., Lin, Y., & Venkataramani, A. S. (2022). Changes in economic outcomes before and after rural hospital closures in the United States: A difference-in-differences study. *Health Services Research, 57*(5), 1020–1028. https://doi.org/10.1111/1475-6773.13988

Cosby, A. G., Maya McDoom-Echebiri, M., James, W., Khandekar, H., Brown, W., & Hanna, H. L. (2019). Growth and persistence of place-based mortality in the United States: The rural mortality penalty. *American Journal of Public Health, 109*(1), 155–162. https://doi.org/10.2105/AJPH.2018.304787

Cosby, A. G., Neaves, T. T., Cossman, R. E., Cossman, J. S., James, W. L., Neal, F., Mirvis, D. M., Jones, C. A., & Farrigan, T. (2008). Preliminary evidence for an emerging nonmetropolitan mortality penalty in the United States. *American Journal of Public Health, 98*(8), 1470–1472. https://doi.org/10.2105/AJPH.2007.123778

Courtemanche, C., Marton, J., Ukert, B., Yelowitz, A., & Zapata, D. (2017). Early impacts of the affordable care Act on health insurance coverage in Medicaid expansion and non-expansion states. *Journal of Policy Analysis and Management, 36*(1), 178–210. https://doi.org/10.1002/pam.21961

Darney, B. G., Lorie Jacob, R., Hoopes, M., Rodriguez, M. I., Hatch, B., Marino, M., Templeton, A., Oakley, J., & Cottrell, E. K. (2020). Evaluation of Medicaid expansion under the affordable care Act and contraceptive care in US community health centers. *JAMA Network Open, 3*(6). https://doi.org/10.1001/jamanetworkopen.2020.6874

Davis, J. C., Cromartie, J., Farrigan, T., Genetin, B., Sanders, A., & Winikoff, J. B. (2023). *Rural America at a glance: 2023 edition (Report No.* U.S. Department of Agriculture, Economic Research Service. https://doi.org/10.32747/2023.8134362.ers

Doogan, N. J., Roberts, M. E., Wewers, M. E., Stanton, C. A., Keith, D. R., Gaalema, D. E., Kurti, A. N., Redner, R., Cepeda-Benito, A., Bunn, J. Y., Lopez, A. A., & Higgins, S. T. (2017). A growing geographic disparity: Rural and urban cigarette smoking trends in the United States. *Special Issue: Behavior Change, Health, and Health Disparities, 104*, 79–85. https://doi.org/10.1016/j.ypmed.2017.03.011

Douthit, N., Kiv, S., Dwolatzky, T., & Biswas, S. (2015). Exposing some important barriers to health care access in the rural USA. *Public Health, 129*(6), 611–620. https://doi.org/10.1016/j.puhe.2015.04.001

Eliason, E. L. (2020). Adoption of Medicaid expansion is associated with lower maternal mortality. *Women's Health Issues, 30*(3), 147–152. https://doi.org/10.1016/j.whi.2020.01.005

Flood, S., King, M., Rodgers, R., Ruggles, S., Robert Warren, J., Backman, D., Chen, A., Cooper, G., Richards, S., Schouweiler, M., & Westberry, M. (2023). *Ipums CPS: Version 11.0*. IPUMS. https://doi.org/10.18128/D030.V11.0

Gandhi, K., Lim, E., Davis, J., & Chen, J. J. (2020). Racial-ethnic disparities in self-reported health status among US adults adjusted for sociodemographics and multimorbidities, national health and nutrition examination survey 2011–2014. *Ethnicity and Health, 25*(1), 65–78. https://doi.org/10.1080/13557858.2017.1395812

Glasgow, N., & Brown, D. L. (2012). Rural ageing in the United States: Trends and contexts. *Growing Old in Rural Places, 28*(4), 422–431. https://doi.org/10.1016/j.jrurstud.2012.01.002

Glover, S., Moore, C. G., Probst, J. C., & Samuels, M. E. (2004). Disparities in access to care among rural working-age adults. *The Journal of Rural Health, 20*(3), 193–205. https://doi.org/10.1111/j.1748-0361.2004.tb00029.x

Goodman, L. (2017). The effect of the affordable care Act Medicaid expansion on migration. *Journal of Policy Analysis and Management, 36*(1), 211–238. https://doi.org/10.1002/pam.21952

Hall, S. A., Kaufman, J. S., & Ricketts, T. C. (2006). *Defining urban and rural areas in U.S. Epidemiologic studies* (Vol. 83).

Han, X., Luo, Q., & Ku, L. (2017). Medicaid expansion and grant funding increases helped improve community health center capacity. *Health Affairs, 36*(1), 49–56. https://doi.org/10.1377/hlthaff.2016.0929

Higgins, S. T. (2021). Behavior change, health, and health disparities 2021: Rural addiction and health. *Behavior Change, Health, and Health Disparities 2021: Rural Addiction and Health, 152*, Article 106834. https://doi.org/10.1016/j.ypmed.2021.106834

Homan, P., Brown, T. H., & King, B. (2021). Structural intersectionality as a new direction for health disparities research. *Journal of Health and Social Behavior, 62*(3), 350–370. https://doi.org/10.1177/00221465211032947

Jensen, L., Monnat, S. M., Green, J. J., Hunter, L. M., & Sliwinski, M. J. (2020). Rural population health and aging: Toward a multilevel and multidimensional research agenda for the 2020s. *American Journal of Public Health, 110*(9), 1–4. https://doi.org/10.2105/AJPH.2020.305782

Jylha, M. (2009). What is self-rated health and why does it predict mortality? Towards a unified conceptual model. *Social Science & Medicine, 69*, 307–316. https://doi.org/10.1016/jsocscimed.2009.05.013

Kandula, N. R., Lauderdale, D. S., & Baker, D. W. (2007). Differences in self-reported health among asians, latinos, and non-hispanic whites: The role of language and nativity. *Annals of Epidemiology, 17*(3), 191–198. https://doi.org/10.1016/j.annepidem.2006.10.005

Kaufman, B. G., Reiter, K. L., Pink, G. H., & George, M. H. (2016). Medicaid expansion affects rural and urban hospitals differently. *Health Affairs, 35*(9), 1665–1672. https://doi.org/10.1377/hlthaff.2016.0357

Kaufman, B. G., Thomas, S. R., Randolph, R. K., Perry, J. R., Thompson, K. W., Holmes, G. M., & Pink, G. H. (2016). The rising rate of rural hospital closures. *The Journal of Rural Health, 32*(1), 35–43. https://doi.org/10.1111/jrh.12128

Kemp, B. R., Grumbach, J. M., & Montez, J. K. (2022). U.S. State policy contexts and physical health among midlife adults. *Socius, 8*, Article 23780231221091324. https://doi.org/10.1177/23780231221091324

KFF. (2022). Total hospital. *State Health Facts*. Retrieved February 9, 2025 https://www.kff.org/other/state-indicator/total-hospital-beds/.

KFF. (2024). Status of state Medicaid expansion decisions: Interactive map. *Affordable Care Act*. https://www.kff.org/affordable-care-act/issue-brief/status-of-state-medicaid-expansion-decisions-interactive-map/. (Accessed 8 May 2024).

Klotter, J. C. (1980). The Black South and white appalachia. *Journal of American History, 66*(4), 832–849. https://doi.org/10.2307/1887639

Kobayashi, L. C., Altindag, O., Truskinovsky, Y., & Berkman, L. F. (2019). Effects of the affordable care Act Medicaid expansion on subjective well-being in the US adult population, 2010–2016. *American Journal of Public Health, 109*, 1236–1242. https://doi.org/10.2105/AJPH.2019.305164

Laditka, J. N., Laditka, S. B., & Probst, J. C. (2009). Health care access in rural areas: Evidence that hospitalization for ambulatory care-sensitive conditions in the United States may increase with the level of rurality. *Health & Place, 15*(3), 761–770. https://doi.org/10.1016/j.healthplace.2008.12.007

Lee, H., & Porell, F. W. (2020). The effect of the affordable care Act Medicaid expansion on disparities in access to care and health status. *Medical Care Research and Review, 77*(5), 461–473. https://doi.org/10.1177/1077558718808709

Lego, V.di, Lazarevic, P., & Luy, M. (2020). The male-female health- mortality paradox. *Encyclopedia of Gerontology and Population Aging, 1–8*.

Li, X., & Zhang, C. (2024). Spatiotemporal trends of poverty in the United States, 2006–2021. *Applied Spatial Analysis and Policy, 18*(1), 3. https://doi.org/10.1007/s12061-024-09604-8

Mayer, J. D., Kohlenberg, E. R., Eric Sieferman, G., & Rosenblatt, R. A. (1987). Patterns of rural hospital closure in the United States. *Social Science & Medicine, 24*(4), 327–334. https://doi.org/10.1016/0277-9536(87)90151-1

Mazurenko, O., Balio, C. P., Agarwal, R., Carroll, A. E., & Menachemi, N. (2018). The effects of Medicaid expansion under the ACA: A systematic review. *Health Affairs, 37*(6), 944–950. https://doi.org/10.1377/hlthaff.2017.1491

McCarthy, S., Moore, D., Andrew Smedley, W., Crowley, B. M., Stephens, S. W., Griffin, R. L., Tanner, L. C., & Jansen, J. O. (2021). Impact of rural hospital closures on health-care access. *Journal of Surgical Research, 258*, 170–178. https://doi.org/10.1016/j.jss.2020.08.055

Mewes, J., & Nicola Giordano, G. (2017). Self-rated health, generalized trust, and the affordable care Act: A US panel study, 2006–2014. *Social Science & Medicine, 190*, 48–56. https://doi.org/10.1016/j.socscimed.2017.08.012

Miller, C. E., & Vasan, R. S. (2021). The southern rural health and mortality penalty: A review of regional health inequities in the United States. *Social Science & Medicine, 268*(October 2020), Article 113443. https://doi.org/10.1016/j.socscimed.2020.113443

Monnat, S. M., & Pickett, C. B. (2011). Rural/urban differences in self-rated health: Examining the roles of county size and metropolitan adjacency. *Health & Place, 17*(1), 311–319. https://doi.org/10.1016/j.healthplace.2010.11.008

Monnat, S. M., & Rigg, K. K. (2016). Examining rural/urban differences in prescription opioid misuse among US adolescents. *The Journal of Rural Health, 32*(2), 204–218. https://doi.org/10.1111/jrh.12141

Montez, J. K., Beckfield, J., Kemp Cooney, J., Grumbach, J. M., Hayward, M. D., Koytak, H. Z., Woolf, S. H., & Zajacova, A. (2020). US state policies, politics, and life expectancy. *The Milbank Quarterly, 98*(3), 668–699. https://doi.org/10.1111/1468-0009.12469

Montez, J. K., Cheng, K. J., & Grumbach, J. M. (2023). Electoral democracy and working-age mortality. *The Milbank Quarterly, 101*(3), 700–730. https://doi.org/10.1111/1468-0009.12658

Montez, J. K., & Grumbach, J. M. (2023). US state policy contexts and population health. *The Milbank Quarterly, 101*(S1), 196–223. https://doi.org/10.1111/1468-0009.12617

Mueller, J. T., Baker, R. S., & Brooks, M. M. (2024). The uneven impact of Medicaid expansion on rural and urban Black, latino/a, and white mortality. *The Journal of Rural Health*. https://doi.org/10.1111/jrh.12859

Obama, B. (2016). United States health care reform: Progress to date and next steps. *JAMA, the Journal of the American Medical Association, 316*(5), 525–532. https://doi.org/10.1001/jama.2016.9797

Reynolds, G. L., & Fisher, D. G. (2020). The role of the Medicaid expansion in the use of preventive health care services in California men. *American Journal of Men's Health, 14*(1), Article 1557988320903193. https://doi.org/10.1177/1557988320903193

Rhubart, D. C. (2017). Identifying associations between state Medicaid expansion decisions and spatial disparities in county insurance rate changes under the affordable care Act. *Population Research and Policy Review, 36*(1), 109–135. https://doi.org/10.1007/s11113-016-9414-0

Rhubart, D., Kowalkowski, J., & Yerger, J. (2023). Rural-urban disparities in self-reported physical/mental multimorbidity: A cross-sectional study of self-reported mental health and physical health among working age adults in the U.S. *Journal of Multimorbidity and Comorbidity, 13*, Article 26335565231218560. https://doi.org/10.1177/26335565231218560

Rhubart, D. C., & Monnat, S. M. (2022). Self-rated physical health among working-aged adults along the rural-urban continuum — United States, 2021. *Morbidity and Mortality Weekly Report Recommendations and Reports, 71*(5), 161–166. https://doi.org/10.15585/mmwr.mm7105a1

Rhubart, D. C., Monnat, S. M., Jensen, L., & Pendergrast, C. (2021). The unique impacts of U.S. Social and health policies on rural population health and aging. *Public Policy & Aging Report, 31*(1), 24–29. https://doi.org/10.1093/ppar/praa034

Rhubart, D. C., & Santos-Lozada, A. R. (2023). Research note showing the rural mortality penalty varies by region and race/ethnicity in the United States, 1999-2016. *Demography, 60*(6), 1699–1709. https://doi.org/10.1215/00703370-11078239

Rigg, K. K., Monnat, S. M., & Chavez, M. N. (2018). Opioid-related mortality in rural America: Geographic heterogeneity and intervention strategies. *International Journal of Drug Policy, 57*, 119–129. https://doi.org/10.1016/j.drugpo.2018.04.011

Santos-Lozada, A. R., Howard, J. T., Monnat, S., Sliwinski, M. J., & Jensen, L. (2023). Age differences in allostatic load among adults in the United States by rural-urban residence. *SSM - Population Health, 23*, Article 101442. https://doi.org/10.1016/j.ssmph.2023.101442

Slack, T., & Monnat, S. M. (2024). *Rural and small-town America: Context, composition, and complexities* (Vol. 9). Univ of California Press.

Sparks, P. J. (2011). Rural health disparities. In *International handbook of rural demography* (pp. 255–271). Springer.

StataCorp. (2023). *Stata statistical software: Release 18*. College Station, TX Stata Corp LLC.

Thiede, B., Kim, H., & Valasik, M. (2018). The spatial concentration of America's rural poor population: A postrecession update. *Rural Sociology, 83*(1), 109–144. https://doi.org/10.1111/ruso.12166

Thompson, O. (2017). Black–white differences in self-rated health, 1972–2015. *Economics Letters, 154*, 69–73. https://doi.org/10.1016/j.econlet.2017.02.026

Trivedi, T., Liu, J., Probst, J. C., & Martin, A. B. (2013). The metabolic syndrome: Are rural residents at increased risk? *The Journal of Rural Health, 29*(2), 188–197. https://doi.org/10.1111/j.1748-0361.2012.00422.x

U.S. Census Bureau. (2022). *American community survey, ACS 1-year estimates detailed tables, table B01003*.

Viruell-Fuentes, E.a, Morenoff, J. D., Williams, D. R., & House, J. S. (2011). Language of interview, self-rated health, and the other latino health puzzle. *American Journal of Public Health, 101*(7), 1306–1313. https://doi.org/10.2105/AJPH.2009.175455

Walker, B. H., & Brown, D. C. (2022). Trends in lifespan variation across the spectrum of rural and urban places in the United States, 1990–2017. *SSM - Population Health, 19*(August), Article 101213. https://doi.org/10.1016/j.ssmph.2022.101213

Woo, H., & Zajacova, A. (2017). Predictive strength of self-rated health for mortality risk among older adults in the United States: Does it differ by race and ethnicity? *Research on Aging, 39*(7), 879–905. https://doi.org/10.1177/0164027516637410

Zajacova, A., Huzurbazar, S., & Todd, M. (2017). Gender and the structure of self-rated health across the adult life span. *Social Science & Medicine, 187*, 58–66. https://doi.org/10.1016/j.socscimed.2017.06.019

Zajacova, A., & Siddiqi, A. (2022). A comparison of health and socioeconomic gradients in health between the United States and Canada. *Social Science & Medicine, 306*, Article 115099. https://doi.org/10.1016/j.socscimed.2022.115099