Explaining Rural/Non-rural Disparities in Physical Health-Related Quality of Life: A Study of United Methodist Clergy in North Carolina

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Purpose: *Researchers have documented lower health-related quality of life (HRQL) in rural areas. This study seeks to identify factors that can explain this disparity.*
Methods: *United Methodist clergy in North Carolina (N = 1,513) completed the SF-12 measure of HRQL and items on chronic disease diagnoses, health behaviors, and health care access from the Behavioral Risk Factor Surveillance Survey (BRFSS). Differences in HRQL between rural (N = 571) and non-rural clergy (N = 942) were examined using multiple regression analyses.*
Results: *Physical HRQL was significantly lower for rural clergy (-2.0; 95% CI: -2.9 to -1.1; P < 0.001). Income, body mass index, and joint disease partially accounted for the rural/non-rural difference, though a sizable disparity remained after controlling for these mediators (-1.02; 95% CI: -1.89 to -.15; P = 0.022). Mental HRQL did not differ significantly between rural and non-rural respondents (1.0, 95% CI: -0.1 to 2.1; P = 0.067).*
Conclusions: *Rural/non-rural disparities in physical HRQL are partially explained by differences in income, obesity, and joint disease in rural areas. More research into the causes and prevention of these factors is needed. Researchers also should seek to identify variables that can explain the difference that remains after accounting for these variables.*

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To date, scholars studying rurality and health-related quality of life (HRQL) have shown that rural areas generally draw the short end of the stick. Weeks and colleagues, for instance, document that veterans in rural areas exhibit lower HRQL than those located in suburban or urban areas and that these differences hold across many geographic contexts and disease categories [1, 2]. In a study of counties in Alabama, Kovac and colleagues verify that disparities exist along the rural/urban divide and argue that these differences are unequally distributed along racial lines, with rural Caucasians exhibiting the lowest HRQL [3]. Oguzturk likewise demonstrates rural/urban differences and identifies factors that negatively correlate with HRQL, including male gender, smoking, age, body mass index (BMI), psychological distress, and, surprisingly, income [4].

While the literature demonstrates a persistent HRQL difference between rural and urban areas, studies have not identified mechanisms underlying this disparity. Weeks and colleagues suggest that rural differences may be due to lower levels of healthcare access or other environmental and social factors, but have not presented data on these [1, 2]. Kovac and colleagues similarly do not identify reasons rural residents-- rural Caucasians in particular--manifest worse HRQL [3]. Oguzturk identifies predictors of HRQL, but notes that this does not explain *why* rural residents' have lower HRQL [4].

Extant studies also do not establish whether the observed rurality/HRQL relationship is causal [1-4]. Theoretically, differences in HRQL could be the result of selection processes, culture, and/or genuine influences from the rural context. In the selection scenario, causal connections are spurious, and rural areas may exhibit lower overall HRQL because a disproportionate number of individuals who come to live there are already unhealthy. This could be due to self-selection or the concentration of disadvantaged sub-groups in rural areas [5]. Another possible explanation is that rural culture(s) encourage behaviors that impede health (e.g., poor dietary habits). In this case, rural culture may be the causal force, and lower health would be expected among those socialized into “rural” ways of living regardless of their actual geographic location. A final possibility is that the rural context itself influences health. Explanations of this type often focus on limited availability of resources in rural areas (e.g. healthcare access, home care services) [6-13]. Contextual explanations logically suggest that rural living should have negative effects on the HRQL of rural residents regardless of their prior health or cultural orientation. Prolonged exposure to these contextual elements could compound their influence, resulting in worse health outcomes for those living in a rural environment for the longest time.

This study aims to take the next step in rural studies of HRQL by identifying factors that mediate the rural/non-rural disparity in HRQL in a sample of United Methodist clergy, a unique population that provides leverage on the question of causality. Understanding the mechanisms underlying the relationship between rurality and health is essential for developing effective health promotion programs for rural communities.

METHODS

Data

Data sources are: 1) the public records of the North Carolina (NC) and Western NC conferences of the United Methodist Church (UMC) and 2) the Clergy Health Initiative survey, a study of the health of UMC clergy conducted in 2008. Participation in the survey was offered to all UMC clergy currently serving in the NC and Western NC conferences in July 2008 (N=1,820). Of these, 1,726 participated (95%). For analyses, we excluded participants with missing data (n=158), those who conflicted with other respondants on perception of church rurality (n=40), and those without health insurance (n=15; final N=1,513). The Duke University Institutional Review Board approved all procedures.

The United Methodist church employs several types of clergy. While most pastors are elders - the seminary-trained main professional body of the church - a sizable minority are local or retired pastors. Local pastors are unordained and often work on a part-time basis. Retired pastors have returned from retirement to fill a clergy shortage and also frequently work part-time. Because local and retired clergy have been shown to have markedly different experiences from other clergy, are overrepresented in rural areas, and itinerate differently, we control for local/retired clergy status in the analyses.

UMC clergy are uniquely appropriate for identifying contextual sources of HRQL disparities, even in a cross-sectional sample. This is because they itinerate, or are periodically relocated by the bishop of each conference, to serve different congregations across a wide geographic area. Therefore, clergy do not self-select into rural areas. Itinerancy also helps reduce the possibility of cultural explanations for rural/non-rural differences, as pastors who were raised in rural areas are not necessarily serving in rural churches. While itineration is *not* equivalent to random assignment of clergy to rural and non-rural conditions, it represents a step in that direction. Selection still occurs, of course, in that bishops control appointments (e.g., some bishops may know pastors' preferences), but there is little to indicate that these assignments *systematically* locate clergy with low HRQL in rural areas. Instead, bishops likely weigh economic considerations when making appointments. Elders in the United Methodist Church receive a minimum compensation based on their years of service [14], and churches are partially responsible for paying the salaries of their clergy. Therefore, the typical path of career advancement is from smaller (often rural) churches towards larger (often non-rural) ones. Additionally, bishops disproportionately assigned local or retired pastors in our sample to rural areas, possibly because they often work only part-time. For our purposes it is unlikely that these selection processes would systematically assign less healthy pastors to rural areas. However, we control for these potential confounds with the goal of identifying mediators that likely operate via contextual rather than selection or cultural processes.

Measures

Rurality

The primary independent variable is *Rural,* a dichotomous variable measured by one item asking participants to indicate the setting of their church. Responses marked "rural or open country" were coded as rural and others were coded as non-rural, as we do not distinguish between suburban and urban. Pastors from the same church who disagreed on rurality were excluded (n=40). Over one-third (38%) of participants were classified as rural (n=571).

This self-report measure of rurality was chosen because other measures had little to no predictive power in even very basic analyses to assess differences consistently documented in the rural health literature (e.g., obesity). We suspect several possible reasons for this. First, most measures rely on 2000 Census data which are likely not reflective of community characteristics in 2008. Second, many Census-based definitions measure rurality at the county or zip code level, which imposes artificial geographic boundaries that may not accurately reflect the immediate vicinity of the churches [2, 8, 9, 15]. This self-report measure addresses these challenges by capturing the surroundings of each church at the time of the survey, albeit subjectively.

Health-Related Quality of Life

HRQL was measured with the Medical Outcomes Study (MOS) Short Form (SF)-12. The MOS SF-12 is a 12-item health functioning measure that yields physical health (*PCS*) and mental health (*MCS*) component scores. Scores were normed on the US population and range from 0 to 100 with 50 indicating average health (SD=10). The SF-12 is widely used and has good reliability, internal consistency, construct validity, and discriminate validity [16-19].

Demographics

Gender, race, and marital status are dichotomous and recorded as variables: *Female, Black,* and *Married*. Educational attainment is measured by three dichotomous variables: *High School (HS) or less, College or some college*, and *Advanced degree*. *Age* is reported in years. *Discretionary income* is yearly household income after payments on educational, credit card, and other debts (not including mortgages and car loans); values are divided by 1000 for ease of presentation (Table 2) and are logged in subsequent analyses to correct for skewness. We used discretionary rather than total income because it better represents the amount respondents could spend on high-quality food, gym memberships, and other health-relevant items not covered by health insurance.

Health Measures

Indicators of both mental and physical health were measured. The Hospital Anxiety and Depression Scale (HADS) was used to measure Anxiety. Scores range from 0 to 21 [20]; *Anxious* is a dichotomous variable coded 1 for a score of 8 or higher [21]. Depression was assessed using the Patient Health Questionnaire (PHQ-9). *Depressed* is coded as 1 for scores of 10 or higher based on previous validation studies [22, 23]. *BMI* is body mass index (BMI) calculated by dividing weight in kilograms by height in meters squared.

Joint disease, *Diabetes*, *High blood pressure*, *Heart attack*, *Asthma,* and *Heart disease* are dichotomous variables with 1 indicating ever having been diagnosed with the condition. *Joint disease* indicates "some form of arthritis, rheumatoid arthritis, gout, lupus, or fibromyalgia," and *Heart disease* indicates "angina or coronary heart disease." Items are from the Behavioral Risk Factor Surveillance System (BRFSS). *Social support* is an ordinal variable assessed with the question "How often do you get the social and emotional support you need?"; answers ranged from 1="Never" to 5="Always."

Health Behaviors

All health behaviors were assessed with self-report items using wording from the BRFSS. *Vigorous activity* is number of hours per week participating in any activity "that causes large increases in breathing or heart rate." *Alcohol* is the number of alcoholic drinks consumed in the 30 days prior to the survey; this is untransformed in Table 1 but logged in analyses to correct for skewness. *Ever smoked* is a dichotomous indicator of whether a respondent has smoked "at least 100 cigarettes in [his/her] entire life." Consumption habits are measured with dichotomous items; *Healthy foods* is coded 1 for individuals reporting they are "very likely" or "somewhat likely" to "choose foods or beverages labeled as healthy". *Healthy drinks* is coded 1 for individuals reporting they most often drink nutritious beverages (i.e., water, 1% or 2% milk, or 100% fruit juice).

Healthcare Access

Several dichotomous measures of access to healthcare are included that correspond to methods typically used to assess healthcare accessibility [8, 9, 11]. *Cost prevented doctor visit* measures whether or not respondents were prevented from seeing a doctor during the previous year because of cost. *Professional shortage* indicates whether or not respondents live in a county designated all or in part as a Persistent Health Professional Shortage Area [24]. *Checkup in last year* indicates whether respondents visited the doctor for a routine check-up in the previous year. The variables *Usual care: none*, *Usual care: 1 source*, and *Usual care: more than 1* are mutually exclusive and derived from the question, "Do you have one person you think of as your personal doctor or healthcare provider?" With the exception of 15 participants whom we excluded, everyone in our sample was insured.

Time in rural area

The variable *Years in church* (not included in Table 1) reports the number of years that a respondent has served his/her current church. *Rural X Years in church* is an interaction term in which *Years in church* is logged to correct for skewness; this approximates time spent in a rural church and, by extension, a rural environment.

Controls

Local and *Retired* are dichotomous measures of whether a pastor is classified as a local and/or retired pastor, respectively. *Time in ministry* gives the square root of the number of years respondents have served as pastors; the square-root transformation is used to correct for skewness.

Analytic Approach

We first identify significant differences between rural and non-rural respondents on variables previously shown to be relevant to HRQL and health more generally, including social support, health behaviors, and healthcare access, using t-tests and Fisher's exact tests for proportions [2-4, 8, 9, 11]. Analyses are adjusted for local and retired clergy status and time in ministry, and only the significantly different variables are retained. We then use multiple regression to determine if these variables mediate the direct relationship between rurality and HRQL (i.e. if they act as indirect effects) [25, 26]. A final model tests the hypothesis that the negative relationship of rurality with HRQL strengthens as time spent in a rural area (i.e. serving in a rural church) increases. All models control for age and the adjustment variables listed above and are corrected for heteroskedasticity using a version of White's robust standard errors [27]. All analyses are performed using R v. 2.9.2 [28-35].

RESULTS

TABLE 1: HRQL FOR RURAL AND NON-RURAL UMC CLERGY

	Rural (N=571)	**Non-rural** (N=942)	**Difference** (95% CI)	**P-value**	**Adjusted Difference**[a] (95% CI)	**P-value**
	M ± SD	M ± SD				
Physical HRQL	49.9 ± 9.3	52.2 ± 7.7	-2.3 (-3.2, -1.4)	<0.001	-2.0 (-2.9, -1.1)	<0.001
Mental HRQL	51.7 ± 9.0	49.6 ± 10.1	2.0 (1.1, 3.0)	<0.001	1.0 (-0.1, 2.1)	0.067

Total N = 1,513; means and standard deviations given
CI = 95% confidence interval for differences
[a]Adjusted for local and retired clergy status, and time in ministry

Table 1 presents the means and standard deviations for physical and mental HRQL for both rural and non-rural respondents. After adjustments, rural clergy score 2.0 points lower on physical HRQL ($p < .001$) but are not significantly different from non-rural pastors on mental HRQL ($p = .067$). We therefore restrict the remaining mediation analyses to physical HRQL.

TABLE 2: RURAL/NON-RURAL DESCRIPTIVE STATISTICS, DIFFERENCES, AND ADJUSTED DIFFERENCES FOR UMC CLERGY

	Rural (N = 571)[a]	Non-rural (N = 942)[a]	Difference (95% CI)	P-value	Adjusted Difference[b] (95% CI)	P-value
Continuous Variables	M ± SD	M ± SD				
Age	54.1 ± 11.1	51.4 ± 10.5	2.7 (1.5, 3.8)	<.001	1.9 (1.0, 2.8)	<.001
Discretionary income ($1000)	72.0 ± 42.7	89.6 ± 46.3	-17.6 (-22.2, -13.0)	<.001	-8.1 (-12.9, -3.3)	.001
BMI	30.1 ± 6.3	29.3 ± 6.0	.8 (.2, 1.5)	.014	.9 (.3, 1.6)	.007
Social support	3.9 ± .9	3.9 ± .8	.1 (.0, .2)	.113	.0 (-.1, .1)	.738
Vigorous activity	1.8 ± 3.5	2.1 ± 3.5	-.3 (-.7, .1)	.091	-.3 (-.6, .1)	.211
Alcohol	2.3 ± 7.0	6.0 ± 16.1	-3.7 (-4.9, -2.5)	<.001	-3.0 (-4.5, -1.5)	<.001
Proportions	% (N)	% (N)				
Female	24.0 (137)	25.3 (238)	-1.3 (-5.9, 3.3)	.623	-3.3 (-8.9, 2.4)	.255
Black	6.2 (35)	6.9 (65)	-.7 (-3.5, 2.0)	.595	-2.0 (-5.2, 1.2)	.216
Married	84.6 (483)	86.2 (812)	-1.6 (-5.4, 2.2)	.406	-2.4 (-8.9, 4.1)	.474
Education						
HS or less	3.9 (22)	1.9 (18)	1.9 (.0, 3.9)	.031	-.2 (-.8, .5)	.605
College	37.3 (213)	19.8 (186)	17.6 (12.7, 22.4)	<.001	4.7 (.7, 8.7)	.022
Advanced degree	58.8 (336)	78.3 (738)	-19.5 (-24.5, -14.5)	<.001	-4.5 (-8.9, -.2)	.043
Anxious	11.2 (64)	14.9 (140)	-3.7 (-7.3, -.1)	.044	-.7 (-5.3, 3.9)	.764
Depressed	7.4 (42)	11.5 (107)	-4.1 (-7.2, -1.0)	.010	-3.0 (-7.7, 1.8)	.219
Joint disease	42.0 (240)	30.9 (291)	11.1 (6.0, 16.3)	<.001	6.8 (2.6, 10.9)	.001
Diabetes	16.1 (92)	13.4 (126)	2.7 (-1.1, 6.6)	.152	.2 (-1.2, 1.5)	.796
High blood pressure	39.6 (226)	33.5 (315)	6.1 (1.0, 11.3)	.017	2.7 (-.5, 5.8)	.097
Heart disease	7.1 (40)	6.1 (57)	1.0 (-1.8, 3.7)	.451	-.1 (-.4, .2)	.571
Heart attack	5.6 (32)	2.9 (27)	2.8 (.4, 5.1)	.009	.1 (-.2, .4)	.545
Asthma	6.3 (36)	6.8 (64)	-.5 (-3.2, 2.2)	.750	-.9 (-5.3, 3.6)	.706
Ever smoked	5.3 (30)	4.9 (46)	.4 (-2.1, 2.8)	.808	-.6 (-3.1, 1.8)	.611
Healthy foods	77.9 (445)	79.7 (751)	-1.8 (-6.2, 2.6)	.434	-2.4 (-7.5, 2.8)	.364
Healthy drinks	43.3 (247)	45.7 (430)	-2.4 (-7.7, 2.9)	.393	-2.5 (-8.0, 3.0)	.376
Cost prevented doctor visit	5.8 (33)	5.9 (56)	-.2 (-2.7, 2.4)	1.000	-.6 (-5.8, 4.6)	.834
Professional shortage	28.8 (161)	30.9 (278)	-2.1 (-7.1, 2.8)	.411	-2.8 (-7.6, 2.0)	.260
Checkup in last year	77.9 (445)	77.6 (731)	.3 (-4.1, 4.8)	.899	.3 (-5.9, 6.6)	.915
Usual source of care						
Usual care: none	8.9 (51)	8.2 (77)	.8 (-2.3, 3.8)	.634	1.4 (-6.9, 9.6)	.740
Usual care: 1 source	58.5 (334)	61.5 (579)	-3.0 (-8.2, 2.3)	.255	-3.5 (-9.3, 2.2)	.229
Usual care: more than 1	32.6 (186)	30.4 (286)	2.2 (-2.8, 7.2)	.391	2.5 (-1.9, 6.8)	.264

Total N = 1,513; means and standard deviations given for continuous variables, and percent of sample and sample size for proportions

[a]Sample size ranges from 560 to 571 (rural) and 900 to 942 (non-rural) due to pairwise deletion of missing data

CI = 95% confidence interval for differences

[b]Means and proportions adjusted for local and retired clergy status, and time in ministry

Table 2 shows descriptive data on the rural and non-rural portions of the sample, and reports statistical significance of differences before and after adjustments. Significant adjusted differences are found for education, discretionary income, BMI, prevalence of joint disease, and alcohol consumption, suggesting that these variables might mediate the rurality/physical HRQL relationship. Age also is significantly different and is included as a control variable in subsequent analyses. No significant differences are found for the remaining variables.

TABLE 3: REGRESSION OF MEDIATORS ON RURALITY

Logistic Models	Rural (Odds Ratio)	95% CI	P-value
College/some college	1.38	(1.06, 1.81)	0.019
Advanced degree	0.76	(0.58, 1.00)	0.053
Joint disease	1.41	(1.10, 1.79)	0.006

OLS Models	Rural (Estimate)	95% CI	P-value
Discretionary income (logged)	-0.07	(-0.12, -0.01)	0.022
BMI	0.85	(0.15, 1.55)	0.018
Alcohol (logged)	-0.34	(-0.45, -0.22)	0.000

Total N = 1,513

All models control for local and retired clergy status, time in ministry, and age

Table 3 shows the results of regressing each suspected mediator on rurality. With the exception of having an advanced degree, every model shows a significant relationship with rurality, suggesting that education, discretionary income, BMI, joint disease, and alcohol consumption *may* function as mediators for the observed rural/physical HRQL relationship, while the marginal significance of *Advanced degree* (p=.053) suggests that it might not.

TABLE 4: OLS REGRESSION MODELS OF PHYSICAL HRQL ON RURALITY

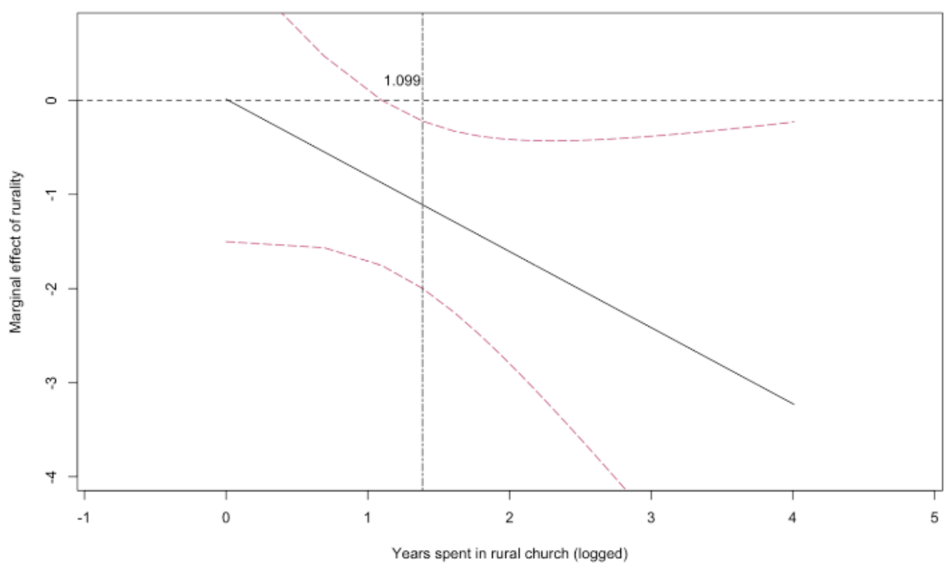
	Model 1			**Model 2**			**Model 3**		
	Estimate	95% CI	P-value	Estimate	95% CI	P-value	Estimate	95% CI	P-value
Rural	-1.71	(-2.64, -.77)	<.001	-1.02	(-1.89, -.15)	.022	.01	(-1.50, 1.53)	.987
Local status	-.74	(-1.94, .45)	.223	-.23	(-1.43, .97)	.707	-.20	(-1.41, 1.00)	.743
Retired status	-.21	(-2.53, 2.10)	.856	-.65	(-2.91, 1.60)	.569	-.66	(-2.92, 1.60)	.568
Time in ministry (sqrt)	-.06	(-.45, .32)	.752	-.17	(-.52, .19)	.360	-.14	(-.50, .22)	.447
Age	-.15	(-.20, -.10)	<.001	-.07	(-.12, -.02)	.005	-.07	(-.12, -.02)	.005
Education: College/some college				.26	(-2.69, 3.21)	.863	.22	(-2.74, 3.19)	.882
Education: Advanced degree				.46	(-2.48, 3.39)	.759	.39	(-2.56, 3.35)	.793
Discretionary income (logged)				1.21	(.38, 2.05)	.004	1.19	(.36, 2.01)	.005
BMI				-.33	(-.40, -.25)	<.001	-.33	(-.41, -.25)	<.001
Joint disease				-4.22	(-5.14, -3.29)	<.001	-4.20	(-5.12, -3.27)	<.001
Alcohol (logged)				.09	(-.26, .43)	.628	.08	(-.27, .42)	.653
Year in church (logged)							.19	(-.39, .76)	.524
Rural X Years in church							-.81	(-1.84, .22)	.122
Intercept	60.35	(58.25, 62.45)	<.001	53.32	(43.18, 63.45)	<.001	53.35	(43.28, 63.42)	<.001
adj. R^2	.055			.192			.192		

Total N = 1,513

CI = 95% confidence interval for estimate

Model 1 in Table 4 is the unmediated model. We tested goodness of fit for Model 1 by comparing it to an expanded version including all two-way interactions between control variables (not shown). A likelihood ratio test supports the adequacy of the simpler model's fit (D=4.42, p=.352). After adding the suspected mediators in Model 2, the magnitude of the *Rural* coefficient decreases from -1.71 ($p < .001$) to -1.02 (p=.022). The confidence intervals and p-values of the potential mediators suggest that discretionary income, BMI, and joint disease mediate the relationship between rurality and physical HRQL. The rural coefficient remains significant, however, indicating these variables only partially mediate the relationship.

FIGURE 1: MARGINAL EFFECT OF RURALITY ON PHYSICAL HRQL BY YEARS SERVING IN CURRENT CHURCH



Note: Solid line represents the marginal effect of rurality on physical HRQL; curved dashed lines represent 95% confidence intervals. The other two lines are included for convenience in interpreting the graph.

The final column in Table 4 addresses the question of whether the relationship between rurality and physical HRQL differs by amount of time spent in a rural area. The interaction term *Rural X Years in church* is not significant (p =.122), but this obscures the fact that including the interaction term makes both the effect size and its standard error depend on the value of *Years in church*. Following the technique outlined by Brambor and colleagues [37], we calculate the total marginal effect of rurality on physical HRQL for each value of *Years in church* and graph the result (Figure 1). This reveals that the negative relationship does strengthen in a statistically significant way as time spent in a rural area increases, but only after clergy have spent more than three years in a rural church (exponentiation of 1.099=3, p =.05).

DISCUSSION

To the best of our knowledge, no prior studies provide a quantitative examination of factors that may explain rural/non-rural disparities in HRQL. In this study, we find that clergy in rural areas exhibited an average of 2.0 points lower physical HRQL than those in non-rural areas. While a difference of 2.0 points seems relatively small, it is comparable to differences found in studies related to other health conditions. Studies have documented that individuals with musculoskeletal complaints report physical HRQL scores 2.0 points lower than controls, and people with asthma and irritable bowel syndrome both average 2.7 points lower than those without the conditions [36]. Differences in our study also are comparable to those found in previous studies of rurality and HRQL [1-4]. We therefore conclude that the lower physical HRQL scores among rural participants in this study are likely to be meaningful.

Results document that the rural/non-rural difference in physical HRQL is partially accounted for by the fact that rural respondents in our sample on average earn less money, have higher BMI scores (adjusted mean rural BMI = 28.7, in the overweight range), and report more cases of joint disease than their non-rural counterparts. These mediators reduce the magnitude of the average HRQL difference, but do not eliminate the relationship completely. This strongly suggests that other variables not captured in this study also play a role.

In addition to identifying mediators, this study provides limited evidence for a causal relationship between rurality and physical HRQL. It is interesting to consider HRQL among a population of people who are *assigned* to geographic locations. Of course, UMC pastors are not *randomly* assigned by bishops to churches, and many pastors who prefer urban areas are likely assigned to rural churches- especially early in their careers - and pastors never have full control over their church assignment. This fact makes it possible that the observed difference in physical HRQL may represent a genuine contextual effect of living in a rural area. Two additional considerations strengthen this interpretation. First, we employ a mediation approach in which reverse causation makes little sense theoretically. While it is conceivable that those in poor physical health select into rural areas, for instance, it is much less likely that being in poor physical health causes obesity, low income, *and* joint disease, and that these in turn cause people to live in rural environments. Although a narrative of reverse causation might possibly be constructed for any one of these pathways (ex. physical HRQL→ obesity→rural living), it seems unlikely that reverse causation credibly accounts for them all. Second, the interaction term *Rural X Years in church* shows a significant marginal effect of rurality on physical HRQL for clergy who have served in a rural church for more than 3 years. This delayed effect is consistent with the idea that changes in health take time and that clergy moving into a rural area likely do not immediately begin to suffer declines in physical HRQL. Combined, the mobility of the sample, use of a mediation approach, and evidence from the interaction term give a greater measure of causal credence to these analyses than can be found in prior studies.

Determining which factors contribute to lower levers of physical HRQL is an important first step in alleviating rural/non-rural health disparities. These analyses suggest, for instance, that effective health interventions should target rural obesity, joint disease, and poverty. Yet simply identifying these factors as mediating causes does not tell us *why* differences in these variables exist. In order to effectively address disparities in physical HRQL, we must first understand how rural contexts generate these differences so that intervention efforts can eliminate their root causes.

Work along these lines has already begun. For example, studies are investigating possible causes of higher rates of obesity in rural residents, such as dietary habits, levels of physical activity, or unavailability of nutritious foods [38-41]. Researchers also have begun to analyze joint disease by geographical context and, consistent with our results, have found that rural areas exhibit higher levels of joint disorders [2, 42, 43]. Joint conditions have been associated with contextual factors including pollutants, mechanical factors affecting the hands (e.g., occupational load), poverty and low education [44-46]. Lee and colleagues further note that obesity can contribute to joint problems [46], suggesting that factors driving differences in obesity levels might also be responsible for higher frequency of joint disease. We tested this link and found that BMI is significantly associated with joint disease in our sample (analyses available upon request). When the proportion of those diagnosed with joint disease (Table 2) is adjusted for BMI, the difference between rural and non-rural respondents drops from 6.8%

(*p*=.001) to 1.1% (*p*=.052).

Scholars also have demonstrated that rural areas are generally poorer than urban areas and that rural residents have fewer opportunities for economic mobility [47, 48]. One consequence of this is that rural churches have fewer resources. As UMC churches help pay clergy salaries, this lack of resources influences rural pastors' income. The observed rural/non-rural income disparity might also reflect the difficulty clergy spouses may have in obtaining suitable employment in rural areas [47].

While identifying discretionary income, body mass, and joint disease as mediators facilitates our understanding of rural/non-rural differences in health, we must also bear in mind that even after accounting for these variables, a sizable disparity remains. A close look at the Model 2 in Table 4 reveals that this unidentified factor has an average effect on physical HRQL equivalent to aging -1.02/-.07 = 14.6 years, or being 3.1 points higher on the BMI scale. Identifying the source(s) of this remaining disparity is an important task for future research.

While our study makes several important contributions to the study of rurality and physical HRQL, it is limited in a number of ways. First, our sample is drawn from North Carolina where residents may have health-related experiences that differ from those in other locations. In Oguzturk's Turkish sample, for instance, income was negatively tied to HRQL, whereas the association is positive in ours; this suggests that sample-specific variation may influence results. The benefit of a North Carolina sample, however, is that the state offers a good mix of rural and non-rural areas, providing us with a sufficient sample size to examine differences. Our sample also cannot definitively demonstrate causality given its cross-sectional nature, although its unique properties combined with our analytical design provide leverage that other cross-sectional studies do not. Our study did not include health-related variables that may have explained more of the variance in HRQL, such as measures of quality of care and perceived control over one's life circumstances, that researchers may want to consider in future studies. Future studies also should distinguish between types of rural context (ex. geographic vs. occupational) as each may exert a unique influence on health. Our inability to find differences reported in other studies- such as differences in mental HRQL–does not indicate that these differences do not exist, nor that they are not contributing to rural/non-rural disparities in health. Our results may simply suggest that these differences are less likely to be seen among a clergy sample, as they exhibited differences in physical health but not in mental health or psychological adjustment.

As researchers make inroads into understanding health disparities between rural and non-rural areas, it remains important to examine the underlying factors so that effective interventions can be developed. This study suggests that interventions may need to include strategies to address issues of obesity, joint disease, and low income in rural areas.

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