Role of Medical Insurance in Reducing Place-based Health Disparities: Functional Disability in Rural Appalachia

Julie Hicks Patrick, PhD
West Virginia University, Department of Psychology
53 Campus Drive
Morgantown, WV 26506-6604
Julie.Patrick@mail.wvu.edu
(Corresponding Author)

Carly E. Pullen, MA
West Virginia University, Department of Psychology
53 Campus Drive
Morgantown, WV 26506-6604
CEPullen@mix.wvu.edu

Kareem Ibrahim-Bacha, BS
West Virginia University, Department of Psychology
53 Campus Drive
Morgantown, WV 26506-6604
KB0147@mix.wvu.edu

S. Mindi Spencer, PhD
University of South Carolina
MSPENCER@mailbox.sc.edu

Abstract

Rural Appalachia, including the entire state of West Virginia, is characterized by high health disparities. Such place-based health disparities contribute to disability across the lifespan and may exacerbate morbidity and disability in late life. Thus, examinations of the contributors to morbidity and disability at mid-and late-life are needed to inform policies and programs.

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Using the most recent data from the Centers for Disease Control and Prevention's (CDC) Behavioral Risk Factor Surveillance System (BRFSS), we examine some of the social determinants of health (e.g., age, gender, education, income) as predictors of access to health care and functional ability among 4,867 adults living in West Virginia. Access to health care was indexed by three variables, including whether one had financial barriers to medical care, the number of personal medical care professionals one saw, and the recency of wellness exams. Functional ability was indexed using items assessing difficulty with dressing, climbing stairs, and doing errands. The model fit the data well for the entire sample, X^2 (DF = 29, N = 4867) = 411.30, $p < .001$, CFI = .94, RMSEA = .052. Post hoc models with the age groups fit well, although some differences in specific paths emerged. Our results suggest that policies and programs that increase medical access for current middle-aged and older adults might decrease functional ability. Moreover, as the younger adults age into midlife, they enter with lower economic and educational resources, further exacerbating their lack of access to health care and increasing disability in future generations of West Virginians.

Keywords: rural, health disparities, policy, Medicaid, aging, older adults

Rol del seguro médico en la reducción de las disparidades de salud basadas en el lugar: Discapacidad funcional en los Apalaches rurales

Resumen

Los Apalaches rurales, incluido todo el estado de Virginia Occidental, se caracterizan por grandes disparidades en la salud. Tales disparidades de salud basadas en el lugar contribuyen a la discapacidad a lo largo de la vida y pueden exacerbar la morbilidad y la discapacidad en la vejez. Por lo tanto, se necesitan exámenes de los factores que contribuyen a la morbilidad y la discapacidad en la mediana edad y en la vejez para informar las políticas y los programas.

Utilizando los datos más recientes del Sistema de Vigilancia de Factores de Riesgo Conductual (BRFSS) de los Centros para el Control y la Prevención de Enfermedades (CDC), examinamos algunos de

los determinantes sociales de la salud (p. ej., edad, género, educación, ingresos) como predictores del acceso a atención médica y capacidad funcional entre 4,867 adultos que viven en West Virginia. El acceso a la atención médica se indexó según tres variables, incluido si uno tenía barreras financieras para la atención médica, la cantidad de profesionales de atención médica personal que uno vio y la actualidad de los exámenes de bienestar. La capacidad funcional se indexó mediante ítems que evaluaban la dificultad para vestirse, subir escaleras y hacer recados. El modelo se ajustó bien a los datos de toda la muestra, X2 (DF = 29, N = 4867) = 411,30, p < 0,001, CFI = 0,94, RMSEA = 0,052. Los modelos post hoc con los grupos de edad encajan bien, aunque surgieron algunas diferencias en caminos específicos. Nuestros resultados sugieren que las políticas y los programas que aumentan el acceso médico para los adultos mayores y de mediana edad actuales podrían disminuir la capacidad funcional. Además, a medida que los adultos más jóvenes llegan a la mediana edad, ingresan con menores recursos económicos y educativos, lo que exacerba aún más su falta de acceso a la atención médica y aumenta la discapacidad en las generaciones futuras de habitantes de Virginia Occidental.

Palabras clave: rural, disparidades de salud, política, Medicaid, envejecimiento, adultos mayores

医疗保险在减少基于地点的健康差异一事中的作用：阿巴拉契亚农村地区的功能性障碍

摘要

阿巴拉契亚农村地区（包括整个西弗吉尼亚州）的健康差异巨大。这种基于地点的健康差异对整个生命周期的残疾情况作贡献，并可能加剧晚年的发病率和残疾。因此，需要对导致中年和晚年发病率和残疾的因素进行分析，以便为政策和计划提供信息。

通过使用美国疾病控制和预防中心（CDC）行为风险因素监测系统（BRFSS）的最新数据，我们分析了一些健康的社会决定因素（例如年龄、性别、教育、收入），将其作为西弗吉尼亚州 4,867 名成年人在医疗保健和功能性能力的获取方面的预测物。医疗保健的可及性由三个变量来衡量，包括个体是否在医疗保健方面面临经济障碍、个体拜访的个人医疗保健专业人员的数量、以及近期健康检查的时间。功能性能力

指标包括评估穿衣、爬楼梯和办事方面遭遇的困难。模型适合整个样本数据，X2（DF = 29，N = 4867）= 411.30，p < .001，CFI = .94，RMSEA = .052。年龄组的事后模型是适宜的，尽管在特定路径中出现了一些差异。我们的结果表明，那些增加当前中老年人医疗获取的政策和计划可能会降低功能性能力。此外，随着年轻人进入中年，他们的经济资源和教育资源较低，这进一步加剧了其缺乏医疗保健获取的情况，同时增加了西弗吉尼亚未来几代人的残疾情况。

关键词：农村，健康差异，政策，医疗补助，老龄化，老年人

Health disparities are those preventable differences in health care access and health outcomes that result from social, economic, and geographic factors (Duran & Perez-Stable, 2019). Duran and Perez-Stable (2019) of the National Institute on Minority Health and Health Disparities point out that in order to advance to the next level of research and policy, the field requires greater clarification of the definition of health disparity, a broader examination of minoritized groups experiencing health disparities beyond racial and ethnic identity, and a broader lens to focus on potential mechanisms of disparity beyond the descriptive trends related to demographic social determinants of health (e.g., age, race, sex, income). They suggest that including an examination of place-based health disparities and a search for modifiable mechanisms within those local contexts are the next stage in health disparities research. Thus, the goal of the next wave of health disparity research should be to focus on the interactions of age-based and place-based factors in order to identify potential interventions and policies to move toward health equity (Wasserman et al., 2019).

As research about health disparities advances, there is an increased interest in examining place-based health disparities (Allen & Roberto, 2014). The construct of place-based health disparities incorporates a variety of influences unique to a particular region or geographic location, such as local value systems, access to medical care, and other resources (Savla et al., 2018). Thus, studies that include within-region examinations may be critical for understanding how best to serve such populations. In the current study, we focus on health disparities with West Virginia. In addition to challenges inherent to most residents of Appalachia in general, West Virginia poses unique health care challenges. West Virginians have been disadvantaged by changes in natural resource-extractive technologies and the decreasing employment opportunities associated with those industry changes (Latimer & Oberholser, 2005). These

changes have had repercussions across the life span, ranging from impacts on the availability of medical services, general health status, and the influx of prescription opioids, which have devasted many rural and West Virginian families and communities (Patrick et al., 2021; Stoltman et al., 2022; Warfield et al., 2019). Thus, it is important to examine health policies affecting older adults, midlife adults who are aging into late life with chronic health conditions, and younger adults who may be struggling with the direct and indirect effects of substance abuse and other diseases of despair (Case & Deaton, 2016).

As the only state contained entirely within Appalachia, West Virginia serves as an important reference point regarding health disparities for the region and the nation. When compared with their rural and nonrural peers, adults in West Virginia are older and face higher morbidity (Pollard & Jacobsen, 2021). This poor health is observed in West Virginians reporting more total unhealthy days per month, more physically unhealthy days per month, and more emotionally unhealthy days per month relative to the rest of the United States (Givens et al., 2019; Patrick et al., 2021).

Frameworks for Studying Health Disparities across the Life Span

Recent discourse has focused on race-related health disparities and who is best-positioned to conduct such work (e.g., Jordan, Brown, and Schrager, 2021; McFarling, 2021). For decades, social gerontologists have been interested in this work and its related constructs across the lifespan, such as Cumulative Dis/Advantage (Dannefer, 2020), multiple jeopardy (e.g., Ferraro, 1987; Ferraro & Farmer, 1996), resilience (Infurna, 2021), and Social Determinants of Health (e.g., Ehrlich, 2020). A benefit to linking the current focus on health disparities to the well-established social gerontology, epidemiology, and life span literatures is that there are useful frameworks and identified potential mechanisms available from these areas that can inform current work in reducing health disparities (Dannefer, 2020). For example, the gerontological literature has developed several testable models in which early disadvantage may accumulate across other developmental periods (e.g., Glymour et al., 2009). These frameworks fit well with social epidemiology models linking acute and chronic stress to wellbeing and functioning (Bagby et al., 2019; Nusslock & Miller, 2016; Wasserman et al., 2021).

It is likely that there are insights to be gained from the disablement process literature, as well. The disablement process was well-described by Verbrugge and Jette (1994) and Lawrence and Jette (1996). Disablement can be viewed as a multistage process in which one may move from disease to impairment to functional limitation to disability. This is important because these functional limitations begin to accumulate at midlife and are a main driving force for the progressive spiral

into the disability process (Verbrugge & Jette, 1994). Specific socio-demographic characteristics (e.g., older age, female sex, less education) are associated with more functional limitations. With nearly three decades of empirical support, this model continues to be robust in current gerontological studies (Espinoza et al., 2018). The idea of accumulating risk factors over time is a critical consideration, although health disparity researchers are only beginning to incorporate developmental time into studies of racism and health inequities (e.g., Gee et al., 2019).

As highlighted by leading scholars (e.g., Duran & Perez-Stable, 2019; Lynn & Franco, 2020), other aspects of health disparities also require examination, including those health disparities related to rurality (Hash et al., 2015; Patrick et al., 2020). Relative to their peers in other geographic areas, rural adults experience higher comorbidities and earlier mortality (Savla et al., 2022). Access to health care providers is challenging in rural areas, as many rural areas are considered to be medically under-served and the travel to health care providers is made more difficult by distance from urban centers, poor transportation infrastructure, and even weather-related challenges that may make roads impassable (Hash et al., 2015; Lam, Broderick, and Toor, 2018; Savla et al., 2022).

Although social determinants of health (SDOH) are larger constructs than demographic indicators, SDOH are often related to such demographics and their intersections (ODPHP, 2021; Williams & Mattos, 2021). For example, SDOH often include constructs such as food insecurity, neighborhood violence, various forms of discrimination, education, poverty, and challenging early life experiences (ODHP, 2021). These contextual factors may lead to health disparities among groups, interfering with one's access to medical care. Moreover, these SDOH may exert direct and indirect effects on one's health and functional ability. Each of these may also be associated with age, race, sex, education, and income.

Cultural Contexts of Appalachia and West Virginia

Adults residing in rural Appalachia experience place-based health disparities (Allen & Roberto, 2014; Krout & Hash, 2015; Weaver et al., 2018). That is, multiple factors interact in ways that challenge the economic, physical, and emotional well-being of residents of Appalachia. Among these challenges are limited economic opportunities, educational disadvantages, few medical resources, a rugged geography which creates travel difficulties, and uneven policies (Patrick et al., 2021).

Appalachia is a 420-county region in the eastern United States which includes all of West Virginia and parts of twelve other states (Appalachian Regional Commission [ARC], 2018). Early attention on the health disparities in this region can be traced to the efforts of the labor union movement to end unsafe and exploitative mining

practices in the early 1900s (Blizzard, 2010) and to Eleanor Roosevelt and her contributions to the New Deal in the 1930s and her emphasis on decreasing poverty (Arthurdale Heritage Foundation, 2022). Research into these poverty- and occupational-related health disparities was often guided by frameworks of "double or multiple jeopardy," in which the cumulative disadvantages of aging, rurality, and employment status interacted to negatively affect health and economic well-being (Patrick et al., 2017). Current investigations rely on a more nuanced view, incorporating both historical and contextual backgrounds. In addition to negative stereotypes, older Appalachians have been disadvantaged by changes in natural resource-extractive technologies and the decreasing employment opportunities associated with those industry changes (Latimer & Oberholser, 2005).

As the only state contained entirely within Appalachia, West Virginia serves as an important reference point regarding health disparities for the region and the nation. When compared with their rural and nonrural peers, adults in West Virginia are older and face higher morbidity (Pollard & Jacobsen, 2021). This poor health is observed in West Virginians reporting more total unhealthy days per month, more physically unhealthy days per month, and more emotionally unhealthy days per month relative to the rest of the United States (Givens et al., 2019; Patrick et al., 2021).

Policy issues may further exacerbate health disparities in West Virginia

As noted by the ODPHP (2021) and Palmer et al. (2021), access to medical care and interactions with health care providers are important SDOH and contribute to health disparities. Each is influenced by the social and legislative policies at the local, state, regional and national level (Appelbaum et al., 2020; Gaynor, 2020). Although federal policies are meant to be "place-neutral" (Rhubart et al., 2021, p. 24), local contexts matter. One specific policy that may differentially influence health care access and health disparities within rural areas is Medicaid. In 2014, states were able to expand Medicaid coverage, although not all states in the United States did so. In fact, many rural states did not expand coverage (Rhubart et al., 2021). However, West Virginia was among the rural states that did expand coverage to include low-income individuals and families without children. In January 2021, more than one-third of West Virginia residents, more than one-half million people, were covered by Medicaid (Rogombe, 2021). Although this policy change reduced the costs of medical care for many younger and middle-aged people (APHA, 2021), the state of West Virginia continues to be medically underserved in terms of having an insufficient number of health care providers. Moreover, the state Medicaid program is likely to become insolvent by 2025 (Rogombe, 2021).

The issue of whether state-wide programs can continue to support res-

idents' access to medical services is critical. For example, Jackson and Engelman (2021) used data from the Health and Retirement Study (HRS) to examine trajectories of functional disability across periods of the life span. They found that those who had experienced fewer economic and social advantages (i.e., education, income, stable employment) often entered midlife with more functional impairment. For adults moving from midlife to late life, those with impairments were more likely to experience mortality, whereas those who entered late life with fewer economic disadvantages began to experience accumulating disability. Race and gender correlated with earlier disadvantage and midlife functional impairment. Similarly, Bolkan et al. (2022) reported on the associations among SDOH and access to care among older adults in Washington state. They note that rurality was associated with decreased access and financial resources were associated with increased access. Although among their sample, age, race education and sex did not uniquely contribute to the equation, these SDOH may exert differential influences among other subgroups within the United States, including those in rural Appalachia. Thus, the purpose of the current study is to examine the links among some of the known SDOH (i.e., age, sex, income, education), including access to care to the experience of functional impairment, which is exacerbated within a rural environment such as West Virginia.

Methods

Data Source

In order to examine the contributions of demographic SDOH to the relation between access to medical care and functional impairment, we used the 2020 Behavioral Risk Factor Surveillance System (BRFSS) from the Centers for Disease Control and Prevention (CDC) for the state of West Virginia. These data represent the most current data available, until the 2021 files become available in the Fall 2022. For the fifty states, a disproportionate stratified sample (DSS) frame is used to identify landlines. In 2011, the BRFSS started using data from cell phone holders, as well as from available landlines. The CDC (2020) reports using sampling frames that are commercially available to pull phone numbers at random from banks of 1,000 numbers. In years past, criticisms were levied against these data because they are collected via telephone, with arguments that phone ownership represented a sampling confound. However, recent evidence from the Federal-State Joint Board on Universal Service (2020) shows that in 2019, 98.5% of West Virginia adults had either landline, cell service, or both. Other criticisms have focuses on the length of the interview and the potential problems of respondent fatigue, However, the core interview requires approximately 17 minutes to complete; optional modules add five to ten minutes to the interview time (CDC, 2020). Thus, despite these limitations, an attraction of the BRFSS is that is includes a large number of West Virginia residents.

Sample

A total of 5,880 West Virginian adults completed portions of the BRFSS in 2020. Our analyses are based on a subset of 5,172 adults who provided complete data on the variables of interest. Between 1.8% and 17.2% of responses were missing for the following: age (17.2% missing), sex (17.2% missing), education (17.2% missing), income (1.8% missing), three indictors of medical access (15% to 17.1% missing), and three items related to functional ability (15.3% to 15.6% missing). Persons excluded from the current analyses were more likely to be women, report lower incomes, report fewer years of education, and report more difficulty with each of the three activity of daily living items. Missingness was not equally distributed across age groups, with 13.6% of the younger adults missing a value on a variable of interest, 13.6% of middle-aged adults missing a value on a variable of interest, and 20.5% of the older adults missing a value of interest. Thus, our sample may under-estimate the effects of low resources on the link between difficulty with medical access and functional ability. Descriptive statistics for the analytic sample are shown in Table 1.

Table 1. Sample descriptive statistics (N = 4,867)

	Category/Coding	N/%	Mean	SD
Age		4,867	56.61	16.1
Younger	1	1,162	33.26	7.3
Middle-aged	2	1,882	55.69	5.8
Older	3	1,823	72.44	5.1
Sex			1.55	0.50
Male	1	2,201 (45.2%)		
Female	2	2,666 (54.8%)		
Education			4.78	1.0
Less than 12 years	1, 2, and 3	8.3%		
12 years/GED	4	34.3%		
Some college	5	26.6%		
4+ years College	6	30.6%		
Income			5.67	2.1
< $20,000	1, 2, and 3	17.5%		
$20,001 - $25,000	4	9.9%		
$25,001 - $35,000	5	13.8%		
$35,001 – $50,000	6	17.5%		
$50,001 - $75,000	7	15.2%		
$75,001+	8	26.0%		

(table cont'd.)

	Category/Coding	N/%	Mean	SD
Number Providers				
0		12.3%		
1-only		82.1%		
2 or more		5.6%		
Check-Up				
Within past year	1	86%		
1 to 2 years	2	6.4%		
2 to 5 years	3	3.5%		
More than 5 /never	4	4.1%		
Financial access	0 difficulty, 1 ease		0.96	0.2
Functional Ability				
Walking			1.78	0.4
Difficulty	1	21.9%		
No Difficulty	2	78.1%		
Dressing			1.95	0.2
Difficulty	1	5.5%		
No Difficulty	2	94.5%		
Errands Alone			1.89	0.3
Difficulty	1	11.0%		
No Difficulty	2	89.0%		

As shown in Table 1, of the 4,867 adults included in the current analyses, most (94.5%) identified as White Non-Hispanic, matching the demographics in the state. Mean age was 56.6 years (SD = 16.1), although about 24% were ages 18 to 44 years, 38.7% were ages 45 to 64 years, and 37.5% were age 65 years or older. Men represented 45.2% of the sample. Most (91.6%) respondents had at least at high school equivalent education, with 34.3% reporting a high school diploma/GED as their highest education, 26.6% had between 1 and 3 years of college, 30.6% had earned a 4-year college degree or higher. Average annual income ranged between $25,000 to $35,000, although 27.4% reported incomes lower than $25,000 per year and 26% reported annual incomes in excess of $75,000.

Measures

Medical Access

Medical Access was assessed via the three indicators available in the BRFSS data set. In terms of the number of

health care professionals with which one interacted, most adults (82.1%) reported having a single medical professional; 5.6% had multiple health professionals and 12.3% reported having zero regular health care professionals with whom they interacted. Similarly, the majority (86%) had visited a health care provider for a wellness check within the past year, with 6.4% visiting within the past 1 to 2 years, 3.5% within the past 2 to 5 years, 3.9% reporting more than 5 years, and 0.2% reporting never having a routine wellness exam outside of an injury or illness. Our third index of medical access was a composite formed from two dichotomous items determining whether adults had a health insurance plan (94.3% affirmative) and whether they had ever foregone medical care due to high cost (90.7% had not done so). We combined these items to form an index of whether adults were able to receive care when they needed to do so, with 96% reporting the ability to receive when needed and 4% reporting difficulty.

Functional Ability

The BRFSS includes only three indictors of functional ability. Although most adults reported few problems, approximately 21.9% reported difficulty walking or climbing stairs, 5.5% reported difficulty with dressing or bathing, and 11% reported difficulty doing errands alone.

Analytical Approach

We tested the analytic version of the model shown in Figure 1 using AMOS v. 28.0.0. Based on the correlations shown in Table 2, we imposed a covariance between education and income. We used maximum likelihood procedures to simultaneously estimate all paths of the model. All analyses were calculated using covariance matrices. Because minor differences between the tested model and the underlying model often result in statistically significant chi square values in large samples (Byrne, 2010), we used additional indexes to assess the fit of the model to the data. We relied upon the comparative fit index (CFI), for which values greater than .90 suggest an acceptable fit, with values greater than .95 being preferred. We also examined the Tucker-Lewis Index (TLI), for which values greater than .90 indicated acceptable fit. We also used the root mean square error of approximation (RMSEA) for which values less than .08 are considered to be acceptable (Byrne, 2010). In addition, we examined each path in the model and evaluated its standardized beta using the critical ratio (CR). CRs >1.96 are significant at the $p < .05$ level. We also intended to examine model fit within each age group using a multigroup analysis procedure.

Results

Model Testing in the Entire Sample

Results of our analyses suggest an acceptable fit of the model to the data, X^2

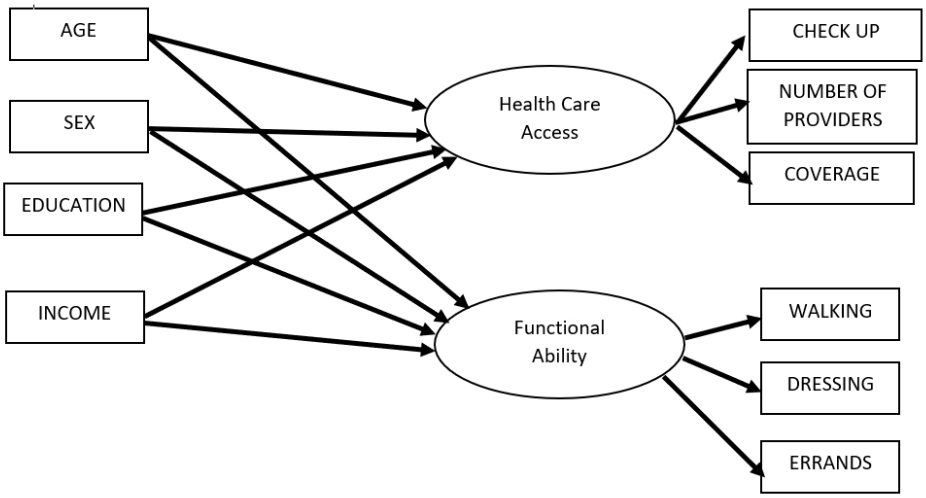

Figure 1: Conceptual Model Linking SDOH to Access and Functional Disability

(DF = 29; N = 4867) = 411.30, $p < .001$; CFI = .937; TLI = .880; RMSEA = .052. As shown in the upper portion of Table 3, the measurement model fit well. The percentage of variance accounted for (R^2 Access = .164; R^2 Function = .223) was low but non-trivial. The structural paths are presented in the lower portion of Table 3. In terms of the demographic SDOH that were associated with medical access, female sex (β = .13), older age (β = .37), and higher income (β = .072) were significant. The path between the two indicators of health disparity, Access and Functional Ability, was significant (β = -.157, $p < .001$), with those reporting more ease of access also reporting lower functional ability. Regarding the SDOH that were significantly associated with better functional ability, only younger age (β = -.13) and higher income (β= .40) reached significance. Of note, the indirect effects of SDOH on functional ability through access were very small, ranging from 0 to -.06 (age).

As shown in the lower portion of Table 3, not all of the individual hypothesized regression paths reached significance. Education, which was significantly correlated with income, was not directly linked to medical access (β = .03) or with functional ability (β = .034). Sex was also not directly associated with medical access (β = -.13). Because we had planned to examine the model based on age, we decided to forego model modifications that would drop non-significant paths, in favor of testing this model across the three age groups. However, we were especially interested in the path from medical access to functional ability, so we ran a sensitivity analysis in which the directional path was reversed between these two constructs. In that model, the path from functional ability to medical access was not significant.

Table 2. Spearman correlations (N = 4,867)

	AGE	Sex	Income	Education	Number of Providers	Recency of Check-Up	Financial barriers	Walking	Dressing	Errands alone
Age (continuous)	--									
SEX	.018	--								
INCOME	-.124**	-.091**	--							
EDUCATION	-.075**	.038**	.446**	--						
Number Providers	.245**	.076**	.018	.025	--					
Check-Up	-.230**	-.084**	-.018	-.001	-.416**	--				
Financial barriers	.121**	.053**	.062**	.070**	.167**	-.151**	--			
WALKING	-.239**	-.044**	.292**	.174**	-.140**	.117**	-.047**	--		
DRESSING	-.080**	-.002	.189**	.084**	-.066**	.041**	-.007	.395**	--	
ERRANDS ALONE	-.082**	-.084**	.290**	.128**	-.069**	.044**	-.018	.410**	.432**	--
Mean (SD)	56.61 (16.1)	54.8	5.67 (2.1)	4.78 (1.0)	0.90 (0.4)	1.25 (0.7)	0.96 (0.2)	1.78 (0.4)	1.95 (0.2)	1.89 (0.3)

Table 3: Results of Model Testing for Entire Sample (N=4,867)

			β	Estimate	S.E.	C.R.	P
Measurement Model							
No. Providers	<---	Access	.687	1.0			
Check-Up	<---	Access	-.609	-1.500	.076	-19.75	***
Financial Barrier	<---	Access	-.274	.187	.014	13.32	***
Walking	<---	Functional Ability	.664	1.000			
Dressing	<---	Function Ability	.595	.493	.017	28.22	***
Errands	<---	Functional Ability	.653	.744	.026	28.98	***
Path Model							
Access	<---	Education	.031	.009	.005	1.59	.112
Access	<---	Age	.373	.007	.000	19.55	***
Access	<---	Income	.072	.010	.003	3.69	***
Access	<---	Sex	.128	.074	.010	7.27	***
Functional Ability	<---	Sex	-.013	-.007	.009	-.79	.429
Functional Ability	<---	Education	.034	.009	.005	1.86	.063
Functional Ability	<---	Age	-.134	-.002	.000	-7.21	***
Function Ability	<---	Income	.400	.053	.003	20.39	***
Functional Ability	<---	Access	-.165	-.157	.023	-6.73	***
Income	<->	Education	.442	.938	.033	28.17	***
X^2 (DF = 29, N = 4867) = 411.30, p < .001; CFI = .937; TLI = .880; RMSEA = .052. R^2 Access = .164; R^2 Function = .223							

Table 4: Post hoc Multigroup Model testing for Younger Adults (N = 1162)

			β	Estimate	S.E.	C.R.	P
Measurement Model							
No. Providers	<---	Access	.766	1.0			
Check-Up	<---	Access	-.557	-1.36	.182	-7.43	***
Financial Barriers	<---	Access	.247	.167	.031	5.46	***
Walking	<---	Functional Ability	.686	1.000			
Dressing	<---	Functional Ability	.702	.530	.046	11.51	***
Errands	<---	Functional Ability	.436	.743	.069	10.69	***
Path Model							
Access	<---	Sex	.227	.172	.027	6.29	***
Access	<---	Education	.106	.041	.015	2.75	.006
Access	<---	Income	.095	.041	.015	2.75	.006
Functional Ability	<---	Sex	.016	.005	.011	.43	.664
Functional Ability	<---	Education	-.003	.000	.006	-.08	.937
Functional Ability	<---	Income	.288	.021	.003	7.11	***
Functional Ability	<---	Access	-.144	-.057	.019	- 3.00	.003
Income	←>	Education	.410	.834	.065	12.92	***
R^2 Access = .08; R^2 Function = .09							

Note: *** p < .001

Post hoc Multigroup: Midlife Adults (N = 1,882)

			β	Estimate	S.E.	C.R.	P
Measurement Model							
No.Providers	<---	Access	.638	1.0			
Check-Up	<---	Access	-.674	-1.86	.214	-8.68	***
Financial Barriers	<---	Access	.272	.241	.031	7.81	***
Walking	<---	Functional Ability	.690	1.000			

(table cont'd.)

			β	Estimate	S.E.	C.R.	P
Measurement Model							
Errands	<---	Functional Ability	.700	.761	.036	20.97	***
Path Model							
Access	<---	Sex	.105	.054	.015	3.51	***
Access	<---	Education	.009	.004	.015	.27	.784
Access	<---	Income	.068	.008	.004	2.06	.039
Functional Ability	<---	Sex	-.021	-.013	.015	-.86	.389
Functional Ability	<---	Education	.022	.006	.008	.819	.413
Functional Ability	<---	Income	.487	.066	.004	16.00	***
Functional Ability	<---	Access	-.192	-.223	.040	-5.61	***
Income	<->	Education	.436	.969	.056	17.35	***
R^2 Access = .015; R^2 Function = .274							

Note: *** p < .001

Post hoc Multigroup: Older Adults (N = 1823)

			β	Estimate	S.E.	C.R.	P
Measurement Model							
No. Providers	<---	Access	.426	1.0			
Check-Up	<---	Access	-.602	-1.94	.528	-3.67	***
Financial Barriers	<---	Access	.150	.098	.026	-3.83	.***
Walking	<---	Functional Ability	.570	1.000			
Dressing	<---	Functional Ability	.573	.529	.034	15.54	***
Errands	<---	Functional Ability	.717	.916	.059	15.43	***
Path Model							
Access	<---	Sex	.111	.033	.021	2.71	.007
Access	<---	Education	.029	.004	.006	.737	.461
Access	<---	Income	.062	.005	.003	1.50	.135
Functional Ability	<---	Sex	-.036	-.019	.015	-1.29	.199
Functional Ability	<---	Education	.026	.006	.008	.846	.398

(table cont'd.)

			β	Estimate	S.E.	C.R.	P
Path Model							
Functional Ability	<---	Income	.341	.047	.005	9.87	***
Functional Ability	<---	Access	-.098	-.175	.077	- 2.27	.023
Income	<->	Education	.465	.943	.052	18.01	***
R^2 Access = .02; R^2 Function = .13							

Multigroup Model Testing

In order to conduct our multigroup analysis, we removed the continuous variable of age from the model. We then constructed a three-level categorical age variable that included 1,162 younger adults (ages 18 to 44 years), 1,882 middle-aged adults (ages 45 to 64 years), and 1,823 older adults (ages 65 to 80+ years). We chose these groupings because they loosely align with other categories of younger, middle-aged, and older adults (e.g., Patrick et al., 2020), because the Medicaid expansion especially benefitted working-age adults (APHA, 2021), and because it resulted in approximately equal sized groups which facilitated the multi-group analysis (Byrne, 2010). The model fit the data well, X^2 (DF = 66) = 363.08, $p < .001$; CFI = .942; TLI = .881; RMSEA = .030. Regression paths for each age group are shown individually in Tables 4 (younger adults), 5 (middle-aged adults) and 6 (older adults).

Younger Adults

As shown in the upper portion of Table 4, the measurement model fit well for the younger adults. The path between the two indicators of health disparity, Access and Functional Ability, was significant (β = -.144, p = .003). The percentage of variance accounted for (R^2 Access = .08; R^2 Function = .09) was low. Among the younger adults, all three demographic SDOH were associated with access to medical care. Access was less difficult for women (β = .23, $p < .001$), those with higher income (β = .10, $p < .02$), and those with more education (β = .11, $p < .01$). In addition to access, the only demographic SDOH significantly associated with better functional ability was higher income (β= .29, $p < .001$).

Middle-Aged Adults

As shown in the upper portion of Table 5, the measurement model fit well for the middle-aged adults. The percentage of variance accounted for was low for Access (R^2 = .02), but moderate for functional ability (R^2 = .27). Among the middle-aged adults, female sex (β = .11, $p < .001$) and higher income (β = .07, $p < .05$) were associated with access to medical care. The path between the two indicators of health disparity, Access and Functional Ability, was significant (β = -.19, $p < .001$). In addition to ac-

cess, the only demographic SDOH significantly associated with better functional ability was higher income (β= .49, p < .001).

Older Adults

Table 6 provides the estimates for the measurement model, which fit well for the older adults. Individual regression paths are also presented. The percentage of variance accounted for was low for Access (R^2 = .02) and low for functional ability (R^2 = .13). Among the older adults, female sex (β = .11, p = .002) was associated with better access to medical care. The path between the two indicators of health disparity, Access and Functional Ability, was significant (β = -.10, p < .05). In addition to access, higher income (β= .34, p < .001) was the only demographic SDOH associated with better functional ability.

Discussion

As the global population ages, rural areas are also experiencing an increase in the number and proportion of older residents. The effects of age-associated functional impairments and other challenges may be especially difficult in resource-poor areas such as Appalachia (Allen & Roberto, 2014; Patrick et al., 2021; Weaver et al., 2018). Thus, it is important to examine modifiable SDOH that may support or hinder wellbeing.

According to foundational work in the field (e.g., Lawrence & Jette, 1996; Verbrugge & Jette, 1994), the progression from functional impairment to disability may be related to age, sex, income, education and rurality. One mechanism that may disrupt the progression to disability is access to medical care. As Wasserman et al. (2019) highlight, there are many factors within the health care system that may contribute to health disparities, including patient-provider communication, payment systems, and practitioner biases and stereotypes. However, policies that enable access to medical care, such as Medicaid, may also influence the association with functional ability. Expanding medical access may be an important avenue to reducing the effects of SDOH for most Americans but may be critical for adults in rural areas.

Rural areas are often characterized by lower income and lower education compared with non-rural areas (Hash et al., 2015), which may influence residents' interactions with the health care system. For adults living in rural Appalachia, who experience increased functional limitations relative to others, medical access is often difficult and may be fraught by stereotypes and inadequate payer systems (Patrick et al., 2020; Savla et al., 2022). When the Medicaid expansion became possible under the Affordable Care Act, 38 states and the District of Columbia enacted such expansion (Rhubart et al., 2021). Of the 12 states not expanding Medicaid coverage, half were included in the Appalachia region (i.e., North Carolina, South Carolina, Tennessee, Mississippi, Alabama, and Georgia). However, West Virginia was among the six states within Appalachia that did expand eligibility, along with Kentucky, Pennsylvania,

Virginia, New York, and Ohio (Rogombe, 2021). Thus, in keeping with the idea that all policies are ultimately enacted at the state level (Applebaum et al., 2020; Bolkan et al., 2022), we sought to examine the associations across demographic SDOH, difficulty accessing medical care, and functional ability with an age-diverse group of West Virginians.

Using data from the CDC's 2020 BRFSS, we focused exclusively on residents of West Virginia. The BRFSS is the nation's largest telephone-based health surveillance survey (CDC, 2020). These data are used by legislators and policymakers to assess the health of residents within specific states. West Virginia is one such state (CDC, 2020). We chose to analyze data from the BRFSS because data from more than 5,800 West Virginians are collected annually and the state often opts to include optional modules on issues of interest to gerontological researchers and service-providers, such as asthma, cognitive decline, and family caregiving. It is important to note, however, that pragmatic decisions related to conducting a large annual surveillance study limit the selection of variables and their measurement properties. For example, although data are collected across all 55 counties in West Virginia and across the calendar year, data from small counties may be anonymized such that age, gender, and other demographics which could potentially identify a person are omitted from the public data files. Thus, missingness on these key variables may potentially influence the magnitude of effects. Even with the weakness to the BRFSS data for our purposes, however, we view these analyses as a starting point for more nuanced studies in the future.

Results of our initial structural equation model examined the influences of age, sex, income, and education on ease of accessing medical care. We also examined whether these four demographic SDOH and medical access influenced functional ability. Within the age-diverse sample, our model fit the data well. Younger age, lower income, and male sex were associated with more difficulty accessing medical care. Reports of relatively greater ease accessing care were associated with lower functional ability. Although these data can not address the reasons for this counter-intuitive finding directly, we believe that it is related to the notion that increased access results in better identification of disability. In contrast, among the demographic SDOH, only income directly related to functional ability. We interpret this as an indication that the expanded coverage through Medicaid and other programs is likely reaching the intended recipients.

Moreover, expanding medical access may act as an equalizer across the age groups. For example, older West Virginians, especially women, often have less education and less income than their younger counterparts. Although such SDOH may influence access to medical care and functional ability among others, only income was directly associated with functional ability among the older adults. However, younger adults' access was multiply influenced by sex, income and education.

For middle-aged adults, only sex and income predicted access to care. We take this finding as a warning sign for our Legislature, who often does not plan on increases in medical costs or eligibility for Medicaid and other programs when planning the next fiscal year's budget (Rogombe, 2021). The population of West Virginia is among the oldest in the nation (CDC, 2022) and is continuing to increase in median age (Rogombe, 2021). The need is likely to expand among younger and middle-aged adults, as well. That is, the economy in West Virginia is changing rapidly, and unemployment and under-employment is high. Affording higher education may continue to be unattainable for many younger West Virginians.

Policy Recommendations for West Virginia

Given the changing economic landscape, the need for expanded coverage is likely to continue. We propose three broad areas for policymakers to consider: the changing demographics within the state, physical and financial barriers to medical access, and the need to include prevention in medical coverage.

Legislators must focus on the changing demographics, but also on the changing health status of residents. For example, family and health demands on workers are also changing as a function of complications from opioid treatment and reproductive health within the state (e.g., Patrick et al., 2021; Stoltman et al., 2022). Such state-wide issues must be considered as part of the context in which allocation of funds are made.

For an area such as West Virginia, rugged terrain creates geographic barriers to medical access, which could be addressed in expanded programs. Residents of rural areas often live further from hospitals than their urban or suburban peers (Lam et al., 2018). But distance is not the only metric that acts as a barrier to access. Travel times are longer on rural roads and the driving may be more challenging, especially for adults with mobility difficulties (Hash et al., 2015; Patrick et al., 2020). Although financial and physical barriers to medical access may exacerbate morbidity and functional disability, adults must be aware of services to use them (Bolkan et al., 2022). This may be one of those areas in which local stakeholders are able to facilitate and promote the use of medical services within their local communities.

A third priority should be to expand coverage to include prevention, not just treatment. Although Medicaid and other payer systems have frequently focused on a treatment model, rather than prevention, as much as 40% of health and wellbeing may be related to individual behaviors (APHA, 2021).

At its current funding in the state, West Virginia's Medicaid program is expected to be insolvent by 2025 (Rogombe, 2021). It is urgent that state leaders consider the next steps for West Virginia and other rural and Appalachian states. Evidence supports the cost-effectiveness of general Medicaid coverage over merely providing supple-

ments (Rhubart et al., 2021), but Legislatures must allocate those funds. The repercussion of not planning beyond the next few budget cycles is that more working-aged adults, who form the tax base of the state, will enter mid- and late life with lower functional ability and increasing disability.

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