Article

Area-level Poverty and Functional Limitations: Exploring Gender-Specific Mechanisms

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Abstract

Area-level socioeconomic disadvantage is an established risk factor for functional limitations. Yet, mechanisms underlying this association and whether such processes vary by gender is unknown. Guided by stress process theory, we examine whether county- and tract-level poverty rates are differentially associated with functional limitations by gender and whether secondary ecological stressors (e.g., perceived neighborhood danger and physical disorder) and individual-level psychosocial factors (e.g., coping behaviors and social support) mediate these relationships. Using data from the Midlife in the United States study, findings from the path analyses revealed that while the total effect of county-level poverty rate did not differ by gender, indirect effects via mediators—especially stress eating—were significant for women only. Tract-level poverty exhibited a gendered total effect and gendered pathways through neighborhood safety and physical activity (significant for women exclusively). This study highlights gendered processes through which area socioeconomic disadvantage may influence the aging process.

Keywords

functional status, neighborhood context, gender, coping behaviors, stress

The prevalence of functional limitations, defined as the inability to complete physical and cognitive actions, has increased in the United States between the late 1990s and the early 2010s, with a notable rise among middle-aged adults (Choi et al., 2016; Martin & Schoeni, 2014). Given the adverse impact on quality of life and increased costs of care from functional limitations, understanding how social determinants influence functional limitations is urgently needed to inform community health interventions. Nagi's disablement model provides a framework for understanding the progression from disease to impairments to functional limitations and eventually, disability. This framework emphasizes the influences of both individual and environmental factors on the pathways from disease to disability (Nagi, 1965), highlighting the critical role of ecological factors in moderating and accelerating the deterioration of daily functioning abilities (Clarke & George, 2005). Functional limitations serve as an intermediate step, arising from physiological, mental, and emotional impairments or dysfunction (Nagi, 1991). Building on this framework, we hypothesize that ecological stressors may contribute to this progression and influence functional limitations among older adults. Ecological stressors, by affecting individuals' stress levels, physiological dysregulation, and routine physical activity, may impair physical functioning. Furthermore, the stress process, including stress responses, appraisal, and resources, can shape the adverse effects of ecological stressors on functional limitations, highlighting the need to study the complex interplay between ecological factors and individual-level outcomes.

Area socioeconomic disadvantages represent a pivotal macro-level ecological stressor that impacts individual vulnerability to risk factors for functional limitations, as well as their access to resources for reducing risks and managing existing conditions. We use the term "area socioeconomic disadvantage" to denote areas where residents experience lower social status and resource levels in comparison to areas with a more privileged and well-resourced population. Extant evidence has documented substantial variation in area socioeconomic disadvantages (Lou et al., 2023; Partridge & Rickman, 2006), raising the possibility of explaining health variation across local areas. Research indicates that individuals living in socioeconomically disadvantaged environments are at higher risk of experiencing functional limitations (Danielewicz et al., 2017; Gill et al., 2021; Jia et al., 2009;

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Schootman et al., 2006; Sun et al., 2012; Won et al., 2016), although some studies have also reported null findings (Glymour et al., 2010; Wight et al., 2008). The place effects of socioeconomic disadvantages are more consistently observed among older adults, possibly because of the cumulative effects of prolonged exposure to such disadvantages (Danielewicz et al., 2017). While there is a wealth of research on how area socioeconomic disadvantage predicts functional limitations, only a limited number of studies have explored the mediating role of psychosocial factors. Furthermore, the differences in the place effects of socioeconomic disadvantage and their underlying mechanisms between men and women remain unclear, despite well-documented gender disparities in stress responses and coping strategies (Kessler & McLeod, 1984; Matud, 2004; Turner & Avison, 1989). In this study, we aim to investigate the gender-specific association between area-level poverty and functional limitations among older adults, while also examining potential mediating pathways.

Area Economic Disadvantage, Psychosocial Mechanisms, and Functional Limitations

The Stress Process Theory offers a foundational framework for comprehending the association between area socioeconomic disadvantage and functional limitations in older adults (Pearlin, 1989; Pearlin et al., 1981). This framework delineates how stress can impact health by identifying and categorizing stress sources, responses to stress, and resulting health outcomes (Aneshensel & Mitchell, 2014; Pearlin et al., 1981). In particular, this theory distinguishes between primary stressors that are the initial and direct source of stress and secondary stressors that emerge as stress proliferates and can manifest in multiple life domains (Pearlin, 1989; Pearlin & Bierman, 2013).

The stress process framework combines environmental sources of stress with individual-level stressful life events and chronic stressors (Hill & Maimon, 2013). We posit that ecological socioeconomic disadvantages act as primary stressors, persistently presenting social and economic obstacles for individuals by restricting their access to opportunities and resources. These environmental difficulties and constraints can lead to the development of secondary stressors in different life domains, reducing an individual's capacity to handle responsibilities and pursue life objectives (Aneshensel & Mitchell, 2014). Elevated stress arising from the proliferation of stressors can result in sustained physiological or psychological dysregulation, with the potential to affect physical and mental functioning (Aneshensel & Mitchell, 2014).

Furthermore, we suggest that county- and census tract-level socioeconomic disadvantages can have adverse effects on functional limitations. Counties serve as integrated social and economic units, uniquely positioned to capture broader environmental and economic factors that influence health outcomes. Examples of these factors include regional job markets, healthcare systems, social services, and food environments, which are often more comprehensively represented at the county level than at smaller geographic units, such as census tracts (Marando & Reeves, 1991). Given that individuals' daily activity spaces and routine social interactions often transcend their census tract boundaries but are commonly confined within a county and socioeconomically segregated (Jones & Pebley, 2014), elevated poverty rates at the county level are indicative of enduring exposure to economic adversity within one's social circles and across networks of neighborhoods. This persistent exposure can lead to cumulative effects on health over time. At the same time, we acknowledge the vital significance of tract-level socioeconomic disadvantages, as they signify the experience of poverty within one's immediate environment, which is intricately linked to factors such as neighborhood safety, perceptions of the local environment, stress levels, and health-related behaviors like physical activity (Diez Roux & Mair, 2010; Hill & Maimon, 2013). By integrating analyses at both the county and census tract levels, our objective is to present a more intricate and multi-faceted understanding of how socioeconomic disadvantages manifest across varying geographical scopes to impact health outcomes. This dual approach allows us to investigate the broader contextual influences at the county level as well as the more immediate, localized effects at the tract level, thereby offering a holistic perspective on the significance of place in shaping health outcomes.

We conceptualize perceptions of neighborhood crime and physical disorder as secondary stressors that stem from structural disadvantages, particularly as manifested in area-level poverty. Research consistently shows that area-level poverty, along with associated social and economic conditions, is strongly correlated with various measures of criminal exposure and offending (Sampson et al., 1997). These conditions, in turn, exacerbate fear of crime and feelings of unsafety at the individual level (Guldåker et al., 2023; Lorenc et al., 2014). Furthermore, the connection between area-level poverty and perceived physical disorder has been extensively documented in the literature (Ross & Mirowsky, 2001; Sampson & Raudenbush, 2004; Wen et al., 2006). Notably, feeling safe and a sense of order in one's local area is associated with positive health behaviors (Diez Roux & Mair, 2010; Dulin-Keita et al., 2013; Fish et al., 2010; Robinette et al., 2016) and better functional status (Clark et al., 2009; Latham & Clarke, 2013).

In addition, area-level poverty may adversely affect functional health through its negative impact on psychosocial factors. For instance, structural disadvantages at the neighborhood level can undermine social support systems (Cutrona et al., 2006; Schieman, 2005), which may contribute to declines in functional health over time (Hajek et al., 2022; Weinberger et al., 1990). Moreover, individuals residing in high-poverty areas may be more susceptible to adopting harmful coping behaviors, such as stress eating, substance misuse, excessive alcohol consumption, and physical inactivity (Stults-Kolehmainen & Sinha, 2014; Tomiyama, 2019).

These detrimental behaviors, often exacerbated by chronic stressors associated with poverty, further compound the risks to health, creating a cycle of disadvantages and poor health outcomes.

Therefore, area-level disadvantage may contribute to functional limitations through two categories of pathways: the emergence of secondary stressors, such as heightened perceptions of neighborhood disorder or physical disorder, and the adoption of harmful coping behaviors, including substance use, heavy drinking, physical inactivity, or unhealthy eating patterns. Despite these insights, substantial gaps remain in the literature concerning the specific mechanisms through which ecological stressors—such as neighborhood poverty and structural disadvantage—impact functional limitations. A deeper understanding of these pathways is critical for developing targeted interventions to mitigate the adverse health effects of area-level disadvantage, particularly among vulnerable older populations.

Gender Differences in Stress Responses among Older Adults

Gender norms and socialization influence the development of gender role that may contribute to differential stress responses (Rieker et al., 2010) and potentially differential stress vulnerability (Pearlin, 1989). For instance, societal expectations may prompt women to prioritize emotions and communal support more than men (Bird & Rieker, 2008; Cohen et al., 2019; Helgeson, 2010). Conversely, in Western cultures, traditional norms have encouraged men to adopt a more agentic and self-reliant approach compared to women, resulting in men's tendency to resort to risk-taking behaviors as a coping mechanism for stress. Men and women also may attribute different meanings to the same stressor (Rosenfield & Mouzon, 2013; Tamres et al., 2002; Thoits, 2013). For example, research suggests that women tend to perceive stressors as more severe as compared to men and seek emotional social support more than men (Tamres et al., 2002). Furthermore, a robust body of literature has consistently demonstrated that women tend to report more negative perceptions of safety, heightened fear of crime, and increased perceptions of disorder in their environments, even after accounting for objective neighborhood conditions (De Jesus et al., 2010; Sampson & Raudenbush, 2004; Schafer et al., 2006). These heightened perceptions can make women more susceptible to the influence of perceived neighborhood safety on their physical activity levels (Bennett et al., 2007) and contribute to adverse health outcomes linked to neighborhood disorder (O'Brien et al., 2019). In essence, the theory of differential vulnerability posits that men and women often experience differing levels of stress in response to similar stressors and, as a result, employ distinct coping strategies. These divergent responses can lead to varying health outcomes by gender (Rosenfield & Mouzon, 2013).

Existing empirical research generally supports the presence of gender differences in stress responses. However, evidence regarding specific differences in coping behaviors is inconsistent. Early studies indicated that working-age men more frequently externalize their problems through risk-taking behaviors, such as substance misuse, while working-age women are inclined to internalize their problems and experience higher levels of psychological distress (Horwitz & Davies, 1994; Rosenfield, 1999). Men are also more likely to cope with stress through physical activities, alcohol use, and substance use (Horta Esper & Furtado, 2013; Nolen-Hoeksema & Hilt, 2006; Nordfjærn et al., 2010; Wills, 1990), whereas women tend to engage in emotional coping, such as binge eating (Chao et al., 2016; Matud, 2004).

More recent evidence has revealed gendered coping patterns that differ from prior research. Specifically, women were found to be more inclined toward self-regulatory coping behaviors, such as drinking, drug use, and eating, compared to men (Mezuk et al., 2017). Age-related decreases in risk-taking behaviors also vary by gender (Rolison et al., 2014), potentially leading to age-specific gender differences.

In summary, a substantial body of empirical evidence indicates that men and women demonstrate distinct patterns in their exposure to poverty, social support, stress appraisal, and coping behaviors, which may ultimately lead to divergent implications for their functional health. However, it remains unclear whether the adverse health effects of area-level disadvantage, as a primary ecological stressor, are similarly moderated by gender. Given well-documented gender differences in health outcomes among older adults (Cameron et al., 2010; Dunlop et al., 2002), further investigation is warranted to determine whether gender-specific stress processes contribute to disparities in functional limitations.

The Present Study

In this study, we examine the case of area-level poverty rates and individual-level functional limitations. Our primary objective is to investigate whether neighborhood perceptions and coping behaviors mediate the relationship between county- and tract-level poverty rates and functional limitations, and whether these relationships differ by gender. Our study objective is two-fold. First, we assess whether the association between area poverty rates, as primary stressors, and functional limitations demonstrates gender-specific patterns. Second, we investigate the extent to which secondary stressors—specifically, perceived neighborhood safety and physical order—and psychosocial factors, including social support and coping behaviors (i.e., heavy drinking, substance misuse, stress eating, and physical activity)—mediate the relationships between area poverty rates and functional limitations, and whether these mediating pathways differ by gender.

Methods

Data

We draw on data from the Midlife in the United States (MIDUS) study (Brim et al., 2004). The original MIDUS study was first

conducted in 1995 with non-institutionalized English-speaking adults in the coterminous United States. Follow-up surveys were completed approximately 9 and 18 years later in 2004–2005 and 2013-2014 respectively and are the focus of the current study (hereafter referred to as MIDUS 2 and 3). Since some of the variables of interest are not available in the first wave of MIDUS, we restricted our sample to MIDUS 2 and 3. Approximately half of the original sample was recruited through random digit dialing, and the remainder of the participants were recruited as over-samples in selected metropolitan areas, siblings of the random sample, or a national sample of twin pairs. Of the 7108 respondents in the original sample, retention for MIDUS 2 was approximately 75% after accounting for mortality. Respondents included in the current analysis were 2,499 adults who completed the telephone interview and self-administered questionnaire at MIDUS 2 and 3 and were aged 55 or above in MIDUS 2. The Milwaukee subsample was introduced in MIDUS 2 to account for the limited representation of racial minorities in the national sample in MIDUS 1. However, since this subsample is city-specific to Milwaukee, Wisconsin, we do not include it in our study to maintain a more balanced geographic representation regarding area-level effects on health. Of the MIDUS 2 sample, 401 respondents were lost in MIDUS 3 due to mortality, and 503 respondents didn't respond to the MIDUS 3 survey. Data collection was originally approved by an Institutional Review Board, and all participants provided written informed consent. This study was deemed exempt by the University of Utah Institutional Review Board (IRB# 00156757), as the study uses only deidentified participant data.

Measures

Functional Limitations. In conceptualizing functional limitations, we drew on the framework established by Verbrugge and Jette (1994), which emphasizes mobility and functional disability. To operationalize this concept, respondents were asked to assess the extent to which their health impeded their ability to perform a range of daily activities, utilizing a modified version of the SF-36 physical functioning instrument (Brazier et al., 1992; Friedman et al., 2015). These activities included lifting or carrying groceries, climbing several flights of stairs, bending, kneeling, or stooping, walking more than a mile, walking several blocks, vigorous activities (e.g., running, lifting heavy objects), and moderate activities (e.g., bowling, vacuuming). The four-point response options provided were "not at all," "a little," "some," and "a lot." To calculate functional limitations, the average of the ratings for the seven items was taken, resulting in potential scores ranging from 0 to 3. A higher value of functional limitations indicates greater difficulty in performing daily life activities.

Area-level Poverty Rate. The area-level poverty is measured by the proportion of individuals living in families with a combined income below 150% of the federal poverty level (FPL). We chose this threshold over the standard 100% FPL due to well-documented limitations of the official poverty measure, which has been criticized for its outdated methodology and failure to accurately capture the true prevalence of economic hardship. Research indicates that the official poverty measure significantly underestimates poverty rates, particularly among older adults, as it does not account for non-cash resources, taxes, or regional cost-of-living variations (Fox et al., 2015; Short, 2012). To address these shortcomings and provide a more accurate representation of economic disadvantage, we adopted the 150% FPL threshold, consistent with prior studies that have utilized this higher benchmark to better reflect the realities of poverty (Akincigil et al., 2012; Sandoval et al., 2009).

The county-level and tract-level poverty rates were obtained from the 2006-2010 American Community Survey (ACS) 5-year estimates, as provided by the U.S. Census Bureau. Since area-level economic disadvantage was measured between the second and third waves of the MIDUS study, and prior research indicates that economic disadvantage tends to remain relatively stable over short time periods, we treated this variable as time-invariant. For respondents who moved from one county to another between MIDUS 2 and 3, we used their residential address at each wave to determine the corresponding area-level economic disadvantage. This approach ensures that the measure accurately reflects the economic context of each participant's neighborhood during the relevant study period.

Gender. *Gender* was assessed as a binary variable, with male and female response options. An inclusive measure of gender identity that includes nonbinary and transgender categories was not available, nor was a measure of gender expression (e.g., masculinity and femininity). Thus, we could not examine how gender identity and gender roles influence differential stress responses (Helgeson, 2010).

Secondary Stressors. *Perceived neighborhood safety* was measured using two items. These items focused on the respondent's feelings of safety when being out alone in their neighborhood during both daytime and nighttime. These specific questions were originally included as part of the perceived neighborhood trust and safety scale developed by Keyes (1998). Response options ranged from 0=not at all to 3=a lot. Perceived neighborhood safety score was calculated as an average of the two items, with higher scores corresponding to a greater perceived safety.

Perceived neighborhood order was assessed using two items on the condition of infrastructure and overall cleanliness. Specifically, respondents were asked to evaluate whether the buildings and streets in their neighborhood are well-maintained and kept in very good repair, as well as whether the neighborhood itself is kept clean. Response options ranged from 0=not at all to 3=a lot. The perceived neighborhood order score was calculated as an average of the

two items, with higher scores corresponding to a greater perceived order in the neighborhood.

Social Support. *Social support* was calculated as the average score on a set of items assessing the level of emotional and instrumental support received by respondents, following prior research (Elliot et al., 2018). For individuals without a spouse, four items were utilized to gauge support from either family members or friends: the extent to which they really care about the respondent; their level of understanding regarding the respondent's feelings; the degree to which the respondent can rely on them for help in times of serious problems; and the ease with which the respondent can open up to them about their worries. In contrast, respondents with a spouse were asked an additional six items that evaluated support from their partner: the extent to which their spouse really cares about them; their level of understanding regarding the respondent's feelings; the degree to which their spouse appreciates them; the extent to which they rely on their spouse for help in times of serious problems; the ease with which they can open up to their spouse about their worries; and the degree to which they feel comfortable relaxing and being themselves around their spouse. The resulting social support index represents the average score of either 8 or 14 items, depending on the respondent's marital status.

Coping Behaviors. *Stress eating* was assessed using two items. The first item focused on whether the respondent tends to eat more than usual during times of stress, while the second item probed whether the respondent consumes more of their favorite foods as a way to comfort themselves during stressful events (Tsenkova et al., 2013). Response options included 0=not at all, 1=only a little, 2=a medium amount, and 3=a lot. Stress eating score was calculated as the average of the two items, with higher scores corresponding to a greater tendency to eat as a stress response.

Substance misuse was operationalized in MIDUS as the self-reported use of any drugs or medications without a doctor's prescription, in quantities larger than prescribed, or for a duration longer than prescribed. The drugs or medications included sedatives, tranquilizers, amphetamines, painkillers, anti-depressants, inhalants, marijuana/hashish, cocaine/crack, hallucinogens, and heroin (Kim et al., 2020). To identify individuals who engaged in substance misuse, we categorized respondents who reported using at least one of these substances. This variable was treated as a dummy variable in analyses.

Heavy drinking was measured as the self-reported number of drinks on the same occasion during the past month in MIDUS. We classified respondents who had five or more drinks on the same occasion at least once during the past month into the heavy drinking category. This variable was treated as a dummy variable in analyses.

Physical activity was operationalized as the average of two items that assessed the frequency of light leisure activities during summer and winter. Response options ranged from never, less than once per month, about once per month, several times per month, about once per week, to several times per week or more.

Other Covariates. We controlled for sociodemographic characteristics, including age, education (high school or below, some college, college or above), household income (adjusted for inflation), race/ethnicity (non-Hispanic white, black, other race/ethnicity), and years of residence in the neighborhood.

Analysis Plan

We conducted path analyses in a multilevel structural equation modeling framework using marginal models with unstructured covariances (Fitzmaurice et al., 2011; Rabe-Hesketh & Skrondal, 2012). Marginal models with unstructured covariances effectively account for autocorrelation by assuming unrestricted covariances between residual terms across time points. This approach is well-suited to longitudinal data and tends to yield more accurate results than methods that do not account for autocorrelation (Fitzmaurice et al., 2011). We estimated the model similar to Andersen's (2022) specification using wide format data. We employed full-information maximum likelihood to handle missing values with Huber-White sandwich robust standard errors to account for the clustering of observations within individuals.

We simultaneously modeled fourteen indirect effects with the following path: county- and tract-level poverty rates → seven mediators → functional limitations. Functional limitations were predicted with two equations:

$$\begin{aligned} FL_{iM2} = {} & \beta_0 + SS_{iM2}\beta_1 + NS_{iM2}\beta_2 + NO_{iM2}\beta_3 + PA_{iM2}\beta_4 \\ & + HD_{iM2}\beta_5 + SM_{iM2}\beta_6 + SE_{iM2}\beta_7 + CPOV_i\beta_8 \\ & + TPOV_i\beta_9 + TVC_{jM2}\beta_j + TIC_k\beta + \epsilon_{iM2} \end{aligned}$$

$$\begin{aligned} FL_{iM3} = {} & \beta_0 + SS_{iM2}\beta_1 + NS_{iM3}\beta_2 + NO_{iM3}\beta_3 + PA_{iM3}\beta_4 \\ & + HD_{iM3}\beta_5 + SM_{iM3}\beta_6 + SE_{iM3}\beta_7 + CPOV_i\beta_8 \\ & + TPOV_i\beta_9 + TVC_{jM3}\beta_j + TIC_k\beta + \epsilon_{iM3} \end{aligned}$$

In these equations, FL is the functional limitations in person i and wave $M2$ or $M3$. SS is social support. NS refers to perceived neighborhood safety. NO refers to perceived neighborhood order. PA stands for physical activity. HD refers to heavy drinking. SM is substance misuse. SE refers to stress eating. $CPOV$ stands for county-level poverty rate. $TPOV$ stands for census tract-level poverty rate. TVC_j refers to the j^{th} individual-level time-varying control variables and TIC_k refers to the k^{th} individual-level time-invariant control variables. Each indirect effect was estimated with the following two equations:

$$MED_{iM2} = \pi_0 + CPOV_i\pi_1 + TPOV_i\pi_2 + TVC_{jM2}\pi_j + TIC_k\pi + v_{iM2}$$

$$MED_{iM3} = \pi_0 + CPOV_i\pi_1 + TPOV_i\pi_2 + TVC_{jM3}\pi_j + TIC_k\pi + v_{iM3}$$

where *MED* refers to one of the seven mediators. The residual term of each variable in all pairs of endogenous variables, FL_{iM2} and FL_{iM3}, and MED_{iM2} and MED_{iM3}, was allowed to freely correlate within pairs to account for autocorrelation. Each equation includes the same set of time-varying and time-invariant control variables. Figure 1 shows the conceptual path model to be tested for each gender.

To test potential gender differences in the pathways between county- and tract-level poverty rates and functional limitations, we employed a general framework using structural equation modeling (Mize et al., 2019) in Stata 15.1. This approach allows us to estimate regression models for both males and females within the same structural equation model, leveraging the flexibility of this technique. Hence, we were able to evaluate the statistical significance of these gender differences using Wald tests. Within this framework, we examined the relationship between county-level poverty rate and functional limitations, as well as the mediating effects of seven key variables, while controlling for a range of covariates, including age, education, household income, race/ethnicity, and years of residence. Indirect effects were estimated using the product of coefficients method (MacKinnon et al., 2007). Path model results were reported for the overall sample, as well as separately for the male and female subsamples.

Results

Sample descriptive statistics are shown in Table 1. There are some observable differences between men and women. Specifically, women reported higher likelihood of stress eating, more social support, lower perceived neighborhood safety, and more physical activity than men on average. On the other hand, both men and women reported similar levels of substance misuse.

Table 2 presents the path analytic model results for the full sample and by gender. In the full sample (as shown in the second column), the findings reveal noteworthy connections between poverty rates at both county and tract levels and functional limitations. While the combined indirect impact of the seven mediators was not statistically significant for the county-level poverty effect, it did show significance for the tract-level poverty effect ($p = .04$), accounting for approximately two-thirds of the primary effect. Put simply, when combining men and women into a single group, the results indicate significant pathways only for the tract-level poverty effect, with no significant mechanisms found for the county-level poverty effect.

Gender-specific analyses revealed more complicated relationships between poverty rates and functional limitations (see the third and fourth columns in Table 2), with gender differences formally tested using Wald tests. In terms of county poverty effects, the direct impact was found to be significant only for men, while the indirect effect was significant solely for women, with the combined influence of the seven mediators explaining approximately 40.3% of the association between county poverty and functional limitations among women. When it comes to the effects of tract-level poverty, although no significant gender differences were observed (as indicated in the last column of Table 2), it is noteworthy that the indirect effects were notably more pronounced among men compared to women. Specifically, the seven mediators accounted for around 88.8% and 46.3% of the tract poverty effects for men and women, respectively.

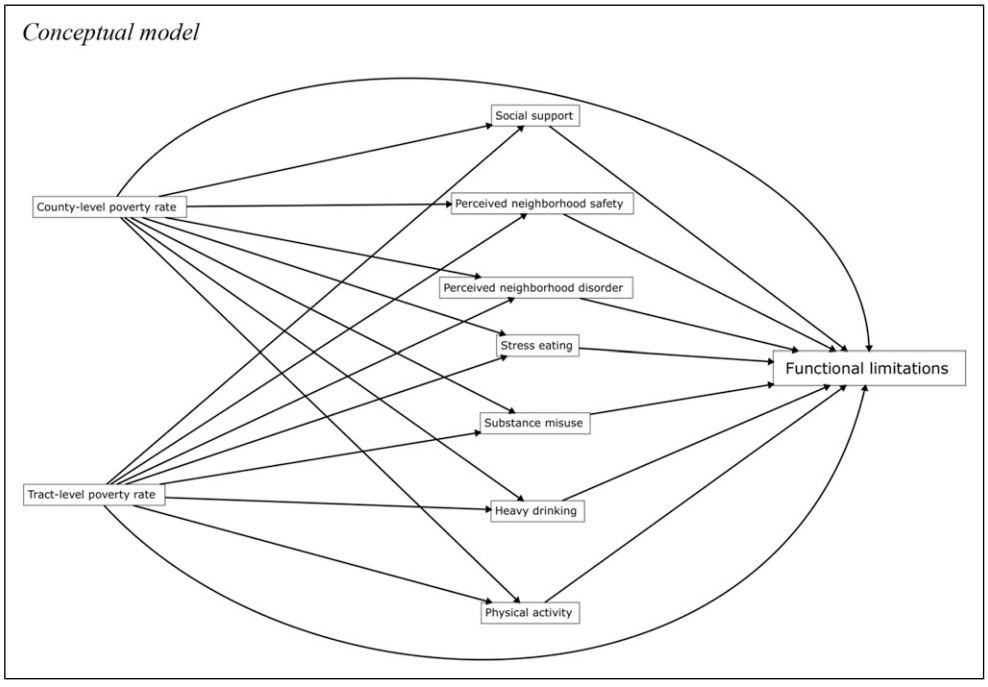

Figure 1. Conceptual model.

Table 1. Sample Descriptive Statistics by Gender (MIDUS 2 and 3).

	Male			Female		
	%	Mean	SD	%	Mean	SD
FL		0.90	0.86		1.19	0.96
County-level poverty rate	21			22		
Tract-level poverty rate	18			19		
Social support		2.52**	0.41		2.57	0.42
Perceived neighborhood safety		2.81***	0.41		2.52	0.57
Perceived neighborhood order		2.58	0.60		2.57	0.60
Stress eating		0.53***	0.73		0.96	0.95
Substance misuse	8			8		
Heavy drinking	11***			2		
Physical activity		3.81***	1.54		4.01	1.57
Years of residence		23.45	16.80		21.66	16.85
Age		68.27	8.16		68.29	8.07
Household income (in 10,000)		6.13	5.10		4.30	4.37
High school or below	28			39		
Some college	25			32		
College or above	47			30		
Non-Hispanic white	91			89		
Black	3			4		
Other racial/ethnic groups	6			7		
N	1349			1547		

Note. two-tailed significance tests for gender difference with chi-square tests or two-sample t-tests are presented for mediators.
*$p < .05$, **$p < .01$, ***$p < .001$.

Table 2. Standardized Estimates for Path Analytic Models by Gender (N=2499).

	Full sample[1]	Male[2]	Female[3]	Gender difference
County-level				
Total effect of poverty rate	0.065** (0.020)	0.092** (0.030)	0.039 (0.028)	−0.054 (0.041)
Direct effect of poverty rate	0.060** (0.019)	0.103*** (0.028)	0.023 (0.027)	−0.080* (0.039)
Indirect effect of poverty rate across all mediators	0.006 (0.005)	−0.011 (0.007)	0.016* (0.007)	0.026** (0.010)
Percentage mediated	8.8%	−11.4%	40.3%	
Tract-level				
Total effect of poverty rate	0.043* (0.021)	0.029 (0.034)	0.059* (0.028)	0.029 (0.044)
Direct effect of poverty rate	0.015 (0.021)	0.003 (0.033)	0.032 (0.028)	0.028 (0.044)
Indirect effect of poverty rate across all mediators	0.028*** (0.007)	0.026* (0.010)	0.027** (0.010)	0.001 (0.014)
Percentage mediated	65.9%	88.8%	46.3%	

Note. Standard errors in parentheses.
[1]CFI: 0.97, TLI: 0.95, RMSEA: 0.02.
[2]CFI: 0.98, TLI: 0.97, RMSEA: 0.02.
[3]CFI: 0.97, TLI: 0.93, RMSEA: 0.02.
+$p < .1$, *$p < .05$, **$p < .01$, ***$p < .001$.

Table 3 presents the standardized estimates for each indirect effect of poverty rates on functional limitations. Figure 1 illustrates our conceptual path model and Figures 2 and 3 include only significant pathways. Among women (see the third column in Table 3 and Figure 2, three pathways were significant: county poverty rate → stress eating → FL, tract poverty rate → perceived neighborhood safety → FL, and tract poverty rate → physical activity → FL. Among men, none of the mediators was significant (see the second column in Table 3 and Figure 2).

Sensitivity Analyses

We conducted sensitivity analyses by employing alternative measures of functional limitations and poverty rates. Specifically, we replaced the original measure of functional limitations with a score based on basic activities of daily living (ADL) in the path analytic model. The ADL score was calculated as the average of three items from the MIDUS questionnaire, which evaluated the extent to which health

Table 3. Standardized Estimates for Each Path by Gender (N = 2499).

	Male	Female	Gender difference
County-level			
Poverty rate → social support → FL	−0.002 (0.002)	0.001 (0.003)	0.003 (0.003)
Poverty rate → perceived neighborhood safety → FL	0.000 (0.000)	0.002 (0.002)	0.002 (0.002)
Poverty rate → perceived neighborhood order → FL	−0.001 (0.002)	0.000 (0.001)	0.001 (0.002)
Poverty rate → stress eating → FL	−0.001 (0.003)	0.010* (0.005)	0.011* (0.005)
Poverty rate → substance misuse → FL	0.000 (0.001)	0.001 (0.001)	0.001 (0.002)
Poverty rate → heavy drinking → FL	0.000 (0.001)	0.000 (0.000)	0.000 (0.001)
Poverty rate → physical activity → FL	−0.007 (0.005)	0.001 (0.002)	0.008 (0.006)
Tract-level			
Poverty rate → social support → FL	0.004 (0.003)	0.003 (0.003)	−0.001 (0.004)
Poverty rate → perceived neighborhood safety → FL	0.002 (0.005)	0.010* (0.005)	0.009 (0.006)
Poverty rate → perceived neighborhood order → FL	0.014^{+} (0.008)	0.005 (0.006)	−0.009 (0.010)
Poverty rate → stress eating → FL	0.003 (0.003)	0.002 (0.004)	−0.001 (0.005)
Poverty rate → substance misuse → FL	0.002 (0.002)	0.000 (0.001)	−0.002 (0.002)
Poverty rate → heavy drinking → FL	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
Poverty rate → physical activity → FL	0.003 (0.006)	0.007* (0.003)	0.004 (0.006)

Note. Standard errors in parentheses. FL stands for functional limitations.
$^{+}p < .1$, $^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$.

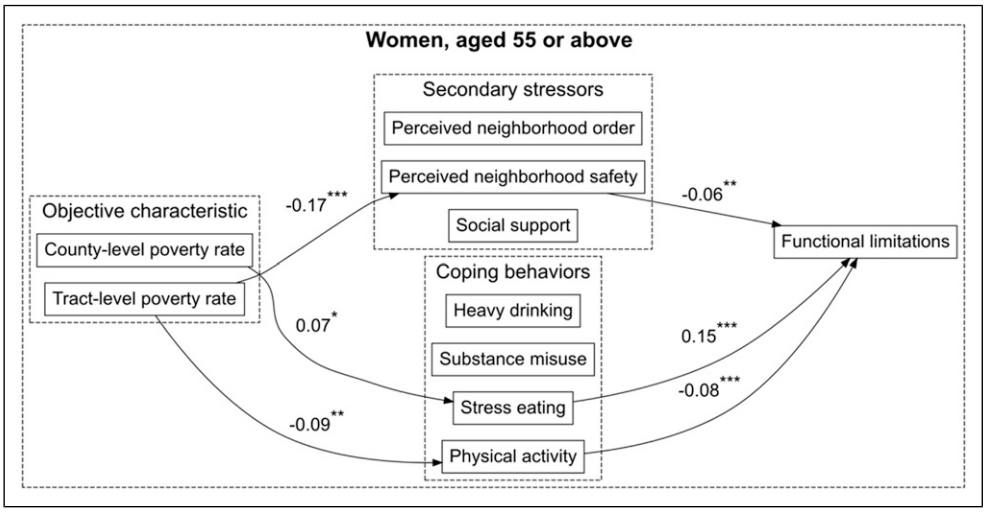

Figure 2. Path model results showing paths and standardized estimates among county-level poverty rate, secondary stressors, coping behaviors, and FL for women. *Note*. Only significant pathways are shown. $^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$.

limits individuals in performing everyday tasks such as bathing or dressing oneself, climbing one flight of stairs, and walking one block. Responses for these items ranged from 0=not at all to 3=a lot. The substantive findings from these analyses closely aligned with those reported in the previous section, for both county- and tract-level effects. Detailed results based on the ADL measure are presented in Tables A3 to A4.

In addition, we assessed the robustness of our findings by employing alternative measures of poverty rates. Specifically, we replaced the original measure—150% of the federal poverty level (FPL)—with the county- and tract-level proportions of individuals with income below 100% of the FPL in the path analytic model. The results from these analyses are detailed in Tables A5 to A6. Importantly, our substantive conclusions regarding our research questions remained consistent. We found no significant gender differences in the total effect, but a significant gender difference in the indirect effect persisted, further reinforcing the validity of our initial findings.

Discussion

This study contributes to the growing body of literature on the relationship between area socioeconomic disadvantage and

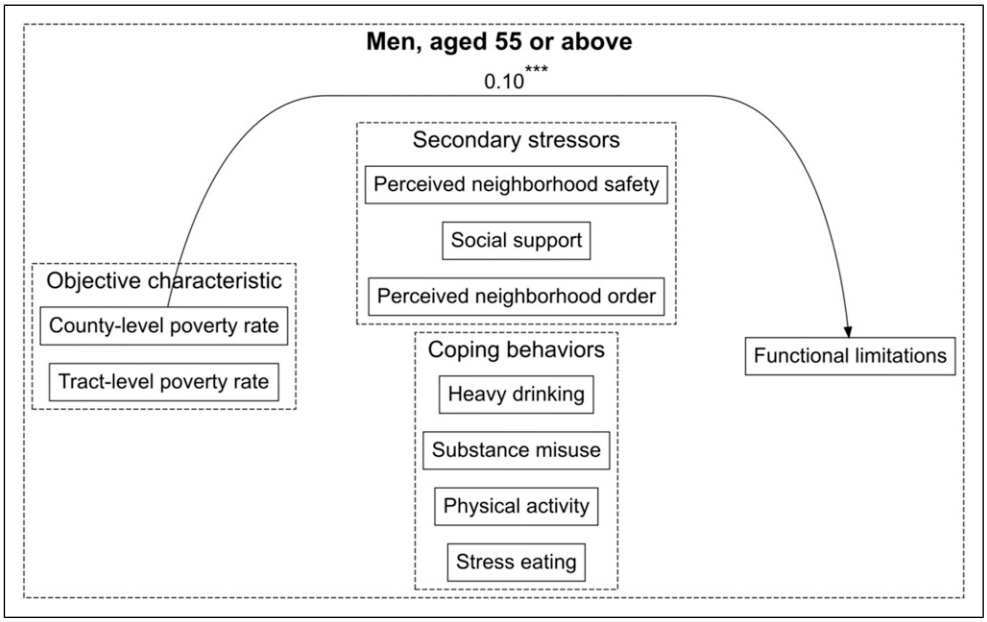

Figure 3. Path model results showing paths and standardized estimates among county-level poverty rate, secondary stressors, coping behaviors, and FL for men. *Note*. Only significant pathways are shown. *$p < .05$, **$p < .01$, ***$p < .001$.

health outcomes by examining gender-specific patterns and mechanisms among a sample of older adults in the United States. Our findings indicate that older adults residing in areas with higher poverty rates are more likely to experience poorer functional status, even after controlling for individual sociodemographic factors. This pattern holds across genders, underscoring the pervasive impact of area-level poverty on health. These results align with and extend prior research that emphasizes the adverse health effects of area-level poverty, reaffirming the critical influence of local socioeconomic context on functional health outcomes (Glass & Balfour, 2003; Jia et al., 2009; Montez et al., 2017). Notably, our study advances the field by demonstrating that both county-level and tract-level poverty independently and simultaneously affect individual-level functional limitations. This highlights the importance of considering multiple geographic scales when analyzing the impact of area-level disadvantage on health. Additionally, our path analyses uncovered significant differences in the direct and indirect effects of poverty for men and women, as well as between county- and tract-level analyses. These gender- and scale-specific insights provide a more nuanced understanding of the mechanisms through which area-level poverty influences functional health, offering valuable directions for future research and targeted interventions.

Our analysis reveals that the seven mediators collectively accounted for a substantial portion of the total effect of poverty on functional limitations, explaining 40.3% of the county-level poverty effect and 46.4% of the tract-level poverty effect for women, as well as 88.8% of the tract-level poverty effect for men. However, these mediators did not significantly contribute to explaining the total effect of county-level poverty for men. In other words, while neighborhood perceptions and individual psychosocial factors effectively elucidate why neighborhood poverty is associated with a higher risk of functional limitations—particularly for men—they do not account for the adverse health effects of county-level poverty on men. Theoretically, county-level disadvantage may influence health through various pathways, such as limited economic opportunities, inferior infrastructure quality, and poorer food environments (Cafer & Kaiser, 2016; Deller et al., 2015; Goetz & Swaminathan, 2006). These factors may lead to differential exposure to secondary stressors, weakened social support networks, and maladaptive coping behaviors. The hypothesized conceptual framework was empirically supported for women to some extent in this study. However, for men, the pathways connecting broader contextual poverty at the county level to health outcomes may encompass unexplored factors that warrant further investigation.

The distinct patterns of indirect effects observed across different geographic scales—tract-level versus county-level poverty—highlight the importance of examining area-level effects using multiple geographic units simultaneously. Moving forward, research should expand beyond the traditional focus on neighborhood-level determinants of functional status. Instead, it should investigate the role of broader geographic contexts, such as county- or commuting zone-level disadvantages, and explore how these effects vary by gender. Additionally, future studies should identify and examine relevant mediating factors that may explain the differential impacts of poverty across geographic scales and demographic groups. This approach will provide a more comprehensive

understanding of the complex interplay between area-level poverty and health outcomes.

A closer examination of the hypothesized pathways reveals three mediators that are particularly significant. Stress eating and physical (in)activity serve as key mediators linking area-level poverty to individual-level functional limitations among women, but not among men. These findings underscore the importance of avoidant coping strategies, which involve modifying cognitive appraisal and emotional responses to stressors (Pearlin & Schooler, 1978), in explaining the relationship between area-level poverty and functional limitations among older adults. The results align with the differential vulnerability thesis, which posits that men and women respond differently to similar stressors (Rosenfield & Mouzon, 2013). A plausible explanation for this gender difference in mediation lies in women's disadvantaged social status (Bird & Rieker, 2008), which often restricts their access to resources and opportunities, thereby limiting their ability to employ approach-oriented coping strategies. Consequently, women may be more likely to resort to avoidance coping mechanisms, which frequently manifest in health-related behaviors such as stress eating and physical inactivity (Mezuk et al., 2017; Tamres et al., 2002). This dynamic helps explain why stress eating and physical inactivity significantly mediate the effects of area-level poverty on functional limitations for women, but not for men. These insights highlight the gendered nature of coping mechanisms and their role in shaping health outcomes in the context of socioeconomic disadvantages.

Perceived neighborhood safety emerged as a significant mediator for the relationship between neighborhood poverty and functional limitations among older women, but not among men. This gender difference may stem from older women's heightened sensitivity to signs and cues of neighborhood safety, potentially due to their perceived vulnerability, particularly considering their advanced age. It is also possible that women, in general, are more attuned to their surroundings than men. This finding aligns with existing literature on women's fear of crime, which suggests that women tend to report lower physical defense capabilities, reduced self-efficacy, and heightened perceptions of potential consequences compared to men (Jackson, 2009). As a result, women may be more likely to limit walking or outdoor activities in their neighborhoods due to safety concerns (Bennett et al., 2007), which can contribute to reduced physical activity and, ultimately, poorer functional status. These insights underscore the gendered nature of neighborhood perceptions and their role in shaping health outcomes among older adults.

The finding that social support does not meaningfully mediate the relationship between area-level poverty and functional limitations is surprising, given the well-documented role of social support as a buffer in the stress process and its significant implications for health (Cairney & Krause, 2005; White et al., 2009). Supplementary analyses (presented in the Appendix) revealed that the association between county-level poverty and social support is negligible for both men and women. One possible explanation for this null finding is that perceived emotional and instrumental support may be less relevant in larger geographic units, such as counties, where many social interactions occur with strangers or colleagues rather than close acquaintances. In contrast, the local neighborhood context may play a more critical role in shaping social connections and support networks. This interpretation is supported by supplementary analyses among men, which suggest that social support mechanisms may operate more effectively at smaller geographic scales, such as the neighborhood level, where interpersonal relationships are more likely to develop and thrive.

By integrating existing research on area socioeconomic disadvantages and gender differences in the stress process, our findings advance the literature by illuminating the distinct ways in which area socioeconomic disadvantage impacts physiological health differently for men and women. Notably, coping behaviors are adopted differentially by gender, leading to disparate health implications. For instance, supplementary analyses (presented in Table A1 in the Appendix) show that women were more likely to engage in stress eating in response to higher county-level poverty rates and were also more severely affected by this behavior. These key findings not only highlight significant gender differences in coping mechanisms but also reveal the detrimental effects of these behaviors on functional status, thereby uncovering a plausible pathway linking chronic stressors to physical health outcomes. Specifically, women are vulnerable in two ways: they exhibit a stronger tendency toward stress-related eating, and this behavior has a more pronounced negative impact on their functional status.

Moreover, these findings underscore the importance of adopting a gendered approach when designing interventions. While our current results do not identify a specific mediator for older men, the prominent role of stress eating as a mediator suggests that improving the local food environment could be particularly beneficial for enhancing older women's functional status. Future research should explore additional mediators for both genders to inform more comprehensive, nuanced, and gender-specific interventions. Such efforts will help address the unique ways in which men and women experience and respond to area socioeconomic disadvantages, ultimately promoting more equitable health outcomes.

The absence of significant mediation by heavy drinking and substance misuse in the relationship between poverty rates and functional limitations among both men and women contradicts early research suggesting men's tendency to externalize problems through risky behaviors (Horwitz & Davies, 1994; Rosenfield, 1999). One possible explanation for this discrepancy lies in the differing risk-taking tendencies between older and younger adults. Research suggests that as individuals age, the likelihood of engaging in risk-taking behaviors, such as heavy drinking and substance misuse, decreases for both men and women (Rolison et al., 2014). Consequently, the prevalence of alcohol and substance misuse

among older adults is relatively low compared to younger age groups (Sacco et al., 2020).

Finally, it is important to note that this study solely focuses on the relationship between poverty rates and functional limitations. However, other dimensions of area-level disadvantages, such as social capital deficiency, may display comparable gender-specific patterns in the mechanisms. For instance, local social networks could play a more significant role in women's health than men's, given that women often depend more on social support and networking as coping strategies (Rieker et al., 2010). Hence, the presence and quality of local social networks could contribute to disparities in functional limitations between genders.

This study has several notable limitations that merit attention. Firstly, the representation of racial/ethnic minorities in the analytic sample is relatively low, comprising just over 10%. This proportion falls short of the national level observed in corresponding periods of MIDUS 2 and 3. Thus, the findings of this study may not accurately reflect the experiences of racial/ethnic minorities at the national level. Future research endeavors should strive to address this gap by ensuring better coverage of racial/ethnic minorities across the country. Secondly, the primary predictor under investigation, the county-level poverty rate, is time-invariant due to data constraints. As a result, this study primarily examines the cross-sectional effect of area-level poverty rate on functional limitations. Future investigation should explore how changes in the poverty rate over time correlate with variation in functional limitations and elucidate how these mediating processes manifest differently across genders. Third, this study focuses on a limited set of potential stressors within the stress proliferation process. Area-level disadvantages can potentially impact health through a multitude of stressors, including physical threats, social isolation, and daily hassles. Thus, future research should assess the diverse array of stressors associated with area-level disadvantages and their respective implications for health outcomes. Lastly, our analysis is limited to a binary conceptualization of gender, with only two categories, male and female. Unfortunately, due to data constraints, we lack a more inclusive measure of gender that includes nonbinary and transgender categories as well as measures of gender expression (e.g., masculinity and femininity), which precludes us from further exploring how gender identity and roles influence differential stress responses, as has been demonstrated in other empirical contexts (Helgeson, 2010). Therefore, we recommend that future research incorporate more nuanced measures of gender to provide a more comprehensive understanding of the ways in which gendered stress responses are shaped by area-level disadvantages.

In summary, while the link between area-level disadvantages and functional limitations is well-documented, this study uncovers significant gender differences in the underlying pathways. Despite the pervasive influence of gender socialization and roles on health and behavior, relatively few studies in area-level research have delved into the interplay between gender dynamics and health outcomes. This study sheds light on crucial gendered mechanisms linking structural disadvantages to functional limitations among older adults, potentially reflecting a broader pattern specific to the aging process. Our findings indicate that while older men and women are similarly affected by the same area-level stressor—namely, poverty rates—they experience different mediating factors. The complexity of these gender-specific mechanisms underscores the need for interventions that recognize and address the distinct ways men and women respond to stressors, as well as the differential impacts of mediating factors. Further exploration, focusing on sociodemographic differences in patterns and mechanisms of the aging process, holds promise for informing targeted interventions and policies tailored to the specific needs of these diverse population subgroups.

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Supplemental Material

Supplemental material for this article is available online.

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