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Socio-Spatial Disparities in County-Level Availability of Aging and Disability Services Organizations

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Cover Page Footnote

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ABSTRACT

Aging and disability services are essential for supporting older adults in living independently in their homes and communities as they age. Applying theoretical perspectives of community gerontology and spatial inequality, we use county-level data (N=3142) from the National Neighborhood Data Archive (NaNDA) and the American Community Survey to explore if and how availability of aging and disability services organizations varies across the rural-urban continuum and across compositional characteristics of counties. Results show that rural counties are significantly more likely to be aging and disability services deserts. Stratified models show that poverty rates and relative shares of non-Hispanic Blacks are positively associated with greater odds of aging and disability services deserts across rural and urban counties, but divergent findings appear for county-level shares of Hispanics. These findings are discussed as well as implications for research, policy, and practice on equitable access to aging and disability services.

KEYWORDS

Aging and disability services, older adults, rural, socio-spatial disparities

INTRODUCTION

The United States population is aging, a demographic shift that will have significant implications for individuals, families, communities, and service providers across the country. Population aging is occurring more rapidly in rural areas (Glasgow and Berry 2013), where a growing number of older adults are “aging in place,” or remaining in their homes and communities

as they age, while the younger population is declining due to outmigration to urban areas and lower birth rates (Tuttle et al. 2020). These demographic shifts may create challenges for rural older adults with growing care needs by reducing the availability of informal family support or formal health and social service supports due to declining working-age populations (Buckwalter, Davis, and Talley 2011). This is particularly problematic as rural older adults have higher rates of a number of chronic health conditions (Cohen et al. 2018; O'Connor and Wellenius 2012) and face socio-spatial barriers to healthcare access (Douthit, Dwolatzky, and Biswas 2015), potentially resulting in a greater need for supportive services in later life. Moreover, rural areas face heightened challenges in supporting larger relative shares of older adults, as lower population density and struggling rural economies create financial and logistical challenges to providing services to address older adults' growing social and healthcare service needs (Morken and Warner 2012).

Aging and disability services organizations play a key role in supporting health and well-being of older adults. These organizations provide older adults with a wide array of social, long-term care, and health-support services. Nearly 80 percent of U.S. adults age 50+ prefer to age in place, and services provided through aging and disability services organizations help older adults remain independent in their own homes and communities and avoid nursing home placement (Binette and Vasold 2018; O'Shaughnessy 2008). The type and amount of supportive services needed to maintain health and quality of life vary widely between individuals and across communities, given differences in vulnerability and access to financial and social resources (Roberto, Weaver, and Wacker 2014; Wacker and Roberto 2014).

However, limited research has examined if and how access to aging and disability services organizations varies between rural and urban areas and within rural areas (Brown et al. 2018; Government Accountability Office 2019). Examining socio-spatial disparities in access to aging and disability services can shed light on additional factors that should be accounted for in examining rural-urban and within-rural inequalities in later life. In addition, as rural America is increasingly racially and socio-economically diverse, research is needed to understand how older adults' access to services differs within rural areas based on race/ethnicity and poverty status (Jensen et al. 2020). The present research addresses this gap by examining if socio-spatial disparities exist in aging and disability services access across the rural-urban continuum

and based on racial, ethnic, socio-economic composition, and age structure.

Aging and Disability Services Organizations

Aging and disability services organizations offer a wide array of programs, services, and resources to assist older adults in living independently and healthily in their communities as they age (Administration for Community Living 2018). Although the specific services provided differ based on organizational mission and capacity, aging and disability services commonly include: home-delivered and congregate meals, health promotion and exercise programs, case management, social programs, transportation, in-home care or chore support, information and referral, and caregiver support (Wacker and Roberto 2014). Disability services organizations offer many similar home- and community-based programs, but typically serve individuals of all ages with physical or intellectual disabilities rather than exclusively serving older adults (Administration for Community Living 2018).

Aging and disability services aim to provide clients with proactive supports to reduce the risk of future health crises that could be life-threatening or lead to prolonged hospital stays or nursing home placement (Gruman and Menne 2020). While aging and disability services support health and independence, they are social services rather than healthcare or long-term care services, and they should be seen as distinct from home- and community-based long-term care services. Home- and community-based services (HCBS) can be financed either through a Medicaid HCBS waiver or by paying out-of-pocket for those who do not qualify for Medicaid (Centers for Medicare & Medicaid Services, n.d.); they are more intensive than aging and disability services and often include medical services, which aging and disability services organizations do not provide.

Older adults vary dramatically in their care needs and preferences, as well as in access to personal resources and informal supports in later life (Wacker and Roberto 2014). Care needs and resources can change significantly should family members become less available for informal care or a health event causes a sudden decline in older adults' independence (Cantor 1989). Aging and disability services can complement informal care from family or friends, or in instances where an older adult is more socially isolated, these services may play a central role in coordinating and providing support over many years (O'Shaughnessy 2008).

Finally, aging and disability services organizations also function as “third places,” providing a location outside the home where older adults build and maintain relationships and access critical social supports that can offer myriad benefits for health and well-being (Aday, Wallace, and Krabill 2019; Ashida and Heaney 2008). Senior centers, or designated places that offer a range of services and activities for older adults, increase social interaction, facilitate the development of strong friendships, and promote feelings of self-worth and community belonging (Wacker and Roberto 2014). The social benefits of senior center participation also offer benefits for older adults’ physical and mental health (Aday et al. 2019). Therefore, an understanding of if and how availability of aging and disability services differs across place is critical to developing solutions for promoting mental, social, and physical healthy aging.

Target Population of the Older Americans Act

The landscape of aging and disability services administration is complex, and the type and structure of aging and disability services organizations varies drastically both within and between states (Roberto et al. 2014). The Older Americans Act (OAA) of 1965 created and funds the Aging Network, a network of federal, state, and local aging services organizations that provide supportive services to older adults (United States 2020). A key element of the design of the OAA and the Aging Network is to allow for flexibility to enable local providers to align services with the unique needs and contexts of diverse communities across the country (Colello and Napili 2021).

The OAA initially intended aging services to be available to all older adults, rather than restricted to serving specific vulnerable sub-populations (National Center on Law & Elder Rights 2018). However, OAA reauthorizations have required that states target limited resources and services to older adults with the greatest social or economic need (United States 2020), including low-income minority older adults and older adults in rural areas (National Center on Law & Elder Rights, 2018). State and local aging services providers are expected to address OAA targeting requirements both by conducting outreach to priority groups named in the Act, and through the allocation of OAA funding to local aging services providers throughout the state using an Intrastate Funding Formula (IFF). While IFFs differ between states, the OAA requires that IFFs reflect the share of the population age 60+ in a local service area, as well as the share of older adults representing groups specifically identified as target populations for OAA services (United States 2020).

Therefore, we would expect to see greater availability of aging and disability services in areas with the largest shares of older adults, the highest rates of poverty, or largest shares of minority individuals. However, the funds for aging services allocated through the OAA are limited and have failed to keep pace with the growing population of older adults in the United States (Ujvari, Fox-Grage, and Houser 2019). This has led aging network programs to supplement OAA resources through an array of sources, including Medicaid, social service block grants, state and local government funds, private sector partnerships, and individual voluntary contributions (Wacker and Roberto 2014). As a result, the extent to which the IFF and its prioritization of target populations is reflected in actual availability of services across the U.S. is limited.

Aging and Disability Services in Rural America

Aging and disability services are provided in communities across the rural-urban continuum, although challenges of delivering aging and disability services in rural environments shape disparities in access to services at the local level. There is minimal research on rural-urban or within-rural differences in aging and disability services demand and availability (Rhubart et al. 2021). Previous studies have found that rural older adults are less likely to use home- and community-based services (HCBS) than their urban counterparts (Sun 2011; Weaver and Roberto 2021). While a narrative suggests that rural communities have a cultural preference for informal support over formal aging services, recent qualitative research suggests that rural older adults navigate conflicting values around assistance but do indicate openness to accepting formal services (Brown et al. 2018; Weaver, Roberto, and Blieszner 2018).

A small body of research has examined the organizational structure and service delivery challenges of rural aging services organizations (Brown et al. 2018; Havir 1991; Krout 1991) and identified spatial disparities in aging service organization structure and activities (Krout 1987; National Association of Area Agencies on Aging 2018). Supply-side factors also limit the amount and quality of aging services in rural areas, including recruiting and retaining a caregiving workforce, funding transportation in rural communities, and meeting the financial needs of aging services agencies in geographically dispersed populations (Nelson 1980; Siconolfi et al. 2019). Although these studies make meaningful contributions to our understanding of aging services in rural areas, there is a clear lack of research examining if and how socio-spatial disparities in aging and disability services availability exists in and across the rural-

urban continuum. This is a critical oversight, as rural places are not only home to larger shares of older adults, but are also increasingly economically and demographically diverse (Jensen et al. 2020).

Theoretical Framework

The characteristics of older adults' social and physical environments have profound consequences for health and well-being in later life (Cagney and Cornwell 2018). The subfield of environmental gerontology focuses on the description, explanation, and modification of older adults' relationship with their socio-spatial surroundings (Wahl and Weisman 2003). We use an environmental gerontological approach in our examination of socio-spatial disparities in aging and disability services organization availability because it emphasizes the importance of social and physical environments in shaping older adults' access to appropriate services and supports needed to safely age in place (Moore 2014; Wanka, Moulaert, and Drilling 2018). Specifically, we engage with the framework of "community gerontology" presented by Greenfield et al. (2018). This framework emphasizes the importance of community context or "meso-level contexts," a scale ranging from individual organizations to metropolitan areas, as fundamental to understanding aging and its diversity.

We build on the community gerontology framework's meso-level focus on characteristics of place that shape the diversity of aging experiences by applying Galster and Sharkey (2017)'s conceptual model of the spatial foundations of inequality, which posits that socio-spatial disparities in the physical and social characteristics of place subsequently shape unequal opportunities for individual and place-level health and well-being. The mechanisms that produce socio-spatial disparities in older adults' health and access to resources are not fully understood (Cagney and Cornwell 2018; Wanka et al. 2018), but evidence suggests that differential access to healthcare and supportive services may in part contribute to observed disparities in later-life health outcomes (Herd, Robert, and House 2011; Mahmoudi and Jensen 2013).

Very little research has examined socio-spatial disparities in access to services that facilitate aging in place (Wacker and Roberto 2014). Understanding and addressing socio-spatial disparities in aging and disability services access is a critical element of growing policy efforts to reduce later-life health disparities and ensure access to aging services for individuals and communities with the greatest social and economic need (Hill et al. 2015; United States 2020). By examining how counties' contextual and compositional characteristics shape availability of aging

and disability services, this study identifies social and spatial inequality in availability of community-based services that support older adults' health and independence.

We argue that given the variable structure and administration of aging and disability services, the differential political contexts and budgetary resources of counties, and the expectation that state and local governments contribute to aging and disability services budgets to supplement OAA funds (Wacker and Roberto 2014), availability of aging and disability services organizations is socio-spatially dependent – influenced by county compositional and contextual characteristics. Figure 1 presents a visual representation of the conceptual framework of counties' contextual and compositional characteristics hypothesized to be associated with being an aging and disability services desert. Specifically, we hypothesize that counties with larger relative shares of racial/ethnic minorities, higher poverty rates, and older age structures, and more rural areas would be more likely to be aging and disability services deserts.

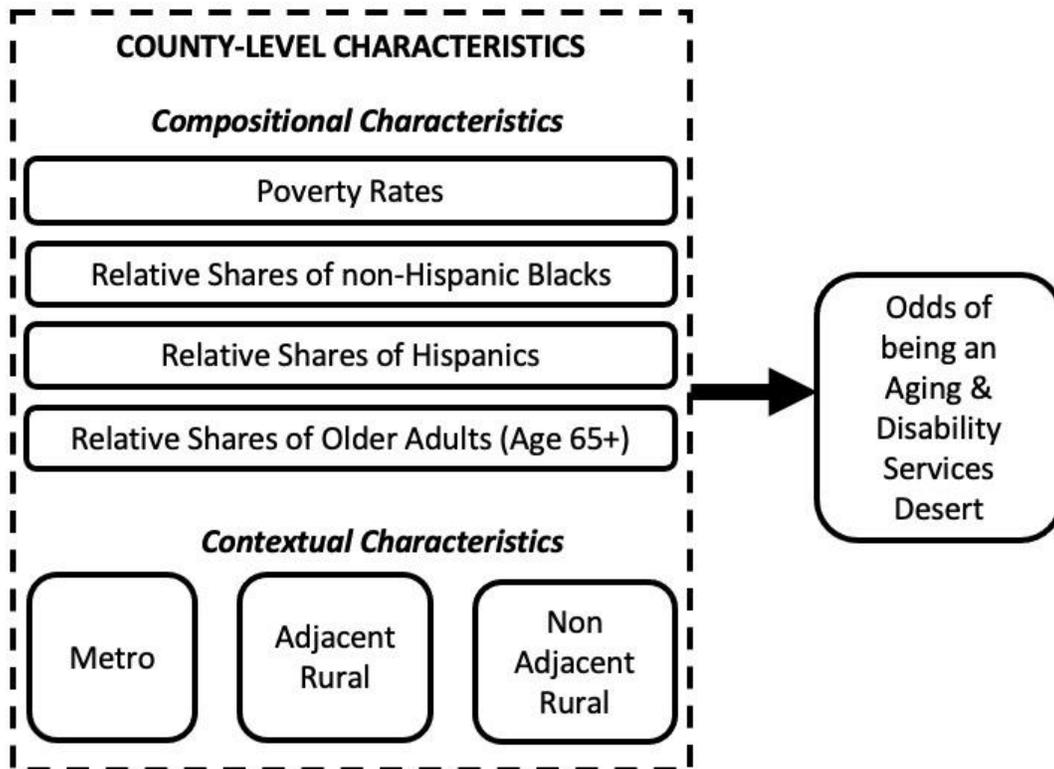


Figure 1: Conceptual Framework of County Compositional and Contextual Characteristics Associated with Greater Odds of Being an Aging and Disability Services Desert

For example, marginalized and disadvantaged communities experiencing the greatest disease burdens and exposed to negative social and physical health risks are often less likely to access healthcare and health promotion resources (Tudor Hart 1971; Walton 2014; White, Haas, and Williams 2012). Areas characterized by geographic, economic, and social disadvantage frequently have less access to a wide range of healthcare and other health-related services (Douthit et al. 2015; Khan and Bhardwaj 1994; White et al. 2012). Concentrated areas of minority populations, economically disadvantaged neighborhoods, rural areas, and areas with older age structures are also likely to have reduced access to healthcare services (Butler et al. 2013) and establishments that shape health behaviors and social determinants of health, including supermarkets, pharmacies, banks, and social service organizations (Hegerty 2020; Sharkey 2009; Small and McDermott 2006; Walker, Keane, and Burke 2010; Wisseh et al. 2020). Given persistent spatial inequity in service access based on community composition and rurality across a range of establishment types, socio-spatial disparities may also exist for aging and disability services organization access.

Economically disadvantaged areas commonly have limited healthcare services and community amenities (Pollack and Armstrong 2009), though some evidence exists that poorer neighborhoods may have greater access to certain establishment types (Anderson 2017; Small and McDermott 2006). Healthcare organizations may preferentially locate in wealthier areas in response to market factors such as consumer demand, health insurance coverage, and health professional availability suggesting greater financial advantage for this location (Butler et al. 2013; Wisseh et al. 2020). Social services organizations may choose to locate in high-poverty areas to achieve economies of scale with service delivery, while others may locate in wealthier areas with greater proximity to potential donors or partner organizations, or clients who generate fee revenue (Allard 2007). Poorer areas are at higher risk of closures of healthcare organizations, social services, or private establishments during periods of economic hardship such as the Great Recession (Finlay et al. 2019; Moblely, Kuo, and Bazzoli 2011), further compounding existing socio-economic and health disadvantages in low-income communities.

Disparities in the spatial distribution of community resources also exist between predominantly racial/ethnic minority and predominantly non-Hispanic White communities, resulting in unequal access to healthcare services, supermarkets, parks and recreation facilities, and banks, to name a few (Anderson 2017; Hegerty 2020; Moore and Diez Roux 2006;

Powell et al. 2004; White et al. 2012). Research has identified racial differences in access to, intent to use, or use of social and medical services for older adults, consistently finding that Blacks face greater barriers to accessing a range of health and aging services than Whites (Anderson 2017; Gornick et al. 1996; Kim et al. 2013; Lehning, Kim, and Dunkle 2013). Inequitable resource access is especially pronounced in predominantly Black areas, largely reflecting historic and ongoing structural racism in the economic development and planning sectors (White et al. 2012). Several potential explanations exist for the reduced presence of beneficial community resources in minority areas. Organizations may leave or avoid minority areas due to poor economic conditions created by redlining and historical disinvestment in these communities, or because of discriminatory processes embedded in segregation, such as negative associations with Black neighborhoods (Anderson 2017). Minority residents may also have been historically relegated to areas lacking long-standing community amenities (Anderson 2017).

Rural areas also commonly face shortages in healthcare resources and other health-relevant services and establishments (Cinnamon, Schuurman, and Crooks 2008; Dai and Wang 2011; Douthit et al. 2015; Sharkey 2009; Skoufalos et al. 2017; Statz and Termuhlen 2020), with implications for rural older adults' health and well-being (Adams-Price et al. 2020; Glasgow and Berry 2013). Within-rural racial/ethnic differences in health-related resource access are also common (Probst et al. 2004), contributing to racial health disparities in rural America (Burton et al. 2013; Cossman, James, and Wolf 2017). Socio-spatial aspects that affect rural community members' access to healthcare and other services include geographically dispersed populations, rural economic decline, professional shortages, limited or nonexistent public transit, and limited communications technology including broadband (Douthit et al. 2015; Probst et al. 2004; Statz and Termuhlen 2020).

While typical conceptualizations of socio-spatial environments do not commonly account for age structure (Galster and Sharkey 2017), we contend it is relevant to our work because age structure and old-age dependency is an important though understudied factor influencing economic development and the availability of community resources (Brown and Eloundou-Enyegue 2016; Thiede et al. 2017). For example, rural communities experiencing significant population aging face declining access to a variety of essential services (Thiede et al. 2017). At the local level, areas with older age structures may have reduced service

availability for several reasons. A small working-age population in places with old age structures may produce workforce challenges for businesses or limit aging business owners' opportunities to transfer businesses to younger individuals (Mishra, El-Osta, and Shaik 2010; Thiede et al. 2017). Older populations also depend more on non-earning and relatively fixed sources of income, such as Social Security, and spend less on goods and services (Thiede et al. 2017), resulting in limited local tax revenue opportunities to fund public services and smaller markets for private service providers.

The OAA requires that federal funds for aging services be targeted to prioritize groups with high social and economic need to increase equity in service provision. However, we expect that structural forces described above will result in spatial inequity in aging and disability service organization access for low-income, predominantly racial/ethnic minority, and rural communities. Understanding the extent to which aging and disability services organization access is associated with communities' contextual and compositional characteristics can help inform policymakers' approach to targeted policy interventions that ensure equitable access to community-based services for an aging population.

METHODS

Data

Dependent variable. To examine disparities in availability of aging and disability services organizations across the entire United States, we used the National Neighborhood Data Archive's (NaNDA) Social Services dataset, which we accessed through the University of Michigan's Inter-University Consortium for Political and Social Research. The dataset includes annual counts of social services organizations at the census tract-level for the years 2003-2015 and 2017. NaNDA data are created using the National Establishment Time Series (NETS) database and establishments are categorized based on the North American Industry Classification System (NAICS) codes. For this research, we focused specifically on NAICS code 624120 which represents "services for the elderly and persons with disabilities." This includes senior centers, adult community centers (except for recreation-based centers), adult day care centers, and social services that provide non-medical home care of elderly, self-help, and homemaker services. While this code includes disability services – some of which are likely accessed by older adults – the code cannot be further disaggregated and therefore the data do include some organizations that provide disability services but may not

exclusively serve older adults. We used 2017 data because it is the most recent year of data available through NaNDA. While the administration of aging services varies at the local and state level, previous work has suggested that counties are the most appropriate scale to examine and compare social services (Brewster et al. 2018; Brown et al. 2018; Thiede et al. 2017; Weaver and Roberto 2021). Therefore, we aggregated census tract data to produce county-level counts. Counties with no aging and disability services were coded as 1 (i.e. aging and disability services deserts) and counties with any aging and disability services were coded as 0.

Independent variables. To examine rural-urban and within rural variation in aging and disability services organization availability, we use the Economic Research Services' Rural-Urban Continuum Codes (RUCCs). Counties are assigned a value ranging from 1 to 9 based on whether they are in a metropolitan area, their urban population size, and their adjacency to a metropolitan area. We aggregated counties into three subgroups: metro (RUCCs 1-3), adjacent rural (RUCCs 4, 6, and 8), and nonadjacent rural (RUCCs 5, 7, and 9). We categorized RUCCs into these three groups for two reasons: 1) adjacency to metro areas can result in outflows of resources and 2) methodologically speaking, we needed to ensure that each category had a large enough number of cases to prevent over separation of the data. To examine variation in aging and disability services organization availability across compositional characteristics of counties, we utilized data from the U.S. Census Bureau's 2013-2017 American Community Survey, which we accessed through Social Explorer. The covariates include: percent of the population that has experienced poverty in the last 12 months, percent of the population that identifies as non-Hispanic Black, percent of the population that identifies as Hispanic, percent of the population age 65 and older, and total population count. Total population count is discussed later as a model weight.

Percent age 65 and older and percent poverty were normally distributed and were therefore dichotomized to represent large shares (upper 50th percentile) and small shares (lower 50th percentile) for each variable. Percent non-Hispanic Black and percent Hispanic were both positively skewed with the majority of counties having very small shares of either group. Therefore, we dichotomized both variables to represent large shares (upper 25th percentile) and small shares (lower 75th percentile) of each variable. Finally, we weighted all analyses for the log of the total population so that counties with larger relative population sizes would

contribute more to the models than counties with smaller relative population sizes. The final dataset contained data for all 3,142 counties in the United States.

Statistical Analyses

Our statistical analyses aimed to identify contextual and compositional characteristics of counties lacking aging and disability services and better understand the meso-level spatial foundations of later life inequality. To determine if there are socio-spatial disparities in availability of aging and disability services organizations across and within rural-urban categories, we use three sets of analyses: Exploratory Data Analyses (EDA), Exploratory Spatial Data Analyses (ESDA), and binary logistic regression models predicting the likelihood of a county being an aging and disability services desert. We use EDA to produce descriptive statistics of the dependent and independent variables (Tables 1-3) and crosstabs with chi-square statistics to examine the relationship between each independent variable and the dependent variable (Table 4).

We use ESDA to present a descriptive county-level map indicating the location of aging and disability services deserts (Figure 2) as well as results and a significance map from a Local Join Count Statistic (Figure 3) which determines whether there is clustering in an unlikely binary outcome variable (i.e. 418 aging and disability desert counties) (Cliff and Ord 1973). To do this, we used a first order Queen's contiguity weights matrix with 999 permutations (Chi and Zhu 2019).

We use binomial logistic regression models predicting the likelihood of being an aging and disability services desert (i.e. having no aging and disability services organizations). We present three sets of models. Table 5 presents the results of the logistic regression models for the entire U.S. Table 6 presents results of the logistic regression models for nonmetro counties only (Models 1 and 2) and metro counties only (Model 3). Diagnostic tests (VIF and TOL) did not indicate issues of multicollinearity. All EDA and regression modeling was conducted in SAS software 9.4 and all ESDA was conducted in ArcMap 10.7 and GeoDa (SAS Institute 2013; ESRI Inc. 2018; Anselin et al. 2006).

RESULTS

Table 1 presents the frequency and percentage distribution of the county-level number of aging and disability services organizations. Across the U.S., 466 counties (14.83 percent) are aging and disability services deserts. Another 599 counties (19.06 percent) have one aging and

disability services organization and 464 counties (14.77 percent) have two aging and disability services organizations. The remaining counties have three or more aging and disability services organizations. While there is a wide range of frequencies – likely reflecting a variety of influences, most notably population size – we are interested in the 466 counties that are aging and disability services deserts. Residents of these counties would need to travel outside of their county in order to access important services that support aging in place and more specifically healthy aging.

Table 1: Frequency and Percentage Distribution of the County-level Number of Aging and Disability Services, 2017

	Frequency	Percent
0	466	14.83
1	599	19.06
2	464	14.77
3	354	11.27
4 or more	1,259	40.07

NOTES: N=3142

Table 2 presents the frequency distribution of the classification of counties along the rural-urban continuum. Slightly over a third of counties are classified as metro (37.11 percent) with the remaining being adjacent rural (32.69 percent) or nonadjacent rural (30.20 percent).

Table 2: Frequency Distribution of Rural-Urban County Classifications

	Frequency	Percent
Metro	1,166	37.11
Adjacent Rural	1,027	32.69
Nonadjacent Rural	949	30.20

NOTES: N=3142

Table 3 presents the descriptive statistics for the remaining independent variables. On average, approximately 18 percent of the population in counties was age 65 and older, and approximately 15 percent had experienced poverty in the last 12 months. Both variables were normally distributed. Percent non-Hispanic Black and percent Hispanic were both positively skewed with neither non-Hispanic Blacks or Hispanics representing more than 4 percent of the county-level population in more than 50 percent of counties. Therefore, as stated in the data section, these variables were dichotomized to compare counties with large and small

shares of each of these populations. Because they were normally distributed, percent age 65 and older and percent poverty were both dichotomized at the median (17.62 percent and 15.19 percent, respectively). Because percent non-Hispanic Black and percent Hispanic were highly positively skewed, they were dichotomized at the 75th percentile (9.88 percent and 9.29 percent, respectively).

Table 3: Descriptive Statistics for Interval Ratio Independent Variables

	Mean	SD	Med	Min	Max
Percent Age 65+	17.94	4.52	17.62	3.69	54.19
Percent Poverty	15.99	6.56	15.19	2.43	51.96
Percent Non-Hispanic Black	8.90	14.44	2.13	0.00	86.92
Percent Hispanic	9.12	13.71	3.98	0.00	99.19

NOTES: N=3142

Table 4 presents the crosstab results and chi-square statistics for rural-urban status and whether the county is an aging and disability services desert. While only 6.95 percent of metro counties are aging and disability services deserts, 16.16 percent of adjacent rural and 23.08 percent of

Table 4: Percent of Counties that are Aging and Disability Services Deserts by County Characteristics

	Percent that are Aging & Disability Services Deserts	Chi-Square (df)	p
Rural-Urban Status		109.907 (df=2)	<0.001
Metro	6.95		
Adjacent Rural	16.16		
Nonadjacent Rural	23.06		
Percent Poverty		10.975 (df=1)	<0.001
Top 50%	16.93		
Bottom 50%	12.73		
Percent Non-Hispanic Black		0.954 (df=1)	0.329
Top 25%	15.90		
Bottom 75%	14.47		
Percent Hispanic		1.755 (df=1)	0.185
Top 25%	13.38		
Bottom 75%	15.32		
Percent Age 65+		40.001 (df=1)	<0.001
Top 50%	18.84		
Bottom 50%	10.82		

NOTES: N=3142

nonadjacent rural counties are aging and disability services deserts. The chi-square test indicates that this relationship is significant. Counties with the highest rates of poverty (top 50 percent) and the largest shares (top 50 percent) of older adults are significantly more likely to be aging and disability services deserts. There were no significant difference in the prevalence of aging and disability services desert when comparing counties with large and small shares of Hispanics and non-Hispanic Blacks.

Figure 2 presents a county-level map of the U.S. indicating the location of aging and disability services deserts. Aging and disability services deserts are most notably in the upper Mountain West (MT, ND, and SD), Nebraska, Texas, and parts of the South (GA, MS, AL, VA, and KY). Interestingly, states with no aging and disability service deserts are located in much of the Northeast as well as California, Arizona, and Michigan.

Figure 2: Location of County-level Aging and Disability Services Deserts

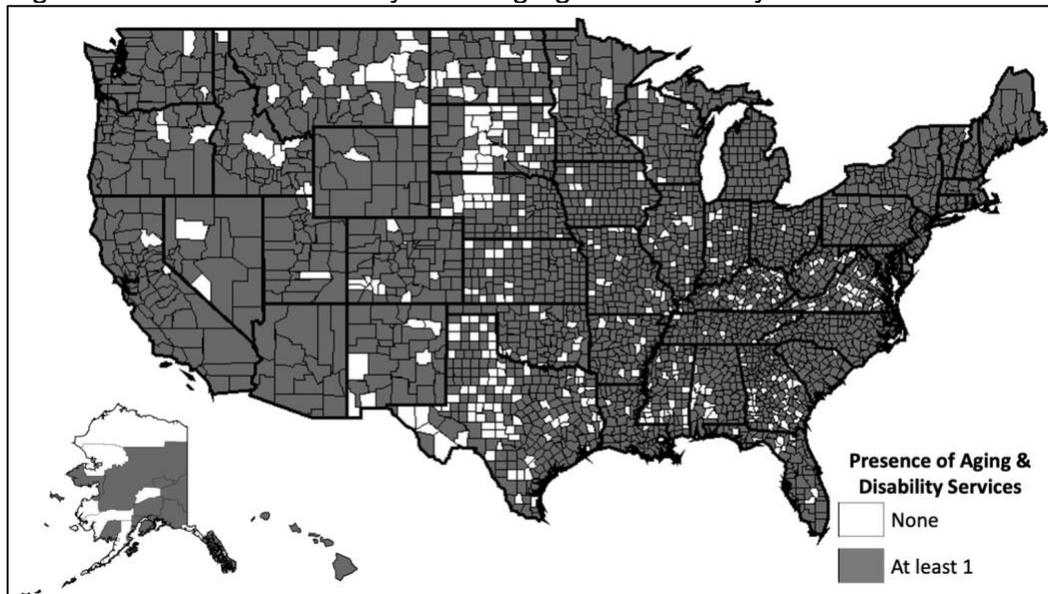


Figure 3 presents a significance map of a Local Join Count Statistic, which identifies areas with significant clustering of aging and disability services deserts. The largest significant clusters of aging and disability services deserts are, again, predominantly located in South Dakota and northern Nebraska. Smaller significant clusters also exist in Montana, Texas, Colorado, Mississippi, Georgia, Florida, Kentucky, Alaska, and Virginia.

Figure 3: Local Join Count Statistic Significance Map for County-level Aging and Disability Services Deserts

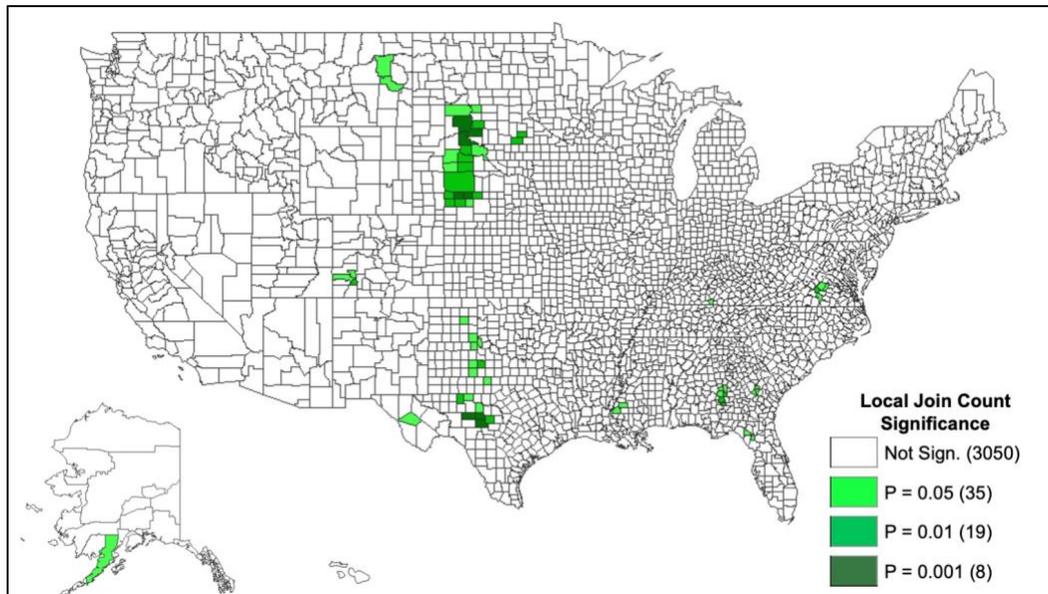


Table 5 presents the logistic regression models predicting odds of being an aging and disability services desert for all counties in the United States. Models are presented in the following order: an unadjusted model for rural-urban status (Model 1) and a full model with all covariates (Model 2). Model 1 shows that compared to metro counties, adjacent rural and nonadjacent rural counties are significantly more likely to be aging and disability services deserts. Model 2 shows that net of model covariates, the findings for rural-urban status remain consistent. In addition, Model 2 also shows that counties with the highest relative rates of poverty, counties with the largest relative shares of non-Hispanic blacks, and counties with the largest relative shares of adults age 65 and older have significantly greater odds of being aging and disability services deserts. The model fit statistic (AIC) indicates improvement from Model 1 to Model 2. And the gamma and c statistic indicate increased strength in model fit from Model 1 to Model 2, though the overall strength remains low to moderate (i.e. less than 0.70).

To assist with interpretation of these findings, Figure 4 presents the odds ratios of the likelihood of a county being an aging and disability services deserts (Model 2 from Table 5). The results show that when compared to metro counties, adjacent rural counties are 2.5 times more likely to be an aging and disability services desert and nonadjacent rural counties are 4.0 times more likely to be an aging and disability services

Table 5: Logistic Regression Results Predicting Odds of Having NO Aging and Disability Services Organizations (All U.S. Counties)

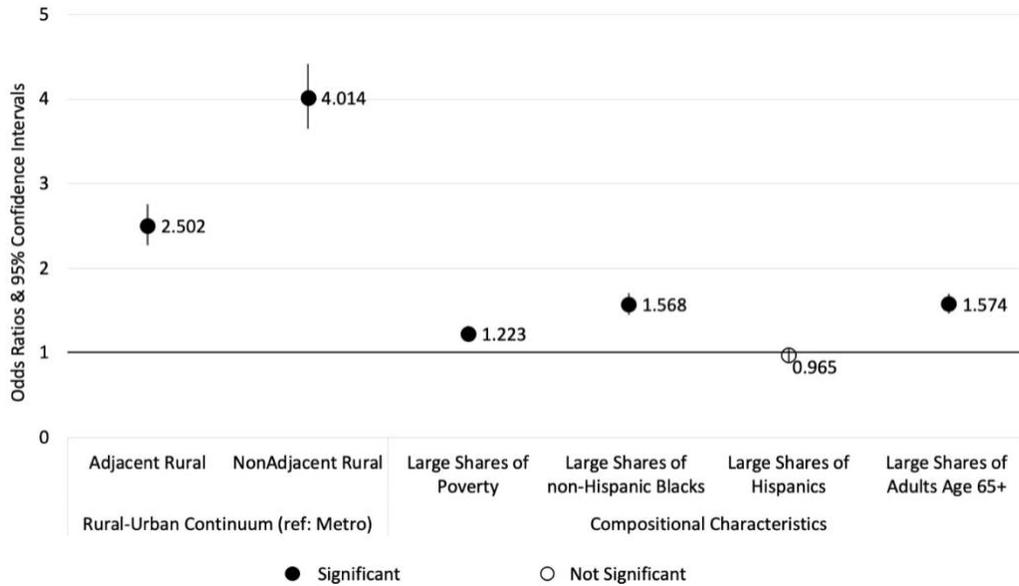
Effect	Model 1			Model 2		
	<i>b</i>	<i>SE</i>	<i>p</i>	<i>b</i>	<i>SE</i>	<i>p</i>
Intercept	-2.789	0.037	<0.001	-3.184	0.049	<0.01
Rural-Urban Status (<i>Ref: Metro</i>)			1			
Adjacent Rural	1.052	0.046	<.001	0.917	0.049	<0.01
Nonadjacent Rural	1.461	0.046	<.001	1.390	0.049	<0.01
Large Shares of Poverty (<i>ref: bottom 50%</i>)				0.202	0.037	<0.01
Large Shares of non-Hispanic Blacks (<i>ref: bottom 75%</i>)				0.450	0.042	<0.01
Large Shares of Hispanics (<i>ref: bottom 75%</i>)				-0.036	0.042	0.395
Large Shares of Adults Age 65+ (<i>ref: bottom 50%</i>)				0.453	0.038	<0.01
AIC	23498.5			23202.9		
Gamma	0.416			0.344		
c	0.643			0.665		

NOTES: N=3142; weighted for the log of the total population

desert. In addition, counties with the highest relative poverty rates (top 50 percent) are 22 percent more likely to be aging and disability services deserts. Counties with the largest shares of non-Hispanic Blacks (top 25 percent) are 57 percent more likely to be an aging and disability services desert, and counties with the largest relative shares of older adults (top 50 percent) are 57 percent more likely to be aging and disability services deserts net of other covariates. The share of the population that was Hispanic is not significant.

Table 6 presents the logistic regression models predicting odds of being an aging and disability services desert but stratified by metro status. Models are presented with coefficient estimates and standard errors, and p values are reported. We first present the unadjusted model (Model 1) and full model (Model 2) for rural counties and then we present the full model for metro counties (Model 3). Model 1 shows that compared to adjacent rural counties, nonadjacent rural counties are significantly more likely to be aging and disability services deserts. Model 2 shows that net of all other variables in the model, the findings for rural-urban continuum

Figure 4: Odds Ratios and 95% Confidence Intervals from the Logistic Regression Results Predicting Odds of being an Aging and Disability Services Desert (All U.S. Counties)



groups remain the same. In addition, Model 2 shows that that counties with the highest relative rates of poverty, counties with the largest relative shares of non-Hispanic blacks, counties with the largest relative shares of Hispanics, and counties with the largest relative shares of older adults are significantly more likely to be aging and disability services deserts. The model fit statistic (AIC) indicates improvement from Model 1 to Model 2. The gamma and c statistic for both Model 1 and 2 suggest that for nonmetro counties, our model specification is weakest.

Table 6 presents the logistic regression models predicting odds of being an aging and disability services desert for only metro counties (Model 3). Only the full model is presented. Model coefficient estimates, standard errors, and p values are reported. Results shows that counties with the highest relative rates of poverty and counties with the largest relative shares of non-Hispanic Blacks are significantly more likely to be aging and disability services. Counties with the largest relative shares of Hispanics are less likely to be aging and disability services deserts. And counties with the largest relative shares of older adults are also more likely to be aging and disability services deserts. And the gamma and c statistic indicate model fit is low to moderate.

Table 6: Logistic Regression Results Predicting Odds of Having NO Aging and Disability Services Organizations by Metro Status

Effect	Nonmetro Models						Metro Model		
	Model 1			Model 2			Model 3		
	<i>b</i>	<i>SE</i>	<i>p</i>	<i>b</i>	<i>SE</i>	<i>p</i>	<i>b</i>	<i>SE</i>	<i>p</i>
Intercept	-1.737	0.028	<0.001	-2.198	0.052	<0.001	-3.276	0.075	<0.01
Rural-Urban Status (<i>Ref: Adjacent Rural</i>)									
Nonadjacent Rural	0.409	0.038	<0.001	0.469	0.039	<0.001			
Large Shares of Poverty (<i>ref: bottom 50%</i>)				0.138	0.042	0.001	0.497	0.081	<0.01
Large Shares of non-Hispanic Blacks (<i>ref: bottom 75%</i>)				0.465	0.050	<0.001	0.497	0.081	<0.01
Large Shares of Hispanics (<i>ref: bottom 75%</i>)				0.134	0.047	0.004	-0.665	0.099	<0.01
Large Shares of Adults Age 65+ (<i>ref: bottom 50%</i>)				0.348	0.042	<0.001	0.850	0.079	<0.01
AIC	17612.0			17453.1			5644.5		
Gamma	0.218			0.186			0.329		
C	0.555			0.587			0.649		

NOTES: Nonmetro N= 1976, Metro N=1,166; weighted for the log of the total population

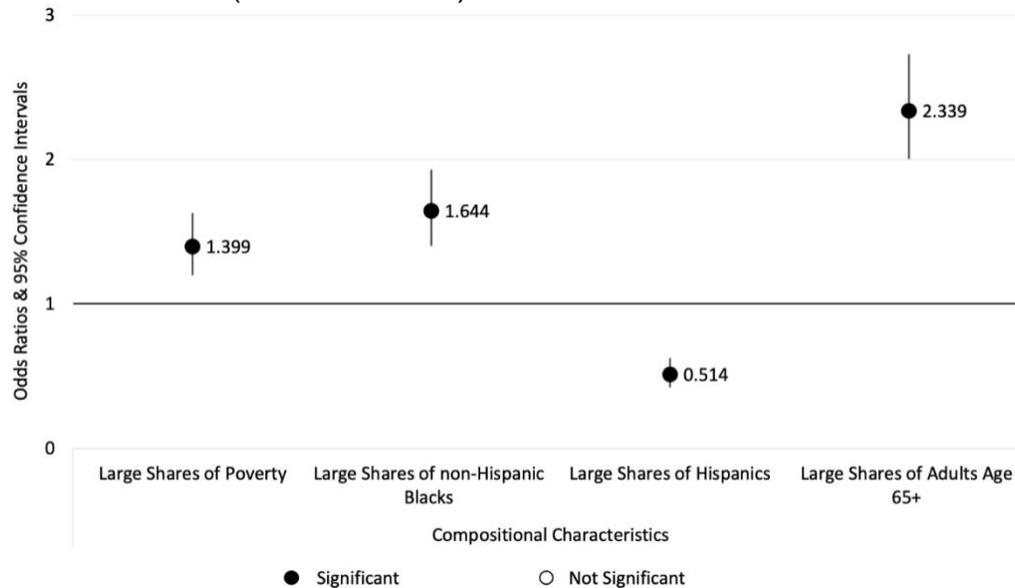
To assist with interpretation of the significant variables, Figure 5 presents the odds ratios of the likelihood of a county being an aging and disability services desert among only nonmetro counties (Model 2 in Table 6). The results show that when compared to adjacent rural counties, nonadjacent rural counties are 60 percent more likely to be aging and disability services deserts. In addition, counties with the highest rates of poverty (top 50 percent) are 15 percent more likely to be aging and disability services deserts. Counties with the largest relative shares of non-Hispanic Blacks (top 25 percent) are 59 percent more likely and counties with the largest relative shares of Hispanics (top 25 percent) are 14 percent more likely to be aging and disability services deserts, net of other covariates. And counties with the largest relative shares of older adults (top 50 percent) are 42 percent more likely to be aging or disability services deserts, net of other covariates.

Figure 5: Odds Ratios and 95% Confidence Intervals from the Logistic Regression Results Predicting Odds of Being an Aging and Disability Services Desert (Nonmetro Counties)



To assist with interpretation of the significant variables, Figure 6 presents the odds ratios of the likelihood of a county being an aging and disability services desert among only metro counties (Model 3 in Table 6). The results show that counties with the highest relative rates of poverty (top 50 percent) are 40 percent more likely to be aging and disability services deserts, net of other covariates. Counties with the largest relative shares of non-Hispanic Blacks are 64 percent more likely to be aging and

Figure 6: Odds Ratios and 95% Confidence Intervals from the Logistic Regression Results Predicting Odds of Being an Aging and Disability Services Desert (Metro Counties)



disability services deserts and counties with the largest relative shares of Hispanics (top 25 percent) are 49 percent less likely to be aging and disability services deserts, net of other covariates. And counties with the largest relative shares of older adults (top 50 percent) are 2.4 times more likely to be aging and disability services deserts, net of other covariates.

DISCUSSION

The purpose of this study was to examine disparities in aging and disability services deserts, specifically across rural-urban categories and across county racial/ethnic, poverty, and age composition. We apply theoretical perspectives of community gerontology by focusing on meso-level contexts to describe the socio-spatial landscape of aging and disability services deserts across the country (Greenfield et al. 2018). Addressing recent calls for attention to spatial mechanisms of social exclusion in later life (Wanka et al. 2018), we hypothesized that areas with larger shares of racial/ethnic minorities, higher poverty levels, and older age structures, and more rural areas would be more likely to be aging and disability services deserts. Our analyses revealed socio-spatial disparities in aging and disability services organization deserts, suggesting a need for policy attention to ensure equity in access to resources and services supporting later-life health and well-being, especially counties with large shares of vulnerable and marginalized populations.

While the OAA directs the Aging Network to target its programs towards older adults with the greatest social and economic need, including rural, minority, and low-income groups (United States 2020), our results show that rural counties and counties with higher poverty rates and with larger relative shares of non-Hispanic Blacks are more likely to be aging and disability services deserts. In addition, while having larger shares of Hispanics is associated with lower odds of being aging and disability services deserts in metro areas, it is associated with greater odds of being aging and disability services deserts in rural areas. These findings suggest that OAA targeting efforts have not been fully successful in overcoming the historical and ongoing structural mechanisms of disinvestment and inequitable service access in low-income and predominantly Black areas. We now discuss these findings in the context of previous literature.

Our findings confirm that the most rural areas (i.e. adjacent rural and nonadjacent rural) are most likely to be aging and disability services deserts. Only 7.0 percent of metro counties are aging and disability services deserts, compared to 16.2 percent of adjacent rural and 23.1 percent of nonadjacent rural counties. All rural counties on average have greater odds of being aging and disability services deserts compared to metro counties. In addition, the regression analyses confirmed that the risk of being an aging and disability services desert is substantially higher for nonadjacent rural counties than for adjacent rural counties. Given that rural areas of the U.S. are home to significantly larger relative shares of older adults, our findings show that these rural older adults are at greater risk of experiencing dramatic unmet need for aging and disability services. This is especially concerning since rural older adults may have greater difficulty than their urban counterparts accessing alternative forms of support from formal service providers or friends and family due to the challenges of fewer healthcare services, greater travel distances, and limited transportation options in rural areas (Douthit et al. 2015; Hinojosa et al. 2014). Innovative approaches to aging and disability service delivery may be beneficial in these areas, such as mobile services or offering remote services by phone or online when feasible.

We find that counties with the highest relative poverty rates are significantly more likely to be aging or disability services deserts, across both the metro and nonmetro models. This finding contributes to the robust body of literature showing that poor communities, arguably most in need of healthcare and social services, instead experience limited or total absence of community resources such as supermarkets, banks, pharmacies, and urgent care clinics (Hegerty 2020; Le and Hsia 2016;

Walker et al. 2010; Wisseh et al. 2020). This means that there is likely a compounding disadvantage in counties with high poverty rates that must be addressed in policy efforts to support older adult health and well-being in these communities. In addition, our findings suggest that aging and disability service organization siting decisions may reflect availability of private funding resources, local tax bases, or access to clients able to contribute fees or donations, rather than strategically locating to maximize access to low-income individuals (Allard 2007). Also given the devastating financial toll of the Great Recession and its disproportionate impact on low-income communities, it is possible that reduced availability to aging and disability services organizations in areas with higher poverty reflects closures or consolidations of organizations in recent years due to financial difficulties (Finlay et al. 2019).

Our findings show that counties with the largest relative shares of non-Hispanic Blacks are significantly more likely to be aging and disability services deserts. This means that aging and disability services organizations are lacking in predominantly Black counties (Table 5), areas clustered predominantly in the South and with particularly pronounced health disparities and limited health resources due to historic policies and an ongoing lack of policy action to address socio-economic and racial inequities at the individual or regional level (Wimberley 2010; Schaeffer 2019). These findings align with a robust body of evidence suggesting that areas with large shares of non-Hispanic Blacks have less access to healthcare and other health-related resources (Anderson 2017; White et al. 2012). Trends of inequitable access to services for predominantly Black communities reflect historical and ongoing policies that uphold structural racism on the individual and community level, and contribute to the dramatic and persistent racial health disparities observed in the United States (Henning-Smith et al. 2019; Murray et al. 2006). More focused research and policy attention to the landscape of services and racial health disparities for older adults in this region is warranted.

These findings of inequitable aging and disability services access are especially concerning, given evidence that closures of nursing homes and hospitals are also concentrated in low-income and minority communities (Feng, Lepore, et al. 2011; Ko et al. 2014). Unmet need for long-term services and supports in these communities is likely to grow as state Medicaid programs try to “rebalance” programs and control costs by shifting Medicaid recipients from nursing home care to home- and community-based alternatives. This shift will likely increase competition and strain limited aging and disability services and may lead to unintended

adverse consequences for older adults in need of care and already facing multiple barriers to equitable access to health and social supports (Feng, Fennell, et al. 2011).

Interestingly, we found significant lower odds of aging and disability service deserts in counties with the largest relative shares of Hispanics in metro counties, but higher odds in the nonmetro model. More attention is needed to better understand this finding, which we conjecture may reflect differences in economic opportunities available in rural and urban communities with large shares of Hispanic residents. Hispanic employment in nonmetro counties is concentrated in agricultural and manufacturing jobs (Kandel and Newman 2004), which are often low-paying and may result in insufficient public and private resources to support aging and disability services, while in urban areas, better paying job opportunities and resources to support aging services may be more available. Further research is needed, including qualitative work, to better understand potential linguistic, socio-economic, and cultural barriers that may still impede social access to aging and disability services for rural and urban Hispanic older adults, which should be considered alongside spatial access (Andersen et al. 1981).

Concerningly, we found that counties with large shares of older adults have higher odds of being aging and disability services deserts. This aligns with Thiede et al. (2017)'s finding of declining service providing establishments in aging communities. Communities with larger shares of older adults may struggle to raise adequate tax revenues to support local public services such as aging and disability services from older adults on fixed incomes. Organizations in counties with large shares of older adults may struggle with staffing given the smaller population of working-age adults available to support a large population needing aging services. As the share of the population age 65+ is expected to rise in communities across the country in the coming decades, further study of the causes and consequences of aging and disability services deserts in areas with large populations age 65+ is warranted.

The Older Americans Act devolves much of the funding and administration of aging services from the federal government to states and counties, potentially producing dramatically different service contexts on the local and state level (Applebaum and Kunkel 2018; Wacker and Roberto 2014). State-level factors such as the generosity of spending on OAA services and states' long-term care policies should also be examined as potential drivers of local and state-level differences in aging and disability service landscapes.

It is also worth noting that certain states were home to disproportionate shares of aging and disability services deserts, while in other states, every county had at least one aging and disability services organization, even in the most remote parts of the state. Future research should evaluate state policies or contextual factors that contribute to more robust aging services access such as state Medicaid policy, OAA service delivery strategy and IFFs, and “age-friendly” state and community initiatives that may shape the robustness and equity of states’ aging and disability services landscape.

Limitations

Results should be considered in light of some limitations. This analysis was conducted at the county level, a relatively large scale for considering access to establishments or services, though aging and disability services are commonly administered at the county level, especially in rural areas. A finer scale such as census tract may be valuable for future analyses to obtain more precise estimates of aging services access given socio-economic composition and racial residential segregation at the neighborhood level. Our analysis examined socio-spatial disparities in aging and disability services deserts; while spatial access is a necessary precursor for actual use of services, many factors may impede individuals’ capacity to make use of services located in their area (Khan and Bhardwaj 1994). A small but growing body of literature examines individual-level factors influencing aging and disability service access and use, and future research should focus specifically on barriers and facilitators for racial/ethnically, socio-economically, and geographically diverse populations of older adults (Lehning et al. 2013; Li 2006; Weaver et al. 2018). Also, as we noted in the results section, the models did not have strong fit statistics. We contend that this is likely - in part - because aging and disability services are administered at the local level but are strongly influenced by state-level administrative units (State Units on Aging) (Colello and Napoli 2021).

In addition, the measure for the study’s dependent variable “aging and disability services organizations” may not be a precise estimate of organizations that serve older adults, as some disability services organizations may exclusively serve younger age groups. Similarly, NaNDA data does not distinguish between different types of aging and disability services organizations or identify direct service providers versus administrative or policy-focused organizations. Future research should identify and make use of data sources that distinguish between

organization types to assess how access varies within aging and disability services organizations. NaNDA data also does not provide information on organizational size, financial resources, service area, or quality of services. Additional research is needed to assess whether the amount, type, and quality of services offered by aging and disability services organizations differs based on geography or demographic composition. Additional questions related to variation in level of staffing as well as travel distance to such services also deserve attention. Lastly, NaNDA does not include satellite locations of aging and disability services organizations that operate through another organization's facilities or mobile services. These limitations may result in an overestimate of counties with no aging and disability services, especially in rural areas where these strategies may be most commonly used.

CONCLUSION

Our analysis represents the first national examination of socio-spatial disparities of aging and disability services deserts, and our findings offer critical insight on opportunities to improve the equity of policy efforts to promote aging in place at all levels of government. Our results highlight the need for further research and policy attention to effective targeting of aging and disability services for rural, low-income, and rural predominantly non-Hispanic Black communities. Minimal research has explored the specific approaches the Aging Network uses to target aging services (Government Accountability Office 2012). The decentralized nature of the network suggests that the strategies and scale of targeting efforts may vary widely at the state and local level, and future research should examine the targeting approaches currently in use. Research is also needed to evaluate the impact of targeting on the reach of aging and disability services or on social and health outcomes for diverse populations (Government Accountability Office 2012, 2019; National Center on Law & Elder Rights 2018).

Our findings on inequitable distribution of aging and disability services in predominantly low-income and minority areas align with the robust body of research showing that these same communities face greater disease burdens as well as inequitable access to a diversity of healthcare and health-related services and establishments. Significant investment in more robust service infrastructure in these under-resourced areas is a critical strategy to address the U.S.'s striking socio-economic and racial health disparities through the life course. Further research examining disparities in access to aging and disability services is also

needed to provide an evidence base to inform policy decisions related to the funding and administration of community-based services at the federal, state, and local level.

Aging and disability services address a diversity of health and social service needs to help older adults live as independently as possible in their communities and avoiding preventable and costly nursing home placements. Concerningly, our findings indicate that the current approach to administering these services creates unequal access to community-based supports to enable healthy and independent aging for all older Americans. Federal funding for aging services has failed to keep pace with inflation and the growing number of older adults in recent years (Ujvari et al. 2019). However, the COVID-19 pandemic created in unprecedented demand for services from older adults sheltering in place and unable to access traditional services and informal supports, and an influx of over one billion additional dollars in funding for aging services (Wilson et al. 2020). While this increase in federal spending on aging services may be temporary, it is possible that the pandemic demonstrated to policymakers and the public the value of investing in community-based aging and disability services for improving older adults' health and independence during times of crisis and on an everyday basis. As the population continues to age, ensuring that aging and disability services are adequately funded and equitably distributed will become even more critical to supporting healthy aging and achieving stated goals of increasing health equity in later life (Hill et al. 2015; United States 2020).

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REFERENCES

- Adams-Price, Carolyn E., Joshua J. Turner, Margaret Ralston, and Joshua Turner. 2020. "Well-Being among Older Adults in Mississippi: Exploring Differences between Metropolitan, Micropolitan, and Noncore Rural Settings." *Journal of Rural Social Sciences*. 35(2). Article 4. Available at: <https://egrove.olemiss.edu/jrssl/vol35/iss2/4>.
- Aday, Ronald. H., Brandon Wallace, and Jennifer J. Krabill. 2019. "Linkages Between the Senior Center as a Public Place and Successful Aging." *Activities, Adaptation & Aging* 43(3):211–31. doi: 10.1080/01924788.2018.1507584.
- Administration for Community Living. 2018. "Aging and Disability Networks." Retrieved December 1, 2020 (<https://acl.gov/programs/aging-and-disability-networks>).
- Allard, Scott W. 2007. *National Poverty Center Working Paper Series Mismatches and Unmet Need: Access to Social Services in Urban and Rural America*.
- Andersen, Ronald, Sandra Zelman Lewis, Aida L. Giachello, Lu Ann Aday, and Grace Chiu. 1981. "Access to Medical Care among the Hispanic Population of the Southwestern United States." *Journal of Health and Social Behavior*. 22:78-89.
- Anderson, Kathryn Freeman. 2017. "Racial Residential Segregation and the Distribution of Health-Related Organizations in Urban Neighborhoods." *Social Problems* 64(2):256–76. doi: 10.1093/socpro/spw058.
- Applebaum, Robert, and Suzanne Kunkel. 2018. "The Life and Times of the Aging Network." *Public Policy & Aging Report* 28(1):39–43. doi: 10.1093/ppar/pty007.
- Ashida, Sato, and Catherine A. Heaney. 2008. "Social Networks and Participation in Social Activities at a New Senior Center: Reaching Out to Older Adults Who Could Benefit the Most." *Activities, Adaptation & Aging* 32(1):40–58. doi: 10.1080/01924780802039261.
- Binette, Joanne, and Kerri Vasold. 2018. *2018 Home and Community Preferences: A National Survey of Adults Age 18-Plus*. AARP Research. Retrieved June 18, 2021 (https://www.aarp.org/content/dam/aarp/research/surveys_statistics/liv-com/2018/home-community-preferences-survey.doi.10.26419-2Fres.00231.001.pdf).
- Brewster, Amanda L., Suzanne Kunkel, Jane Straker, and Leslie A. Curry. 2018. "Cross-Sectoral Partnerships By Area Agencies On Aging: Associations With Health Care Use And Spending." *Health Affairs*

- 37(1):15–21. doi: 10.1377/hlthaff.2017.1346.
- Brown, David L., and Parfait Eloundou-Enyegue. 2016. "Age Structure and Development." in *The Sociology of Development Handbook*. University of California Press.
- Brown, David L., Nina Glasgow, Laszlo J. Kulcsar, Scott Sanders, and Brian C. Thiede. 2018. "The Multi-Scalar Organization of Aging-Related Services in US Rural Places." *Journal of Rural Studies* 68:219–29. doi: 10.1016/j.jrurstud.2018.09.010.
- Buckwalter, Kathleen, Linda Davis, and Ronda Talley. 2011. "Elder Caregiving in Rural Communities." Pp. 33–46 in *Rural Caregiving in the United States*, New York, NY: Springer.
- Burton, Linda M., Daniel T. Lichter, Regina S. Baker, and John M. Eason. 2013. "Inequality, Family Processes, and Health in the 'New' Rural America." *American Behavioral Scientist* 57(8):1128–51. doi: 10.1177/0002764213487348.
- Butler, Danielle C., Stephen Petterson, Robert L. Phillips, and Andrew W. Bazemore. 2013. "Measures of Social Deprivation That Predict Health Care Access and Need within a Rational Area of Primary Care Service Delivery." *Health Services Research* 48(2pt1):539–59. doi: 10.1111/j.1475-6773.2012.01449.x.
- Cagney, Kathleen A., and Erin York Cornwell. 2018. "Place, Aging, and Health." in *Future Directions for the Demography of Aging: Proceedings of a Workshop*. National Academy of Sciences.
- Cantor, M. H. 1989. "Social Care: Family and Community Support Systems." *The Annals of the American Academy of Political and Social Science* (503):99–112. doi: 10.1177/0002716289503001008.
- Centers for Medicare & Medicaid Services. (n.d.). *Home & Community-Based Services 1915(c)*. Retrieved June 18, 2021, from <https://www.medicare.gov/medicaid/home-community-based-services/home-community-based-services-authorities/home-community-based-services-1915c/index.html>.
- Cinnamon, Jonathan, Nadine Schuurman, and Valorie A. Crooks. 2008. "A Method to Determine Spatial Access to Specialized Palliative Care Services Using GIS." *BMC Health Services Research* 8(1):140. doi: 10.1186/1472-6963-8-140.
- Cliff, Andrew, and J. Keith Ord. 1973. *Spatial Autocorrelation*. London: Pion.
- Cohen, Steven A., Sarah K. Cook, Trisha A. Sando, and Natalie J. Sabik. 2018. "What Aspects of Rural Life Contribute to Rural-Urban Health Disparities in Older Adults? Evidence From a National Survey." *The*

- Journal of Rural Health* 34(3):293–303. doi: 10.1111/jrh.12287.
- Colello, Kirsten, and Angela Napili. 2021. *Older Americans Act: Overview and Funding*. Retrieved June 18, 2021 (<https://crsreports.congress.gov/product/pdf/R/R43414>).
- Cossmann, Jeralynn, Wesley James, and Julia Kay Wolf. 2017. “The Differential Effects of Rural Health Care Access on Race-Specific Mortality.” *SSM - Population Health* 3:618–623. doi: 10.1016/j.ssmph.2017.07.013.
- Dai, Dajun, and Fahui Wang. 2011. “Geographic Disparities in Accessibility to Food Stores in Southwest Mississippi.” *Environment and Planning B: Planning and Design* 38(4):659–77. doi: 10.1068/b36149.
- Douthit, N., S. Kiv, T. Dwolatzky, and S. Biswas. 2015. “Exposing Some Important Barriers to Health Care Access in the Rural USA.” *Public Health* 129(6):611–20. doi: 10.1016/j.puhe.2015.04.001.
- Feng, Zhanlian, Mary L. Fennell, Denise A. Tyler, Melissa Clark, and Vincent Mor. 2011. “Growth of Racial and Ethnic Minorities in Us Nursing Homes Driven by Demographics and Possible Disparities in Options.” *Health Affairs* 30(7):1358–65. doi: 10.1377/hlthaff.2011.0126.
- Feng, Zhanlian, Michael Lepore, Melissa A. Clark, Denise Tyler, David B. Smith, Vincent Mor, and Mary L. Fennell. 2011. “Geographic Concentration and Correlates of Nursing Home Closures: 1999-2008.” *Archives of Internal Medicine* 171(9):806–13. doi: 10.1001/archinternmed.2010.492.
- Finlay, Jessica, Michael Esposito, Min Hee Kim, Iris Gomez-Lopez, and Philippa Clarke. 2019. “Closure of ‘Third Places’? Exploring Potential Consequences for Collective Health and Wellbeing.” *Health and Place* 60. doi: 10.1016/j.healthplace.2019.102225.
- Galster, George, and Patrick Sharkey. 2017. “Spatial Foundations of Inequality: A Conceptual Model and Empirical Overview.” *The Russell Sage Foundation Journal of the Social Sciences* 3(2):1–33.
- Glasgow, Nina, and E. Helen Berry, eds. 2013. *Rural Aging in 21st Century America*. Springer Netherlands.
- Gornick, Marian E., Paul W. Eggers, Thomas W. Reilly, Renee M. Mentnech, Leslye K. Fitterman, Lawrence E. Kucken, and Bruce C. Vladeck. 1996. “Effects of Race and Income on Mortality and Use of Services among Medicare Beneficiaries.” *New England Journal of Medicine* 335(11):791–99. doi: 10.1056/nejm199609123351106.
- Government Accountability Office. 2012. *Older Americans Act: Options to*

- Better Target Need and Improve Equity*. Government Accountability Office. Retrieved June 18, 2021 (<https://www.gao.gov/assets/gao-13-74.pdf>).
- Government Accountability Office. 2019. *OLDER AMERICANS ACT: HHS Could Help Rural Service Providers by Centralizing Information on Promising Practices*. Government Accountability Office. Retrieved June 18, 2021 (<https://www.gao.gov/assets/gao-19-330.pdf>).
- Greenfield, Emily A., Kathy Black, Tine Buffel, and Jarmin Yeh. 2018. "Community Gerontology: A Framework for Research, Policy, and Practice on Communities and Aging." *The Gerontologist* 59(5):803–10. doi: 10.1093/geront/gny089.
- Gruman, Cindy, and Heather L. Menne. 2020. "Strengthening the Research Evidence for HCBS Policy and Practice." *Journal of Applied Gerontology* 39(7):700–701. doi: 10.1177/0733464820919184.
- Havir, Linda. 1991. "Senior Centers in Rural Communities: Potentials for Serving." *Journal of Aging Studies* 5(4):359–74. doi: 10.1016/0890-4065(91)90016-L.
- Hegerty, Scott W. 2020. "'Banking Deserts,' Bank Branch Losses, and Neighborhood Socioeconomic Characteristics in the City of Chicago: A Spatial and Statistical Analysis." *The Professional Geographer* 72(2):194–205. doi: 10.1080/00330124.2019.1676801.
- Henning-Smith, Carrie E., Ashley M. Hernandez, Rachel R. Hardeman, Marizen R. Ramirez, and Katy Backes Kozhimannil. 2019. "Rural Counties with Majority Black or Indigenous Populations Suffer the Highest Rates of Premature Death in the US." *Health Affairs* 38(12):2019–26. doi: 10.1377/hlthaff.2019.00847.
- Herd, Pamela, Stephanie A. Robert, and James S. House. 2011. "Health Disparities among Older Adults: Life Course Influences and Policy Solutions." Pp. 121–34 in *Handbook of Aging and the Social Sciences*. Academic Press.
- Hill, Carl V., Eliseo J. Pérez-Stable, Norman B. Anderson, and Marie A. Bernard. 2015. "National Institute on Aging Health Disparities Framework." *Ethnicity & Disease* 25(3):245–54. doi: 10.18865/ed.25.3.245.
- Hinojosa, Ramon, Melanie Sberna Hinojosa, Toni Chiara, and Melanie Hinojosa. 2014. "Rural Caregivers and Social Isolation: Some Properties and Dimensions." *Journal of Rural Social Sciences* 29(2):12–31. Available at: <https://egrove.olemiss.edu/jrss/vol29/iss2/2>.
- Jensen, Leif, Shannon M. Monnat, John J. Green, Lori M. Hunter, and

- Martin J. Sliwinski. 2020. "Rural Population Health and Aging: Toward a Multilevel and Multidimensional Research Agenda for the 2020s." *American Journal of Public Health*. doi: 10.2105/AJPH.2020.305782.
- Kandel, William, and Newman, Constance. 2004. *Rural Hispanics: Employment and Residential Trends*. USDA Economic Research Service. Retrieved June 18, 2021 (<https://www.ers.usda.gov/amber-waves/2004/june/rural-hispanics-employment-and-residential-trends/>).
- Khan, Abdullah, and Surinder Bhardwaj. 1994. "Access to Health Care: A Conceptual Framework and Its Relevance to Health Care Planning." *Evaluation & the Health Professions* 17(1):60–76. doi: 10.1177/016327879401700104.
- Kim, Giyeon, Jason M. Parton, Jamie DeCoster, Ami N. Bryant, Katy L. Ford, and Patricia A. Parmelee. 2013. "Regional Variation of Racial Disparities in Mental Health Service Use Among Older Adults." *The Gerontologist* 53(4):618–26. doi: 10.1093/geront/gns107.
- Ko, Michelle, Jack Needleman, Kathryn Pitkin Derosé, Miriam J. Laugesen, and Ninez A. Ponce. 2014. "Residential segregation and the survival of U.S. urban public hospitals." *Medical Care Research and Review* : 71(3):243–260. doi: 10.1177/1077558713515079.
- Krout, John A. 1987. "Rural-Urban Differences in Senior Center Activities and Services1." *The Gerontologist* 27(1):92–97. doi: 10.1093/geront/27.1.92.
- Krout, John A. 1991. "Rural Area Agencies on Aging: An Overview of Activities and Policy Issues." *Journal of Aging Studies* 5(4):409–24. doi: 10.1016/0890-4065(91)90019-O. doi: 10.1016/0890-4065(91)90019-O.
- Le, Sidney T., and Renee Y. Hsia. 2016. "Community Characteristics Associated with Where Urgent Care Centers Are Located: A Cross-Sectional Analysis." *BMJ Open* 6(4):10663. doi: 10.1136/bmjopen-2015-010663.
- Lehning, Amanda J., Min Hee Kim, and Ruth E. Dunkle. 2013. "Facilitators of Home and Community-Based Service Use by Urban African American Elders." *Journal of Aging and Health* 25(3):439–58. doi: 10.1177/0898264312474038.
- Li, Hong. 2006. "Rural Older Adult's Access Barriers to in-Home and Community-Based Services." *Social Work Research* 30(2):109–18.
- Mahmoudi, Elham, and Gail A. Jensen. 2013. "Exploring Disparities in Access to Physician Services Among Older Adults: 2000–2007." *The Journals of Gerontology: Series B* 68(1):128–38. doi: 10.1093/geronb/gbs105.

- Mishra, Ashok, Hisham El-Osta, and Saleem Shaik. 2010. "Succession Decisions in U.S. Family Farm Businesses on JSTOR." *Journal of Agricultural and Resource Economics* 35(1):133–52.
- Mobley, Lee, Tzy Mey Kuo, and Gloria J. Bazzoli. 2011. "Erosion in the Healthcare Safety Net: Impacts on Different Population Groups." *Open Health Services and Policy Journal* 4:1–14. doi: 10.2174/1874924001104010001.
- Moore, Keith Diaz. 2014. "An Ecological Framework of Place: Situating Environmental Gerontology within a Life Course Perspective." *The International Journal of Aging and Human Development* 79(3):183–209. doi: 10.2190/AG.79.3.a.
- Moore, Latetia V., and Ana V. Diez Roux. 2006. "Associations of Neighborhood Characteristics with the Location and Type of Food Stores." *American Journal of Public Health* 96(2):325–31. doi: 10.2105/AJPH.2004.058040.
- Morken, Lydia, and Mildred Warner. 2012. *Planning for the Aging Population: Rural Responses to the Challenge*. National Association of Area Agencies on Aging. Retrieved June 18, 2021 (<http://s3.amazonaws.com/mildredwarner.org/attachments/000/000/196/original/de6841e2187c889cdf4a15a7b45512f4>).
- Murray, Christopher J. L., Sandeep C. Kulkarni, Catherine Michaud, Niels Tomijima, Maria T. Bulzacchelli, Terrell J. Iandiorio, and Majid Ezzati. 2006. "Eight Americas: Investigating Mortality Disparities across Races, Counties, and Race-Counties in the United States" edited by T. Novotny. *PLoS Medicine* 3(9):e260. doi: 10.1371/journal.pmed.0030260.
- National Association of Area Agencies on Aging. 2018. *Rural AAAs Structures and Services: Information and Planning Issue Brief*. Retrieved June 18, 2021 (<https://www.n4a.org/Files/Rural%20AAAs%20Structures%20and%20Services.pdf>).
- National Center on Law & Elder Rights. 2018. *Targeting Older Americans Act Services Without Means Testing: Meeting the Challenge*. Retrieved June 18, 2021 (<https://ncler.acl.gov/pdf/Targeting-OAA%20-Services-Without-Means-Testing-Issue-Brief.pdf>).
- Nelson, Gary. 1980. "Social Services to the Urban and Rural Aged: The Experience of Area Agencies on Aging." *The Gerontologist* 20(2):200–207. doi: 10.1093/geront/20.2.200.
- O'Connor, A., and G. Wellenius. 2012. "Rural-Urban Disparities in the Prevalence of Diabetes and Coronary Heart Disease." *Public Health*

- 126(10):813–20. doi: 10.1016/j.puhe.2012.05.029.
- O’Shaughnessy, Carol V. 2008. “The Aging Services Network: Broad Mandate and Increasing Responsibilities.” *Public Policy & Aging Report* 18(3):1–18. doi: 10.1093/ppar/18.3.1.
- Older Americans Act. 1965. 45 CFR § 1321.37 - Intrastate funding formula. Retrieved June 18, 2021 (<https://www.law.cornell.edu/cfr/text/45/1321.37>).
- Pollack, Craig Evan, and Katrina Armstrong. 2009. “The Geographic Accessibility of Retail Clinics for Underserved Populations.” *Archives of Internal Medicine* 169(10):945–49. doi: 10.1001/archinternmed.2009.69.
- Powell, Lisa M., Sandy Slater, and Frank J. Chaloupka. 2004. "The Relationship between Community Physical Activity Settings and Race, Ethnicity and Socioeconomic Status." *Evidence-Based Preventive Medicine*. 2:135-144.
- Probst, Janice C., Charity G. Moore, Sandra H. Glover, and Michael E. Samuels. 2004. “Person and Place: The Compounding Effects of Race/Ethnicity and Rurality on Health.” *American Journal of Public Health* 94(10):1695–1703. doi: 10.2105/AJPH.94.10.1695.
- Rhubart, Danielle C., Shannon M. Monnat, Leif Jensen, and Claire Pendergrast. 2021. “The Unique Impacts of U.S. Social and Health Policies on Rural Population Health and Aging.” *Public Policy & Aging Report* 31(1):24–29. doi: 10.1093/ppar/praa034.
- Roberto, Karen A., Raven H. Weaver, and Robbyn R. Wacker. 2014. “Delivering Aging Services: Stability and Change in Policies and Programs.” *Generations: Journal of the American Society on Aging* 38(2):14–21.
- Schaeffer, K. 2019. "Rising Number of U.S. Counties are Majority Hispanic or Black." Pew Research Center. Retrieved June 18, 2021 (<https://www.pewresearch.org/fact-tank/2019/11/20/in-a-rising-number-of-u-s-counties-hispanic-and-black-americans-are-the-majority/>).
- Sharkey, Joseph R. 2009. “Measuring Potential Access to Food Stores and Food-Service Places in Rural Areas in the U.S.” *American Journal of Preventive Medicine* 36(4 SUPPL.):S151–55. doi: 10.1016/j.amepre.2009.01.004.
- Siconolfi, Daniel, Regina A. Shih, Esther M. Friedman, Virginia I. Kotzias, Sangeeta C. Ahluwalia, Jessica L. Phillips, and Debra Saliba. 2019. “Rural-Urban Disparities in Access to Home- and Community-Based Services and Supports: Stakeholder Perspectives From 14 States.”

- Journal of the American Medical Directors Association* 20(4):503-508.e1. doi: 10.1016/j.jamda.2019.01.120.
- Skoufalos, Alexis, Janice L. Clarke, Dana Rose Ellis, Vicki L. Shepard, and Elizabeth Y. Rula. 2017. "Rural Aging in America: Proceedings of the 2017 Connectivity Summit." *Population Health Management* 20(S2):S1–10. doi: 10.1089/pop.2017.0177.
- Small, Mario Luis, and Monica McDermott. 2006. "The Presence of Organizational Resources in Poor Urban Neighborhoods: An Analysis of Average and Contextual Effects." *Social Forces* 84(3):1697–1724. doi: 10.1353/sof.2006.0067.
- Statz, Michele, and Paula Termuhlen. 2020. "Rural Legal Deserts Are a Critical Health Determinant." *American Journal of Public Health* 110(10):1519–22. doi: 10.2105/AJPH.2020.305807.
- Sun, Fei. 2011. "Community Service Use by Older Adults: The Roles of Sociocultural Factors in Rural-Urban Differences." *Journal of Social Service Research* 37(2):124–35. doi: 10.1080/01488376.2011.547446.
- Thiede, Brian C., David L. Brown, Scott R. Sanders, Nina Glasgow, and Laszlo J. Kulcsar. 2017. "A Demographic Deficit? Local Population Aging and Access to Services in Rural America, 1990–2010." *Rural Sociology* 82(1):44–74. doi: 10.1111/ruso.12117.
- Tudor Hart, Julian. 1971. "The Inverse Care Law." *The Lancet* 297(7696):405–12. doi: 10.1016/S0140-6736(71)92410-X.
- Tuttle, Cody, Jill Tanem, Megan Lahr, Jonathan Schroeder, Ma Mariana Tuttle, Carrie Henning-Smith, Andrea Piacquadio, Tristan Le, Nashua Volquez-Young, and Noelle Otto. 2020. *Chartbook August 2020: Rural-Urban Differences among Older Adults*. University of Minnesota Rural Health Research Center. Retrieved June 18, 2021 (https://rhrc.umn.edu/wp-content/uploads/2020/08/Rural-Urban-Older-Adults_Chartbook_Final_8.25.20.pdf)
- Ujvari, Kathleen, Wendy Fox-Grage, and Ari Houser. 2019. *Older Americans Act - AARP Spotlight*.
- United States. 2020. *Older Americans Act of 1965, as Amended*. Administration on Aging, Office of Human Development Services, U.S. Department of Health, Education, and Welfare.
- Wacker, Robbyn R., and Karen A. Roberto. 2014. *Community Resources for Older Adults: Programs and Services in an Era of Change*. Thousand Oaks, CA: SAGE.
- Wahl, Hans-Werner, and Gerald D. Weisman. 2003. "Environmental Gerontology at the Beginning of the New Millennium: Reflections on

- Its Historical, Empirical, and Theoretical Development.” *The Gerontologist* 43(5):616–27. doi: 10.1093/geront/43.5.616.
- Walker, Renee E., Christopher R. Keane, and Jessica G. Burke. 2010. “Disparities and Access to Healthy Food in the United States: A Review of Food Deserts Literature.” *Health and Place* 16(5):876–84. doi: 10.1016/j.healthplace.2010.04.013.
- Walton, Emily. 2014. “Vital Places: Facilitators of Behavioral and Social Health Mechanisms in Low-Income Neighborhoods.” *Social Science and Medicine* 122:1–12. doi: 10.1016/j.socscimed.2014.10.011.
- Wanka, Anna, Thibault Moolaert, and Matthias Drilling. 2018. “From Environmental Stress to Spatial Expulsion - Rethinking Concepts of Socio-Spatial Exclusion in Later Life.” *International Journal of Ageing and Later Life* 12(2):25–51. doi: 10.3384/ijal.1652-8670.18402.
- Weaver, Raven H., and Karen A. Roberto. 2021. “Location Matters: Disparities in the Likelihood of Receiving Services in Late Life.” *The International Journal of Aging and Human Development* 93(1):653–672. doi: 10.1177/0091415020948205.
- Weaver, Raven H., Karen A. Roberto, and Rosemary Blieszner. 2018. “Older Adults in Rural Appalachia: Preference and Expectations for Future Care.” *International Journal of Aging and Human Development* 86(4):364–81. doi: 10.1177/0091415017720891.
- White, Kellee, Jennifer S. Haas, and David R. Williams. 2012. “Elucidating the Role of Place in Health Care Disparities: The Example of Racial/Ethnic Residential Segregation.” *Health Services Research* 47:1278–99. doi: 10.1111/j.1475-6773.2012.01410.x.
- Wilson, T. L., Scala-Foley, M., Kunkel, S. R., & Brewster, A. L. 2020. “Fast-track Innovation: Area Agencies on Aging Respond to the COVID-19 Pandemic.” *Journal of Aging & Social Policy*, 0(0), 1–7. <https://doi.org/10.1080/08959420.2020.1774313>.
- Wimberley, Ronald C. 2010. “It’s Our Most Rural Region; It’s the Poorest; It’s the Black Belt South; and It Needs Our Attention.” *Journal of Rural Social Sciences*, 25(2): Article 7. Available at: <https://egrove.olemiss.edu/jrss/vol25/iss2/7>.
- Wisseh, Cheryl, Kristin Hildreth, Jazalene Marshall, Ashton Tanner, Mohsen Bazargan, and Paul Robinson. 2020. “Social Determinants of Pharmacy Deserts in Los Angeles County.” *Journal of Racial and Ethnic Health Disparities* 1–11. doi: 10.1007/s40615-020-00904-6.