

Prevalence of Disability and Disability Types by Urban–Rural County Classification—U.S., 2016



Guixiang Zhao, MD, PhD,¹ Catherine A. Okoro, MS, PhD,² Jason Hsia, PhD,¹
William S. Garvin, BS,¹ Machell Town, MS, PhD¹

This activity is available for CME credit. See page A3 for information.

Introduction: In the U.S., disability affects approximately 61.4 million (25.7%) adults, with mobility disability being the most prevalent type, affecting about 1 in 7 U.S. adults. However, little is known about the prevalence of disability and functional disability types by urbanization level.

Methods: Data from the 2016 Behavioral Risk Factor Surveillance System were analyzed. The prevalences of disability, overall and by functional disability type, were estimated among U.S. adults across 6 levels of urban–rural county categories based on the 2013 National Center for Health Statistics Urban–Rural Classification Scheme for Counties. Adjusted prevalence ratios with 95% CIs were estimated by conducting log-linear regression analyses with robust variance estimator while adjusting for study covariates. Data analyses were conducted in 2018.

Results: The prevalences of having any disability, functional disability type, or multiple disabilities were lowest in large metropolitan centers and fringe metropolitan counties and highest in noncore (rural) counties. After controlling for age, sex, race/ethnicity, education, and federal poverty level, adults living in noncore counties were 9% more likely to report having any disability, 24% more likely to report having 3 or more disabilities, and 7% (cognition) to 35% (hearing) more likely to report specific disability types than the adults living in large metropolitan centers.

Conclusions: Results of this study suggest that significant disparities in the prevalence of disability exist by level of urbanization, with rural U.S. residents having the highest prevalence of disability. Public health interventions to reduce health disparities could include people with disabilities, particularly in rural counties.

Am J Prev Med 2019;57(6):749–756. Published by Elsevier Inc. on behalf of American Journal of Preventive Medicine.

INTRODUCTION

Rural populations in the U.S. have well-documented health disparities, including higher prevalences of disability.^{1–5} Disability affects approximately 61.4 million (25.7%) adults in the U.S., with the most prevalent functional disability type, mobility, affecting about 1 in 7 U.S. adults (13.7%).⁶ The economic impact of disability is substantial. Disability-associated healthcare expenditures for all U.S. adults totaled \$397.8 billion in 2006 (range, \$598 million in Wyoming to \$40.1 billion in New York).⁷

People with disabilities have health disparities across several health-related measures and social determinants

of health (e.g., health-related behaviors; physical, mental, and oral health; socioeconomic position).^{8–10} Adults living with a disability often experience poor economic outcomes, such as declines in earnings, income, and consumption (e.g., food, housing).⁹ In 2017, for example,

From the ¹Division of Population Health, National Center for Chronic Disease Prevention and Health Promotion, Atlanta, Georgia; and ²Division of Human Development and Disability, National Center on Birth Defects and Developmental Disabilities, Centers for Disease Control and Prevention, Atlanta, Georgia

Address correspondence to: Guixiang Zhao, MD, PhD, Division of Population Health, Centers for Disease Control and Prevention, 4770 Buford Hwy, MS F-78, Atlanta GA 30341. E-mail: fwj4@cdc.gov.

0749-3797/\$36.00

<https://doi.org/10.1016/j.amepre.2019.07.022>

35.5% of adults with disabilities aged 18–64 years were employed compared with 76.5% of adults without disabilities, and had twice the rate of poverty (29.6% vs 13.2%).⁸ Limited personal finances may contribute to foregone or delayed health care among adults with disabilities, and subsequently lead to poorer health outcomes.¹⁰

Urban and rural areas differ in several demographic, socioeconomic, environmental, health, and healthcare access factors, which might contribute to the higher proportions of people living with a disability in rural communities.^{1–5,10–12} Compared with their urban counterparts, adults with disabilities living in rural areas may face additional barriers (e.g., lower SES, transportation problems, access to education and vocational rehabilitation services, access to health care, and accessible communities) as they strive to maintain and improve their health, quality of life, and community participation.^{2,4,10–12} These challenges, together with shifts in population demographics, labor market conditions, and healthcare resources that are occurring in rural America and existing health disparities, may contribute to adverse health-related behaviors, poor health outcomes, progression of disability, and early mortality among rural adults with disabilities.^{1,10–13}

Disability prevalence varies widely by HHS regions (ranges from 20.3% to 28.2%),¹⁴ by state (ranges from 18.7% to 36.6%),¹⁴ and by county (ranges from 3.7% to 32.4%).⁵ Despite what is known about the prevalence of disability in these geographies and the substantial impact of disability, few studies have examined the prevalence of disability and functional disability types across urban–rural areas overall and among selected subpopulations.^{2,3,5} Using data from the 2008–2012 American Community Survey, von Reichert et al.³ found the highest estimates of any disability and each functional disability type among adults living in noncore counties and the lowest estimates among adults living in metropolitan counties. However, the study did not examine the impact of level of urbanization (i.e., across 6 urban–rural county categories) on prevalences of disability and functional disability types or consider other potential confounding factors.

The goal of this study is to extend previous research findings by examining the prevalence of disability and functional disability types by urban–rural county classification using data from the Behavioral Risk Factor Surveillance System (BRFSS).

METHODS

Study Population

Data for this study came from the 2016 BRFSS, a state-based telephone (both landline and cellular) survey of non-institutionalized adults aged ≥ 18 years conducted annually since 1984. Descriptions of the BRFSS survey design and sampling, data collection,

and weights have been described elsewhere.^{15,16} The median survey response rate was 47.0% for the 2016 BRFSS.

Measures

In 2016, the BRFSS included questions about 6 disability types (hearing, vision, cognition, mobility, self-care, and independent living) to measure disability prevalence by functional type.^{6,15} Specifically, participants were classified as having 1 of the 6 disability types if they answered *yes* to the following questions: (1) *Are you deaf or do you have serious difficulty hearing?* (hearing disability); (2) *Are you blind or do you have serious difficulty seeing even when wearing glasses?* (vision disability); (3) *Because of a physical, mental, or emotional condition, do you have serious difficulty concentrating, remembering, or making a decision?* (cognitive disability); (4) *Do you have serious difficulty walking or climbing stairs?* (mobility disability); (5) *Do you have difficulty dressing or bathing?* (self-care disability); and (6) *Because of a physical, mental, or emotional condition, do you have difficulty doing errands alone such as visiting a doctor's office or shopping?* (independent living disability). Respondents who answered *yes* to at least one of the disability questions were classified as having any disability. For each respondent reporting any disability, the number of disability types was calculated by summing the *yes* responses to the 6 questions and categorized as having 1, 2, or 3 or more disabilities.

The urban–rural county classification was conducted by applying the National Center for Health Statistics 2013 Urban–Rural Classification Scheme for Counties¹⁷ to the BRFSS data using state and county FIPS codes. This classification scheme assigns each U.S. county to 1 of the 6 following categories, from most urban to most rural: (1) large central metropolitan, (2) large fringe metropolitan, (3) medium metropolitan, (4) small metropolitan, (5) micropolitan, and (6) noncore (i.e., rural). This classification is based on population density and metropolitan statistical areas (with an urbanized core of $\geq 50,000$ residents), micropolitan statistical areas (with a population cluster of between 10,000 and 49,999 residents), and noncore areas in the 50 states and District of Columbia.¹⁷

Statistical Analysis

Data analyses for this study were conducted in 2018. Participants who responded *don't know/not sure*, refused to answer, or had missing responses to the disability questions or sociodemographic variables were excluded from analysis ($\leq 7\%$). The weighted prevalence of any disability, type of disability, and number of disability types were estimated by urban–rural classification category. Adjusted prevalence ratios with 95% CIs were estimated by conducting log-linear regression analyses with a robust variance estimator while adjusting for study covariates: age (18–34, 35–44, 45–54, 55–64, 65–74, and ≥ 75 years), sex, race/ethnicity (white, non-Hispanic; black, non-Hispanic; Hispanic, and other, non-Hispanic race or multiracial), educational attainment (less than high school graduate, high school graduate/GED, some college, and college graduate or above), and federal poverty level ($<100\%$, $100\%–199\%$, $\geq 200\%$, and unknown). SUDAAN, version 9.4, was used to account for the multistage, complex sampling design. Results were considered statistically significant if $p < 0.05$.

RESULTS

After excluding participants with missing sociodemographic variables, 467,774 participants were included in

the study. The mean age was 47.2 years, 48.6% were male, and 63.9% were white, non-Hispanic (Table 1). The socio-demographic distributions across urban–rural counties differed significantly except for sex (Table 1). Specifically, adults who lived in large central metropolitan counties were more likely to be younger (aged 18–44 years), Hispanic, or living with a household income <100% of the federal poverty level. By contrast, adults who lived in non-core counties were more likely to be older (aged ≥65

years); white, non-Hispanic; or to have a high school education or less, but less likely to live with a household income ≥200% of the federal poverty level.

The percentages of adults who reported having any disability or having 1, 2, or 3 or more disabilities were 25.1%, 14.2%, 5.6%, and 5.3%, respectively (Table 2). Overall, the adjusted prevalence of any disability was 4%–9% higher in adults living in medium or small metropolitan, micropolitan, and noncore counties compared

Table 1. Sociodemographic Distributions by Urban and Rural Classification in U.S. Adults Aged ≥18 Years, BRFSS, 2016

Sociodemographic characteristic	All n (%)	Large central metropolitan % (95% CI)	Large fringe metropolitan % (95% CI)	Medium metropolitan % (95% CI)	Small metropolitan % (95% CI)	Micropolitan % (95% CI)	Noncore % (95% CI)	p-value
Overall	467,774 (100)	30.4 (30.1, 30.6)	24.4 (24.2, 24.6)	20.7 (20.6, 20.9)	9.1 (9.0, 9.2)	8.7 (8.6, 8.8)	6.7 (6.6, 6.8)	
Age, years								<0.001
18–44	125,095 (46.5)	33.3 (32.8, 33.7)	23.3 (22.9, 23.7)	20.7 (20.4, 21.1)	9.0 (8.8, 9.2)	8.0 (7.8, 8.2)	5.6 (5.5, 5.8)	
45–64	177,188 (33.5)	28.9 (28.4, 29.3)	26.0 (25.6, 26.4)	20.3 (20.0, 20.6)	8.7 (8.5, 8.9)	8.9 (8.7, 9.1)	7.2 (7.0, 7.4)	
≥65	165,491 (20.0)	26.1 (25.6, 26.7)	24.2 (23.7, 24.6)	21.5 (21.1, 21.9)	9.9 (9.7, 10.1)	10.1 (9.8, 10.3)	8.2 (8.0, 8.5)	
Sex								0.660
Male	202,301 (48.6)	30.3 (29.9, 30.7)	24.4 (24.0, 24.7)	20.7 (20.4, 21.0)	9.2 (9.0, 9.4)	8.7 (8.6, 8.9)	6.7 (6.5, 6.9)	
Female	265,473 (51.4)	30.4 (30.1, 30.8)	24.5 (24.1, 24.8)	20.8 (20.5, 21.1)	9.0 (8.8, 9.1)	8.7 (8.5, 8.9)	6.7 (6.5, 6.8)	
Race/ethnicity								<0.001
White, NH	366,868 (63.9)	21.9 (21.7, 22.2)	26.0 (25.8, 26.3)	21.9 (21.7, 22.2)	10.8 (10.6, 11.0)	10.9 (10.7, 11.0)	8.4 (8.3, 8.6)	
Black, NH	38,576 (11.9)	42.1 (41.2, 43.1)	23.1 (22.4, 23.9)	18.2 (17.6, 18.8)	6.6 (6.3, 7.0)	5.3 (4.9, 5.6)	4.7 (4.3, 5.0)	
Hispanic	33,006 (15.9)	47.7 (46.8, 48.7)	18.7 (18.0, 19.4)	20.3 (19.7, 21.0)	5.8 (5.5, 6.2)	4.6 (4.2, 4.9)	2.8 (2.5, 3.2)	
Other, NH race or multiracial	29,324 (8.2)	45.2 (43.9, 46.5)	24.7 (23.6, 25.8)	16.0 (15.3, 16.8)	5.6 (5.2, 6.0)	4.9 (4.6, 5.2)	3.6 (3.3, 3.9)	
Education								<0.001
Less than high school	35,586 (13.8)	33.5 (32.5, 34.5)	18.4 (17.6, 19.1)	20.5 (19.7, 21.2)	8.9 (8.5, 9.4)	10.1 (9.6, 10.6)	8.7 (8.2, 9.2)	
High school	132,278 (28.2)	25.9 (25.4, 26.5)	22.8 (22.3, 23.3)	21.7 (21.3, 22.1)	10.1 (9.8, 10.3)	10.8 (10.5, 11.0)	8.8 (8.5, 9.0)	
Some college	129,125 (31.1)	28.9 (28.3, 29.4)	24.8 (24.4, 25.3)	21.4 (21.0, 21.8)	9.6 (9.4, 9.9)	8.7 (8.5, 9.0)	6.4 (6.2, 6.6)	
College or higher	170,785 (26.9)	35.1 (34.7, 35.6)	28.7 (28.3, 29.1)	19.1 (18.8, 19.4)	7.4 (7.3, 7.6)	5.8 (5.7, 6.0)	3.8 (3.7, 3.9)	
FPL (%)								<0.001
<100	44,184 (13.4)	35.0 (34.0, 35.9)	17.4 (16.8, 18.2)	21.6 (20.9, 22.3)	9.1 (8.7, 9.5)	9.2 (8.8, 9.7)	7.7 (7.2, 8.1)	
100–199	97,170 (19.7)	28.9 (28.2, 29.6)	19.6 (19.0, 20.1)	21.7 (21.2, 22.2)	10.4 (10.0, 10.7)	10.8 (10.5, 11.2)	8.7 (8.4, 9.0)	
≥200	243,152 (48.2)	29.7 (29.3, 30.1)	27.9 (27.5, 28.2)	20.3 (20.0, 20.5)	8.7 (8.5, 8.9)	7.8 (7.6, 7.9)	5.6 (5.5, 5.8)	
Unknown	83,268 (18.6)	30.2 (29.5, 30.9)	25.6 (25.0, 26.2)	20.4 (19.9, 20.9)	8.7 (8.4, 9.0)	8.6 (8.3, 8.8)	6.6 (6.3, 6.9)	

Note: Boldface indicates statistical significance ($p < 0.05$). BRFSS, Behavioral Risk Factor Surveillance System; FPL, federal poverty level; NH, non-Hispanic.

with adults living in the large metropolitan centers ($p < 0.05$ for all; Table 2). Adults living in the micropolitan and noncore counties were 12% and 24% more likely to report having 3 or more disabilities (Table 2). Further stratified analyses showed the prevalence of any disability increased ($p < 0.05$ for all) from large metropolitan centers to noncore counties in most sociodemographic subgroups except for older adults (aged ≥ 65 years) and the Hispanic population (Figure 1), without or with adjustment for other sociodemographic characteristics.

For functional disability type, mobility disability was the most frequently reported type (13.6%), followed by disability in cognition (10.7%), independent living (6.7%), hearing (5.8%), vision (4.6%), and self-care (3.7%). The prevalences of individual disability types differed significantly by level of urbanization, with the lowest in the large central or fringe metropolitan counties and highest in the noncore counties (Figure 2); there were increasing trends ($p < 0.05$ for all) from large metropolitan centers to noncore counties. After multiple variable adjustment for sociodemographic characteristics, adults living in noncore counties were 7% (cognition) to 35% (hearing) more likely to report a functional disability types than adults living in large metropolitan centers (Figure 2). In addition, adults living in micropolitan counties were 7%, 15%, and 24% more likely to report mobility, vision, and hearing disability, respectively, than adults living in large metropolitan centers. Adults living in small metropolitan counties were 6% and 27% more likely to report cognitive and hearing disability, respectively, than adults living in large metropolitan centers. Adults living in medium metropolitan counties were 9% more likely to report vision disability and 12% more likely to report hearing disability than adults living in large metropolitan centers.

DISCUSSION

This study, based on data from a large, population-based surveillance system, showed significant disparities in the prevalence of functional disability among U.S. adults by level of urbanization. The large metropolitan centers and large fringe metropolitan counties had the lowest prevalences of disability and the noncore counties had the highest. Notably, the prevalence of having 3 or more disabilities was significantly higher among adults living in the most rural areas (micropolitan and noncore counties). Furthermore, the prevalence of any disability increased from large metropolitan centers to noncore counties in almost all sociodemographic subgroups, with the exception of older adults (aged ≥ 65 years) or Hispanics, even after adjustment for other sociodemographic characteristics.

Table 2. Weighted Prevalence and Adjusted Prevalence Ratios for Having Any Disability or Number of Disabilities Among U.S. Adults Aged ≥ 18 Years, by Urban–Rural Status, BRFSS 2016

Urban–rural classification	Having any disability		Having 1 disability		Having 2 disabilities		Having ≥ 3 disabilities	
	% (95% CI)	APR ^a (95% CI)	% (95% CI)	APR ^a (95% CI)	% (95% CI)	APR ^a (95% CI)	% (95% CI)	APR ^a (95% CI)
Overall	25.1 (24.8, 25.3)		14.2 (14.0, 14.4)		5.6 (5.5, 5.8)		5.3 (5.1, 5.4)	
Large central metropolitan	23.1 (22.5, 23.6)	1.00 (ref)	13.4 (12.9, 13.8)	1.00 (ref)	4.9 (4.6, 5.2)	1.00 (ref)	4.8 (4.5, 5.1)	1.00 (ref)
Large fringe metropolitan	22.8 (22.2, 23.3)	1.01 (0.97, 1.04)	13.4 (13.0, 13.8)	1.00 (0.96, 1.05)	5.0 (4.8, 5.3)	1.03 (0.95, 1.11)	4.3 (4.1, 4.6)	0.99 (0.91, 1.07)
Medium metropolitan	25.6 (25.1, 26.2)	1.04 (1.01, 1.07)*	14.3 (13.9, 14.7)	1.01 (0.97, 1.06)	6.0 (5.7, 6.3)	1.09 (1.01, 1.18)*	5.3 (5.1, 5.6)	1.06 (0.98, 1.14)
Small metropolitan	27.2 (26.5, 27.9)	1.07 (1.03, 1.10)***	15.4 (14.9, 16.0)	1.07 (1.01, 1.12)*	6.1 (5.8, 6.5)	1.07 (0.98, 1.16)	5.6 (5.3, 6.0)	1.08 (0.99, 1.17)
Micropolitan	29.5 (28.7, 30.2)	1.07 (1.04, 1.11)***	16.0 (15.4, 16.6)	1.05 (1.00, 1.10)	6.8 (6.5, 7.2)	1.08 (1.00, 1.17)	6.7 (6.3, 7.0)	1.12 (1.04, 1.22)**
Noncore	31.9 (31.0, 32.7)	1.09 (1.05, 1.13)***	16.4 (15.7, 17.0)	1.03 (0.98, 1.09)	7.3 (6.9, 7.8)	1.08 (0.99, 1.17)	8.1 (7.7, 8.6)	1.24 (1.14, 1.34)***

Note: Boldface indicates statistical significance (* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$).
^aAdjusted for age, sex, race/ethnicity, education, and federal poverty level.
 APR, adjusted prevalence ratio; BRFSS, Behavioral Risk Factor Surveillance System.

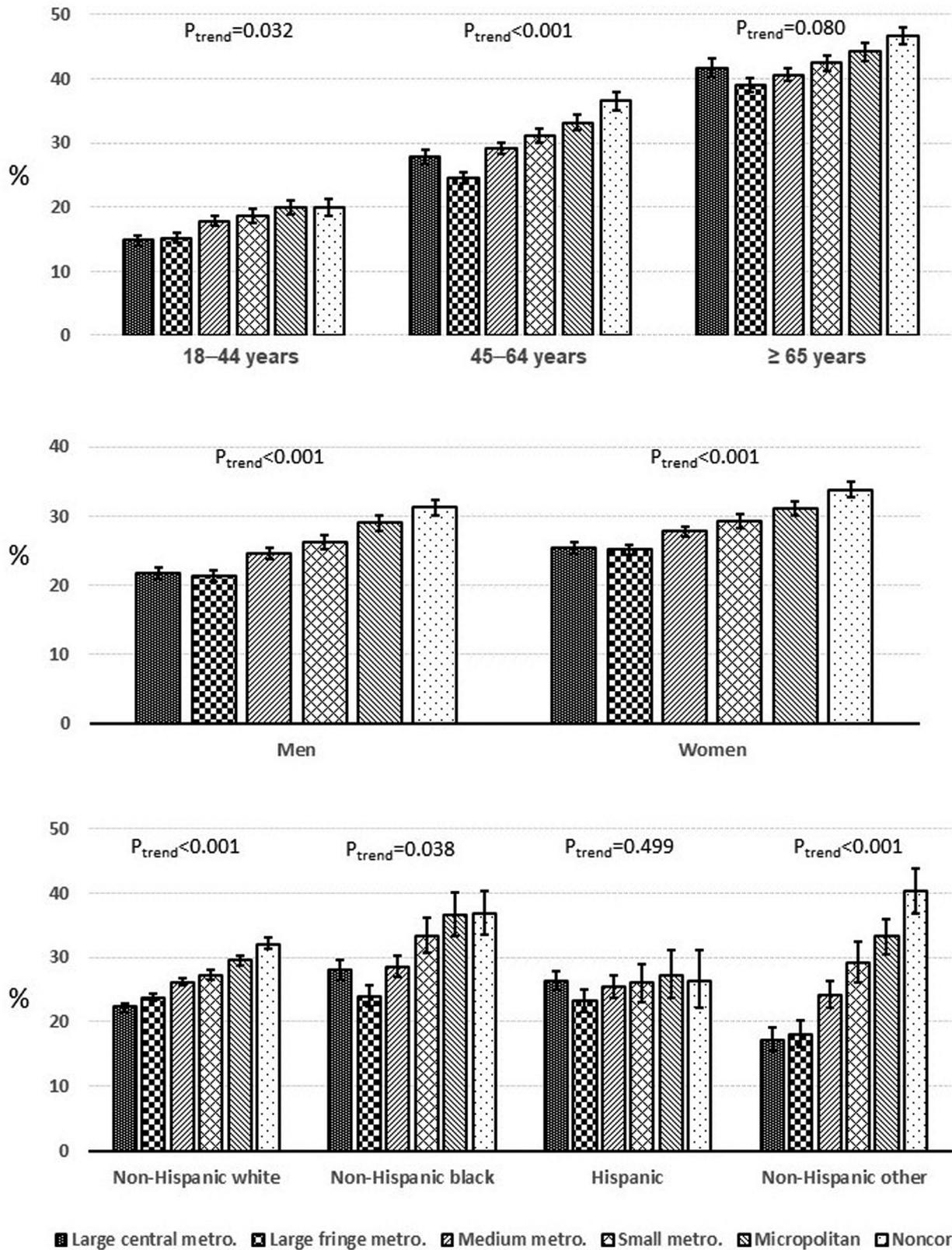


Figure 1. Weighted prevalence of having any disability (with 95% CIs) by urban–rural classification category among sociodemographic subgroups in U.S. adults aged ≥ 18 years. Note: Data from Behavioral Risk Factor Surveillance System, 2016. P_{trend} : p -value for linear trend with adjustment for all other sociodemographic characteristics.

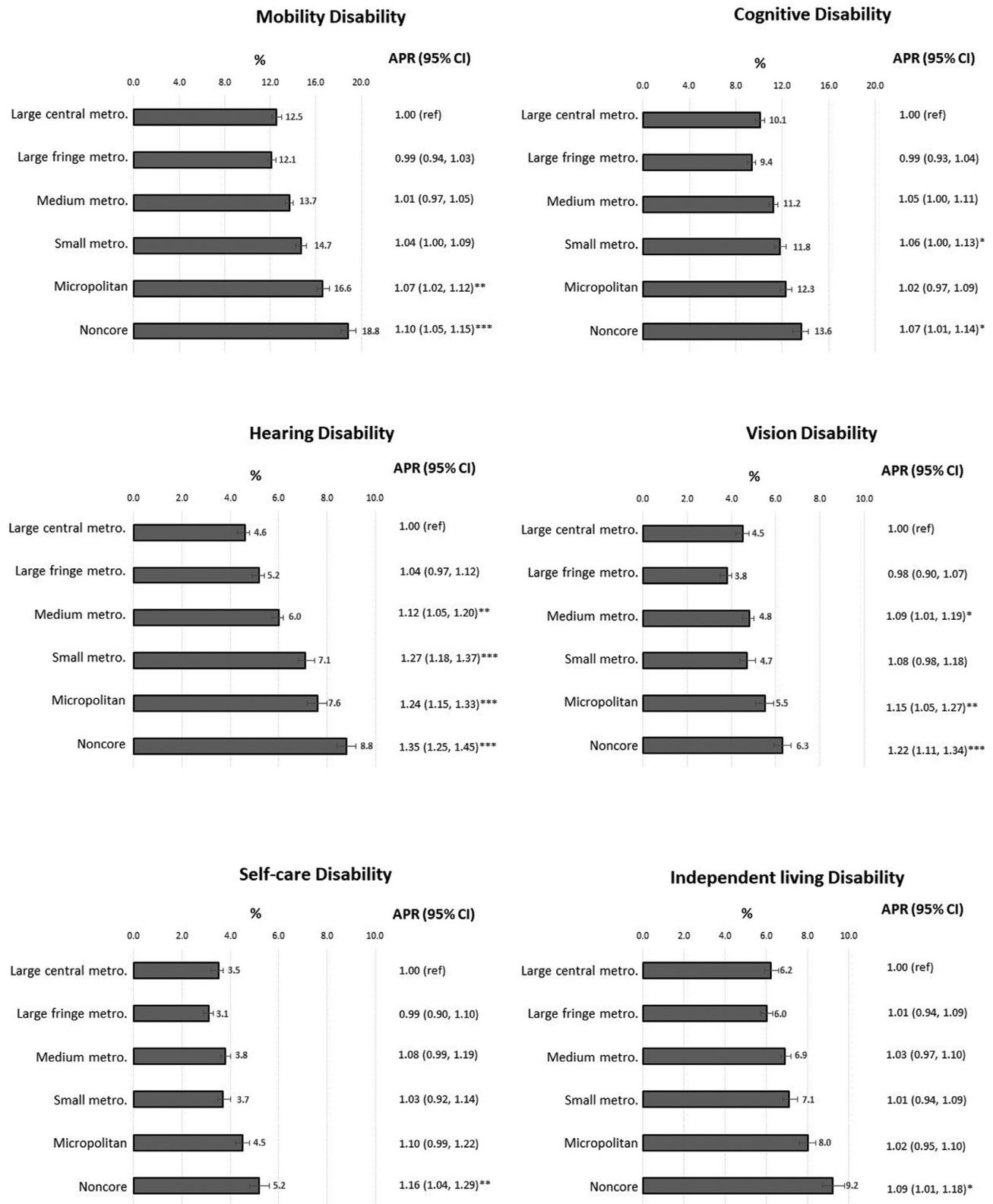


Figure 2. Weighted prevalences and adjusted prevalence ratios (with 95% CIs) of 6 types of functional disabilities among U.S. adults aged ≥ 18 years, by urban–rural classification category.

Note: Data from Behavioral Risk Factor Surveillance System, 2016. APRs adjusted for age, sex, race/ethnicity, education, and federal–poverty ratio.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

APR, adjusted prevalence ratio

These results not only confirmed the finding of a previous study using 2008–2012 American Community Survey data³ that the prevalence estimates of any disability and functional disability types were highest among U.S. adults living in noncore counties and lowest among adults in metropolitan counties, but also further demonstrated that significant disparities in the prevalence of disabilities existed across 6 levels of urbanization among age-, sex-, and racial/ethnic-specific subpopulations, even with multiple variable adjustment for potential confounders. These findings contribute to the knowledge gap in this area, and provide important information for health policy programs, suggesting the need for ongoing surveillance and evaluation of resource allocation (e.g., socioeconomic; health care including, emergency and specialty care facilities; and specialists) and environmental barriers (i.e., natural and built), especially in rural (noncore) counties, to improve the health and well-being of people with disabilities.^{1–5,10–12}

One in 4 U.S. adults reported any disability in 2016, and higher prevalences of disability were found among older adults, women, American Indians/Alaska Natives, and adults living in poverty.⁶ Geographically, populations with higher prevalences of disability were highest in the South, followed by the Midwest, West, and Northeast U.S. Census regions.^{6,18} In this study, nearly 19% of noncore counties are located in the South and Midwest regions compared with 3.1% in the West region, 2.9% in the Northeast region, and 6.7% nationally (data not shown). The higher proportions of older adults and those of lower SES (i.e., lower education, lower income, or both) residing in rural areas may, in part, explain the higher prevalences of disability and number of functional disabilities in rural counties as shown in this study. Indeed, the results of this study are consistent with earlier findings that about 1 in 3 rural U.S. adults report doctor-diagnosed arthritis and more than half of these adults report arthritis-attributable activity limitations.¹⁹

Although adults living in large metropolitan centers generally had lower prevalences of disability than those living in noncore counties for most of the sociodemographic subpopulations, this study did not show significant differences in disability prevalence among older adults (aged ≥ 65 years) or Hispanics based on urbanicity of residence, showing nonsignificant trends in both subgroups ($p_{\text{trend}}=0.080$ and 0.499 , respectively). These observations require further elucidation.

In a recent population-based study, Matthews and colleagues¹³ reported the prevalence of having 5 healthy behaviors (sufficient sleep, current nonsmoking, no or moderate drinking, maintaining a healthy body weight,

and meeting aerobic physical activity recommendations) was lowest in noncore counties. Evidence has shown that people with disabilities are more likely to have obesity, smoke, be physically inactive, or have sleep-related problems compared with people without disabilities.^{20–23} However, whether the low prevalence of having 5 healthy behaviors in noncore counties reported by Matthews et al.¹³ is attributable to a high proportion of adults with disability residing in those areas remains unknown and needs to be investigated further.

People with disabilities have been shown to have high prevalences of secondary health conditions that occur after the primary disabling condition (e.g., obesity, heart disease, diabetes, cancer, mental distress, or depression).^{23–27} In addition, people with disabilities who engage in adverse health behaviors increase their risk of secondary health conditions. All of these can exacerbate their primary disabling condition^{24,28,29} and lead to higher healthcare utilization.⁷ In 2006, annual disability-associated healthcare expenditures were estimated at \$398 billion, and varied greatly by state.⁷ Public health interventions to reduce health disparities could be inclusive of people with disabilities, and this is particularly relevant in rural areas. This could be an appropriate use of disability-related healthcare resources.

Limitations

This study is subject to several limitations. First, all information from BRFSS is based on self-reports and may be subject to recall and social desirability bias. Second, although this study examined individual disabilities and the number of functional disabilities by urban–rural county classification, information on the severity and duration of the disabling condition is not known. Third, the BRFSS is conducted among non-institutionalized adults, so the true prevalence of disability might have been underestimated because people with severe or multiple disabilities may live in institutional settings or group homes.

CONCLUSIONS

The prevalence of any disability, disability types, and number of disabilities varied significantly by level of urbanization. The higher prevalence of disabilities, including the increased number of functional disabilities, among adults residing in rural areas of the U.S. highlights the need for evidenced-based strategies that are inclusive of people with disabilities. By including people with disabilities in the design, implementation, and evaluation of interventions, rural healthcare providers, support services, and community organizations may be more effective in increasing healthy behaviors, chronic disease self-management, and access to community

resources for this population. Such efforts may positively impact the health, functioning, and quality of life of people with disabilities in rural areas.

ACKNOWLEDGMENTS

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

Author contributions: GZ and CAO had full access to the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis. Study concept and design: GZ. Acquisition of data: GZ. Analysis and interpretation of data: GZ. Drafting of the manuscript: GZ, CAO. Critical revision of the manuscript for important intellectual content: GZ, CAO, JH, WSG, MT. Administrative, technical, and material support and study supervision: MT.

No financial disclosures were reported by the authors of this paper.

REFERENCES

- Meit M, Knudson A, Gilbert T, et al. *The 2014 Update of the Rural-Urban Chartbook*. Bethesda, MD: Rural Health Reform Policy Research Center, 2014.
- Sage R, Ward B, Myers A, Ravesloot C. Transitory and enduring disability among urban and rural people. *J Rural Health*. In press. Online November 22, 2018.
- von Reichert C, Greiman L, Myers A. *University of Montana Rural Institute. The Geography of Disability in America: on Rural-Urban Differences in Impairment Rates*. Missoula, MT: University of Montana, 2014.
- Moy E, Garcia MC, Bastian B, et al. Leading causes of death in non-metropolitan and metropolitan areas—United States, 1999–2014. *MMWR Surveill Summ*. 2017;66(1):1–8. <https://doi.org/10.15585/mmwr.ss6601a1>.
- Seekins T, Greiman L. *University of Montana Rural Institute. Map Facts: Disability in Rural America (Rural Facts)*. Missoula, MT: University of Montana, 2014.
- Okoro CA, Hollis ND, Cyrus AC, Griffin-Blake S. Prevalence of disabilities and health care access by disability status and type among adults—United States, 2016. *MMWR Morb Mortal Wkly Rep*. 2018;67(32):882–887. <https://doi.org/10.15585/mmwr.mm6732a3>.
- Anderson WL, Armour BS, Finkelstein EA, Wiener JM. Estimates of state-level health-care expenditures associated with disability. *Public Health Rep*. 2010;125(1):44–51. <https://doi.org/10.1177/003335491012500107>.
- Houtenville A, Boege S. *Annual Report on People With Disabilities in America: 2018*. Durham, NH: University of New Hampshire, Institute on Disability/UCED, 2019.
- Meyer BD, Mok WKC. Disability, earnings, income and consumption. *J Public Econ*. 2019;171:51–69. <https://doi.org/10.1016/j.jpubeco.2018.06.011>.
- HHS. *The Surgeon General's Call to Action to Improve the Health and Wellness of Persons With Disabilities*. Rockville, MD: HHS, 2005.
- Siconolfi D, Shih RA, Friedman EM, et al. Rural-urban disparities in access to home- and community-based services and supports: stakeholder perspectives from 14 states. *J Am Med Dir Assoc*. 2019;20(4):503–508. e1. <https://doi.org/10.1016/j.jamda.2019.01.120>.
- Naylor KB, Tootoo J, Yakusheva O, Shipman SA, Bynum JPW, Davis MA. Geographic variation in spatial accessibility of U.S. healthcare providers. *PLoS One*. 2019;14(4):e0215016. <https://doi.org/10.1371/journal.pone.0215016>.
- Matthews KA, Croft JB, Liu Y, et al. Health-related behaviors by urban–rural county classification—United States, 2013. *MMWR Surveill Summ*. 2017;66(5):1–8. <https://doi.org/10.15585/mmwr.ss6605a1>.
- CDC, National Center on Birth Defects and Developmental Disabilities, Division of Human Development and Disability. Disability and health data system (DHDS) data. Atlanta, GA: CDC; 2016. www.cdc.gov/ncbddd/disabilityandhealth/dhds/index.html. Accessed December 20, 2018.
- CDC. Behavioral Risk Factor Surveillance System (BRFSS). www.cdc.gov/BRFSS/. Accessed December 20, 2018.
- Mokdad AH, Stroup DF, Giles WH, Behavioral Risk Factor Surveillance Team. Public health surveillance for behavioral risk factors in a changing environment. Recommendations from the Behavioral Risk Factor Surveillance Team. *MMWR Recomm Rep*. 2003;52(RR–9):1–12.
- Ingram DD, Franco SJ. NCHS urban–rural classification scheme for counties. *Vital Health Stat*. 2014;166:1–73.
- Li CM, Zhao G, Hoffman HJ, Town M, Themann CL. Hearing disability prevalence and risk factors in two recent national surveys. *Am J Prev Med*. 2018;55(3):326–335. <https://doi.org/10.1016/j.amepre.2018.03.022>.
- Boring MA, Hootman JM, Liu Y, et al. Prevalence of arthritis and arthritis-attributable activity limitation by urban–rural county classification—United States, 2015. *MMWR Morb Mortal Wkly Rep*. 2017;66(20):527–532. <https://doi.org/10.15585/mmwr.mm6620a2>.
- Pharr JR, Bungum T. Health disparities experienced by people with disabilities in the United States: a Behavioral Risk Factor Surveillance System study. *Glob J Health Sci*. 2012;4(6):99–108. <https://doi.org/10.5539/gjhs.v4n6p99>.
- Puri S, Herrick JE, Collins JP, Aldahi M, Baattaiah B. Physical functioning and risk for sleep disorders in U.S. adults: results from the National Health and Nutrition Examination survey 2005–2014. *Public Health*. 2017;152:123–128. <https://doi.org/10.1016/j.puhe.2017.07.030>.
- Shandra CL, Kruger A, Hale L. Disability and sleep duration: evidence from the American Time Use Survey. *Disabil Health J*. 2014;7(3):325–334. <https://doi.org/10.1016/j.dhjo.2014.02.002>.
- Turk MA. Secondary conditions and disability. In: Field MJ, Jette AM, Martin L, eds. *Workshop on Disability in America: A New Look*. Washington, DC: The National Academies Press, 2006:185–193.
- Milaneschi Y, Penninx BW. Depression in older persons with mobility limitations. *Curr Pharm Des*. 2014;20(19):3114–3118. <https://doi.org/10.2174/13816128113196660060>.
- Zhao G, Ford ES, Li C, Crews JE, Mokdad AH. Disability and its correlates with chronic morbidities among U.S. adults aged 50–<65 years. *Prev Med*. 2009;48(2):117–121. <https://doi.org/10.1016/j.yjmed.2008.11.002>.
- Okoro CA, Strine TW, Balluz LS, et al. Serious psychological distress among adults with and without disabilities. *Int J Public Health*. 2009;54(suppl 1):52–60. <https://doi.org/10.1007/s00038-009-0077-z>.
- Okoro CA, Strine TW, Balluz LS, Crews JE, Mokdad AH. Prevalence and correlates of depressive symptoms among United States adults with disabilities using assistive technology. *Prev Med*. 2010;50(4):204–209. <https://doi.org/10.1016/j.yjmed.2010.01.008>.
- Covinsky KE, Yaffe K, Lindquist K, Cherkasova E, Yelin E, Blazer DG. Depressive symptoms in middle age and the development of later-life functional limitations: the long-term effect of depressive symptoms. *J Am Geriatr Soc*. 2010;58(3):551–556. <https://doi.org/10.1111/j.1532-5415.2010.02723.x>.
- Cronin-Stubbis D, de Leon CF, Beckett LA, Field TS, Glynn RJ, Evans DA. Six-year effect of depressive symptoms on the course of physical disability in community-living older adults. *Arch Intern Med*. 2000;160(20):3074–3080. <https://doi.org/10.1001/archinte.160.20.3074>.