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Americans Aging With Disabilities Are More Likely to Have Multiple Chronic Conditions

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Abstract

Using data from the 2010 to 2017 National Health Interview survey, bivariate and multivariate regression analyses were utilized to estimate the percentage and odds of having multiple chronic conditions (two or more, three or more) among U.S. adults ages 65 and over with and without disabilities, controlling for sociodemographic factors and presence of psychological distress. Older adults with and without disabilities in the United States most frequently reported having hypertension, arthritis, and diabetes. Regression results indicate that older adults with disabilities are significantly more likely to experience two or more and three or more chronic conditions than older adults without disabilities, controlling for sociodemographic factors and health behaviors. These findings highlight a need for improvement in coordinated care that considers both disability and multiple chronic conditions in the management of patient health to support well-being in aging.

Keywords

aging, health care, policy

Projections estimate that one in five residents of the United States will be age 65 or older by 2030 (U.S. Census Bureau, 2018). Many of these older adults will concurrently experience disability and chronic health conditions, as the risk of disability and the risk of having chronic conditions both increase with age (Froehlich-Grobe et al., 2016; Tesch-Römer & Wahl, 2017). As people age, they are more likely to have more than one chronic condition (Fried et al., 1999). Having chronic conditions such as cardiovascular disease, cancer, or diabetes has been found to contribute to disability among older populations (Verbrugge et al., 1989; Yokota et al., 2017). Freedman & Martin (2000) found that the prevalence of chronic conditions among older persons (age 70 and above) has increased over time, perhaps due to improved detection, but that these conditions have become less debilitating given improvements in treatment and in environmental factors such as improved accessibility.

The co-occurrence of disability and chronic health conditions is concerning at both the individual and systems levels. First, in the aging literature, persons with both a disability and chronic conditions do not meet current conceptualizations of aging well, suggesting that they face poorer aging outcomes. Successful aging has been operationalized using a variety of measures, many of which incorporate the absence of chronic illness, high physical functioning, freedom from disability, and absence of cognitive impairments (Li et al., 2015; McLaughlin, 2017; McLaughlin et al., 2012; Rowe & Kahn, 1987). Even newer models of well-being in old age that are inclusive of adults aging with disabilities (Mitra et al., 2020) consider the absence of chronic conditions as a key correlate of well-being.

Second, the complex needs of older adults with disabilities and multiple chronic conditions will increase demands on the health care system as the U.S. population ages. An aging population has significant resource implications and raises serious concerns about the quality of healthcare older adults with multiple chronic conditions can expect to receive (Anderson & Horvath, 2004; Barnett et al., 2012). Elderly individuals with multiple conditions, for example, tend to have higher health care utilization and out-of-pocket health care spending than others (Lehnert et al., 2011; Paez et al., 2009). Understanding the intersection of disability and health for this cohort can inform the development of health promotion and

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health care activities that aim to improve overall well-being for people as they age.

Although there are many ways of conceptualizing and defining disability, the leading model of disability is the World Health Organization's (WHO) International Classification of Functioning Disability and Health (ICF) framework (Iezzoni & Freedman, 2008). In the ICF model, disability can be understood as the result of the interactions between a person with a health condition and their environment that may facilitate or restrict participation (World Health Organization, 2001). Here, *environment* refers to contextual factors, which include the physical environment as well as the socio-economic, legal, and cultural environments. The proportion of people with disabilities increases with age, from 10.6% for American adults ages 21 to 64 years to 25.1% for adults ages 65 to 74 years and 48.7% for those ages 75 and older (Erickson et al., 2019).

Chronic conditions have been defined as health conditions that "last twelve or more months and resulted in functional limitations and/or the need for ongoing medical care" and include hypertension, cancer, and diabetes (Hwang et al., 2001, p. 268). Currently, about half the U.S. population has at least one chronic condition, and the 27% of Americans with multiple chronic conditions account for two thirds of total health care spending (Anderson, 2010; Ward, 2015). Chronic conditions are the primary causes of death and disability for Americans (Centers for Disease Control and Prevention [CDC], 2019). People with multiple chronic conditions—defined as two or more co-occurring chronic conditions (Parekh et al., 2011)—face greater risks for poor health outcomes such as preventable complications, adverse drug events, number of hospitalizations, and conflicting instructions from various care providers (Vogeli et al., 2007; Wolff et al., 2002).

Overall, persons with disabilities are more likely to have chronic conditions and to face barriers in accessing necessary health care than persons without disabilities (Fox & Reichard, 2013; Gulley et al., 2011; Iezzoni, 2011; Reichard et al., 2014). Adults with disabilities are more likely to exhibit health behaviors that contribute to the development of certain chronic conditions, with higher rates of obesity and smoking than nondisabled adults (Lauer & Houtenville, 2019) and lower rates of physical activity (Hollis et al., 2017; Sansano-Nadal et al., 2019). They are also less likely than the general population to receive preventive services such as mammograms, pap tests, and dental care (Altman & Bernstein, 2008; Chevarley et al., 2006; Diab & Johnston, 2004; Iezzoni et al., 2000; Reichard et al., 2011). There are at least two pathways to the co-occurrence of disability and chronic conditions: A person with a disability is later diagnosed with a chronic condition that may or may not be a result of their disability, or a person with a chronic condition later develops a disability—the onset of which may or may not be a result of their chronic condition (Krahn et al., 2014). Although people with disabilities are more likely to also have chronic conditions, most individuals with chronic conditions do not have a disability (Reichard et al., 2015).

For persons with disabilities, barriers to accessing health care may be financial or related to other factors, such as finding accessible and reliable transportation, ensuring the availability of someone to attend appointments with the patient, or guaranteeing that medical facilities are providing accessible clinical services and supports (Bauer et al., 2016; Henning-Smith et al., 2016). As the older population of Americans primarily receive health care coverage through public health insurance programs such as Medicare or Medicaid, access to health insurance likely plays less of a role in influencing overall health than it would for younger populations, who may face disparities due to limitations in accessing health insurance coverage. Older adults with serious illness face other barriers that are commonly faced by persons with disabilities, however, as 48% of those who receive care struggle to understand medical instructions and 30% have trouble getting to medical appointments (Kaiser Family Foundation, 2017). Persons with multiple chronic conditions, who are more likely to see multiple providers, may find these challenges exacerbated (National Academy of Social Insurance, 2003).

Despite changing health care needs and the rise in individuals managing chronic co-occurring conditions, the U.S. health care system continues to be largely structured to address acute, episodic illnesses and individual diseases rather than concurrent, long-term conditions (Boyd et al., 2008; Fortin et al., 2007; Schoen et al., 2009; Tinetti & Fried, 2004). A 2001 report by the Institute of Medicine summarized the issues created by the fragmented and siloed nature of the health system and called for improved care coordination and integration (Institute of Medicine, Committee on Quality of Health Care in America, 2001). In response, in 2010 the U.S. Department of Health and Human Services (HHS) developed a strategic framework for addressing multiple chronic conditions where one of the objectives is to characterize and address the disparities across subgroups of the large and heterogeneous population with multiple chronic conditions. People with disabilities are gaining recognition as a health disparities population and were identified in the HHS framework as one of the important subgroups among individuals with multiple chronic conditions (Krahn et al., 2015; U.S. Department of Health and Human Services, 2010).

Disability should not be conflated with chronic conditions. The ICF-based approach to defining disability allows that a person with a disability can be healthy or unhealthy (Wendell, 2001). Researchers have struggled to simultaneously dispel the outdated perspective that disability is equated to poor health while also noting that surveillance data show that people with disabilities are four times more likely to self-report poor health than those without a

disability (Altman & Bernstein, 2008). These seemingly incompatible elements are reconciled through a social determinants of health perspective, which considers factors like poverty, low education, race/ethnicity, and physical barriers, among others, as the principal sources of population-level health disparities and differences (Drum, 2014; Krahn et al., 2015; Reichard et al., 2014).

The overlap between people with disabilities and individuals with multiple chronic conditions is of significant interest to the public health community and requires further description. There has been a call for the use of population-based data from national health surveys to frequently monitor and characterize multiple chronic conditions across the U.S. population and key subpopulations to inform targeted interventions (Goodman et al., 2013; Ward et al., 2014). The purpose of this article is to provide updated statistics on the intersection of chronic conditions and disability among persons ages 65 and older and to estimate the likelihood of having chronic conditions for older adults with disabilities, controlling for sociodemographic characteristics and health behaviors. Better understanding of the relationship and overlap between disability and multiple chronic conditions will be essential to informing and improving the health care system in this transition to more integrated, patient-centered care.

Method

Samples for this study were drawn from publicly available 2010 to 2017 National Health Interview Survey (NHIS) data (unweighted $N = 111{,}023$). The NHIS is a cross-sectional, in-person, complex sample survey of the health and function of the noninstitutionalized U.S. civilian population conducted continuously by the U.S. Census Bureau and the CDC's National Center for Health Statistics (NCHS). Data were obtained from Integrated Public Use Microdata Series (IPUMS; Blewett et al., 2019).

Data were weighted to adjust for differences in selection probability and nonresponse, and to provide nationally representative estimates per guidance from IPUMS (2020). Weights for the entire sample were divided by eight to account for 8 years of data. All information gathered was based on self-report or provided by a designated family respondent or household proxy when the adult was physically or mentally unable to participate.

Measures

Our focal variable, multiple chronic conditions, included persons having two or more or three or more of the following conditions: arthritis, asthma, cancer, coronary artery disease, chronic obstructive pulmonary disease (COPD), diabetes, hepatitis, hypertension, kidney disease, or stroke. These 10 physical conditions are identified in the NHIS and recommended by HHS for consistent and standardized measurement of chronic conditions in the United States (Goodman et al., 2013). Respondents were identified as having chronic conditions if they responded "Yes" to dichotomous questions asking if they had hypertension, coronary heart disease, stroke, diabetes, cancer, arthritis, or hepatitis (diagnosed by doctor or health care provider); weak or failing kidneys (during the past 12 months); asthma (currently); or COPD (defined as having emphysema or chronic bronchitis in the past 12 months). Coding of these responses was validated with the NCHS. Adults were categorized as having two or more chronic conditions or three or more chronic conditions consistent with the published CDC literature (also validated with NCHS; Ward, 2014; Ward & Schiller, 2013).

Adults were identified as having a disability if they reported difficulties in the following areas: vision, hearing, ambulation, cognition, independent living, and self-care. These questions are the standard set of questions used across federal surveys to measure disability (Madans et al., 2011).

Age was measured continuously. Sex was measured as male or female. Race was measured as White, Black, Asian, and Other. Marital status was measured as married or not. Education was measured as "less than high school," "high school (HS)," "some college," or "bachelor's or more." Poverty was measured as living in income poverty (below the U.S. poverty line) or not.

Health behaviors were measured using three variables. First, excessive alcohol use was measured as having at least 1 day of having five or more alcoholic drink in the past year. Smoking was measured as ever or current smoking. Obesity was measured as having a body mass index (BMI) of 30 or higher.

Analytical Approach

First, descriptive statistics were used to produce weighted proportions. Difference by disability status was tested using chi-square, with alpha set to .05. To estimate the odds of having multiple chronic conditions, two logit regressions were run, controlling for sociodemographic characteristics, health behaviors, and survey year. All analyses were conducted using Stata.

Results

Table 1 presents the sociodemographic characteristics for persons ages 65 and older by disability status. Nineteen percent of older adults in the United States had a disability. Older adults with a disability were significantly more likely to be older, married, less educated, and living in poverty than others ($p < .05$ or less for all associations). No differences were noted by sex or excessive alcohol use. Older

Table 1. Characteristics of Adults Ages 65 and Older by Disability Status, NHIS 2010–2017.

	Total		Disability		No disability		
Characteristic	Proportion	*SE*	Proportion	*SE*	Proportion	*SE*	Significance
Disability	0.193	.002					
Age (*M*)	73.89	.040	76.14	.068	73.36	.039	***
Sex							
Male	0.443	.002	0.441	.004	0.443	.002	NS
Female			0.559	.004	0.557	.002	
Race							
White	0.859	.003	0.853	.004	0.861	.003	*
Black	0.090	.002	0.098	.003	0.088	.002	
Asian	0.049	.001	0.047	.002	0.050	.001	
Other	0.002	.000	0.002	.000	0.002	.000	
Marital status							
Married	0.438	.003	0.518	.005	0.406	.003	***
Not married	0.572	.003	0.482	.005	0.594	.003	
Education							
Less than high school	0.184	.002	0.259	.004	0.167	.002	***
High school	0.307	.002	0.318	.004	0.304	.003	
Some college	0.246	.002	0.237	.004	0.248	.002	
Bachelor's degree or higher	0.263	.003	0.186	.004	0.282	.003	
Living in poverty							
In income poverty	0.076	.002	0.117	.003	0.066	.002	***
Not	0.924	.002	0.883	.003	0.934	.002	
Excessive alcohol use							
5+ drinks/day past year	0.132	.003	0.128	.006	0.132	.003	NS
Not	0.869	.003	0.872	.006	0.868	.003	
Smoking							
Current or ever smoked	0.483	.003	0.503	.005	0.477	.003	***
Never smoked	0.518	.003	0.497	.005	0.523	.003	
Obesity							
BMI 30 plus	0.266	.002	0.318	.005	0.253	.002	***
BMI < 30	0.734	.002	0.682	.005	0.747	.002	

Note. NHIS = National Health Interview Survey; NS = Not significant; BMI = body mass index.
*$p < .05$. ***$p < .001$.

adults with disabilities were more likely to be smokers (either current or former) and to be obese than older adults without disabilities ($p < .001$ for both measures).

Table 2 displays chronic condition information for older adults with and without disabilities. Persons with disabilities were more likely to have asthma, arthritis, cancer, coronary heart disease, COPD, diabetes, hypertension, kidney issues, or stroke than nondisabled adults (all $p < .001$). Older adults with disabilities were significantly more likely than those without disabilities to have two or more (42.5%, $p < .001$) or three or more (27.5%, $p < .001$) chronic conditions.

Table 3 presents the results of the regressions showing odds ratios, confidence intervals, and significance levels for each variable. Model 1 estimates the odds of having two or more chronic conditions. Model 2 estimates the odds of having three or more chronic conditions.

Older persons with disabilities had statistically significantly higher odds of having two or more (OR: 1.790, $p < .001$) and three or more (OR: 1.893, $p < .001$) chronic conditions, holding all else constant. In both models, persons who were older and persons who were Black had significantly higher odds of having multiple chronic conditions. Smokers and persons who were obese had higher odds as well across both models, holding all else constant. Females had lower odds of having multiple chronic conditions. Excessive alcohol use was not associated with the odds of having chronic conditions.

Discussion

Our results show that older Americans with disabilities face an increased risk of having multiple chronic conditions, even when controlling for known correlates of chronic

Table 2. Chronic Conditions by Disability Status Among Adults Ages 65 and Older, NHIS 2010–2017.

	Total		Disability		No disability		
Chronic condition	Proportion	*SE*	Proportion	*SE*	Proportion	*SE*	Sig.
Asthma	0.040	.000	0.057	.002	0.035	.000	***
Arthritis	0.504	.003	0.621	.005	0.474	.003	***
Cancer	0.244	.002	0.271	.005	0.237	.002	***
Coronary disease	0.146	.002	0.204	.004	0.131	.002	***
Chronic obstructive pulmonary disease	0.089	.002	0.132	.004	0.078	.002	***
Diabetes	0.208	.002	0.273	.005	0.191	.002	***
Hepatitis	0.040	.000	0.043	.002	0.039	.001	NS
Hypertension	0.625	.003	0.695	.005	0.607	.003	***
Kidney disease	0.049	.000	0.084	.003	0.040	.000	***
Stroke	0.082	.001	0.130	.004	0.070	.001	***
Two or more conditions	0.334	.002	0.425	.004	0.312	.002	***
Three or more conditions	0.184	.002	0.275	.004	0.164	.002	***

Note. NHIS = National Health Interview Survey; NS = Not significant.
*$p < .05$. ***$p < .001$.

conditions such as sociodemographic factors and health behaviors. Although we did not conduct a replication study, our overall results regarding chronic condition prevalence are largely consistent with results documented in the existing literature (Ward, 2014; Ward & Schiller, 2013). Our identification of characteristics other than disability that are associated with an increased risk of having multiple chronic conditions highlights health inequities for other subpopulations as well. For example, we identified males and persons who were Black as having increased odds of having multiple chronic conditions at age 65 or older, holding all else constant. Future research should examine in more detail the intersection of these characteristics with disability over the life course to understand their association with the development of chronic conditions.

Our research also pointed out that persons with certain health behaviors (i.e., obesity, smoking) had increased odds of having multiple chronic conditions at ages 65 and older. Prior research has found that persons with disabilities are more likely to have health behaviors that lead to chronic diseases (Carroll et al., 2017; Guillermo et al., 2019; Lauer & Houtenville, 2019). Although our analysis, based on cross-sectional data, cannot firmly establish such a pathway, our findings do highlight associations among smoking and obesity with multiple chronic conditions among adults with disabilities who are ages 65 and older. Ensuring that persons with disabilities are receiving appropriate preventative care throughout the life span can help to reduce the likelihood of persons with disabilities developing certain chronic conditions as they age. Interventions that improve overall nutrition and increase physical activity, for example, can reduce the likelihood of developing obesity-related conditions such as coronary artery disease or diabetes.

Ultimately, however, the high prevalence of two or more chronic conditions for older persons with and without disabilities (42.5% and 31.2%, respectively), combined with the increased odds of chronic conditions for older persons with disabilities in multivariate models, suggest that there are factors contributing to the association between disability and chronic conditions that are not completely captured by sociodemographic characteristics and health behaviors. These findings point to a need for further research to determine the cause of these inequities. Older adults with disabilities, for example, may be experiencing barriers to accessing or coordinating care that other older adults do not, increasing overall risk for developing chronic conditions. If so, efforts to ensure that medical facilities are accessible and that supportive services such as transportation and personal assistance services are consistently available and affordable can improve overall access to health care for the population aging with disabilities and chronic conditions. Healthcare models and disparities research should recognize that people with and without disabilities ages 65 and over are equally likely to have health insurance coverage, regardless of chronic condition status, but that substantial differences in numbers of chronic conditions remain between those with and without disabilities.

These findings are relevant for the care, policy, services, and supports for people with disabilities ages 65 and over. The differences in prevalence and odds of multiple chronic conditions between older adults with and without disabilities are significant and substantial, and they have implications for millions of people. Providers and policymakers should be aware of how pervasive multiple chronic conditions are among the cohort of elderly people with disabilities. At the individual level, these results underscore the importance of

Table 3. Odds of Having Two or More and Three or More Chronic Conditions for Adults Ages 65 and Older.

	Model 1: Two or more conditions		Model 2: Three or more conditions	
Characteristic	OR (95% CI)	Sig.	OR (95% CI)	Sig.
Disability				
No (reference group)				
Yes	1.790 [1.641, 1.952]	***	1.893 [1.747, 2.053]	***
Age	1.043 [1.039, 1.048]	***	1.039 [1.034, 1.044]	***
Sex				
Male (reference group)				
Female	0.932 [0.879, 0.987]	*	0.868 [0.814, 0.926]	***
Race				
White (reference group)				
Black	1.349 [1.211, 1.502]	***	1.226 [1.093, 1.376]	**
Asian	0.814 [0.690, 0.960]	*	0.744 [0.605, 0.914]	**
Other	0.770 [0.404, 1.472]		0.711 [0.372, 1.362]	
Married				
Not married (reference group)				
Married	1.020 [0.961, 1.082]		1.002 [0.938, 1.069]	NS
Education				
Less than HS (reference group)				
HS	1.026 [0.930, 1.131]		0.928 [0.834, 1.032]	
Some college	1.093 [0.989, 1.207]		1.009 [0.908, 1.121]	
Bachelor's degree or higher	0.979 [0.886, 1.081]		0.872 [0.785, 0.970]	*
Living in poverty				
No (reference group)				
Yes	1.125 [0.986, 1.282]		1.178 [1.029, 1.348]	NS
Excessive alcohol use				
No (reference group)				
5+ drinks/day past year	1.059 [0.973, 1.153]		0.960 [0.873, 1.056]	NS
Smoking				
Never (reference group)				
Ever or current smoker	1.362 [1.284, 1.444]	***	1.463 [1.374, 1.558]	***
Obesity				
Not (reference group)				
BMI 30 plus	2.597 [2.422, 2.786]	***	2.352 [2.192, 2.523]	***
Year				
2010 (reference group)				
2011	1.003 [0.877, 1.147]		1.079 [0.945, 1.233]	
2012	0.950 [0.841, 1.073]		1.065 [0.935, 1.214]	
2013	0.999 [0.881, 1.133]		1.005 [0.880, 1.149]	
2014	0.997 [0.878, 1.132		1.067 [0.937, 1.215]	
2015	0.959 [0.845, 1.088]		1.105 [0.968, 1.262]	
2016	1.022 [.907, 1.152]		1.159 [1.020, 1.317]	*
2017	1.004 [.892, 1.131]		1.159 [1.023, 1.313]	*
Constant	0.039 [0.027, 0.057]	***	0.015 [0.010, 0.023]	***

Note. HS = High school; NS = Not significancet; BMI = body mass index.
*$p < .05$. **$p < .01$. ***$p < .001$.

considering disability in the context of a patient's life and the management of their health. A patient-centered approach requires that disability must be considered by all care providers and not only specialists. Medical providers often lack training specific to people with disabilities, contributing to unsatisfactory outcomes and negative experiences with the health care system (Iezzoni & Long-Bellil, 2012). In the short term, disability literacy and competency must be built at the provider level. Longer term, addressing these concerns and further exploring the overlap among disability, multiple chronic conditions, sociodemographic characteristics, and health behaviors will be critical to improving the health care

system and supporting the well-being of all Americans as they age. Adults with disabilities can play an important role in facilitating this change by continuously advocating for the highest level of care possible to ensure that all of their health care needs are being met.

Limitations

The NHIS is a cross-sectional survey utilizing self-report and affirmative and negative responses to disability questions are affected by survey design effects, question phrasing, response type/categorization, and question locations within the survey (Lauer et al., 2019; Lauer & Houtenville, 2018). Several biases may affect the results in this study, including, but not limited to, selection bias, observation bias, response bias, recall bias, and nonresponse bias. People participating in the NHIS may be systematically different from the people who are not participating. The NHIS is focused on health and function, and this may differentially prime participants to respond to disability measures based on their exposure to other health-related questions and location in the survey. People who experienced their disability and/or health events more recently may be more likely to report a disability. The NHIS is a long survey and participants may experience survey fatigue, thus increasing response error and missing responses, especially for the disability questions used in this study, which appear later in the survey. People with missing responses may be different from people who complete the survey.

Conclusion

Improving the health and care of individuals with multiple chronic conditions is one of the most pressing public health issues facing the United States. Over the past two decades, it has become clear that a fragmented system is poorly equipped to serve the rising number of people managing multiple chronic conditions. The promise of integrated, patient-centered care has yet to be fully realized, and demands on the health care system are only expected to increase as the U.S. population continues to age. This challenge presents an opportunity to enhance care coordination that would both improve the quality of care for patients with multiple chronic conditions and reduce waste in health care spending (Berwick & Hackbarth, 2012). Such coordinated care would improve care for older adults with disabilities as well.

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