



Explaining the increasing disability prevalence among mid-life US adults, 2002 to 2016



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ABSTRACT

Several recent studies have documented an alarming upward trend in disability and functional limitations among US adults. In this study, we draw on the sociomedical Disablement Process framework to produce up-to-date estimates of the trends and identify key social and medical precursors of the trends.

Using data on US adults aged 45–64 in the 2002–2016 National Health Interview Surveys, we estimate parametric and semiparametric models of disability and functional limitations as a function of interview time. We also determine the impact of socioeconomic resources, health behaviors, and health conditions on the trends.

Our results show increasing prevalence of disability and functional limitations. These trends reflect the net result of complex countervailing forces, some associated with increases in functioning problems (unfavorable trends in economic well-being, especially income, and psychological distress) while other factors have suppressed the growth of functioning problems (favorable trends in educational attainment and some health behaviors, such as smoking and alcohol use).

The results underscore that disability prevention must expand beyond medical interventions to include fundamental social factors and be focused on preventing or delaying the onset of chronic health problems and functional limitations.

Disability is costly in many ways. At the national level, health care expenditures related to disability are estimated around \$400 billion annually (Anderson et al., 2010). Additional economic losses due to lower productivity and caregiving are large and projected to grow further as the US population ages (Freedman and Spillman, 2014). Disability is also a strong predictor of lower quality of life, hospitalization, institutionalization, and mortality (Cutler, 2001; Freedman and Spillman, 2014). The exorbitant costs of disability to individuals, families, and communities (Freedman et al., 2002; Fried et al., 2001) make it imperative that we carefully track its levels and trends, and understand the causes of any changes in prevalence.

Our analysis has two aims. The first aim is to provide up-to-date estimates of trends in disability and functional limitations for mid-life US adults. Focusing on mid-life adults is critical because trends found in this age group are a harbinger of future disability levels as the cohorts enter older adulthood in the coming decades. The second aim is to investigate how changes in socioeconomic resources, health behaviors, and health conditions predict the functioning trends. Identifying the key precursors is imperative for effective targeting of prevention and intervention efforts.

Extensive literature has documented US trends in disability in the past century (Verbrugge and Liu, 2014). Disability rates increased in the 1960s and 70s (Crimmins et al., 1997; Verbrugge, 1989) but then declined steadily through the 1980s and 1990s (Crimmins and Saito, 2001; Crimmins, 2004; Manton et al., 2006). The declines in the late 20th century were pronounced and systemic across all major population groups. In contrast, much less is known about early 21st century trends. Continued declines in disability were observed among older adults (Freedman et al., 2013; Martin et al. 2007, 2010b; Seeman et al., 2010; Tsai, 2015) but studies of the non-elderly suggested stagnating or even increasing functional limitations and disability (Crimmins and Beltrán-Sánchez, 2011; Freedman et al., 2013; Martin et al. 2010a, 2010b), especially among less-educated men and women (Zajacova and Montez, 2017).

Based on patterns from prior decades, as well as recent trends among older adults, we could expect continued declines in functioning problems. On the other hand, based on the emerging findings among non-elderly respondents, we could expect stable or increasing levels of functioning problems. Further refinement of our working hypothesis derives from the Disablement Process framework, in which our work is

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conceptually grounded (Verbrugge and Jette, 1994). This widely-used sociomedical model describes how health conditions lead to functioning problems and focuses especially on predisposing socioeconomic resources, health behaviors, and demographic factors that speed up (exacerbate) or slow down the process of disablement. The present analysis examines population-level trends over time rather than the gradual disablement process at the individual level. Thus we expect that changing distribution of key risk factors in the population may have affected the prevalence of functioning problems.

However, different risks and resources may have countervailing effects on functioning trends, depending jointly on the direction of their effect on the disablement process (speeding it up or slowing it down) and how their distribution in the population changed over time. One set of factors comprises socioeconomic resources, such as educational attainment, economic wellbeing, and certain types of social ties. The gradual increase in educational attainment in the population, coupled with education's importance to health, made schooling an important driver of functioning improvements in the late 20th century (Freedman and Martin, 1999; Schoeni et al., 2008). We expect that further increase in the average educational attainment in the mid-life population between 2002 and 2016 slows down increases in functioning problems.

On the other hand, the observation period spans the Great Recession of 2007–2009. This period was characterized by severe economic shocks followed by little economic recovery for many American families. It also launched a decade-long decline in homeownership rates (Goodman and Mayer, 2018), which may have had consequences for disability in particular, given the importance of home ownership for modifying the environment to accommodate health problems and functional limitations. We therefore expect that declines in economic wellbeing may have exacerbated the growth of functioning problems. In addition, changes in certain types of social ties and living arrangements may have adversely affected trends in functioning as well, given their importance for emotional and instrumental support. For instance, between 1990 and 2015, the rise in the proportion of adults living alone rose the most for middle-aged adults (Wu, 2017).

Health behaviors are also an important determinant of functioning (Cutler, 2001). The increases in obesity in the population and concomitant metabolic and musculoskeletal problems are likely to worsen functioning (Martin and Schoeni, 2014); in contrast, the declining prevalence of smoking may have the opposite effect and suppress the growth of functioning problems (Martin et al., 2010b). Among health conditions, the declining prevalence of severe cardiovascular problems, thanks to better prevention and management of clinical symptoms, may slow down increases in functioning problems (Tsai, 2016; Yokota et al., 2016). In contrast, pain and depression or distress have both become more prevalent among American adults and could be a precursor to the growth of functioning problems (Grol-Prokopczyk, 2017; Weinberger et al., 2017; Zimmer and Zajacova, 2018). We therefore expect a complex set of influences on the functioning trends, with some predisposing factors exerting positive effects on the trends while other factors exerting negative effects.

Answers to the two aims will contribute to the body of knowledge about contemporary trends in functioning in mid-life US adults. Moreover, our results will show how fundamental predisposing factors such as educational attainment and economic wellbeing, intervening factors like health behaviors, and proximate factors like health conditions affect aggregate trends in disability and functional limitations. We analyze functional limitations in addition to disability because in the mid-life sample, physical limitations such as difficulty walking or climbing stairs are a salient problem and a potential precursor of disability as posited by the Disablement Process. The term “functioning” refers to both outcomes collectively.

1. Data and methods

1.1. Data

We use the National Health Interview Surveys (NHIS) 2002–2016 (Blewett et al., 2016). The NHIS is an annual cross-sectional, nationally-representative survey of the non-institutionalized US population. It is the best available source of data for this study because it includes a long series of questions on functional limitations and disability, important covariates, and a large sample size of non-elderly respondents. We start with the year 2002 because it is the first year for which information about arthritis, an important covariate of physical functioning, is collected systematically; 2016 is the most recent available wave of data.

Sample is defined as “sample adult” women and men age 45 to 64 who were interviewed between January 2002 and December 2016 and provided valid information about functioning. The “sample adult” group is a random subsample of 43% of all adult NHIS respondents; this group was administered all of the health, functional limitations, and disability measures used here. Of the 150,552 “sample adults” age 45–64, 150,515 (99.9%) answered all disability questions and 149,761 (99.5%) answered all functional limitation questions; our analyses include these respondents. See section below about our approach for handling missing data on predictors.

1.2. Variables

The **key predictor** is the time of interview, constructed from interview month and year as $yearmonth = year + (month - 0.5)/12$. Thus, the earliest interviews conducted in January 2002 are assigned a value of 2002.042 and last interviews conducted in December 2016 have a value of 2016.958. This continuous time variable is then recoded to range from -0.5 to 0.5 using the formula $time = (yearmonth - 2009.5)/15$, so that the coefficient associated with a one unit change in time is the change in the dependent variable from the start to the end of the observation period. In other words, the coefficient for time is interpretable as the change in outcome across the 15-year time period.

Outcomes are disability and functional limitations. Disability is operationalized as needing help with activities of daily living (ADLs) or instrumental activities of daily living (IADLs). ADLs are assessed using the prompt, “Because of a physical, mental, or emotional problem, does [the respondent] need the help of other persons with personal care needs,” including bathing or showering, dressing, eating, using the toilet, getting around inside the home, and getting in or out of bed or chairs. Needing help with any of these six personal care needs is defined as having an ADL disability. IADLs are assessed with a single question that asks whether the respondent, “because of a physical, mental, or emotional problem, needs the help of other persons in handling routine needs, such as everyday household chores, doing necessary business, shopping, or getting around for other purposes.” Following Spector and Fleishman (1998), we combine the ADL and IADL measures and define individuals as experiencing disability if they responded that they needed help in at least one of these domains. Among adults with disability in our analytic sample, 58% had only an IADL limitation, 8% had only an ADL limitation, and 34% had both.

Functional limitations assessed the level of difficulty with physical tasks. The respondents were asked: “By yourself, and without any special equipment, how difficult is it for you to:” walk up 10 steps, carry 10 pounds, grasp objects, reach over your head, sit two hours, stand two hours, stoop or bend or kneel, and walk a quarter mile. We aggregated the responses, and dichotomized the resulting variable, so that “any difficulty in at least one domain” is coded as 1 and “no limitation in any domain” is coded as 0.

Basic covariates included in all models comprise demographic and interview-related information. Age, ranging from 45 to 64 years, is a continuous variable measured in single years and centered on 55.

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