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Trends in U.S. Adult Chronic Disability Rates Over Time

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Abstract

Background—Trends in the patterns and prevalence of chronic disability among U.S. residents carry important implications for public health and public policies across multiple societal sectors.

Objectives—To examine trends in U.S. adult population rates of chronic disability from 1998–2011 using 7 different disability measures and examining the implications of trends in population age, race and ethnicity, and body mass index (BMI).

Methods—We used National Health Interview Survey data on civilian, non-institutionalized U.S. residents ages 18 from selected years between 1998 and 2011. We used self-reported information on functional impairments, activity/participation limitations, and expected duration to create 7 chronic disability measures. We used direct standardization to account for changes in age, race/ethnicity, and BMI distributions over time. Multivariable logistic regression models identified associations of disability with sociodemographic characteristics.

Results—Without adjustment, population rates of all 7 disabilities increased significantly ($p < 0.0001$) from 1998–2011. The absolute percentage change was greatest for movement difficulties: 19.3% in 1998 and 23.3% in 2011. After separate adjustments for trends in age, race/ethnicity, and BMI distributions, 6 disability types continued to show increased rates over time ($p < 0.01$), except for sensory disabilities. Over time, poor education, poverty, and unemployment remained significantly associated with disability.

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Conclusions—If these trends continue, the numbers and proportions of U.S. residents with various disabilities will continue rising in coming years. In particular, the prevalence of movement difficulties and work limitations will increase. Furthermore, disability will remain strongly associated with low levels of education, employment, and income.

Keywords

disability; prevalence rates; movement difficulties; National Health Interview Survey

The patterns and prevalence of chronic disability in the U.S. population have significant implications for a range of public health, health care delivery system, social, and other public policies. Estimates from 2010 data suggest that approximately 56.7 million civilian, noninstitutionalized Americans, or 18.7% of the population, are living with disabilities.¹ Here, for simplicity, we use the word “disability” as does the *International Classification of Functioning, Disability and Health*, as an “umbrella term” encompassing the interacting domains of impairments and limitations in activities and participation mediated by personal factors and the social and physical environments.² Global estimates of “disability,” however, belie the heterogeneity of this population and the complexity of assessing population prevalence. Different methods for identifying disability and classifying disability types generate differing population estimates. In addition, the timeframe of the disability – whether it is chronic, likely to persist across years, or temporary (e.g., caused by an illness or injury from which persons will recover) – has important implications for addressing disability.^{1, 3, 4}

Importantly for policy purposes, subgroups of persons within this diverse population require differing environmental and individual accommodations to allow them to participate fully in daily and community life. Examples include personal care assistance, accessible housing, special educational programs, public transportation, employment, and income support. Depending on the chronicity of the disability, individuals might need these accommodations for different time periods, imposing different resource and distributive implications. Thus, the notion of “disability in all public policies” – considering the implications of population disability when developing all new governmental policies – is gaining attention.⁵

Planning public policies requires an understanding of the size and nature of the population to be served, both today and in the future. When quantifying chronic disability prevalence, several sociodemographic trends affect both current and future estimates. The obvious first factor is population aging, with the well-recognized and amply documented relationship between age and disability.¹ Rates of disability in current elderly populations have declined compared with rates of earlier generations,^{6–9} although that trend might be flattening out among persons ages 65 to 84.¹⁰ Growing numbers of studies are finding increasing rates of disability over time among middle-aged and late middle-aged populations. Analyses of National Health and Nutrition Examination Survey (NHANES) data across cohorts suggests increasing disability rates over time among persons ages 60 to 69 years.¹¹ Studies using National Health Interview Survey data from 1997 through 2007/2008 found rising disability rates among individuals ages 30 through 64¹² and among persons ages 40 to 64.¹³ Although precise estimates of disability trends vary depending on how disability is measured,⁹ it is

clear that as the absolute number of older persons in the population increases, so too will the number of individuals with disabilities.

A second factor is changing patterns of race and ethnicity. The relationship of disability to race and ethnicity is complex and confounded by differences in age distributions and other sociodemographic factors.^{1, 14, 15} Analyses of NHANES data found higher increases in disability rates over time among non-white than white populations.¹¹ Education and income might mediate some effects of race and ethnicity on disability.¹⁵ Social and cultural differences in accommodating disability (e.g., providing personal assistance in homes) might also complicate relationships of race and ethnicity to disability. Nonetheless, as captured by the 2010 U.S. Census, dramatic shifts in race and ethnicity are underway nationwide. These changes will likely affect disability prevalence and population needs relating to disability.

Furthermore, studies indicate that obesity is strongly associated with disability^{16–18} and disability rates might be growing more quickly over time among individuals who are overweight or obese.¹¹ The rise in obesity rates, especially across younger individuals,¹⁹ is therefore raising concern about increasing disability prevalence. These trends suggest that “rising obesity could wipe out recent improvement in disability among older Americans.”²⁰

The purpose of this paper is to examine trends in chronic disability among civilian, noninstitutionalized adults using different disability indicators, concentrating primarily on measures representing activity and participation, for selected years from 1998 through 2011. In particular, we examine associations between chronic disability rates and trends in age distribution, race and ethnicity, and weight (body mass index or BMI). In addition, we examine associations of other sociodemographic factors that might affect general health – education, employment, and poverty – to chronic disability prevalence over time. We use data from the National Health Interview Survey (NHIS), which relies on respondents’ self reports to indicate chronic disability. We chose disability measures that maximized the use of the functional information captured within the NHIS and that ranged from indicators of certain body functions to measures of activity and participation in various contexts (e.g., daily living activities, employment). As noted below, unlike many other studies, we specifically aimed to focus on chronic disability as much as we could given information contained in NHIS.

Methods

Data

We downloaded NHIS Public Release data from the National Center for Health Statistics (NCHS) Web site. This analysis was part of a larger study of cancer screening; we therefore only accessed NHIS data for those years that included supplemental questionnaires on screening services: 1998, 2000, 2003, 2005, 2008, 2010 and 2011. NHIS redesigned its sampling plan in 2006, reducing its participant size by 13%. The NHIS Basic Module or Core questionnaire contains 3 components: Family Core, Sample Adult Core, and Sample Child Core. The Family Core gathers information on all family members. One randomly selected adult (age ≥ 18) within each family receives the Sample Adult Core questionnaire, which collects more detailed health and functional status information. If the randomly

sampled adult is physically or mentally unable to respond, a knowledgeable adult family member provides a proxy response. In 2011, for example, the NHIS interview sample included 39,509 households; the Sample Adult Core included 33,014 individuals, including 465 with proxy responses.²¹ The household response rate was 82.0%, and the conditional response rate for the Sample Adult Core was 81.6%.²¹

NHIS oversamples black and Hispanic populations, and since 2006 has oversampled Asian populations and minorities ages 65 years and older. Because of its sophisticated sampling methods, NHIS's associated sampling weights allow analysts to produce nationally representative figures for civilian, noninstitutionalized populations. We used these sampling weights for all analyses.

Indicators of Chronic Disabilities

To identify adults with chronic disabilities, we started with algorithms created by NCHS researchers using NHIS data to identify disabilities for their chart book *Disability and Health in the United States, 2001–2005*.²² These algorithms maximize the use of the NHIS data and produce measures that range from limitations in body functions to various activity and participation difficulties. The types of accommodations required to address these different difficulties vary, therefore necessitating different policy responses. The NCHS algorithms use answers from the “Adult Health Status and Limitations” section in the Sample Adult Core questionnaire, which asks about various functional and activity limitations using the following question stem:

“The next questions ask about difficulties you may have doing certain activities because of a HEALTH PROBLEM. By ‘health problem’ we mean any physical, mental, or emotional problem or illness (not including pregnancy). By yourself, and without using any special equipment, how difficult is it for you to...”

Typical response categories are: “not at all difficult,” “only a little difficult,” “somewhat difficult,” “very difficult,” “can’t do at all,” “do not do this activity” (“refused” and “don’t know”).

As detailed in the Appendix to this paper, the NCHS researchers combined responses from different functional and activity limitation questions to create their disability indicators, which they grouped into two broad categories with seven subcategories as follows:

Basic Action Difficulties (BAD)

- **Movement difficulty:** walking, standing, stair climbing, sitting, stooping, reaching, grasping, or carrying “somewhat difficult”, “very difficult” or “can’t do at all”
- **Sensory (hearing or seeing) difficulty:** trouble seeing even when wearing glasses or contact lenses or blind/unable to see at all; deaf or a “lot of trouble” hearing without a hearing aid
- **Emotional difficulty:** sad, nervous, restless, hopeless, “everything was an effort,” and worthless feelings in the past 30 days; answers given points (“all of the time,”

4 points; “most of the time,” 3; “some of the time,” 2; “a little of the time,” 1; and “none of the time,” 0); point totals 1–3 indicate emotional difficulty

- **Cognitive difficulty:** limited in any way because of difficulty remembering or because of periods of confusion

Complex Activities Limitations (CAL)

- **Self-care limitation:** difficulty with any component of activities of daily living (ADLs) or instrumental ADLs (IADLs)
- **Social limitation:** going out, participating in social activities or relaxing “somewhat difficult”, “very difficult” or “can’t do at all”
- **Work limitation:** cannot work at a job or business or limited in the kind or amount of work because of physical, mental or emotional problem

The seven categories are not mutually exclusive; in particular, individual BAD problems might contribute to the CAL difficulties. Furthermore, CAL measures represent interactions between individuals and their environments (e.g., economic environment for work limitations) and individuals’ coexisting BADs.

We refined the NCHS disability indicators by focusing only on persons with chronic disabilities. When participants indicate difficulties on the functional status questions, NHIS asks if the cause of the identified limitations is chronic, defined as lasting for 3 months or longer. We considered only those BAD or CAL difficulties reported to be related to chronic causes. The fraction of participants with non-chronic conditions varied by the type of disability. Across all years of data, the percentage with non-chronic conditions ranged from 1.5% for social limitation (2008) to 40.0% for sensory difficulty (2008). In all analyses, participants reporting non-chronic conditions were combined with those without the particular disability.

Other Variable Definitions

Changes in educational attainment and income over time, as well as other sociodemographic factors, may contribute to observed trends in population disability.^{15, 23–26} We identified basic sociodemographic characteristics using information from responses to the Sample Adult Core questionnaire, except for income information, which came from Family Core answers linked to the Sample Adult respondent. To facilitate analyses, we grouped age into 4 categories (18–44, 45–64, 65–79, 80+) and combined some response categories for other variables to have adequate numbers for analysis.

In addition to age category, we examined: sex; race (white, black, Asian, Other/multiple races); ethnicity (Hispanic, non-Hispanic); BMI (<25, 25–29, 30–34, 35–39, 40+); education (less than high school, high school, some college/associate degree, college or more); employment status (working, looking for work, not working/looking for work); and whether household income was below the federal poverty level. Because NHIS is a cross-sectional survey, we could not look at these factors over time for individual respondents as other studies have done.²³

Analysis

All analyses used SAS 9.2 and SUDAAN 11.0 and included the weights, cluster, and strata variables to account for NHIS's complex sampling design. As noted above, NHIS sampling changes, which started in 2006, reduced the sample size and reduced the number of strata from 339 to 300. We combined data across all years. All analyses and statistical tests accounted for correlations that might exist among data collected within the same design period (years 1998–2005 and 2008–2011).²⁷ We produced results for each of the seven years. We used two-sided Wald Chi-square tests to assess the significance of the associations of categorical variables with survey year.

As described below, we used direct standardization to compare estimates of disability rates over the years accounting for changes in core population characteristics: age, race-ethnicity, and BMI. To account for differences in population age and race-ethnicity over time, we obtained two sets of standardized estimates using the distribution of age and race-ethnicity from the 2010 U.S. Census (www.census.gov/prod/cen2010/briefs/c2010br-03.pdf). However, U.S. Census data do not contain information about BMI distributions. Because our results indicated that BMI had changed significantly over the years, we wanted to adjust our rates to a standard BMI distribution. We could not identify any source that gave BMI distributions for the U.S. population. We therefore used the BMI distribution from the 2010 NHIS to standardize our rates.

To calculate standardized rates and test for trends of these disability rates across the years, we combined the data from the seven years of NHIS and re-computed weights to achieve the same distribution of age, raceethnicity, and BMI as the target population. We obtained the standardized rates for each disability variable by computing the adjusted percentages from separate logistic regression models with each of the disability variables as the outcome and including only the survey year as a categorical independent variable. To test the significance of a linear trend, we included survey year as a continuous variable (instead of the categorical variable) in the same logistic regression models. We used two-sided Wald F tests to assess statistical significance of the linear trends in the standardized rates.

We further obtained adjusted odds ratios and 95% confidence intervals from multivariable logistic regression models fit to assess the relationship of the sociodemographic characteristics with having either BAD or CAL adjusting for other factors.

Results

Table 1 shows basic sociodemographic characteristics of the entire civilian, noninstitutionalized U.S. population ages 18 and older over selected years from 1998 through 2011. During this period, this population rose from an estimated 197.3 million to 231.4 million persons. With the exception of sex, the distribution of the population across all other characteristics changed significantly ($p < 0.0001$) across the years. In particular (Figure 1), the percentage of the population in the youngest age category (18–44 years) fell from 54.9% in 1998 to 47.9% in 2011; the white subgroup dropped from 82.8% to 80.5% while the Hispanic population rose from 10.1% to 14.2%; and BMI increased, including the percentages in the highest categories (BMI >35.0).

Table 2 shows the unadjusted percentages (standard errors) of persons reporting chronic disability by specific disability types and by any BAD or CAL across years; Figures 2, 3, and 4 display these trends graphically, depicting both unadjusted and adjusted rates. The percentage of the population within every disability group increased significantly ($p < 0.0001$) from 1998 to 2011. Of the individual BAD types, the absolute percentage change was greatest for movement difficulties, moving from 19.3% in 1998 to 23.3% in 2011 (unadjusted percentages). “Work limitations” was the most common specific disability among the CAL conditions. Table 3 shows population estimates of civilian, noninstitutionalized U.S. residents by disability category over time, calculated using NHIS sampling weights.

Chronic Disability Rates and Age, Race-Ethnicity, and Body Mass Index Trends

As noted above, we aimed to examine the associations between disability rates and changes over time in population age, race-ethnicity, and BMI distributions (Figure 1). We show the trends over time of the rates adjusted for age, race-ethnicity and BMI for each of the four BAD disabilities (Figure 2), for each of the three CAL disabilities (Figure 3), and for any BAD or CAL (Figure 4). The disability trends for all BAD and all CAL disabilities were statistically significant ($p < 0.01$) except for the unadjusted ($p = 0.07$), age-adjusted ($p = 0.33$), and BMI-adjusted ($p = 0.72$) rates of sensory disability. None of the adjustments changed the rates substantially although adjusting for age and BMI significantly increased the rates before 2005. This is likely due to the proportion of older persons and those with higher BMIs increasing over time, with both attributes (age and BMI) being associated with higher disability rates (data not shown). Older age and being in higher BMI categories at any age were independently associated with higher rates of disability. However, persons who are older and have higher BMIs have the highest disability risk.

Rates of disability within the different race groups increased over time (data not shown). Black persons had a higher odds of BAD and CAL when adjusted for age and sex. However, adjusting for education, employment status, and poverty attenuated the differences in disability rates between white and black populations.

Table 4 presents results from multivariable models predicting the adjusted odds of having any BAD or CAL, accounting for various sociodemographic factors. Being older, female, white (except in years 1998 and 2011), not Hispanic, having less than a high school education, not working or looking for work, family income less than 100% federal poverty level, and having higher BMIs (except in 1998) are significantly ($p < 0.0001$) associated with having any BAD or any CAL. The magnitude of these associations remained generally consistent across the years.

Finally, the population percentages with disability clearly indicate that some individuals have more than one of the seven disability types. Persons with multiple coexisting disabilities could require significantly different supportive services than individuals with single disability types. We therefore conducted a preliminary descriptive analysis of coexisting disability types. As expected, the percent of persons with multiple disability types increases with age: among persons younger than age 45 years, 32.7% report no disabilities, compared with 22.6% of persons ages 45–64, 17.7% of persons ages 65 to 79, and 9.6% of

those ages 80 and older; in contrast, among persons younger than age 45 years, 18.2% report 3 or more disability types, as do around 27.6% of persons ages 45 to 79 years, and 45.4% of individuals ages 80 and older. Using all years of data, we examined the percent of respondents reporting individual disability types who reported each of the other six disability types. For example, as shown in Table 5, looking across rows, among persons who report movement difficulties, 27.6% also report sensory difficulties and 42.7% report work limitations; looking down columns, 80.3% of persons who report sensory difficulties also report movement difficulties, as do 89.0% of persons reporting work limitations. Thus, certain disability types are more likely to be reported with other specific disability types by individuals than are other pairs of disabilities.

Discussion

Across all seven individual indicators of chronic disability – and two summary measures – chronic disability rates among civilian, noninstitutionalized U.S. residents ages 18 and older increased significantly from 1998 through 2011. As expected, the population prevalence of chronic disability varies depending on how disability is measured, although because of data limitations there are certainly inter-relationships that we could not study (e.g., without environmental accommodations, increasing rates of BAD could drive upward trends in CAL). Movement difficulties are by far the most common of all individual disability types, affecting an estimated 54 million people in 2011. Movement disabilities also frequently coexist with other disability types. Adjusting for significant changes in population distributions by age, race-ethnicity, and BMI during that time period does not erase these statistically significant increases in disability rates over time, with the exception of sensory deficits (vision and hearing losses), where adjustments for age and BMI eliminate the statistical significance of increases. Therefore, rising numbers of older persons, increasing populations of racial and ethnic minorities, and higher rates of obesity do not account fully for the rising prevalence of disability. In addition, over time disability continues to be strongly and consistently associated with critical social determinants of health – low education, unemployment, and poverty.

If these trends continue, the numbers and proportions of U.S. residents with disabilities, variously defined, will continue rising in coming years. In particular, the prevalence of movement difficulties and work limitations will increase. As shown in our preliminary descriptive analysis, it is also likely that individuals with movement difficulties might simultaneously experience other types of impaired body function or activity and participation limitations (e.g., emotional difficulties or cognitive impairments). Coexisting disability types will increase the complexity of accommodation requirements. Furthermore, disability will remain strongly associated with low levels of education, employment, and income – key social determinants of health.

These trends have implications for a range of public policies. Healthy People 2020, a federal initiative that provides evidence-based objectives for improving the health of all Americans during the decade from 2010–2020, includes objectives about improving the wellness of persons with disabilities.^{28, 29} Healthy People 2020's disability overview notes that, compared with other persons, individuals with disabilities are more likely to be overweight

or obese, smoke tobacco, not engage in physical activities, and to be unemployed, among other disparities. In addition to standard public health responses, such as weight reduction and exercise programs, Healthy People 2020 asserts the need to address “the inequitable distribution of resources among people with disabilities and those without disabilities by increasing ... Education and work opportunities [and] social participation.”²⁸ Even more broadly, Healthy People 2020 aims to improve the conditions of daily living of persons with disabilities by “removing barriers in the environment using both physical universal design concepts and operational policy shifts.” Our findings support the need for wide-ranging initiatives that cut across traditional policy sectors (e.g., health, housing, education, transportation, employment) – and suggest that the number of U.S. residents affected by these issues is currently growing. Changing this upward trend will require concerted, multi-sectoral efforts. Focusing those efforts might require careful parsing of components of overall disability statistics. For example, CAL measures may reflect more fully the interaction of the capabilities of individuals (their BADs) within certain environments than BAD indicators alone. Thus, trends in CAL prevalence could reflect both trends in BAD levels, as well as trends in making environments more accommodating.

Our results share the limitations of other studies of cross-sectional survey data. We can identify only associations, not causal links. All NHIS data represent participants’ self reports. Factors such as economic recessions might affect not only respondents’ experiences (e.g., employment) but also the nature of their responses (e.g., how positive they feel about their situations). The economic climate could clearly affect certain indicators of disability, such as the work limitation subcategory of CAL. The NHIS data also do not contain information about environmental factors that mediate or accommodate an individual’s functional difficulties. Our results support those of many other analyses of federal survey data. However, prior studies have looked primarily at older populations, variously defined but generally involving individuals age 60 or 65 and older.^{6, 7, 10, 11} Some studies have used earlier age cut offs, including ages 50¹² and 40 years old;^{13, 30} we looked across the entire adult age range (ages 18 and older). Especially with the high rates of excess weight and obesity among younger adults, including them in examining disability trends over time is important.

Furthermore, unlike many other analyses, we focused on disabilities reported to be chronic, rather than identifying disabilities regardless of time frame.²² NHIS’s measure of chronicity involves conditions self-reported to last at least 3 months, while a longer time frame might more strongly indicate chronic problems. Nonetheless, we used chronic disability indicators that cover a range of perspectives, including functional impairments (self-reported movement, sensory, emotional, and cognitive difficulties) and various activity and participation measures. This level of detail might offer policy makers useful information about future population needs as they map governmental priorities and programs.

The strength of the associations between obesity and chronic disability in our analyses is not surprising and is consistent with reports from numerous other studies. However, the causal relationship between disability and excess weight is likely complex and multifactorial rather than unidirectional. Unfortunately, NHIS data do not contain information about individuals’

previous weight or prior functional status; therefore, we cannot begin to explore causal linkages with these data.

Finally, our analyses do not precisely indicate what public and private responses are required to accommodate the needs of the growing population of persons with disabilities. In addition, several different types of disabilities might coexist in individuals, which may influence the design of disability-related programs, accommodations, and policies: we did not examine all these permutations of coexisting conditions. Nonetheless, given the nature of the activity and participation limitations we examined, drawing policy inferences from our findings is relatively straightforward. As several examples, individuals with movement and sensory difficulties will need environments, such as housing, workplaces, and communities, without physical and communication barriers; they may also rely more heavily on public transportation than others and so need accessible buses, subways, and trains. Persons with self-care limitations might need personal assistance services in the home. Individuals with disabilities who are poor, uneducated, and unemployed clearly need income support but also education and vocational training services that accommodate their individual needs. Enhancing the accessibility of educational resources, including not only in childhood and early adulthood but also for adult learning, is essential to maximize long-term opportunities for individuals with disabilities.

As suggested by this speculation, multiple sectors of society affect populations with disabilities. With the increasing population of U.S. residents living with disabilities, recognizing the need for thinking across what historically have been separate policy silos will be necessary to develop comprehensive responses to population needs. Thus, going forward, considering disability in all policies will be critical to ensure inclusion of increasing numbers of Americans in daily and community life.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Figure 1.
Distribution of Age, Race/Ethnicity and BMI over Time

Figure 2.

Trends over Time of Unadjusted and Adjusted Rates of Individual Basic Action Difficulty Among Persons with Chronic Disabilities

P-values for all trends ≤ 0.01 except for Unadjusted ($p=0.07$), Age-Adjusted ($p=0.32$) and BMI-ADjusted ($p=0.72$) of Sensory Disability.

Figure 3.
Trends over Time of Unadjusted and Adjusted Rates of Individual Complex Activity Limitation Among Persons with Chronic Disabilities
P-values for all trends ≤ 0.001

Figure 4.
Trends over Time of Unadjusted and Adjusted Rates of Any Basic Action Difficulty and Any Complex Activity Limitation Among Persons with Chronic Disabilities
P-values for all trends ≤ 0.0001

Table 1

Population Estimates and Sociodemographic Characteristics of Civilian, Noninstitutionalized U.S. Residents Ages 18 and Older

Variable	Year						P-Value ^d
	1998	2000	2003	2005	2008	2010	2011
NHIS respondents: raw numbers	32,440	32,374	30,852	31,428	21,781	27,157	33,014
U.S. population estimates: millions	197.3	201.7	213.0	217.8	225.2	229.5	231.4
<i>Age categories: percent (SE)</i>							
18–44	54.9 (0.4)	53.8 (0.4)	51.9 (0.4)	50.7 (0.4)	49.1 (0.5)	48.2 (0.4)	47.9 (0.4)
45–64	28.7 (0.3)	30.0 (0.3)	32.0 (0.4)	33.2 (0.3)	34.3 (0.4)	34.9 (0.4)	34.9 (0.3)
65–79	12.6 (0.2)	12.5 (0.2)	12.0 (0.2)	11.7 (0.2)	12.1 (0.3)	12.4 (0.3)	12.6 (0.2)
80+	3.7 (0.1)	3.7 (0.1)	4.1 (0.1)	4.3 (0.1)	4.5 (0.2)	4.4 (0.2)	4.5 (0.1)
<i>Male: percent (SE)</i>	48.0 (0.3)	47.9 (0.3)	48.0 (0.4)	48.2 (0.3)	48.3 (0.4)	48.3 (0.4)	48.4 (0.3)
<i>Race: percent (SE)^a</i>							
White	82.8 (0.3)	81.1 (0.3)	83.5 (0.4)	82.9 (0.4)	81.1 (0.4)	80.8 (0.4)	80.5 (0.4)
Black	11.4 (0.3)	11.3 (0.3)	11.3 (0.3)	11.4 (0.3)	11.9 (0.4)	12.1 (0.4)	12.0 (0.3)
Asian	3.1 (0.2)	3.3 (0.2)	3.5 (0.2)	3.7 (0.2)	4.7 (0.2)	4.8 (0.2)	5.0 (0.2)
Other	2.8 (0.1)	4.3 (0.2)	1.8 (0.1)	2.0 (0.2)	2.4 (0.2)	2.3 (0.1)	2.6 (0.1)
<i>Hispanic: percent (SE)</i>	10.1 (0.3)	10.5 (0.3)	12.3 (0.3)	12.8 (0.3)	13.6 (0.4)	14.0 (0.3)	14.2 (0.3)
<i>Body mass index categories: percent (SE)</i>							
< 25.0	44.8 (0.3)	43.4 (0.3)	41.0 (0.4)	39.7 (0.4)	38.0 (0.4)	37.4 (0.4)	37.2 (0.4)
25.0–29.9	35.2 (0.3)	35.3 (0.3)	35.8 (0.3)	35.3 (0.3)	34.6 (0.4)	34.6 (0.4)	34.5 (0.3)
30.0–34.9	13.8 (0.2)	14.2 (0.2)	14.8 (0.3)	16.0 (0.3)	16.5 (0.3)	17.2 (0.3)	17.4 (0.3)
35.0–39.9	4.2 (0.1)	4.7 (0.1)	5.2 (0.2)	5.7 (0.1)	6.7 (0.2)	6.6 (0.2)	6.7 (0.2)
40.0+	2.0 (0.1)	2.4 (0.1)	3.2 (0.1)	3.2 (0.1)	4.3 (0.2)	4.2 (0.2)	4.2 (0.1)
<i>Education: percent (SE)</i>							
Less than high school	18.3 (0.3)	18.0 (0.3)	16.8 (0.3)	16.3 (0.3)	15.4 (0.4)	14.4 (0.3)	14.3 (0.3)
High school	30.5 (0.4)	30.6 (0.4)	29.6 (0.4)	29.7 (0.4)	27.7 (0.4)	26.9 (0.4)	26.7 (0.4)
Some college ^b	28.4 (0.3)	28.4 (0.3)	29.2 (0.3)	28.3 (0.4)	30.1 (0.4)	30.5 (0.4)	31.2 (0.3)
College degree or more	22.8 (0.4)	23.0 (0.4)	24.4 (0.4)	25.8 (0.4)	26.7 (0.5)	28.2 (0.4)	27.8 (0.4)

Variable	Year						P-Value ^d
	1998	2000	2003	2005	2008	2011	
Employment: percent (SE)							<.0001
Working ^c	65.4 (0.3)	65.7 (0.3)	63.8 (0.3)	64.7 (0.4)	64.0 (0.5)	59.9 (0.4)	
Looking for work	1.9 (0.1)	1.9 (0.1)	3.7 (0.1)	3.1 (0.1)	3.9 (0.2)	6.7 (0.2)	
Not working, not looking for work	32.7 (0.3)	32.5 (0.3)	32.4 (0.3)	32.1 (0.4)	32.0 (0.4)	33.4 (0.4)	
Family income < federal poverty level: percent (SE)	11.6 (0.3)	10.7 (0.3)	11.6 (0.3)	10.9 (0.3)	12.1 (0.4)	14.5 (0.3)	<.0001

^a Percentages do not include missing values.

^b Includes associate's degree.

^c Includes "Working for pay at job or business" in 1998 and 2000; Includes "Working for pay at job or business" and "Working not for pay at job or business" after 2000.

^d P-values based on two-sided Wald Chi-Square tests of independence.

Table 2

Unadjusted Percentages of Civilian, Noninstitutionalized U.S. Residents Ages 18 and Older with Different Types of Chronic Disabilities

Variable	Year						
	1998	2000	2003	2005	2008	2010	2011
U.S. population estimates: millions	197.3	201.7	213.0	217.8	225.2	229.5	231.4
Basic action difficulties (BAD): percent (SE)							
Any BAD	21.5 (0.3)	21.2 (0.3)	22.8 (0.3)	23.3 (0.3)	23.4 (0.4)	25.0 (0.4)	25.4 (0.4)
Movement difficulty	19.3 (0.3)	19.2 (0.3)	21.0 (0.3)	21.3 (0.3)	21.1 (0.4)	23.1 (0.3)	23.3 (0.3)
Sensory difficulty	7.2 (0.2)	6.9 (0.2)	6.8 (0.2)	7.7 (0.2)	7.5 (0.2)	7.4 (0.2)	7.4 (0.2)
Emotional difficulty	2.0 (0.1)	1.9 (0.1)	2.2 (0.1)	2.4 (0.1)	2.4 (0.1)	2.5 (0.1)	2.7 (0.1)
Cognitive difficulty	2.0 (0.1)	1.9 (0.1)	2.3 (0.1)	2.4 (0.1)	2.6 (0.1)	2.8 (0.1)	3.3 (0.1)
Complex activities limitations (CAL): percent (SE)^a							
Any CAL	12.1 (0.2)	11.3 (0.2)	12.3 (0.2)	12.7 (0.3)	12.8 (0.3)	13.5 (0.3)	14.1 (0.3)
Self-care limitation	3.5 (0.1)	3.2 (0.1)	3.7 (0.1)	3.8 (0.1)	4.1 (0.2)	4.2 (0.1)	4.6 (0.2)
Social limitation	6.2 (0.2)	6.2 (0.2)	7.1 (0.2)	7.4 (0.2)	6.9 (0.2)	7.9 (0.2)	8.1 (0.2)
Work limitation	9.8 (0.2)	9.1 (0.2)	9.7 (0.2)	10.0 (0.2)	10.4 (0.3)	10.6 (0.2)	11.4 (0.3)
Any BAD or CAL: percent (SE)	22.6 (0.3)	22.1 (0.3)	23.7 (0.3)	24.3 (0.3)	24.4 (0.4)	26.2 (0.4)	26.5 (0.4)

* Rates and standard errors obtained from analysis accounting for the complex sampling design.

** Disability rates are significantly different by year and also have a significant linear trend ($p < 0.001$) except for Sensory disability which has a borderline significance for a linear trend over time ($p = 0.07$).

Table 3

Estimated Population of Civilian, Noninstitutionalized U.S. Residents Ages 18 and Older with Different Types of Chronic Disabilities^a

Variable	Year						
	1998	2000	2003	2005	2008	2010	2011
Basic action difficulties (BAD): N							
Any BAD	41,888,939	42,161,405	47,755,823	50,041,879	52,078,172	57,006,936	58,424,716
Movement difficulty	38,022,033	38,661,851	44,480,143	46,196,800	47,265,875	52,824,745	53,951,396
Sensory difficulty	14,264,276	13,976,807	14,572,599	16,722,838	16,933,124	16,981,111	17,058,598
Emotional difficulty	3,866,862	3,812,447	4,614,631	5,045,124	5,234,959	5,781,497	6,257,719
Cognitive difficulty	3,939,987	3,846,501	4,807,861	5,218,667	5,756,456	6,531,690	7,624,581
Complex activities limitations: N							
Any CAL	23,559,696	22,568,334	25,938,665	27,276,875	28,389,227	30,533,612	32,095,148
Self-care limitation	6,835,413	6,494,180	7,825,317	8,309,318	9,253,907	9,550,984	10,628,120
Social limitation	12,059,997	12,281,812	14,777,722	15,761,756	15,231,756	17,703,649	18,212,802
Work limitation	19,181,474	18,355,933	20,542,308	21,831,006	23,448,728	24,325,245	26,312,014
Any BAD or CAL	43,697,077	43,663,146	49,377,293	51,884,962	54,049,764	59,098,981	60,541,777

^aThese estimates are adjusted only for NHIS sampling weights to produce national estimates

Table 4
Adjusted Odds Ratios of Having Any Chronic Basic Action Difficulty or Complex Action Limitation

Factors	Survey Year					
	1998	2000	2003	2005	2008	2010
Adjusted odds ratios (95% confidence intervals)						
SEX						
Male	1.0*	1.0*	1.0*	1.0*	1.0*	1.0*
Female	1.3 (1.2,1.5)	1.3 (1.2,1.4)	1.3 (1.2,1.4)	1.3 (1.2,1.4)	1.4 (1.2,1.5)	1.3 (1.2,1.5)
AGE						
18–44	1.0*	1.0*	1.0*	1.0*	1.0*	1.0*
45–64	2.7 (2.5,3.0)	2.9 (2.6,3.2)	2.9 (2.6,3.2)	3.2 (3.0,3.6)	3.1 (2.8,3.4)	3.4 (3.1,3.8)
65–79	4.1 (3.6,4.5)	4.1 (3.6,4.7)	3.9 (3.5,4.4)	3.7 (3.3,4.2)	3.5 (3.0,4.1)	4.0 (3.5,4.5)
80+	9.9 (8.2,12.0)	7.7 (6.4,9.3)	7.8 (6.5,9.4)	8.4 (7.0,10.0)	8.4 (6.9,10.4)	7.7 (6.5,9.2)
RACE						
White	1.0*	1.0*	1.0*	1.0*	1.0*	1.0*
Black	0.9 (0.8,1.0)	0.8 (0.7,0.9)	0.8 (0.7,0.9)	0.8 (0.7,0.9)	0.8 (0.7,0.9)	0.9 (0.8,1.0)
Asian	0.6 (0.4,0.8)	0.5 (0.4,0.7)	0.5 (0.4,0.7)	0.6 (0.4,0.8)	0.6 (0.5,0.8)	0.6 (0.5,0.7)
Other/Multiple Race	1.2 (0.9,1.6)	1.4 (1.1,1.8)	1.5 (1.1,2.0)	1.4 (1.0,1.9)	1.4 (1.0,1.8)	1.5 (1.2,1.9)
HISPANIC ETHNICITY						
Not Hispanic	0.6 (0.5,0.7)	0.5 (0.4,0.6)+	0.5 (0.4,0.6)+	0.5 (0.5,0.6)	0.6 (0.5,0.7)	0.6 (0.5,0.6)+
Hispanic	1.0*	1.0*	1.0*	1.0*	1.0*	1.0*
BMI						
< 25	1.0*	1.0*	1.0*	1.0*	1.0*	1.0*
25–29.9	1.2 (1.1,1.4)	1.4 (1.2,1.5)	1.3 (1.2,1.4)	1.3 (1.2,1.5)	1.4 (1.2,1.6)	1.4 (1.2,1.5)
30–34.9	2.0 (1.8,2.2)	2.2 (2.0,2.5)	2.0 (1.8,2.2)	2.2 (2.0,2.4)	2.1 (1.9,2.5)	2.1 (1.8,2.3)
35–39.9	2.5 (2.2,3.0)	3.3 (2.8,3.9)	2.9 (2.5,3.4)	3.1 (2.6,3.7)	3.3 (2.8,3.9)	3.6 (3.0,4.2)
40+	5.1 (4.1,6.5)	5.9 (4.8,7.3)	5.7 (4.6,6.9)	5.6 (4.7,6.8)	6.6 (5.4,8.2)	5.0 (4.2,6.0)
EDUCATION						
Less than High School	1.0*	1.0*	1.0*	1.0*	1.0*	1.0*

Factors	Survey Year					
	1998	2000	2003	2005	2008	2010
	Adjusted odds ratios (95% confidence intervals)					
High School	0.7 (0.7,0.8)	0.8 (0.7,0.9)	0.8 (0.7,0.9)	0.9 (0.8,1.0)	0.7 (0.6,0.8)	0.9 (0.8,1.0)
Some college/assoc deg	0.7 (0.6,0.8)	0.8 (0.7,0.9)	0.8 (0.7,0.9)	0.7 (0.7,0.8)	0.6 (0.5,0.7)	0.8 (0.7,0.9)
College/more	0.5 (0.4,0.5)	0.4 (0.4,0.5)	0.5 (0.4,0.6)	0.5 (0.4,0.6)	0.4 (0.4,0.5)	0.5 (0.4,0.6)
EMPLOYMENT						
Working [†]	1.0*	1.0*	1.0*	1.0*	1.0*	1.0*
Looking for work	1.7 (1.3,2.2)	1.7 (1.3,2.3)	1.7 (1.4,2.1)	1.9 (1.5,2.4)	1.6 (1.3,2.1)	1.4 (1.2,1.6)
Not working, not looking for work	2.7 (2.5,3.0)	2.9 (2.6,3.1)	2.9 (2.6,3.2)	3.4 (3.1,3.7)	3.4 (3.0,3.8)	3.2 (2.9,3.6)
POVERTY THRESHOLD						
Family Income Above 100% Federal Poverty Level	1.6 (1.4,1.8)	1.5 (1.3,1.7)	1.5 (1.3,1.7)	1.6 (1.5,1.8)	1.6 (1.4,1.8)	1.7 (1.5,1.9)
Family Income Below 100% Federal Poverty Level	1.0*	1.0*	1.0*	1.0*	1.0*	1.0*

* Reference Category. Analysis account for the complex NHIS sampling design. All factors are significantly associated with having any BAD or CAL ($p < 0.001$).

[†] Includes “Working for pay at job or business” in 1998 and 2000; Includes “Working for pay at job or business” and “Working not for pay at job or business” after 2000.

Table 5

Weighted Percentage of Population Reporting Two Specific Disability Types^a

	Basic action difficulties			Complex action difficulties		
	Movement difficulty	Sensory difficulty	Emotional difficulty	Cognitive difficulty	Self-care limitation	Work limitation
Basic action difficulties						
Movement difficulty	100.0	27.6	9.5	10.5	17.3	32.5
Sensory difficulty	80.3	100.0	12.8	15.4	22.6	39.4
Emotional difficulty	86.3	40.0	100.0	27.7	28.5	62.9
Cognitive difficulty	89.7	45.1	26.7	100.0	53.5	68.0
Complex action difficulties						
Self-care limitation	94.3	42.5	17.5	34.3	100.0	76.3
Social limitation	92.5	38.1	19.3	21.6	37.9	100.0
Work limitation	89.0	33.7	14.7	20.7	32.8	51.9

^aFor example, 27.6% of person with movement disability also had sensory disability; 80.3% of persons with sensory difficulty also had movement disability. These results come from data combined across all years (1998–2011).