



Published in final edited form as:

Disabil Rehabil. 2013 August ; 35(17): 1479–1490. doi:10.3109/09638288.2012.740137.

Health disparities among workers and nonworkers with functional limitations: implications for improving employment in the United States

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Abstract

Purpose—The aim of this study was to compare workers and nonworkers who reported mild, moderate, and severe/complete functional limitations to identify disparities in 19 health and social indicators.

Method—Using the International Classification of Functioning, Disability and Health as our conceptual framework, we analyzed data from the combined 2000–2008 National Health Interview Survey, comparing workers and nonworkers by severity of functional limitations, as measured by the FL12 Scale of Functional Limitation Severity.

Results—Only 9.5% of people reporting moderate/severe functional limitations worked. Although not without exception, not working and severity of functional limitation were associated with poorer health outcomes, with nonworkers reporting severe/complete limitations having least optimal health. Prevalence of chronic conditions was associated with level of functional limitation severity, with the strongest associations among nonworkers.

Conclusions—By focusing exclusively on people with functional limitations, we were better able to examine factors contributing to health and participation of workers and nonworkers. People who worked and had moderate or severe/complete limitations often did so while reporting poor health. With improved access to health care, health promotion activities, and other support systems, the quality of life and likelihood of work participation of people with greater functional limitations might also be improved.

Keywords

Health outcomes; International Classification of Functioning; Disability and Health

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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. This manuscript has not been published elsewhere and has not been submitted simultaneously for publication elsewhere.

Declaration of Interest: The authors report no conflicts of interest.

Introduction

Although the literature comparing employment outcomes for working aged adults with and without disabilities is extensive [1–3], the physical and mental health conditions, and health behaviors – those factors likely to contribute to the ability to sustain work – of workers and nonworkers with disabilities are largely neglected [4]. This study focuses upon the association of these health factors in relation to the severity of functional limitation, and the findings inform the importance of health promotion among people with functional limitations – both workers and nonworkers.

Background

Employment is associated with independence and improved quality of life. In the United States, employment rates among people with disabilities have not changed substantially despite the Americans with Disabilities Act (ADA) and the Ticket to Work program [5,6]*. People with disabilities are twice as likely as people without disabilities to live below the government established poverty line [5,7–9]. Employment rates for people with substantial disabilities remain low, ranging from 15 to 44%, depending on the population studied [8–12].

Barriers to employment for people with disabilities include lack of transportation and environmental factors, such as the built environment, attitudes, and social practices [13,14]. Additional barriers include federal income support programs, such as Supplemental Security Income and Social Security Disability Insurance [8,15] and pervasive poverty [8]. Health-related factors may compromise the capacity to work, may force people with disabilities out of the workforce or may limit quality of life. These factors include adverse health behaviors [16,17]; chronic conditions, including secondary conditions [18–20]; lack of mental health care [21,22]; the lack of health promotion for people with disabilities [16,17,23,24]; significant out-of-pocket expenses, including lack of or inadequate health insurance coverage [12]; the lack of assistive technology [25] and repair [26]; and lack of access to care by knowledgeable providers [26].

Understanding the complex experience of people with disabilities is further complicated by definitional issues regarding what constitutes a disability [27]. Efforts to define disability recognize the importance of the person-environment interaction, suggesting that the built, policy, and attitudinal environment can serve as a barrier or facilitator enhancing or limiting the ability of people with disabilities to pursue social roles [28]. The introduction of the International Classification of Functioning, Disability and Health (ICF) has codified the dimensional experience of disability [29]. Discussions of disability, however, often treat the experience as a threshold concept – suggesting that people reach a tipping point where they become “disabled.” Dichotomous notions of disability fail to recognize variability of function. Severity of disability may be captured by concepts of work disability or eligibility for certain social support program, including Supplemental Security Income or Social Security Disability Income [15]. Much research compares people with and without disabilities in relation to health and social participation outcomes, including work, without considering severity of disability.

A recent examination of the Behavioral Risk Factor Surveillance System in the US identified differing health behaviors among three groups of people with disabilities (those reporting assistive device use and activity limitation, assistive device use only, and activity limitation only) compared with people with no disability [4]. The investigators then modeled the interaction of work/nonwork to disability severity. The chief finding was that nonworkers with more severe disabilities reported a greater likelihood of physical inactivity. Our investigation advances this line of inquiry.

Specific aims of this study

Rather than comparing people with and without disabilities, the aim of this study was to compare workers and nonworkers reporting any functional limitation by severity of limitation (mild, moderate or severe/complete) on several health-related and social characteristics to identify disparities in 19 different outcome indicators. These indicators include physical health; level of psychological distress; disability income and health insurance coverage; activities of daily living (ADLs), instrumental activities of daily living (IADLs), and use of special equipment; occurrence of comorbid chronic conditions; and health behavior practices. Since workers are generally healthier than nonworkers [30] and adults with lower levels of disability tend to be healthier than those with more severe disabilities [31], we attempted to pinpoint patterns of disparity in specific health-related and participation areas among workers and nonworkers with varying levels of functional limitations. Identification of these patterns of disparity might identify appropriate points of intervention for health promotion and workforce retention. To accomplish this goal, we asked the following research questions: In what areas of health and participation do workers and nonworkers with functional limitations differ most? How does level of limitation severity affect differences in health and participation among workers and nonworkers with functional limitations?

Methods

Conceptual framework

Our conceptual framework for this study was based on the ICF, a taxonomy developed by the World Health Organization (WHO) [30] as a companion tool to the International Classification of Diseases (ICD) [32]. The ICF promotes understanding of functioning, disability, and health across cultures by describing these concepts as health-related domains associated with body structures (s-codes), body functions (b-codes), activity limitations and participation (d-codes), and environmental factors (e-codes).

Data source

Our data source for this study was the Sample Adult and Person files from the 2000–2008 National Health Interview Survey (NHIS), a random sample survey [33]. Since 1997, the NHIS Core has included a Sample Adult Core module. An adult aged 18 years or older is selected from each surveyed family to participate as a Sample Adult. The Sample Adult Core contains specific information on commonly occurring chronic conditions and health behavior practices that is not found in other survey components.

We retained all records in the 9-year database of the combined survey files and excluded missing responses only in cases where respondents refused to answer the question or did not know the answer to the question. To ensure parity across data files over the 9-year period, we developed a crosswalk (grid) in which we entered all variables and their values. In some cases, recoding was necessary to achieve parity across files and make certain that variables and their values measured the same constructs across years. After our master database was in place and we identified survey questions of interest associated with targeted variables that were relevant to our research questions, we backcoded NHIS questions from the 2000–2008 surveys to the ICF taxonomy for all independent and dependent measures for which codes were available. This backcoding process helped us link our conceptual framework to our research questions and analytic procedures. We used SPSS 14.0 for our data management and SUDAAN 10.0 for our data analysis [34,35].

Sample

Our 9-year sample included 54,775 working-age adults with all levels of functional limitations. In this group, 22,908 respondents were aged between 18 and 44 years and 31,867 were between the ages of 45 and 64 years. Our sample included 20,619 males, 34,156 females, and included 18,581 respondents from minority respondents (African-Americans, Latinos/Hispanics, Asians, Native Americans, Pacific Islanders, and other races), and 36,194 non-minority whites (Caucasians). Our sample contained 5,501 military veterans. A total of 1,429 veterans had functional limitations severe enough (moderate, severe/complete) to be considered veterans with disabilities. A total of 14,150 individuals, regardless of military status, had functional limitations severe enough to be classified as disabilities, while 40,625 working-age respondents had mild functional limitations. Workers numbered 29,207, while 25,568 respondents with functional limitations did not currently work. Workers with moderate, severe/complete functional limitations numbered 3,051, while nonworkers with these functional limitations equaled 11,099.

Independent measures

Measuring functional limitations—We measured level of functional limitation severity with the FL12 Scale of Functional Limitation Severity, which was developed by the lead author for this investigation, using the 12 functional limitation questions in the NHIS Sample Adult file that are associated with six areas of functional limitations found in the ICF. The FL12 Scale also uses the same severity coding found in the ICF that parallels response severity levels in the NHIS. The FL12 Scale is patterned along the same principle as the K6 Scale of Psychological Distress, which was developed by Kessler and colleagues [36] and employs the six NHIS questions associated with feelings that interfered with respondents' daily activities (see the K6 Scale description later in this section.) The NHIS identifies respondents with functional limitations with 12 questions related to functional activities and participation [33]. These questions can be grouped in several areas associated with the ICF: Changing and Maintaining Body Position (ICF codes d410–d429), which includes difficulties with sustained sitting and standing, bending and stooping, and reaching over one's head; Carrying, Moving and Handling Objects (ICF codes d430–d449), which includes difficulty carrying and pushing objects and grasping objects with the fingers; Walking and Moving (ICF codes d450–d469), which includes difficulty walking and

climbing steps; Acquiring Resources (ICF codes d610–d669), which includes difficulty shopping for groceries and other necessities; Interpersonal Relationships (ICF codes d710–d769), which includes difficulty socializing with family and friends; and Recreation and Leisure (ICF code d920), which includes difficulty relaxing and participating in leisure activities [29]. NHIS respondents who had any difficulties with these activities could express that difficulty in four different ways by rating the activity as (i) only a little difficult (mild, no disability), (ii) somewhat difficult (moderate), (iii) very difficult (severe), and (iv) cannot do at all (complete). We considered individuals with mild limitations as having some limitation but no disability. We classified individuals whose responses were moderate, severe, or complete levels of difficulty as having disability.

Since any given respondent may answer each of the 12 questions associated with the six areas in the FL12 Scale to indicate different levels of difficulty, we scored the FL12 Scale by summing across the unweighted values for all of the functional limitation questions. The total represented the respondent's FL12 Scale score. Scores of 1–12 indicated mild limitation (no disability), 13–24 indicated moderate limitation and disability, 25–36 indicated severe limitation and disability, and 37–48 indicated complete limitation and disability. In our study, respondents with severe and complete limitations were combined to maximize cell sizes of workers and nonworkers. Respondent nonworkers with mild limitations served as the reference group for the comparisons discussed below. We chose this specific reference group, because we are most interested in investigating health characteristics of workers who have significant (moderate and severe/complete) functional limitations to possibly increase access to employment opportunities for individuals with significant functional limitations who are not currently working. Knowing the health issues for respondents with significant functional limitations who are currently in the work force may inform service providers of health care services and employment services and equip them with the information needed to design better interventions for people with significant limitations who are having difficulty accessing or remaining in the workforce. In our multivariate logistic regression analyses, each outcome measure was entered into a separate model with the covariate demographic variables and our disability/work status measure, which was comprised the measure of functional limitation by the work stature measure, i.e. limitation level times work status. In this way, we could examine each level of functional limitation by each level of work status for each outcome, controlling for demographic covariates.

Definition of work status—As noted earlier, our study focused on workers and nonworkers with functional limitations. We identified workers as respondents between the ages of 18 and 64 years who were currently working at a job or business (ICF codes d840–d859). Individuals who did not answer affirmatively to this question were classified as nonworkers, even though they might have been doing some unpaid work activity.

Dependent measures

Physical health status—We measured health status as family respondent-reported ratings of excellent/very good, good or fair/poor health. In our generalized logit models, we

set having excellent/very good health as our reference category to identify workers and non-workers at risk for fair/poor health.

Psychological distress—Psychological distress (ICF codes b152–b155) was derived from responses to six survey items based on the K6 Scale of Psychological Distress. For more than a decade, the K6 Scale has been a part of WHO’s series of screening surveys. Over time, it has demonstrated sensitivity and specificity in detecting the prevalence of mood and anxiety disorders, and it has been shown to have strong psychometric properties, for screening serious mental illness among people with substance abuse disorders, and consistent psychometric properties for screening psychological distress across major socio demographic subgroups [36–42]. The K6 Scale includes items measuring feelings of sadness, hopelessness, restlessness, worthlessness, nervousness, and the sense that everything is an effort, that significantly interfered with the respondent’s performance of daily activities none of the time (no psychological distress), a little of the time (mild psychological distress), some of the time (moderate psychological distress) or most of the time or all of the time (severe psychological distress) during the past 30 days. Values for these variables were reverse coded and summed across all six variable scores (unweighted) to calculate each adult respondent’s K6 Scale score. Adults with a score of six were considered to have no psychological distress. Scores of 7–12 indicated mild distress, scores of 13–18 signified moderate distress, and scores of 19–30 were classified as severe distress [38].

Chronic conditions—We examined several measures for chronic conditions that are common among adults with functional limitations, including four respondent-reported physician-diagnosed conditions and four respondent-related conditions not specifically diagnosed by a physician. The respondent-reported physician-diagnosed (“Have you ever been told by a doctor or other health professional that you had...?”) conditions were hypertension (ICF code b420), diabetes (metabolic and endocrine functioning, ICF codes b540–b555), heart problems (ICF codes b410–b429), and breathing problems (ICF codes b440–b449). Respondents with heart problems reported physician-diagnosed myocardial infarction, angina, coronary heart disease or other heart problems. Respondents with breathing problems reported having physician-diagnosed emphysema, asthma or chronic bronchitis. We did not have enough information to attribute disability causality to a specific condition. Respondent-related conditions not specified as physician-diagnosed health problems included swelling and pain in joints within the past 12 months (ICF codes b280–b289), low back pain within the past 3 months, (ICF code b28013), hearing loss (a little trouble hearing, a lot of trouble hearing or deafness, ICF code b230) and visual impairment (difficulty seeing even with glasses or contact lenses, ICF codes b210–b229).

Health behaviors—Health behavior measures included cigarette smoking (no ICF code), alcohol use (no ICF code), physical inactivity (ICF code d5701), and weight maintenance problems – overweight, but not obese and obesity (ICF code b530).

Respondents were classified as current smokers if they smoked every day or some days per week and were categorized as current drinkers if they had one or more alcoholic drinks each week. We included weekly use of any alcohol because of its potential for negative

interaction with commonly used prescription medications [43,44]. We did not address levels of alcohol consumption because of small cell sizes among some groups of workers and nonworkers with different severity levels of functional limitations.

Body mass index (BMI) was calculated at the National Center for Health Statistics [33] for each survey respondent by dividing the metric equivalent of weight (kilograms) by the metric equivalent of height (meters) squared. Respondents were categorized as having a weight maintenance problem if they were overweight but not obese (BMI ≥ 25 and <30) or if they were obese (BMI ≥ 30).

Respondents were deemed physically inactive if they reported no regular weekly exercise or if they never exercised at all.

Disability income and insurance coverage were determined by positive responses to questions regarding those topics. Self-care was measured by any positive response to ADLs (bathing, eating, dressing or getting around inside the home) or IADLs (household chores, doing necessary business, shopping or getting around for other purposes) questions.

Results

Our analyses for this study were age-adjusted to the 2000 Census. After controlling for demographics (age, sex, minority status, income education, and marital status) in the multivariate analyses, findings were statistically significant at $p < 0.001$ for comparisons of workers and nonworkers by level of functional limitation severity for our outcome measures.

Population

Our population of workers and nonworkers with functional limitations is described in Table I.

Sixty-six percent of respondents (approximately 11.3 million people) with mild functional limitations but no disabilities were currently working, compared with 30.8% of people with moderate functional limitations and 9.5% of individuals with severe/complete functional limitations. Thus, an estimated 3,290,000 working-age adults with limitations severe enough to be classified as disabilities were actively engaged in the workforce, while an estimated 3.7 million adults with substantial disabilities were not working. An estimated 5.8 million working-age adults with mild functional limitations reported that they were not currently working.

Demographics

Demographic characteristics of our working and nonworking adults are displayed in Table II.

Respondents in both work categories across functional limitation groups were more likely to be female. Minorities in all limitation groups were less likely to be working, especially those with moderate or severe/complete limitations. Workers with severe/complete limitations were more likely to have a high school education or less, as were their nonworking

counterparts. Almost two-thirds (64.0%) of respondents having severe/complete limitations who did not work said they had no college training. About two-fifths (38.9%) of workers with severe/complete limitations reported their income was less than \$20,000 annually, compared with half (50.1%) of their nonworking counterparts. Across limitation groups for both workers and nonworkers, respondents were more likely to be unmarried, especially workers with severe/complete limitations (61.2%). Nonworkers with moderate limitations were the most likely group to have served in the military. Respondents in all limitation categories across work categories were more likely to live in the South than in any other region. Nearly, one-half (46.2%) of nonworkers with severe/complete limitations resided in the South. Fewer workers and nonworkers with all levels of limitations lived in the Northeast. These results seem to be due to the over-all pattern of responses to the survey, but we could not determine whether pattern of response to the survey was the sole reason for this demographic pattern.

Health and participation factors

Outcomes for health and social participation factors are shown in Table III.

Physical health status

Having fair/poor health was strongly associated with limitation severity among workers and nonworkers, though more strongly so among nonworkers. Workers and nonworkers with severe/complete limitations were more likely to report having fair/poor health. About half of all workers in this limitation category rated their health as fair/poor (53.8%, adjusted odds ratio (AOR) = 6.04), compared with three-fourths of their nonworking counterparts (77.7%, AOR = 19.85).

Psychological distress

Patterns of psychological distress in either workers or non-workers were not as straightforward as were patterns for fair/poor health. Psychological distress for all levels of limitation severity was more common among nonworkers than workers. Nonworkers with mild limitations were the most likely to report mild psychological distress (55.2%), while nonworkers with severe/complete limitations were more likely to indicate moderate/severe psychological distress (47.7%, AOR = 3.72). Among workers, individuals with severe/complete limitations were more likely to say they experienced mild psychological distress (57.9%, AOR = 1.83), and respondents with moderate limitations were more likely to say they experienced moderate/severe psychological distress (31.7%, AOR = 1.43).

Disability income

We examined disability income as possible disincentive to work for people with functional limitations. A small number of workers with functional limitations reported receiving disability income, but most recipients were nonworkers, for whom receipt of disability income was strongly associated with limitations severity. Receipt of disability income ranged from 16.4% for people with mild limitations, 42.2% (AOR = 3.57) for people with moderate limitations, and 51.7% (AOR = 5.32) for nonworkers with severe/complete

limitations. These findings should be viewed with caution, because at least one response category had less than 100 respondents per cell.

Health insurance coverage

Findings on health insurance coverage were mixed. Workers with mild limitations were more likely to have health insurance coverage (84.0%, AOR = 1.30), while 79.0% (AOR = 0.97) of workers with moderate limitations had coverage, and 83.9% (AOR = 1.28) of workers with severe/complete limitations had health insurance. Among nonworkers, health insurance coverage was associated with disability severity. More than three-fourths (78.4%) of nonworkers with mild limitations had coverage, while 84% (AOR = 1.61) of moderately limited nonworkers and 86.3% (AOR = 1.93) of nonworkers with severe/complete limitations were covered. Notably, more than 16% of workers with severe/complete limitations and almost 14% of their nonworking counterparts reported having no health insurance coverage.

Self-care and participation

Very few workers with all levels of functional limitations had difficulties with ADLs, and almost one-fourth (24.1%, AOR = 5.95) of respondents with severe/complete limitations indicated difficulty with IADLs. Use of special equipment among workers was associated with severity of functional limitations, with workers who had severe/complete limitations having the highest usage (43.2%, AOR = 13.61).

Nonworker respondents in all functional limitation categories were more likely than worker respondents to report having difficulty with ADLs and IADLs and use of special equipment, and nonworkers with severe/complete functional limitations were more likely than nonworkers in other functional limitation categories to report difficulty in these areas. Almost one-quarter (24.5%, AOR = 18.87) of nonworkers with severe/complete limitations reported they experienced difficulties with ADLs, while more than two-fifths (44.5%, AOR = 14.08) of this group had difficulties with IADLs, and more than half (54.8%, AOR = 23.73) said they used some type of special equipment.

Chronic conditions

For both workers and nonworkers, hypertension was associated with level of functional limitation severity, with the strongest associations among nonworkers. This was also true for diabetes, heart problems, and breathing problems.

In regard to respondent-related conditions that were not diagnosed by a physician, workers were more likely than nonworkers to report having joint symptoms and low back pain, though respondents in both groups who had greater limitation severity were more likely to report having these conditions than were respondents in other functional limitation categories. Reports of hearing loss were mixed. Workers with mild limitations were more likely than their nonworking counterparts to report having hearing loss (19.1% v. 15.9%, AOR = 1.09), while nonworkers in the other limitation categories reported more hearing loss than their working counterparts. Nonworkers across all limitation groups were slightly more likely to report having vision loss than were workers.

Health behaviors

Smoking was more likely among nonworkers with functional limitations, especially among individuals with moderate limitations (37.7%, AOR = 1.26). Workers were more likely to use alcohol weekly than nonworkers, but alcohol usage decreased as level of limitation severity increased for both workers and nonworkers with limitations. Almost three-fourths of workers with mild limitations (72.7%, AOR = 1.76) reported weekly alcohol use, compared with 59.6% of workers with moderate limitations and 48.1% of workers with severe/complete limitations. Patterns of overweight (25 <math>BMI < 30\text{ kg/m}^2</math>), but not obesity, decreased with increasing level of disability severity, with workers having mild limitations being more likely than any other group to be overweight, but not obese (32.6%, AOR = 1.10). Workers were slightly more likely than nonworkers to be obese (BMI ≥ 30), with more than half of workers with severe/complete limitations reporting obesity (57.0%, AOR = 2.21). Conversely, nonworkers at all limitation levels were more likely to be physically inactive in their leisure time, with nearly four-fifths of nonworkers with severe/complete limitations reporting no regular leisure-time exercise (79.2%, AOR = 5.76).

Discussion

In this investigation, we examined health, psychological distress, chronic conditions, income support, and other characteristics of workers and nonworkers with mild, moderate or severe/complete functional limitations. To our knowledge, this is the first investigation to do so. We addressed two research questions: In what areas of health and participation do workers and nonworkers with functional limitations differ most? How does the level of limitation severity affect differences in health and participation among workers and nonworkers with functional limitations? This analysis illustrates the complex and dimensional balance between the health of people with disabilities and work, and how that balance becomes more precarious as severity of limitation increases. For people with disabilities, health is often the key to participation in social roles, but because “they ordinarily have a thinner margin of health,” although they are “not by definition sick” [45, p. 283], their ability to obtain or sustain work is compromised. This analysis focuses exclusively on people with mild, moderate or severe/complete limitations; therefore, we can identify some of the barriers and facilitators related to work participation.

In regard to our first research question – In what areas of health and participation do workers and nonworkers with functional limitations differ most? – we found that while two-thirds of people with mild limitations (those not considered to be disabled in our model) report working full time or part time, less than one-third of people with moderate limitations and less than one-tenth of people with severe/complete limitations report working. While both workers and nonworkers report poorer health, greater prevalence of comorbid chronic conditions (hypertension, diabetes, heart problems, breathing problems, joint problems, low back pain, hearing impairment, and visual impairment), and greater psychological distress as severity of limitation increases, nonworkers consistently demonstrate a greater magnitude of poor health, psychological distress, and chronic conditions across virtually all measures in this investigation. Only joint problem, current drinking, and obesity break the pattern. The greatest differences between workers and nonworkers with severe/complete limitation are in

self-reported health, performance of ADLs and IADLs, and use of special equipment. The latter three may serve as proxy measures for severity of disability.

In response to our second research question – How does the level of limitation severity affect differences in health and participation among workers and nonworkers with functional limitations? – we found that those with severe/complete limitations consistently reported poorer health, and people who do not work report the poorest health. Nonworkers with severe/complete limitation had 19.85 times the odds of reporting fair/poor health than nonworkers with mild limitations. Health may encompass a variety of concerns, including comorbidity [46]; pain, fatigue, and weakness [47]; and physiologic reserve [48]. While fewer than 10% of people with severe/complete limitations report working, more than half of those report fair/poor health.

Likewise, severity of limitation is associated with higher levels of psychological distress, particularly so among non-workers with severe/complete limitation, 47.7% of whom report moderate/severe psychological distress using the Kessler Scale. Psychological distress may explain why people do not work [49], and it may threaten the ability to sustain work. The mental health needs of people with disabilities remain largely unrecognized [22], poorly screened, and unaddressed [23]. Few mental health practitioners are trained to address the unique mental health problems of people with disabilities.

Limitation severity was also associated with greater prevalence of chronic conditions, with greater increases among nonworkers. Nonworkers were more likely than their working counterparts to report chronic conditions, except for joint symptoms and low back pain. The effects of chronic conditions are demonstrated in higher prevalence of ADL and IADL limitations, especially among nonworkers. In addition, the high prevalence of chronic conditions, including pain, among workers with severe/complete limitations suggests the fragile circumstances of workers with severe/complete limitations, and mirrors self-reports of poorer health.

The magnitude of self-reported health problems and self-reported psychological distress and the high prevalence of chronic conditions among workers and nonworkers with limitations call attention to the potential for changes in health care, health promotion, and access to health care. Having multiple conditions and poorer overall health is likely to magnify the need to seek medical care [50]. Addressing multiple health conditions and poorer overall health in the face of multiple barriers preventing access to health care may overwhelm the capacity of workers with severe limitations to manage healthcare and work. Drainoni identified multiple barriers to healthcare access for people with disabilities, noting, “Commonly reported areas of difficulty include navigating the health-care and insurance systems; finding knowledgeable providers; accessing specialists; obtaining approvals for rehabilitation services, durable medical equipment, and repair; and coordinating care” [26, p. 103]. Our findings reinforce the magnitude of these barriers.

Marginal improvement in the delivery of health care and mental health care may improve outcomes for workers and nonworkers with functional limitations. Iezzoni measured satisfaction with quality and access to medical care for people with disabilities, and found

that one quarter of those with moderate or major difficulties reported dissatisfaction with information, concern, specialists, availability, ease, costs, location, and telephone consultation [51, p. 371]. High levels of dissatisfaction with quality of care suggest opportunities to improve health care provision and access.

Our findings also reveal the social economic disparities that occur in association with severity of limitation. Decreases in high school completion and income are associated with severity of limitation and are magnified among those who are nonworkers. For example, among workers with severe/complete limitations, nearly three-fifths (61.1%) reported income below \$20,000. Other studies confirm high rates of poverty among working-aged people with disabilities [52], and Kaye notes that “adults with disabilities are employed at much lower levels and on average earn substantially less when they do work, than their counterparts without disabilities” [53, p. 115]. Limited financial resources restrict the capacity of people with severe/complete limitations to purchase adapted equipment and personal attendant services and to make environmental modifications enhancing the capacity to work and engage in social roles.

Within the study of disability, severity of functional limitation is a key concept. Therefore, we propose the FL12 Scale of Functional Limitation Severity to characterize those with mild, moderate or severe/complete limitations. This summary measure aggregates responses to 12 questions from the NHIS consistent with ICF domains to describe severity in three categories. We believe that the FL12 Scale, like the K6 Scale of Psychological Distress, is a consistent, economical measure to portray disability severity. In addition, we employed the ICF as a conceptual framework for this paper. We did so because the ICF model portrays the dimensional experience of disability, and it illustrates the importance of participation in social roles – in this case, work – as a desirable outcome.

Study limitations

Because our data were cross-sectional, we were not able to describe any longitudinal associations. We had considered evaluating trends, but our small cell sizes of people with severe and complete functional limitations from year to year would make the findings very unstable. Our data were self-reported and therefore subject to recall bias in answering the survey questions. We did not know the cause or duration of each respondent’s functional limitations. We could only determine that they had these limitations at a specific point in time.

The FL-12 Scale is new and needs further study to determine its usefulness in estimating severity of functional limitations.

The K6 Scale of Psychological Distress effectively discriminates between cases and noncases of mood disorders among those in the community as defined by the Diagnostic and Statistical Manual of Mental Disorders IV, but it does not allow for identification of many specific diagnostic categories of mental illness.

We have used the ICF to profile a number of health-related domains among workers and nonworkers with functional limitations, including body functioning, limitations in activities,

difficulties with social participation and environmental factors. While the ICF is an established taxonomy for studying disability, functioning, and health, the ICF does not allow for the coding of demographics, specific chronic conditions, and some health behavior practices. Having coding for these domains would provide a richer, more detailed health profile of our targeted population.

Conclusion

In this investigation, we examined workers and nonworkers who experienced mild, moderate or severe/complete functional limitations. By focusing exclusively upon people with functional limitations, we were better able to examine self-reported health, psychological distress, chronic conditions, income support, and other characteristics that contribute to health and participation of workers and nonworkers. In our model, we did not consider people with mild limitations as disabled. Our findings indicated that people reporting moderate or severe/complete limitations reported substantial levels of overall poorer health, psychological distress, and multiple chronic conditions. People who work and have moderate or severe/complete limitations, often do so in remarkably fragile circumstances, situations that threaten their ability to sustain employment. With improved access to health care, health promotion activities, and other support systems, people with moderate or severe/complete limitations might increase the likelihood of improved quality of life and increased work participation.

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Implications for Rehabilitation

- Improving access to health care, health promotion activities, and other support systems may increase the quality of life and likelihood of work participation of people with moderate or severe/complete limitations.
- Specifically addressing health behaviors among workers and nonworkers with moderate and severe/complete functional limitations in the course of rehabilitation may improve both work participation and job retention.
- Workers and nonworkers with mild, moderate, and severe/complete activity limitations exhibit different patterns of health and participation requiring carefully crafted intervention strategies
- Consistent management of chronic health conditions and chronic pain may improve the likelihood of work participation and retention in the workforce among adults with moderate and severe/complete functional limitations.

Table 1

Population estimates for workers and nonworkers with functional limitations.

Level of limitation	N	%	95% CI	Pop. estimate
Workers				
Mild (ICF level = 1)	26,156	66.0	65.4, 66.7	11,340,000
Moderate (ICF level = 2)	2,589	30.8	29.6, 32.2	3,130,000
Severe-complete (ICF level = 3–4)	462	9.5	8.5, 10.6	163,000
Nonworkers				
Mild ^a (ICF level = 1)	14,469	34.0	33.3, 34.6	5,832,000
Moderate (ICF level = 2)	6,318	69.2	67.8, 70.4	2,164,000
Severe-complete (ICF level = 3–4)	4,781	90.5	89.4, 91.6	1,559,000

People who did not respond, refused to respond or those whose responses were missing were excluded from the analysis.

Data source: National Health Interview Survey 2000–2008. Centers for Disease Control and Prevention, National Center for Health Statistics. Available at: <http://www.cdc.gov/nchs/nhis.htm> (Accessed on 16 August 2009).

CI, confidence interval.

^aReference group.

Table II

Demographic characteristics of workers and nonworkers with functional limitations.

Demographics	Mild limitation			Moderate limitation			Severe/complete limitation		
	n	%	95% CI	n	%	95% CI	n	%	95% CI
Workers									
Age									
18-44 years	12,794	62.7	62.0, 63.5	956	50.5	48.0, 52.9	152	44.5	39.0, 50.2
45-64 years	13,362	37.3	36.5, 38.0	1,633	49.5	47.1, 52.0	301	55.5	49.8, 61.0
Sex									
Male	1,086	46.2	45.5, 47.0	741	33.9	31.5, 36.4	127	34.4	29.0, 40.2
Female	1,529	53.8	53.0, 54.5	1,848	66.1	63.6, 68.5	335	65.6	59.8, 71.0
Race & ethnicity									
Minorities	7,528	23.1	22.4, 23.8	903	28.4	26.2, 30.7	175	29.7	25.0, 34.9
Nonminorities	18,628	76.9	76.2, 77.6	1,686	71.6	69.3, 73.8	287	70.3	65.1, 70.0
Education									
High school	10,245	38.0	37.2, 38.8	1,219	44.9	42.7, 47.1	225	47.5	42.1, 53.0
>High school	15,731	62.0	61.1, 62.8	1,370	55.1	52.9, 57.3	237	52.5	47.0, 57.9
Annual income									
<\$20,000	4,888	19.3	18.6, 20.1	715	26.8	24.7, 29.1	171	38.9	33.5, 44.7
\$20,000	18,795	80.7	79.9, 81.4	1,603	73.2	70.9, 75.3	223	61.1	55.3, 66.5
Marital status									
Not married	13,178	51.8	51.0, 52.6	1,470	56.6	54.5, 58.8	282	61.2	55.6, 66.6
Married	12,906	48.2	47.4, 49.0	1,112	43.4	41.2, 45.5	179	38.8	33.4, 44.4
Veteran status									
Had military service	2,593	9.1	8.7, 9.5	230	8.5	7.4, 9.9	35	7.0	4.9, 10.0
No military service	23,537	91.5	90.1, 92.6	2,359	91.5	90.1, 92.6	427	93.0	90.0, 95.1
Region									
Northeast	4,234	16.9	16.0, 17.9	383	14.8	13.1, 16.6	82	18.2	14.4, 22.8
Midwest	7,459	30.0	28.8, 31.2	657	26.3	24.1, 28.6	110	24.6	20.1, 29.6
South	8,643	32.8	31.8, 34.6	1,006	38.5	36.0, 41.1	181	38.1	32.2, 44.4
West	5,820	20.3	19.4, 21.1	543	20.4	18.3, 22.7	89	19.1	14.8, 24.3

Demographics	Mild limitation			Moderate limitation			Severe/complete limitation		
	n	%	95% CI	n	%	95% CI	n	%	95% CI
Nonworkers									
Age									
18–44 years	6,090	57.5	56.5, 58.6	1,840	43.2	41.6, 44.8	1,076	36.3	34.6, 38.1
45–64 years	8,379	42.5	43.5, 52.8	4,478	56.8	55.2, 58.4	3,705	63.7	61.9, 65.4
Sex									
Male	4,938	36.2	35.2, 37.2	2,290	38.6	37.1, 40.2	1,657	38.6	36.7, 40.5
Female	9,531	63.8	62.8, 64.8	4,028	61.4	59.8, 62.9	3,124	61.4	59.5, 63.3
Race & ethnicity									
Minorities	5,414	29.7	28.7, 30.8	2,601	32.4	30.7, 34.1	1,960	31.5	29.7, 33.3
Non-Hispanic whites	9,055	70.3	62.9, 70.3	3,717	67.6	65.9, 69.3	2,821	68.6	67.0, 70.5
Education									
High school	7,963	52.1	51.0, 53.3	4,160	63.8	62.4, 65.3	3,131	64.0	62.4, 65.6
>High school	6,507	47.9	46.7, 49.0	2,168	36.2	34.7, 37.6	1,650	36.0	34.4, 37.6
Annual income									
<\$20,000	4,271	37.5	36.2, 38.9	2,294	48.3	46.3, 50.4	1,723	50.1	47.5, 52.6
\$20,000	5,747	62.5	61.1, 63.8	1,712	51.7	49.6, 53.7	1,126	49.9	47.4, 52.5
Marital status									
Not married	7,380	52.7	51.6, 53.8	3,821	60.9	59.5, 62.8	2,919	59.8	58.1, 61.5
Married	7,019	47.3	46.2, 48.4	2,474	39.1	37.7, 40.5	1,843	40.2	38.5, 41.2
Veteran status									
Had military service	1,479	9.4	8.8, 9.9	674	10.9	10.8, 11.8	490	10.3	9.4, 11.3
No military service	12,970	90.6	90.1, 91.2	5,636	89.1	88.2, 89.9	4,281	89.7	88.7, 90.6
Region									
Northeast	2,454	16.7	15.7, 17.7	1,145	17.3	16.1, 18.5	742	14.6	13.2, 16.2
Midwest	3,431	25.2	23.9, 26.5	1,362	23.0	12.5, 24.5	932	21.0	19.3, 22.9
South	5,205	36.5	35.2, 37.9	2,495	40.8	39.1, 42.6	2,125	46.2	43.9, 48.5
West	3,379	21.6	20.5, 22.8	1,316	18.9	19.5, 22.5	982	18.2	16.6, 19.8

People who did not respond, refused to respond or those whose responses were missing were excluded from the analysis.

Data source: National Health Interview Survey 2000–2008. Centers for Disease Control and Prevention, National Center for Health Statistics. Available at: <http://www.cdc.gov/nchs/nhis.htm> (Accessed on 16 August 2009).

CI, confidence interval.

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Table III

Health characteristics among workers and nonworkers by limitation severity.

Health-related characteristics	Mild limitation			Moderate limitation			Severe/complete limitation			
	n	%	AOR 95% CI	n	%	AOR 95% CI	n	%	AOR 95% CI	
Workers										
Health status										
Excellent/very good (comparison group)	13,780	55.0	1.00	569	23.5	1.00	69	15.8	1.00	–
Good	9,153	33.8	0.75 0.72, 0.79	1,008	38.6	1.99 1.78, 2.22	125	30.4	2.32 1.72, 3.12	
Fair/poor	3,223	11.2	0.36 0.34, 0.38	1,012	37.9	0.75 0.72, 0.79	268	53.8	6.04 4.58, 7.98	
Psychological distress (ICF codes b152–b155)										
None (comparison group)	7,183	52.4	1.00	580	37.4	1.00	60	27.5	1.00	–
Mild	14,143	21.7	1.13 1.08, 1.19	1,072	40.9	0.97 0.86, 1.08	172	57.9	1.83 1.02, 1.87	
Moderate/severe	4,830	25.9	0.70 0.66, 0.75	937	31.7	1.43 1.27, 1.60	230	14.6	3.04 2.27, 4.10	
Income & insurance coverage										
Disability income	253	1.4	0.05 0.04, 0.06	101	3.5	0.19 0.15, 1024	58	14.8	0.92 0.67, 1.26	
Has health insurance coverage	21,956	84.0	1.30 1.22, 1.39	2,064	79.0	0.97 0.84, 1.11	375	83.9	1.28 1.07, 1.77	
Self-care & participation										
ADLs (ICF codes d510–d599)	57	0.2	0.11 0.08, 0.15	45	2.0	1.15 0.77, 1.69	50	13.2	8.80 5.97, 12.98	
IADLs (ICF codes d610–d799)	178	0.7	0.12 0.06, 0.15	164	6.3	1.16 0.94, 1.42	100	24.1	5.95 4.11	
Uses special equipment (ICF codes e115–e129)	702	2.5	0.42 0.37, 0.48	397	15.2	3.28 2.71, 3.84	181	43.2	13.61 10.46, 17.70	
Comorbid chronic conditions										
Hypertension (ICF code b420)	7,507	25.2	0.78 0.74, 0.83	1,106	39.2	1.51 1.35, 1.9	211	44.2	1.85 1.47, 2.33	
Diabetes (ICF codes b450–b455)	1,885	6.2	0.68 0.62, 0.73	357	13.5	1.56 1.34, 1.82	87	17.5	2.01 1.50, 2.70	
Heart problems (ICF codes b410–b429)	2,873	10.2	0.70 0.65, 0.75	470	17.0	1.31 1.14, 1.49	109	22.0	1.80 1.36, 2.37	
Breathing problems (ICF codes b440–b449)	5,026	19.5	0.88 0.83, 0.95	778	30.2	1.52 1.34, 1.73	156	31.7	1.64 1.28, 2.10	
Joint symptoms (ICF codes b280–b289)	14,925	55.3	1.14 1.08, 1.20	1,924	73.4	2.65 2.33, 3.00	360	76.5	3.15 2.33, 4.26	
Low back pain (ICF code b8013)	12,464	48.4	1.09 1.03, 1.15	1,789	68.8	2.56 2.28, 2.87	361	78.2	4.15 3.19, 5.39	
Hearing impairment (ICF code b230)	5150	19.1	1.09 1.01, 1.17	629	23.0	1.53 1.36, 1.73	126	26.5	1.86 1.49, 2.39	
Visual impairment (ICF codes b210–b229)	3820	13.8	0.91 0.85, 0.98	660	23.9	1.72 1.52, 1.95	147	31.0	2.46 1.91, 3.16	
Health behaviors										
Current smoker	7,224	28.5	1.21 1.09, 1.33	814	32.3	1.14 0.99, 1.24	153	33.2	1.26 1.16, 1.36	

Health-related characteristics	Mild limitation				Moderate limitation				Severe/complete limitation			
	n	%	AOR	95% CI	n	%	AOR	95% CI	n	%	AOR	95% CI
Current drinker	18,457	72.7	1.76	1.67, 1.86	1,487	59.6	1.07	0.96, 1.19	212	48.1	0.67	0.53, 0.85
Weight management problem – obesity (ICF code b530) BMI 30	10,204	37.8	1.06	1.00, 1.11	1,297	48.6	1.58	1.42, 1.75	256	57.0	2.21	1.73, 2.21
Looking after one's health – problem with physical inactivity (ICF code d5701)	8,827	31.8	0.82	0.78, 0.86	1,383	52.8	1.88	1.66, 2.10	325	69.9	3.91	2.97, 5.14
Nonworkers												
Health status												
Excellent/very good (comparison group)	5,285	39.0	1.00	–	669	11.6	1.00	–	262	6.2	1.00	–
Good	5,088	35.0	1.00	–	1,584	26.2	2.50	2.26, 2.76	737	16.1	2.93	2.54, 2.40
Fair/poor	4,096	25.0	1.00	–	4,065	62.2	8.21	7.47, 9.03	3,782	77.7	19.85	17.33, 22.80
Psychological distress (ICF codes b152–b155)												
None (comparison group)		26.0	1.00	–	1,279	21.1	1.00	–	688	14.6	1.00	–
Mild		55.2	1.00	–	2,227	35.4	0.94	0.87, 1.02	1,275	37.7	1.01	0.90, 1.13
Moderate/severe		18.8	1.00	–	2,812	43.5	1.91	1.75, 2.07	2,818	47.7	3.72	3.36, 4.13
Income & insurance coverage												
Disability income	2,637	16.4	1.00	–	2,784	42.2	3.57	3.31, 3.85	2,561	51.7	5.32	4.86, 5.82
Has health insurance coverage	11,292	78.4	1.00	–	5,307	84.0	1.61	1.47, 1.76	4,125	86.3	1.93	1.73, 2.16
Self-care & participation												
ADLs (ICF codes d510–d599)	264	1.7	1.00	–	463	7.9	4.94	4.12, 5.93	1,150	24.5	18.87	16.05, 22.18
IADLs (ICF codes d610–d799)	822	5.5	1.00	–	1,374	22.0	4.93	4.44, 5.47	2,098	44.5	14.08	12.60, 15.73
Uses special equipment (ICF codes ee115–e129)	914	5.3	1.00	–	1,781	26.4	6.80	6.05, 7.65	2,615	54.8	23.73	20.94, 26.89
Comorbid chronic conditions												
Hypertension (ICF code b420)	5,153	30.2	1.00	–	3,272	47.7	2.07	1.93, 2.21	2,700	51.5	2.41	2.21, 2.63
Diabetes (ICF codes b450–b455)	1,694	9.6	1.00	–	1,294	18.6	2.10	1.90, 2.33	1,234	24.2	2.84	2.58, 3.13
Heart problems (ICF codes b410–b429)	2,279	13.6	1.00	–	1,764	26.4	2.29	2.10, 2.51	1,602	31.0	2.87	2.61, 3.16
Breathing problems (ICF codes b440–b449)	3,148	22.0	1.00	–	2,069	31.6	1.68	1.54, 1.82	1,824	37.6	2.19	1.99, 2.40
Joint symptoms (ICF codes b280–b289)	7,664	50.8	1.00	–	4,469	69.2	2.25	2.08, 2.44	3,617	74.1	2.86	2.58, 3.18
Low back pain (ICF code b8013)	6,779	46.5	1.00	–	4,198	66.3	2.25	2.07, 2.43	3,586	74.9	3.40	3.08, 3.74
Hearing impairment (ICF code b230)	2,640	15.9	1.00	–	1,577	24.0	1.58	1.43, 1.73	1,375	27.6	1.91	1.74, 2.10
Visual impairment (ICF codes b210–b229)	2,389	15.5	1.00	–	1,750	25.5	1.84	1.68, 2.02	1,599	32.3	2.57	2.33, 2.84
Health behaviors												
Current smoker	4,451	31.1	1.00	–	2,318	37.7	1.26	1.16, 1.36	1,726	36.9	1.14	0.89, 1.48

Health-related characteristics	Mild limitation			Moderate limitation			Severe/complete limitation					
	n	%	AOR	95% CI	n	%	AOR	95% CI	n	%	AOR	95% CI
Current drinker	7,911	57.2	1.00	-	2,676	44.9	0.63	0.58, 0.68	1,632	35.5	0.42	0.38, 0.46
Weight management problem – obesity (ICF code b530) BMI 30	5,622	37.7	1.00	-	3,004	48.0	1.50	1.39, 1.61	2,381	49.2	1.57	1.45, 1.71
Looking after one's health – problem with physical inactivity (ICF code d5701)	6,128	39.3	1.00	-	4,195	66.0	2.86	2.65, 3.10	3,832	79.2	5.76	5.19, 6.39

People who did not respond, refused to respond or those whose responses were missing were excluded from the analysis.

Data source: National Health Interview Survey 2000–2008. Centers for Disease Control and Prevention, National Center for Health Statistics. Available at: <http://www.cdc.gov/nchs/nhis.htm> (Accessed on 16 August 2009). (–), Comparison group for health status and psychological distress in logistic regression analyses.

AOR, adjusted odds ratio; CI, confidence interval.

Reference group: nonworkers with mild limitations.