DISABILITY, EARNINGS, INCOME AND CONSUMPTION

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ABSTRACT

Using longitudinal data for 1968-2009 for male household heads, we determine the prevalence of pre-retirement age disability and its association with a wide range of outcomes, including earnings, income, and consumption. We then employ some of these quantities in the optimal social insurance framework of Chetty (2006) to study current compensation for the disabled. Six of our findings stand out. First, disability rates are high. We divide the disabled along two dimensions based on the persistence and severity of their work-limiting condition. We estimate that a person reaching age 50 has a 36 percent chance of having been disabled at least temporarily once during his working years, and a 9 percent chance that he has begun a chronic and severe disability. Second, the economic consequences of disability are frequently profound. Ten years after disability onset, a person with a chronic and severe disability on average experiences a 79 percent decline in earnings, a 35 percent decline in after-tax income, a 24 percent decline in food and housing consumption and a 22 percent decline in food consumption. Third, economic circumstances differ sharply across disability groups. The outcome decline for the chronically and severely disabled is often more than twice as large as that for the average disabled head. Fourth, our findings show the partial and incomplete roles that individual savings, family support and social insurance play in reducing the consumption drop that follows disability. Fifth, time use and detailed consumption data further indicate that disability is associated with a decline in well-being. Sixth, using the quantities we have estimated, we provide the range of behavioral elasticities and preference parameters consistent with current disability compensation being optimal within the Chetty framework.

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An online appendix is available at:
http://www.nber.org/data-appendix/w18869

1. Introduction

This paper examines the lifetime prevalence of disability and how the disabled fare before and after the onset of disability. Disability is one of the main risks individuals face during their lifetime. The Social Security Administration (SSA) estimates that a twenty year old worker has nearly a 30 percent chance of becoming disabled before reaching age 65.[1] Disability is also one of the primary reasons for public insurance spending. In 2006, Social Security Disability Insurance (SSDI) payments equaled $92 billion and the share of Supplementary Security Income (SSI) for the blind and the disabled was $36 billion.[2] Private spending on the disabled was also high, with $55 billion spent on Workers' Compensation in 2005.[3] Looking forward, Autor and Duggan (2006) predict that the SSDI receipt rate will rise 71 percent before reaching a steady state rate of approximately 7 percent of non-elderly adults.

Despite high disability rates and high costs, there are major gaps in our understanding of the economic consequences of disability. The dynamic nature of disability calls for longitudinal measures that reflect its persistence and prevalence over an individual's lifetime. To date, however, few studies examine the long-term economic circumstances of the disabled.[4] Our study aims to bridge this gap in the literature.

This information is needed to design and evaluate disability policies. In the framework of Chetty (2006), optimal disability benefits depend on the fall in consumption with disability, the frequency of disability, and the moral hazard effects of disability benefits (as well as utility function parameters).[5] While there is an extensive literature on the moral hazard effects of disability,[6] we have less information on lifetime disability rates and the fall in consumption with disability. This framework, which guides our analyses, also emphasizes

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[1] See Baldwin and Chu (2006) who also estimate that the probability of receiving Social Security Disability Insurance by age 67 is 38 percent for men and 31 percent for women.

[2] Specifically, the federal government spent $33 billion on SSI for the blind and the disabled (age 0-64), while another $3 billion was spent in state supplementation (U.S. Social Security Administration 2007).

[3] See Sengupta et al. (2007). The $55 billion includes payments for medical treatment and cash benefits.

[4] Important past work on this topic includes Haveman and Wolfe (1990) who study the difference between the incomes and earnings of the disabled and non-disabled using the Current Population Survey. Bound and Burkhauser (1999) also compare earnings of the disabled and the non-disabled. Bound and Waidman (2002) look at employment rates among the disabled. Charles (2003) examines earnings, hours and wages after disability. Stephens (2001) analyzes some of these outcomes as well as food consumption. There is also related work by Rupp and Davies (2004) and others.

[5] Other important research that examines the adequacy of insurance for disability includes Chandra and Samwick (2005) and Low and Pistaferri 2010).

[6] See for example, Parsons (1984, 1991), Haveman and Wolfe (1984a, b), Bound (1989, 1991), Gruber (2001), Black et al. (2002), and Autor and Duggan (2003).

that even though disability is endogenous, the endogenous *rate* of disability and the accompanying fall in consumption are among the most important features to measure when assessing the optimality of disability compensation.

Our study differs from the literature in several ways. First, by using 42 years of longitudinal data from the Panel Study of Income Dynamics (PSID) we are able to estimate the risk of disability over a household head's lifetime. Second, we comprehensively examine the economic circumstances of the disabled: we investigate changes in earnings, income, public transfer receipt, poverty rates, work hours, employment, food consumption, housing consumption, home production, and leisure time.[7] In taking this wider view, we obtain a better picture of the well-being of the disabled. Third, our estimates account for public transfer under-reporting, an issue that can lead researchers to overestimate the income decline as well as the poverty rate of the disabled. Fourth, we go beyond a uniform characterization of the disabled by dividing the population based on a disability's duration (persistence) and severity. We then examine the lifetime prevalence of and changes in welfare from different degrees of disability. To our knowledge, almost all previous economic studies have examined the disabled as a single homogeneous group or only along a single disability dimension – persistence or severity. Fifth, going beyond theoretical discussions of benefit optimality in the literature, we quantitatively examine the implications for optimality of estimated disability rates and changes in consumption in the Chetty framework.

This study has many findings. First, disability rates are high. A male household head reaching age 50 has a 36 percent chance of having been disabled at least once during his working years and about a 22 percent chance of experiencing a chronic disability that lasts at least four years. We also estimate that by age 50, about 9 percent of male household heads have begun a chronic and severe disability. By age 56, that number rises to 15 percent

Second, disability is associated with bad economic outcomes. Ten years after disability onset, those with a chronic and severe disability condition have on average seen their earnings drop by 79 percent, their after-tax income drop by 35 percent, their family food and housing consumption drop by 24 percent, and their consumption of food alone fall by 22 percent. In addition, about two-thirds of these most disabled individuals never return to work in the long run. Third, there are sharp outcome differences across disability groups; those with chronic and severe disabilities often experience a percentage decline in these economic outcomes more than twice as large as those of the average disabled.

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[7] Our companion paper, Meyer and Mok (2012), focuses on earnings, income and public benefit receipt.

Fourth, our findings indicate the partial but incomplete roles that individual savings, family support, and government and private insurance play in reducing the consumption drop that follows disability. Despite the various government programs available, the incomes of one-sixth of families with a chronically and severely disabled head drop below the poverty line in the long term, even after accounting for in-kind transfers and the under-reporting of benefits. Fifth, we find a noticeable fall in earnings and income prior to the onset of a reported disability. Consumption also falls somewhat prior to reported onset, indicating that future disability is partially but incompletely predictable in the short run.

Sixth, recent research suggests that the dollar expenditures of the retired may understate their true consumption because they get more for their money through increased shopping and home food preparation (Aguiar and Hurst 2005). Evidence from time-use surveys does not suggest that the disabled and their spouses do more shopping. We also find that instead of working more on food and other home production, the disabled spend more time using medical services, watching television, relaxing, and sleeping. Together these findings suggest a true decline in material well-being after the onset of disability, especially for those who are more disabled. To further assess our finding that consumption declines following disability, we examine food surveys and find suggestive evidence that the diet of the disabled is worse than that of the non-disabled in many dimensions.

Seventh, we use our estimates in the Chetty (2006) optimal benefit formula that balances insurance against moral hazard. We find the set of behavioral elasticities and utility function parameters consistent with the current compensation for the most disabled being optimal. While the values of the key risk preference parameters that are not settled in the literature, there is a substantial range over which current compensation is lower than is optimal.

The rest of the paper is organized as follows. Section 2 describes our dataset and sample, and how we define and categorize the disabled. This section also discusses lifetime prevalence of disability, and outlines the empirical strategy for the rest of the paper. Section 3 examines the change in earnings and employment following disability onset. Section 4 examines the fall in income following disability onset, the rise in poverty and public transfer receipt. Section 5 summarizes the changes in consumption of food and housing. Section 6 discusses a series of robustness checks, revisits the change in food consumption and considers the time use of the disabled. Section 7 outlines the Chetty model of optimal social insurance and examines the optimality of current provisions for the disabled in this

framework, while Section 8 concludes. The appendices include additional results concerning the impact of disability on food quantity and quality, as well as the usage of time.[8]

2. Data, Categorizing the Disabled and the Prevalence of Disability

A. Data

We use the PSID, a longitudinal dataset begun in 1968 with an initial sample of about 4,800 U.S. households and 18,000 individuals. The initial sample had two components, both of which we use: a nationally representative sample (Survey Research Center sample) and a national sample of low-income families (Survey of Economic Opportunity sample). The latter group included about 1,800 households.

Households were interviewed annually between 1968 and 1997, and biannually since then.[9] Children in sample households are followed as they leave and form their own families. Since the survey's initial focus was the dynamics of poverty, questions are asked about benefits received, work hours, earnings, income, health, and other outcomes. A particularly attractive feature of the PSID is that it collects information on housing and family food expenditures, variables that are available in few other microeconomic surveys. Many authors have used this particular feature to measure the material well-being of individuals. As of 2009, the PSID has collected information on 71,285 individuals.

In this study, we use the entire PSID panel, beginning with 1968 and continuing through the 2009 wave. Most of our analysis focuses on male household heads who are 22-61 years old in the survey year.[10] We focus on those 22 and older because those below this age are unlikely to be household heads. The choice to focus on male household heads is necessary because the PSID did not ask disability questions of spouses until 1981. The PSID defines the household head in a married couple family to be the male, except when he is so

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[8] The appendices can be accessed online at http://harrisschool.uchicago.edu/directory/faculty/bruce_meyer

[9] Some data are available for intervening years. For example, the 1999 survey asked about both 1998 and 1997 earnings.

[10] We retain any data on disability for people outside this age range because it may be useful in determining the persistence or severity of an individual's disabling condition. As we will explain later, the degree of persistence is determined based on the frequency of positive limitation reports after disability onset. Thus, ignoring information after the age of 61 may lead to an individual being misclassified, especially if his age of disability onset is close to 61. Similarly, the onset age cannot be correctly determined if we exclude all data outside the age range. For example, a person whose disability began at age 18 could have his onset age mistakenly set to 22 if we disregard the responses to the disability question outside the age range.

severely disabled that he is unable to respond to the survey. In order to assure sufficient information about the variables of interest, we select male household heads who are interviewed for at least six years and who are 22-61 years old for at least four interviews, three of which are consecutive.

B. Disability Questions, Limitations and Severity

The main disability question in the PSID is, "*Do you have any physical or nervous condition that limits the type or amount of work you can do*?" This question is asked of household heads consistently throughout the life of the survey.[11] After determining the presence of a work-limiting condition, a severity question asks the extent that this condition limits the work capability of the head. We group the responses to this question into two categories: "Severely Disabled" and "Not Severely Disabled." We define **Not Severely Disabled in Year t** to be those who respond "Just A little," "Somewhat," "Not Limiting," or "Not at all" to the severity question in the year t survey. **Severely Disabled in Year t** are those who respond "Can do nothing," "Completely," "A lot," or "Severely."

Table 1 tabulates the unweighted and weighted disability rates for male household heads aged 22-61 during the 1968-2009 period. These rates are usually between 11-15 percent and are comparable to those found by Burkhauser et al. (2006).[12] The table also reports the share of the disabled with a severe disability. The fraction of the disabled classified as severe is usually about one-third. However, during the 1977-1985 period the possible responses to the severity question in the survey were more limited, apparently leading to a higher fraction of respondents indicating that their condition limited their work capability "A lot."[13] We have investigated the sensitivity of our disability rates and outcomes to reduced reliance on these years, and have found only small impacts given the averaging over time and classification system we use, as discussed in the Appendix.

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[11] In the period 1973-1975, this disability question was asked only of new entrants to the survey. We assume the disability status of these new entrants has not changed until the 1976 survey.

[12] These authors find that PSID disability rates are higher than those in the March CPS, but are generally lower than those found using the Survey of Income Program Participation (SIPP) or the National Health Interview Survey (NHIS).

[13] See the data appendix (Appendix 3) for the exact wording of the question in different periods. No severity question was asked during 1969-1971.

C. Self-Reported Disability and its Validity

1) Self-Reported Disability Status

Many researchers have argued that self-reported disability status is the preferred way to define disability given that a large share of disabilities, even those compensated by SSDI, cannot be determined by an explicit physical marker (because they are psychological or driven by pain).[14] Other authors question the validity of self-reported disability status and choose to focus instead on those who receive benefits such as SSDI or SSI.[15] Such an approach is not without its limitations, however. First, some disabled individuals may not file for SSDI or SSI because of the paperwork and the requirement that the disabling condition is expected to last for at least 12 months. Others may be unwilling to receive government benefits or if they do, they may omit reporting them in surveys. Second, not all disabled individuals will meet these programs' qualifications. For example, SSDI requires the applicant to have worked sufficiently during the years prior to disability,[16] and SSI has a stringent asset limit. SSDI and SSI benefits are unavailable to those who earn above certain amounts despite their disabilities. In 2006, an SSDI recipient could not earn more than $860 after a trial period, and SSI recipients had their monthly benefits reduced by 50 percent of the amount of any monthly earnings above $85 (U.S. Social Security Administration 2006). Third, the denial of an SSDI or SSI application does not necessarily imply that an individual is not disabled (Nagi 1969; Bound 1989), as indicated by the high acceptance rates for those who appeal denials (Benitez-Silva et al. 1999 report that in 1993, of the 48 percent of denied SSDI claimants who requested reconsideration, 50 percent were accepted).[17]

Past research, however, has also pointed out the merits of self-reported disability measures. Benitez-Silva et al. (2004) suggest that self-reported disability responses are an unbiased indicator of SSDI eligibility decisions. Stern (1989) finds that a self-reported disability question is close to exogenous. To the extent self-reported disability was endogenous, the relationship was the opposite of what had been hypothesized in the literature

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[14] Autor and Duggan (2006) report that more than half of SSDI awards in 2003 were for either mental disorders or musculoskeletal disorders (e.g. back pain).

[15] See Bound et al. (2007), Kreider and Pepper (2007), and Kreider (1999) for discussions of the limitations of self-reported disability.

[16] Only about 80 percent of working age individuals are insured by SSDI (Autor and Duggan, 2006).

[17] Bound (1989) suggests that many rejected SSDI applicants are in fact incapable of work. Citing the study by Nagi (1969), Bound states: "Of the population denied benefits, 35.6 percent were found incapable of any work, and another 12.3 percent were only capable of work at home or in sheltered environments." In addition, Bound cites the study of Treitel (1976), which suggests that many rejected applicants did not work despite the SSDI denials. Using administrative follow-up records, he shows that 13.8 percent of those denied benefits in 1967 died within the next six years.

(i.e. health tended to deteriorate when working rather than disability being used to justify not working). In their comparison of the Current Population Survey (CPS) and the National Health Interview Survey (NHIS), Burkhauser et al. (2002) argue that the self-reported work-limitation-based definition of disability may even underestimate disability rates. Given that alternative definitions have their own endogeneity problems or are often too narrow, we believe that self-reported disability status responses, while not perfect, offer the best available method of measurement.[18]

2) Self-Reported Severity

The main difficulty in using self-reported disability severity responses is that they are necessarily subjective. One may argue that more objective measures, such as the number of everyday tasks the individual has difficulty with, should be used instead (see Bound 1989). For example, the Census Bureau partly bases its definition of *severely disabled* on how many Activities of Daily Living (ADL), Instrumental Activities of Daily Living (IADL) and functional activities an individual cannot perform.[19] Surveys such as the PSID or the CPS, however, do not ask these questions on a regular basis.

The PSID asked questions about physical limitations and specific medical conditions diagnosed by a health professional in 1986, and the 1999-2009 surveys. In Appendix 1, we provide extensive comparisons of our disability measures to these measures of health limitations. We show that the severely disabled group in our sample has on average much greater numbers of physical and health limiting conditions, as well as more serious forms of these conditions, relative to the non-severe group and the non-disabled. For example, the average number of activity limitations (difficulty walking, bending, driving, etc.) is 2.74 for the Severe group, 1.15 for the Not-Severe group and 0.11 for the non-disabled. The average number of doctor diagnosed severe health conditions (high blood pressure, diabetes, asthma, etc.) is 1.17 for the Severely disabled, 0.19 for the Not-Severely disabled and 0.01 for the

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[18] Bound (1991) argue that there are biases in both self-reported and objective measures and that the biases from the endogeneity of and measurement error in self-reported health measures tend to cancel each other out.
[19] Specifically, using the Survey of Income and Program Participation (SIPP), the Census Bureau (McNeil 2001) defines severe disability using the following criteria: 1) The person used a wheelchair, a cane, crutches or a walker, 2) The person had any other mental or emotional condition that seriously interfered with everyday activities, 3) The person received federal benefits based on an inability to work, 4) The person had Alzheimer's disease, 5) The person had developmental disability or mental retardation, 6) The person was unable to perform or needed help to perform one or more of the functional activities, ADLs or IADLs, 7) The person was unable to do housework, 8) The person was in the age range 16-67 and had a condition that made it difficult to work at a job or business. A person who falls in any one of the above criteria is considered to be severely disabled.

Non-Disabled. These results strongly indicate that self-reported disability severity captures important features of the true severity of individual disabilities.

D. Sample Construction

Our focus is on disabilities that begin during the working years; accordingly, we exclude those whose onset age is under 18 or above 56.[20] In order to have sufficient information after onset, we require that a disabled individual in our sample be in the survey for a minimum of three years during the ten years after onset. This restriction is important to determine the disability persistence and severity groups (which we introduce in Section E below). Due to the restrictions that we impose in selecting our sample, we slightly understate the extent of work limitations, as discussed further below. We replace missing demographic information (age, marital status, years of education, number of family members, number of children and state of residence) by the non-missing value in the nearest wave. We exclude, however, individuals who are missing key demographic variables (education, age and marital status).[21]

Determining the year of limitation onset for the disabled requires combining information from multiple years of data. A valuable feature of the PSID is a retrospective question on when a work limitation began that is available for the 1969-1978 waves (except 1976 and 1977). For those disabled on or before 1978, we use the responses to this question to determine their year of onset.[22] For those who first report having a disability after 1978, we require that such individuals report no limitations in the two consecutive survey years immediately prior to the year in which they first report having a work limitation.[23] The application of these restrictions results in a primary sample of 6,741 male household heads, 1,937 (29 percent) of whom are classified as ever disabled.

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[20] Our main estimation sample includes the person-year observations prior to disability onset for those who became first disabled after age 56 as they enter disability rates and are part of the implicit comparison group for the disabled.

[21] We exclude 117 individuals (1.2 percent of the main estimation sample) because key demographic information is unavailable.

[22] Some individuals may have more than one response due to the panel nature of the data. Because the possible responses to these questions were coded in intervals (except in the 1978 survey, when the exact number of years is given), we determine the intersection of the intervals given by these questions and take the earliest year within the intersection as the year of disability onset.

[23] For example, if an individual first reports having a limitation in 1980, then the year of onset would be 1980 if he has no limitations in 1978 and 1979. Since there is only one survey per year, we also adjust the year of onset by determining the midpoint in time of adjacent interviews. See the data appendix.

E. Categorizing the Disabled

Besides determining how the disabled fare around disability onset, we examine how economic outcomes evolve for different types of disabilities. We divide the extent of disability along two dimensions: persistence and severity.

We divide the disabled into three persistence groups, building on Charles (2003). The **One-Time Disabled** are those who report a disability once, but do not report a disability again during the next ten years. The **Temporarily Disabled** are those who have one or two positive limitation reports within the ten years after disability onset. Thus, including the onset report, a temporarily disabled individual will have at most three positive limitation reports through the tenth year after onset. The **Chronically Disabled** are those who have three or more positive limitation reports during the ten years after disability onset. To reduce the dependence of the definition on time in survey, we use all the survey waves and require that a disabled individual be in the survey for at least three years within the ten years after onset.[24]

The severity questions are asked nearly every year of reported disability, giving us multiple reports. We rely on average severity throughout the paper.[25] Specifically, we define the **severity ratio** as the fraction of the time the individual reports he is severely disabled in the year of onset and the subsequent ten years after onset.[26] We then define the **Severely Disabled** to be those whose severity ratio is greater than 0.5. In the case where exactly half of the responses indicate severe disability (a severity ratio of 0.5), we classify the disabled head based on the first severity report.[27]

We combine the two disability dimensions in our main analyses by splitting the Chronically Disabled into two groups. Hence, this classification yields four groups of

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[24] If we require more than three (four to six) post-onset positive limitation reports to be in the chronic group, the results are very similar. Our disability persistence classification differs from that of Charles (2003), who defines his most chronically disabled group to be those who report a positive limitation in every year after onset (as long as they are in the survey). Thus, in his classification system, whether an individual is chronic partly depends on the number of years an individual is in the survey, and his use of a shorter panel (1968-1993) increases this dependence. Thus, a disabled person is more likely to be in the most chronic group the closer his year of onset is to 1993.

[25] The results are similar if we use only the initial severity report.

[26] 22 individuals in the main analyses are dropped who never respond to the severity question in this 11-year period (year of onset and the subsequent 10 years).

[27] Of the 1,937 disabled, 109 have a severity ratio of 0.5. Of the 877 chronically disabled individuals, only 43 have a severity ratio of 0.5.

interest – **One-time, Temporary, Chronic-Not Severe and Chronic-Severe**, which we collectively call the **Extent of Disability groups**.[28]

To further motivate the need for a multiyear definition of disability and to summarize the dynamic nature of disability status, Table 2 reports a modified second-order Markov transition matrix for disability group. A given row conditions on disability status (non-disabled, Currently Not Severely Disabled, Currently Severely Disabled) during the previous two years. The probability of the various outcomes over the next two years are then reported. The results indicate both patterns of mobility and persistence, depending on past history. We see that there is strong persistence over time in disability status for those who are non-disabled or Severely Disabled in two consecutive years. There is a 0.97 probability that someone non-disabled for the past two years will be non-disabled this year, and the probability is 0.95 next year. However, someone Severely Disabled the past two years has a 0.80 probability of being severely disabled this year and a 0.73 probability of being severely disabled next year. Among those becoming severely disabled who were previously non-disabled, future disability status is fairly uncertain. It is almost equally likely that they will be in any of the three states the following year. Table 3 reports the descriptive statistics for the extent of disability groups. Of the 1,937 disabled individuals, 465 (24 percent) are One-Time disabled, 595 (31 percent) are Temporary disabled, 548 (28 percent) are Chronic-Not Severe and 329 (17 percent) are Chronic-Severe. The average age at disability onset is highest for the Chronic-Severe group (41.7 years), followed in descending order by the Chronic-Not Severe group (37.0 years), the Temporary group (35.6 years) and the One-Time group (35.7 years). The Chronic-Severe group is also the least educated group – only 19 percent have ever attended college; by comparison, 46 percent of the One-Time group have attended college.

Members of each of the four disabled groups have participated on average in the survey for at least 10 years after disability onset, though the Chronic-Not Severe participated on average 6.3 more years than the One-Time group. It is also encouraging to see that all four disabled groups have participated in a similar number of surveys, at least 17 on average. This similarity in years in the survey, especially after onset, should reduce any concerns that the One-Time group members are categorized as such because they are more likely to have exited the survey after disability.

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[28] In principle, these four groups are not fully ordered. We cannot say, a priori, that the Chronic-Not Severe group is "more disabled" than the Temporary group. In practice, though, the Chronic-Not Severe group fares much worse than the non-chronic groups, as we see in our analyses.

In much of the paper, we focus on the Chronic-Severe group. While this group is defined in a restrictive way, it still includes a much smaller share of a given age group than is receiving Social Security disability payments as we will see shortly. Members of the Chronic-Severe group have more persistent disabilities on average than the Chronic-Not Severe group. The Chronic-Severe group reports a mean of 6.2 positive limitation reports within ten years after disability, while the Chronic-Not Severe group reports a mean of 5.4. The average severity ratio of the Chronic-Severe group (0.84) is almost seven times that of the Chronic-Not Severe group (0.12).

F. Disability Rates and Lifetime Prevalence

We saw in Table 1 that roughly one in seven male household heads experiences a work limitation in a given year. However, the statistic that more naturally feeds into calculations of the insurance value of disability insurance is the probability that a person becomes disabled some time during his working life.[29] With data currently spanning 42 years, the PSID is ideally suited for this calculation. We define the **lifetime prevalence of disability** as the probability that an individual becomes disabled during his working years by a given age. We calculate this measure for all ages 28-64. For this purpose we use the information on disability reports and severity in a rolling ten-year-ahead window to classify an individual's current disability for each survey year. Accordingly, this measure fully accounts for the potential worsening of a condition over time. We then classify individuals by the most serious form of disability ever experienced, ranking the disability types in increasing order of seriousness as follows: One-Time, Temporary, Chronic-Not Severe and Chronic-Severe. In these analyses, we use sample weights to better approximate U.S. averages.[30]

As the number of years after 1968 increases, so does the number of years of past information in the PSID. In addition, we use up to ten years of future information on persistence and severity to classify a person's current condition. Thus, in order to have the best data to summarize disability histories, we focus on those individuals in the survey's middle years (1980-1992) who have been in the survey for at least ten prior years. Using the survey's initial waves would understate the prevalence rate because we do not have

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[29] The information relevant in a full life-cycle model of insurance might be more extensive, including probabilities of disability at each age, the duration of the disability or the probability of recovery, the change in consumption, and any effects on the mortality rate.

[30] We use the current year weights in these analyses. Using the initial year weights (the first observed weight in the 1980-90 window) yields almost identical percentages.

information about the individual prior to 1968 and many will have had a disabling condition well before the PSID began.[31] By contrast, using the most recent years would not give us the full ten years of data after onset to classify a given disability.

We first report the chance of experiencing disability by the time an individual reaches a given age in Table 4 for the 1980-1992 subsample.[32] Not surprisingly, the chance of experiencing disability rises with age. By the time a person reaches age 50, there is a 36 percent chance that he has experienced some kind of disability during his working years. In particular, there is a 9 percent chance that an individual has ever experienced a Chronic-Severe disability by that age. The corresponding rates for One-Time, Temporary and Chronic-Not Severe disabling conditions are 6 percent, 7 percent and 13 percent. The rise in the prevalence of Chronic-Severe disability with age is steep. The chance of ever experiencing a Chronic-Severe disability approximately triples between age 40 and age 50. Between age 50 and age 60 the probability nearly doubles again. The rates of chronic-severe disability tend to be about twice as high as the SSDI receipt rates by age indicated in SSA data. Despite a broader definition than SSDI eligibility, we will see that the Chronic-Severe group fares very poorly.

In the Appendix we examine changes in disability prevalence over time. Our most sophisticated analyses that account for definitional and sample changes, suggest only a modest decline in disability rates over time.

H. Empirical Methodology

To measure the change in economic outcomes associated with disability, consider the following fixed effect model for person i in year t:

$$(1) \quad y_{it} = \alpha_i + \gamma_t + X_{it}\beta + \sum_g \sum_k \delta_k^g A_{kit}^g + \varepsilon_{it},$$

where y_{it} is the outcome of interest (such as hours worked) for person i in year t, α_i is an individual fixed effect and γ_t is an indicator variable for year t. X_{it} is a set of time-varying explanatory variables including marital status, state of residence, age and age-squared,

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[31] Recall that the retrospective question was asked only if an individual was disabled at the time.
[32] These prevalence rates may still be understated because of sample attrition and because the PSID does not interview the head if he is totally incapacitated. We have examined the reasons for attrition and find that the main causes are refusal and death, with total incapacitation accounting for less than 5 percent of all attrition. See the Appendix for further discussion.

education, and number of children. Additional controls are included, depending on the dependent variable.[33] A_{kit}^g is an indicator variable that equals one if in year t, individual i belongs to disability group g and he is *k* years from the year of onset, and ε_{it} is a potentially serially correlated error term.

The sample for our analyses consists of the nondisabled and the disabled during all years prior to disability onset through the ten years after onset. Throughout this study, we focus on a set of outcomes five years before and ten years after the year of disability onset, thus $k \in \{-5, 10\}$. Given the inclusion of individual fixed effects, δ_k^g measures the change in the dependent variable k years away from the year of onset for those in disability group g relative to the value of their dependent variable more than five years prior to disability. The non-disabled are included to improve the precision of the estimated effects of age, education and the other control variables. This way of modeling the time pattern of economic outcomes is similar to the approach of Jacobson, LaLonde and Sullivan (1993), Stephens (2001) and Charles (2003).

Specification (1) is attractive for some dependent variables, but in other cases we may be interested in percentage changes in the dependent variable and may believe proportional effects of explanatory variables are more natural that additive effects. Although one can transform specification (1) into a log-linear form, by replacing the dependent variable y_{it} by *log (y_{it})*, this method however is not suitable if a large number of observations on the dependent variable are zero. As we will show, many disabled men have zero earnings because they do not work at all. Defining a lower cutoff (that is, *log (y) = log (a) for y<a*) is also not ideal, as the estimates may be sensitive to this cutoff. We therefore consider the Poisson fixed effect regression model:

$$(2) \quad y_{it} = \exp(\alpha_i' + \gamma_t' + X_{it}\beta' + \sum_g \sum_k \delta_k'^g A_{kit}^g) + \varepsilon_{it}'$$

where the coefficients of interest can be estimated by conditional maximum likelihood methods. Modeling in this way allows us to keep observations with zero outcomes.

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[33] The number of members in the family is included in the income regressions. For earnings, hours, hourly earnings and income, we also include interactions of education with age, age-squared and time since 1968. For the food and housing consumption regressions, variables for the numbers of family members of different genders and ages are also included. For more details, see the data appendix (Appendix 3).

Estimated percentage change in the outcome of a one-unit change in the dependent variable can be obtained simply as *exp(b)-1*, where *b* is the estimated coefficient of interest.[34]

We estimate model (1) if our interest is how disability affects the *level* of the outcome (such as hours of work, receipt of public transfers), whereas we estimate model (2) if we are interested in knowing how disability affects the *percentage change* of the outcome (such as earnings, income, food and food plus housing consumption). Standard errors are clustered by person.[35]

In our analysis, all monetary values are reported in 2010 dollars, adjusting for inflation using the Consumer Price Index Research Series using Current Methods (CPI-U-RS).[36]

3. Employment and Earnings Following Disability

We first focus on labor supply and investigate the changes in annual earnings, annual hours worked, the probability of working and the hourly wage during the five years before and ten years after disability onset.

A. Earnings

With many disabled having zero earnings and zero hours of work following disability, using Poisson regression to estimate the effect of disability on earnings is a better choice.[37] Table 5 shows the results of estimating equation (2) for the disabled as a whole. The results for annual earnings are reported in column 1 (estimated coefficient) and column 2 (the corresponding implied percentage change). These percentage changes are also displayed in Figure 1. Annual earnings decline rapidly around the year of disability onset, falling about 8.4 percent by the year prior to onset and 13.9 percent by the year of onset, relative to the years more than five years prior to onset (that is, $k < -5$, where $k = 0$ in the year of disability onset).   This decline continues over the next two years, reaching about 20 percent.   The

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[34] A poisson regression differs from the standard log-linear model in one important way. The former estimates *log E(y|x)* while the latter estimates *E[log(y|x)]*.
[35] Note that we do not impose the Poisson variance assumption.
[36] See the data appendix (Appendix 3).
[37] Charles (2003) analyzes outcomes in logarithms, omitting observations with zero values and includes a selection correction term (inverse Mill's ratio).

earnings drop remains at around this level through the ten years after onset. These results are very similar to those of Stephens (2001).[38]

The change in average earnings for all disabled heads hides great heterogeneity across the Extent of Disability groups. Figure 1 also shows each disability group's implied percentage change in annual earnings (the full set of estimates are shown in Appendix Table 4). Not surprisingly, earnings drop the least after disability for the One-Time and Temporary groups. For the One-Time group, they fall 7.3 percent by the year of onset. By the fifth year after onset, the decline reaches about 12.3 percent. In the second five year period (six to ten years after disability onset), annual earnings drop about 10 percent.[39] While many of the single-year differences in earnings from the base period for the One-Time group are substantial and statistically significant, by years 9 and 10 the effects are much smaller and not statistical significant. As one might expect, a short-lived disability does not greatly affect an individual's earning ability in the long run.

A slightly different pattern emerges for the Temporary group. Earnings have dropped 11 percent by the year of onset and 14.5 percent by the year after onset. By the third year after onset, the earnings drop has shrunk to about 9 percent. The estimated percentage decline in later years are about 8 percent but the estimates are statistically indistinguishable from zero.[40]

For the Chronic-Not Severe group, earnings drop about 17.3 percent by the year of disability onset. This decline in earnings continues through the following ten years; by the tenth year after disability onset, it reaches almost 30 percent.

The decline in the earnings of the Chronic-Severe group is especially large. The coefficient estimates and the corresponding implied percentage changes are reported in columns 1 and 2 of Table 6 respectively. By the year of onset, earnings fall 36.5 percent. In the following year, they fall an additional 23 percentage points, resulting in a cumulative loss of about 59 percent. This downward trend continues, and by the tenth year after onset,

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[38] Stephens (2001) finds that disabled individuals experience a decline in annual earnings of about 10 percent during the year of onset and experience a long-term loss in annual earnings of about 22 percent. Both our results and those of Stephens's are not comparable with those of Charles (2003) because the analyses in Charles exclude those with zero earnings. As we summarize in Mok, Meyer, Charles and Achen (2008), we are unable to reproduce results in Charles (2003).

[39] These estimates are obtained by estimating the model with four time groups instead of the 16 years from onset indicator variables. The four time groups are $k = -5$ to $k = -2$, $k = -1$ to $k = 1$, $k = 2$ to $k = 5$ and $k = 6$ to $k = 10$, where k is the year from onset.

[40] An F-test of the null hypothesis that all estimates after $k = 5$ are zero has a p-value of 0.72, hence the null hypothesis cannot be rejected.

earnings have dropped by about 76 percent. Such a drop is more than tripled that of the average disabled. As we will see, this pronounced drop is due to the high fraction of people who work zero hours after disability.

A closer examination of the two chronic groups suggests that they both experience a decline in earnings prior to disability onset. By the year before onset, earnings of the Chronic-Not Severe group and the Chronic-Severe group drop 11.4 percent and 19.4 percent, respectively. It seems likely that a person experiencing a decline in his earnings ability would hesitate to call himself disabled initially, but would be more willing to do so after a condition persisted.

B. Hours of Work and Employment

In this subsection, we examine how annual hours of work and employment change with disability. We estimate model (1) for hours since the estimated coefficients represent changes in the level of annual hours which are easily interpreted. Column 3 of Table 5 shows the changes in annual hours of work of the average disabled, and Figure 2 depicts these changes. Similarly, column 4 reports the percentage of the average disabled working zero hours; these results are displayed in Figure 3. By the year of onset, annual hours of work are estimated to decline about 250 hours for the average disabled, with about 6 percent of this population not working during the year. By the following year, the drop increases to 370 hours with about 13 percent of the disabled not working. From then on, the change in annual hours of work remains roughly flat, but the percentage of the disabled who work zero hours continues to rise. In the long term (six to ten years after disability onset), almost one-fifth of the average disabled do not work at all during the year.

Figures 2 and 3 also show the hours and employment changes for the Extent of Disability groups. We see relatively small changes in annual work hours for the One-Time group; they are estimated to drop by only about 110 hours during disability onset and by an additional 17 hours the following year. From then on, the fall diminishes. An F-test that all estimates of the fall in hours are zero after $k = 5$ fails to reject the null hypothesis (p-value = 0.14) for our One-Time group. We observe a similar pattern for the Temporary group. By the tenth year after onset, about 7 to 8 percent of people in the One-Time and Temporary groups work zero hours.

Changes in yearly hours of work are much larger for the Chronic-Not Severe group, with an estimated decline of more than 200 hours by the year of onset. By the fifth year after

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onset, this group's work hours are estimated to decline by about 350 with about 11 percent of these individuals not working at all. In the long run (six to ten years after disability onset), yearly work hours are estimated to decline by about 300 with about 10 percent of these household heads not doing any work during the year. Although these declines are large, they are much smaller than those of the Chronic-Severe group (columns 3 and 4 of Table 6), whose annual hours of work are estimated to plummet by almost 690 by the year of onset. By the following year, annual hours are estimated to decline by about 1,100, and about 40 percent of this group is doing no work during the year. In the long run (six to ten years after onset), annual hours of work for the Chronic-Severe group are estimated to decline by about 1,400. We also see that only about 35 percent of this group will do any work in a year during this period. Note, however, that the rise in this zero-work percentage is not instantaneous; it rises gradually from about 40 percent in the year after onset to about 65 percent by the tenth year after onset. An explanation might be that these people's disabilities worsen over time, and eventually they find themselves incapable of doing any work.

C. Hourly Earnings Following Disability

The above results indicate a rise in non-work following disability onset. We now examine what happens to hourly earnings conditional on working. It is unlikely that those who are working are a random sample of the disabled population. Instead, we expect disabled individuals who are working to be experiencing lower hourly earnings losses. We measure hourly earnings as annual earnings divided by hours of work, and classify as working those who work 500 hours or more during the year. We estimate model (1) with log hourly earnings as the outcome and figure 4 displays the percentage change in hourly earnings before and after disability onset for all disabled and by extent of disability groups.[41] For the One-time and Temporary groups, there is no evidence that their hourly earnings decline at all throughout the first ten years of disability, as all estimates are small and imprecisely measured. The Chronic-Not Severe and Chronic-Severe groups, however, experience sharp drops in hourly earnings following disability even among those who are working. By the fifth year after disability onset, hourly earnings drop 15 percent for the Chronic-Not Severe group and 13 percent for the Chronic-Severe group. In the long-run (six to ten years after disability onset), hourly earnings decline an estimated 18 percent for the Chronic-Not Severe group and about 21 percent for the Chronic-Severe group. These findings contrast sharply

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[41] The estimates for the change in hourly earnings are reported in Appendix Table 9.

with those in Charles (2003), who finds very small changes in hourly earnings (no more than 3.2 percent and most of the changes found are statistically insignificant).

4. Changes in Income, Poverty and Transfers with Disability

A. After-Tax Income

Our results in the previous section suggest that earnings decline after disability, especially for the Chronic-Severe group. It would be premature to conclude, however, that these large declines translate into large reductions in economic well-being. The effects of lowered earnings may be cushioned by many factors, including 1) public benefits, 2) intra-family risk-sharing through earnings of a spouse or children, 3) inter-family transfers such as support from friends and relatives and 4) reductions in taxes or increases in tax credits from programs such as the Earned Income Tax Credit that supplement income for the working-poor. In this section, we examine changes in family income after disability.

Using the summary family income variable provided by the PSID, which is the sum of labor, asset and transfer income, may be unsatisfactory even after we account for federal income tax liabilities.[42] First, this measure does not include in-kind transfers such as Food Stamps and subsidized housing. Second, public transfer income is generally under-reported in household surveys, and transfers to the disabled in the PSID are no exception.[43]

We formulate two income measures that are useful when examining the material well-being of the disabled. First, we define "After-Tax Pre-Public Transfer Income" as family income after federal income taxes but without benefits from the main types of public benefit programs.[44] This income measure may enable us to see how much non-labor earnings, and intra- and inter-family transfers mitigate the income loss due to the lowered earnings of the head that result from disability.

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[42] We use TAXSIM to generate tax liability estimates. See the Data Appendix (Appendix 3) for details. A technical appendix discussing how we deal with the family issues in estimating federal tax liabilities via TAXSIM is available upon request.

[43] See Meyer, Mok and Sullivan (2009) for evidence of under-reporting of public transfers in several datasets including the PSID.

[44] The public benefit programs are Social Security, Supplemental Security Income, unemployment insurance, workers' compensation, Aid to Families with Dependent Children/Temporary Assistance for Needy Families, Veterans (VA) pensions and other welfare.

Second, we define "After-Tax Post-Transfer Income" as the sum of after-tax family income, Food Stamps and the amount of any housing subsidy received.[45] In addition, we account for under-reporting in the main public benefit programs by scaling the benefits received using the program-specific reporting rates following Meyer, Mok and Sullivan (2009). These reporting rates are calculated by comparing the weighted sum of the benefits received by the entire PSID sample with those reported to have been paid out by government agencies. By scaling up benefits in this way, we implicitly assume that non-reporting recipients share the same characteristics as reporting recipients. The difference between our two income measures will enable us to see how the receipt of benefits from various public programs affects the drop in income after disability. Column 5 of Table 5 reports the Poisson regression estimates for after-tax pre-public transfer income received for the disabled as a whole. The corresponding implied percentage changes are reported in column 6 and are displayed in Figure 5. For the disabled as a whole, after-tax pre-public transfer income drops about 9 percent by the year of disability onset. The decline continues and the drop by the tenth year after onset is about 13 percent.

Before examining the changes for the other disability groups, let us consider how public transfers mitigate the income drop for the average disabled. Columns 7 and 8 report the analogous estimates for after-tax post-transfer income, the implied percentage changes are also displayed in Figure 6. Including public transfers reduces the income drop for the average disabled by almost a half, to about 5 percent by the year of onset and about 8 percent by the tenth year after onset.[46]

Changes in family income vary considerably across the disabled groups as can be seen in the Appendix Tables 7 and 8. For the Chronic-Not Severe group, pre-public transfer income drops an estimated 7.8 percent by the year of onset. Public transfers reduce this drop to under 3 percent. Income continues to fall through the ten years after disability. By the tenth year after onset, pre-public transfer income has fallen by almost 13 percent. With public transfers, the income drop is reduced to about 7.6 percent. A similar pattern is apparent for the Temporary group. For the One-Time group, the pre-transfer income change by the tenth year after disability onset is small and statistically insignificant and the effect of moving to post-transfer income is small.

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[45] See the Data Appendix (Appendix 3) for how we estimate the value of housing subsidies.
[46] Stephens (2001) finds that family income falls about 7.4 percent by the year of onset and 15.5 percent by the fifth year after onset. He does not, however, account for benefit under-reporting.

Columns 5-8 in Table 6 report the income changes for the Chronic-Severe group, and they are also displayed in Figures 5 and 6. There is significant evidence of a pre-onset fall in both income measures which, as we saw earlier, is primarily due to a fall in earnings prior to disability. We will later see some evidence that suggests that there is worsening of health prior to onset. By the year of onset, the drop in after-tax pre-public transfer income is about 23 percent, but only 11 percent when public transfers are included. The role of public transfers in alleviating the post-onset income drop is evident throughout the Chronic-Severe group's disability history. By the tenth year after onset, pre-public transfer income drops 52 percent; when public transfers are included, the income drop is reduced to 28 percent.

B. Poverty

A standard indicator of well-being is the percentage of a group with income below the poverty line. Figure 7 shows the percentage of the different disabled groups living below poverty in the years before and after disability onset. Here we deviate from the official poverty measure and incorporate some of the conceptual improvements that are commonly suggested. In particular, we account for taxes and in-kind transfers (food stamps and the value of subsidized housing). We compare this after-tax post-public transfer income to the official poverty thresholds published by the U.S. Census Bureau which depend on the number of family members and children.

Not surprisingly, the Chronic-Severe group has the highest poverty rate. Over 17 percent of the Chronic-Severe disabled group lives below poverty during the year of disability onset; the number reaches 23 percent by the following year. The poverty rate for this group remains above 20 percent until the tenth year after onset, when about 19 percent of the Chronic-Severe group has income below the poverty threshold. The rate for the Chronic Not-Severe group tends to rise over time and is over 10 percent in most later years. In contrast, there is little change in the poverty rate for the One-Time disabled group over time. Poverty among the Temporary group rises to a peak of around 15 percent in the second year after onset, and then declines steadily.

C. Public Transfer Income and Dissaving

Our estimates above reveal that the Chronic-Severe group suffers the largest average decline in earnings and income. A comparison of the changes in our two income measures also suggests that the Chronic-Severe group receives substantial public transfers. To see this

result, we estimate specification (1) with public transfers received as the dependent variable (adjusted for benefit under-reporting, including Food Stamps and subsidized housing). Figure 8 shows these estimates for various disabled groups. The Chronic-Severe group receives by far the largest amount of public transfers; total benefits increase $7,000 by the year of onset then rise sharply in the next year. Benefits received then rise slowly reaching about $14,000 per year ten years after onset. In contrast, members of the Chronic-Not Severe group receive only about $2,500 ten years out.

Given the importance of public transfer income for the disabled in the long run (six-ten years after disability onset), it is useful to disaggregate this broad category into specific social insurance programs. In Appendix Table 10 we report receipt rates for disabled individuals who are in their sixth to tenth year after disability onset.[47] Not surprisingly, most of the disabled in the Chronic-Severe group receive benefits – 49 percent receive Social Security retirement or disability benefits (42 percent receive SSDI), 9 percent receive SSI (and about 50 percent receive SSDI or SSI), and 24 percent receive food stamps.[48] These rates are considerably higher than those of the Chronic-Not Severe and Temporary groups. In the case of SSDI, the receipt rate of the Chronic-Severe group is about ten times that of the Chronic-Not Severe group. But as we will see in our next section, those in the Chronic-Severe group still suffer on average from a large drop in living standards despite these relatively high benefit receipt rates. Appendix Table 10 also reports the share of each disability group that neither receives benefits nor works in the long run. This fraction is especially high for the Chronic-Severe group of which 13 percent does not have an obvious means of nonpublic support besides family member earnings or asset returns. This statistic is likely overstated (and the earlier program receipt rates overstated) because of the under-reporting of transfers mentioned earlier. The last two rows of Appendix Table 10 report pre-onset and post-onset median net wealth. We see that for the Chronic-Severe group there is a substantial decline in assets over time from 41 thousand dollars to 26 thousand dollars. On the other hand, median assets rise sharply for the other less disabled groups. This difference suggests that a substantial part of the resources that prevent an even larger consumption fall for the Chronic-Severe disabled come from dissaving.[49] We have further explored the extent

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[47] This is discussed more extensively in Meyer and Mok (2012)

[48] The SSDI receipt rate is based on 1984-1992 surveys, as these are the only years when the type of Social Security payments received was recorded for the household head.

[49] In our companion paper (Meyer and Mok forthcoming), we also study how differences in pre-onset net wealth affect government benefit receipt. We find that those Chronic-Severe disabled with below median net wealth are three times more likely to receive food stamps than their richer counterparts.

of dissaving by calculating the annual change in wealth when possible. We examine true changes using the five-year apart wealth measures beginning in 1984 and the two-year apart measures which begin in 1997. These numbers also indicate a sharp difference in the saving/dissaving of the Chronic-Severe group compared to the other disabled groups and the nondisabled. While the median annual change in wealth is about two to three thousand dollars for all other groups, for the Chronic-Severe group it is essentially zero (though the point estimate is positive). Again, the estimates suggest that the Chronic-Severe group only maintains consumption by drawing upon wealth, though the estimates are imprecise given that we have just under 200 observations on wealth changes.

We have also studied the degree of spousal risk sharing by estimating the change in annual hours of work by wives of disabled heads.[50] Appendix Table 6 shows these results. The general pattern suggests a decline in hours worked by the wife, particularly for those with a chronically and severely disabled husband; the estimates are not precise, however.[51] Although not reported, we have also examined changes in marital status of the disabled over time. We find that the share of disabled male heads that report their marital status as "Divorced" or "Separated from Spouse" rises sharply over time relative to the nondisabled, after accounting for age, education, children and other characteristics. The rise is especially sharp for the more seriously disabled groups.[52] On the surface, these findings suggest that badly disabled men often lose support from their wives as well.

This part of the paper illustrates the economic hardships of the disabled and their reliance on public transfer programs. This pattern is particularly true for the Chronic-Severe group, which suffers large earnings losses and has a high receipt rate of public transfer income. Despite the various public transfers they receive, about one-fifth of this group has incomes below the poverty line in the long term.

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[50] A priori, there is no reason to believe that the wife of a disabled husband will unequivocally work more, as she may prefer to spend less time working and instead care for her husband. While we find little evidence of increased spousal work, as we also later indicate, we also find little evidence of increased spousal time caring for other adults in the family.

[51] Although not reported, we have also studied the degree of intra-family risk sharing by examining the changes in earnings of other family members during the head's period of disability; we find that they are generally small and insignificant, consistent with the findings of Nagi and Hadley (1972).

[52] A study by Charles and Stephens (2004) finds no change in the divorce hazard after disability. Using the Survey of Income and Program Participation, Singleton (2012) finds an increase in divorce probability after disability for a sample of men.

5. Consumption Changes Surrounding Disability

In this section, we focus on consumption changes surrounding disability onset because consumption has advantages over income when measuring well-being. We will also see below in Section 7 that whether current disability compensation is optimal can be assessed using the consumption fall with disability as in Chetty (2006). Economic theory suggests that material well-being is more directly tied to current consumption than to current income. Conceptually, income is subject to transitory fluctuations caused by events such as job or family composition changes. Living standard may remain unaffected despite large income changes, however, if savings can be drawn upon (Poterba 1991, Cutler and Katz 1991). Consumption may also lend itself to more accurate reporting than income for those who are disadvantaged. There is substantial evidence suggesting that income is under-reported. For example, Meyer, Mok and Sullivan (2009) find that major household surveys sharply under-report many types of government transfer income, and this under-reporting is rising. Meyer and Sullivan (2003) argue that income is badly measured for those who are at the bottom of the resource distribution, likely because this group has many small irregular sources of income. Measuring disposable income entails the further complication of accounting for taxes. By contrast, analyzing consumption may reduce or even eliminate many of these problems. Furthermore, consumption is more closely associated with other measures of well-being for the disadvantaged (Meyer and Sullivan 2003, 2011).

The canonical model for examining the welfare implications of income shocks and consumption is the life-cycle model. In the life-cycle model, households maximize the present discounted value of expected utility, subject to an inter-temporal budget constraint. The life-cycle model has the clear prediction that in the absence of uninsured shocks to income, the pattern of the marginal utility of consumption should move slowly over time. Absent other changes, this result implies that consumption has a roughly constant or slowly trending time pattern (Dynan 1993, Bernheim, Skinner and Weinberg 2001).

A few comments on the assumptions and applicability of the model to the disabled are in order. First of all, the model only implies small consumption changes if the interest rate is not too far from the discount rate adjusted for mortality and if precautionary saving motives are small. In general, we expect these conditions to hold for most households. Second, the marginal utility of consumption must not fall sharply with disability onset. In principle, the marginal utility of consumption could rise or fall. Marginal utility might rise if

disability sufficiently increases demand for uncovered medical or nursing care, wheelchairs, scooters, elevator buildings, and ranch houses. It might fall if travel, eating out, and recreation demand fall.[53] Third, and most importantly, the disabled person is embedded in a household that has in our data on average about 4 members, falling to 3.5 after ten years from disability onset. Thus, it seems reasonable to assume that the household level marginal utility of consumption does not change appreciably with the head's disability.

A. Food and Housing Consumption

We focus on the two components of consumption that can be measured well in the PSID: food and housing.[54] Food consumption is defined as the sum of family food consumption expenditure at home, family food consumption expenditure outside the home and the face value of Food Stamps received.[55] We define housing consumption as the sum of owned dwelling service flows calculated as 6 percent of current housing value, rent payments and the rental subsidy for those with free or subsidized housing.[56] Note, that consumption is measured at the household level, so in most cases a fall in consumption reflects a decline in living standards for more than the disabled head.

Columns 9 and 11 of Table 5 report the estimated coefficients of the Poisson regressions for food consumption and food plus housing consumption respectively for the average disabled. The corresponding percentage changes are displayed in column 10 and column 12 and they are also shown in Figure 9 (food) and Figure 10 (food plus housing). For the disabled as a whole, food consumption falls 2.5 percent by the year of onset while food plus housing drops about 4.1 percent. By the tenth year after onset, food consumption drops 9 percent on average while food plus housing drops 8.7 percent. These estimates are very similar to those in Stephens (2001). Overall, our estimates imply that by the tenth year

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[53] For recent empirical evidence on the effect of bad health on the marginal utility of consumption see Finkelstein, Luttmer and Notowidigdo (2013) and the discussion and references there.

[54] Many authors have used the food and housing variables in the PSID to impute total consumption expenditures (Skinner 1987; Meyer and Sullivan 2003; Blundell et al. 2005) via the use of the Consumer Expenditure Survey (CE Survey). A potential problem in predicting consumption for the disabled is that the relationship between characteristics and consumption differs between the disabled and non-disabled, and the CE Survey question on disability is very different from the PSID question. In the CE Survey the question is only asked of those who have not worked in the past 12 months, and includes disability along with other reasons for not working.

[55] The PSID food-spending question is "How much do you (family) spend on food in an average week?" We assume that the question refers to the time of interview rather than the previous year.

[56] The PSID does not ask questions about the amount of any rental subsidy received, especially for those whose dwelling is partially publicly subsidized. We thus construct a rental subsidy for a head by predicting the rent he would pay if he lived in market housing and then subtracting the actual rent paid from this predicted rent. Details on how we construct the rental subsidy are included in the data appendix (Appendix 3).

after disability onset, the average disabled man faces a decline in earnings of 22 percent, in after-tax post-transfers income of 8 percent, in food plus housing consumption of 8.7 percent and in food consumption of 7.6 percent.

Across the Extent of Disability groups, we again see that the decline in consumption is most dramatic for the Chronic-Severe group (columns 9-12 of Table 6).[57] By the year of onset, food consumption has fallen an estimated 8.9 percent and food plus housing consumption has fallen by 11.9 percent. Consumption continues to decline through the next ten years – by the tenth year after disability onset, food consumption has fallen by about 18 percent and food plus housing by about 25 percent. These large declines are about triple those of the Temporary and Chronic-Not Severe groups, for whom food consumption drops about 6.7 percent and 6.6 percent, respectively. Compared with our previous estimates for the Chronic-Severe group, earnings fall 76 percent, after-tax post-transfers income falls 28 percent, food plus housing falls 25 percent and food falls 18 percent. These declines are close to triple those of the average disabled. The pattern also reflects the incomplete roles that savings, family support and social insurance play in reducing the consumption drop following disability for the Chronic-Severe group.[58] The smaller decline found for disposable income than for earnings and the even smaller decline in consumption is plausible given other sources of income and the drawing down of savings by some households.

We also note that food consumption has fallen by about 12 percent the year before onset for the Chronic-Severe disabled. As noted in our discussion of earnings changes, a person may not immediately report he has a disability even when his productivity has fallen. During this period of decreased productivity, however, he might suspect that his future income will be lower. Consequently, such a person may adjust his consumption downwards as suggested by the Permanent Income Hypothesis.

B. Food Eaten at Home and Outside the Home

The above estimates suggest that food consumption falls after disability. It is important to remember that our food consumption variable primarily consists of food eaten at home and food eaten outside, and the latter is more expensive. If the observed fall in food

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[57] Full set of estimates can be found in Appendix Table 8.

[58] We have also examined food security of the disabled using data from the 1999, 2001 and 2003 PSID. While the sample sizes are small, the Chronic-Severe group in the long run after disability onset is about four times more likely to report problems of food security in the family than the non-disabled, and two to three times more likely than the other disability groups.

consumption were due purely to a switch from meals eaten outside the home to meals eaten at home, then it would be premature to conclude that a fall in food consumption translates to a fall in actual material well-being. To clarify this issue, we look at the change in food eaten at home and outside the home separately. The results are depicted in Figure 11 (food at home) and Figure 12 (food outside the home).[59]

We focus on the Chronic-Severe group as its members suffer the greatest drop in expenditures on food eaten at home and outside the home. Although the estimates suggest a pre-onset fall in both measures, these changes are mostly imprecisely measured.[60] The decline in consumption of food at home (11 percent) is first apparent in the second year after disability onset. While the fall is not precisely estimated for individual years, most indicate a decline of over ten percent. Food outside the home falls more sharply, dropping by over 40 percent by the seventh year after onset and staying low. That both food eaten at home and food eaten outside fall substantially after disability suggests that the drop in overall food consumption for the Chronic-Severe disabled is not mostly due to a shift towards more meals eaten at home.

C. Exploring the Source of Changes in Housing Consumption

We saw in Table 6 that food and housing consumption fall after disability. Exactly how the fall in housing consumption occurs is unclear because on the surface housing consumption seems hard to adjust. We examine the importance of post-disability housing adjustments, such as selling a home and becoming a renter, buying a smaller home or renting a smaller apartment. To analyze the sources of the decline, we decompose the changes in housing consumption into changes in housing type and consumption given the housing type. Let C_{it} be the housing consumption for person i in year t, defined as the sum over housing types of the product of an indicator for housing type *j*, S_{it}^{j}, and the consumption of housing type *j*, C_{it}^{j} where $j \in \{own, rent, public housing\}$. In other words

$$(3) \quad C_{it} = \sum_{j} S_{it}^{j} C_{it}^{j}.$$

We let the corresponding variables without the subscript i denote averages over i. By appropriately adding and subtracting terms, we can then write the change between two periods, denoted t and τ, as

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[59] Appendix Table 12 reports the underlying estimates.
[60] An F-test that all pre-onset estimates are zero has the p-value 0.42 for food at home.

$$(4) \qquad C_\tau - C_t = \sum_j (S_\tau^j - S_t^j) C_\tau^j + \sum_j (C_\tau^j - C_t^j) S_t^j .$$

Equation (4) shows that the change in consumption between two periods depends on the change in shares (S^j) and the changes in consumption, given type (C^j). To estimate these terms, accounting for individual characteristics, we run a series of fixed effect regressions similar to equation (1) above. We focus on changes specifically after the fifth year of disability onset. First, we run a series of fixed effect linear probability models of the form

$$(5) \qquad S_{it}^j = \alpha_i + \gamma_t + X_{it}\beta + \sum_g \sum_k \delta_k^g A_{kit}^g + \sum_g \theta^g B_{it}^g + \varepsilon_{it}$$

where S_{it}^j is a dichotomous variable that equals one if individual i consumes a particular housing type j, α_i is a fixed effect, γ_t is a set of time indicator variables, and X_{it} is a set of time-varying explanatory variables (including marital status, state of residence, age and age-squared, education, and the number of children). A_{kit}^g is a dichotomous variable that equals one if individual i is in disability group g and is k years after disability onset, where $k \in \{-5, -4,...,4, 5\}$. B_{it}^g is a dichotomous variable that equals one if the individual i is in disability group g and is in year six through ten after disability onset. ε_{it} is a potentially serially correlated error term, as before. We run the fixed effect linear probability model three times, once for each housing type. We again focus on our four disability groups, so $g \in \{1, 2, 3, 4\}$. The coefficients of interest are the θ^g, which represent the estimated change in the probability of consuming a housing type j in the long run (six to ten years following disability).

Panel A of Table 7 shows the results. For the Chronic-Not Severe and the Chronic-Severe group, the likelihood of living in public housing increases in the long run by 2 percent and 4.5 percent, respectively, with the change for the Chronic-Severe group statistically significant. The likelihood of these groups renting or owning a home, however, does not change significantly in the long run.

Next, we examine the change in housing consumption within each type of housing. We estimate models similar to equation (5), but now the amount of consumption of a particular type of housing becomes the dependent variable. We split the sample into three parts according to the type of housing chosen and estimate the fixed effect regressions in each sub-sample.[61] Again, the coefficients of interest are the θ^g, which represent the

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[61] We do not report expenditures for publicly subsidized housing since the sample sizes are extremely small.

estimated long-term change in the amount of housing consumption, conditional on the
individual being in Extent of Disability group g and consuming a particular housing type j.

Panel B of Table 7 shows the results. The Chronic-Severe group again displays some
pronounced patterns. The estimated decline in homeowners' housing consumption in the
long run is more than $3,000 a year; this corresponds to a drop in home value of more than
$51,450. For those who rent private housing units, estimated annual rent paid declines about
$1,400 ($116 per month) in the long run. Both results suggest that members of the Chronic-
Severe group who do not receive public housing decrease their housing consumption to
accommodate an overall decline in resources by moving to less costly dwelling units.

D. Consumption after Social Security Eligibility

Up to now, we have investigated how the working age disabled fare after their
disability onset. However, after a disabled person becomes eligible for social security
retirement benefits, his income and consequently consumption may rise. To examine this
issue, we retain observations after age 61 and regress consumption on age indicator variables.
Specifically, we regress consumption (food plus housing) on a set of age indicator variables
(62-64, 65-69, 70-74), year indicator variables, individual fixed effects and a set of non-age
demographic variables (indicator for being married, number of family members, number of
children in the family and years of education of the head). We estimate these regressions
using only members of the Chronic-Severe group. The coefficients of interest are those on
the age indicator variables that measure changes in consumption for the average Chronic-
Severe disabled as he reaches 62-64, 65-69 and 70-74 relative to his pre-retirement
consumption. We find that food and housing consumption for the average Chronic-Severe
disabled is not significantly different during all periods after social security eligibility than it
was earlier, though the point estimates suggest that consumption falls slightly relative to the
pre-eligibility years.[62] The change with age is not significantly different for those who
receive SSDI prior to age 62, and those who do not.

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[62] When we further control for time after disability onset (by including a set of 13 indicator variables A_{kit}, where
k is the year from onset for individual i in year t for $k=\{0,1,...,10, 11-20, 21$ and above$\}$), we obtain very similar
estimates, that are not significantly different from zero, that again suggest a small decline in consumption after
the earliest eligibility age for social security retirement benefits.

6.   Robustness Checks, Detailed Consumption, and Time Use

In this section we examine alternative explanations for our results, and the effects of accounting for unobserved differences between the disabled and the nondisabled through fixed effects. We examine results for subsamples defined by program receipt and cohort. We further examine changes in well-being using detailed consumption data. We also examine the time-use of the disabled both because it is another indicator of well-being and because time can potentially offset the lower incomes of the disabled. The details of these analyses are in Appendix 2 Additional Results, but we summarize the main findings here.

A. Differences in Unemployment, Illness and Health Prior to the Onset of Disability

One might wonder if a period of unemployment or other bad employment outcomes leads a person to say he is disabled. While conceptually it may be difficult to observe what leads to bad employment outcomes, i.e. whether it is bad health, a declining industry, or a string of bad luck, we can compare the pattern of unemployment and health prior to disability onset. As the individual's decision on when he is disabled is likely a function of his time-varying productivity, disutility of work, and other factors, we present suggestive evidence for this view by looking at how unemployment, illness and health change prior to when an individual reports a condition that limits work. We examine the number of working days lost due to unemployment in each of the five years before disability onset (Appendix Figure 1 shows the results). For the average disabled, there is virtually no change over time. For the chronic groups, however, there is a dip in days of unemployment during the third and fourth years before onset, compared to earlier or later years, but no clear evidence of a prolonged rise in unemployment leading up to onset.

Next, we examine the number of workdays lost due to illness (Appendix Figure 2). The results suggest that the number of workdays lost due to illness rises as we approach the year of onset; the changes are similar for all disabled groups. Finally, we examine health status (Appendix Figure 3 reports estimates of equation (1) with a dependent variable that equals one if an individual is in fair or poor health). Again, we see suggestive evidence that a decline in health is an important reason for reporting a disability. This change is particularly noticeable for our Chronic-Severe group; the fraction of those reporting fair or poor health increases about 7 percentage points just prior to disability onset. Overall, the results suggest that declining health, but not unemployment, is a key reason for reporting a disability.

Though the optimality framework of the next section explicitly allows for endogeneity of disability, this result suggests that it may not be a strong influence in any case on self-reported disability as defined in this paper.

B. Underlying Permanent Differences Between the Disabled and Non-Disabled

We compare the estimated effect of disability on various outcomes with and without fixed effects to examine how the disabled differ in terms of unobservable permanent characteristics. These estimates indicate whether it is important to estimate fixed effects models, which account for these unobserved differences, rather than OLS models of disability outcomes. In both sets of specifications we include the non-disabled. When we include fixed effects, the estimates for outcomes are relative to those for the disabled more than five years before onset. When we do not include fixed effects, the estimates for outcomes are relative to the disabled more than five years before onset *and the non-disabled* with similar age, education, etc. Thus, a comparison of the estimates with and without fixed effects tells us how the unobserved characteristics of the disabled that affect the outcome in question compare to those of the non-disabled with similar observed characteristics.

In the case of the Chronic-Severe group, we notice a number of patterns. The most striking pattern is a lack of difference between the estimates with and without fixed effects after onset. After-onset earnings, hours, after-tax post-transfer income, and food consumption are all very similar with and without fixed effects. This result suggests that those in the most disabled group are not different from the non-disabled (after accounting for observed characteristics) in terms of unobserved attributes that affect these outcomes. There is a noticeable difference for food plus housing consumption, with the estimates without fixed effects being about six percentage points higher than those with fixed effects after onset. This result implies that the Chronic-Severe disabled consumed more pre-onset than their characteristics imply. In terms of pre-disability estimates, the disabled have unobserved characteristics that lead to lower hours (about 80 hours per year) and lower earnings in the five years before disability onset, but these differences disappear after onset. This pattern is also true for post-tax, post-transfer income,   Thus, there appears to be little pronounced difference between Chronic-Severe and non-disabled groups. What differences exist initially between the groups appears to be overwhelmed by the changes in sample composition during the years after onset.

For all disabled men combined, the patterns are mostly similar. The differences after onset tend to be fairly small, with almost no difference for consumption. Before onset, the estimates with fixed effects are slightly higher for most outcomes, indicating that the disabled in the sample for those years have worse unobserved characteristics than the non-disabled. These results suggest that cross-sectional methods often do a fairly good job of approximating panel data methods.

C. Later Disabilities

We base our disability classification throughout the paper only on the first observed disability. Here, we examine whether those non-Chronic-Severe disabled individuals whose disability classification subsequently changes to Chronic-Severe over time (using a rolling ten-year-ahead window) exhibit outcomes similar to those of the original Chronic-Severe group. We find that the long-term changes in outcomes during these later Chronic-Severe disability spells are quantitatively similar to those of the original Chronic-Severe group presented above.

D. Social Security and Outcomes

Since Social Security disability or SSI payments are the main safety net for the permanently disabled, it is natural to ask how recipients fare relative to non-recipients. We split the Chronic-Severe group into those who receive SSDI or SSI benefits more than half of the time over the ten years after disability onset (SSA recipients) and those who do not (SSA non-recipients). We find that that those who receive Social Security payments stop working earlier than those who do not. Nonetheless, the fall in income and consumption is very similar for the two groups (Appendix Figures 4 through 7). The results indicate that those with low pre-transfer income are more likely to be recipients, with the benefits raising these worst off recipients to the level of the other disabled.

E. Cohort Differences

We examine whether the material consequences of disability have changed over time. To do so, we split the disabled into two samples: those who are first disabled before 1985, and those disabled later. We estimate the outcome regressions on these two samples separately and find that the two sets of results for the Chronic-Severe group are very similar. Results for earnings and income can be found in Meyer and Mok (forthcoming).

F. Detailed Consumption and Time-use Data

The results in Section 5 suggest that the disabled suffer from a sizable drop in food consumption, particularly the Chronic-Severe group. We should interpret these estimates with care, however, because the PSID records only food and housing expenditures. As Becker (1965) notes, consumption is the result of home production that uses both expenditure and time as ingredients. Individuals with a lower relative price of time may substitute time in home production for expenditures. Thus, the fall in food consumption we observe for the disabled may be a result of the disabled: 1) spending more time shopping and searching for lower prices for the goods they purchase and/or 2) spending more time on food preparation, which may turn cheaper ingredients into better food.

Our findings do not support these effects being important, as we find further evidence that the drop in consumption reflects a lower living standard. Using data from the 1989-1991 Continuing Survey of Food Intake of Individuals (CSFII) we find that the disabled have worse nutrition, with about a 10-15 percent lower intake of Vitamin A, Vitamin C and Vitamin E. To examine time use, we employ the American Time Use Survey (ATUS) and find that currently disabled male heads spend 0.66 hours per week (5.7 minutes per day) more on food preparation. Relative to the mean for the non-disabled, this represents a 34 percent increase in the time spent on food preparation, but the amount of time is small. In fact, this increase takes up only a small fraction of their extra 24.3 hours of leisure hours per week of the disabled. Major uses of the additional non-work time of the disabled are time spent watching TV – 10.6 hours per week, obtaining medical care – 7.2 hours per week, sleeping – 6.8 hours per week, and "relaxing" – 3.2 hours per week. Given that the household production function employs time inputs of both the husband and the wife, we also investigate the time use of wives of the disabled. On average, wives of the disabled do not spend more time working than those whose husbands are not disabled; this is consistent with the PSID results discussed earlier. Wives of disabled men also do not spend more time on food preparation. Maybe surprisingly, there is also no conclusive evidence that wives of disabled husbands spend more time on caring for adult family members. Taken together, these results do consistently suggest that the disabled suffer from a real decline in material well-being.

G. Life Satisfaction and Adaptation

Our study has examined changes in a variety of economic variables before and after the onset of disability. One variable that we have not analyzed but has attracted much attention is "life satisfaction". Some authors have suggested that the disabled may adapt (or habituate) to their new state and utility may not fall despite the consumption drop. There are three important issues here. First, how life satisfaction questions are phrased in the questionnaire seems to affect individual's responses. Second, whether life satisfaction is equal to utility or part of utility remains controversial in the literature.[63] If utility is a function of consumption and life satisfaction, then utility will still decrease as a result of disability even when life satisfaction remains unchanged, due to the drop in consumption. Third, there are few empirical studies to date investigating how life satisfaction evolves after disability onset, especially in the United States.[64] Data limitation may prevent us from taking on this issue here but we believe such question should be seriously addressed in future research.[65]

7. Optimal Disability Benefits

While social insurance benefits alleviate material deprivation by smoothing an individual's consumption, the optimality of benefits needs to account for their distortion of labor supply. The classic reference is Baily (1978) who examines the optimality of unemployment insurance benefits under some simplifying assumption on preferences. Chetty (2006) generalizes this result by relaxing the assumptions that the third and higher order terms of the utility function are small and considering adverse events besides

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[63] See Stevenson and Wolfers (2000).

[64] Lucas (2007), Oswald and Powdthavee (2008), and Daly and Gardiner (2012) examine the existence of adaptation by studying how life satisfaction changes after disability. The papers come to different conclusions, though their results differ in part due to differences in methodology and data. In addition, the first two studies use British and German longitudinal data, and benefits are more generous in these countries than those in the United States. Daly and Gardiner (2012) use the U.S. Health and Retirement Study and the General Social Survey and find "*little evidence that individuals return to their pre-disability level of subjective wellbeing as measured by life satisfaction,*" though they also note that the length of their panel is short relative to the first two studies above.

[65] The PSID has data on life satisfaction in its 2009 'Disability and Use of Time' supplement but the data are only available for a small subsample of older survey respondents.

unemployment. Moreover, he emphasizes that the results are robust to a number of complications such as a leisure value of nonemployment, private insurance arrangements as well as saving and costly search.

A. The Framework

Suppose an individual lives for one unit of time and faces disability with probability p. If he is not disabled, he will receive wage w until the end of time. In the event of disability, the individual chooses the duration of disability D. Suppose $\delta(D)$ is a concave and increasing function capturing the net benefit of disability duration (such as the pain avoided). Let A_0 be the individual's asset level at the beginning of time, and $u(c)$ be a strictly concave and state-independent utility function of the individual, where $c=\{c_e, c_d\}$ represent the consumption of the individual in the event of no disability (c_e) and disability (c_d). Thus, given the disability probability p, the benefit amount b and tax τ the individual chooses c_e, c_u and D to maximize his expected lifetime utility:

max $(1-p)u(c_e) + p(u(c_u) + \delta(D))$

s.t. $A_0 + (w - \tau) - c_e \geq 0$

   $A_0 + bD + w(1-D) - c_u \geq 0$

Suppose a social planner chooses b and τ to maximize the expected utility of the individual, subject to a balanced budget constraint. Let $V(b,\tau)$ be the indirect utility function of the individual, then the social planner's problem is to choose the benefit amount and tax to maximize the utility of the individual:

$Max_{b, \tau} V(b,\tau)$

s.t. $(1-p)\tau = pbD$

The first order condition for optimality is:

$$(6) \quad u'(c_e)\left[1 + \frac{b}{D}\frac{dD}{db}\right] = u'(c_d)$$

This condition simply says that the marginal benefit of providing one extra dollar of benefit is equal to the marginal cost, which is the sum of the direct cost of raising the tax ($u'(c_e)$) and a term due to the individual's behavioral response of extending duration of disability. By applying a Taylor Series expansion, and assuming the fourth and higher order derivatives of $u(.)$ are small, the optimal benefit condition can be written as:

$$(7) \quad \gamma \frac{\Delta c}{c}(b^*)\left[1+\frac{1}{2}\rho\frac{\Delta c}{c}(b^*)\right] \approx \varepsilon_{D,b}$$

where $-\frac{\Delta \bar{c}}{\bar{c}}(b^*)$ is the drop in mean consumption with disability as a function of the benefit level b, γ is $-u''c_t/u'$, the coefficient of relative risk aversion, and ρ is $-u'''c_t/u''$, the coefficient of relative prudence. D is the fraction of a lifetime spent disabled, and $\varepsilon_{D,b}$ is the elasticity of D with respect to b. In his calibration exercises, Chetty finds that assuming $u'''=0$, i.e. ignoring the term in ρ, leads to substantial bias.

Chetty (2006) also derived a similar optimality condition under a more general setting. He considered a continuous-time dynamic setting where a representative agent faces persistent risk of an adverse event, such as disability. The agent makes a vector of decisions at time t contingent on a vector of state variables at time t. With some standard assumptions, proposition 2 in his paper states that the optimal benefit level b* is implicitly defined by the equation: [66]

$$(8) \quad \left\{\left[\frac{\Delta \bar{c}}{\bar{c}}(b^*)\gamma\left[1+\frac{\rho}{2}\frac{\Delta \bar{c}}{\bar{c}}(b^*)\right]+1\right]F-1\right\} = \frac{\varepsilon_{D,b}}{1-D}$$

where $F = (1+\gamma\rho s_d^2)/(1+\gamma\rho s_n^2)$, s_d is the coefficient of variation of consumption in the disabled state and s_n is the coefficient of variation of consumption in the non-disabled state. Chetty finds in his calibration exercises given his assumed range of F that setting $F=1$ leads to little bias, while below we find that our estimate of F leads to an elasticity at the optimum that is up to 14 percent lower than it would be with $F=1$, depending on preferences.

The relationship in (8) provides a way of checking whether current benefits are optimal in this model. If the left hand side is greater than the right hand side then benefits are too low; if the reverse is true then benefits are too high. This relationship highlights the importance of knowing the consumption fall with disability when designing disability policy.

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[66]See p.1889 of Chetty (2006) for the details.

Furthermore, this optimality condition is robust to a number of extensions: private insurance arrangements (spousal supply of labor), the leisure value of unemployment, dynamic search and saving behavior, and borrowing constraints.[67]

B. Optimality of Disability Compensation

To implement the optimality rule implied by equation (8), we first take the proportional drop in consumption to be 0.25, based on the estimate of the change in food plus housing consumption for the Chronic-Severe group ten years after disability onset, as reported in Section 5. We assume that this estimate is a reasonable average for the entire post-onset period, including the period more than ten years after onset. Given our finding that the consumption drop for the Chronic-Severe group continues until at least age 75, this approach seems reasonable. To estimate D, the fraction of the working life spent disabled, we rely on our estimated probability of having had a disability by various ages reported in Section 2. We average these probabilities from ages 20 through the expected life span for men conditional on reaching age 20, which is age 76. Since our samples are only large enough to estimate disability probabilities precisely from age 27 through 61, we take earlier years to have the rate at age 27 and later years the rate at 61. This calculation gives us an estimate of D of 0.12. Given that some work disabilities occur after age 61, our estimate of D may be too low. On the other hand, since mortality among the disabled is higher than average, our estimate of D may be too high. The optimal level of benefits though is not very sensitive to the estimate of D as can be seen in equation (8) where the quantity 1-D enters multiplicatively. To obtain the coefficient of variation of consumption in the disabled state and the non-disabled state, we split the sample into two groups: 1) The Chronic-Severe disabled individuals beginning in the year of onset. 2) The Non-disabled, the non-Chronic-Severe disabled and the Chronic-Severe disabled observations prior to disability onset. Using their food plus housing consumption data (adjusted by family size and composition), we obtain $s_d = 0.272$ and $s_n = 0.289$.[68]

We report the optimal benefit calculation in Table 8. This table reports the elasticity of D with respect to benefits that would be consistent with benefits being optimal, for different values of the coefficients of relative risk aversion (γ) and relative prudence (ρ).

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[67] Interested readers can refer to pp.1895-96 in Chetty (2006).
[68] To adjust the food and housing consumption data, we use the equivalence scale $(A+0.7K)^{0.7}$ where A is the number of adults and K is the number of children in the family.

Since the literature considers a wide range of values for these parameters, we do as well. We assume that the marginal utility of consumption (at a given consumption level) is the same before and after disability, though as discussed earlier, the direction of any change is uncertain. Particularly since, as mentioned earlier, it is the marginal utility of consumption for a household of 3 to 4 members on average not just one disabled individual, the assumption of constancy seems reasonable. As γ ranges from 1 to 5 and ρ ranges from 0 to 5, the elasticity consistent with optimality ranges from 0.22 to 1.58. If we focus on an estimate of γ of at least 3 as assumed typically,[69] benefits are optimal or higher than optimal if the true elasticity of time spent disabled is at least 0.66, depending on ρ, but are lower than optimal if the elasticity is lower.

It is a simplification to summarize policy as a single benefit and a single elasticity, since compensation for disability comes from many programs: SSDI, workers' compensation, SSI and private disability insurance. Thus, the average benefit and elasticity should be thought of as averages across programs. We focus on SSDI and workers' compensation, as they are the largest programs available to the disabled, and because little is known about benefit elasticities for the other programs. We have also simplified the model by not considering the choice of waiting times and screening stringency (see Low and Pistafferi 2010 for an analysis that emphasizes the determinants of these other program features).

To determine the elasticity of D with respect to the disability insurance benefit, we turn to estimates in the literature for SSDI. The literature has tended to focus on the elasticity of the non-participation probability with respect to the benefit. Bound and Burkhauser (1999) report estimates that range from 0.21 to 0.93 in their survey, with a median estimate of 0.49. They argue that most of the estimates are likely to be biased upward. The question still remains as to how to convert elasticities of non-participation into elasticities of self-reported disability. To see how the two elasticities compare, note that they can be written as

$$(9) \quad \varepsilon_{D,j} = \frac{\partial D_j}{\partial b} \frac{b}{D_j},$$

where j equals s or np indicating a self-report or non-participation respectively. To convert one to the other, we need to compare the levels of non-participation and self-reported disability, D_s and D_{np} respectively, and the derivatives of the two states with respect to

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[69] See Chandra and Samwick (2005) who also take γ to be 3, or Cohen and Einav (2007) who suggest that a widely used estimate is "a low single-digit coefficient".

benefits, $\partial D_s /\partial b$ and $\partial D_{np} /\partial b$, respectively. The former comparison can be directly obtained from our PSID data. We find that in the prime years for work disability (ages 35 to 55), the nonparticipation rate is only about ten percent higher than the fraction of men who are currently severely disabled, and slightly lower than the fraction of those who have experienced a Chronic-Severe disability by that age. To examine the latter comparison, we note that an individual induced by higher disability benefits to not participate in the labor market is extremely likely to indicate that he is disabled. It also seems unlikely that a large number of individuals would be induced to call themselves disabled because of higher benefits, but still work. Thus, we take the two derivatives to be equal and conclude that $\varepsilon_{D,s} \approx \varepsilon_{D,np}$. The combination of these numbers, suggests that current compensation for disability appears to be below the optimal amount suggested by equation (8), if we believe that the coefficient of relative risk aversion is three or higher, regardless of the coefficient of relative prudence (as long as it is zero or positive).

One can also examine the elasticity of non-work with respect to workers' compensation (WC) benefits. Meyer (2002) reports a wide range of claim incidence and duration elasticities. The elasticity of time receiving benefits is the sum of these two elasticities.[70] The sum of the median estimates for these two elasticities in the literature is under 0.6. Given that the WC claim elasticity likely significantly overstates the nonwork elasticity, the evidence again suggests that our compensation for disability may be lower than optimal in this framework, if again we hold the same belief on the magnitudes of the coefficients of relative risk aversion and prudence.

One might also wonder whether one could implement this type of optimal benefit formula in practice. In particular, how does the screening mechanism for disability insurance compare to the Chronic-Severe classification of disability emphasized in the paper? We should emphasize that we do not anticipate program eligibility being determined by the answers to the PSID questions. Rather, other screening mechanisms could approximate our disability classification. We have already noted that at each age the share of men who are on the Social Security disability program is considerably lower than the share that is in the Chronic-Severe disability group. Thus, we have not focused on a more select and severely disabled group than those who currently receive SSDI benefits. Our PSID classification does require examining disability over several years, but in practice SSDI does as well. In general,

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[70] To see this, consider average benefit duration as the product of claim incidence and disability duration. Then log differentiate this product.

disability screening relies on much more information than is available in the PSID, including a potential recipient's medical history and doctors' examinations, so it could be more effective. Thus, it does not appear that the screening stringency required is beyond that which could be implemented.

8. Discussion and Conclusions

This paper studies the prevalence of disability prior to retirement, changes in household material well-being surrounding disability onset, and the optimality of current benefits for the disabled in a standard model. Using longitudinal data for the period 1968-2009 from a sample of male household heads, we determine the prevalence of disability and examine how it affects a range of outcomes, including earnings, income, and consumption. This paper has several key findings. First, disability rates are high. We estimate that by age 50, about 9 percent of male household heads have begun an enduring and severe disability. By age 56, that number rises to 15 percent. An even larger share of men have experienced some type of disability. A man reaching age 56 has a 41 percent chance of having been disabled at least once during his working years and about a 28 percent chance of experiencing a chronic disability that lasted at least four years.

Second, disability is associated with worsened economic outcomes. Ten years after disability onset, those with a chronic and severe disability condition have on average experienced a 76 percent decline in earnings, a 28 percent decline in after-tax income, a 25 percent decline in food and housing consumption and a 18 percent decline in consumption of food alone. In addition, about two-thirds of these most disabled individuals do not return to work in the long run.

Third, there are sharp outcome differences across disability groups; the outcome declines for those with chronic and severe disabilities are often more than twice those for the average disabled. Fourth, our findings indicate the partial but incomplete roles that individual savings, family support, and government and private insurance play in reducing the consumption drop that follows disability. Despite the various government programs available, the incomes of about one-sixth of families with a chronically and severely disabled head drop below the poverty line in the long term – even after accounting for in-kind transfers and the under-reporting of benefits.

Fifth, we find a noticeable fall in earnings and income prior to the onset of a reported disability. Consumption also falls somewhat prior to reported onset, indicating that future disability is partially but incompletely predictable in the short run. Sixth, evidence from time-use surveys does not suggest that the disabled do more shopping, which might enable them to enjoy lower prices through greater search effort. We also find that instead of working more on home and food production, the disabled spend more time watching television, relaxing, sleeping and using medical services. Together these findings indicate a real decline in material well-being after the onset of disability, especially for those who are more disabled. To further substantiate our claim that consumption declines following disability, we examine food surveys and find that the diet of the disabled is worse than that of the non-disabled in many dimensions.

Seventh, employing the Chetty (2006) optimal benefit formula, we find that for a substantial range of plausible parameter values current compensation for the most disabled appears to be lower than this standard model suggests is optimal. However, stronger statements require knowing preference parameters that have not been pinned down in the literature. This calculation accounts for the moral hazard effects of disability, but assumes that the marginal utility of consumption at the household level does not change with disability of the head. We believe these findings will be useful for future research on the disabled as well as policy discussions.

There are many questions raised by our research. We are unable to examine the prevalence and circumstances of disabled women given the lack of information on disability for women in the early years of the PSID. Recent evidence from other sources suggests that disability during the working years is rising for women (Baldwin and Chu 2006). Furthermore, we only focus on disability during the working years. We find that consumption does not rebound once a disabled head reaches the Social Security eligibility age. However, we do not examine disabilities that begin at later ages. Finally, we would like to supplement the rich economic data we use with detailed health information, which would allow us to refine our disability definition and potentially focus on specific health conditions. However, small samples and lack of generality might limit such an approach.

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Figure 1
Percent Change in Annual Earnings Before and After Disability Onset,
Extent of Disability Groups and All Disabled
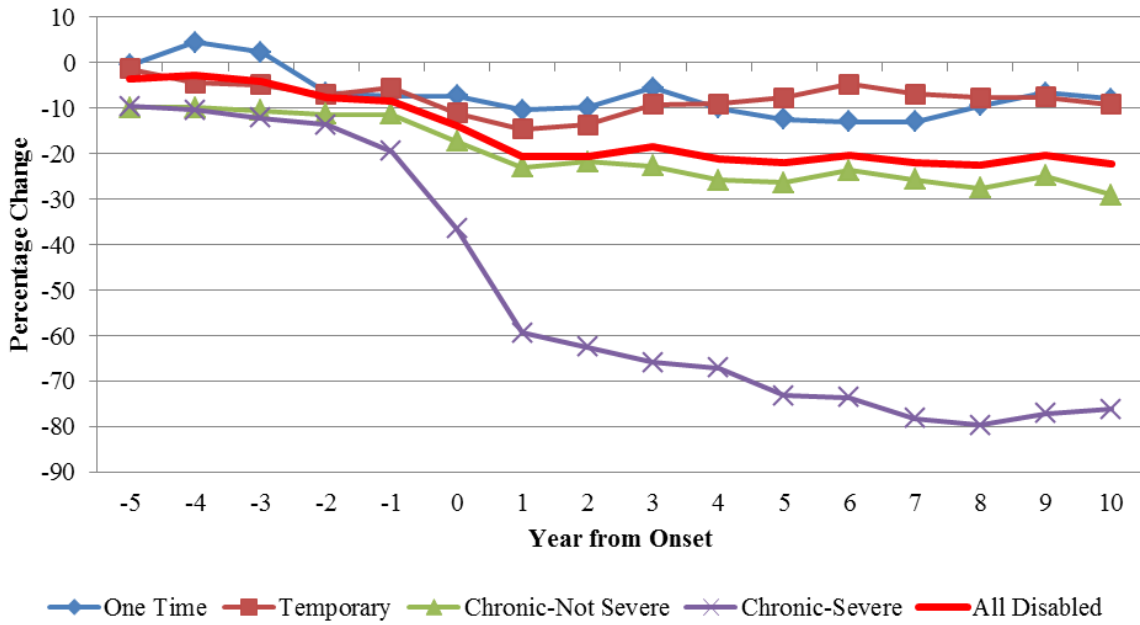
Figure 2
Change in Annual Hours of Work Before and After Disability Onset,
Extent of Disability Groups and All Disabled

47
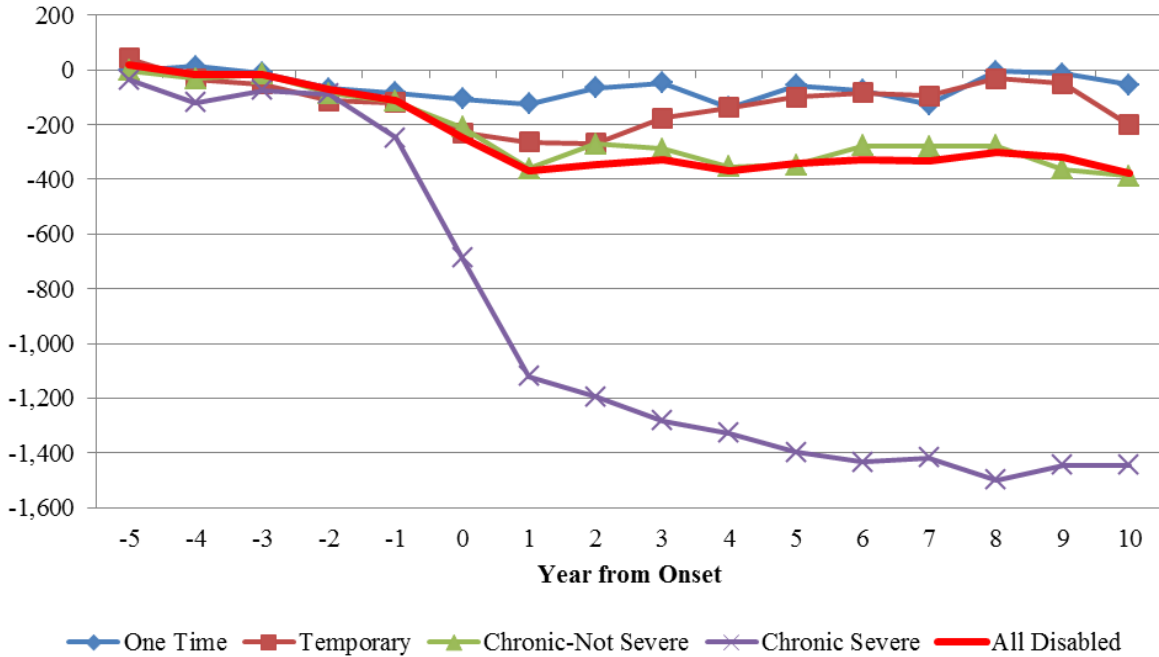
Figure 3
Percentage of Disabled with Zero Hours of Work
Before and After Disability Onset,
Extent of Disability Groups and All Disabled

Figure 4
Percentage Change in Hourly Earnings Before and After Disability Onset,
Extent of Disability Groups and All Disabled

Figure 5
Percentage Change in After-Tax Pre-Public Transfer Income
Before and After Disability Onset,
Extent of Disability Groups and All Disabled
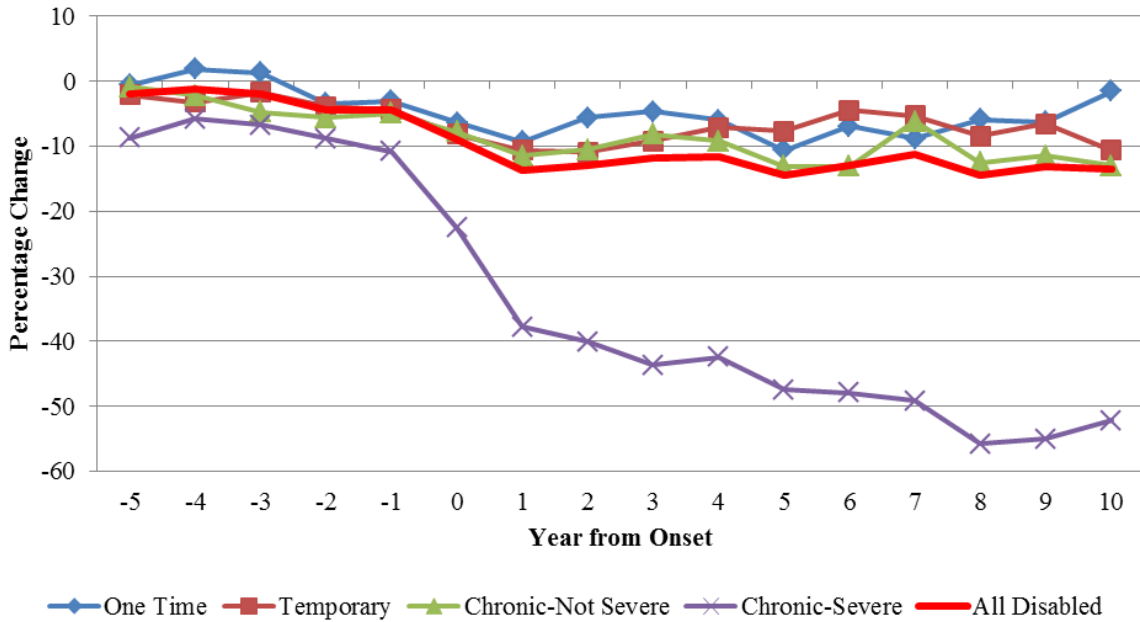
Figure 6
Percentage Change in After-Tax Post-Transfer Income
Before and After Disability Onset,
Extent of Disability Groups and All Disabled

49

Figure 7
Percentage of Families with After-Tax Post-Transfer Income
Below the Poverty Line,
Extent of Disability Groups and All Disabled
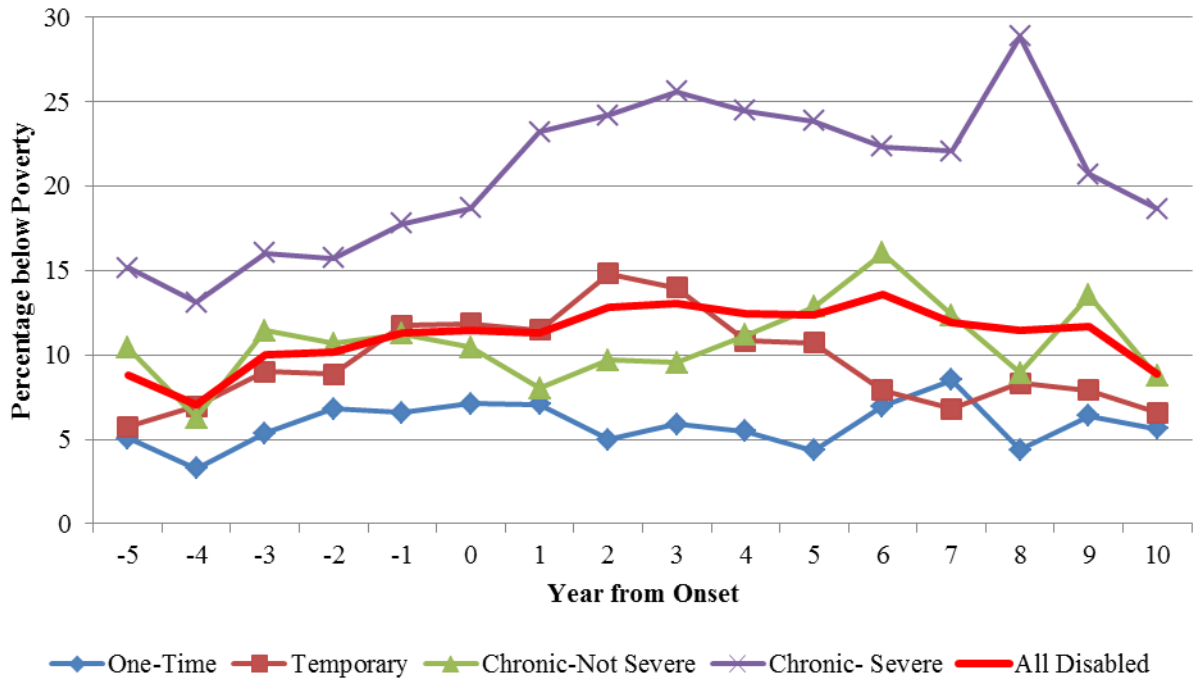
Figure 8
Change in Under-reporting Adjusted Public Transfer Income
Before and After Disability Onset,
Extent of Disability Groups and All Disabled

Figure 9
Percentage Change in Food Consumption Before and After Disability Onset,
Extent of Disability Groups and All Disabled

Figure 10
Percentage Change in Food plus Housing Consumption
Before and After Disability Onset,
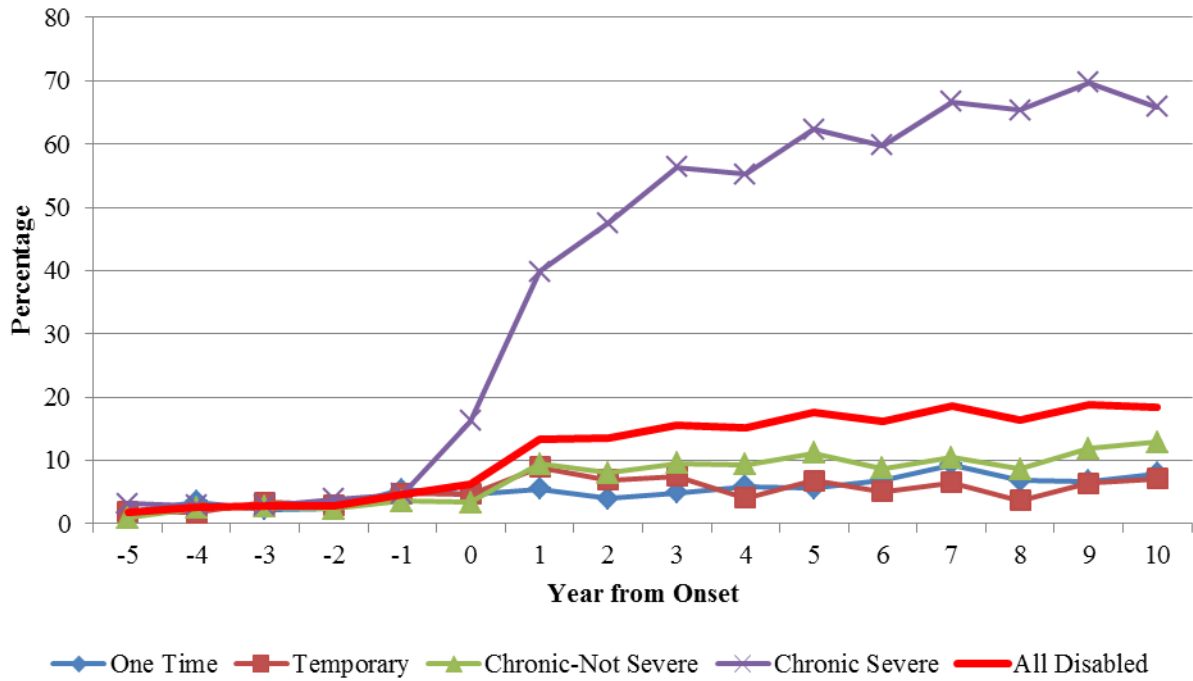**Extent of Disability Groups and All Disabled**

51
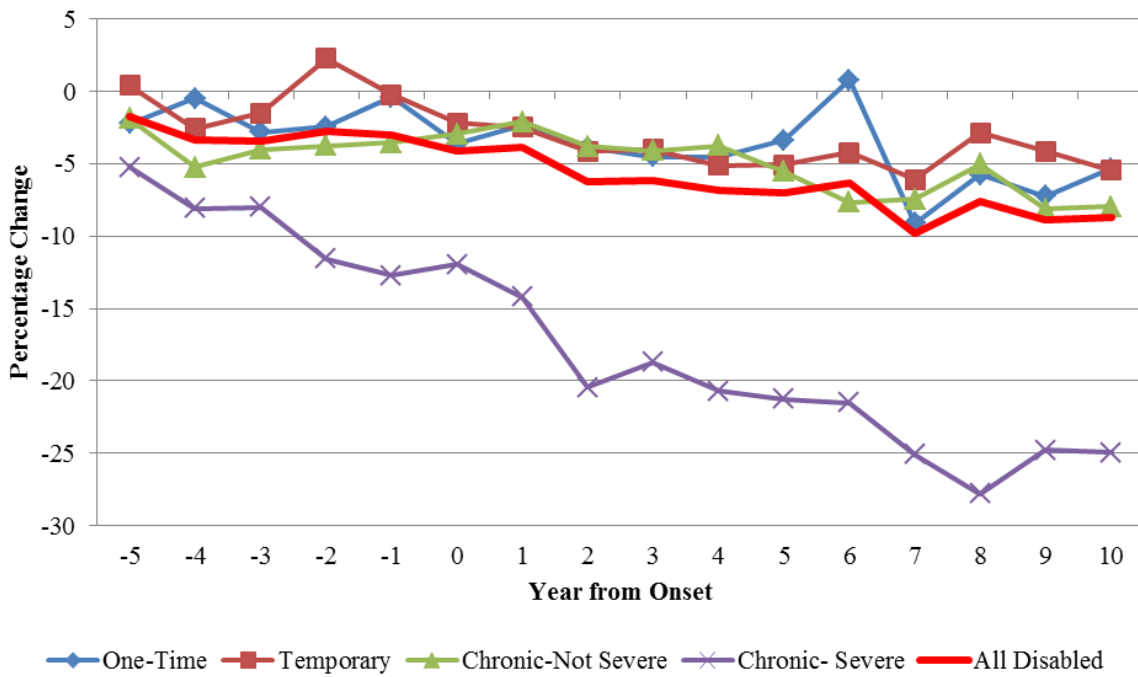
Figure 11
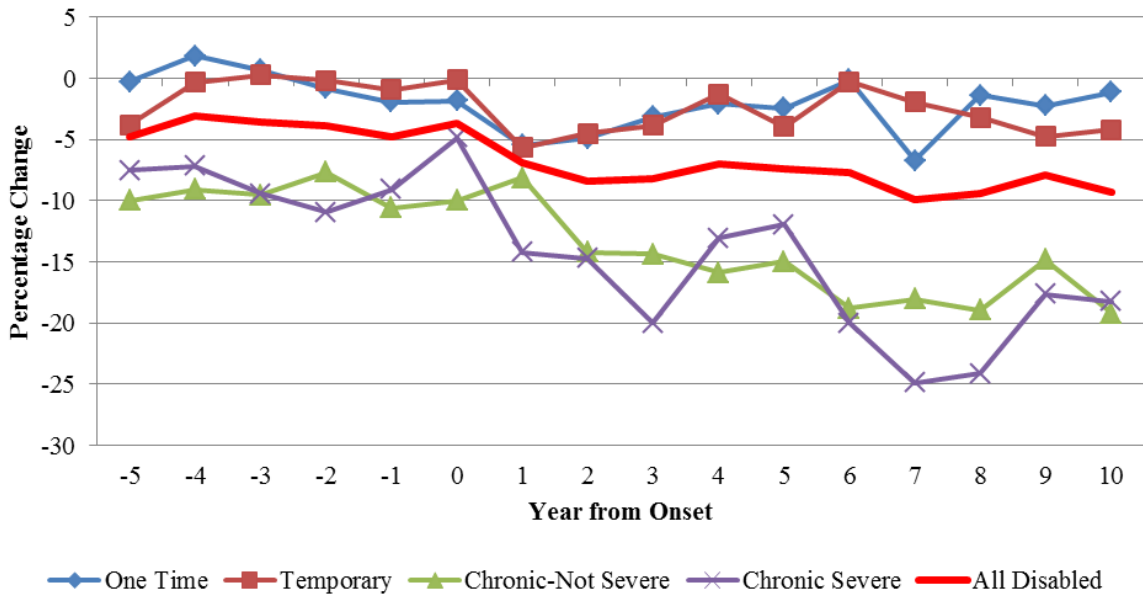**Percentage Change in Food Eaten at Home Before and After Disability Onset,**
Extent of Disability Groups and All Disabled
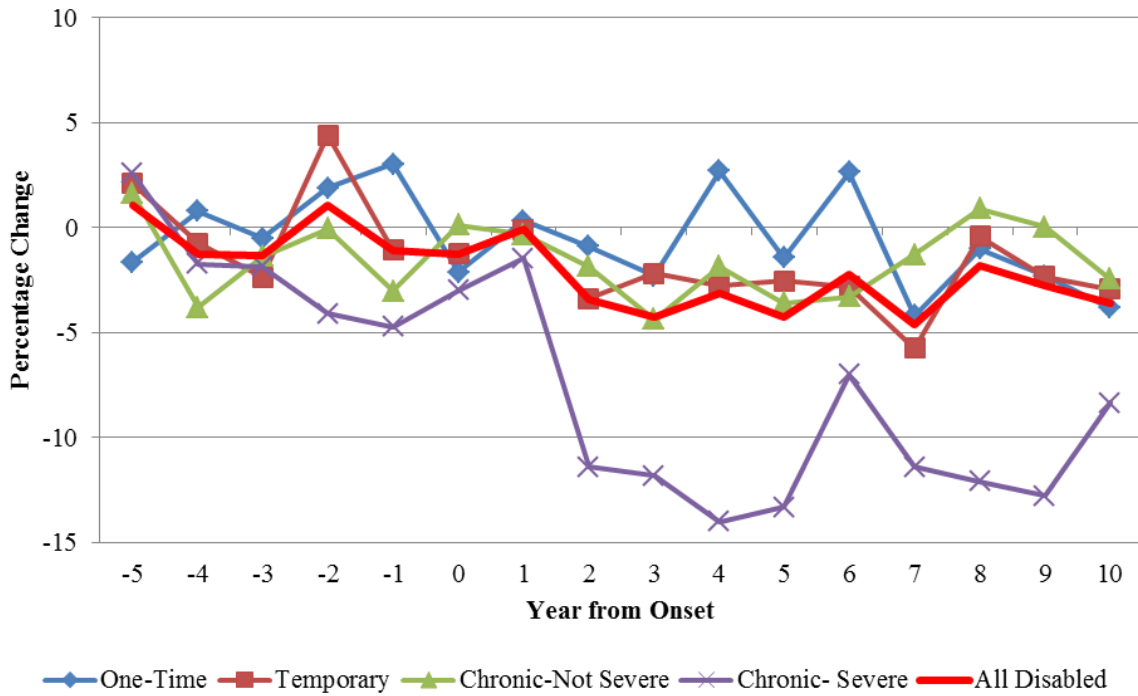
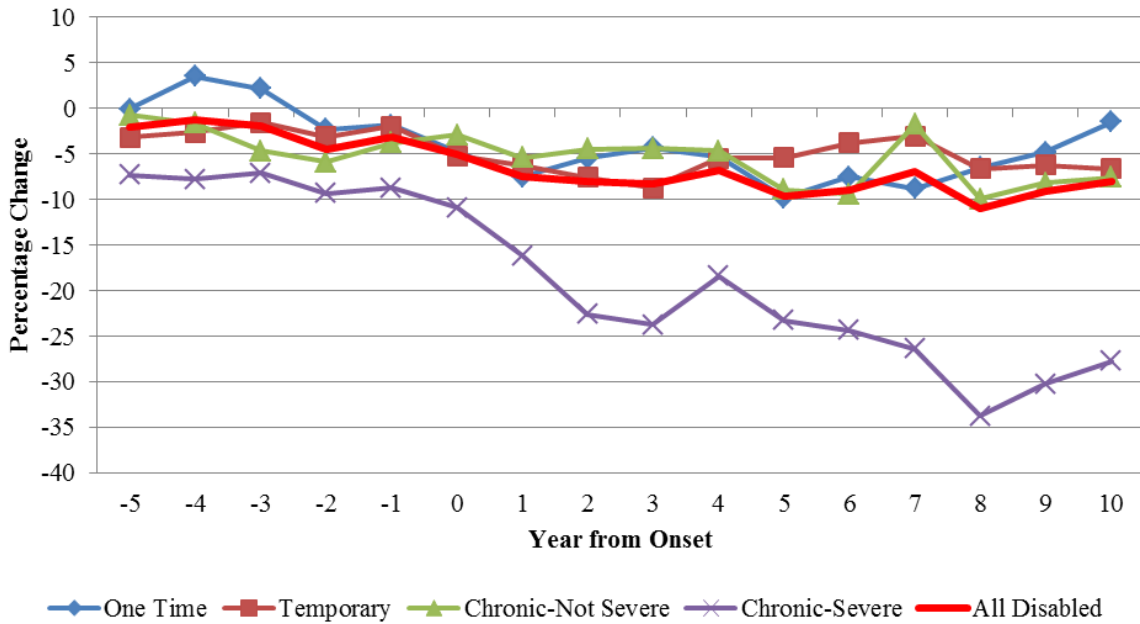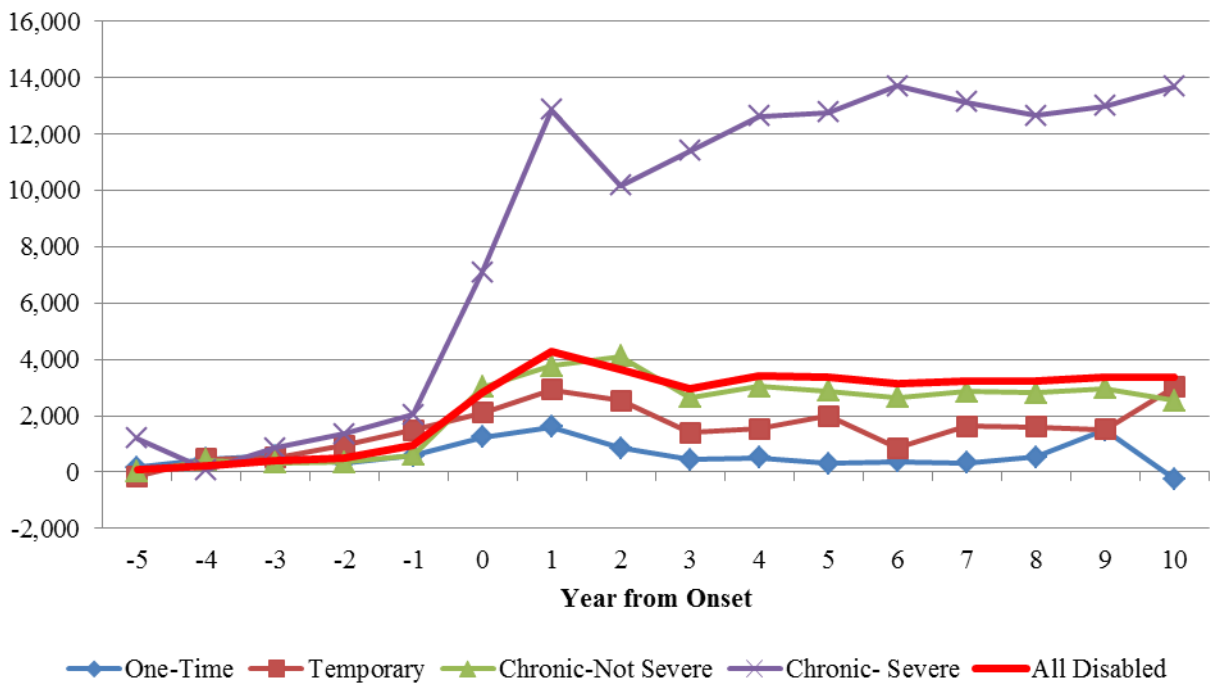
Figure 12
Percentage Change in Food Eaten Outside the Home Before and After Disability Onset,
Extent of Disability Groups and All Disabled

52
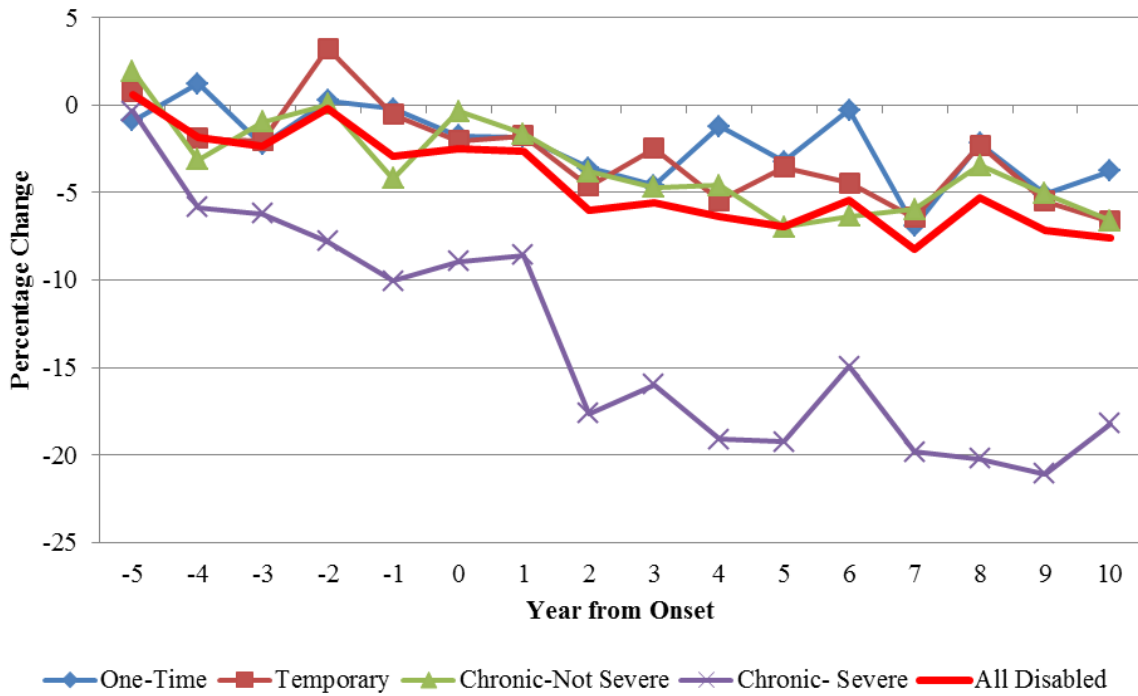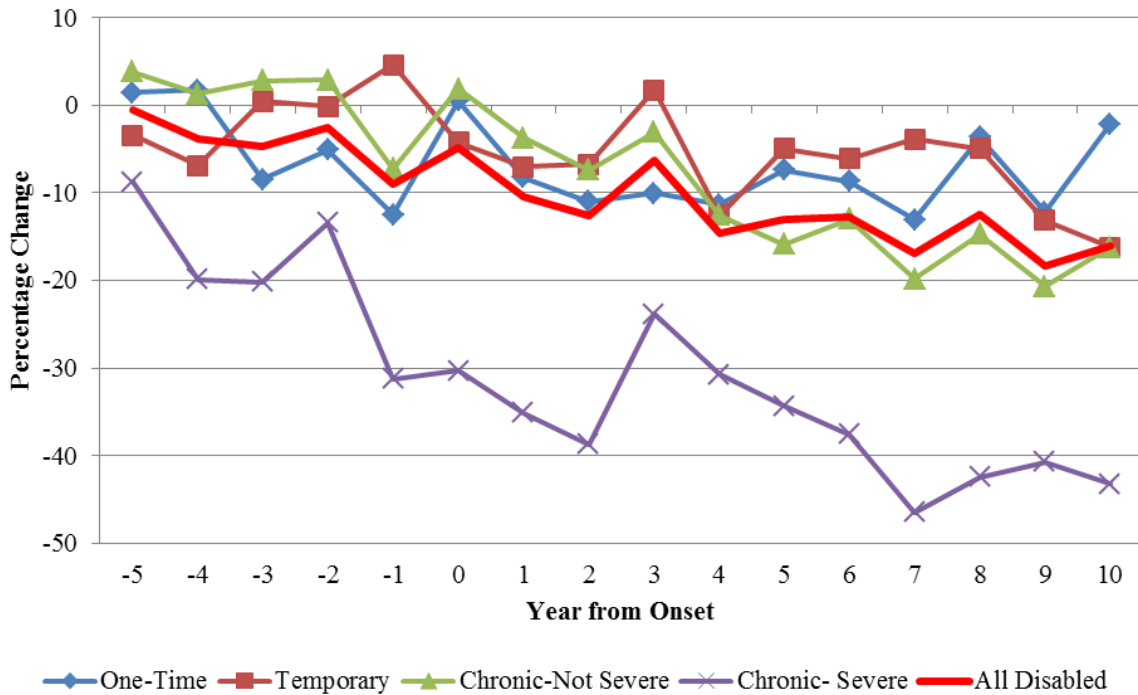
Table 1
Working Age Male Household Head Disability Rates, and Shares Severely Disabled
1968-2009

Year	N	Disability Rate (Unweighted)	Disability Rate (Weighted)	Share of Disabled that are Severely Disabled (Weighted)
	(1)	(2)	(3)	(4)
1968	2,865	15.17	13.74	0.30
1969	2,659	17.84	16.25	
1970	2,730	16.40	14.76	
1971	2,809	16.87	16.01	
1972	2,901	14.03	13.16	0.33
1973	3,039	12.62	12.24	0.28
1974	3,164	11.79	11.41	0.27
1975	3,307	10.81	10.60	0.27
1976	3,418	10.89	10.43	0.35
1977	3,542	11.86	10.95	0.48
1978	3,663	12.17	11.39	0.44
1979	3,799	13.26	12.79	0.44
1980	3,905	14.09	13.60	0.42
1981	3,931	12.46	12.38	0.48
1982	3,970	11.74	11.99	0.45
1983	4,046	11.46	11.25	0.48
1984	4,093	12.38	12.86	0.37
1985	4,177	11.95	12.14	0.41
1986	4,193	10.55	11.25	0.26
1987	4,221	12.62	13.64	0.31
1988	4,262	12.86	13.71	0.28
1989	4,266	12.90	13.49	0.31
1990	5,485	13.65	14.42	0.33
1991	5,451	13.48	14.09	0.31
1992	5,716	13.50	13.99	0.28
1993	5,712	13.24	13.46	0.29
1994	6,224	13.46	12.80	0.30
1995	5,966	13.03	12.98	0.34
1996	4,946	12.78	13.19	0.34
1997	4,028	11.34	12.02	0.28
1999	4,175	12.11	12.29	0.34
2001	4,475	12.45	13.02	0.29
2003	4,718	12.13	12.35	0.32
2005	4,746	11.60	12.07	0.38
2007	4,858	12.13	13.20	0.36
2009	5,034	11.45	12.03	0.39

Notes: The sample is male household heads ages 22-61 years in the PSID full sample. The disabled in a survey year are those who answer yes to the question: "Do you have a physical or nervous limitation that limits the amount or type of work you can do?" Severely disabled family heads are those who report "Can do nothing," "Completely," "A Lot" or "Severely" in response to the follow-up severity question.

Table 2

Disability Transition Matrix

t-1	t	t+1			t+2		
		Non-disabled	Not Severe	Severe	Non-disabled	Not Severe	Severe
Non-disabled	Non-disabled	0.967	0.023	0.007	0.954	0.029	0.011
Non-disabled	Not Severe	0.586	0.336	0.075	0.619	0.300	0.074
Non-disabled	Severe	0.309	0.255	0.431	0.345	0.253	0.388
Not Severe	Non-disabled	0.752	0.203	0.041	0.726	0.202	0.067
Not Severe	Not Severe	0.252	0.647	0.094	0.323	0.546	0.118
Not Severe	Severe	0.124	0.314	0.552	0.173	0.309	0.514
Severe	Non-disabled	0.647	0.196	0.145	0.609	0.211	0.165
Severe	Not Severe	0.194	0.464	0.342	0.212	0.397	0.386
Severe	Severe	0.066	0.129	0.796	0.099	0.160	0.728

Notes: The sample is male household heads ages 22-61. See the text for further details.

	Non-Disabled	All Disabled	Extent of Disability Groups			
			One-Time	Temporary	Chronic Not Severe	Chronic Severe
	(1)	(2)	(3)	(4)	(5)	(6)
Age at Disability Onset		37.0 (10.3)	35.7 (9.0)	35.6 (10.5)	37.0 (10.3)	41.7 (10.2)
Age	35.9 (7.9)	40.5 (8.7)	37.0 (6.7)	39.5 (8.4)	42.1 (8.6)	44.9 (9.2)
White	0.667 (0.471)	0.670 (0.470)	0.716 (0.451)	0.657 (0.475)	0.752 (0.432)	0.489 (0.501)
Married	0.802 (0.317)	0.799 (0.312)	0.786 (0.319)	0.797 (0.307)	0.816 (0.299)	0.792 (0.331)
Number of Years In Survey	13.7 (8.0)	19.3 (8.1)	19.4 (8.0)	19.2 (8.3)	20.6 (7.9)	17.5 (8.0)
Highest Level of Educ-High School	0.347 (0.476)	0.315 (0.465)	0.347 (0.476)	0.331 (0.471)	0.336 (0.473)	0.264 (0.442)
Highest Level of Educ-College	0.461 (0.499)	0.355 (0.479)	0.462 (0.499)	0.360 (0.480)	0.358 (0.480)	0.191 (0.394)
Years in Survey after Onset		13.7 (8.6)	10.2 (6.7)	13.8 (9.3)	16.5 (8.5)	13.9 (8.2)
Number of Consecutive Positive Limitation Reports		1.919 (4.225)		0.444 (0.631)	3.339 (5.193)	4.933 (6.167)
Number of Non-missing Reports of Disability Status from Onset to the 10th Year after Onset		7.471 (2.495)	6.794 (2.599)	7.218 (2.542)	8.210 (2.196)	7.653 (2.392)
Number of Positive Limitation Reports from Onset to the 10th Year after Onset		2.993 (2.912)		1.402 (0.491)	5.363 (2.113)	6.155 (2.339)
Severity Ratio		0.277 (0.371)	0.129 (0.336)	0.207 (0.307)	0.121 (0.164)	0.837 (0.168)
Age in the Last Interview	45.2 (11.7)	54.8 (13.4)	50.2 (11.8)	53.6 (13.7)	57.6 (13.1)	58.5 (13.4)
Number of Observations	4,804	1,937	465	595	548	329

Notes: Standard deviations are in parentheses. The variables Age and Married are averages over the sample years during which the individual is the head and ages 22-61. Individuals are classified by their first observed disability. See data appendix or text for sample restrictions and the text for group definitions.

Table 4
Prevalence of Disability by Age

Age	Number of Male Heads	Any disability (1)	Currently Disabled (2)	One-Time (3)	Temporary (4)	Chronic Not Severe (5)	Chronic Severe (6)
30	607	0.2171	0.0862	0.0428	0.0650	0.0736	0.0357
		(0.0201)	(0.0147)	(0.0089)	(0.0120)	(0.0124)	(0.0102)
32	1009	0.2160	0.0769	0.0422	0.0645	0.0772	0.0321
		(0.0156)	(0.0102)	(0.0077)	(0.0090)	(0.0101)	(0.0071)
34	1214	0.2443	0.0899	0.0570	0.0590	0.0902	0.0382
		(0.0150)	(0.0102)	(0.0079)	(0.0079)	(0.0098)	(0.0078)
36	1272	0.2448	0.0989	0.0584	0.0572	0.0964	0.0329
		(0.0143)	(0.0098)	(0.0075)	(0.0074)	(0.0102)	(0.0057)
38	1112	0.2683	0.0824	0.0635	0.0693	0.1069	0.0286
		(0.0161)	(0.0098)	(0.0084)	(0.0092)	(0.0118)	(0.0057)
40	1009	0.2658	0.0882	0.0536	0.0712	0.1118	0.0292
		(0.0167)	(0.0105)	(0.0081)	(0.0096)	(0.0121)	(0.0062)
42	902	0.2827	0.1079	0.0611	0.0710	0.1204	0.0302
		(0.0178)	(0.0126)	(0.0091)	(0.0099)	(0.0132)	(0.0067)
44	743	0.3001	0.1205	0.0484	0.0995	0.1201	0.0321
		(0.0199)	(0.0141)	(0.0088)	(0.0132)	(0.0143)	(0.0070)
46	583	0.3298	0.1317	0.0507	0.1061	0.1130	0.0599
		(0.0231)	(0.0169)	(0.0108)	(0.0152)	(0.0155)	(0.0116)
48	554	0.3411	0.1275	0.0470	0.0910	0.1394	0.0637
		(0.0237)	(0.0165)	(0.0101)	(0.0144)	(0.0175)	(0.0116)
50	542	0.3595	0.1628	0.0558	0.0790	0.1332	0.0916
		(0.0245)	(0.0191)	(0.0117)	(0.0134)	(0.0170)	(0.0151)
52	555	0.3544	0.1687	0.0606	0.0720	0.1200	0.1018
		(0.0239)	(0.0190)	(0.0119)	(0.0121)	(0.0164)	(0.0152)
54	538	0.3824	0.1909	0.0607	0.0758	0.1281	0.1178
		(0.0242)	(0.0198)	(0.0122)	(0.0126)	(0.0164)	(0.0160)
56	545	0.4140	0.2152	0.0639	0.0734	0.1312	0.1456
		(0.0243)	(0.0205)	(0.0127)	(0.0125)	(0.0165)	(0.0172)
58	383	0.6047	0.3033	0.0841	0.1041	0.2104	0.2060
		(0.0298)	(0.0281)	(0.0171)	(0.0179)	(0.0250)	(0.0244)
60	352	0.6142	0.3039	0.0808	0.1007	0.1878	0.2451
		(0.0309)	(0.0290)	(0.0180)	(0.0181)	(0.0251)	(0.0268)

Notes: This table reports for each age the fraction of the sample members who have had a disability by the specified age, the fraction of individuals who are currently disabled, and the fraction for whom a given disability type is their most severe disability to date. For this table we only use data from 1980-1992. The fractions are weighted. Standard errors are in parentheses. We restrict the sample to individuals with at least 10 years of data prior to the specified age. See text for details.

Table 5
Changes in Economic Outcomes Before and After Disability Onset, All Disabled

Year from onset	Earnings (1)	Implied % Change (2)	Hours of Work (3)	% working zero hours (4)	Pre-Public Transfer Income (5)	Implied % Change (6)	Post-Public Transfer Income (7)	Implied % Change (8)	Food (9)	Implied % Change (10)	Food plus Housing (11)	Implied % Change (12)
-5	-0.038 (0.024)	-3.68	22 (20)	1.84	-0.019 (0.013)	-1.91	-0.021 (0.013)	-2.04	0.006 (0.014)	0.59	-0.017 (0.011)	-1.72
-4	-0.028 (0.022)	-2.80	-15 (23)	2.63	-0.012 (0.015)	-1.20	-0.012 (0.015)	-1.18	-0.019 (0.013)	-1.87	-0.034** (0.012)	-3.32
-3	-0.043 (0.027)	-4.21	-18 (23)	2.78	-0.019 (0.018)	-1.90	-0.020 (0.018)	-1.95	-0.023 (0.013)	-2.31	-0.034** (0.013)	-3.38
-2	-0.080** (0.027)	-7.73	-70** (25)	2.81	-0.045** (0.015)	-4.40	-0.045** (0.015)	-4.43	-0.002 (0.014)	-0.17	-0.028* (0.014)	-2.74
-1	-0.087** (0.021)	-8.36	-112** (25)	4.59	-0.046** (0.017)	-4.50	-0.032 (0.016)	-3.11	-0.030* (0.014)	-2.95	-0.030* (0.014)	-2.99
0	-0.150** (0.025)	-13.93	-246** (27)	6.21	-0.095** (0.017)	-9.02	-0.051** (0.017)	-4.97	-0.025 (0.013)	-2.48	-0.042** (0.014)	-4.10
1	-0.231** (0.030)	-20.63	-368** (29)	13.30	-0.147** (0.019)	-13.67	-0.078** (0.018)	-7.48	-0.027 (0.016)	-2.63	-0.040* (0.016)	-3.88
2	-0.230** (0.030)	-20.55	-346** (30)	13.52	-0.138** (0.019)	-12.89	-0.084** (0.019)	-8.06	-0.062** (0.014)	-6.02	-0.065** (0.016)	-6.26
3	-0.203** (0.036)	-18.37	-328** (30)	15.50	-0.125** (0.024)	-11.75	-0.086** (0.024)	-8.23	-0.058** (0.015)	-5.61	-0.063** (0.017)	-6.12
4	-0.237** (0.032)	-21.10	-368** (30)	15.23	-0.124** (0.026)	-11.66	-0.070** (0.025)	-6.75	-0.066** (0.015)	-6.35	-0.071** (0.018)	-6.82
5	-0.247** (0.039)	-21.89	-343** (32)	17.50	-0.157** (0.023)	-14.53	-0.101** (0.022)	-9.61	-0.072** (0.015)	-6.95	-0.072** (0.019)	-6.99
6	-0.226** (0.036)	-20.23	-329** (33)	16.17	-0.138** (0.024)	-12.89	-0.094** (0.023)	-8.97	-0.056** (0.016)	-5.46	-0.065** (0.023)	-6.29
7	-0.248** (0.041)	-21.96	-334** (33)	18.55	-0.119** (0.034)	-11.22	-0.071* (0.033)	-6.90	-0.086** (0.016)	-8.23	-0.103** (0.019)	-9.79
8	-0.255** (0.037)	-22.51	-300** (34)	16.33	-0.157** (0.025)	-14.53	-0.117** (0.024)	-11.04	-0.054** (0.017)	-5.26	-0.079** (0.022)	-7.62
9	-0.226** (0.042)	-20.23	-320** (36)	18.72	-0.140** (0.027)	-13.06	-0.096** (0.026)	-9.14	-0.074** (0.017)	-7.18	-0.092** (0.022)	-8.83
10	-0.252** (0.043)	-22.28	-378** (38)	18.41	-0.144** (0.028)	-13.41	-0.083** (0.028)	-7.97	-0.079** (0.018)	-7.56	-0.091** (0.023)	-8.69

Notes: The numbers reported are, for each variable of interest, the coefficient estimates of the time from onset indicator variables in fixed effect regressions. The omitted period is more than 5 years before onset. Standard errors clustered by person are in parentheses. Statistical significance of each estimate is denoted as follows: **Significant at 1 percent level, *Significant at 5 percent level. See the data appendix for variable definitions and the text for further details.

Table 6
Changes in Economic Outcomes Before and After Disability Onset, Chronic-Severe Group

Year from onset	Earnings (1)	Implied % Change (2)	Hours of Work (3)	% working zero hours (4)	Pre-Public Transfer Income (5)	Implied % Change (6)	Post-Public Transfer Income (7)	Implied % Change (8)	Food (9)	Implied % Change (10)	Food plus Housing (11)	Implied % Change (12)
-5	-0.101* (0.060)	-9.61	-36 (58)	3.20	-0.091** (0.034)	-8.70	-0.076* (0.031)	-7.27	-0.003 (0.027)	-0.33	-0.054* (0.022)	-5.25
-4	-0.109** (0.054)	-10.33	-120* (51)	2.82	-0.059 (0.035)	-5.78	-0.081* (0.033)	-7.80	-0.06 (0.031)	-5.85	-0.084** (0.027)	-8.07
-3	-0.129** (0.045)	-12.10	-75 (53)	2.90	-0.07 (0.038)	-6.78	-0.073* (0.035)	-7.08	-0.064* (0.033)	-6.20	-0.083** (0.028)	-7.98
-2	-0.147** (0.041)	-13.67	-87 (63)	3.90	-0.092* (0.040)	-8.77	-0.098** (0.035)	-9.33	-0.081* (0.034)	-7.78	-0.123** (0.032)	-11.57
-1	-0.216** (0.043)	-19.43	-249** (59)	4.67	-0.114** (0.042)	-10.77	-0.091* (0.037)	-8.73	-0.106** (0.036)	-10.06	-0.136** (0.032)	-12.72
0	-0.454** (0.079)	-36.49	-686** (71)	16.18	-0.255** (0.052)	-22.51	-0.115** (0.041)	-10.86	-0.093** (0.033)	-8.93	-0.127** (0.032)	-11.93
1	-0.900** (0.103)	-59.34	-1,121** (69)	39.85	-0.475** (0.060)	-37.81	-0.176** (0.049)	-16.14	-0.09 (0.049)	-8.58	-0.153** (0.039)	-14.19
2	-0.981** (0.112)	-62.51	-1,195** (73)	47.49	-0.512** (0.060)	-40.07	-0.256** (0.044)	-22.59	-0.194** (0.034)	-17.63	-0.229** (0.032)	-20.47
3	-1.075** (0.126)	-65.87	-1,283** (68)	56.36	-0.574** (0.069)	-43.67	-0.271** (0.048)	-23.74	-0.174** (0.039)	-15.97	-0.207** (0.033)	-18.70
4	-1.111** (0.129)	-67.08	-1,327** (70)	55.26	-0.553** (0.095)	-42.48	-0.203** (0.066)	-18.37	-0.212** (0.033)	-19.10	-0.232** (0.034)	-20.71
5	-1.314** (0.136)	-73.13	-1,397** (66)	62.28	-0.643** (0.069)	-47.43	-0.265** (0.048)	-23.28	-0.214** (0.036)	-19.27	-0.239** (0.034)	-21.26
6	-1.331** (0.145)	-73.58	-1,434** (72)	59.75	-0.653** (0.072)	-47.95	-0.279** (0.053)	-24.35	-0.162** (0.039)	-14.96	-0.242** (0.037)	-21.49
7	-1.525** (0.156)	-78.24	-1,417** (74)	66.67	-0.676** (0.078)	-49.14	-0.306** (0.054)	-26.36	-0.221** (0.040)	-19.83	-0.289** (0.039)	-25.10
8	-1.594** (0.184)	-79.69	-1,499** (75)	65.35	-0.817** (0.078)	-55.82	-0.412** (0.053)	-33.77	-0.226** (0.034)	-20.23	-0.326** (0.036)	-27.82
9	-1.474** (0.180)	-77.10	-1,444** (86)	69.73	-0.800** (0.082)	-55.07	-0.360** (0.054)	-30.23	-0.237** (0.036)	-21.10	-0.285** (0.045)	-24.80
10	-1.431** (0.196)	-76.09	-1,445** (85)	65.82	-0.739** (0.095)	-52.24	-0.325** (0.064)	-27.75	-0.201** (0.044)	-18.21	-0.287** (0.040)	-24.95

Notes: The numbers reported are, for each variable of interest, the coefficient estimates of the time from onset indicator variables in fixed effect regressions, for the Chronic-Severe disability group. The omitted period is more than 5 years before onset. Standard errors clustered by person are in parentheses. Statistical significance of each estimate is denoted as follows: **Significant at 1 percent level, *Significant at 5 percent level. See the data appendix for variable definitions and the text for further details.

Table 7
Decomposition of Change in Housing Consumption

	One-Time (1)	Temporary (2)	Chronic Not Severe (3)	Chronic Severe (4)
A. Housing Type				
Homeowner	-0.028	-0.073**	-0.006	-0.059
	(0.026)	(0.026)	(0.026)	(0.037)
Publicly Subsidized	0.018	0.011	0.02	0.045*
	(0.010)	(0.009)	(0.011)	(0.022)
Rental	0.01	0.062*	-0.014	0.013
	(0.025)	(0.026)	(0.027)	(0.040)
B. Housing Consumption Given Type				
Homeowner	-1003.76	-233.37	-924.01	-3,086.54**
	(599.61)	(890.58)	(723.18)	(607.09)
Rental	-942.77*	-1,081.96**	-564.83	-1,396.83**
	(405.11)	(398.77)	(468.94)	(391.41)

Notes: The table reports the coefficient estimates on the interaction of each disability group with being after the 6th year after onset ($t \in \{6,10\}$). Standard errors clustered by person are in parentheses. Statistical significance of each estimate is denoted as follows: **Significant at 1 percent level, *Significant at 5 percent level. For the upper panel, the dependent variable is a dichotomous variable that equals one if the specified housing type is chosen. For the bottom panel, the dependent variable is the amount of housing consumption, conditional on the housing type chosen. See the text for details.

Table 8
Estimates of $\varepsilon_{D,b}$ for Current Disability Compensation Programs to be Optimal

		Coefficient of Relative Risk Aversion, γ				
		1	2	3	4	5
	0	0.2200	0.4400	0.6600	0.8800	1.1000
Coefficient of	1	0.2373	0.4720	0.7045	0.9353	1.1646
Relative	2	0.2557	0.5082	0.7585	1.0074	1.2551
Prudence, ρ	3	0.2748	0.5471	0.8179	1.0878	1.3571
	4	0.2946	0.5879	0.8807	1.1731	1.4652
	5	0.3149	0.6302	0.9457	1.2613	1.5769

Notes: This table shows, for a given value of γ (coefficient of relative risk aversion) and ρ (coefficient of relative prudence), what $\varepsilon_{D,b}$ (elasticity of the fraction of a lifetime spent disabled with respect to the disability benefit level) would be if the current compensation programs for the chronic-severe disabled are optimal.