Unemployment and Disability:
Evidence from the Great Recession

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ABSTRACT

It is well known that disability insurance (DI) enrollment is countercyclical. But less is known about why DI is countercyclical. Understanding this point is crucial given the rapid rise in DI caseloads in recent decades combined with the widely publicized forecast that the Social Security Disability Insurance Trust Fund will be exhausted by 2016. However, no systematic evidence describes how or why caseloads have changed during the Great Recession. In this paper, we compare DI applications and awards during the great recession to other recent recessions. We find that changes in the caseload from 2007 to 2010 are not unique compared with other recessions. We then use individual data on older U.S. workers from the Health and Retirement Study to analyze two hypotheses for why DI applications rise during recessions. Based on research suggesting that job loss and recessions more broadly have deleterious effects on health, we test whether the number and/or severity of health shocks during recessions can explain elevated DI application rates. Second, we test whether changes in the opportunity costs of applying for DI can explain higher DI application rates during recessions. Although we find evidence that severity of health shocks and measures of the opportunity cost of DI application predict DI application among older workers, we find no support for either the health shocks or opportunity cost hypothesis. Alternative explanations for the countercyclicality of DI applications are required to describe recent recessions, including the Great Recession.

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It is well known that disability insurance (DI) enrollment is countercyclical. Enrollment rose markedly in the recessions of the early 1970s, the early 1990s and the early 2000s, and declined during the subsequent expansions. Only the period of disability insurance terminations in the early and mid-1980s displays a cyclical DI pattern. The countercyclical trend in DI has been noted by Stapleton et al. (1995), Autor and Duggan (2003; 2006), and many others[1].

But less is known about why DI is countercyclical. Understanding this point is crucial given the rapid rise in DI caseloads in recent decades (Figure 1) combined with the widely publicized forecast that the Social Security Disability Insurance Trust Fund will be exhausted by 2016 (Pear 2012). There are two broad theories of recessions and disability insurance. The first theory is a theory of health shocks: DI is countercyclical because health shocks are greater in recessions than in expansions (Brenner and Mooney 1983; Bartley 2007; Coile, Levine, and McKnight 2012). People might suffer different shocks when the economy is worse, the care they receive for shocks may be inferior, or the accumulation of shocks may affect health non-linearly – for example, mental health shocks such as depression and anxiety may magnify the impact of physical shocks on ability to work (Strully 2009, Stuckler et al. 2011). In this theory, disability insurance rises in a recession because impairment is truly greater. Despite evidence that certain health outcomes improve temporarily during recessions, new evidence from the U.S. suggests that the health of older adults worsens following recessions (Ruhm 2000; Coile, Levine, and McKnight 2012).

The second theory is one of opportunity costs. This theory argues that a person at the same level of impairment will be more likely to apply for DI in a recession, because the return to staying in the labor force is lower. Such hypotheses are common in both academic literature and popular media (Autor and Duggan 2003; Paletta 2011; Leonhardt 2011). Earnings losses in a recession reduce the return to

[1] See Bound and Burkhauser 1999 for a review of earlier literature on this topic.

work, and non-wage benefits such as health insurance and pensions may decline as well. Autor and Duggan (2003) argue that DI and unemployment are correlated because of changes in the opportunity cost of applying for disability insurance.[2]

In this paper, we explore the link between recessions and DI, disentangling the health shock and opportunity cost theories. We start by analyzing the historical link between unemployment and disability insurance. We do this in part to understand the best fitting temporal relationship between the two and in part to understand the impact of the Great Recession of 2009-10 on DI receipt. Given the severity of the Great Recession, one might suspect that its effect on DI would be more than proportionately greater than for a less severe recession. On the other hand, large extensions of unemployment insurance made available during the recession might have limited the increase in DI resulting from the downturn.

Using both national and state data, we show that DI receipt responds rapidly to the economy: the best fitting annual relationship between unemployment and DI receipt is a contemporaneous one. Accounting for this relationship, we find that the Great Recession is a 'normal' recession. DI receipt rose, but did so by about the amount that one would expect given the severity of the economic shock.

We then proceed to disentangle the health shock and opportunity cost theories. To do this, we turn to micro data from the Health and Retirement Study (HRS). The HRS is a biennial panel study of elderly and near-elderly individuals, asking rich questions about economic and health events. We examine the population aged 52-64, for whom job separation is a common occurrence and DI applications are prevalent. Our data start in 1992 and extend through 2010, thus including the relatively small recession of 2001 and the much greater recession of 2007-2009. Using restricted access geographical data, we match quarterly data on area-specific unemployment rates (the MSA level for people living in MSAs and the state level for

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[2] This theory is continuous. See Parsons (1980), Bound et al. (1989), Autor and Duggan (2003), for example.

people outside of MSAs) to individual-level data on health, job changes, retirement, and disability.

To examine the health shock theory, we consider the how health shocks translate into physical and mental health status at different points in the business cycle. The health shock theory implies that there are more shocks during a recession (Strully 2009), or that functional levels after a given shock should be worse for shocks that occur during a recession compared to shocks that occur outside of a recession (Brenner 1983; Coile et al. 2012). Our measures of health shocks are common and effects range from moderate to severe; they include new cases of heart disease, cancer, stroke, psychiatric issues, back pain, diabetes, and arthritis. Controlling for area and time fixed effects, we find no evidence for the health shock theory. Health shocks adversely influence physical and mental health functioning, but the impact on DI application is no greater during a recession than during an expansion. Self reported activity limitations and poor functional status do not explain the cyclicality of DI application in the HRS.

To examine the opportunity cost theory (Stapleton 1995; Autor and Duggan 2003), we estimate models of DI application as a function of demographics, household composition, health insurance status and source, and job characteristics. Although less educated workers are indeed more likely to apply for DI benefits (consistent with the opportunity costs theory), holding health status (and the onset of new conditions) constant across older workers aged 52 to 64, we find that the strong link between unemployment and DI applications remains even after controlling for various measures meant to capture the opportunity costs of DI application.

The paper is structured as follows. The next section discusses the health shock and opportunity cost models of DI and unemployment. The second section presents the results of aggregate analysis relating unemployment and DI applications and awards. The third section presents our HRS data and discusses sample issues. The fourth section then considers the health shock and opportunity cost theories empirically. The last section concludes.

1. The US Disability Insurance Program and Models of Disability Insurance and Unemployment

In the U.S., two programs provide income support to disabled individuals: Social Security Disability Insurance (DI) and Social Security Supplemental Security Income (SSI). The DI program, the focus of this paper, offers insurance coverage for covered workers with medical impairments that are expected to last at least 12 months or result in death. The impairments must be sufficiently severe to prevent "substantial gainful activity", measured as earnings of $1000 per month in 2010. Average monthly benefits paid by Social Security to disabled workers in 2010 were similar in magnitude, $1068. The SSI program includes identical eligibility criteria, but covers individuals with little or no work history, and pays lower benefits than DI. Once on the DI program, exit from the program is very rare for reasons other than death or attaining the full retirement age of eligibility for Social Security's Old Age Pension Benefits (65 for cohorts in this study).

Historically, many researchers have noted the counter-cyclical nature of DI applications and awards. The earliest studies documenting this relationship in a convincing fashion, with time series data of a repeated sample of state DI and unemployment rates, controlling for state effects and year effects, come studies by Stapleton and colleagues and summarized in Rupp and Stapleton (1995). Using data from 1980-1993, Stapleton, Coleman and Deitrich (1995) estimated that DI awards grew by 2 to 3% for each percentage point rise in the unemployment rate. Applications for DI rose by more, 4%, for each percentage point rise in unemployment (Stapleton and Deitrich 1995). Autor and Duggan (2003) assess how labor market demand shocks, measured as changes in the employment to population ratio, affected DI applications in two eras, one of tightening DI eligibility in 1978-84 and one of loosening eligibility for the program (1985-1998). They estimate that for high school dropouts, or those workers with the highest wage replacement rates in the DI program, a one percent change in the employment to population ratio coincided with an additional 4.4 applications per 1000 population during the period since 1984. This study was focused on the tightening of eligibility in 1980 to 84 and the subsequent loosening of DI eligibility criteria after 1984. Thus, the authors did not examine health separately, except in models controlling for local mortality rates, to verify that the rising response to labor market conditions did not reflect changes in the health of the high school drop out population. In a more descriptive analysis of the DI program and the US, Autor and Duggan make the case that DI applications are countercyclical with data on unemployment rates and applications over time (2006).

Ample research documents health changes during recessions, which is relevant since recession-induced health shocks could potentially lead more individuals to claim DI. Although Ruhm (2000) argues that health improves during recessions due to fewer deaths related to unhealthy activities that rise during booms (activities that lead to injuries, such as greater use of cars, and risk factors for cardiovascular deaths such as smoking, poor diet, or sedentary activity), he stresses short term health effects, and there are important exceptions to this pattern. Suicides rise during recessions (Ruhm 2000), and thus depression marks one notable health outcome that deteriorates during recessions. Others find worse health along a variety of dimensions during recessions (Brenner et al. 1981; Bartley 2007). Of relevance for this paper, new evidence suggests that mortality of older workers exposed to recessions in their 50s is higher than similar workers not exposed to recessions (Coile et al. 2012). Coile et al. (2012) document that the older workers exposed to recessions in their 50s were less likely to be employed and less likely to have health insurance during this time, compared with cohorts of older workers not exposed to recessions during these ages.

Although ample studies document correlations between unemployment and DI activity, no one, to our knowledge, tests how disability application changes due to recession induced health changes, and the literature focused on direct effects of business cycles almost exclusively analyzes aggregate level data, with the exception of Black, Daniel and Sanders (2002) work on coal mining communities, a clever example, but perhaps not as general as a more national overview of business cycles and DI.

To motivate our empirical work, we adopt a conceptual framework often used in this literature by authors such as Autor and Duggan (2003), but adapted to allow for changes in the hazard of losing and finding a job, as a function of the unemployment rate, and to include changes in health status related to changes in local unemployment. We consider the choice between remaining in the labor market and applying for DI (which due to DI program rules essentially requires applicants to leave the labor market). As in Autor and Duggan, per-period utility of employment v(c,h), rises in both compensation (including wage and non-wage compensation) and health $v_c(.)$, $v_h(.) > 0$. Employed workers face a hazard *s* of job loss in each period, and unemployed job seekers face a per-period hazard *q* of reemployment. Job loss s is increasing with local unemployment rates, $s_{UR}(.) > 0$, and similarly, reemployment q falls with unemployment, $q_{UR}(.) <0$. DI applicants obtain DI benefits with probability p, which is increasing in the severity of health conditions and functional limitations, $p_h < 0$. The literature on health shocks reviewed above suggests that h is sensitive to employment, and thus to local labor markets such that $p_{UR} > 0$. As in the real program, rejected applicants may reapply.

Potential DI applicants compare the value of applying for disability V_D = f(p) to the value of remaining in the labor force, V_R = f(q,s,c,h). An opportunity cost model implies that V_R increases with increasing wages and non-cash compensation, such as employer sponsored health insurance. Thus, worsening local labor market conditions, or rising unemployment rates, tip the balance toward V_D and away from V_R. This can happen directly through changes in q and s, or reductions in c, but also indirectly through recession-induced changes in health which might affect the ability of individuals to work, and which might increase the probability that a DI application would be accepted. In section 3, we discuss how we test each of these hypotheses (health severity and opportunity costs) using individual level data. Before turning to individual analyses of data, however, we describe the aggregate relationships between DI applications, DI awards, and unemployment rates over time, and to assess how, if at all, the Great Recession differs from other recent recessions.

2. DI Awards & Applications in Aggregate

To assess how DI applications and awards changed during the Great Recession compared with previous recessions, we use administrative data from the Social Security Administration on DI applications, and new DI awards between 1965 and 2011. We report these as rates, per 1000 workers insured by DI, often called "covered workers." Award rates are adjusted by age to the year 2000 population. In practice, this age adjustment scarcely affects the relationship between unemployment and DI activity. Data on applications are unadjusted due to lack of available information on age.

Figure 2 plots national DI awards and applications per 1000 covered workers along with unemployment rates over time. Two patterns emerge. Both applications and awards rise with unemployment rates, although changes are more pronounced for applications than awards. Second, there is a clear pattern of relatively immediate response to rising unemployment rates in applications (and awards), but applications and awards remain elevated even after unemployment rates begin to fall again. The one period that does not fit this pattern is during the period between 1980 and 1984, when new awards fell to historic lows despite a significant recession. Under the presidential administration of Ronald Reagan, eligibility criteria were tightened substantially, and beneficiaries were subject to more stringent reviews to maintain eligibility. These eligibility restrictions were relaxed by the mid 1980s. In later analyses of trends in DI over time, we will account for the eligibility stringency during 1980 to 1984.

Figures 3-5 show data on DI award rates (per 1000 covered workers) separately by sex and age group. Historically, DI was more common among men than women (Figure 3). However, since 2000, award rates for men and women are nearly identical. The pattern of immediate response in DI awards during rising unemployment, followed by a period of elevated award rates occurs across gender and age groups. Also, despite rapid growth in DI among younger age groups, the rate of new awards is much higher for older workers aged 50 to 64 compared with workers aged 18 to 49 (over 15 versus 5 per 1000 covered workers). Table 1 summarizes the rise in DI awards and rising unemployment numerically. During the period surrounding the last 3 recessions, unemployment grew much more between 2007 and 2010, 5.1 percentage points, compared with about 2 percentage point growth in each of the prior two recessions. Yet, in both absolute and relative terms, the rise in DI awards was greatest between 1989 and 1992, not in 2007 to 2010.

Testing for Excess DI Awards During the Great Recession

Next we explore more formally the timing of trends between unemployment rates and disability awards and applications. Using national data on awards from 1965 through 2011, we estimate models of the following form:

$$(1) \qquad DI\_AWARD_t = \alpha + \beta_1 UNEMP_t + \beta_2 (1980-84) + \varepsilon_t$$

We estimate equation (1) to describe award rates per 1000 covered workers in year t as a function of unemployment rates in that year. To address the tightening eligibility in 1980-84, we include a dummy variable equal to 1 during these years. As an alternative, we further test our models on years after 1989. Figure 6a plots residuals from these regressions against annual unemployment rates. The figure shows that the Great Recession looks relatively “normal”, without a big unexplained rise in DI awards compared to other recessions. Furthermore, the residuals from these models change little regardless of whether we include or exclude periods before 1990.

We also test how residuals change when replacing the current year unemployment rate in (1) with lagged unemployment. The model fit is better (R^2 = .28 versus R^2 = .20) using contemporaneous unemployment. Using our basic model in (1), we test whether each year’s residual differs significantly from zero, presenting these results in Table 2. We also estimate (1) separately for men and women, and we report how the residuals differ for men and women of different ages. None of the residuals on DI awards differ substantially from zero. That is, for no year around the great recession were DI award rates above that predicted by earlier patterns of unemployment and DI.

The pattern of awards and unemployment contrasts with that of applications, however. Figure 6b shows residuals from similar models of DI application rates. Available data on application rates do not include the age of applicants, and thus we control for the aging of the population by adding a simple linear time trend to the model from equation (1), but for DI application rates. In national data on applications, the Great Recession does stand out from prior recessions. Applications spiked upward at the time of the great recession, with an unexpected excess application rate of 2.5 per 1000 covered workers. This "excess application" rate was even larger in models of lagged unemployment, nearly 5 per 1000. Of course, many things changed in the US around the Great Recession, and factors besides unemployment may drive the change in DI application rates. Further, national trends mask great heterogeneity across states, and looking within states over time gives a cleaner sense about how much applications respond to unemployment rates independent of any national trends in DI. Thus, we estimate models of the form:

(2) $$DI\_APP_{st} = \alpha + \beta UNEMP_{st} + \gamma TIME + \delta_s + \phi_q + \varepsilon_{st}$$

These models include a linear time trend, TIME, varying from 1 to 44 for the 44 quarters between 2001 and 2011, state fixed effects, δ_s, to control for fixed differences in DI applications across states, and quarter effects ϕ_q to address seasonality in DI applications.[3] We begin in 2001 because earlier application data at the state level were not available. The DI application rates are expressed per 1000 covered (insured) workers in a given state and quarter. Because SSA does not describe covered workers by state, we constructed the denominator for each state-quarter as the total covered workers in the U.S. multiplied by the share of the labor

[3] Applications drop substantially in the fourth quarter of each year in administrative data.

force in that state and year based on Bureau of Labor Statistics data. Figure 6c and Table 2c show the results of these models. In this preferred specification that exploits within-state changes in unemployment over time, we find that the relationship between DI applications and unemployment suggest that the Great Recession is not very unique, since residuals differ little from zero. For example, the residual on 2009-11 suggests application rates were actually .19 per 1000 lower than would be predicted by earlier recessions. Applications spiked about as much as earlier historical trends in unemployment would suggest.

Finally, before turning to individual level models of DI application and receipt, we used the state data on quarterly application rates to test the timing of changes in DI application versus unemployment rates. Table 3 displays how the relationship with DI changes when including the current unemployment rate versus lagged unemployment rates for up to 8 quarters earlier (estimated in separate regressions with a single unemployment variable in each). We also compare the models with a linear time trend (quarters) to one in which we include a fixed effect for each quarter. In our preferred specification, with a linear time trend, the effect of unemployment is very similar for the four quarters following an unemployment change, and then it falls off substantially. In models that look at variation within states controlling for national rates in a given quarter, the effect of unemployment on applications is smaller, and lasts about seven quarters before diminishing substantially. We take these models as evidence that the response to unemployment rates on applications is relatively immediate, and this informs the analyses of individual application decisions in the HRS.

Section 3. Data and Methods to Examine DI Application and Receipt in the HRS

Health and Retirement Study

The HRS is a biennial panel study of elderly and near-elderly individuals, asking rich questions about economic and health events. In 1992, targeted respondents were aged 51-61. Spouses of respondents were also surveyed (regardless of age), and the sample has been augmented with additional cohorts in 1998 (war babies, children of the depression) and 2004 (early baby boomers) to maintain adequate samples of older adults. We examine the male population aged 52-64 at any given interview, for whom job separation is a common occurrence and DI applications are prevalent. Because male cohorts in this age group were much more likely to work during this time period, and because we wish to compare the opportunity costs of applying for DI relative to work, we focus on males. Our data start in 1992 and go through 2010, thus including the relatively small recession of 2001 and the much greater recession of 2007-2009. Using restricted access geographical data, we match quarterly data on area-specific unemployment rates (the MSA level for people living in MSAs and the state level for people outside of MSAs) to individual-level data on health, job changes, retirement, and disability.

We present information on three samples a) all male HRS respondents aged 52-64 at a given point in time (n=8,333 persons and n=24,680 person waves); b) male HRS respondents aged 52-64 who were not retired and had not applied to DI in the prior interview; and c) male HRS respondents aged 52-64 who reported working part-time or full-time in prior interview. Table 4 displays descriptive characteristics of these groups for comparison. Of note, DI application rates are substantially higher in the full sample (11%) compared with the subsamples of non-retired men not collecting disability in the prior wave. In these groups of recent workers, DI application rates are 2.2% in the larger sub-sample of non-retired and 1.6% in the sample of men working in the prior wave. The latter group is the focus of analyses testing the opportunity costs theory of DI application.

DI Applications and Unemployment Rates

In each wave of the HRS, respondents are asked whether they have applied for DI benefits, and if so, the status of the application (pending, rejected, or approved), and whether they are receiving benefits. We construct the variable DI_APP = 1 if an individual reports having applied for DI since the prior interview, if an application from a prior interview is still pending, or if the individual is now receiving DI benefits. Quarterly unemployment rates for 1990 to 2010 were constructed from monthly Bureau of Labor Statistics data for each Metropolitan Statistical Area (MSA) and state (for respondents not living in an MSA) in the HRS.[4] In our baseline specifications, we include unemployment rates in the year prior to the interview. This is consistent with our aggregate models, in which unemployment in the current or prior year has the greatest effect on disability application rates.

New Health Shocks and Prior Health Conditions

In each wave, respondents are asked about new health conditions. We create a measure of the onset of several major health conditions, or "health shocks" as a positive response to any of the following, "Has a doctor ever told you you have: Arthritis, Cancer, Diabetes, Lung disease, Heart disease, Stroke, or Psychiatric conditions?" In addition, respondents were asked "[Since we last talked to you in (previous interview month)) Have you had any back pain or problems?" at every wave through 2004, and every other wave after that. We add back pain to the list of "health shocks." Our choice of health conditions builds largely on the conditions studied by Smith (1999) in his study of health shocks, but we added psychiatric diagnoses, arthritis, back pain, and diabetes given the growing role of such conditions for those claiming DI. In other words, these conditions are relatively common, and sometimes disabling, as shown in Figure 7 which displays SSA administrative data on the number of awards in each year by diagnosis. Musculoskeletal disorders showed the fastest growth in DI awards since 1980. Mental health diagnoses also showed significant growth over the past three decades.

For comparison to SSA numbers, we show the 2008 prevalence and the 1994-2010 incidence of health conditions for our HRS sample in figure 8. By 2008, over half of our respondents had arthritis, and nearly half reported back pain during at least one interview. New onset of back pain is by far the most common new condition. The bottom panel in figure 8 displays, by health shock, the share of individual with a

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[4] We begin in 1990 because some specifications include lagged unemployment rates.

given health shock that applied for disability since the prior wave. Lung disease and stroke are the most common precedents to DI application. Over 10% of individuals with new onset of these conditions apply for DI. Psychiatric conditions also contribute strongly to applications with 6% of individuals with new psychiatric diagnoses applying for disability. For brevity, many results will show the impact of having any of these conditions, but we also estimated models with indicators of each separate health condition. In practice, however, this affects our results very little.

We build up the prior (pre-existing) conditions from these questions, and our models control for whether a respondent reported (Cancer, Diabetes, Heart Disease, Lung Disease, Psychiatric Diagnoses, Stroke, Arthritis, back pain) in an earlier interview wave. We also control for a five category measure of self reported health status from the prior wave.

We control for demographics, (single year of age, race, sex, education, marital status), household composition, health insurance coverage, and job characteristics of workers, specified as shown in Table 4. In addition, all models in the worker samples include industry effects for 9 out of 10 industry codes and occupation effects for 16 out of 17 occupation codes of most recent job held by respondents.

In each baseline specification, we test how changes in local unemployment rates over time relate to DI applications. So the baseline specification is:

$$\begin{aligned} DI\_APP_{st} &= \alpha + \beta UNEMP_{s,t-1} + \Gamma' HEALTH_{it} + \Phi' DEMOG_{it} + \\ &\quad \Psi' HOUSEHOLD_{it} + \Pi' JOB_{it} + \Theta' HI_{it} + \delta_s + \gamma_t + \varepsilon_{ist} \end{aligned} \tag{3}$$

In these models, we include unemployment in a respondent's MSA (or for respondents not living in an MSA, in that respondent's state) in the calendar year prior to that interview. In (3) the area effects, δ_s, are MSA or state effects as appropriate. The γ_t terms are year of interview effects, and the health (health shock, prior health shock), demographics, household, job, and health insurance variables are as described above and in Table 4. This gives us a baseline relationship between unemployment and DI applications. We estimate this model for all individuals that did not report retirement, disability application or disability receipt in the prior wave, and then again for males working full time in the prior wave. Table 5 shows the results of these baseline specifications. A one percentage point rise in unemployment coincides with a 4.8 per 1000 chance of applying for DI for the non-retired, non-disabled sample, and a 3.7 per 1000 chance of applying for the sample of workers. These rates imply a 2 to 2.5 percentage point rise in DI applications during the Great Recession.

Testing Hypothesis of Severe Health Shocks

To test the hypothesis that more severe health shocks generate the strong link between recessions and DI application, we change (3) slightly to add specific health shocks (lung disease, stroke, cancer, heart disease, diabetes, arthritis, psychiatric diagnoses, back pain), instead of a single health shock variable, for both new and prior health shocks. In addition, we add measures of physical and mental function. These include: the number of functional limitations (whether respondent has trouble walking one/several block(s), jogging 1 mile, sitting for 2 or more hours, rising from chair, climbing stairs, stooping/kneeling/crouching, carrying 10+ lbs., or picking up dime); the number of Activity of Daily Living, or ADL, limitations (dressing, walking across room, bathing, eating, getting in/out of bed); the number of Instrumental Activity of Daily Living, or IADL, limitations (trouble with: preparing meals, getting groceries, taking medication); Community Epidemiology Study – Depression scores (score ranges from 0 to 8, >=3 is likely depression).

If recessions and the ensuing elevation in health shocks, physical, and/or mental limitations lead to higher rates of DI application, we should see that a) DI application rates respond to these health measures and b) that the relationship between unemployment rates and DI application should fall compared with the baseline specification. Table 6 displays the results of regressions of DI applications controlling for specific health shocks, as well as controlling for measures of physical and mental functioning. The baseline specification is shown in column 1 for comparison. Column 2 shows that measures of health severity indeed predict DI application. For example, lung disease is associated with a 9 percentage point increase in the probability of DI application. New diagnoses of cancer, stroke and psychiatric diagnoses lead to a 4 to 6 percentage point increase in the probability of DI application as well. Similarly, having a functional limitation, ADL or IADL elevate the probability of DI application, holding existing and new onset health conditions constant. Surprisingly, the measure of depression shows no significant relationship with DI application rates.

However, the second prediction implied by the health shocks hypothesis, that controlling for severity of health conditions and functional limitations would diminish the link between unemployment rates and DI application, does not hold. In column 2, the impact of a 1 percentage point rise in unemployment on DI applications is 4.3 per 1000, nearly the same as the effect without controlling for severity of health conditions, physical and mental functioning.

Testing the Opportunity Costs Hypothesis

We next turn to hypotheses regarding the opportunity costs of DI application during recessions. Recall that eligibility rules for DI in the US consider someone eligible for disability if his/her disability prevents "Substantial Gainful Activity" (SGA) in the labor market, and if it is suspected to last more than 12 months, or to result in death. In 2010, levels of SGA were about $1000 per month. Thus workers earning less than this due to disabling impairments are considered legally disabled. During times of increased unemployment, we expect that the relative returns to applying for DI will be larger, that is, it will be harder for individuals with a given health condition to earn income beyond the SGA level, all else equal.

Aside from any stigma or time costs associated with DI application, because the application process can last xx to yy months, it requires that individuals go without work and with reduced or no earnings for a significant time period before any potential income support can be collected. Furthermore, if individuals obtain health insurance through an employer, they will forgo employer sponsored health insurance benefits upon leaving an employer to apply for disability. Although health insurance coverage is available for purchase from a former employer that offered coverage for up to 18 months, this health insurance coverage is often prohibitively expensive for someone who has recently left the labor force. Even a successful DI application confers health insurance coverage through Medicare only after a two year waiting period from the onset of disability. Thus, application for DI requires individuals to forgo health insurance, or to obtain insurance from some alternative source.

Given these characteristics of the SSDI program, the opportunity cost hypothesis regarding recessions and DI implies that we should observe certain groups to be more likely to apply for DI with rising unemployment due to their lower opportunity costs of application: the less educated (forgone wages from exiting the labor force are lower, on average compared with College attendees); individuals in more heavily recession-affected industries (construction and manufacturing); individuals close to the normal retirement age of eligibility for Social Security pension benefits and availability of Medicare benefits (ages 62-64, since Medicare is available at 65 and SSA benefits become available at age 65 for cohorts studied in this paper), and individuals with access to retiree health insurance coverage, since they can leave a job and maintain health insurance coverage. In Table 8, we restrict analyses to our sub-sample of males working in the prior waves. In separate specifications, we interact the unemployment with each of these "low opportunity cost" groups. If opportunity cost hypotheses can explain heightened application for DI during recessions, we should see large effects of UR interacted with one of these low opportunity cost groups on DI application rates, and we should observe the main effect of unemployment rates fall, since the remaining groups should be those with higher opportunity costs of applying for DI.

Surprisingly, given the attention to this relationship in the literature, Table 8 shows no support for the opportunity cost theory of DI application. The main effect of unemployment rates on DI application is virtually unchanged as one adds in interactions for the various low opportunity cost groups. In one case, recession affected jobs, the coefficient has an unexpected sign, suggesting that individuals in construction and manufacturing were less likely to apply to DI than workers other industries.

5. Conclusions

In this paper, we examined historical and recent trends in unemployment rates and DI applications and receipt. In aggregate data over the five decades since 1960, application and award rates, although they are counter-cyclical in nature, do not differ very much for the Great Recession versus earlier recessions. Application rates respond more to economic conditions, but allowance rates (awards as a share of applications) are lower during recessions. In aggregate, there is excess application behavior for DI during the Great Recession. However, within state changes in unemployment and application over time do not exhibit unusual application activity around the Great Recession.

We tested two potential hypotheses to explain countercyclical trends in DI application in the US. First, we test whether adverse health effects during recessions raise disability rates in ways that generate a link between unemployment and DI applications, and second, we test whether opportunity cost declines during times of recession can explain the strong link between unemployment and DI applications. Economists have focused largely on the second theory, with only crude controls for health in these models, often focusing on aggregate data (Autor and Duggan 2003, 2006; Stapleton 1995). In cases when researchers used individual level data, they focus on a particular group of workers, such as those in coal industries in the 1970s and 1980s (Black, Daniel, and Sanders 2002) or they fail to account for health conditions in any detail. Thus, our paper augments the literature on unemployment and disability insurance with a richer picture of the role of changes in health status and changes in labor markets.

In this paper, we examined individual level data on older male workers in the Health and Retirement Study in the US. We first estimated how local unemployment rates translated into DI applications. We found a strong relationship between the two, controlling for new onset of health conditions, demographics, household composition, and health insurance. We tested whether more detailed controls for current health status, including controls for the onset of specific health conditions and controls for physical limitations and symptoms of depression, could explain the strong link between unemployment and DI applications. We found no support for this health shocks hypothesis. However, in models that interacted unemployment rates with variables likely to proxy for low opportunity costs of DI application, we similarly found no support for the opportunity costs hypothesis.

Recent work suggests that unemployment insurance benefits extensions may delay application to DI (Rutledge 2011; Lindner 2011). Rutledge (2011) estimates that half the costs of unemployment insurance extensions are offset by reductions in SSDI and Medicare. Given repeated extensions of Unemployment Insurance Benefits during the Great Recession, it is possible that the normal reduction in the opportunity costs of applying for DI that would occur during recessions was dampened. Individuals cannot technically receive UI while applying for DI since they must demonstrate active job search activities while receiving UI. Future work should consider the role of extended Unemployment Insurance and whether it did, indeed, dampen the rise in DI applications during the Great Recession. The prior work in this area focuses on periods before 2007.

References

Autor, David H. and Mark G. Duggan, "The Rise in the Disability Rolls and the Decline in Unemployment," Quarterly Journal of Economics, (2003), 157-205.

Bartley, M., "Unemployment, Stress, and Health," Encyclopedia of Stress (Second Edition), (2007) Academic Press, pp. 797-803.

Black, Dan, Kermit Daniel, and Seth Sanders, "The Impact of Economic Conditions on Participation in Disability Programs: Evidence from the Coal Boom and Bust," *American Economic Review,* XCII (2002), 27–50.

Bound, John and Richard Burkhauser. "Economic Analysis of Transfer Programs Targeted on People with Disabilities." *Handbook of Labor Economics, (1999) Vol. 3*, edited by Orley Ashenfelter and David Card, pp. 3417-3528. Amsterdam: North-Holland.

Brenner, M.Harvey and J.F. Forbes, "Unemployment and Health," *The Lancet*, (1981) pp. 874-875.

Brenner, M. Harvey and Anne Mooney, "Unemployment and Health in the Context of Economic Change, Social Science and Medicine, (1983), 1125-1138.

Coile, Courtney C., Philip B. Levine, and Robin McKnight, "Recessions, Older Workers, and Longevity: How Long Are Recessions Good for Your Health?" Cambridge: NBER Working Paper 18361 (2012).

Leonhardt, David."Men, Unemployment and Disability," *The New York Times* Economix Blog, April 8, 2011, accessed September 14, 2012 at http://economix.blogs.nytimes.com/2011/04/08/men-unemployment-and-disability/.

Lindner, Stephan, "How Does Unemloyment Insurance Affect the Decision to Apply for Social Security Disability Insurance?" Working Paper Chestnut Hill, MA: Center for Retirement Research at Boston College.

Paletta, Damian, "Insolvency Looms as States Drain U.S. Disability Fund," *The Wall Street*

Journal, March 22, 2011, accessed September 14, 2012 at http://online.wsj.com/article/SB10001424052748703752404576178570674769318.html.

Parsons, Donald O., "The Decline of Male Labor Force Participation," *Journal of Political Economy,* LXXXVIII (1980), 117–134.

Pear, Robert, "Social Security's Financial Health Worsens," *New York Times*, April 24, 2012, p. A13.

Ruhm, Christopher J. "Are Recessions Good for Your Health," *The Quarterly Journal of Economics*, (2000), pp. 617-650.

Rupp, Kalman, and David Stapleton, "Determinants of the Growth in the Social Security Administration's Disability Programs: An Overview," *Social Security Bulletin,* LVIII (1995), 43–70.

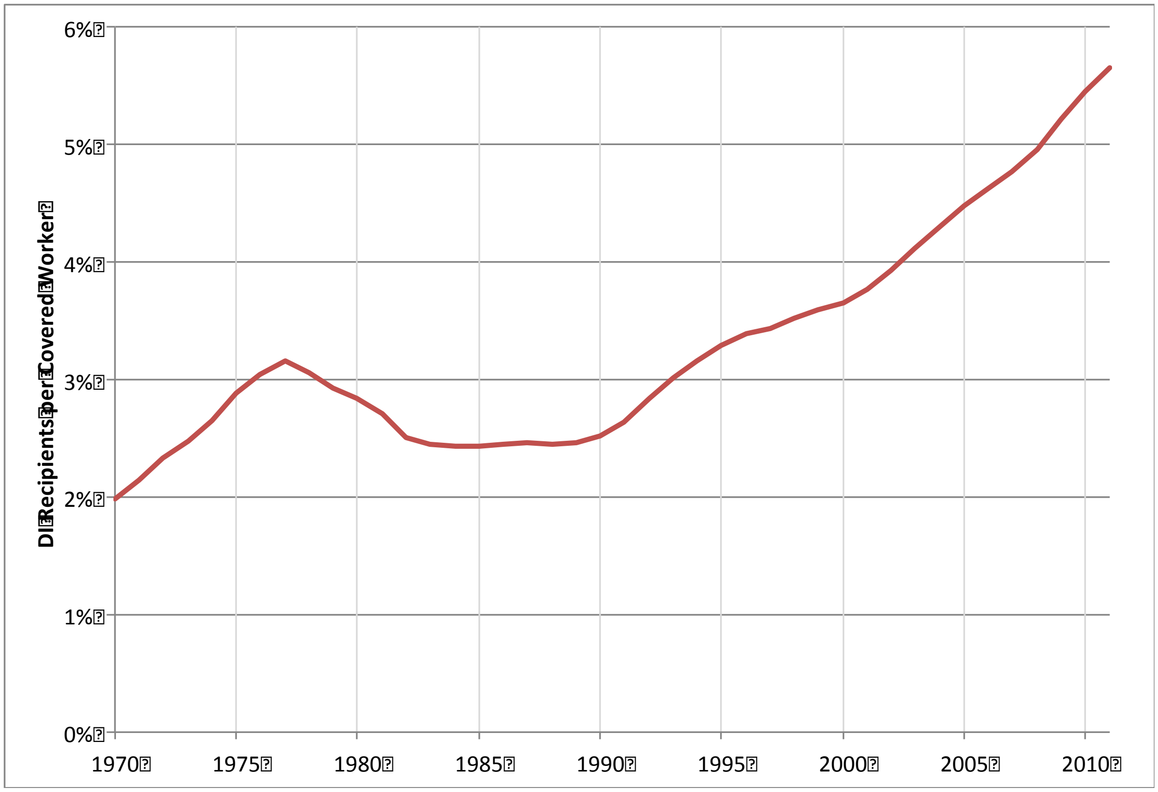
Rutledge, Matthew S., "The Impact of Unemployment Insurance Extensions on Disability Insurance Application and Allowance Rates", Boston College Center for Retirement Research Working Paper. (2011).

Stapleton, David, Kevin Coleman, Kimberly Dietrich, and Gina Livermore, "Empirical Analyses of DI and SSI Application and Award Growth," in Kalman Rupp and David Stapleton, eds., *Growth in Disability Benefits: Explanations and Policy Implications* (Kalamazoo, MI: W.E. Upjohn Institute for Employment Research, 1998), pp. 31–92.

Strully, Kate W., "Job Loss and Health in the U.S. Labor Market," *Demography*, (2009), pp. 221-246.

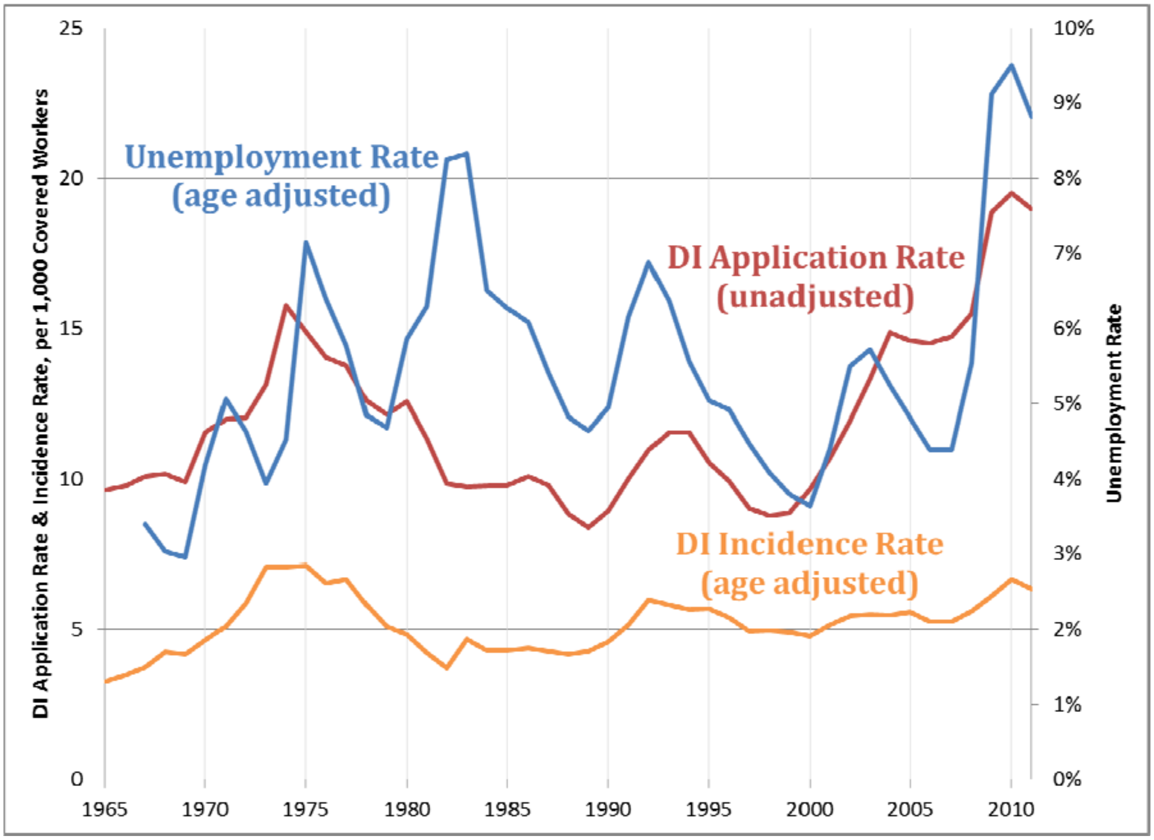
Stuckler, David, Sanjay Basu, Marc Suhrck, Adam Coutts, Martin McKee, "Effects of the 2008 Recession on Health: A First Look at European Data, *The Lancet*, (2011) pp. 124-125.

Figure 1. Disability Insurance Recipients per Covered Worker



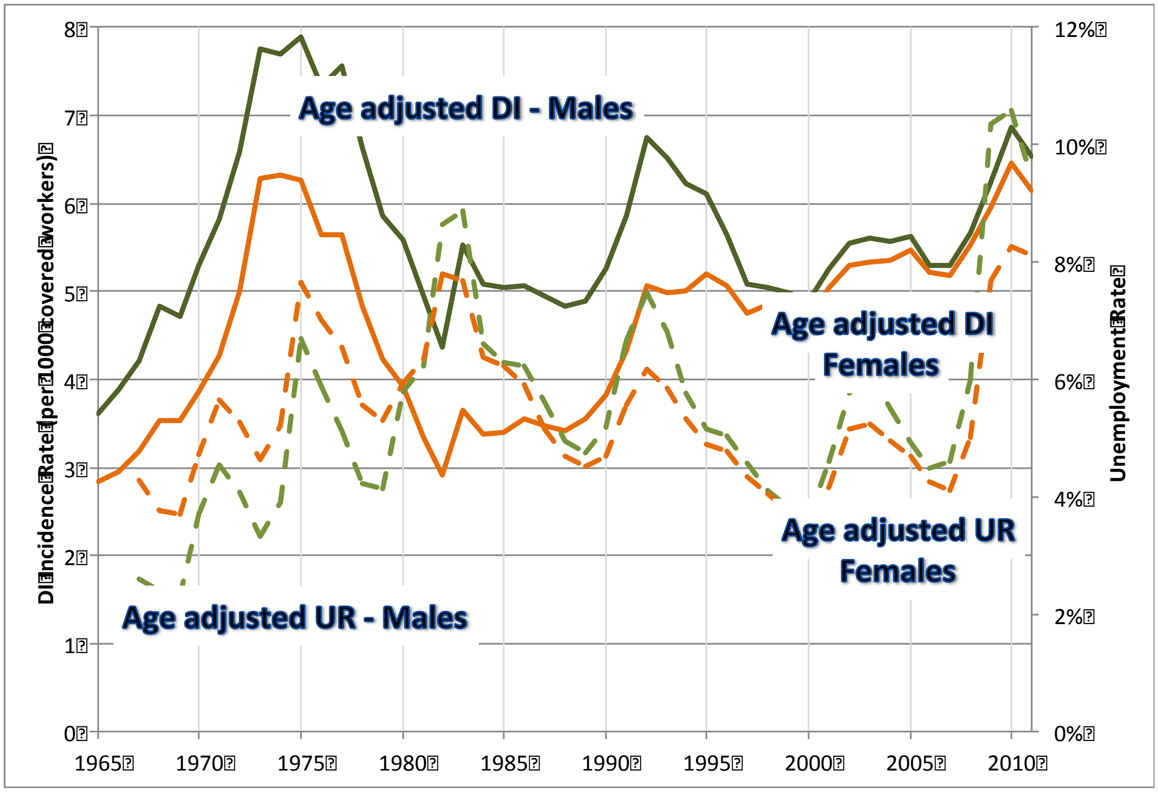
Source: Social Security Administration

Figure 2. Disability Applications, Incidence and Unemployment Rates, 1965-2011



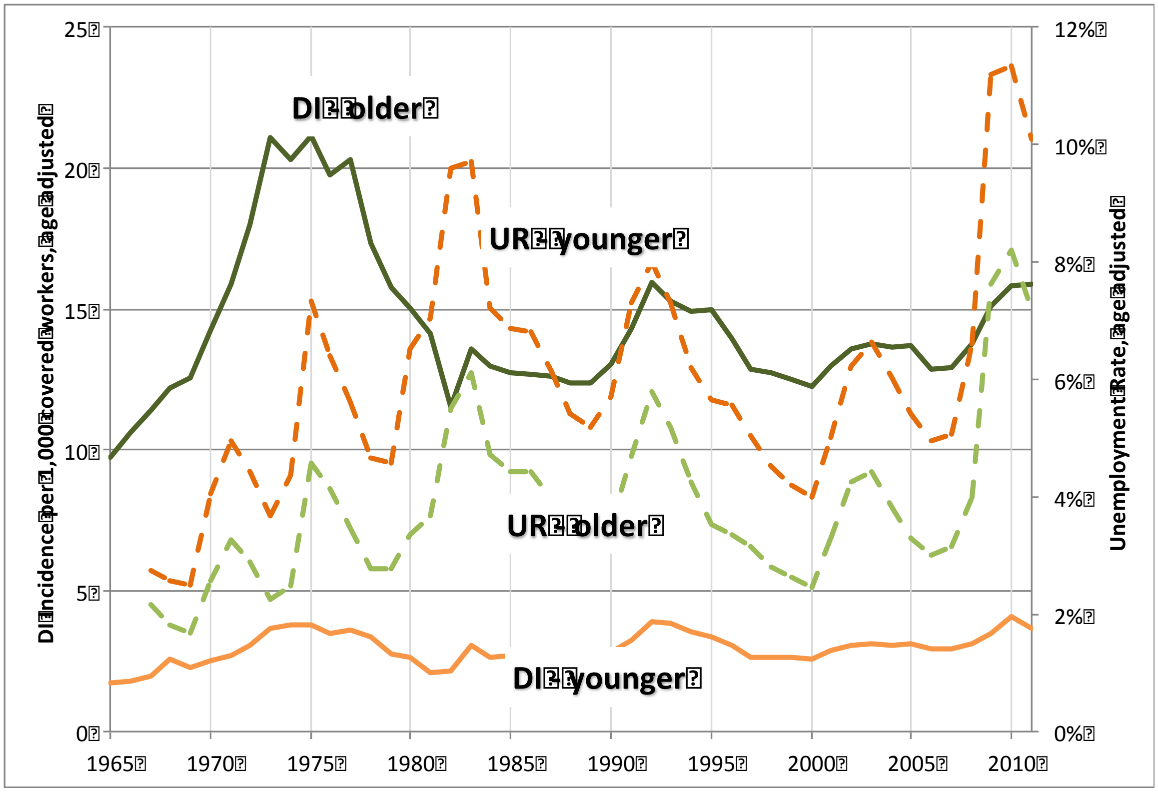
Source: Social Security Administration, Application rates accessed 9/14/12 at http://www.ssa.gov/oact/STATS/table6c7.html. Age adjustments are made to the 2000 US Census population.

Figure 3. Disability Incidence and Unemployment Rates, by Sex



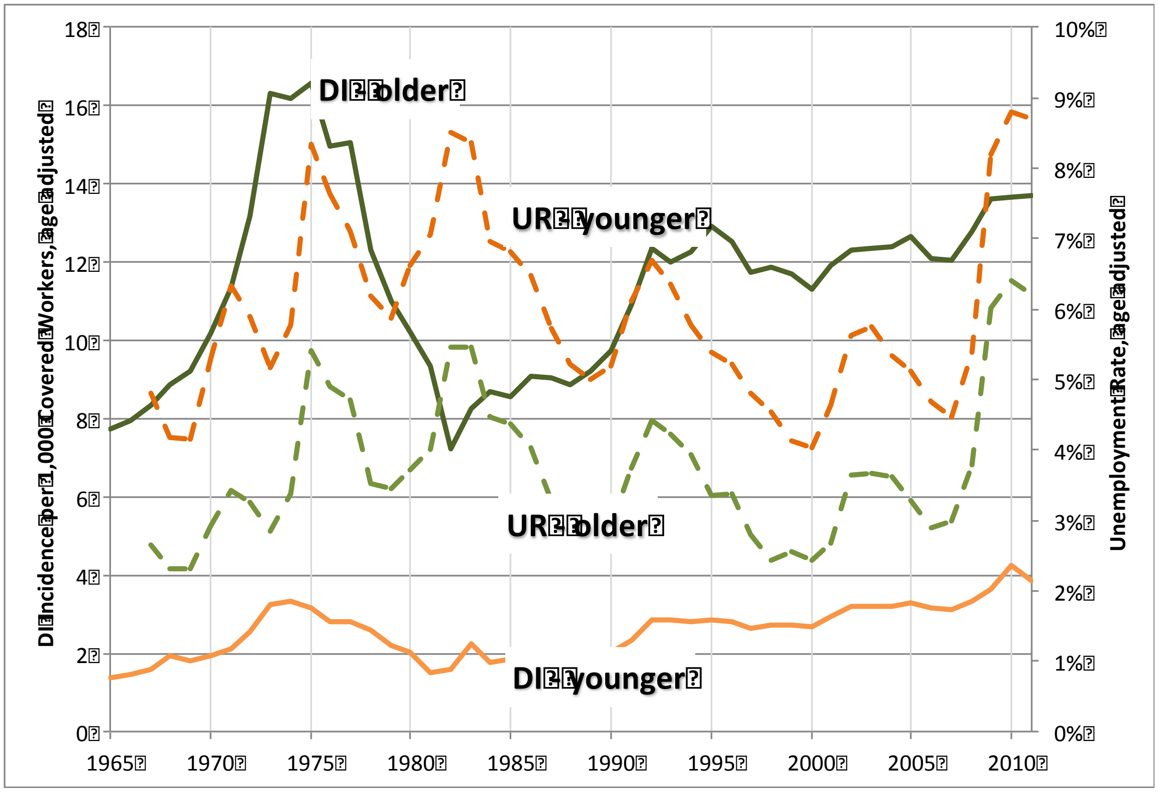
All estimates are age adjusted to year 2000 population, within each age group.

Figure 4. Male Disability Incidence per 1,000 and Unemployment, by Age*



* Younger males are age 15- 49, and older males are 50-64. All estimates are age adjusted to year 2000 population, within each age group.

Figure 5. Female Disability Incidence per 1,000 and Unemployment Rates, by Age*



*Younger females are age 15- 49, and older females are 50-64. All estimates are age adjusted to year 2000 population, within each age group.

Figure 6a. Graph of Residual DI Incidence, by Year

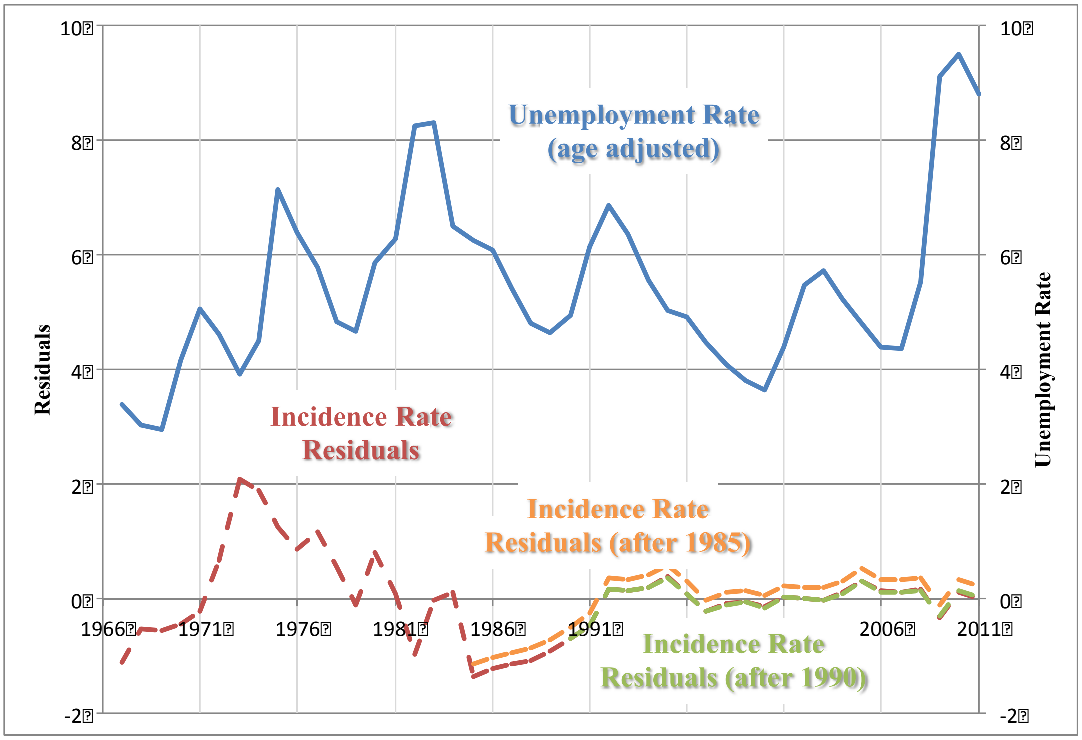


Figure 6b. Residual DI Applications per 1000 and Unemployment, National

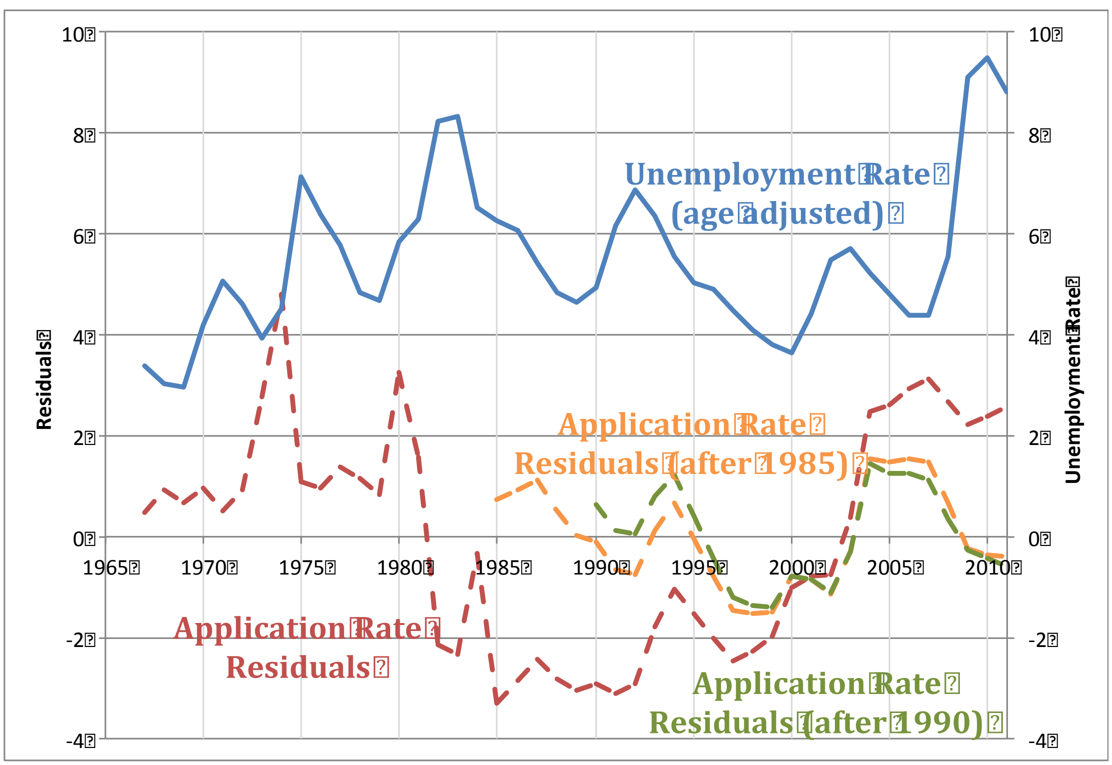
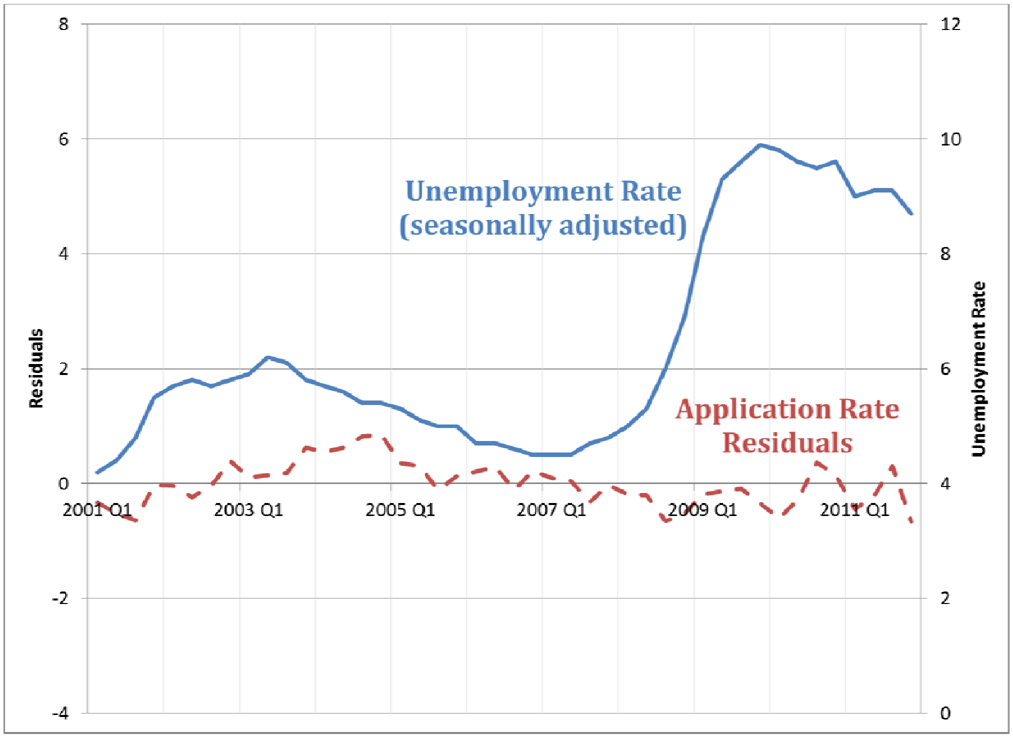
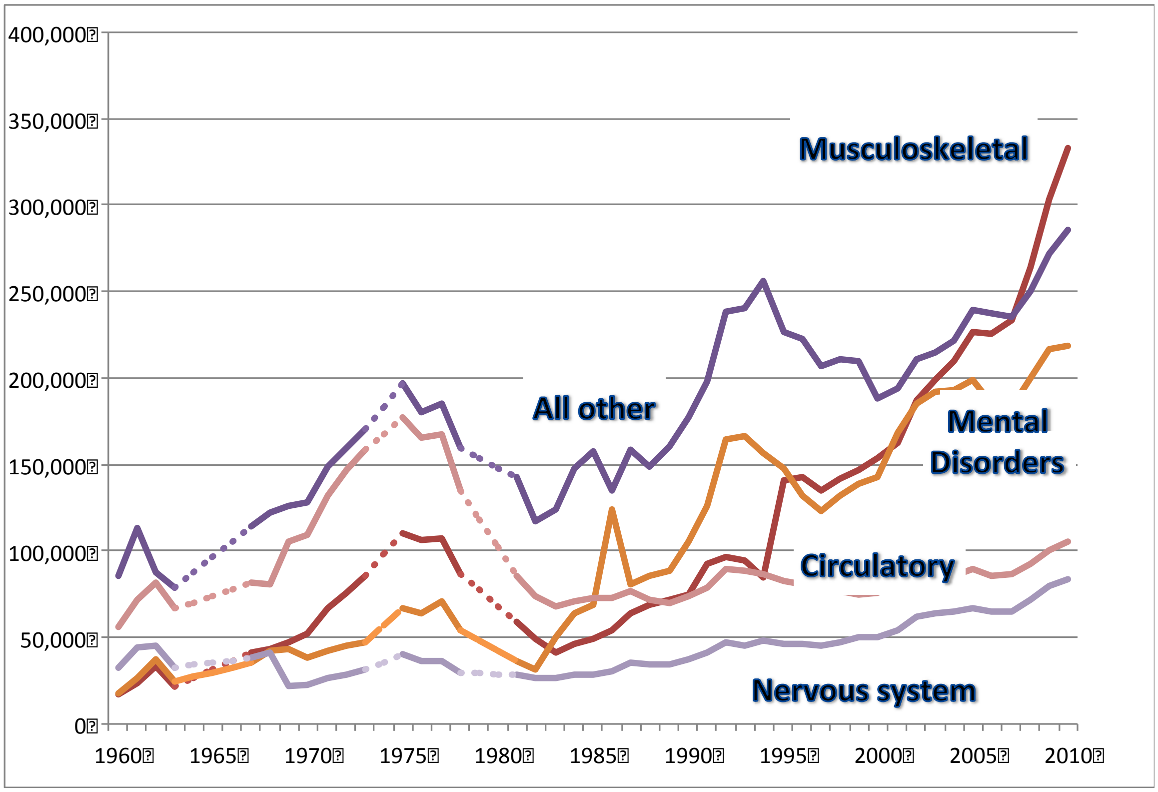


Figure 6c. Residual DI Applications per 1000 and Unemployment, State



Note: Plot shows residuals from a regression of annual DI application rates per 1000 covered workers on seasonally adjusted unemployment, including a linear time trend, state fixed effects, and three quarter effects to adjust for seasonality in the state regressions. Graphs reflect all ages, males, and females.

Figure 7. DI Awards by Diagnosis Since 1960



Dotted lines indicate interpolated data during years when diagnoses were unavailable. Over half of new awards between 2005 and 2009 (52%) went to individuals with musculoskeletal diagnoses. This was followed by awards to individuals with mental health diagnoses (12%), Nervous system diagnoses (9%), and Circulatory disorders (7%).

Figure 8a. Prevalence of Major Conditions in HRS Males, 2008

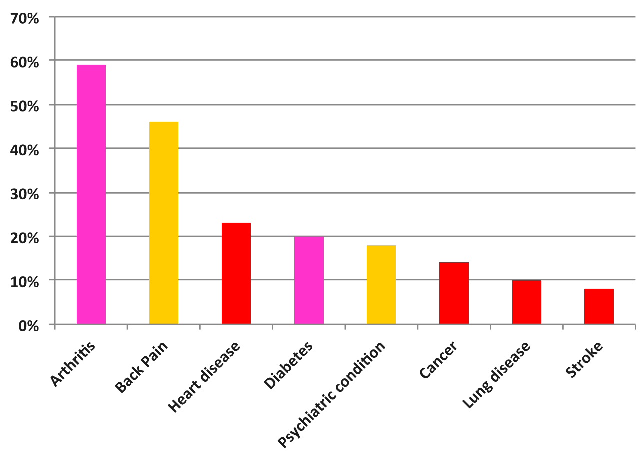


Figure 8b. Incidence of New Major Conditions, HRS Males, 1994-2010

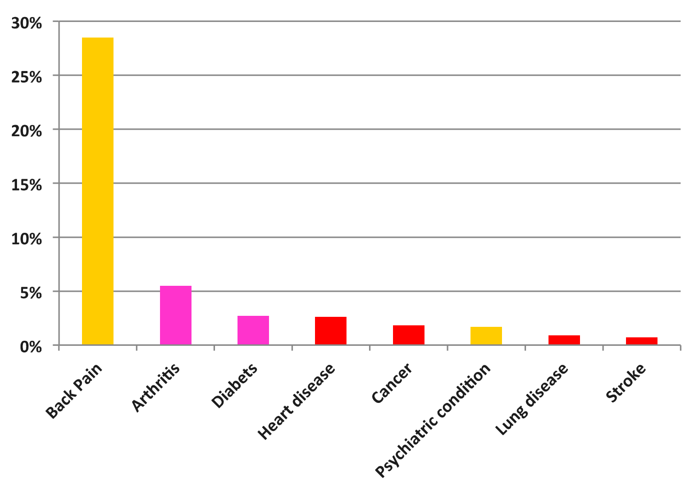


Figure 8c. Probability of applying for DI by New Condition, HRS Males

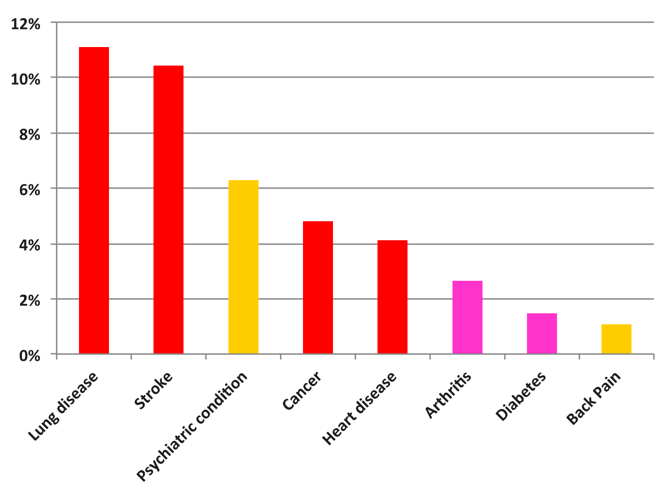


Table 1: Change in Disability Insurance Incidence During Recessions

Recession	Percentage Point Rise in UR	Change in DI Awards per 1000 workers	% change in DI Awards
1989-92	2.2%	1.70	40%
2000-02	1.9%	0.65	14%
2007-10			
All	5.1%	1.43	27%
Men			
15-49	6.3%	1.15	39%
50-64	5.1%	2.90	22%
Women			
15-49	4.3%	1.16	38%
50-64	3.4%	1.62	13%

Source: Social Security Administration Annual Statistical Supplements, various years & Bureau of Labor Statistics Unemployment Data, various years.

Table 2a. Residuals from Regression of DI Awards per 1000 workers on UR

	2007	2008	2009	2010	2011	2009-11
Basic	0.125	0.162	-0.323	0.128	0.008	-0.062
Lagged UR	0.002	0.364	0.642	0.486	0.098	0.409
1990-2011	0.112	0.156	-0.304	0.150	0.024	-0.044
Men	-0.095	-0.074	-0.596	-0.037	-0.059	-0.231
Women	0.347	0.429	0.054	0.394	0.120	0.189

Table presents coefficients testing for the significance of residuals from regressions of DI incidence on Unemployment Rates between 1965 and 2011. Regressions include an indicator for 1980-84 due to policies to tighten eligibility for DI during that period.

Table 2b. Residuals from National Regression of DI Applications on UR

	2007	2008	2009	2010	2011	2009-11
Basic	3.582	3.048	2.341	2.492	2.774	2.536
Lagged UR	3.140	3.947	6.464	4.344	3.547	4.785
1990-2011	3.990	3.004	0.908	0.908	1.455	1.090

Table presents coefficients testing for the significance of residuals from regressions of national DI applications per covered worker on unemployment rates between 1965 and 2011. Regressions include an indicator for 1980-84 due to policies to tighten eligibility for DI during that period.

Table 2c. Residuals from State Regression of DI Applications on UR

	2007	2008	2009	2010	2011	2009-11
Basic	-0.066	-0.426	-0.230	-0.092	-0.264	-0.196

Table presents coefficients testing for the significance of residuals from regressions of quarterly state level DI applications per 1000 covered workers on quarterly state-specific unemployment rates between 2001 and 2011. Regressions include a linear time trend.

Table 3. Effect of Unemployment Rate on DI applications per 1000 Covered Workers

	Coefficient	Standard error	Coefficient	Standard error
Current UR	0.419***	0.020	0.185***	0.031
UR in:				
t-1	0.423***	0.020	0.192***	0.032
t-2	0.417***	0.021	0.219***	0.033
t-3	0.385***	0.021	0.235***	0.034
t-4	0.327***	0.022	0.221***	0.035
t-5	0.269***	0.022	0.212***	0.036
t-6	0.210***	0.023	0.208***	0.038
t-7	0.139***	0.024	0.198***	0.040
t-8	0.062**	0.026	0.171***	0.042
Linear Time Trend?	YES		NO	
Quarterly Fixed effects?	NO		YES	
State Fixed effects?	YES		YES	

* p < .10, ** p<.05

Each coefficient & standard error pair comes from a separate regression of quarterly state level DI applications per 1000 covered workers on quarterly state-specific unemployment rates between 2001 and 2011. Unemployment rate in t-1 is the rate in prior quarter.

Table 4. Sample Means from HRS Males aged 52-64 at interview

	All	Not retired or DI app last wave	Working full-time or part-time last wave
DI APPLICATION (since last wave)	0.114	0.022	0.016
WORK STATUS			
Full-time worker	0.556	0.741	0.773
Part-time worker	0.043	0.051	0.050
Unemployed	0.018	0.023	0.018
Disabled (self report)	0.044	0.018	0.009
Not in labor force	0.301	0.134	0.108
DEMOGRAPHICS			
Age at interview	59.0	58.6	58.6
	(3.3)	(3.2)	(3.2)
Black Race	0.134	0.122	0.116
Other Non-white Race	0.049	0.052	0.051
Hispanic Ethnicity	0.091	0.096	0.092
Education			
<12 years	0.219	0.202	0.191
12 years	0.307	0.299	0.301
13-15 years	0.211	0.217	0.219
16+ years	0.263	0.282	0.289
Marital status, lagged			
Single	0.160	0.140	0.132
Working spouse	0.527	0.573	0.582
Age difference,	-2.6	-2.9	-2.9
Spouse–Respondent	(5.1)	(5.0)	(5.0)
JOB TRAITS, LAGGED	-		
High stress	-	0.56	0.60
Highly physical	-	0.62	0.67
Stooping	-	0.58	0.62
Lifting	-	0.45	0.48
Sight important	-	0.87	0.92
Blue collar (longest)	-	0.42	0.41
Blue collar	-	0.40	0.42
Services (longest)	-	0.06	0.06
Services		0.08	0.08
HOUSEHOLD			
2 person	0.04	0.03	0.03
3-4 people	0.31	0.34	0.33

4+ people	0.08	0.08	0.08
HEALTH INSURANCE			
Covers Self	0.61	0.67	0.70
Covers Spouse	0.15	0.14	0.14
Spouse covers self	0.38	0.42	0.44
Spouse covers R	0.30	0.31	0.31
Retiree HI, self	0.37	0.36	0.38
Retiree HI, spouse	0.15	0.15	0.15
HEALTH STATUS			
New health shock	0.20	0.19	0.18
Prior health shock	0.60	0.54	0.54
Prior Self Reported Health			
Excellent	0.18	0.21	0.22
Very Good	0.31	0.37	0.35
Fair	0.15	0.12	0.11
Poor	0.07	0.03	0.02
N = person-waves	24,680	17,499	16,464
N = persons	8,383	5,854	5,562

Based on data from the HRS 1992-2010. Standard deviations of continuous variables are shown in ()s. Person waves include only those waves in 1994 and later, since lagged variables are constructed from the prior wave.

Table 5. Basic Regressions of DI Application in Current Wave, Males in the Health and Retirement Study

	No DI or retirement last wave	Workers only
Local UR	0.0048***	0.0033***
	(0.0013)	(0.0013)
New Health Condition	0.0304***	0.0242***
	(0.0048)	(0.0048)
Prior Health Condition	0.0105***	0.0089***
	(0.0026)	(0.0020)
DEMOGRAPHICS		
Black race	0.0066	0.0026
	(0.0058)	(0.0049)
Other Nonwhite Race	0.0012	-0.004
	(0.0062)	(0.0048)
Hispanic Ethnicity	-0.0108**	-0.0054
	(0.0052)	(0.0045)
Education		
<12 years	-0.0002	0.0024
	(0.0052)	(0.0005)
13-15 years	-0.0069*	-0.0052
	(0.0039)	(0.0035)
16+ years	-0.0078*	-0.0064*
	(0.0041)	(0.0033)
Marital status		
Single	0.004	0.0062
	(0.006)	(0.0053)
Working spouse	-0.0045	-0.0032
	(0.0030)	(0.0028)
R – Spouse age	-0.0002	-0.0001
	(0.0003)	(0.0002)
JOB TRAITS		
High stress	0.0028	0.0044**
	(0.0023)	(0.0022)
Physical	-0.0001	0.0003
	(0.0035)	(0.0035)
Stooping	0.0032	0.0041
	(0.0037)	(0.0037)
Lifting	-0.0076**	-0.0071**
	(0.0035)	(0.0035)

Sight important	-0.0052	-0.0012
	(0.0045)	(0.0040)
Blue Collar	0.0012	-0.0014
	(0.0058)	(0.0047)
Blue Collar (now)	0.0051	0.0078
	(0.0054)	(0.0048)
Services	0.0044	0.0015
	(0.0086)	(0.0070)
Services now	-0.0055	-0.0037
	(0.0073)	(0.0064)
HOUSEHOLD		
2 person	0.0135	-0.0029
	(0.111)	(0.0076)
3-4 people	-0.0039	-0.0008
	(0.0030)	(0.0026)
4 or more	-0.0095**	-0.0082***
	(0.0038)	(0.0031)
HEALTH INSURANCE		
Own HI	-0.0141***	-0.0109***
	(0.0044)	(0.0040)
Own HI for spouse	-0.0107**	-0.0044
	(0.0050)	(0.0042)
Spouse covers R	0.0079**	0.0042
	(0.0035)	(0.0029)
Spouse covers self	0.0089**	0.0014
	(0.0043)	(0.0033)
Retiree HI self	0.0005	-0.0002
	(0.0026)	(0.0025)
Retiree HI from spouse	-0.0045	0.0002
	(0.0041)	(0.0034)
N	17,499	16,464

* p < .10, ** p<.05, *** p<.01

Models also include self-reported health status from the prior wave, 9 industry effects, 16 occupation effects, dummy variables for each year of age, state fixed effects, and year of survey effects.

Table 6. Regressions of DI Application in Current Wave with Severity of Health Shock, Males in the Health and Retirement Study

	Basic	With health severity
Local UR	0.0048***	0.0043***
	(0.0013)	(0.0012)
New Health Condition	0.0304***	
	(0.0048)	
Prior Health Condition	0.0105***	
	(0.0026)	
NEW HEALTH SHOCK		
Arthritis		0.0121
		(0.0088)
Back pain		0.0064
		(0.0070)
Heart disease		0.0314**
		(0.0148)
Diabetes		0.009
		(0.0101)
Psychiatric diagnosis		0.0376*
		(0.0213)
Cancer		0.0392***
		(0.0150)
Lung disease		0.0966***
		(0.0322)
Stroke		0.0654*
		(0.0351)
PRIOR HEALTH SHOCK		
Arthritis		-0.0099***
		(0.0030)
Back pain		-0.0017
		(0.0038)
Heart disease		0.0032
		(0.0052)
Diabetes		0.0049
		(0.0053)
Psychiatric diagnosis		0.0029
		(0.0080)
Cancer		0.0115
		(0.0095)
Lung disease		0.0205
		(0.0145)
Stroke		0.0166
		(0.0163)

# functional limitations	0.0130***
	(0.0020)
# ADLs	0.0407***
	(0.0090)
# IADLs	0.0171
	(0.0135)
CES-Depression	0.0018
	(0.0013)

* p < .10, ** p<.05, *** p<.01

Models also include four dummy variables for self-reported health status in prior wave, 9 industry effects, 16 occupation effects, dummy variables for each year of age, state fixed effects, and year of survey effects.

Table 7. DI Application or Receipt & Opportunity Cost of Work, Males in the HRS

	(1)	(2)	(3)	(4)	(5)
UR	0.0033**	0.0026**	0.0050**	0.0033**	0.0035**
	(0.0012)	(0.0013)	(0.0013)	(0.0013)	(0.0014)
UR*No College		-0.001			
		(0.001)			
UR*Recession affected job			-0.006**		
			(0.001)		
UR*Ages 62-64				-0.0004	
				(0.0010)	
UR*Retiree HI					-0.001
					(0.001)
N			16,483		

* p < .10, ** p<.05, *** p<.01

All models include four dummy variables for self-reported health status in prior wave, state fixed effects, year of survey fixed effects, 9 industry and 16 occupation dummies, and all control variables shown in Table 5.