The Effect of the Receipt of Disability Insurance Benefits on Health

By Florian Heiss, Steven Venti, and David A. Wise

It is well known that disability insurance (DI) participation is strongly related to health. But does DI participation itself have an effect on health? Initial receipt of DI typically follows the onset of a disability and is accompanied by the loss of a job, possibly financial hardship and perhaps the loss of employer-provided health insurance. These events suggest that subsequent health may decline. However, the receipt of DI cash benefits may help to alleviate economic hardship following the onset of a disability and, in particular, the supplemental income provided by DI benefits may afford improved access to health care. In the longer-run, DI recipients also qualify for Medicare 24 months after they are first entitled to receive benefits. Thus it is unclear how the receipt of DI benefits may affect subsequent health. The goal of this paper is to estimate the relationship between DI participation and the evolution of subsequent health. We first compare the trajectory of health before and after *application* for DI benefits and then compare health trajectories before and after the *approval* (or denial) of DI benefits for those who applied. A problem that arises when health profiles are compared is that mortality selection (less healthy persons are more likely to die and exit the sample) distorts observed profiles. WE discuss the effect of correcting for the effect of mortality selection on observed profiles of health.

1) Motivation

In October 2014 about 9.5 million persons under the age of 65 received disability benefits under the Social Security Disability Insurance program in the United States. These persons have been judged by the Disability Determination Service to be unable to engage in “substantial gainful activity” and to have little prospect to be able to work for at least a year. Persons must have accumulated the required number of lifetime and the required number of recent work credits to qualify. Applications typically take 3 to 5 months to process before a decision is made. Applicants who are denied benefits have the right to appeal. If an application is approved the monthly disability benefit is based on average lifetime earnings. Medicare coverage automatically begins two years after a person is entitled to receive DI benefits. Both the 24 month waiting period and benefits

may be retroactive to the date of "benefit eligibility" which may be the date of application.

It is well-know that DI participants rarely return to the labor force, although there is much debate whether this is due to the persistence of disabling health conditions or to the incentive effect of generous DI benefits. In a seminal study, Bound (1989) shows that fewer than 50 percent of male applicants rejected for DI benefits ever return to the labor force. If, as Bound presumes, successful applicants are in better health than rejected applicants, then this finding suggests that most successful DI applicants are truly disabled and would not work even in the absence of the DI program. Bound's findings have been replicated and extended in a number of studies. von Wachter, Song and Manchester (2011) confirm Bound's finding for older rejected applicants, but find significant post-application reemployment for persons rejected at younger ages. Maestas, Mullen and Strand (2013) take a different approach to the question of whether DI recipients fail to return to work because of health or because or disincentives in the DI program. They compare the post-application work patterns of otherwise similar applicants who were denied or approved for benefits only because they were randomly assigned to disability examiners with different propensities to approve applications. They find that in the absence of DI, the labor force participation rate of recipients would be on average 21 percentage points greater and the likelihood of engaging in substantial gainful activity (as defined by the DI program rules) would be 13 percentage points higher. Using a similar methodology, Chen and van der Klaauw (2008) and French and Song (2014) also find substantial, but slightly smaller, effects on employment.

In this study we take another look at these issues, focusing on pre and post application health rather than employment. In the literature surveyed above, the receipt of DI benefits is expected to have negative incentive effects on work behavior. The direction and magnitude of the effect of DI benefits on health is much less clear and much less studied. The study that addresses these issues and most closely related to ours is Livermore, Stapleton and Claypool (2009). The authors use data from the National Health Interview Study linked to administrative DI and Medicare records to examine the characteristics of beneficiaries at the time they begin to receive DI benefits.

One of their primary goals is to document the extent of health insurance coverage prior to and after benefit receipt. They also consider how health care utilization changes over this period. They find that the number of doctor visits and hospital stays is higher for beneficiaries than for the general population prior to entry into DI. They also observe a sharp run-up in this measure of health care utilization just prior to and coincident with initial benefit receipt and a leveling of utilization once persons are on SSDI. The authors find similar results when other indicators of health status are used. Our analysis uses a broader measure of health and a different data source that allows for longer periods of observation before and after the start of DI benefits. We consider the health trajectories of three groups, non-applicants, beneficiaries, and rejected applicants and we are able to identify both the date of initial application (for approved and rejected applicants) and the date of initial receipt (for beneficiaries). Because of data limitations Stapleton and Claypool focus on the health of beneficiaries before and after the date of initial benefit receipt.

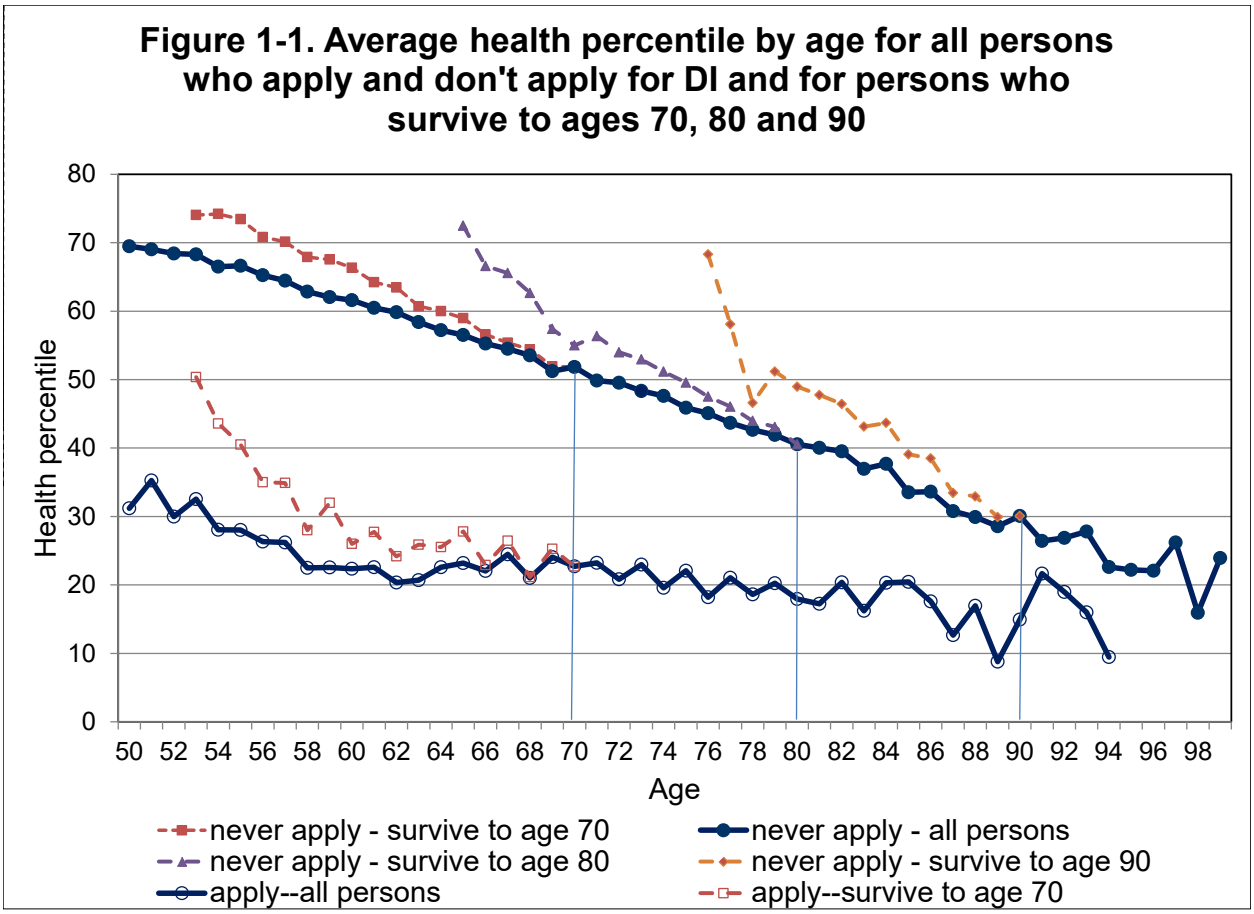
We track the health of DI applicants in the years preceding and subsequent to the date an application for DI benefits is filed. Separate analyses are conducted for persons whose applications are approved and for persons whose applications are denied. The analysis is based on persons age 50 to 65 surveyed in the first 10 waves of the Health and Retirement Study (HRS), a nationally representative longitudinal survey of older Americans. To measure health we use a health index based on detailed health information provided by HRS respondents. This index, scaled to range from 1 to 100, is described in the next section.

A potential concern is our findings may be affected by mortality selection. Figure 1-1 helps to motivate how mortality selection may affect our results. The heavy blue lines show the health-age profiles of all HRS respondents alive at each age for persons who never applied for DI (the top profile) and for persons who applied for DI (the bottom profile). There is considerable difference between applicants and non-applicants in the average level of health at each age. This difference is almost 40 percentile points at age 50 and narrows to about 20 percentile points at age 80. For both applicants and non-applicants these average health trajectories reflect the offsetting effects of two forces. First, average health declines as people age. Second, there is a "selection

effect" in the opposite direction as people age: those in better health are more likely to survive from year to year--Vaupel, Manton and Stallard (1979), Contoyannis, Jones and Rice (2004), Jones, Koolman and Rice (2006), Heiss, Boersch-Supan, Hurd, and Wise (2008), Heiss (2011), Heiss, Venti, and Wise (2014).] This selection effect is illustrated by the other profiles shown in Figure 1-1. The top panel shows the average health at earlier ages of those who survived until at least age 70, age 80 and age 90. At each age those who will survive longer are in better health. Those who survived until at least age 80 had much better health at age 65 than the average of all of those who survived until at least age 70. The health at age 75 of the persons who survive until 90 was, on average, much higher than the health of all those who survived until 80.

The profiles at the bottom of the figure show the average health at each age for all persons who applied for DI and for applicants who survived until age 70. (The prior health of those who survived until ages 80 and 90 are not shown.) The bottom profiles show the average health at each age for all persons who applied for DI and for applicants who survived until age 70. Looking at the prior health of those who survived until age 70, the effect of mortality selection is apparent for both applicants and for non-applicants. But there are two apparent differences between the two groups. First, the average decline in health between age 50 and age 65 is noticeably steeper for those who applied for DI than for those who did not apply for DI. Second, the difference in the steepness of the decline is even more apparent for those who survived until age 70; the decline is much greater for DI applicants. This suggests that mortality selection is greater for DI applicants than for all persons.

The substantial differences between the profiles of persons who survive to a particular age (the light profiles) and the profiles for all persons (the dark profiles) indicates the extent of mortality selection. The former profiles reflect the changing health of persons as they age. The latter profiles reflect both the decline in health as people age and the effect of mortality selection. The model described in section 3 “corrects” observed health profiles for the effect of mortality selection.



2) **Data**

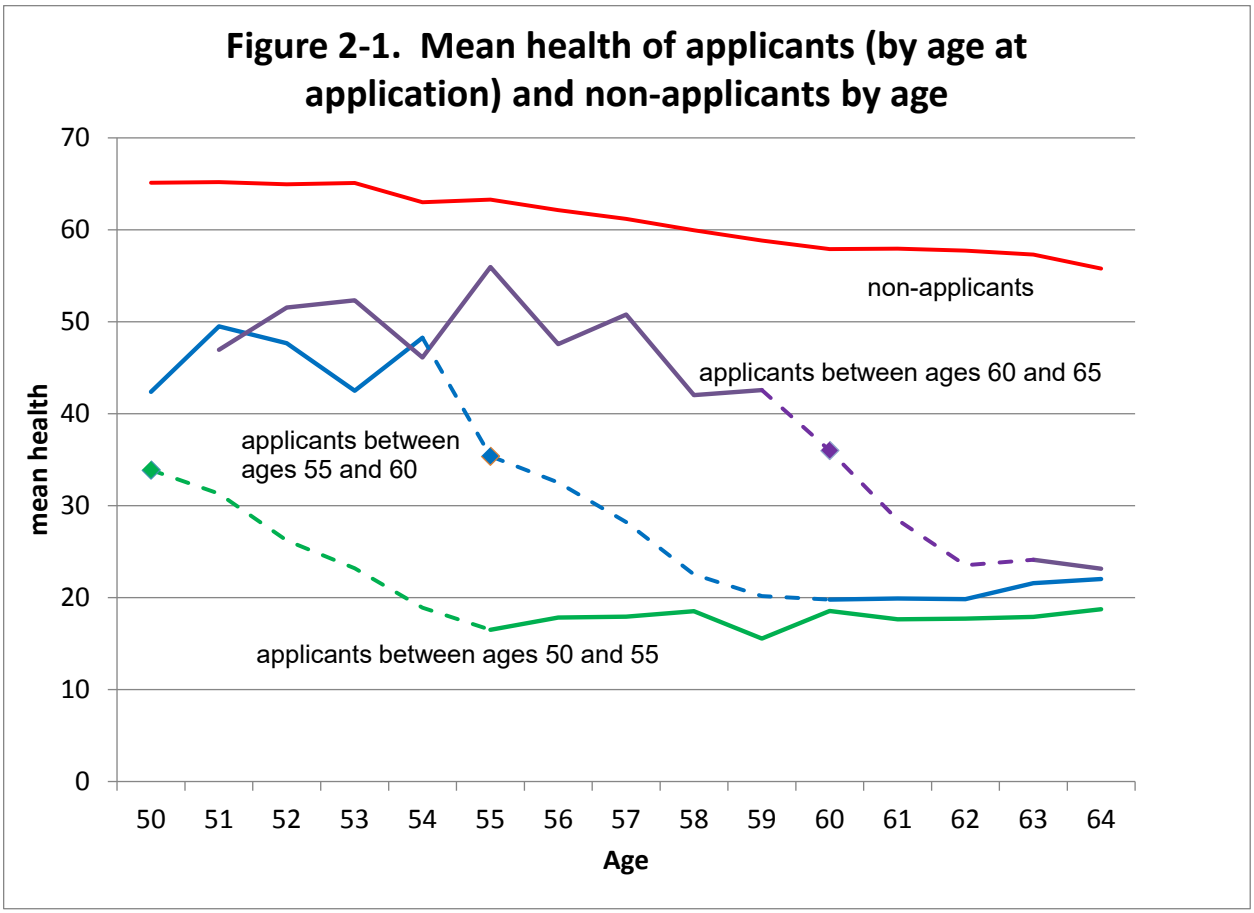
The HRS surveyed persons at approximately two year intervals between 1992 and 2010.[1] We restrict our analysis to persons who applied for DI benefits between the ages of 50 and 65 at any time over this period. The information used to construct the health index is obtained from these interviews. Thus for each respondent we are able to construct an index of health on up to 9 dates corresponding to the date of each HRS interview. The HRS also asks respondents for the calendar date they first applied for benefits and the date they first started receiving benefits, which we refer to as the benefit receipt date. Using the application date and the date of each interview, we calculate the calendar time between each interview and the application date. We

[1] Because of missing data issues we do not use data for 1992. The HRS includes several cohorts who were first interviewed in different waves: the original HRS cohort in 1992, the AHEAD cohort in 1993, the CODA cohort in 1998, and the WB and EBB cohorts in 2004. Thus there are fewer than 9 observations for most respondents.

calculate a variable “years before application” and show observed health for years prior to the application and a variable “years after application date and show observed health for years after the date of application.

The health index is the first principle component of 27 health indicators reported in the HRS. Construction of the index and its properties are described in some detail in Poterba, Venti, and Wise (2013), Heiss, Venti and Wise (2014) and Venti and Wise (2014). For convenience, an updated version of that discussion is reproduced in the Appendix to this paper.

Figure 2-1 shows the large differences between the health of persons who apply for DI and those who don’t apply. The mean health percentile by age (50 to 64) of those who do not apply is shown by the red line. Because of small sample sizes the data for applicants have been grouped—those who are at least age 50 but less than age 55 when they apply, those who are at least age 55 but less than age 60 when they apply, and those who are at least age 60 but less than age 65 when they apply. There are three features of the data that stand out. First, even before application, the health of applicants was substantially lower than the health of non-applicants—by approximately 15 percentile points. Second, by the time the applicants apply (>50 for the first age group, >55 for the second age group, and >60 for the third age group, the beginning of the application interval is shown by the diamond markers for each group) the health of applicants was much lower than the health of non-applicants—31 percentile points for the 1st group, 29 for the 2nd, and 22 for the 3rd. Third, for each of the three age groups the most precipitous decline in health occurs just before and during of the application interval. These periods of sharply declining health are indicated by the dashed segments within each profile.



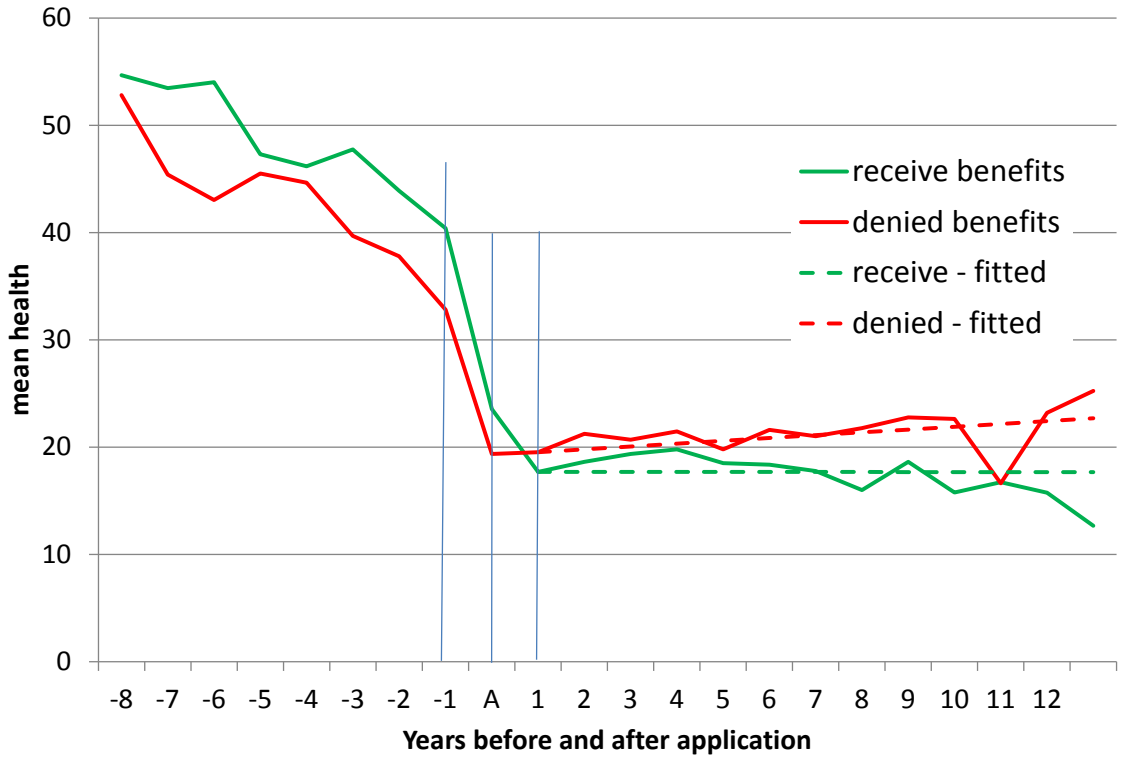
3) Estimation with and without Mortality Correction

We begin by showing empirical profiles of health before and after the application date. We then fit these profiles with a simple linear model and then correct these profiles for the effect of mortality selection. We the repeat the same sequence of steps for health before and after the date of the receipt of benefits.

Health Before and After Application: The mean level of health for applicants approved and denied DI are shown by the solid lines in Figure 3-1 by years before and after application. These health profiles are shown for 8 years before application and for 13 years after application. The profiles were constructed by rounding "years before" and "years after" to the closest integer. Thus health at application in these figures is the health of all persons who were interviewed in a six month interval bracketing the application date. All persons between the ages of 50 and 65 who applied between the ages of 50 and 65 are included in the sample.

One might expect the decline in health before application to be greater for those approved for DI than for those denied. The two profiles, however, track each other closely, although applicants who will receive benefits have better pre-application health than applicants who will be denied benefits. The decline in health over the period beginning 8 years before application and ending one year before application is noticeably greater for those who were denied benefits—14.3 percentile points for those who will receive benefits and 20 percentile points for those who were denied benefits. The most striking difference between the two groups is the decline in health in the period spanning the application date. Between one year before application and one year after application, the decline was much greater for those who will receive benefits—22.7 percentile points versus 13.3 percentile points for those denied. After application, the health of those who will receive DI remains essentially flat while the health of those denied benefits increases noticeably. Those who receive benefits have lower post-application health than those who were denied benefits. Overall, it is perhaps surprising that those who will be denied benefits have poorer health in the years preceding a DI application. However, those who will receive benefits experience a much larger decline in health in the two-year period spanning the application and have lower health after the application date. These results are surprisingly similar to the findings of von Wachter, Song and Manchester (2011), although they focus on earnings, rather than health, prior to application for DI. They find that rejected applicants have lower pre-application earnings than successful applicants, and that earnings fall gradually over a number of years prior to application for those rejected, but the earnings decline is concentrated in the year prior to application for successful applicants.

Figure 3-1. Mean health of applicants who receive and are denied benefits, by years before and after application



To highlight the trend in health following application, we fit the data for each profile (beginning one year after application) with a simple linear regression of the form (suppressing the individual subscript):

$$H_t = H_{+1} + \beta * t$$

where t is the number of years following application, H_t is the level of health t years following application, and H_{+1} is the level of health one year after application. The estimated slope coefficients are shown in the top row of Table 3-1 below. The dashed lines in the figure show the fitted values based on these estimates. As is evident from the mean health profiles, the health of applicants receiving benefits remains flat after the application date, but the health of applicants denied benefits increases by about one-quarter of one percentile point in each year following application. In the next section we explain how these fitted values can be corrected for mortality selection.

Table 3-1. Linear estimates of health trajectories after DI application*

Variable	Estimated coefficient	t-stat	Estimated coefficient	t-stat
all applicants				
	receiving benefits		denied benefits	
Years after applied	-0.001	0.0	0.263	**3.4**
N	2,972		1,809	
applicants less than or equal to age 56 at application				
	receiving benefits		denied benefits	
Years after applied	0.183	**3.7**	0.517	**5.9**
N	1,725		1,077	
applicants over the age of 56 at application				
	receiving benefits		denied benefits	
Years after applied	0.414	**3.2**	0.150	0.9
N	1,247		732	

* intercept set to mean level of health one year after application

Figure 3-2 shows the mean health of applicants who were at least age 50 and less than or equal to age 56 when they applied.[2] Figure 3-3 shows mean health for applicants between the ages of 56 and 65 when they applied. As with the broader sample of applicants (ages 50 to 65) we find modest differences in the health trajectories between those who receive benefits and those who are denied benefits. The top row of Table 3-2 below summarizes the decline in health for the period between 4 years and 1 year prior to application for the younger applicant group and for the period between 8 years and 1 year prior to application for the older applicant group. The next row shows the decline in health for the period between one year prior and one year after application (-1 to +1). These declines are substantial, particularly for persons who apply on or before age 56 and for both age groups the decline in health in the year spanning the date of application (-1 to +1) is much larger for applicants who will receive benefits. The total difference (shown in the last row) between those who will receive benefits and

[2] The profiles for these applicants begin four years prior to application. In principle, we could follow these applicants six years back to age 50, but sample sizes for ages 50 and 51 are too small for reliable analysis so we only follow them back four years.

those who will be denied benefits is substantial for the younger group, but is relatively small, less than five health percentile points, for older applicants. Again, these data suggest that applicants who would go on to receive benefits and applicants who would be denied benefits both experienced declining health in the decade or so preceding application. However, the trends were quite different—the decline was gradual for those who would be denied benefits, but the decline was precipitous for those who would receive benefits.

Figure 3-2. Mean health of applicants who receive and are denied benefits, by years before and after application, persons <= age 56 at application

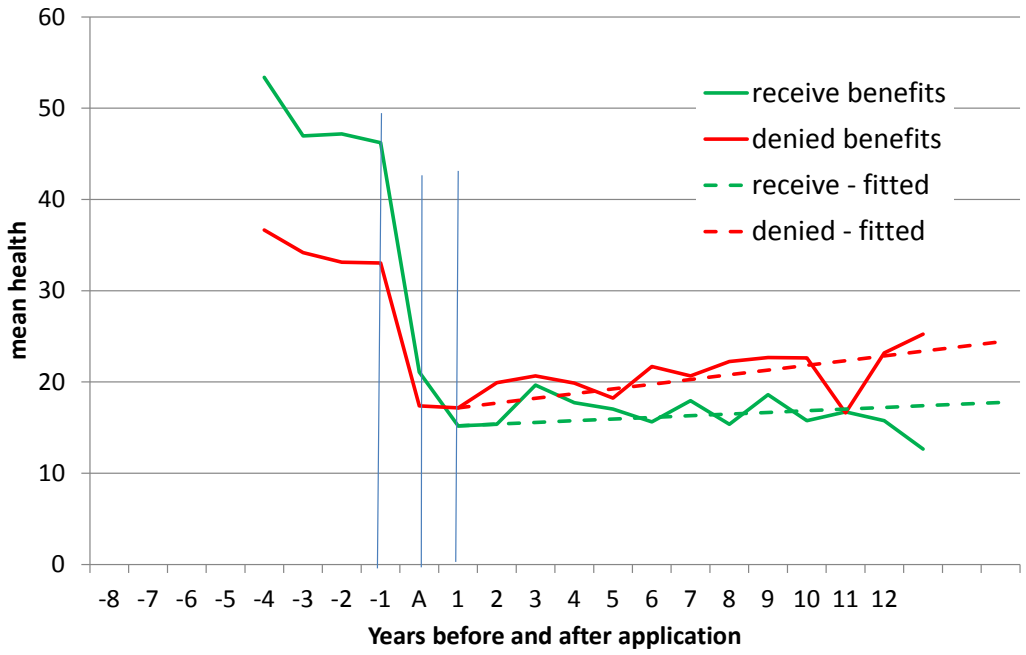


Figure 3-3. Mean health of applicants who receive and are denied benefits, by years before and after application, persons > age 56 at application

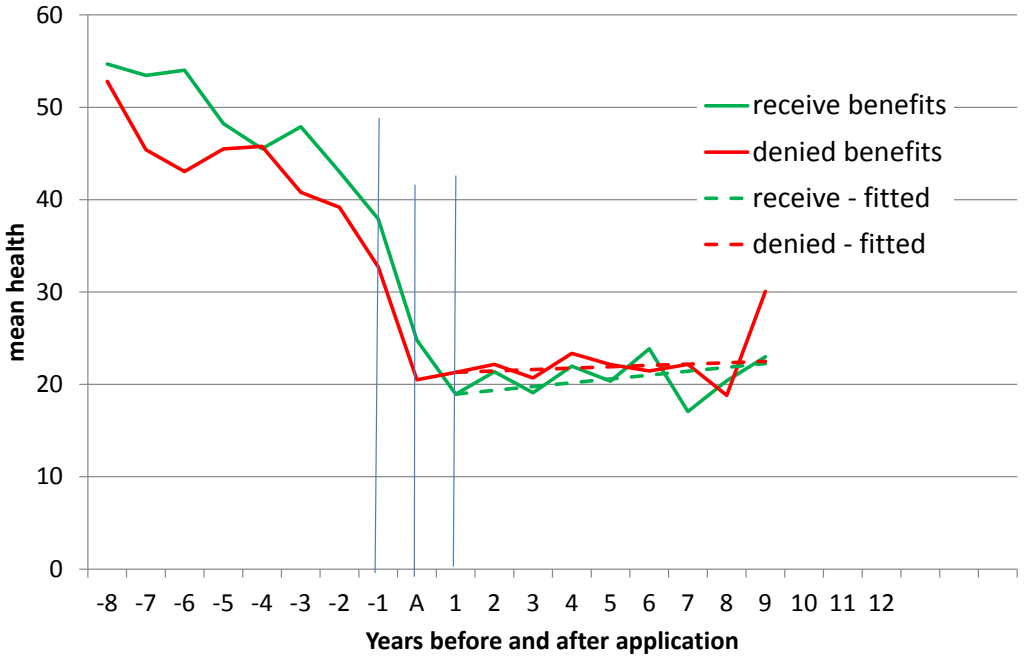


Table 3-2. The decline in health by age group

	Age at Application			
	Less than or equal to 56		Greater than 56	
	Receive	Denied	Receive	Denied
Decline in health between 8 years before application and one year before application*	7.2	3.6	16.8	20.1
Decline in health between 1 year before application and one year after application	30.9	15.9	19.0	11.4
Sum	38.1	19.5	35.8	31.5

*between 4 years before and one year before for those less than or equal to age 56

We also fit the health profiles beginning one year after application for each of the two age groups. The slope estimates are shown in the second and third rows of Table 3-1 and the fitted values are shown by the dashed lines in Figures 3-2 and 3-3. For the younger group, health of those who receive benefits increases by about 0.18 percentile points per year; the health of those who were denied benefits increases by about 0.52

percentile points each year following application. For persons at least age 56 at application, health of those who receive benefits increases by about 0.41 percentile points per year; the health of those who were denied benefits increases by about 0.15 percentile points each year following application.

Correcting the profiles for mortality selection: The mean health profiles graphed above can, in principle, provide a misleading picture of how health evolves for a typical person. The profiles may overstate health because persons in poorer health die and leave the sample. To address this concern we attempted to estimate a joint model of health and mortality and use the parameter estimates to simulate health profiles adjusting for the fact that healthier people are more likely to survive to older ages. The model is described in detail in Heiss, Venti and Wise (2014). Our attempts to estimate the model and make this correction failed due to two factors. First, the number of persons between the ages of 50 and 62 who die each year in our sample is very small. Second, if the goal is to correct profiles after application for DI, we also have to condition on survival to the age persons apply for DI thus making the number of useable deaths even smaller. Taken together, these two factors prevent us from reliably estimating the mortality equation we need to make the correction. However, these two factors also suggest that the mortality selection problem is not a serious concern in this application.

Appendix on Measuring Health[3]

Our analysis depends critically on measuring health status. We use a health index that is based on respondent-reported health diagnoses, functional limitations, medical care usage, and other indicators of health contained in the HRS. We use the first principal component of the 27 indicators of health status that are shown in Appendix Table 1. The first principal component is the weighted average of the health indicators where the weights are chosen to maximize the proportion of the variance of the individual health indicators that can be explained by this weighted average. The variables in the table are ordered by the principal component loadings.

[3] Reproduced from Venti and Wise (2014)

Appendix Table 1. Health index weights (principal component loadings)

Variable	Loading
Difficulty walking several blocks	0.294
Difficulty lift/carry	0.277
Difficulty push/pull	0.272
Difficulty with an ADL	0.267
Difficulty climbing stairs	0.261
Health problems limit work	0.259
Difficulty stoop/kneel/crouch	0.257
Self-reported health fair or poor	0.255
Difficulty getting up from chair	0.248
Difficulty reach/extend arms up	0.210
Health worse in previous period	0.208
Difficulty sitting two hours	0.184
Ever experience arthritis	0.183
Difficulty pick up a dime	0.153
Hospital stay	0.148
Ever experience heart problems	0.146
Home care	0.144
Back problems	0.136
Doctor visit	0.134
Ever experience psychological problems	0.131
Ever experience stroke	0.125
Ever experience high blood pressure	0.120
Ever experience lung disease	0.120
Ever experience diabetes	0.107
Nursing home stay	0.069
BMI at beginning of period	0.065
Ever experience cancer	0.057

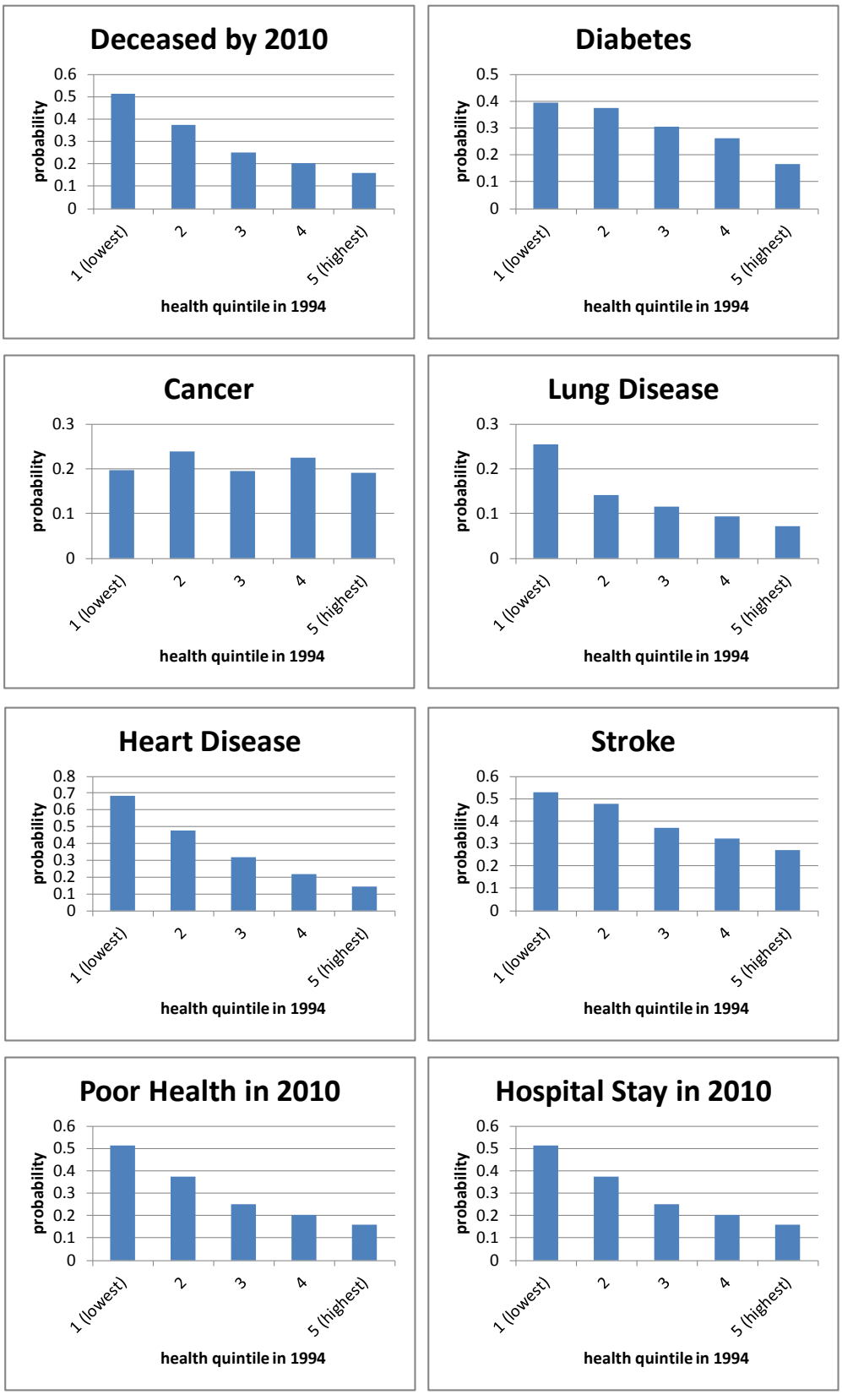
This index used here is identical to that used in Heiss, Venti and Wise (2014) and is an updated version of the index used in Poterba, Venti and Wise (2013). Prior work has shown that separate estimates of the index for each wave of the HRS produce similar factor loadings, so this version of the index pools all waves. We have also combined men and women based on the similarity of factor loadings. We use data from all five HRS cohorts spanning the years 1994 to 2010 to estimate the principal component index.[4] The estimated coefficients are used to predict a "raw" health score

[4] The full set of questions was not asked of all respondents for the HRS cohort in 1992 and the AHEAD cohort in 1994. Thus we have excluded all data for these two cohorts.

for each respondent. For presentation purposes we convert these raw scores into percentile scores for each respondent at each age.

The health status index that we use in this paper is a cardinal measure. It has several important properties. 1) It is strongly related to the evolution of assets, as shown in Poterba, Venti and Wise (2013). 2) It is strongly related to mortality. The upper left panel of Appendix Figure 1, abstracted from Heiss, Venti and Wise (2014) shows the relationship between the health index in 1994 and mortality in 2010 for members of the HRS cohort. Among those in the poorest health in 1994, approximately 51 percent are deceased by 2010. Among persons in the best health only about 16 percent are deceased by 2010. 3) It is strongly predictive of future health events such as stroke and the onset of diabetes, as is also shown in the remaining panels of Appendix Figure 1. The index value in 1994, however, has little predictive power for future episodes of cancer. 4) It is strongly related to economic outcomes prior to 1994, such as earnings, and to economic outcomes in later years.

Appendix Figure 1. Probability of health events by 2010 by health quintile in 1994, all persons age 53 to 63 in 1994



References

Bound, John. 1989. “The Health and Earnings of Rejected Disability Insurance Applicants.” *American Economic Review*, 79(3): 482-503.

Chen, Susan and Wilbert van der Klaauw. 2008. “The Effect of Disability Insurance on Labor Supply of Older Individuals in the 1990s.” *Journal of Econometrics*, Vol. 142(2):757-784.

Contoyannis, Paul, Andrew Jones, and Nigel Rice. 2004. The Dynamics of Health in the British Household Panel Survey,” *Journal of Applied Econometrics*, 19: 473-503.

French, Eric and Jae Song. 2014. “The Effect of Disability Insurance Receipt on Labor Supply.” *American Economic Journal: Economic Policy*. 6(2):291-337.

Heiss, Florian. 2011. “Dynamics of Self-Rated Health and Selective Mortality,” *Empirical Economics*, 40(1): 119-140.

Heiss, Florian, Axel Boersch-Supan, Michael Hurd, and David Wise. 2008. “Pathways to Disability: Predicting Health Trajectories, in D. Cutler and D. Wise (ed.) *Health at Older Ages*, University of Chicago Press, 105-150.

Heiss, Florian, Steven Venti and David Wise. 2014. “The Persistence and Heterogeneity of Health among Older Americans.” NBER Working Paper No. 20306.

Jones AM, X. Koolman, and N. Rice. 2006. “Health-related Non-response in the British Household Panel Survey and European Community Household Panel: Using Inverse-Probability-Weighted Estimators in Non-Linear Models,” *J Royal Statistical Society A* 169(3):543–569.

Livermore, Gina, David Stapleton and Henry Claypool. 2009. “Health Insurance and Health Care Access Before and After SSDI Entry.” The Commonwealth Fund, May.

Maestas, Nicole, Kathleen J. Mullen, and Alexander Strand. 2013. "Does Disability Insurance Receipt Discourage Work? Using Examiner Assignment to Estimate Causal Effects of SSDI Receipt." *American Economic Review*, 103(5): 1797-1829.

Poterba J, Venti S, Wise D. 2013. Health, Education and the Post-retirement Evolution of Household Wealth. *Journal of Human Capital* **7**(4):297-339.

Vaupel, James, Kenneth Manton and Eric Stallard. 1979. “The impact of heterogeneity in individual frailty on the dynamics of mortality.’ Demography 16 (3), 439-454

Venti, Steven and David Wise. 2014. “The Long Reach of Education: Early Retirement.” NBER Working Paper No. 20740.

von Wachter, Till, Jae Song and Joyce Manchester. 2011. “Trends in Employment and Earnings of Allowed and Rejected Applicants to the Social Security Disability Insurance Program.” *American Economic Review*, 101(7): 3308-3329