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ABSTRACT

The growth of longevity in the U.S. and other countries has increased interest in raising the age of eligibility for public retirement benefits. The consequences of this policy depend on the health of the older adult population overall and by socioeconomic group. In this paper, we estimate how multiple dimensions of non-fatal health in older adults evolve over time and across cohorts – physical functioning, mental health, pain, and cognition. Our sample is individuals in the Health and Retirement Study who are aged 51 to 54 at baseline and are followed for up to two decades. We find that limitations in most domains have increased for younger cohorts, especially pain and cognitive impairment. People are more impaired in their 50s, where such impairment used to occur in one's 60s. However, this appears to be a speeding up of impairment more than a long-term increase. Among people in their late 60s, health for later cohorts is similar to health for earlier cohorts. To evaluate the implications of these trends, we simulate the work capacity of adults just before reaching age 65 based on the health status of people at this age and the relationship between health and the labor force outcomes of younger people. Overall health among those age 62 to 64 remains high, despite impairment striking at younger ages. However, among people without high school degrees, less than half are predicted to have the capacity to work full time by age 62 to 64, and over a quarter are predicted to be receiving SSDI.

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In order for the US Social Security program to remain solvent, reforms are required to more closely align revenues with benefits. Raising the age of early and normal retirement is one frequently suggested reform, given that life expectancy has increased (Bowles and Simpson 2010, Steuerle 1999, Munnell, Meme et al. 2004, Coile, Milligan, and Wise 2017, Berger, López Garcia, Maestas, and Mullen, 2022; Borsch Supan and Coile 2023, Steuerle and Kramon 2023). Indeed, retirement age changes have been a hallmark of recent Old Age Assistance reforms in a number of countries (Börsch-Supan and Coile 2023) and have adherents in the US as well (Congressional Budget Office, 2022; Steuerle and Kramon 2023).

While the average older adult is living longer than they used to, there are important equity considerations about any change in retirement ages (Berkman & Tuesdale, 2022). One key consideration is health; people in poor health are less able to work longer, particularly full time, than those in better health. Recent evidence that middle-aged Americans without a college education have experienced rising mortality rates and report higher rates of pain (Case and Deaton 2015, 2017, 2023) heightens concerns over the equity of such policies (Berkman & Tuesdale, 2022).

However, health has many dimensions, each of which may have distinct impacts on one's ability to work into older ages, and all of which may trend differently over time. Thus, what is true about some dimensions of health, such as pain, may not apply to all dimensions of health relevant to work capacity. In this paper, we examine the multi-faceted elements of health for different populations of older adults and estimate the work capacity of different groups.

We start by examining health trends for different socioeconomic groups. Much past work has focused on single/global measures of health, typically mortality rates, or in the case of non-fatal health, overall self-reported health status (Milligan and Wise 2015, Johnson 2018, Munnell

2019, Congressional Budget Office 2019).[1] The general finding from examining this univariate metric of health is that health deteriorates only slowly in the 60s. Our own calculations using household survey data (described below) suggest the health of people aged 62 to 64 is only marginally worse than the health of people aged 57 to 61.[2] This is true overall and for most demographic groups. It is also true through age 69.[3]

However, self-reported health is inherently normed; people often assess their health relative to others like them (Krause and Jay 1994). Thus, health changes for everyone in an age group will be understated in aggregate. Further, different domains of health may change in different ways – deteriorating where it cannot be treated effectively (as with pain) and perhaps improving where treatment capacity has expanded (mental illness, for example). In this paper, we analyze health trends and summarize their implications for potential labor market participation.

We measure health in four domains: physical health (which we measure using physical functioning); pain; mental health (for which we are limited to a measure of depression); and cognition. These dimensions are among the most common in national and international health metrics (Stewart et al., 2014). For each domain, we form an index based on a number of questions, using scoring algorithms developed in the literature or factor analysis to combine items.

The data are from the Health and Retirement Study (HRS). The HRS is a panel study of the older adult population from 1992-2020. We consider all people aged 51 to 54 in one of the years in which new people enter the survey: 1992, 1998, 2004, 2010, and 2016. Across all waves, our sample has over 10,000 people observed entering the HRS and followed over time. We have

[1] This is generally addressed as a single question, for example from the National Health Interview Survey: "Would you say your health is in general excellent, very good, good, fair, or poor?"
[2] For example, using our HRS data, on a 5-point scale from excellent to poor, average self-rated health at ages 57-61 is 2.70 compared to 2.74 at ages 62 to 64.
[3] Using the same data as above, average health deteriorates from 2.53 at age 51 to 2.82 at age 69.

over 140,000 observations on these individuals. We examine health trends by age, education, and cohort, with cohorts capturing those age 51-54 in the waves when new HRS respondents were added: 1992, 1998, 2004, 2010, and 2016.

The data show that younger cohorts are in worse health in their 50s than older cohorts were at those ages. In particular, pain and cognition are both materially worse in the 50s for people in later cohorts. Depression is generally about the same by cohort. In contrast, health in the 60s is roughly similar for earlier and later cohorts. Thus, the earlier onset of pain and cognitive impairment observed for later cohorts has not (yet) carried over into worse health as people age.

To understand the implications of these different trends for work in the future, we simulate the work capacity and disability insurance receipt of people aged 62 to 64. We define work capacity as the ability of a person to hold a full time job. We operationalize it as predicted labor force participation of people aged 62 to 64, using individual health impairments and a model of the relationship between health and work status estimated among younger individuals. In our analysis, we consider the relationship between health and work at ages 51 to 54 and again at ages 60 to 61. Analogously, we estimate predicted Social Security Disability Insurance (SSDI) receipt using the relationship between health and disability insurance receipt at the same younger ages.

We find that work capacity (i.e., predicted rates of full-time-work at age 62 to 64) is 14 to 23 percentage points higher than observed full-time work rates across most education groups in 2020. The gaps were even larger (14 to 32 percentage points) in 2014. Thus, there is room for labor supply to increase further. However, work capacity differs greatly by socioeconomic status. For example, less than 45 percent of people without high school degrees are predicted to work full time at age 62 to 64 in 2020 based on health status along the dimensions studied. Thus, there is enormous heterogeneity in health status which policy will need to recognize.

The paper is structured as follows. Section 1 discusses past research on health and work capacity. Section 2 describes the data we analyze. Section 3 presents descriptive calculations of health for different education groups. Section 4 estimates models of work capacity and simulates labor force status in the wake of alternative incentives for early retirement. Section 5 discusses the implications of these results.

Section 1. Background

A central economic concern is understanding the work capacity of older adults, and in turn the potential impact of economic reforms on such individuals. A lengthy literature has considered the impact of changes in retirement ages on labor force participation of older adults (Mitchell & Phillips 2000, Gustman & Steinmeier 2005, Van der Klauw & Wolpin 2008, Blau & Goodstein 2010, Berkman & Tuesdale, 2022). Much of this literature simulates hypothetical responses to policy changes affecting Social Security using a structural model of retirement (Mitchell and Phillips 2000, Gustman and Steinmeier 2005, Van der Klauw and Wolpin 2008, Blau and Goodstein 2010, Coile, Milligan & Wise 2017; Borsch, Supan & Coile 2023).[4] Health status is a key element in these structural models.

Health is clearly important for work decisions. Early retirees – particularly those that retire at age 62 – are in worse health than those who retire before becoming eligible for early Social Security benefits or those who retire at older ages (Burkhauser, Couch et al. 1996, Panis, Hurd et al. 2002, Li, Hurd et al. 2008, Zhivan, Sass et al. 2008, Haaga and Jonson 2012, Milligan & Wise

[4] In research focused on earlier decades, authors simulate that adults would retire later without large changes in claiming disability benefits. Estimates based on earlier decades suggest a 5 percentage point drop in retirement at 62 or 63 (Gustman and Steinmeier 2005), larger increases in retiring at normal retirement ages than in disability caseloads (Mitchell and Phillips 2000), and an increase in employment among married males aged 62 to 69 (Van der Klauw and Wolpin 2008).

2017; Borsch, Supan & Coile 2023). Those retiring at 62 also tend to have less education and are more likely to work in physically demanding jobs. Though severe health problems are uncommon among early retirees, roughly 20 percent of early retirees have a work-limiting health condition that may make continued work after age 62 more difficult (Leonesio, Vaughan et al. 2000, Li, Hurd et al. 2008, Johnson 2018). Self-perception of health is also an important determinant of retirement (McGarry 2004).

Recent work also shows how common health impairment is among non-workers, including those at younger ages. Krueger (2017) documents that nearly half of prime age men who are not in the labor force are taking opioid medications – used appropriately for pain, or perhaps inappropriately. Further, labor force participation has declined more in areas where opioid prescribing is higher (Currie, Jin, and Schnell 2019; Aliprantis, Fee, and Schweitzer, 2023).

One concern about many of these papers is that they are forced to make strong assumptions regarding an individual's ability to borrow against future Social Security benefits, or to restrict empirical populations to narrow groups to overcome the complexity introduced by joint retirement and claiming decisions and by variation in private retiree benefits.[5,6] The specification of health status is also often limited to a single dimension. Thus, the literature has difficulty answering important questions regarding the potential burden of reforms that raise the age of eligibility for retirement benefits: what is the older adult population able to do and how does that differ across socioeconomic groups?

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[5] Health insurance benefits provided by employers also influence labor force participation, as does Medicare eligibility, but modestly (Gustaman and Steinmeier 1994, Lumsdaine, Stock et al. 1996, Blau and Gilleskie 2008).

[6] A related literature examines the behavioral response to changes in benefits available to early retirees. The Social Security Amendments of 1983, which gradually raised the Full Retirement Age (FRA) from 65 to 67 and increased the penalty for claiming retirement benefits at 62, the higher FRA was found to delay retirement (Behagel and Blau 2012) while leading to a small increase in disability program participation, affecting 0.6 percent of men and 0.9 percent of women aged 45-64 (Duggan, Singleton et al. 2007, Li and Maestas 2008).

In addition, the data used in the papers is often dated. Discussion of Social Security reform was common in the 2000s, and thus many analyses date from that time period. This often limits data analysis to around 2000. However, a recent literature argues that health has deteriorated since that time. For example, Case and Deaton (2015, 2017, 2023) and NASEM (2021) show that mortality has increased among people with fewer years of education, especially since 2000.

Only a few papers have examined more recent health trends in the older adult population and their implication for ability to work. Milligan and Wise (2015) compared male labor force participation rates across countries to mortality rates in 1977 and again in 2007. They concluded that men in 2007 would need to work 47 percent more than they did to match the rate of work for men with similar mortality rates in 1977. Cutler, Meara, and Richards-Shubik (2013) compared self-reported health of adults just below and above early retirement age and the predicted labor force participation of 62 to 64 year-olds if their work, retirement, and self-reported disability mirrored those of 57 to 61 year-olds with the same self-reported health. They found that workers at age 62 to 64 had predicted labor force participation 15 to 20 percent higher than what was observed at those ages.

Our work complements this earlier work in several ways. We consider a number of dimensions of health – physical health, mental health, and cognition – and over a longer period of time. Further, we relate these aspects of health to labor force participation, work, and disability, and we describe differences in health and labor force outcomes by socioeconomic status.

2. Data to Estimate Health and Work Capacity

We use data from the Health and Retirement Study, or HRS (Hauser and Willis 2004). The HRS is a panel study of adults aged 51 to 61 at baseline. It began in 1992 and re-interviews respondents every two years regarding health insurance, labor force participation, physical and mental health and functioning, a rich set of demographics, disability status, and household characteristics. The HRS is representative of the non-institutionalized US population with survey weights.[7]

To trace out the age profile of older adult health and labor force outcomes, we examine adults aged 51 to 54 at each wave in which the HRS admits new sample members: 1992, 1998, 2004, 2010, and 2016.[8] Other than age at baseline and restricting ourselves to respondents entering in these years, we make no other sample restriction. We include workers and non-workers alike. We follow these five cohorts of individuals as they near early and normal retirement ages for Social Security. Our upper age limit is 70.

We measure socioeconomic status using education, which we divide into four groups: those with less than a high school degree, those with a high school diploma or GED, those with any college education, and those with a college degree or more. Education is preferred to income because income may fall with poor health, while education is generally set at a much younger age. Still, because younger cohorts of Americans are more educated than older cohorts, the composition of adults in each education group has changed over time. To mitigate this potential source of bias, we randomly re-assigned more educated individuals in the 1998, 2004, 2010, and 2016 cohorts to match the observed education distribution of adults aged 51 to 54 in 1992, following the methods in Meara, Richards and Cutler (2008). In this way, any observed changes across cohorts reflect changes within pre-set education groups.

After dropping observations missing data on key variables, the HRS sample includes

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[7] Initial samples in the HRS exclude people in long-term care facilities. The HRS becomes representative of this sample roughly 4 years after a cohort enters.
[8] Most of the sample is individuals who enter at those waves. Some individuals entered earlier, for example as spouses of other entrants, but are excluded until they are aged 51 to 54.

10,602 individuals observed between ages 51 and 54 at their first interview.

Health Measures

There are a number of dimensions of health utilized in epidemiological studies (Stewart et al., 2014). These include difficulty with primary activity, social activity limitations, physical activity impairment, pain, mental health, energy, sensory impairment, and cognition. We do not have data on all of these metrics. Rather, we consider health in four domains.[9] In each case, we measure health by ability rather than diagnosis. For example, our measure of depression involves the person's mood, not whether they report a diagnosis of depression. Actual functioning influences labor supply more than labels (McClellan 1998; Cutler, Meara, and Richards-Shubik, 2013). We provide brief information about our health measures here and more detail in the Appendix.

Physical Functioning. The first domain is physical functioning. Physical limitations were assessed in several ways. A series of questions asks about any difficulty with a number of activities: walking 1 block, sitting 2+ hours, rising from a chair, stooping/kneeling/crouching, carrying weights over 10 pounds, reaching/extending arms above shoulder, or pushing/pulling a large object. We define an individual as having difficulty if they report difficulty or say they cannot or do not do the activity. Roughly 55 percent of people aged 61 to 64 report at least one physical functional impairment. We summarize this measure of functioning using factor analysis. We have over 145,000 observations we use in the factor analysis. We take the first principal factor of the seven variables as our metric.[10]

[9] There is no one-to-one mapping between our four measures and this fuller list, but the overlap is high.
[10] This is close to the average number of limitations, but not exactly so, as shown in the Appendix. The data strongly suggest one factor is appropriate. The first eigenvalue is 2.98, and the second eigenvalue is 0.25.

Pain. A second domain is pain. In each wave, respondents were asked if they were often troubled with pain, and whether the pain at its worst is mild, moderate, or severe. This was used to create a 4-category pain measure: 0-no pain, 1-mild pain, 2-moderate pain, and 3-severe pain. Pain needn't reflect just physical functioning; mental health challenges can lead to physical pain reports as well (Trivedi, 2004). Nonetheless, the physical function measure and the pain measure are highly correlated. As **Appendix Figure A1** shows, the relationship between the two is almost entirely monotonic; the correlation is 0.6. Because of this, in our primary analysis of work capacity, we wind up including pain but not physical functioning difficulties. We discuss this below.

Mental Health. Mental health has many dimensions. In practice, the HRS includes only a depression questionnaire, the 8-item Community Epidemiological Scale of Depression, or CES-D (felt: depressed, everything was an effort, happy, lonely, sad; slept too little or too much, could not get going, enjoyed life). Typically, depression is coded as endorsing four or more of the eight items. To allow somewhat greater flexibility, we formed a continuous depression measure as a factor score of the eight items, based on nearly 140,000 observations on depression. As **Appendix Table A1** shows, the factor loadings are relatively similar in magnitude across measures,[11] so that this is close to an average of responses.

Cognition. Cognitive impairment is particularly high at older ages, but signs of cognitive impairment often occur at younger ages (Nicholas et al., 2021). Cognition is measured based on six items: series 7's (which asks respondents to count backwards by seven from 100), immediate word recall, delayed word recall, memory rating, memory change rating, and backward counting

[11] Six of the variables are defined so that higher numbers are worse health. Two of the variables are defined the opposite way: whether the individual felt happy and enjoyed life. These have negative factor loadings. Again, one factor seems most appropriate. The first eigenvalue is 3.07, and the second eigenvalue is 0.26.

from 20. To form a continuous measure, we estimate factor scores of these six items. Immediate and delayed word recall receive the highest factor weights.[12] A higher score indicates worse cognition.

Summary. Finally, for descriptive analyses, we formed a summary measure of "very bad health" when respondents had at least three of the following: three or more physical functioning limitations, four or more negative responses to the eight item CES-D, severe pain, memory rated fair or poor, and under two correct on the "series 7" test. This metric picks up non-linearity that may result from a confluence of domains with poor health status.

In addition to these measures of health, we also consider smoking at baseline (current smoker or former smoker), which is among the most important risk factors in predicting poor health outcomes.

Labor Force Measures

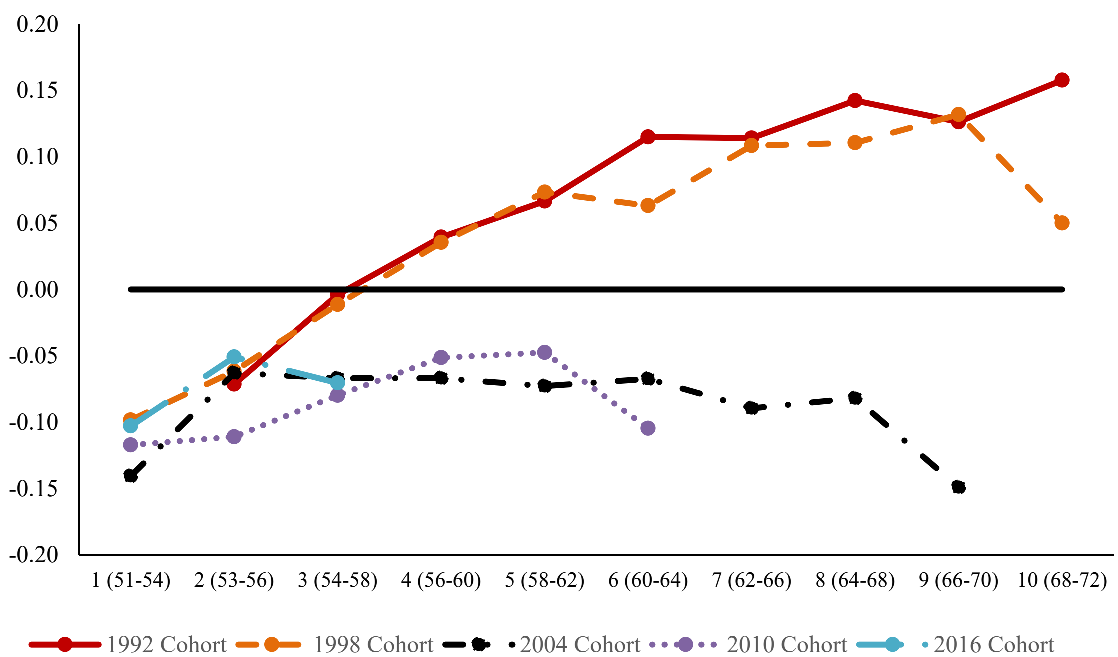
We measure work capacity using data on labor force participation, which is available for each wave. We divide the population into four labor force groups. We first categorized "adults with disability" as people reporting that they currently receive SSDI or Supplemental Security Income (SSI) benefits. For the remaining respondents, we used the question: "Are you working now, temporarily laid off, unemployed and looking for work, disabled and unable to work, retired, a homemaker, or what?" to form three mutually exclusive categories: full-time work, part-time work (including those saying they are partly retired or unemployed), and not in labor force, the latter of which includes those who are retired and those who report they are "disabled and unable to work" but are not receiving SSDI or SSI.

[12] Again, one factor seems most appropriate. The first eigenvalue is 1.58, and the second eigenvalue is 0.40.

3. The Health Status of Older Adults

We begin our empirical analysis by describing health trends by cohort of birth and age. We consider trends first in physical health, then pain, then depression, and finally cognition. Figure 1 displays information about our physical functioning score. Physical functioning is similar for all cohorts in their 50s. However, there is a difference across cohorts as they age. Physical function deteriorated for the earliest two cohorts as they aged; in contrast, there is no deterioration in physical functioning for later cohorts. Thus, by this metric, older adults are healthier than they were formerly.

Figure 1: Trends in Physical Functioning Limitations by Cohort and Age



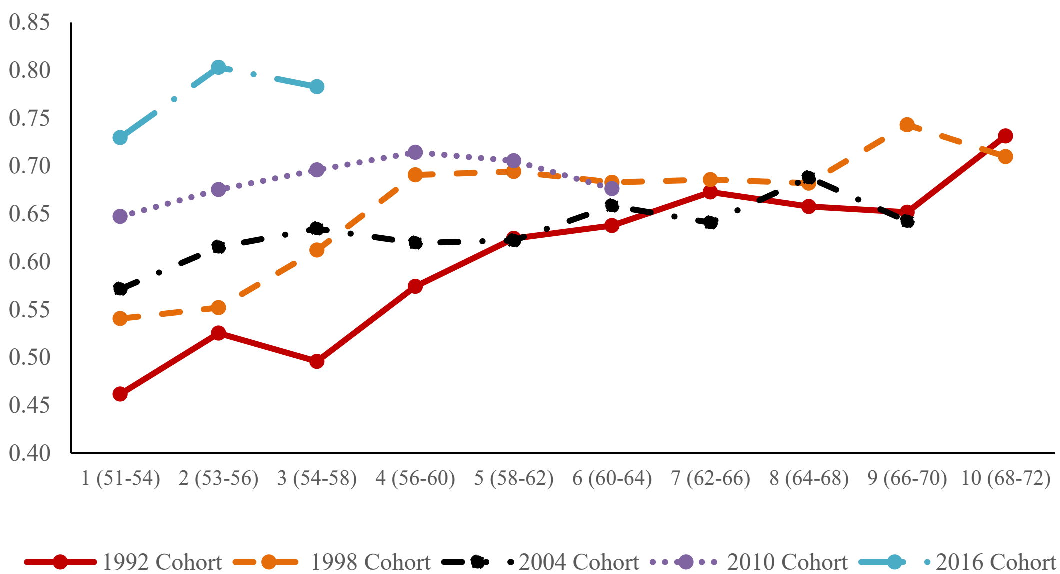
Note: The sample is HRS respondents who were aged 51-54 at the start of the indicated cohort. The index is the first factor from a factor analysis including difficulty walking 1 block, sitting for 2 hours, standing from a chair, stooping/kneeling/crouching, lifting/carrying 10 lbs, reaching above one's head, and pushing/pulling large objects. The 1992 cohort did not have comparable measures in the first wave of the HRS, so for the 1992 cohort only, we show physical functioning limitations in the second wave and later. Data are weighted to be representative of national population.

Figure 2 shows trends in pain by cohort. Figure 2a shows the average pain score; Figure 2b shows the percent in severe pain. Despite the fact that pain and physical functioning are highly correlated, the trend in pain is very different from the trend in physical functioning. Pain has worsened with each new cohort, rising by about .3 standard deviations at age 54 to 58 when comparing the 1992 and 2016 cohorts. The percent in severe pain appears to be rising as well, especially in the last two cohorts, though this difference is somewhat less pronounced than the growth in the pain score. Pain seems to be worsening, though more for "mild" and "moderate" than "severe" pain.

Pain trends by age are also changing. For the 1992 cohorts, pain rose sharply with age.[13] For the 2010 cohort, in contrast, pain is constant with age. Thus, it appears that the onset of pain is about 10 years earlier than it was formerly, but the maximum pain reports are not much higher.

Figure 2: Trends in Pain by Cohort and Age

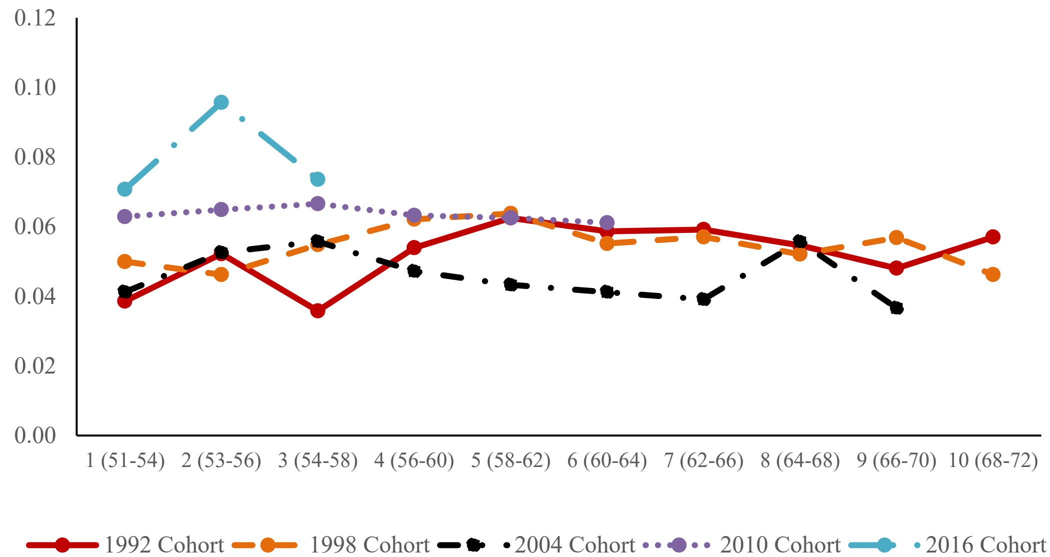
(a) Pain Index



[13] The differences between all cohorts in the first three waves are statistically significantly different, control for exact age, gender, race, Hispanic ethnicity, and education.

Figure 2 (continued)

(b) Percent in Severe Pain

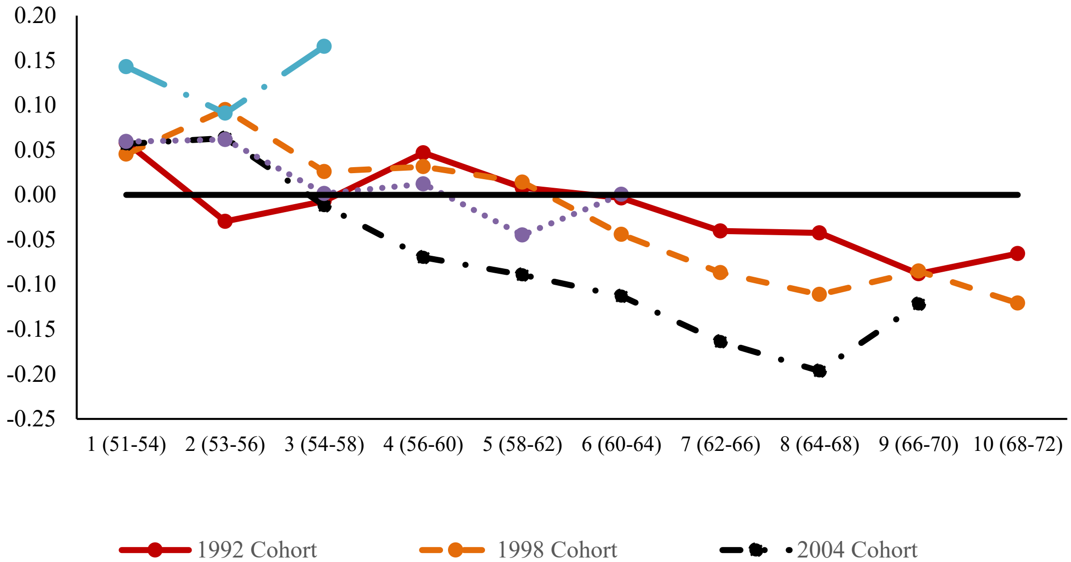


Note: The sample is HRS respondents who were aged 51-54 at the start of the indicated cohort. The pain index in panel (a) ranges from 0-3 (no pain, mild pain, moderate pain, severe pain). Data are weighted to be representative of national population.

Figure 3 shows the trend in depressed mood. Depression trends are similar for all cohorts. The highest rates of depressed mood are in the young 50s. As people age beyond then, depression declines, a finding consistent with epidemiological studies of depression in the population (National Institute of Mental Health 2023). The decline in depression with age appears relatively similar for all cohorts. While mental health treatment has increased over time, treatment changes or other changes are not sufficient to lower the rate of depressed mood as people reach their 50s.

Finally, cognitive impairment is shown in Figure 4. The trend in cognitive impairment is similar to the trend in pain. For people in their young 50s, cognitive impairment has increased over time. However, cognition declined more rapidly in older cohorts than in younger cohorts, for whom cognition is essentially constant through the 60s. Thus, the onset of cognitive impairment is earlier in age, but the cognition of the population aged 65 and older is somewhat better now than a few decades ago.

Figure 3: Trends in Depression by Cohort and Age

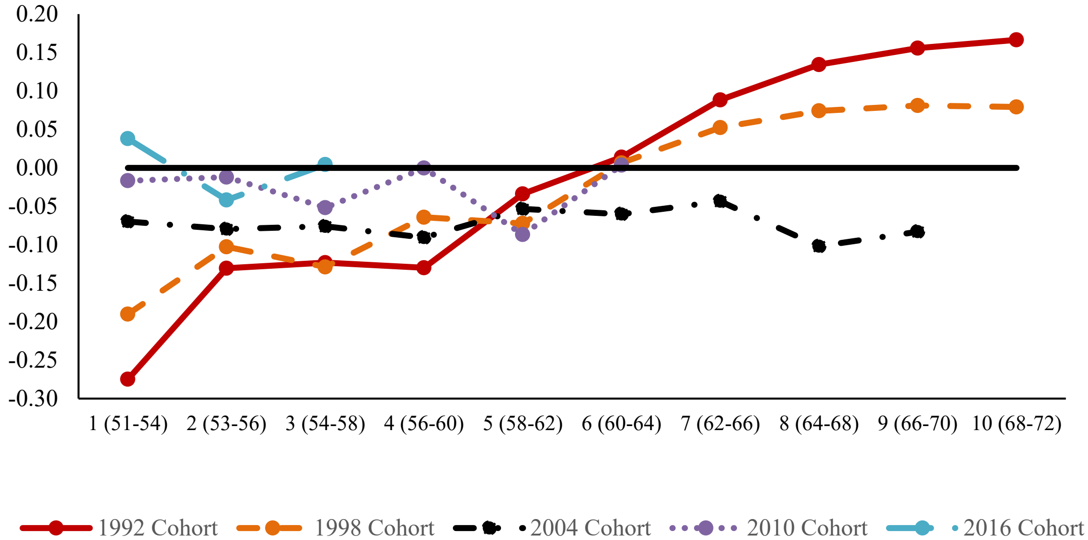


Notes: The sample is HRS respondents who were aged 51-54 at the start of the indicated cohort. Depression measure is a factor score of the 8-item Community Epidemiological Scale of Depression (felt: depressed, everything was an effort, happy (reverse coded), lonely, sad; slept too little or too much, could not get going, enjoyed life (reverse-coded)). Data are weighted to be representative of national population.

Figure 5 shows our combined measure of the percent of adults in very bad health. About 8 percent of our youngest age group is in very bad health. This share has grown with newer cohorts.[14] For adults aged 54 to 58, the percent in very bad health grew from 7.3 percent to 9.8 percent between the 1992 and 2010 cohorts, a 33 percent increase. Overall, the rates of very bad health are relatively constant as cohorts age; the increase in physical and cognitive impairment in older populations is roughly offset by the reduction in depression as those cohorts age.

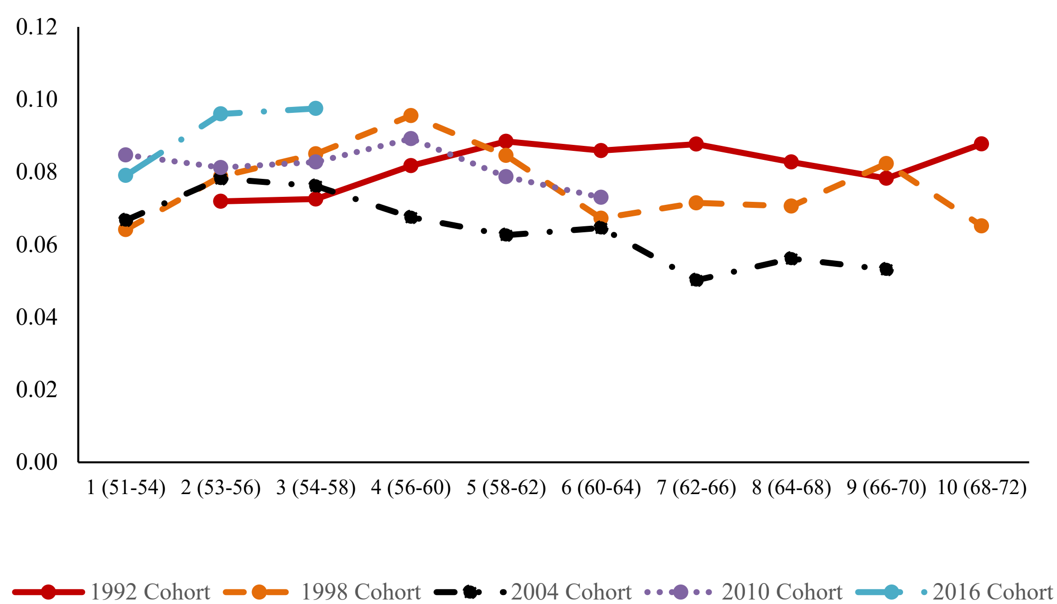
[14] The average coefficient on bad health in the first three waves for 2004 and 2010 cohorts is statistically significantly greater than the average coefficient for the first three waves of the 1992 and 1998 cohorts, controlling for exact age, gender, race, Hispanic ethnicity, and education.

Figure 4: Trends in Cognitive Impairment by Cohort and Age



Notes: The sample is HRS respondents who were aged 51-54 at the start of the indicated cohort. Cognitive impairment is a factor score of six items: serial 7's which asks respondents to count backwards by seven, immediate word recall, delayed word recall, memory rating, memory change rating, and backward counting from 20. A higher score indicates worse cognition. Data are weighted to be representative of national population.

Figure 5: Share of the Population in Very Bad Health by Cohort and Age



Notes: The sample is HRS respondents who were aged 51-54 at the start of the indicated cohort. Data are weighted to be representative of national population. Very bad health refers to three or more physical functioning limitations, four or more negative responses to the eight item CES-D, severe pain, memory rated fair or poor, and under two correct on the "series 7" test. The 1992 cohort did not have comparable measures in the first wave of the HRS, so for the 1992 cohort only, we omit the first wave for that cohort.

Health by Education

For our analysis, we care about health both overall and for different socioeconomic groups. **Figure 6** shows the trend in each of our four health domains separated out by education. For visual ease, we show only the population with a high school degree/GED and those with a college degree. We also show only the 1992, 2004, and 2010 cohorts. The full set of results for all four education groups and each cohort are in **Appendix Figures A2-A6**.

Without discussing each figure, we remark on several general trends. First, there are clear differences in the level of health by education. People with more years of education report better health than people with fewer years of education along every dimension we examine. For example, people with a high school degree or GED have a one-half standard deviation higher score on the functional limitations scale at baseline.

Second, within each education group, health at baseline has deteriorated over time. For example, pain is higher among younger cohorts than among older cohorts, even holding constant years of education. Thus, the findings that people are in more pain, have more functional limitations, and have worse cognition, are not due to changes in the share of people with different levels of education.

Third, younger cohorts generally have a flatter profile in health impairment than older cohorts. Older cohorts had a rapidly steepening onset of health impairment from their young 50s through the mid 60s. For younger cohorts, on average, health is worse in the early 50s, but it does not deteriorate as rapidly through the 60s.

Together, these individual health gaps translate into an eight-fold difference in the percent of respondents reporting they are in very bad health comparing high school/GED

Figure 6. Health Trends by Education, Cohort, and Age

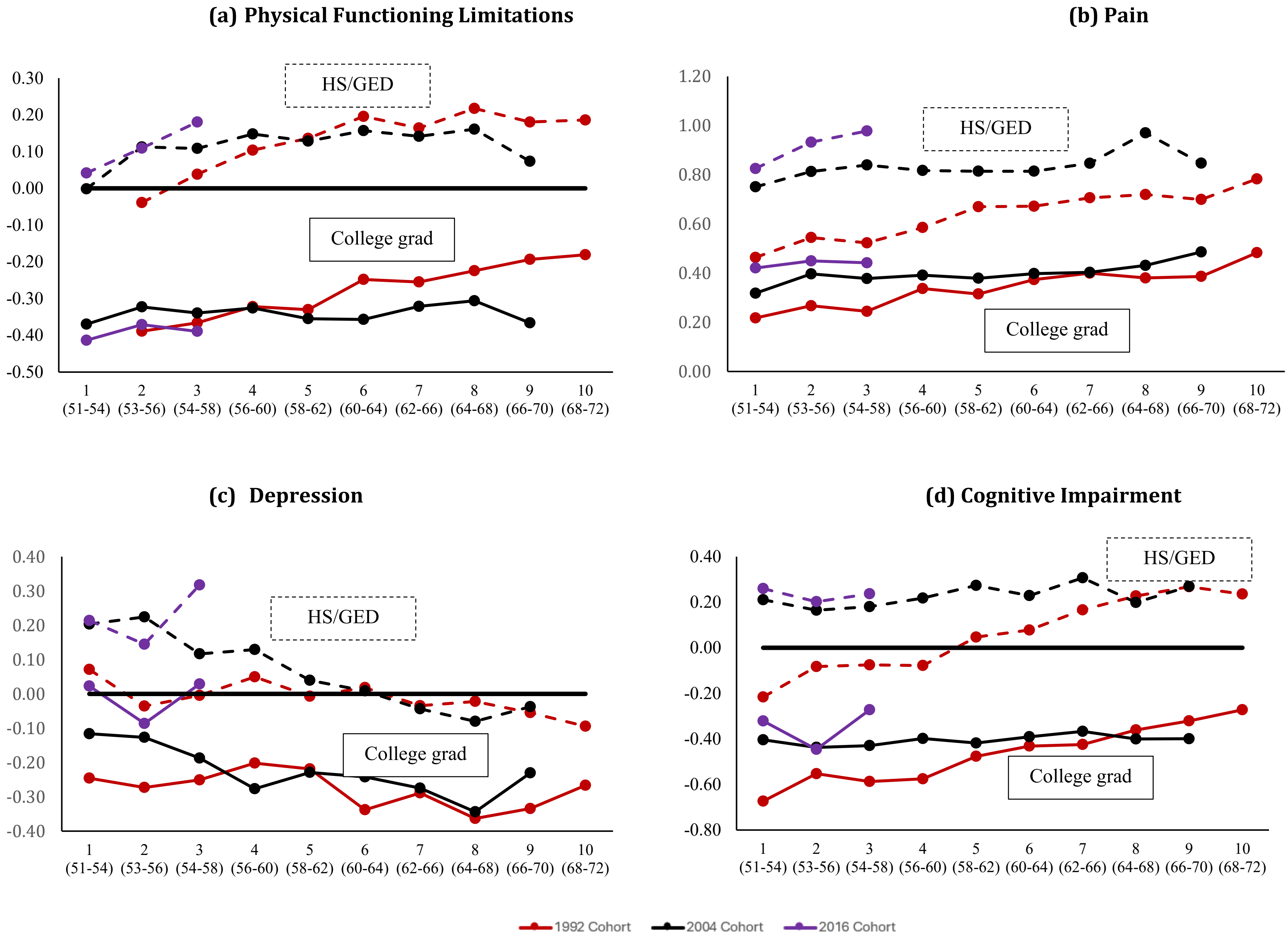
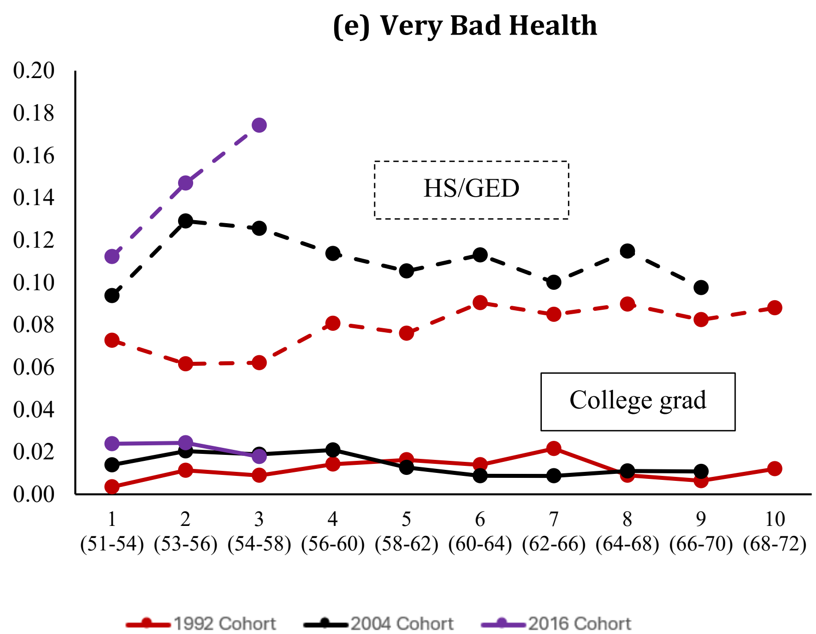


Figure 6 (continued)



Notes: The sample is HRS respondents who were aged 51-54 at the start of the indicated cohort. Data are weighted to be representative of national population. The physical functioning limitations index is the first factor from a factor analysis including difficulty walking 1 block, sitting for 2 hours, standing from a chair, stooping/kneeling/crouching, lifting/carrying 10 lbs, reaching above one's head, and pushing/pulling large objects. The pain index in panel (a) ranges from 0-3 (no pain, mild pain, moderate pain, severe pain). The depression measure is a factor score of the 8-item Community Epidemiological Scale of Depression (felt: depressed, everything was an effort, happy (reverse coded), lonely, sad; slept too little or too much, could not get going, enjoyed life (reverse-coded)). Cognitive Impairment is a factor score of six items: serial 7's which asks respondents to count backwards by seven, immediate word recall, delayed word recall, memory rating, memory change rating, and backward counting from 20. A higher score indicates worse cognition. Very bad health refers to three or more physical functioning limitations, four or more negative responses to the eight item CES-D, severe pain, memory rated fair or poor, and under two correct on the "series 7" test. The 1992 cohort did not have physical functioning measures in the first wave of the HRS, so for the 1992 cohort only, we omit the first wave for that cohort in figures a and e.

recipients to college graduates at younger ages (e.g. 1 to 2 percent v. 7 to 11 percent). Further, the increase in very bad health over time is greater for those with just a high school degree or GED compared to those with a college degree.

4. Estimating Work Capacity

In this section, we consider how the various dimensions of health presented above can be combined into a summary measure of work capacity. Statistically, this is a familiar problem: we have a variety of different attributes, denoted $\mathbf{X_i}$ for person i, which we want to weight into a common index. The ideal weights in this case reflect ability to work. Of course, we do not have a measure of *ability* to work. Instead, we have measures of *actual* employment, labor force participation, retirement, and disability status. We thus weight the $\mathbf{X_i}$'s by their relationship to various labor market outcomes.

We introduce our method using some notation. Denote labor force status for person *i* at date *t0* is given by $LFStatus_{i,t0}$. For example, this might be full-time work, part-time work, on SSDI/SSI, or otherwise not in the labor force as of one's early 50s. We relate labor force status to health characteristics $\mathbf{X_{i,t0}}$ and other characteristics $\mathbf{Z_i}$, which we assume here do not change over time (race and cohort of birth, for example). Our model of the form:

$$\text{LFStatus}_{i,t0} = f(\mathbf{X_{i,t0}}\,\boldsymbol{\beta} + \mathbf{Z_i}\,\boldsymbol{\gamma}). \qquad (1)$$

Because labor force status is discrete, we estimate this using a multinomial logit model, as noted below, leading to estimates $\hat{\boldsymbol{\beta}}$ and $\hat{\boldsymbol{\gamma}}$.

We wish to understand what these coefficients imply about predicted labor force status at a different date, which we term *t1*. Here, we are interested in ages just before a person reaches current Social Security full eligibility age, roughly ages 62 to 64.[15] We do this by predicting labor force status using the $\hat{\boldsymbol{\beta}}$ and $\hat{\boldsymbol{\gamma}}$ estimates but with **X**'s from the later time period:

$$\text{Predicted LFStatus}_{i,t1} = f(\mathbf{X}_{i,t1}\,\hat{\boldsymbol{\beta}} + \mathbf{Z}_i\,\hat{\boldsymbol{\gamma}}). \qquad (2)$$

We focus on the predicted share of people working full time, which we define as "work capacity," and the predicted share of people who are on SSDI/SSI, which we use to gauge expected disability rates.

The $\hat{\boldsymbol{\beta}}$ and $\hat{\boldsymbol{\gamma}}$ estimates can be taken from any age. We use two age groups in our analysis: ages 51 to 54 and the last observation before age 62, generally age 60 or 61. The 51 to 54 age group is well before early retirement for Social Security and generally before most private pension "cliffs" would strongly encourage many people to retire (Gustman & Steinmeier, 2005). Thus, it is a reasonably good measure of the relationship between health and retirement purged of these factors. However, health may change between one's 50s and 60s in ways we do not fully capture. Thus, we estimate a second model relating labor force status to health for people aged 60 to 61. The rationale for this age is that age 62 is the age of early Social Security benefits. Thus, the choice of 60 to 61 avoids any effect of contemporaneous eligibility for Social Security benefits on labor force behavior.

The first columns of **Table 1** show means for the sample aged 51 to 54, which is 10,602 people across all entry waves. Of this group, 62 percent are working full time as of their early 50s,

[15] Although cohorts born after 1937 experienced the gradual phase in of Full Retirement Ages greater than age 65 (until its current level of age 67 for cohorts born in 1960 and later), we focus on a constant age group, 62 to 64, when all adults in our sample were eligible for early retirement with reduced Social Security Retirement benefits, but none were eligible for full retirement benefits.

Table 1 Characteristics of Sample at Baseline and in Last Wave Prior to Age 65

	First wave in sample Age 51-54 N=10,602		Last wave prior to age 65 Age 62-64 N=3,081	
Measure	Mean	Std Dev	Mean	Std Dev
Employment and Disability Insurance Receipt				
Working Full Time	0.619	0.485	0.337	0.473
Working Part Time	0.133	0.340	0.171	0.377
Not in Labor Force	0.169	0.375	0.369	0.482
SSDI/SSI	0.078	0.268	0.123	0.329
Health scales				
Physical Functioning Limitation Factor[a]	-0.106	0.881	-0.005	0.901
Mild Pain[b]	0.108	0.310	0.117	0.322
Moderate Pain[b]	0.171	0.377	0.200	0.400
Severe Pain[b]	0.056	0.230	0.049	0.216
Depression Factor[c]	0.073	0.959	-0.047	0.879
Cognitive Limitation Factor[d]	-0.071	0.818	0.029	0.890
Other variables				
Former Smoker in first wave	0.322	0.467	0.347	0.476
Current Smoker in first wave	0.231	0.421	0.238	0.426
Male	0.467	0.499	0.524	0.500
Education				
Less than High School	0.103	0.305	0.106	0.308
Some College	0.291	0.454	0.267	0.442
College Graduate	0.296	0.457	0.299	0.458
First wave in:				
1992	0.056	0.233	0.180	0.384
1998	0.213	0.409	0.224	0.417
2004	0.241	0.428	0.246	0.431
2010	0.280	0.449	0.350	0.477
2016	0.209	0.407	--	--

Note: Means are for the sample of HRS respondents with complete information on labor force status, pain, depression, and cognition when first in the HRS between the ages of 51and 54. The second set of means are for the subset of those baseline respondents who were also in the data in their last wave prior to age 65. Data are weighted to be representative of national population.

[a]The physical functioning limitations index is the first factor from a factor analysis including difficulty walking 1 block, sitting for 2 hours, standing from a chair, stooping/kneeling/crouching, lifting/carrying 10 lbs, reaching above one's head, and pushing/pulling large objects. The physical functioning mean excludes those entering HRS in 1992, when comparable physical functioning measures were not available. [b]The pain index ranges from 0-3 (no pain, mild pain, moderate pain, severe pain). [c]Depression is a factor score of the 8-item Community Epidemiological Scale of Depression (felt: depressed, everything was an effort, happy (reverse coded), lonely, sad; slept too little or too much, could not get going, enjoyed life (reverse-coded)). [d]Cognitive limitation is a factor score of six items: serial 7's which asks respondents to count backwards by seven, immediate word recall, delayed word recall, memory rating, memory change rating, and backward counting from 20. A higher score indicates worse cognition.

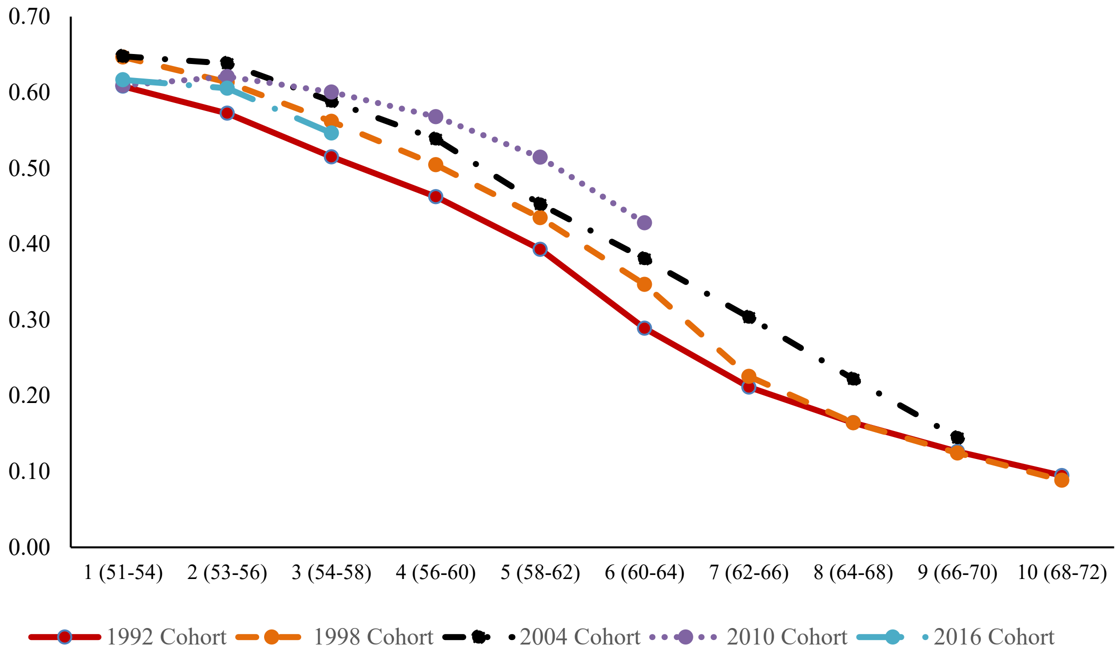
13 percent are working part-time, 8 percent are on SSDI or SSI, and 17 percent are otherwise not in the labor force (including people who were never in the labor force). Among this sample, the number who were also present in the data at ages 62 to 64 is 3,081.[16]

Figure 7 shows how labor market status varies over time. Panel (a) shows that the share of people reporting they are working full time declines from around 65 percent in the early 50s to about 10 percent by age 70. Recent cohorts are working more at comparable ages than older cohorts were. For example, full-time work around age 60 increased from 46 percent for the 1992 cohort to 57 percent for the 2010 cohort. There is a concurrent increase in the share of people receiving SSDI or SSI as people age, shown in panel (B). However, this increase is less steep in later cohorts, consistent with the earlier onset of disability. For people in their 50's, SSDI/SSI receipt rises in successive cohorts, doubling from about 5 to 11 percent from 1992 to 2016. In contrast, among people in their 60's, receipt rates converge to a narrower range of 9–13 percent. The health measures we examine are the four discussed above (physical functioning limitations, pain, mental health impairment, and cognitive function), means for which are provided in the middle panel of Table 1. Because some of our health measures are correlated with each other, we pay particular attention to which variables are entered. In addition to the health measures, we control for several other covariates: gender; education; cohort (to capture other time trends in labor force participation); and smoking status as of the first year in the survey (current/former/never). We do not control for smoking status on an ongoing basis because it may respond to health shocks.[17] In the models for labor force status at ages 60 and 61, we also control for labor force status at the first wave of survey entry, between ages 51 and 54. This picks up measures of long-

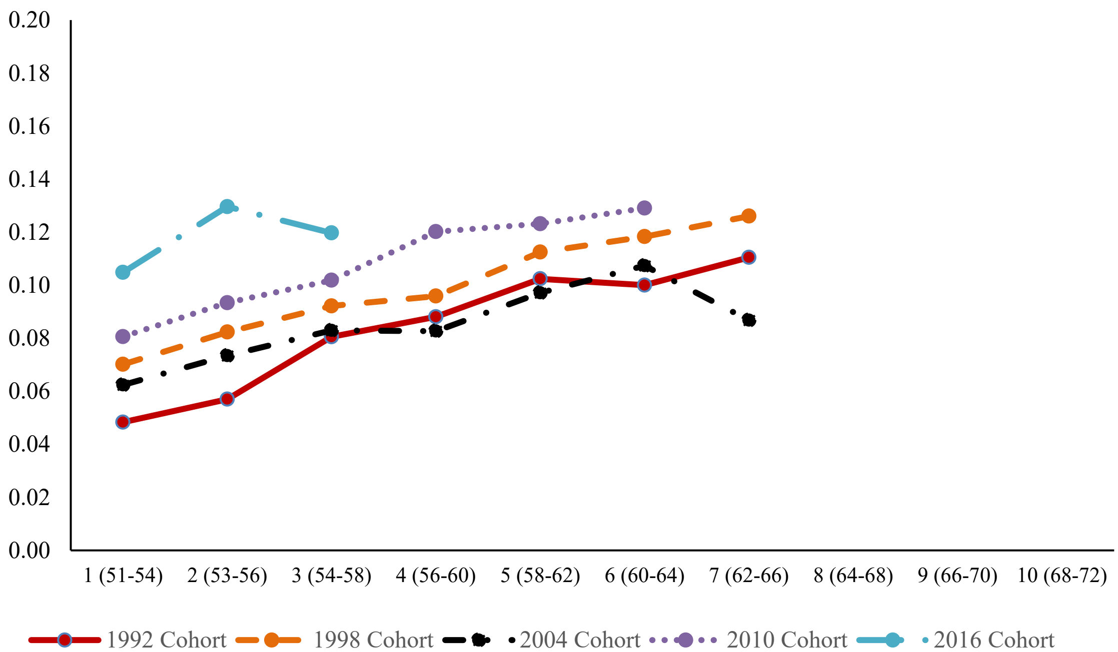
[16] Note that people entering the sample in 2016 have not yet reached age 62 by 2020, our final year of data.
[17] Other risk factors such as Body Mass Index (BMI) are sufficiently highly correlated with physical and mental health that we cannot distinguish the effects of BMI from its sequalae and we omit it in this parsimonious model of labor force status.

Figure 7: Changes in Labor Force Status Over Time

(a) Full-Time Work



(b) On SSDI/SSI



Notes: The sample is HRS respondents who were aged 51-54 at the start of the indicated cohort. Data are weighted to be representative of national population. We omit waves with ages above 64 since SSDI applies only at ages below Social Security's Full Retirement Age.

run labor force attachment.

Estimating Labor Force Outcomes

Table 2 reports relative risk ratios from multinomial logit models of labor force status in the HRS among those in their first wave of HRS (age 51 to 54). This model includes the pain categories along with the depression and cognition factor scores. We do not include the physical functioning score, due to the strong relationship with pain, as shown in Appendix Figure 1a. The omitted outcome is full-time work; the coefficients show how each variable affects other outcomes relative to that: part-time work, being out of the labor force, and being on SSDI/SSI.

All of the health scores are in the expected direction. A one standard deviation increase in depressive symptoms is associated with a 5.0 percentage point lower probability of being a full-time worker (translating the relative risk into percentage points) and a 2.0 percentage point increase in the probability of being on SSDI/SSI. Pain is highly related to labor force status. A person with severe pain is 29 percentage points less likely to work full time and 24 percentage points more likely to be on SSDI/SSI than is a person with no pain. Cognition is also associated with full-time work. A one standard deviation increase in symptoms of cognitive impairment symptoms is associated with a 4.1 percentage point lower probability of being a full-time worker and a 3.2 percentage point increase in the probability of being on SSDI/SSI. We return to what these results imply about work capacity below.

Although we do not focus on it as much, smoking is related to labor force participation as well. Both current and former smokers are more likely to be on SSDI/SSI. Other labor force choices are less affected.

Table 2. Multinomial Logit Predicting Work and Disability Status, Ages 51-54

Independent Variable	Categories Relative to Working Full Time		
	Work Part Time	Not in Labor Force	On SSDI/SSI
Health scores			
Mild Pain[a]	0.080	-0.050	0.580**
	(.130)	(.120)	(.188)
Moderate Pain[a]	0.253**	0.419**	1.680**
	(.114)	(.092)	(.134)
Severe Pain[a]	0.462**	1.149**	2.933**
	(.219)	(.159)	(.181)
Depression Factor[b]	0.063	0.335**	0.451**
	(.050)	(.039)	(.048)
Cognitive Limitation Factor[c]	0.068	0.231**	0.677**
	(.050)	(.048)	(.076)
Smoking at first wave			
Current Smoker in first wave	-0.085	0.090	0.628**
	(.108)	(.088)	(.133)
Former Smoker in first wave	-0.084	-0.191**	0.449**
	(.090)	(.085)	(.139)
Education (relative to HS/GED)			
< High School	0.4377**	0.605**	0.498**
	(.133)	(.106)	(.154)
Some College	0.070	-0.086	-0.110
	(.100)	(.089)	(.133)
College Graduate	-0.106	-0.514**	-0.381**
	(.108)	(.105)	(.192)
N		10,602	
Pseudo R^2		0.113	

Note: Table presents relative risk ratios and standard errors (in parentheses) from a multinomial logit model. The model also controls for gender and the wave the person started the survey. The sample includes HRS respondents with complete information on all measures when first in the HRS between the ages of 51and 54. Data are weighted to be representative of national population. **p < 0.05

[a]The pain index ranges from 0-3 (no pain, mild pain, moderate pain, severe pain).

[b]Depression is a factor score of the 8-item Community Epidemiological Scale of Depression (felt: depressed, everything was an effort, happy (reverse coded), lonely, sad; slept too little or too much, could not get going, enjoyed life (reverse-coded)). [c]Cognitive limitation is a factor score of six items: serial 7's which asks respondents to count backwards by seven, immediate word recall, delayed word recall, memory rating, memory change rating, and backward counting from 20. A higher score indicates worse cognition.

Table 3 examines how the results differ when including physical functioning scores in the model. The upper panel of the figure includes physical functioning and omits the pain variables. The overall fit of the model is similar to that with pain alone, and physical functioning is strongly associated with work. A one standard deviation increase in the physical functioning impairment score leads to a 10.0 percentage point reduction in the probability of working full time and an 8.0 percentage point increase in the probability of being on SSDI/SSI.

The next panel includes both pain and physical functioning in the model. It is clear that the model has a hard time differentiating between pain and physical functioning. The physical functioning impairment coefficient falls in this specification, and mild pain is found to increase full-time work relative to no pain. The coefficients on the other pain variables fall as well. The overall fit of the model is essentially unchanged.

Our conclusion is that it is not possible to fully differentiate between pain and difficulties with physical functioning. In many ways, this is not a surprise; one would expect the two to be

Table 3. Comparing Pain and Physical Functioning Limitation in Labor Force Decisions, Ages 51-54

	Categories Relative to Working Full Time		
Independent Variable	Work Part Time	Not in Labor Force	On SSDI/SSI
Part A: Including Physical Functioning Limitation as an Independent Variable			
Health scores			
Physical Limitation Factor[a]	.139**	.572**	1.612**
	(.051)	(.045)	(.058)
Depression Factor[b]	0.068	0.290**	0.317**
	(.049)	(.039)	(.054)
Cognitive Limitation Factor[c]	0.067	0.212**	0.617**
	(.050)	(.049)	(.082)
N		10,529	
Pseudo R2		0.153	

Table 3 (continued)

Part B: Including Pain and Physical Functioning Limitation as an Independent Variable

Health scores			
Physical Limitation Factor	0.100	0.587**	1.546**
	(.062)	(.052)	(0.083)
Mild Pain[d]	0.037	-0.401**	-0.489**
	(.134)	(.129)	(.220)
Moderate Pain[d]	0.177	-0.118	0.080
	(.130)	(.105)	(.165)
Severe Pain[d]	0.332	0.398**	0.815**
	(.237)	(.181)	(.222)
Depression Factor[b]	0.058	0.284**	0.274**
	(.050)	(.040)	(.055)
Cognitive Limitation Factor[c]	0.065	0.209**	0.617**
	(.051)	(.049)	(.083)
N		10,529	
Pseudo R2		0.156	

Note: Table presents relative risk ratios and standard errors (in parentheses) from a multinomial logit model. The models also control for gender, education level, smoking status, and the wave the person started the survey. The sample includes HRS respondents with complete information on all measures when first in the HRS between the ages of 51and 54. **p < 0.05.
[a]The physical functioning limitations index is the first factor from a factor analysis including difficulty walking 1 block, sitting for 2 hours, standing from a chair, stooping/kneeling/crouching, lifting/carrying 10 lbs, reaching above one's head, and pushing/pulling large objects. The physical functioning mean excludes those entering HRS in 1992, when comparable physical functioning measures were not available. [b]Depression is a factor score of the 8-item Community Epidemiological Scale of Depression (felt: depressed, everything was an effort, happy (reverse coded), lonely, sad; slept too little or too much, could not get going, enjoyed life (reverse-coded)). [c]Cognitive limitation is a factor score of six items: serial 7's which asks respondents to count backwards by seven, immediate word recall, delayed word recall, memory rating, memory change rating, and backward counting from 20. A higher score indicates worse cognition. [d]The pain index ranges from 0-3 (no pain, mild pain, moderate pain, severe pain).

related. In the rest of the paper, we show results with the pain variables included instead of the physical functioning. This is in part because pain is likely a broader measure than the physical functioning data available in the HRS, and in part because we are interested in the "worst case" for work capacity, and pain has increased by more than have impairments in physical function.

Table 4 shows regression results predicting labor force status in the last wave prior to age

Table 4: Multinomial Logit Predicting Work and Disability Status, Ages 60-61

	Categories Relative to Working Full Time		
Independent Variable	Work Part Time	Not in Labor Force	On SSDI/SSI
Mild Pain[a]	0.149	0.060	0.728**
	(.151)	(.126)	(.189)
Moderate Pain[a]	0.199	0.217**	1.563**
	(.123)	(.101)	(.159)
Severe Pain[a]	0.340	0.603**	1.888**
	(.260)	(.189)	(.241)
Depression Factor[b]	0.031	0.229**	0.320**
	(.062)	(.046)	(.063)
Cognitive Limitation Factor[c]	-0.014	0.161**	0.316**
	(.058)	(.049)	(.080)
Current Smoker in first wave	0.089	0.137	0.546**
	(.122)	(.098)	(.162)
Former Smoker in first wave	0.064	-0.032	0.048
	(.100)	(.085)	(.159)
< High School	0.193	0.234**	0.156
	(.163)	(.112)	(.171)
Some College	0.090	-0.0003	-0.212
	(.110)	(.095)	(.161)
College Grad	0.280**	0.039	-0.703**
	(.114)	(.103)	(.217)
Working Part Time first wave	2.102**	1.305**	0.950**
	(.116)	(.115)	(.207)
Not in Labor Force first wave	1.351**	2.324**	2.023**
	(.145)	(.108)	(.160)
On SSDI/SSI first wave	1.727	3.162**	7.380**
	(.937)	(.723)	(.694)
N		8,933	
Pseudo R^2		0.224	

Note: Table presents relative risk ratios and standard errors (in parentheses) from a multinomial logit model. The sample includes HRS respondents who were 51-54 at the start of the cohort, now in their last wave prior to age 62. The model also controls for gender and the wave the person started the survey. SSDI/SSI = self-reported receiving SSDI or SSI receipt. **p < 0.05.

[a]The pain index ranges from 0-3 (no pain, mild pain, moderate pain, severe pain). [b]Depression is a factor score of the 8-item Community Epidemiological Scale of Depression (felt: depressed, everything was an effort, happy (reverse coded), lonely, sad; slept too little or too much, could not get going, enjoyed life (reverse-coded)). [c]Cognitive limitation is a factor score of six items: serial 7's which asks respondents to count backwards by seven, immediate word recall, delayed word recall, memory rating, memory change rating, and backward counting from 20. A higher score indicates worse cognition.

62. The results are generally similar to those in Table 2. The coefficients are in the same direction, and generally somewhat larger than for people aged 51 to 54. This is to be expected given that full-time work is lower in the 60s than in the 50s and SSDI/SSI participation is higher.

Implications for Work Capacity and SSDI/SSI

We use these model estimates to predict the probability that people will be a full-time worker or receiving SSDI/SSI in their last interview before age 65. To do this, we use models in Tables 2 and 4, and substitute the $\mathbf{X_{i,t1}}$ variables for the $\mathbf{X_{i,t0}}$ variables. The results for the full population are shown in **Figure 8**. Panel 8a is for predicted full-time work, and panel 8b is for predicted SSDI/SSI receipt.

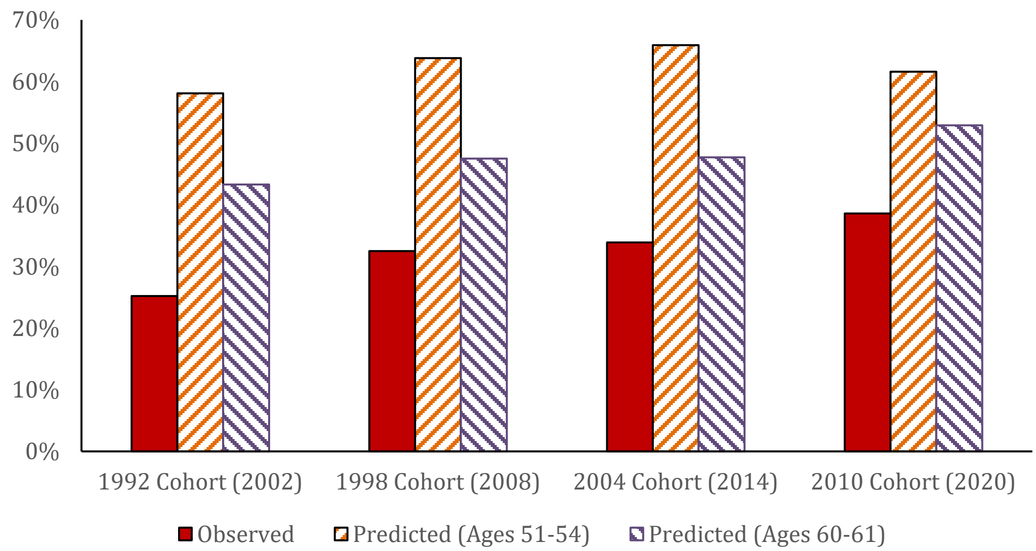
We start with the model for full-time work. The panel has four groups, each corresponding to a different cohort. The first bar in the group shows observed full-time work status in the last wave before age 65, roughly 2002 and 2020 for the first and last cohorts. The middle bar shows predicted labor force participation for the same ages based on the model estimated at ages 51 to 54. The right bar shows predicted full-time work based on the model estimated at ages 60 to 61.

In each of the four cohorts, observed full-time work is lower than predicted full-time work. This is true even though the percent of people working full time at ages 62 to 64 has increased over time. Between (roughly) 2002 and 2020, the observed percent of people ages 62 to 64 working full time rose from 25 to 39 percent. Based on health characteristics a decade earlier, the predicted full-time work rate in 2020 was 62 percent. Even using the predictions from ages 60 to 61, the predicted percent working full time was 53. Thus, full-time work was 14 to 23 percentage points below predictions based on the models.

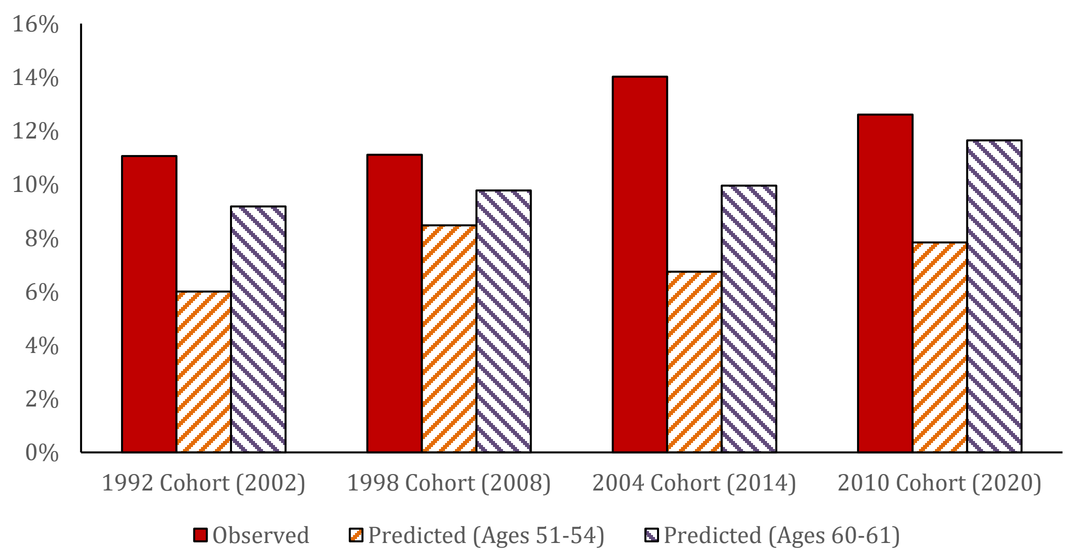
Corresponding to this is that SSDI/SSI receipt is above predictions. In this case, however,

Figure 8: Observed versus Predicted Labor Force Outcomes at Age 62 to 64, Based on the Relationships Between Health and Outcomes at Age 51 to 54, and at Age 60 to 61

(a) Full-Time Work



(a) SSDI/SSI Receipt



Notes: Observed levels of full-time work and SSDI receipt and predicted capacity to perform full-time work and propensity to receive SSDI/SSI among HRS respondents in their last wave prior to age 65 (ages 62 to 64). Predicted capacity is from models including depression, pain, cognitive limitations, gender, starting wave, education level, and smoking status (current former, former smoker, never smoker) in the first wave an HRS respondent is observed between age 51 and 54 (first/green hatched bar). In the model based on estimates in the last wave prior to 62 (second/blue hatched bar), we include labor force status when the individual was first observed between age 51 and 54. Data are weighted to be representative of national population.

actual and predicted outcomes are closer together. In 2020, for example, the actual rate of SSDI/SSI receipt for people aged 62 to 64 was 12.6 percent. The predicted rates of SSDI/SSI receipt are 7.8 percent (model ages 51 to 54) and 11.6 percent (model ages 60 to 61). The difference between these predictions reflects the fact that health conditions are more associated with SSDI/SSI receipt as people age. If one takes the model from ages 51 to 54 as the correct reflection of work-limiting disability, SSDI/SSI receipt is still far above what is expected. If the model from ages 60 to 61 is more reasonable, SSDI/SSI rates are not that far above expected. Put another way, the increase in work that is possible would not come from reductions in disability insurance receipt but rather from people deciding not to retire as early.

We care about overall rates of work capacity and also work capacity by socioeconomic status. **Figure 9** shows predicted full-time work and predicted SSDI/SSI rates by education group. For ease, we focus on the 2010 cohort; the figure shows other cohorts as well.

Labor force status compared to expected levels vary greatly by education. For people without a high school degree, full-time work at ages 62 to 64 is more in line with expectations than for the overall sample. Observed full-time work was 29 percent in 2020, compared to predictions of 42 and 35 percent. Predicted full-time work for the group without a high school degree has not changed much over time; however, this group is far more likely to work now than in the past. Correspondingly, the rate of SSDI/SSI participation for this group is about at expected levels, especially based on the predictions from ages 60 to 61.

For college graduates, in contrast, predicted full-time work remains far above actual levels. In 2020, the actual rate of full-time work was 44 percent, compared to predicted rates of 70 and 59 percent. Receipt of SSDI/SSI for people with a college degree is very low (about 3 to 4 percent observed and predicted in 2020); the reduced rate of full-time work is largely accounted for by more people out of the labor force.

Overall, these results suggest that policy regarding work and receipt of social insurance will need to be nuanced. Full-time work increases can occur, but they will need to be larger among

Figure 9: Observed versus Predicted Labor Force Outcomes by Education Level at Age 62 to 64, Based on the Relationships Between Health and Outcomes at Age 51 to 54, and at Age 60 to 61

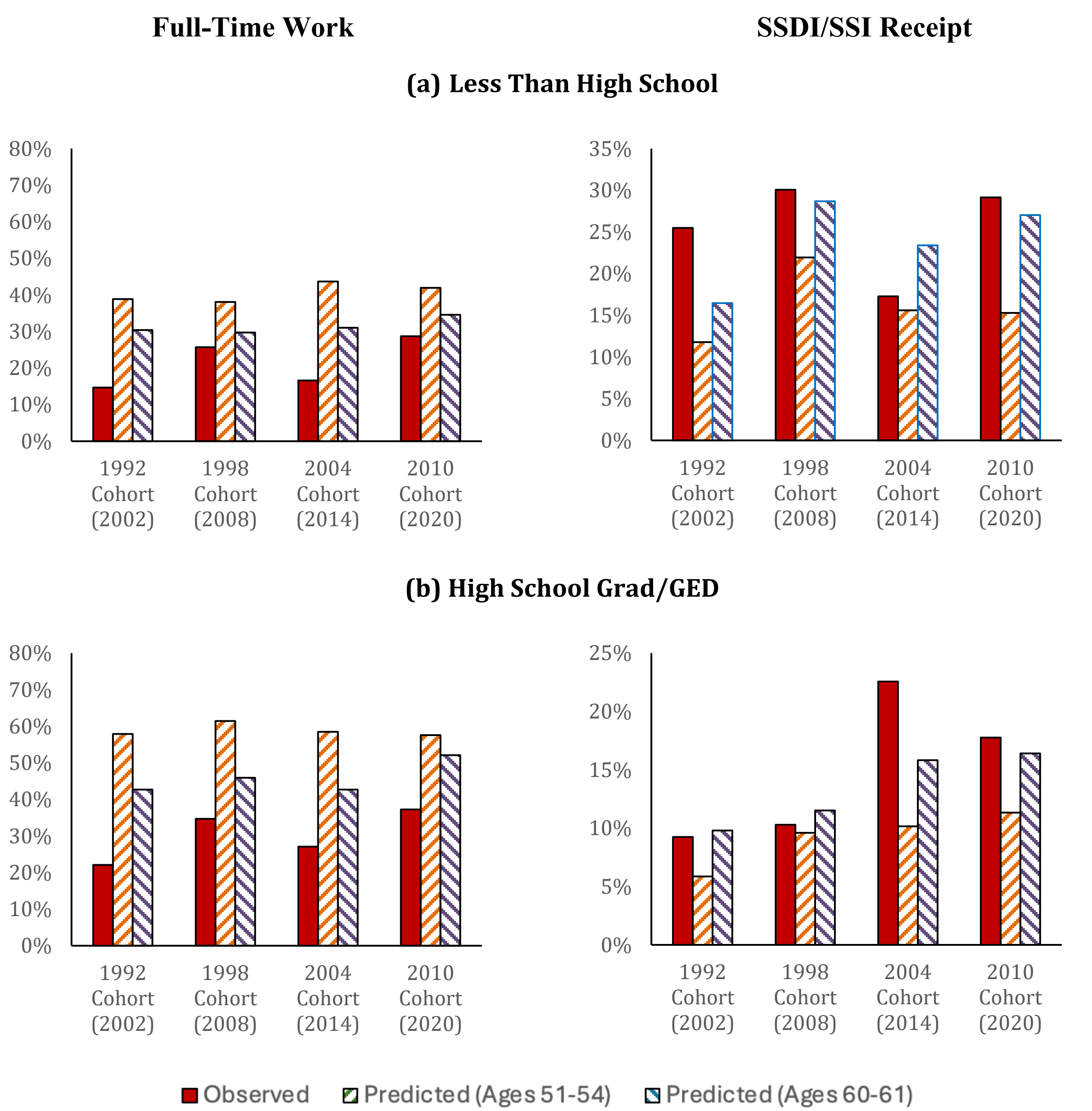
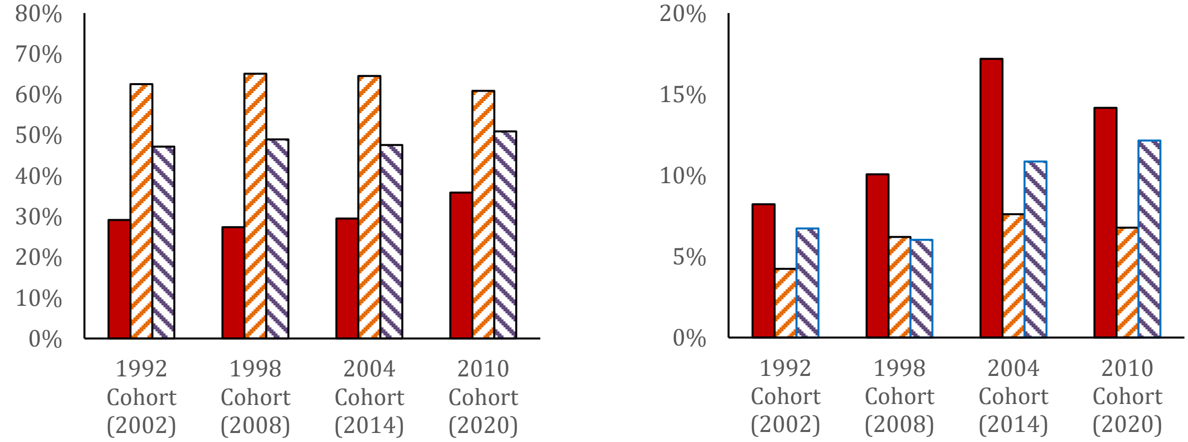


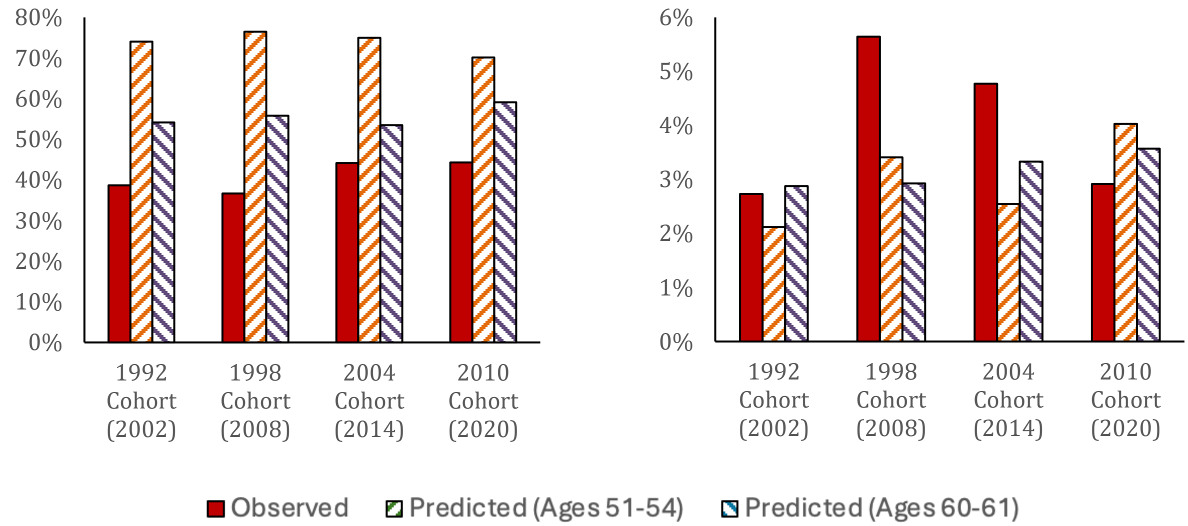
Figure 9 (continued)

Full-Time Work | **SSDI/SSI Receipt**

(c) Some College



(d) College Grad



Notes: Observed levels of full-time work and SSDI receipt and predicted capacity to perform full-time work and propensity to receive SSDI/SSI among HRS respondents in their last wave prior to age 65. Predicted capacity is from models including depression, pain, cognitive limitations, gender, starting wave, education level, and smoking status (current former, former smoker, never smoker) in the first wave an HRS respondent is observed between age 51 and 54 (first/green hatched bar). In the models on those in their last wave prior to 62 (second/blue hatched bar), we include labor force status when the individual was first observed between age 51 and 54. Data are weighted to be representative of national population.

people with more years of education than among people with fewer years of education. In addition to health, other factors correlated with fewer years of education that reduce the ability to work longer include more physically or cognitively demanding jobs, family caregiving responsibilities, and age discrimination (Berkman & Tuesdale, 2022). Regarding SSDI/SSI, increasingly, the issue is not that more people receive these benefits than one would expect, but rather that people are outside of the labor force and not receiving benefits.

5. Conclusion and Discussion

In this paper, we trace the age profile of health along four dimensions, physical functioning limitations, pain, mental health functioning, and cognition. All but depression present ongoing or increasing challenges to individuals as they age. In general, people with fewer years of education are limited in these areas at much higher rates than people with more years of education. We simulated the work capacity – the predicted probability of full-time work based on observed health characteristics – of individuals in age groups targeted by policies that limit access to Social Security benefits, such as a rise in the age of eligibility for early benefits.

We reach two fundamental conclusions. First, health has deteriorated over time for people in their 50s. We find health deteriorations for more recent cohorts using our measures of pain, depression, and cognitive impairment. Only physical functioning limitations have not deteriorated. However, even as more recent cohorts are in worse health in their 50s, their health is not particularly worse in their 60s. Health impairments used to accumulate from the 50s through the 60s; more recently, health impairment is high in the 50s but not deteriorating much over the next two decades.

Second, we find that even with the changes in health, work capacity remains high, especially for those with more years of education. Overall, based upon the health of today's young retirees, many more individuals could work than currently do. The capacity for work, like the health underlying it, is very uneven across groups by education. We estimate that less than half of people without high school degrees have health that suggests they have the capacity to work full time by age 61 to 64. People with a college degree, in contrast, have far higher work capacity.

To put our findings in context, consider the drop in labor force participation between 1970 and 1994 (Burkhauser, Couch et al. 1996). Between 1970 and 1994, the percentage of 63-year-old men in the labor force fell by 24 percentage points. This is of a similar magnitude to our estimate of additional work capacity assuming that only health status changed across ages. Thus, our analysis suggests that work capacity is nearly as high now as actual labor force participation was several decades ago.

On the downside, however, there are significant disparities in these findings across groups, and the earnings capacity of older adults with fewer years of education who may be induced to work with changing work incentives, such as reduced access to early Social Security benefits, is likely to be significantly lower compared with current workers. The uneven work capacity suggests the need for alternative sources of income among older workers, especially older workers facing higher risk of disability or barriers to work, and for policies that are nuanced by lifetime socioeconomic status.

Despite these concerns, our results offer reasons to be cautiously optimistic about the ability of many older Americans to continue working beyond current retirement ages. Encouraging workers to use this potential will require approaches to disability, unemployment insurance, and early retirement that recognize both the untapped potential of older workers and find ways to maintain financial security for workers facing limits to their ability to work in sustained ways, like those without a high school degree.

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Appendix to Cutler, Meara & Stewart, 2025 NBER Working Paper

Trends in Work Capacity in the US Population: Are Recent Cohorts in Worse Health?

We form four primary health measures.

Physical limitations is based on the person reporting some difficulty with seven activities: walking one block, sitting for two hours, getting up from a chair, stooping/kneeling/crouching, lifting/carrying 10 lbs., reaching/extending arms up, and pushing/pulling large objects. Each variable is coded 0-1, where 1 indicates difficulty with the activity or inability to do the activity. We form a factor analysis from these seven variables, shown in Appendix Table A1. The first eigenvalue is 2.98 and the second eigenvalue is 0.25. Thus, the data strongly suggest a single factor. All of the factor loadings are in the expected direction.

Pain is based on two questions: whether the person is often troubled with pain, and if so how bad is the pain most of the time – mild, moderate, or severe. We form a four item response from no pain to severe pain.

Depression is based on the CES-D. Respondents answer yes or no to 8 questions, including depressed mood and lack of energy in the past week. A response of 4 or higher is generally interpreted as depression. To allow somewhat more flexibility in the responses, we form a factor analysis based on the eight item response. The factor loadings are shown in Appendix Table A1. The first eigenvalue is 3.07 and the second eigenvalue is 0.26. Thus, the results strongly support a single factor. The factor loadings are nearly similar across variables, so that an average response would do almost as well as our factor score.

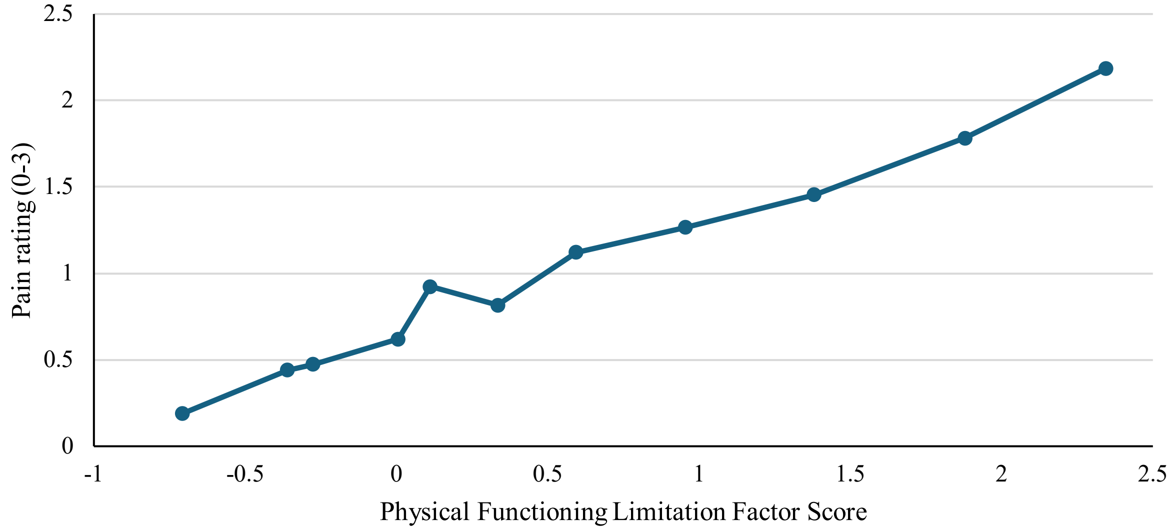
Cognition is based on six items: serial 7's (which asks respondents to count backwards by seven from 100; scored from 0-5), immediate word recall (0-10), delayed word recall (0-10), memory rating (1-5), memory change rating (1-3), and backward counting from 20 (0-2). For the serial 7's, word recalls, and backwards counting from 20, a higher number indicates a better score. For memory ratings and memory change, a higher number indicates worse health. The factor analysis is based on all individuals with information on these six attributes, 130,077 in total. The first eigenvalue is 1.57 and the second eigenvalue is 0.4. Thus, the model strongly suggests only one factor. The factor loadings are shown in Appendix Table A1 and are in the direction we expect. We multiply the final factor score by -1 so that a higher number indicates worse cognition.

Table A1: Factors Scores for Cognition, Depression, and Physical Functioning

Variable	Scoring	Factor Loading
Physical Functioning (N=146,640)		
Walking 1 block	Some difficulty (0-No; 1-Yes, Can't do, Don't do)	0.68
Sitting 2 hours	Some difficulty (0-No; 1-Yes, Can't do, Don't do)	0.58
Standing from chair	Some difficulty (0-No; 1-Yes, Can't do, Don't do)	0.66
Stooping/kneeling/crouching	Some difficulty (0-No; 1-Yes, Can't do, Don't do)	0.64
Lifting/carrying 10 lbs	Some difficulty (0-No; 1-Yes, Can't do, Don't do)	0.71
Reaching/extending arms	Some difficulty (0-No; 1-Yes, Can't do, Don't do)	0.55
Pushing/pulling large object	Some difficulty (0-No; 1-Yes, Can't do, Don't do)	0.72
Depression (N=139,906)		
Depressed	Felt depressed (0-No; 1-Yes)	0.73
Effort	Felt everything an effort (0-No; 1-Yes)	0.55
Sleep	Slept too little or too much (0-No; 1-Yes)	0.44
Happy	Felt happy (0-No; 1-Yes)	-0.69
Lonely	Felt lonely (0-No; 1-Yes)	0.61
Sad	Felt sad (0-No; 1-Yes)	0.71
Get going	Could not get going (0-No; 1-Yes)	0.52
Enjoy life	Enjoyed life (0-No; 1-Yes)	-0.64
Cognition (N=130,077)		
Series 7	Number of subtractions (out of 5)	0.39
Immediate word recall	Words recalled (out of 10)	0.80
Delayed word recall	Words recalled (out of 10)	0.79
Memory rating	1-Excellent; 2-Very good; 3-Good; 4-Fair; 5-Poor	-0.33
Memory change	1-Better; 2-Same; 3-Worse	-0.12
Backwards count	0-Incorrect; 1-Correct, 2nd try; 2-Correct, 1st try	0.19

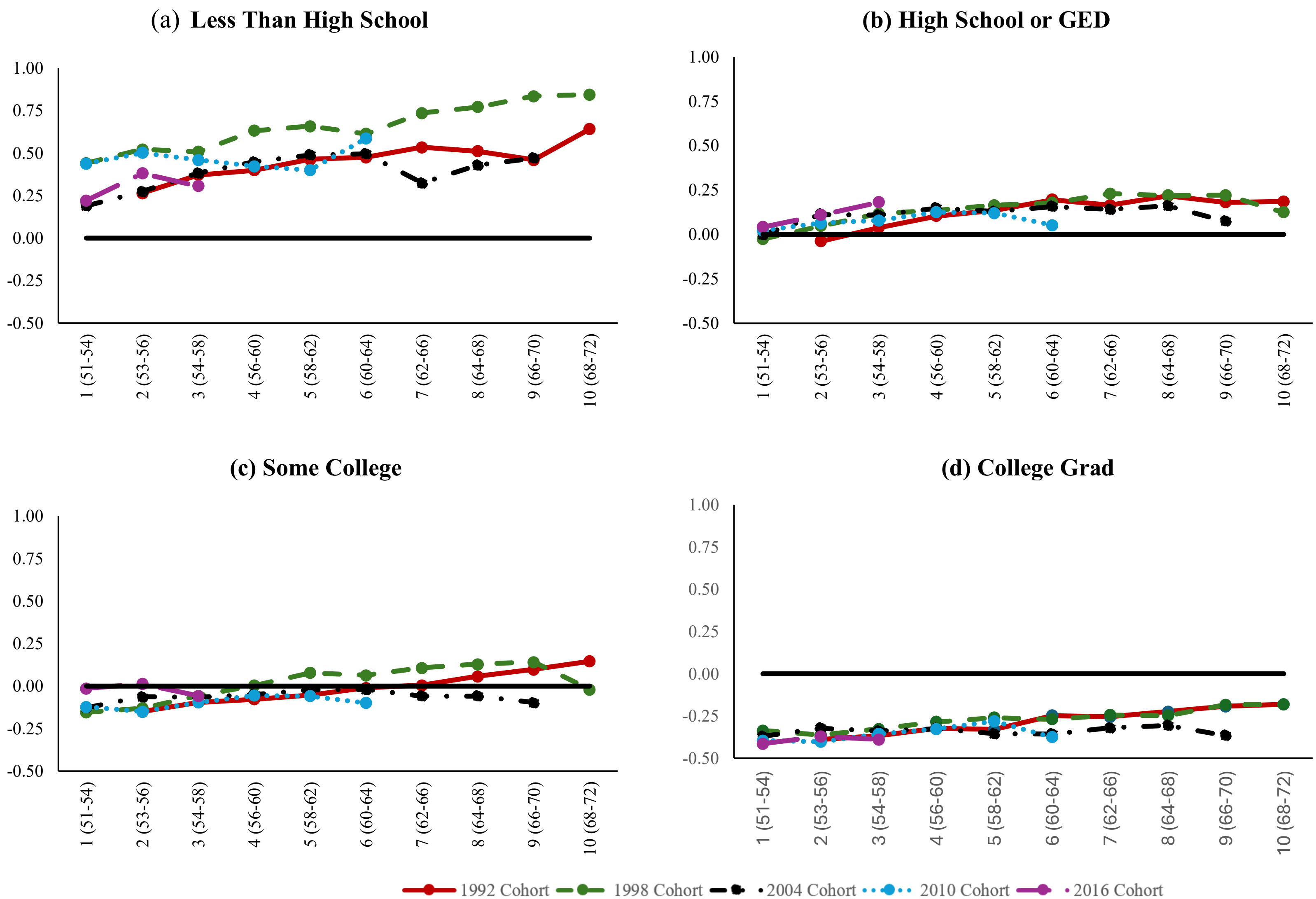
The factor scores are from factor analyses using all of the observations of HRS respondents age 51-70 with complete data on the items contributing to the factor, pooled across waves. Data are weighted to be representative of national population.

Figure A1: The Relationship Between Pain and Physical Functioning Limitations



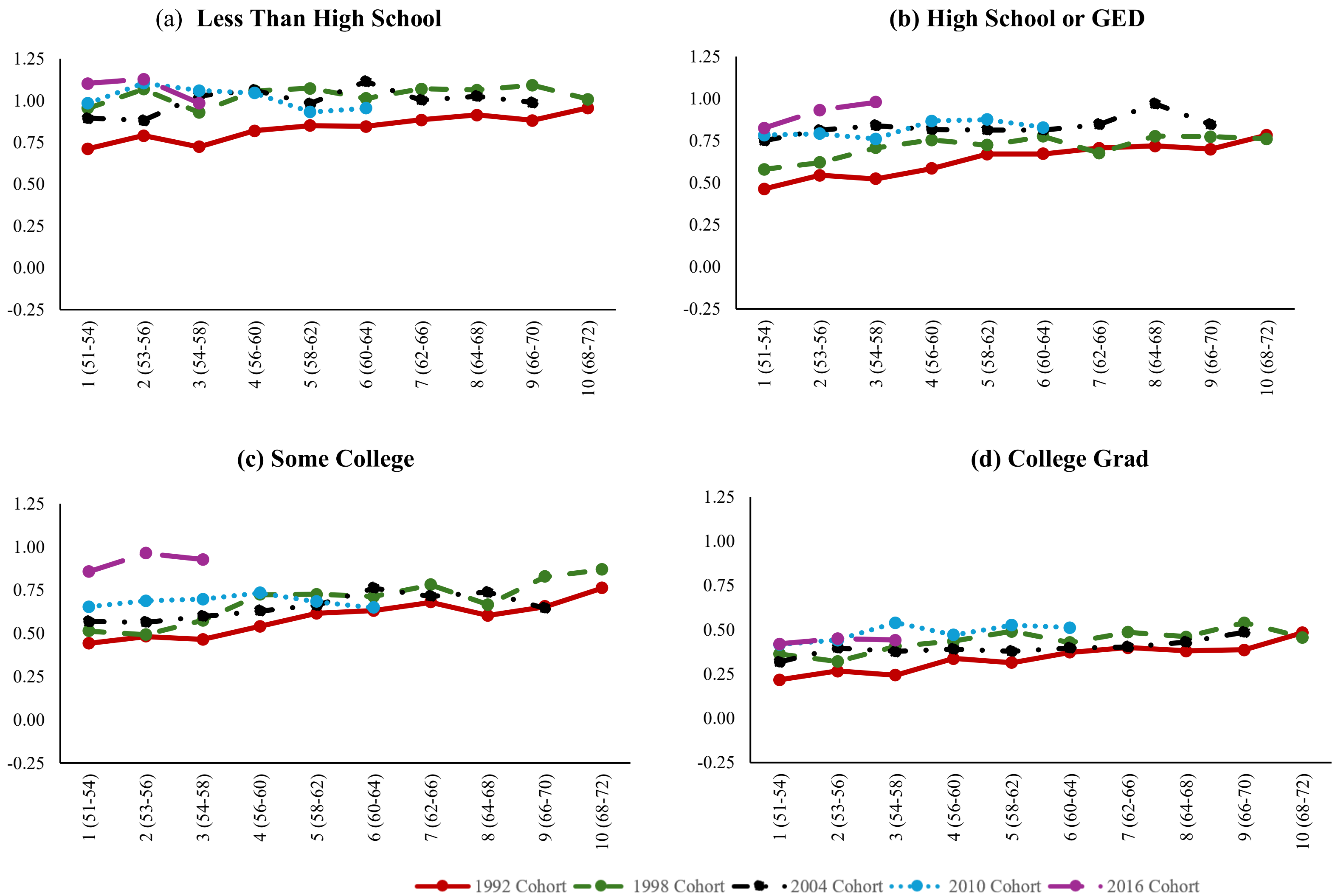
Notes: The sample includes all HRS Respondents who were initially observed between age 51 and 54. The index is the first factor from a factor analysis including difficulty walking 1 block, sitting for 2 hours, standing from a chair, stooping/kneeling/crouching, lifting/carrying 10 lbs, reaching above one's head, and pushing/pulling large objects. The 1992 cohort did not have comparable measures in the first wave of the HRS, so for the 1992 cohort only, physical functioning limitations are shown in the second wave and later. Respondents were asked if they were often troubled with pain, and if so, when the pain was at its worst, whether it was mild, moderate, or severe. 0 = no pain, 1= mild pain, 2 = moderate pain, 3 = severe pain. Data are weighted to be representative of national population.

Figure A2. Physical Functioning Limitation Factor Score by Education, Cohort, and Age



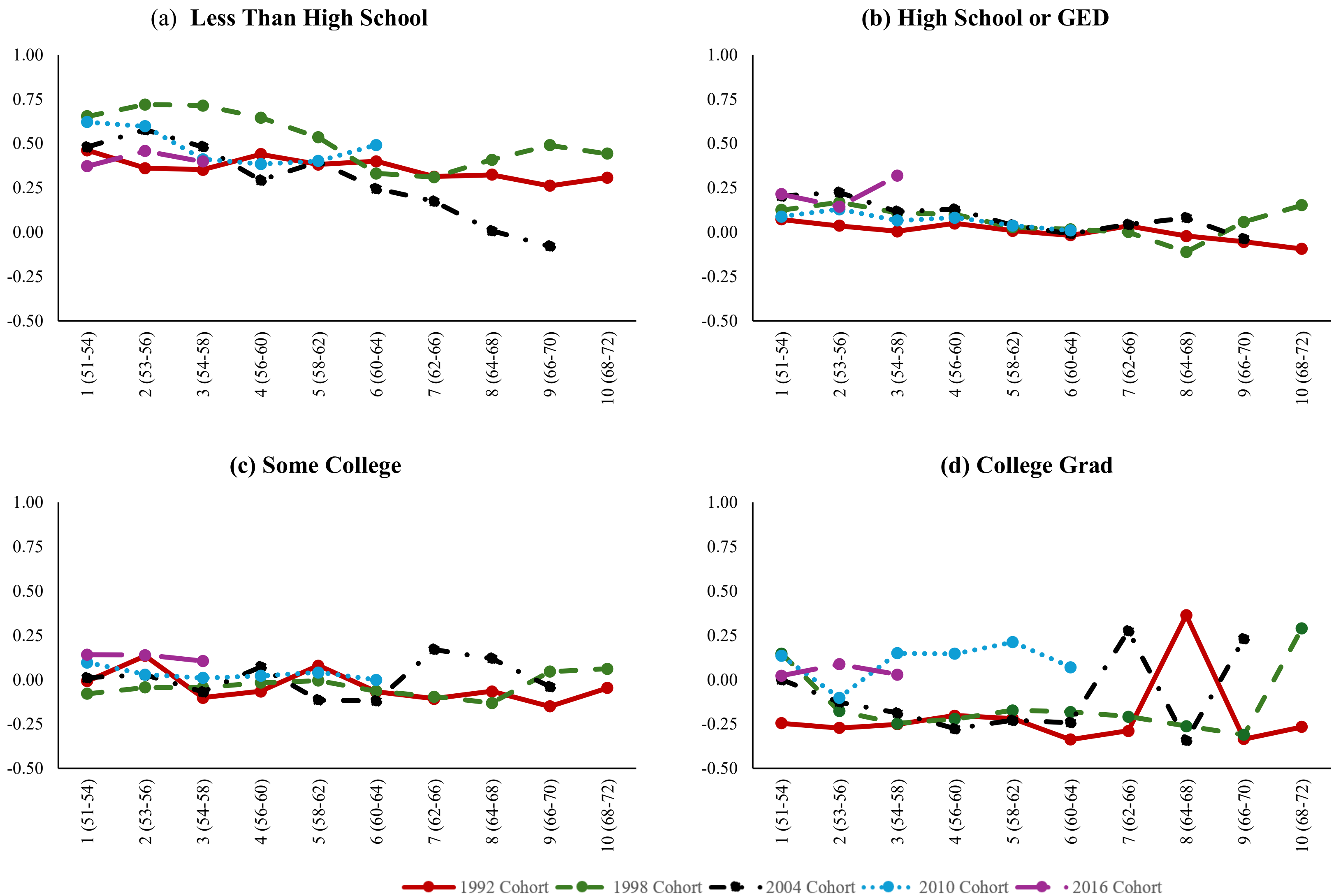
Notes: The sample includes HRS Respondents age 51 to 54 in the indicated cohort year. The index is the first factor from a factor analysis including difficulty walking 1 block, sitting for 2 hours, standing from a chair, stooping/kneeling/crouching, lifting/carrying 10 lbs, reaching above one's head, and pushing/pulling large objects. The 1992 cohort did not have comparable measures in the first wave of the HRS, so for the 1992 cohort only, physical functioning limitations are shown in the second wave and later. Data are weighted to be representative of national population.

Figure A3. Pain Score by Education, Cohort, and Age



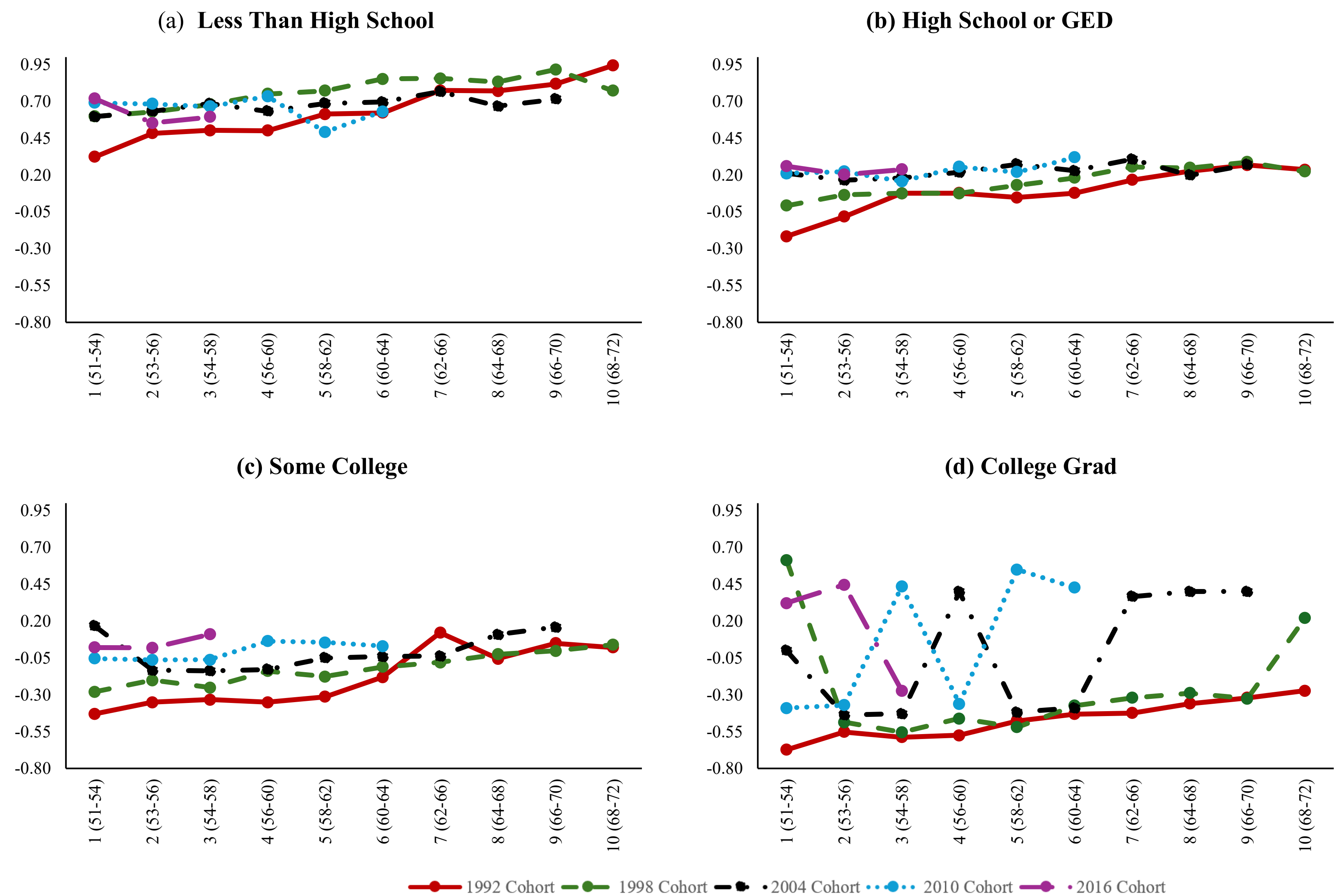
Notes: The sample includes HRS Respondents age 51 to 54 in the indicated cohort year. Respondents were asked if they were often troubled with pain, and if so, when the pain was at its worst, whether it was mild, moderate, or severe. 0 = no pain, 1= mild pain, 2 = moderate pain, 3 = severe pain. Data are weighted to be representative of national population.

Figure A4. Depression Factor Score by Education, Cohort, and Age



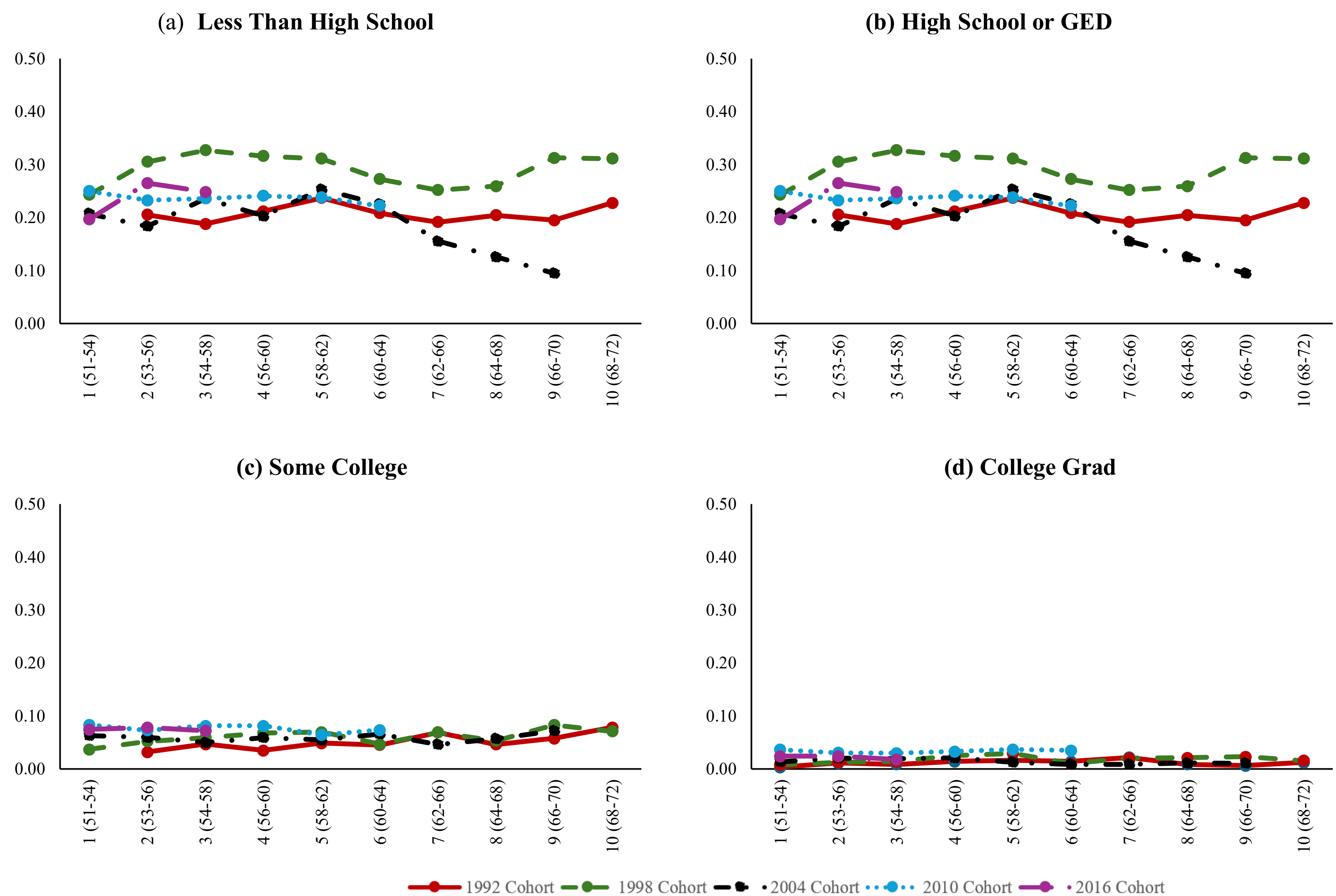
Notes: The sample includes HRS Respondents age 51 to 54 in the indicated cohort year. Depression measure is a factor score of the 8-item Community Epidemiological Scale of Depression (felt: depressed, everything was an effort, happy (reverse-coded), lonely, sad; slept too little or too much, could not get going, enjoyed life (reverse-coded)). Data are weighted to be representative of national population.

Figure A5. Cognition Factor Score by Education, Cohort, and Age



Notes The sample includes HRS Respondents age 51 to 54 in the indicated cohort year. Cognition is the reverse of a factor score of six items: serial 7's (counting backwards by seven), immediate word recall, delayed word recall, memory rating, memory change rating, and backward counting from 20. Thus, a higher score indicates worse cognition. Data are weighted to be representative of national population. The axis range for these figures is greater than for Figure 4 in the main paper, due to the different ranges of scores across education groups.

Figure A6: Share of the Population in Very Bad Health by Cohort and Age



Notes: The sample includes HRS Respondents age 51 to 54 in the indicated cohort year.. Very bad health refers to three or more physical functioning limitations, four or more negative responses to the eight item CES-D, severe pain, memory rated fair or poor, and under two correct on the "series 7" test. The 1992 cohort did not have comparable measures in the first wave of the HRS, so for the 1992 cohort only, we omit the first wave for that cohort. Data are weighted to be representative of national population. The axis range for these figures is greater than for Figure 4 in the main paper, due to the different ranges of scores across education groups.