2026 Mar 25

Growth in Social Security Disabled-Worker Entitlements, 1970–2019, an update and extension

Authors: David Pattison[1] and Hilary Waldron[2]

The findings and conclusions presented in this paper are those of the authors and do not represent the views of either the Social Security Administration or the US Department of the Treasury. No potential conflicts of interest apply to any of the authors.

[1] Senior Economist, Social Security Administration

[2] Senior Economist, US Department of the Treasury

Growth in Social Security Disabled-Worker Entitlements, 1970–2019, an update and extension

Summary

The growth in the number of new Social Security Disability Insurance (DI) disabled worker entitlements each year can be considered the combination of three factors: 1) the growth in the working-age population, 2) the growth in the proportion of that population that is insured for disability, and 3) the growth in the disability incidence rate -- the proportion of those insured workers each year who become entitled to disability. In our earlier article, Pattison and Waldron (2013), we looked at these three factors over the period 1972-2008, using a chained logarithmic growth index (the Sato-Varia index) that allows separating the growth attributable to changes in the age and sex specific incidence rates from the growth attributable to a growing working-age population or to the growth in the number of insured workers. That analysis found that much of the apparent increase in the third factor, the fraction of insured workers becoming entitled to disability, was attributable to the aging of the baby-boomer cohorts into the disability-prone ages, and not to changes in the age and sex specific disability incidence rates themselves. The growth in the number of disabled worker entitlements over the whole period was almost entirely explained by this age composition effect in conjunction with the growth of the working-age population and the impact on the number of disability-insured workers of the large increase in women's labor force participation.

In this article we extend the analysis to 2019, the last pre-Covid year. The most distinctive feature of the recent period is the sharp decline in new disabled worker entitlements, dropping steadily after 2011 at an annual rate of approximately 6.3 percent per year. In sharp contrast to the period examined in the earlier article, this decline is almost entirely attributable to declines in the age and sex specific incidence rates themselves. The growth in the working-age population and the aging of the baby boom cohorts continue to be an upward force on disability entitlements, but the decomposition indicates that they account for only a 0.7 percent per year increase in the disability entitlements, offset many times over by the 7.0 percent per year decline attributable to the fall in the age and sex specific disability incidence rates themselves.

This article also extends the index decomposition analysis into a separate decomposition by sex. Some of the large differences in the aggregate male and female incidence rates, measured over the whole working-age population, are removed when the age-composition effects are accounted for, but there still remain some differences worth further research. In the final period the adjusted female disability insured rate has continued to rise slightly, indicating that there is still room for some increase in disability entitlements from that source.

Although the age and sex adjusted incidence rates developed in this article provide a basis for further research into the causes of changes in those incidence rates, the causes are not explored in this article.

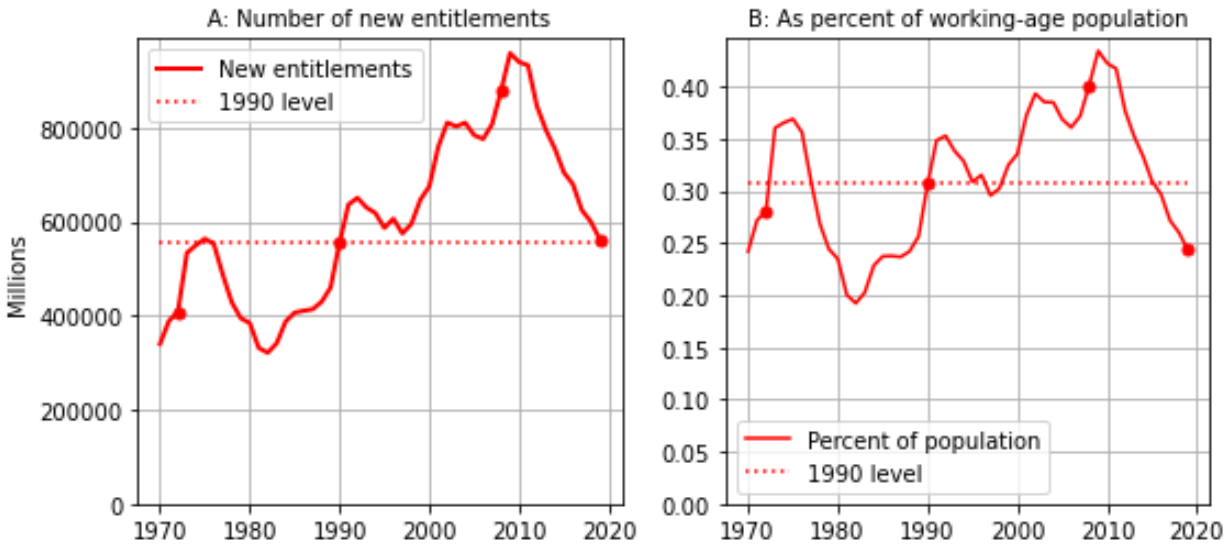
Introduction

Chart 1A displays the number of working-age persons becoming entitled to Social Security disabled worker benefits each year in 1970 through 2019, the last pre-Covid year. Chart 1B shows these new entitlements as a percent of the working-age population (ages 16-64).[3] That percentage has

[3] The Social Security Administration, following the Social Security Act, defines the month of entitlement as the first month in which a person has filed an application and meets all the requirements for eligibility. For this article, "new

fluctuated over the period, hitting a low of a fifth of a percent in 1982 and a high of almost half a percent in 2009.

Chart 1: New disabled worker entitlements, 1970-2019



For purposes of discussion, we distinguish three periods, indicated in the chart by dots. (Three selected years, 1972, 1990, and 2008, were years of mid-range disability incidence rates as measured by the age-sex adjusted incidence rate developed in this article. The fourth, 2019, is the final year of this analysis.) The first period, 1972-1990, was characterized by large swings in both the number and the percentage of new disabled worker entitlements, making it difficult to identify an overall trend, although the chosen reference points, at 1972 and 1990, indicate an overall rise, from 0.28 percent of the working-age population in 1972 to 0.31 percent in 1990. The second period, 1990-2008, is characterized by a further overall rise in new entitlements, from 0.31 percent of the working-age population in 1990 to 0.40 percent in 2008, but with fluctuations that are attributable at least in part to economic cycles. The third period, from 2008 on, ends with a sharp decline, mostly after 2011, reaching by 2019 the level of 1990 in number of new entitlements and, at 0.24 percent of the working-age population, less than the 1972 level of 0.28 percent.

The rise in number of new entitlements in Chat 1A is attributable in part to the growth in the working-age population. The remaining growth and fluctuations, the component shown in Chart1B, can be explained as the product of three additional factors:

- Changes in the proportion of the working-age population insured for disability (referred to here as the disability-insured rate),
- Changes in the proportion of insured workers becoming newly entitled to disability (the disability incidence rate), and

entitlements" or "new disabled workers" will refer to the number of workers whose month of entitlement to disabled worker benefits occurred during the year.

- Changes in the age composition of the population as the aging of the baby boom increased the number of disability-insured workers at the disability-prone[4] ages.

A fall in the rate of new entitlements, like that seen from 2011 through 2019 in Chart B, is due in large part to an average decrease in entitlement rates by age, but it could also be due in part to a shift in the age distribution of the population away from the high entitlement rate ages. Decomposing the overall decline into population and rate effects is essentially a price and quantity index number problem. The numbers in the working-age population at each age and sex take the place of quantities and the rates of entitlement at each age and sex take the place of prices.

For our purposes, however, it is important to divide the rate of entitlement into two components: the fraction of the working-age population that is insured for disability, which will be referred to as the disability-insured rate, and the fraction of the insured population that becomes entitled to disabled worker benefits, which will be referred to as the disability incidence rate. A number of procedures have been used in the literature to decompose the growth in disability into three factors (or more: Liebman 2015, studying growth in the beneficiaries on the rolls and not just the growth in new entitlements, included changes in beneficiary recovery and mortality rates). Many of these procedures require ad hoc choices for base years, for the sequencing of the factors, and for dealing with the residual from an inexact decomposition. In this article we continue to explore the use and presentation of a chained index decomposition that is independent of the sequencing, that leaves a negligible residual, and that requires a base year only for the presentation of the cumulative growth of the components included in the decomposition.

The decomposition of the total growth in new disabled worker entitlements requires detailed age by sex data on the working age population, the number of insured workers, and the number of disabled worker entitlements. Our earlier article, Pattison and Waldron (2013), used administrative data files to tabulate these numbers and carry out the decomposition over the first two periods, through 2008. The decomposition indicated that much of the apparent growth in disability entitlements over 1972-2008 was attributable to an increase in disability-insured rate, due to the increase in labor force participation among women, and that the aging of the baby boom cohorts into the disability-prone ages provided an additional boost to the growth in entitlements in 1990-2008. The disability incidence rates themselves, once adjusted for the changes in the age-sex composition of the disability-insured population, although they showed large fluctuations, appeared to be fluctuating over a level that was not rising substantially over time.

In this article, we extend that analysis to 2019, the last pre-Covid year. The analysis will show that the aging of the baby boom has continued to increase disability entitlements, although at a slower pace, but that this increase is offset many times over by a general decrease in the incidence rates.

In addition, we extend the analysis to separate decompositions by sex. The unadjusted disability-incidence rates (the rates calculated for whole working-age population as a whole) show a much larger fluctuation for females than for males in the 1972-1990 period and a much larger overall rise for females than for males in the 1990-2008 period. Over this period, however, there were large differences between

[4] Disability-prone, as used throughout this article, refers to both the ages at which new entitlement to disabled worker benefits has historically been the highest—roughly ages 45 through 61 as well as alluding to the underlying natural correlation between age and health, where the risk of experiencing poor health and disabling conditions increases with age. See Pattison and Waldron (2013) for further discussion of how disabled worker entitlement varies by age.

males and females in the age distribution of insured workers, and it is important to adjust for the changing age compositions before comparing the adjusted incidence rates.

The first section section below describes the data and methods used to carry out the analysis.

The second section presents an initial decomposition of the growth in new disabled workers that uses only totals over the whole working-age population without taking into account the effects of the changing age composition. The unadjusted disability-insured rate is simply the number of insured workers at all working ages divided by the working age population. The unadjusted disability incidence rate is the number of newly entitled disabled workers at all ages divided by the number of insured workers.

The third section briefly describes, with particular attention to the age distribution, the three components of the decomposition -- the working-age population, the portion of that population insured for disability, and the proportion of disability-insured workers coming on to the disability rolls.

The fourth section presents the decomposition after adjusting for the changing age-sex composition of the factors, indicating that in the period up through 2008 the adjusted disability incidence rate showed little overall growth, despite large fluctuations, but that after 2008 it declined sharply, a decline to which changes in the insured worker population contributed virtually nothing.

A final section, before a concluding discussion, carries out the age-adjusted decomposition separately by sex. The unadjusted growth rates indicate that the increase up through 2008 in disability-insured rates in the working-age population is entirely attributable to the increase in disability insured status among the female working-age population, an increase that had almost leveled off by the last period.

Data and Methods

The data files used in our analysis come from several internal SSA research files, using the same 1 percent sample population as that used in SSA's Continuous Work History Sample (CWHS). The CWHS 1 percent sample "may be described as a stratified cluster probability sample of all possible SSN's" (Smith 1989). More specifically, we combine 1 percent extracts of the Numident, the Master Beneficiary Record (MBR), and the active and inactive CWHS.

These data allow the tabulation over single years (1970-2019 for this study) and single ages (the working ages, 16 to 64 for this study) of the population of people with Social Security numbers (SSNs), the subset of that population that is insured for disability but not receiving benefits, and the subset of the disability-insured population that becomes entitled to benefits. In Pattison and Waldron (2013) we document our data and methods in greater detail.

Population

The population counts in this article are from tabulations of the number of persons with valid SSNs in years 1970-2019 at each age from 16 through 64. Age is age at end of year. Persons who die during a year are given reduced weights in the tabulations that depend on their month of death. Foreign-born workers are assumed to have been in the population from the year they were issued an SSN.

We limited our analysis to ages 64 and under for consistency across cohorts in our analysis. For most of the sample period, age 65 was the age at which workers were no longer eligible for disabled worker benefits (disabled workers reaching age 65 were converted to retired worker benefits). Starting in 2003, that age began rising, and by 2019 had reached 66 years and 6 months. We exclude from our count of disabled workers the workers in those years who became entitled at or after age 65.

The resulting population counts only approximately match Census populations totals by age. Apart from including only persons with valid SSNs, the counts will include persons who were at one point members of the working age population but who have since emigrated or died without the exit having been reported. (Beneficiary deaths are virtually always captured in the administrative data, but the deaths of workers who had not yet claimed benefits were not always recorded.)

Our population counts will therefore overestimate the actual population at older ages. To the extent that our population is over-estimated, the insured rates at older ages will be under-estimated. In our decomposition, therefore, some of the growth attributed to population growth should actually be attributed to growth in disability-insured rates. The year-to-year growth estimates, however, will be affected only to the extent that any over- or underestimate is changing over time.

Workers insured for disability

Only workers who are insured for disability at the time they become disabled are eligible for entitlement to disabled worker benefits. Disability insured status requires sufficient earnings in covered employment in 20 out of the preceding 40 quarters, roughly equivalent to having worked five out of the last ten years, with reduced requirements for workers under age 30.[5] From the record of annual covered earnings in our administrative data sample, we calculate a disability-insured status each year of each person in the sample and tabulate the number insured by year, age, and sex.

Although workers who become entitled to disability retain their disability insured status while on the rolls, we do not include the entitled workers in our count of insured workers because we are interested in the disability incidence rate among workers insured for but not yet entitled to disability.[6]

New disabled worker entitlements

The count of newly entitled disabled workers is the count of workers in the administrative data files who have a date of entitlement to disability benefits during the year, by age at end of year. Because of backlogs in the adjudication of disability applications, the count will be underestimated particularly in the year of the CWHS extract and the year preceding. The tabulations here were made from the 2021 CWHS.

Disability entitlement generally refers to the month 5 months after the month in which the onset of disability was determined to have occurred—the month that follows the 5-month disability waiting period.[7] An argument could be made for using the date of onset; however, over the long span of data used in this analysis, we judged the data on month of entitlement to be more reliable than the data on month of disability onset.

Another possible date would be the date of disability award – the month in which the disability determination is made, often months or even years after the date of entitlement. The month of award is the first month in which benefits are actually paid from the trust fund (when the award month is after the entitlement, retroactive benefits are paid). Social Security's Actuarial Services office in its short-range

---

[5] More precisely, the 40 quarters considered exclude any quarters that include disability periods, whether from earlier spells that a worker recovered from or from a current spell. This allows a recovered worker to start back to work with the insured status that had been achieved before becoming disabled. We do not include the relatively small number of recovered workers in our count of insured workers. We do not expect this exclusion to materially affect our results.

[6] The insured workers excluding those not receiving benefits are sometimes referred to as "exposed" workers. Our definition of the disability incidence rate, using as denominator only workers not on the rolls, is similar in this regard to the definition used in the 2025 Social Security Trustees report and by SSA's Actuarial Services office.

[7] Prior to January 1973, the waiting period between the month of disability onset and the month of entitlement was 6 months.

projections and in its analyses of disability incidence tends to use new awards rather than new entitlements to count disability incidence. We use the date of entitlement, partly because the date of entitlement is more reliably obtainable in the data available to us, but partly also because we surmise that the date of initial entitlement better captures the state of the labor market to which the worker was exposed at the time that the worker lost employment or filed for disabled worker benefits.[8] The date of entitlement is also usually closer to the date of disability onset.

As a practical matter, either measure, by awards or by entitlement, will capture trends in the flow of workers onto the DI program rolls. The most noticeable difference is that the adjusted disability incidence rate reported in the 2025 Trustees Report, measured by disability awards, reached a peak in 2010, while we find that our adjusted disability incidence rate, measured by new disabled worker entitlements, peaked in 2009. Separate from the difference between awards and entitlements, the rate calculated by the Social Security actuaries is more refined than our measure, as described in Pattison and Waldron (2013). However, we believe data and definitional differences between the two measures are not large enough to negate the use of our analysis as a compliment to that of the actuaries'.

Age-sex adjusted growth

Our age-sex adjusted growth rates are a weighted average of the growths in the tabulated numbers in each age-sex cell from one year to the next, with the weights derived from each cell's share in total disabled worker entitlements in the two years. Because the growth rates are measured in logarithms (logs), the weighted averages can be added both across the decomposition components (total growth is the sum of population growth, the insured rate, and the incidence rate) and across years (cumulative growth is the sum of the annual growth rates). The weighted average technique, a Törnqvist index using Sato-Vartia weights, is described in more detail in the appendix. It has been chosen for its additivity and for its convenience in being able to deal with three or more factors without having to specify a factor ordering or a base year for the weights.

In the charts, the growth is presented as cumulative growth since 1972, a level around which the age-sex adjusted incidence rate has fluctuated several times in the five-decade analysis span. (The three reference points, 1972, 1990, and 2008, were chosen, as explained in the appendix, because the age-sex adjusted disability incidence rate developed later in this article are all close to this level around which the adjusted incidence rate has fluctuated.) Cumulative growth is shown in log percents, approximately equal to percent growth at small percentages and maintaining additivity at larger changes: a 10 percent log growth plus a five percent log growth yields a 15 percent log growth.[9] When log growth is used, he disability-insured rate growth is the growth in the number of insured workers minus the growth in the working-age population. Similarly, the growth in the disability incidence rate is the difference between the growth in the number of newly entitled disabled workers and the number of insured workers.

---

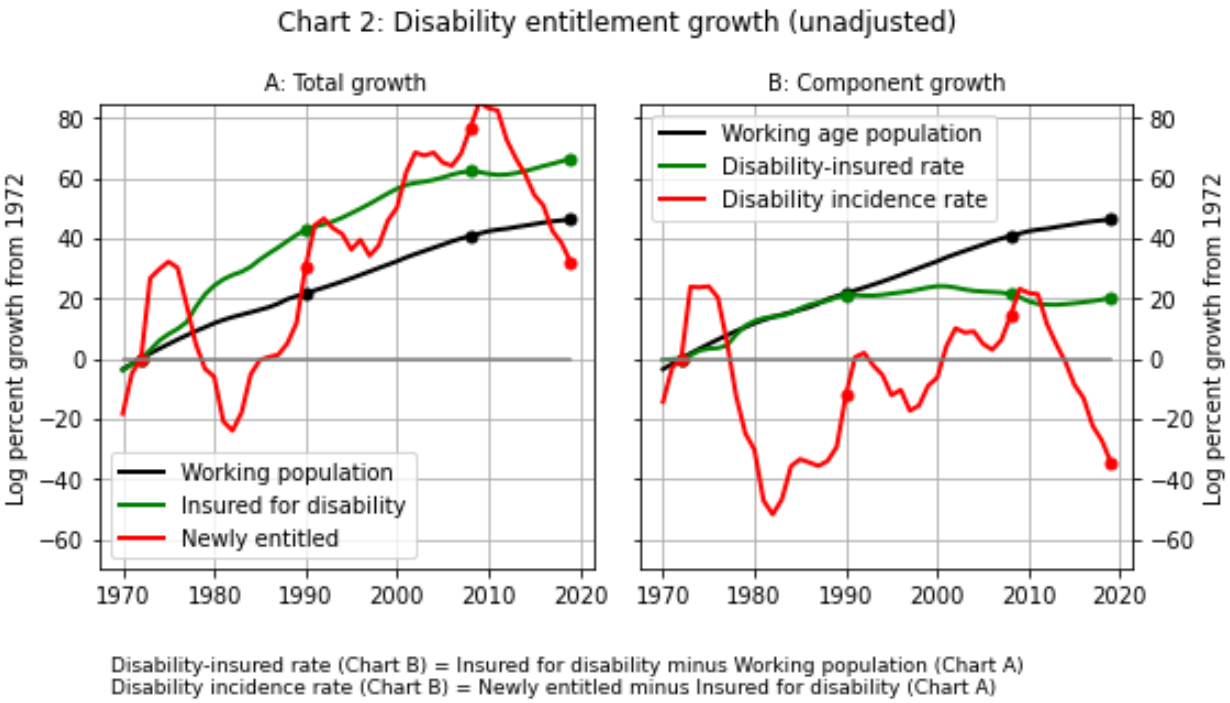
[8] Estimation of the impact of business cycles on disability incidence is not included in this article, but the impacts in some years will be discernable in some of the charts. Entitlement to DI is not based on the inability to find employment—a entitlement is based on the determination that an applicant has an inability to engage in substantial gainful activity based on a disability that is expected to last for at least 12 months or to result in death. However, persons in the labor force who would otherwise have met a medical determination of a disability fitting the statutory definition may involuntarily exit the labor force and subsequently become entitled during periods of relatively higher unemployment. The early 1980s recession provides one notable historical exception to this observation.

[9] Similarly, a 20 percent log increase followed by a 20 percent log decrease yields zero percent growth. In non-log percents, the equivalent would be a 22.1 percent increase followed by an 18.1 percent decrease.

Unadjusted decomposition of the growth in disabled worker entitlements

In this section we discuss the trends in three of our component factors – the growth in the working-age population, the growth in the disability-insured rate, and the growth in the disability incidence rate – without adjusting for the fourth factor -- changes in the age-sex composition. This initial decomposition is done on a combined-sex basis, so that we can later highlight results after adjusting for changes in the age-sex composition of disabled-worker entitlements.

Chart 2 gives the growth over the period 1970-2019 in these three components, shown in two different ways. (Because the levels in 1970 were slightly below trend, the growth is measured from 1972.)



The left side (A) shows the growth in the working-age population, the number of insured workers, and the number of new disabled worker entitlements. The right side (B) shows the growth in the component factors. The first factor, the growth in the working-age population, is the same in both graphs. The growth in the disability-insured rate on the right side is the difference between the growth in the working-age population and the growth in the number of insured workers on the left side. The growth in the disability incidence rate component on the right side is the difference between the growth in the number of newly entitled disabled workers and the growth in the number of insured workers on the left side.

Looked at the other way around, the growth in the number of new disabled workers on the left side is the sum of the growth in the three components on the right side.

We can see from the two graphs that:

- The working-age population grew steadily over the period, with a slight slowdown toward the end, contributing a steady growth to the number of disabled workers.

- The growth in the disability-insured *rate* (right side) was almost exactly equal to growth in the working-age population until 1990, after which it leveled off. Cumulative growth in the *number* of insured workers, therefore, was about twice that of growth in the working-age population through 1990, after which it grew approximately in parallel.
- Finally, the growth in the incidence rate, the proportion of insured workers who became entitled to benefits (right side), fluctuated dramatically over the period. Between the first two reference points, 1972 and 1990, the rate first rose to a peak in 1973-1975, then fell sharply to around 1982, then rose again, until by 1990 it was a little below the 1972 value. Between 1990 and 2008 it rose overall, but with fluctuations that can be correlated to business cycles. After 2008 it rose and fell with the recession that began in 2008, and then after 2011 fell sharply.

The unadjusted decomposition leaves out an important additional factor that must be taken into account when analyzing the disability trends: the changing age composition of the working age population. At the beginning of the 1970-2019 span, the large baby boom cohorts were just entering the labor force, and by the end of the period they were exiting. At any time as this large cohort aged, the population growth at some ages was greater than the overall population growth and at other ages it was less.

Disability-insured rates are much higher at some ages than at others, as will be shown in the next section. As the large baby boom cohorts passed through the ages at which disability-insured rates are high, the unadjusted disability insured rate will have risen even if the age-specific disability-insured rates were not themselves changing.

The same holds for the disability-incidence rates, which are even more strongly age related than the disability-insured rates. As a large cohort of insured workers passes through the high disability incidence ages, or if the proportion of women insured for disability rises, the unadjusted disability incidence rate will rise even if the age-sex-specific incidence rates are not changing.

The age distribution of the working age population, disability-insured rates, and disability incidence rates

In this section the changing age patterns of the working-age population, the relatively stable age pattern of male insured rates, the changing age pattern of female insured rates, and the relatively stable age incidence patterns will be examined. Most of the data and charts in this section are derived from tabulations of the data sources described earlier.

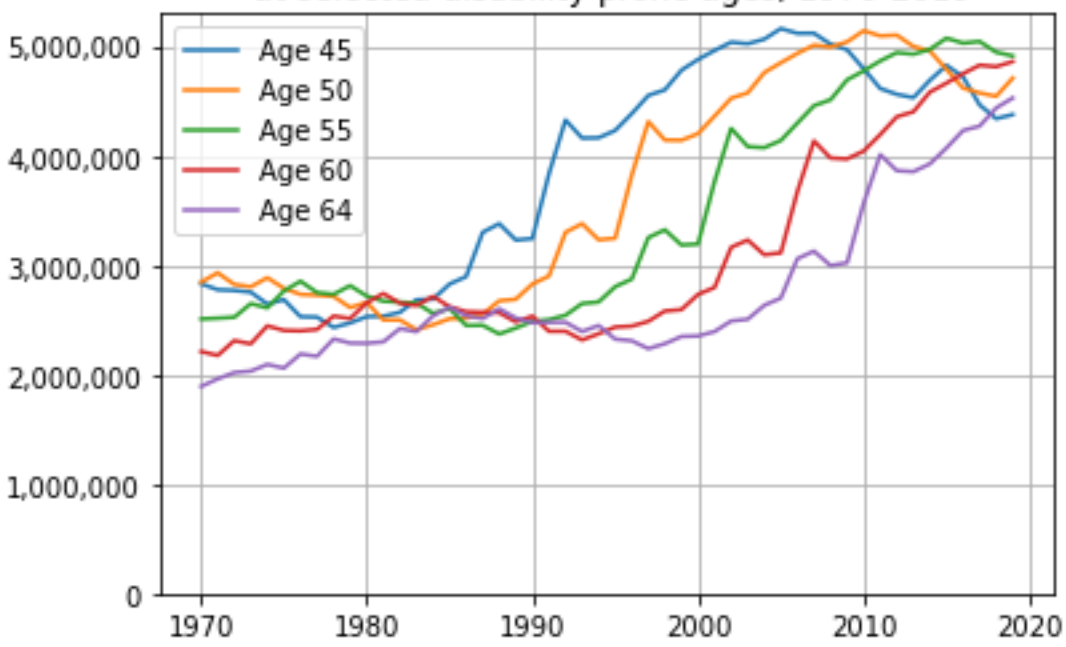
Population

The size and age composition of the working-age population during the study period, 1970 through 2019, was affected by the aging of the baby boom, conventionally defined as born in 1946 through 1964. The fertility rate and number of births jumped sharply in 1946 and continued to grow through 1957, then declined, falling back to pre-boom levels around 1964. In 1970 (when the baby boom cohorts were ages 6 through 24) only about half of them had entered the working-age population (ages 16-64). By 2019 (ages 55 through 73) about half had aged out of ages 16-64. As the baby boom cohorts moved into and through the working ages, they would have first swelled the number of workers and insured workers. Only later, as the wave of baby boomers aged into the disability-prone ages, would they have added substantially to the number of disabled worker entitlements.

Chart 3 presents our estimates of the number of persons in the population in 1970-2019 at select ages. The line representing age 45 takes a sharp jump upward in 1991, the year the leading edge of the

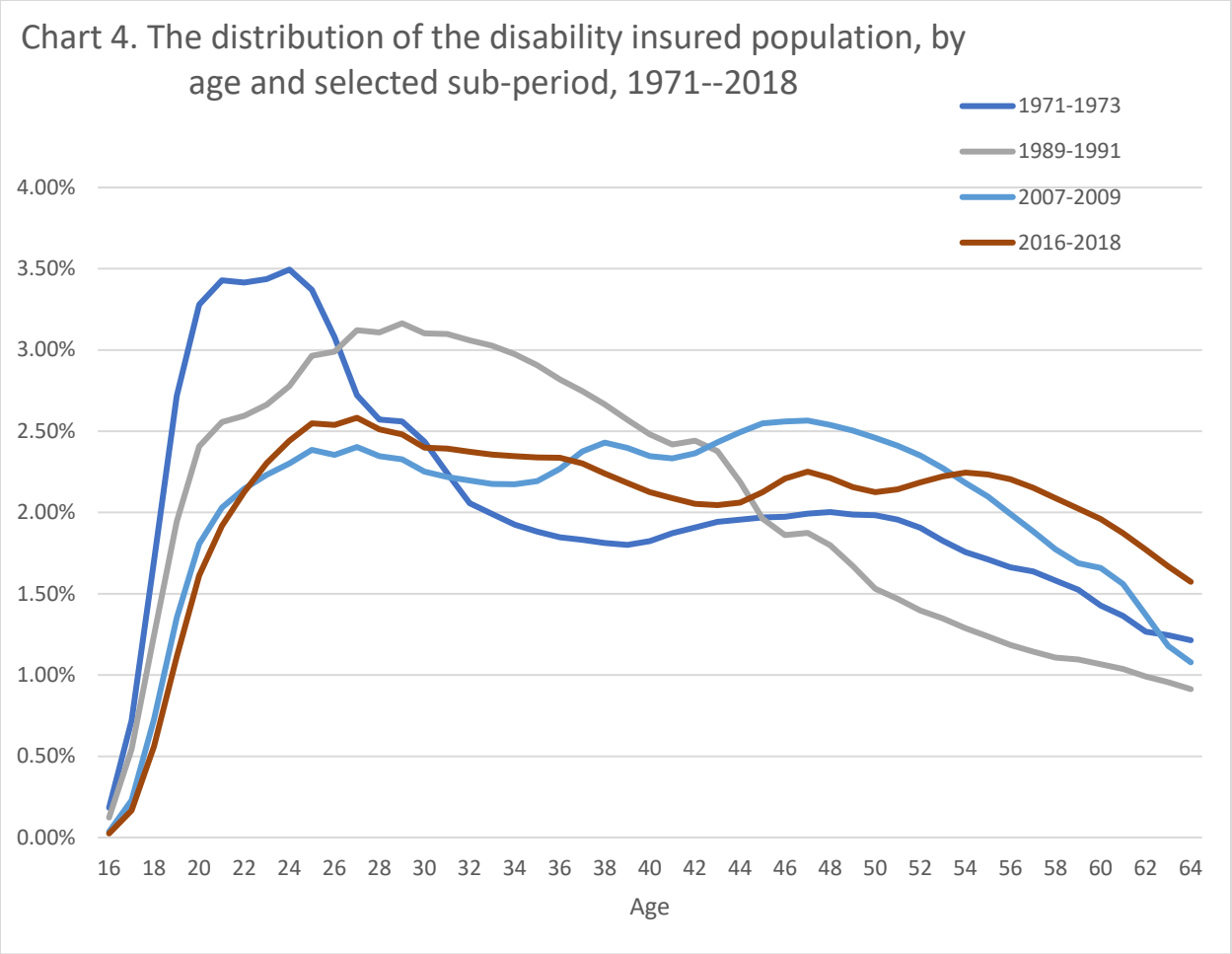
baby boom reached that age. The aging of that leading edge is easily visible, reaching age 64 in 2010, the year before aging out of the working-age population. The peak baby boom cohorts, born more than 10 years after the leading edge, reached age 45 in the early 2000s and had aged out of the working-age population by 2019.

Chart 3. Number of persons in the working-age population (16-64) at selected disability prone ages, 1970-2019



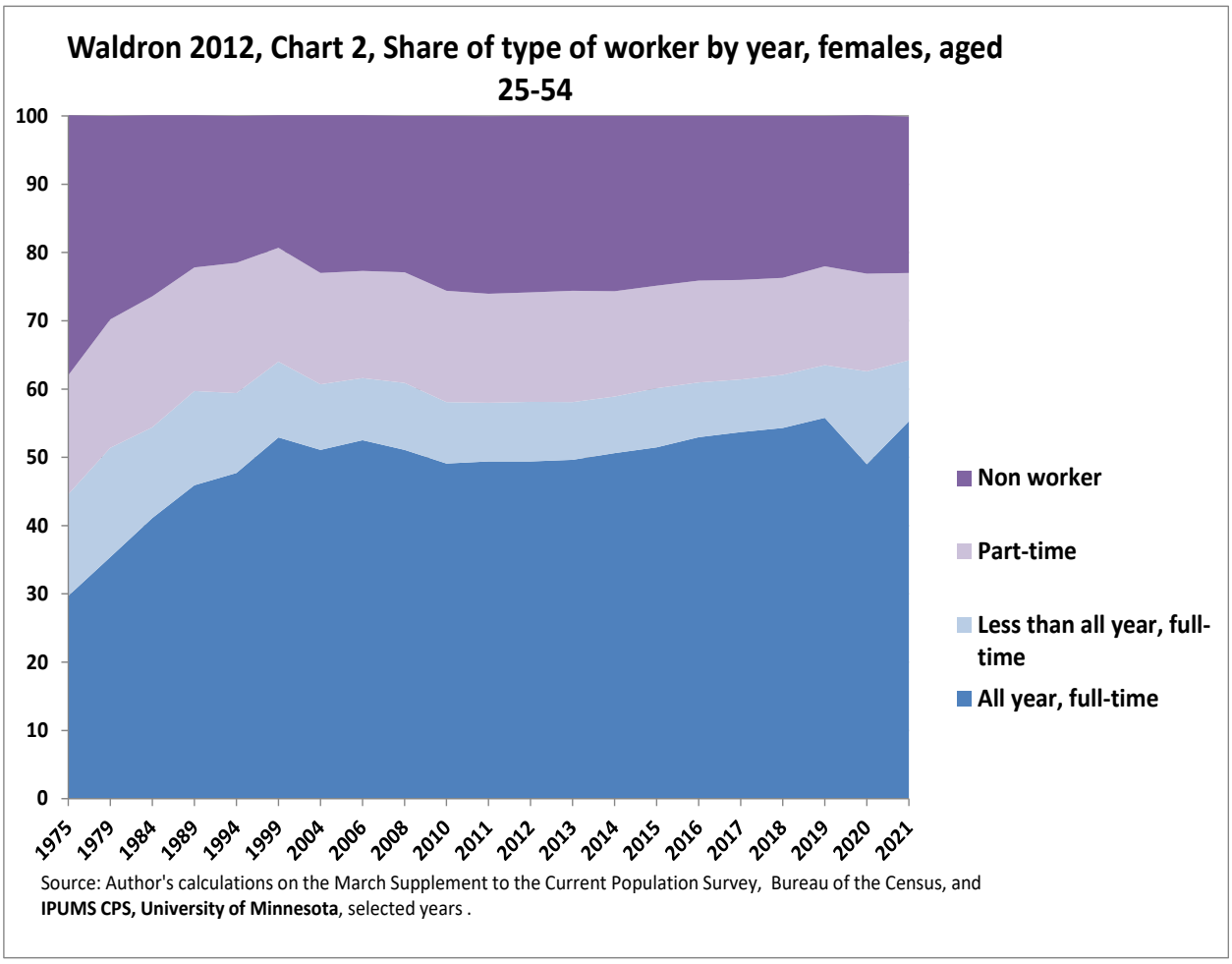
Insured workers

Chart 4 shows the distribution by age of the subset of the working-age population that is insured for disability, for selected sub-periods from 1971-2018. Visible in the chart is a rapid rise at the younger ages as workers acquire the work credits that give them insured status, followed by a general decline at older ages as workers either leave the labor force or change to non-covered jobs. Overlaid on this general pattern by age are shifting patterns attributable to the relatively larger baby boom as it aged.



The subset, or proportion, of the working age population that is disability insured over 1970-2019, has also been impacted by large increases in female labor force participation that occurred from roughly the beginning of the period through the mid-1990s (Chart 5). Increases in female labor force participation over that period will have led to an increase in the proportion of women insured for disability over our time series (Chart 6), because that greater female labor force participation will lead to more women meeting the recency of work requirements that are required for entitlement to disabled worker benefits, as is apparent from tabulations from our data (Chart 8).

Chart 5


Waldron 2012, Chart 2, Share of type of worker by year, females, aged 25-54
100
90
80
70
60
50
40
30
20
10
0
1975
1979
1984
1989
1994
1999
2004
2006
2008
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
Non worker
Part-time
Less than all year, full-time
All year, full-time
Source: Author's calculations on the March Supplement to the Current Population Survey, Bureau of the Census, and IPUMS CPS, University of Minnesota, selected years .

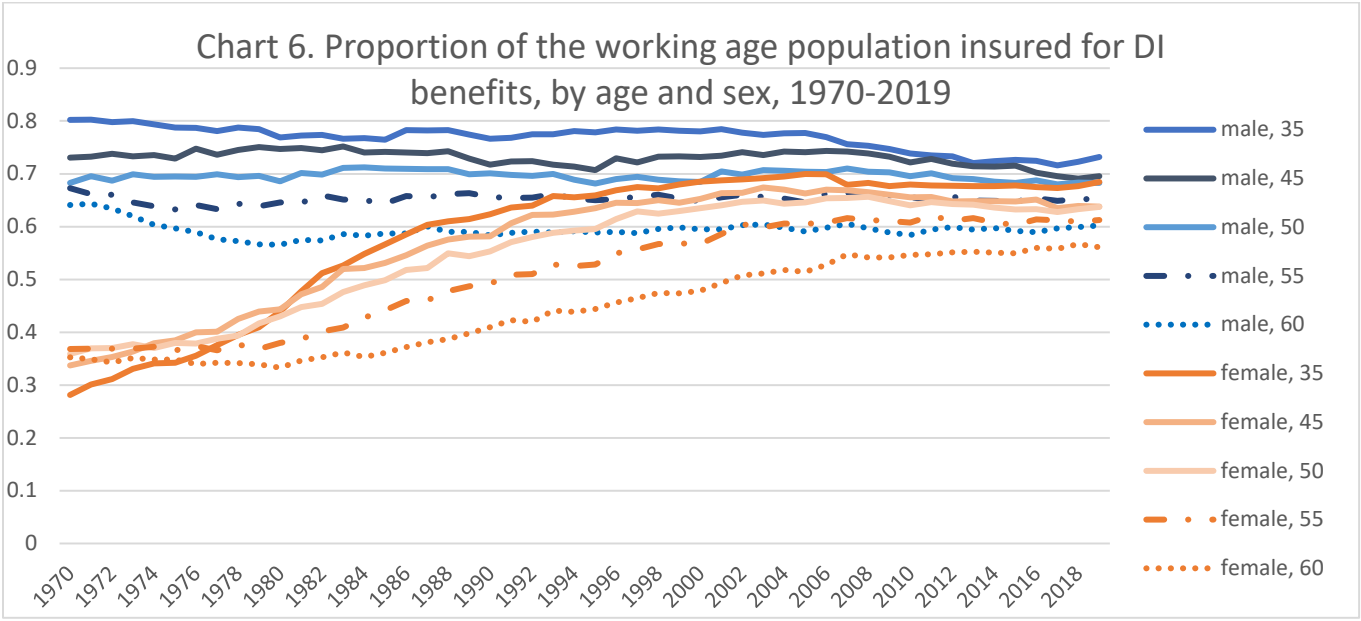
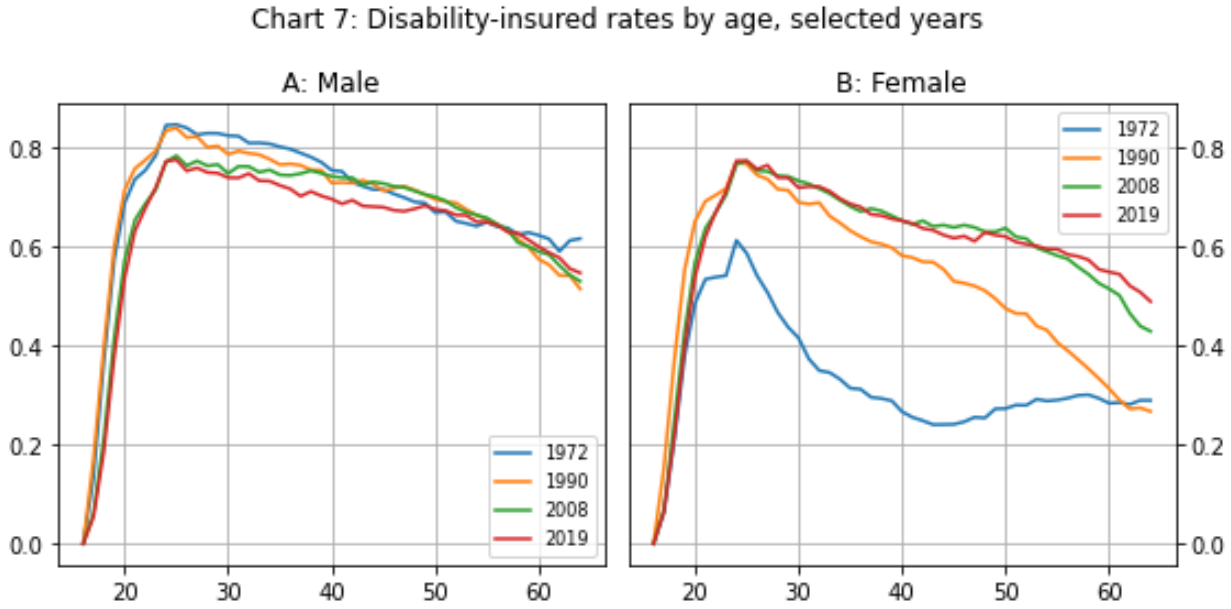

Chart 6. Proportion of the working age population insured for DI benefits, by age and sex, 1970-2019
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1970
1972
1974
1976
1978
1980
1982
1984
1986
1988
1990
1992
1994
1996
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
male, 35
male, 45
male, 50
male, 55
male, 60
female, 35
female, 45
female, 50
female, 55
female, 60

Chart 7, also tabulated from our data, is a complement to Chart 6, presenting male and female disability-insured rates by age in selected years. For men, disability-insured rates have kept the same general pattern by age – a sharp rise to the mid-20s followed by a more gradual decline. Over the years, male rates up to 2008 declined somewhat at both young ages and middles ages, and continued to decline in the middle ages through 2019. Above age 50, the male rates are not noticeably different in 1990, 2008, and 2019.

For women, there is also a sharp rise to the mid-20s followed by a decline, but the disability-insured rates began in 1972 at much a much lower level than the men's and rose strongly between then and 2008, with the largest increases at the younger ages in the earlier period and at the older ages in the later period. After 2008, they continued to rise at the oldest ages. By 2019, the age pattern for women was similar in level and slope to the pattern for men.

Because the disability-insured rates are not distributed evenly by age, they will interact with the aging of the baby boom cohorts. When the baby boom cohorts were young they will have been at the peak insured-status ages, driving up the unadjusted disability-insured rates. For men, the aging of the baby boom into lower disability-rate ages, along with the general decline in the male disability-insured rates, will push the index of male disability-insured rates down. For women, the large increase in the disability-insured rates at all ages will push the index up, at least through 2008, counteracting the negative effect that would be expected if the baby boom aged along a fixed cross-sectional age pattern.



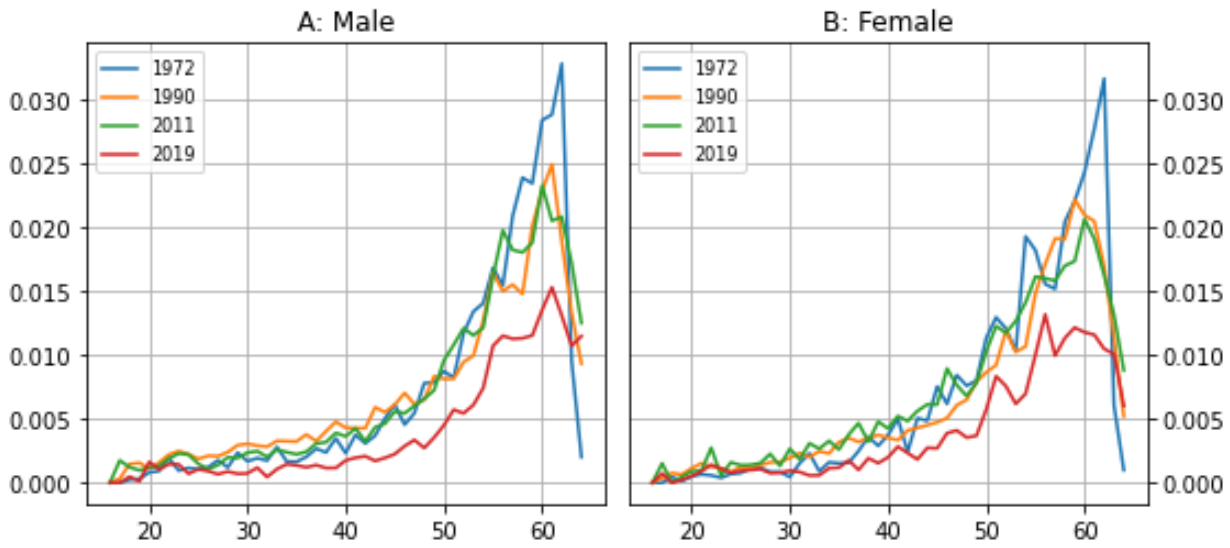
Disability incidence rate

Chart 8 presents disability incidence rates tabulated from our data (number of new disability entitlements divided by number of insured workers, by age and sex) by age in selected years. Rates above age 55 have declined substantially over time, particularly between 1972 and 1990 and between 2008 and 2019. The decline after 2011 is also seen at the younger ages, but the average shifts between 1972 and 1990 or between 1990 and 2008 are less clear cut at those ages.

Although the levels change over the years, the general age pattern is steady: an accelerating rise to age 62 for men (when retired worker benefits become available) and slightly earlier for women.

As will be confirmed in our analysis, this pattern will interact strongly with the aging of the baby boom, driving up unadjusted incidence rates as the baby boom cohorts pass through the high disability-incidence rate ages.

Chart 8: Disability incidence rates by age, selected years

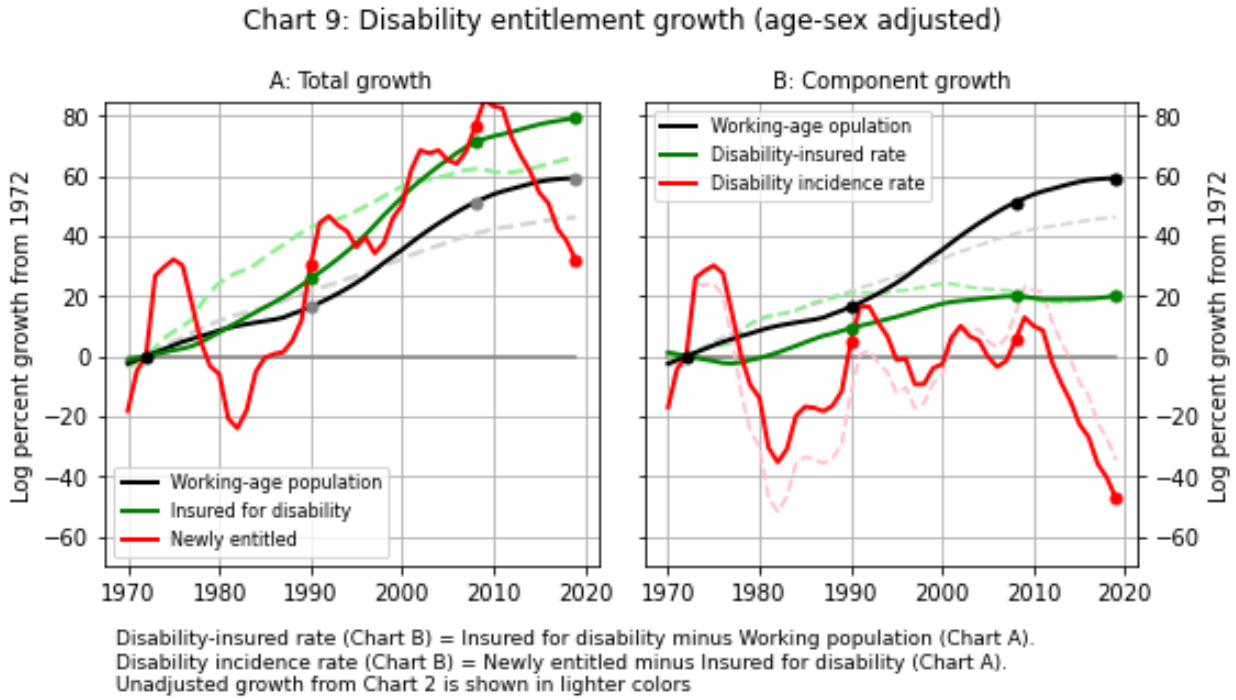


Disability trends adjusted for age and sex

In this section, we consider the contribution of the growth components after adjusting for changes in the age-sex composition. As discussed in the methods section, the growth rates in this section are weighted averages of the growth rates in each age-sex cell, with each cell's weight determined by that cell's current share in total new entitlements at that point. The resulting adjusted annual growth rates can then be added together year by year to get the cumulative growth rates. We rely primarily on a graphical presentation of these growth rates, but in this section we also tabulate the average annual growth rates over select periods. These averages are sensitive to the choice of beginning and ending points.

Chart 9 gives the resulting cumulative growth rates after the adjustments, corresponding to Chart 2 for the unadjusted rates. (For convenience of comparison, the unadjusted growths from Chart 2 are shown in lighter colored dashed lines.) The effect of the age-sex adjustment is indicated by the difference between the unadjusted growth and the age-sex adjusted growth. Because the total cumulative growth – growth in newly entitled disabled workers – is the same in both cases, there is no age-composition effect added to the other components to yield total growth. Instead, the age-sex adjustment increases some component growth rates while decreasing others, with a net effect across the three components of zero.[10]

[10] The presentation differs here from that of others, e.g., Liebman 2015, who include the unadjusted population growth as one component of the decomposition and an age-sex composition effect as another, then add to that what in our terms would be the adjusted disability-insured rate and disability incidence rate components.



Comparing the adjusted population growth (black line) to the unadjusted (gray dashed line, partly obscured by the dashed green line), the adjusted growth was lower in the early years, when the population growth from the baby boom cohort was concentrated among ages at which workers are less susceptible to disability. As the baby boom aged and the high-population-growth ages moved up into the ages of higher disability incidence, the ages with high population growth began to coincide with ages with high disability incidence. As a result, the adjusted population growth had passed the unadjusted growth by 2000.

The adjusted disability-insured component in Chart 9B (green) was also pushed below the unadjusted growth (dashed light green) in the early years. By 2008 the adjusted rate reached the same cumulative growth as the unadjusted, and after that closely tracked the unadjusted rate.

The disability incidence rate in Chart 9B (red) is the difference between, in Chart 9A, the new entitlements (red) and insured for disability (green). Comparing the adjusted incidence rate with the unadjusted rate in Chart 3B (dashed light red), the cumulative adjusted growth was higher than the unadjusted growth until about 2000, after which the growth was lower. These are the mirror image of the adjustments to population growth and disability-insured-rate growth, which in combination decreased in the early years and increased in the later years.

In Table 1, we calculate the average annual log percent growth over 1972-2019, as well as selected subperiods, to create a summarized measure of the contribution of our components to the total growth in new disabled worker entitlements.

Table 1. Average annual percent growth, unadjusted and age-sex adjusted, selected periods

	1972-1990		1990-2008		2008-2019		1972-2019	
	Unadj	Adj.	Unadj.	Adj.	Unadj.	Adj.	Unadj.	Adj.
Population	**1.21**	**0.92**	**1.06**	**1.93**	**0.50**	**0.73**	**0.98**	**1.26**
adjustment		-0.29		+0.87		+0.23		0.28
Insured rate	**1.17**	**0.52**	**0.02**	**0.59**	**-0.11**	**0.02**	**0.43**	**0.43**
adjustment		-0.65		+0.57		+0.13		0.00
Incidence rate	**-0.68**	**0.27**	**1.47**	**0.03**	**-4.44**	**-4.80**	**-0.74**	**-1.01**
adjustment		+0.95		-1.44		-0.36		-0.27
DW entitlements	**1.70**	**1.71**	**2.55**	**2.55**	**-4.05**	**-4.05**	**0.68**	**0.68**

Because the three growth components, either unadjusted or adjusted, add up to the same growth in disabled worker entitlements, the three adjustments in the growth rates must add up to zero. An increase in the contribution of one or two of the components must be offset by a decrease in the remaining one or two components.

In the first reference period, 1972-1990, the adjusted insured-rate component grew less than the unadjusted rate by 0.65 percent per year. The changing age-sex composition contributed an additional negative component of 0.29 percent per year. The remaining component, the growth in the disability incidence rate, accordingly, was larger by 0.95 percent per year, changing an apparently negative growth to a slightly positive one. This period was marked by large swings in the disability incidence rate but more modest overall growth. In Pattison and Waldron (2013) we included extensive discussion of legislative changes and changes to SSA's administration of the program over the period that are thought to have impacted the disability incidence rate and will not repeat that discussion here.

In the second reference period, 1990-2008, the unadjusted analysis shows virtually no change in the disability-insured rate but a large growth, apart from fluctuations, in the disability incidence rate, averaging 1.47 percent per year. In the age-sex adjusted analysis, the disability insured rate shifts from an almost constant 0.02 percent growth per year to an average annual growth of 0.59 percent per year. The population contributes an additional 0.87 percent per year to the average annual growth in new entitlements. Offsetting these two components is a reduction in the age-sex-adjusted disability incidence rate of 1.44 percent per year, bringing its growth down to almost zero, although it fluctuates several times around this flat trend. (The fluctuations can be shown to correlate with unemployment cycles.)

In our final reference period, 2008-2019, the unadjusted analysis indicated a small decline in the disability-insured rate (0.11 percent per year) and a large decline in the disability incidence rate (-4.44 percent per year). The age-sex adjusted analysis eliminates the decline in the disability-insured rate and adds a growth of 0.28 percent per year attributable to the population adjustment. These are offset by an even faster decline in the disability incidence rate, bringing it down to -4.80 percent per year.

The 2008 recession increased the disability incidence rate for several years after 2008. If the decomposition were carried out over the period of the sharp decline, 2011-2019 (Table 2) rather than 2008-2019, the incidence rate annual growth would be -7.00 percent per year, whether unadjusted or adjusted. The adjusted population growth is 0.12 percent higher, offset by a reduction in the adjusted disability-insured rate.

Table 2. Average annual percent growth, unadjusted and age-sex adjusted, 2011-2019

	2011-2019	
	Unadj.	Adj.
Population	**0.42**	**0.54**
adjustment		+0.12
Insured rate	**0.26**	**0.14**
adjustment		-0.12
Incidence rate	**-7.00**	**-7.00**
adjustment		0.00
DW entitlements	**-6.32**	**-6.32**

Our earlier article covered only the first two periods, 1972-1990 and 1990-2008. This article has repeated that analysis using newer data sets and similar rules for assigning insured status and month of entitlement. The central conclusion from that article is replicated here, namely that the apparent rise in the disability entitlements between 1990 and 2008 was largely explained by growth in the working-age population and the disability-insured rates in conjunction with the changing age-sex composition. The age-sex adjusted incidence rates played very little role.

The subsequent period, 2008-2019, newly examined in this article, provides a strong contrast, particularly when limited to the 2011-2019 period. The strongest effect is the decline in the age-sex adjusted incidence rate itself, -7.00 percent per year, whether unadjusted or adjusted. Only a small part of that decline is offset by a 0.54 percent per year increase in the adjusted population and a 0.14 percent per year growth in the adjusted disability-insured rate.

In Pattison and Waldron (2013), when calculating averages through 2008, the annual average growth rates over our selected time periods were positive, enabling us to provide an easily understandable percentage decomposition of the overall growth that added up to 100 percent. With the extension to 2019, the growth in total new entitlements was negative in the final period, and although the growth over the whole period was positive, the growth in the incidence rate was negative. A percentage decomposition of the total growth in these cases would be hard to interpret. For this reason, in this article, we have not shown cumulative component growths as percentages of total growths.

Disability entitlement trends separately by sex, adjusted for age

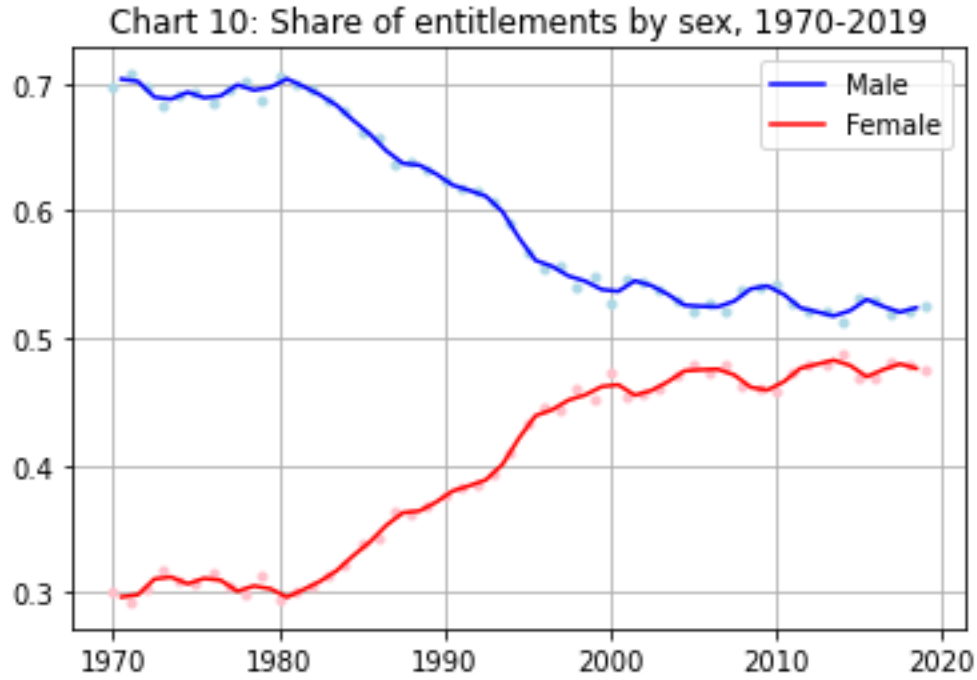
As discussed earlier, the disability-insured rates by age among women were well below for those men in 1972 but by 2019 and risen to about the same level as those for men. The unadjusted disability-insured rate will accordingly have risen substantially for women compared with men. This section carries out the decompositions, both unadjusted and adjusted, separately by sex.

Because female labor force participation levels are still below those of men, while, at the same time, younger female birth cohorts have more years of education than their male counterparts, with presumably greater lifetime earnings potential than in the past, there may be potential for further increases in the proportion of disability insured workers who are female.

For the decomposition by sex, the same weights and age-sex growth rates are used as for the combined sex analysis, except that they are aggregated separately by sex. Chart 10, below, graphs the chained weights used in our decomposition, aggregated each year separately by sex. (A feature of the Sato-Vartia weights used for the chain weighting is that the total each year will be close to, but not necessarily equal to, 1.0.) The summed weights for each sex in each year indicate that sex's contribution

to newly disabled worker entitlements that year. Convergence between the sexes was especially rapid over the period 1981 through 1995, with convergence at a noticeably less rapid rate after 1995.

The year 1995 is also the year at which SSA/AS begins using historical data in the regression they use as a part of their overall ultimate disability incidence projection procedures. In their model documentation, they note that they begin their regression in 1995 to capture recent higher levels of female disability incidence rates.[11]



Note to Chart 10: The dots each year indicate the share of entitlements by sex that year. The solid line gives Sato-Vartia weights aggregated by sex, plotted at the mid-point of the two years for which each weight is an average.

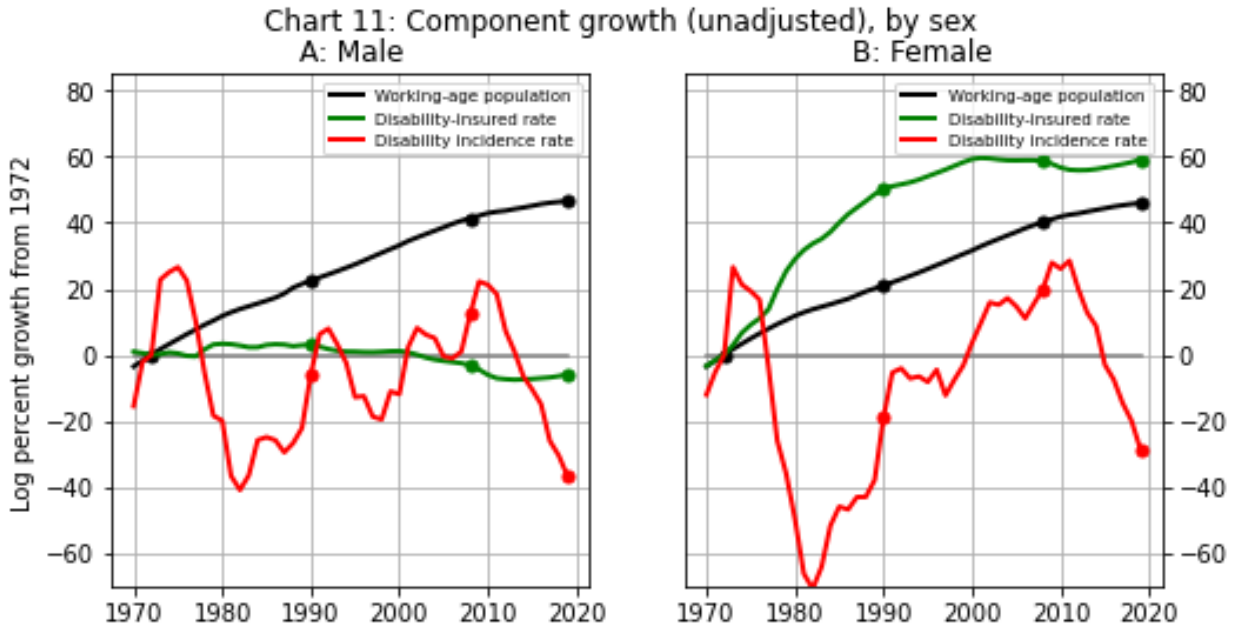
Using this level of disaggregation, we do find some differences by sex in the disability incidence rate, or the portion of cumulative positive and negative growth in the number of newly entitled disabled workers over our time series that is unexplained by demographic factors. In general, beginning around the mid-1990s, the cumulative growth in the number of newly entitled male disabled workers was either close to equal or below the cumulative growth in the number of male disability insured workers. In contrast, the cumulative growth in the number of newly entitled female disabled workers did not fall below the cumulative growth in the number of newly entitled female disability insured workers until 2014. In other words, if, after adjustment for disability insured status and age, women would have been identical to men in their risk of becoming entitled to disability, the total number of newly disabled workers over that period would have been lower. On the other hand, both sexes have experienced similar declines in the growth in disability incidence over the past 8 years, it is just that women are experiencing a decline from a previous higher level of growth in disability incidence, relative to their male counterparts.

The unadjusted component growth rates are given in Chart 11. Population growth for both sexes was virtually identical. The growth in the disability-insured rate, on the other hand, is starkly different:

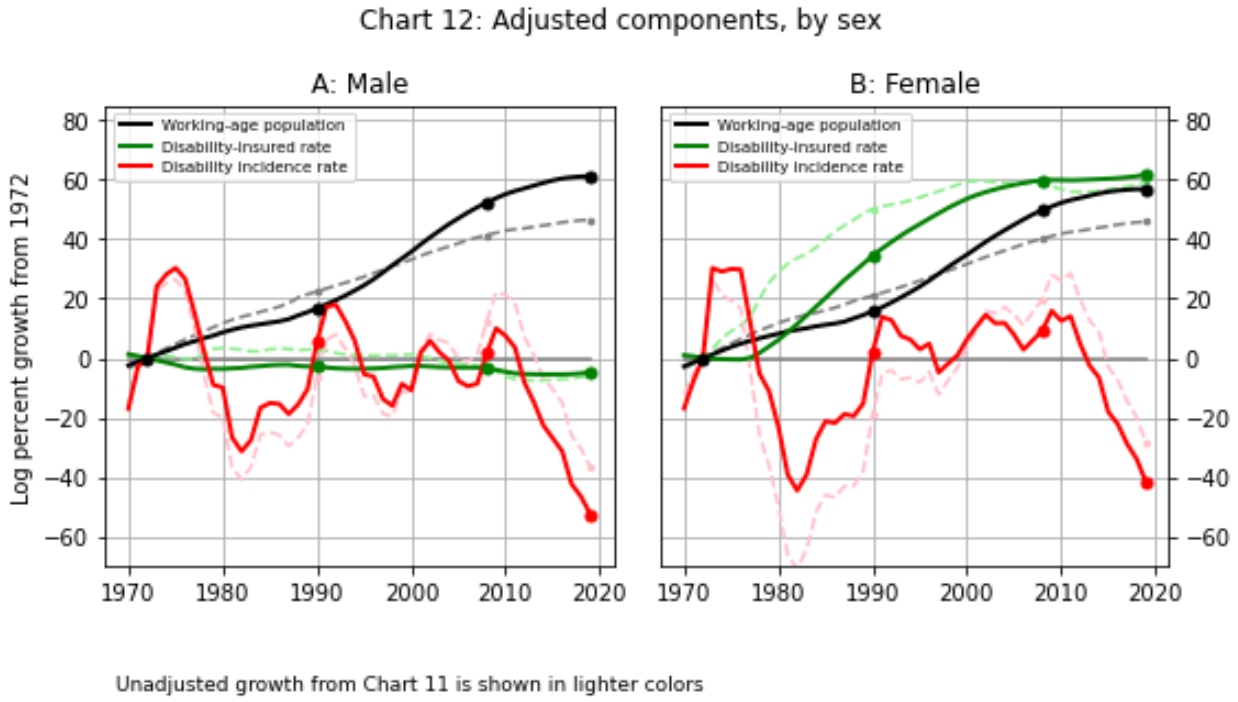
[11] See https://www.ssa.gov/oact/TR/2025/2025_Long-Range_Disability_Assumptions.pdf

the male disability insured rate rose only slightly in the early period and by the end had declined somewhat from its 1972 value. The female disability-insured rate, in contrast, rose very rapidly before 1990, and less rapidly until 2000, after which it levelled off.

The fluctuations in the unadjusted disability-incidence rate growth, comparing the two sexes, roughly match in timing but differ in size. The fall from 1971-1972 to 1982 was much larger for females, offset by a larger subsequent rise to 2009. The decline since 2011 has been about the same for both. It is also noticeable that the fluctuations between 1990 and 2011, associated with business cycles, were smaller for females.



The component rates adjusting for changes in the age composition are given in Chart 12. (For convenient comparison, the lines from Chart 11 are included as lightly colored dashed lines.) The adjustment for age composition is slightly larger for males than for females. For males the age composition effect and the adjusted disability-insured rate reduce growth in the early period. The adjusted incidence rate, correspondingly, is increased somewhat. In the later periods the age composition adds to the cumulative growth, and the disability incidence rate is correspondingly pushed down. This reduction, in conjunction with the negative contribution from the age-composition effect, is offset by a positive shift in the adjusted disability incidence rate.



Although the age-composition adjustments move the male and female incidence rates much closer to each other, there are still some differences. Both see a large increase in the early 1970s, with an increase above the 1972 levels of more than 25 log percent, the highest level seen in the study span. Between the mid-1970s and the early 1980s, both fell sharply, with a larger fall for females, to around 40 log percent below the 1972 level. Between the early 1980s and the early 1990s, both rose again, but not to the level of the mid-1970s, to between 10 and 20 log percent above the trend growth.

After 1990, the pattern has been roughly the same for males and females, with peaks around 1992, 2002, and 2009, and a sustained decline since the last peak, rivaling that of the late 1970s up through the year measured here. Over much of the period since 1992 females had a slightly higher disability incidence rate than males relative to 1972, although the differences are not large. Although the decline in the final period was about the same for both, the females maintained a slightly higher level, relative to 1972, than the males. By 2019, males are at levels below anything seen in the earlier periods. Females, however, were just reaching the very low level previously seen in 1982.

Discussion (under development, no citations right now)

The decomposition analysis indicates that the combined effect of population growth and the growth in insured status among women, accounts for the apparent growth in disability incidence over the 1970-2008 period, but has less important since then relative to changes in the disability incidence rate. The apparent drop in incidence in the last period, and the fluctuations before then, have to be explained by factors not analyzed in this article. We close by listing some of these possible factors.

- Business cycles: In the period from around 1990 through the 2008 recession, the fluctuations in the incidence rate have coincided to a large degree with business cycles. It is possible to quantify this relationship by analyzing, for example, correlations between the unemployment rate and the age-sex adjusted disability incidence rate. Such an analysis was carried out by Liebman (2015) and is anticipated to be a later stage of this project. As part of this later analysis, it would also be

interesting to explore whether the somewhat differing behavior of the adjusted incidence rate of males and females over this same period can be explained by differences in unemployment shocks by sex. Some but perhaps not all of the post-2011 decline might be explained by recovery from the 2008 recession.

- Changing work requirements: a shift away from manufacturing toward industries or occupations that aren't as physically demanding might have contributed to a general trend that was masked before 2011 by other factors. Even within industries or occupations the greater availability of telework options or relaxed workplace requirements could have contributed, possibly at evolving rates, to a decline in disability incidence.
- Improvements in population health over time are unlikely to explain the fluctuations in the incidence rate. If, however, there were other factors that were pushing the incidence rate up before 2011 but since 2011 have ceased doing so, those other factors might have masked the decline attributable to improving health. Alternatively, selective mortality of persons who would otherwise have been at greatest risk of disability over this time period could have made the disability insured population selectively healthier. Because the total number of deaths at the disability-prone ages is still fairly small, it is not clear, a priori, whether any effect of this nature could move the estimates to a noticeable degree, however.
- The ACA (legislated in 2010, with many provisions becoming effective in 2014), by making health insurance more widely available, may have provided health care to workers who otherwise would have had to fall back on applying for disability.
- Changing program requirements. Cost of applying. Likelihood of allowance.
- As discussed above, the increase in the normal retirement age beginning in 2003 will have added to the number of disability-insured workers and new disabled worker entitlements. We excluded this component of any increase although it has been estimated by others.[12] There is an additional possible effect. As the normal retirement age increases, the benefit payable to age 62 claimants will decrease, possibly increasing the inducement to apply for DI benefits, which are not reduced for early retirement. Such an effect will have fallen into our residual disability incidence category.
- In Pattison and Waldron (2013), we ended our series in 2008, which was prior to the period over which much of the impacts of the great recession would have had the potential to show up in the disability insured status measure. Over the 2009-2018 period, our data shows some modest declines in disability insured status for men and women at ages 35, 45, and 50. However, disability insured status was flat at ages 55 and 60 and even increased modestly for women at age 60. The steepest decline in disability insured status was at age 35 for men. By the end of our observation period, those men were still too young to have aged into the disability-prone ages. Thus, any change in the composition of the DI trust fund's risk pool occurring from declines in the labor force participation rates of males aged 35 (or younger) was not shown in our decomposition to have had large effects on the flow of newly entitled workers onto the Disability Insurance program rolls over our time series, but this was not expected, given these ages were below the disability-prone ages. [13] Overall, one implication of our results is that one should

[12] Liebman 2015. Goss, Stephen C. https://www.ssa.gov/legislation/testimony_072414a.html

[13] Note that declines in disability insured status over the post-recessionary period, were not necessarily caused by the slow recovery from the great recession, although they could have been. We cannot observe the reason for a decline in a worker's disability insured status in our data.

continue to monitor the impact of disability insured status trends, as a potentially emerging issue in later vintages of data.

Conclusion

As was documented in our earlier article, the large increase in disability entitlements from the early 1970s to just before the 2008 recession was mostly attributable to the combination of population growth and the increase in the working age population that was insured for disability benefits, in conjunction with the aging of the baby boom into the disability-prone ages. Changes in the disability incidence rate fluctuated around the trend attributable to population growth without contributing to the long-term growth.

This paper extends the analysis through 2019, a period over which disability entitlements declined. In contrast to the earlier period, the decline was attributable almost entirely to a fall in the disability incidence rates. Continuing population growth contributed very little, and growth in the proportion of the population insured for disability contributed almost none.

The paper also analyzed the growth over the whole period by sex. That analysis indicated that the growth attributable to growth in insured status among the working age population in the earlier period was entirely attributable to women. The fluctuations in the disability entitlement rate were broadly similar between males and females, with both sexes sharing roughly equal disability incidence rate peaks around 1975, 1992, and 2009. The troughs between these peaks, however, differed slightly. In the large decline and followed by increase between the mid-1970s and early 1990s, females reached a deeper trough. Since the mid-1990s, however, males have fluctuated around a slightly lower level, and in the post 2010 decline have reached lower levels than females.

Technical Appendix

The Törnqvist index

Typical price growth indexes combine two components (price and quantity) tabulated over a range of goods. The product of price and quantity for each good is the total expenditure on that good. For this article, we have three components (population, the insured/population ratio, and the entitled/insured ratio) tabulated over both sexes and a range of ages, whose product for an age/sex cell is total new entitlements for that cell. The Törnqvist index is convenient for this purpose because it extends easily to three or more components.[14] The index decomposes the total growth with a negligible residual and, as a chained index, does not require selecting a base year.

The index for a component is the weighted average across both sexes and all ages of the log growth from one year to the next in that component's growth for each age sex cell. For population, for example, the growth to year y at age x and sex s is:

$$g_{y,x,s}(Pop) = \log\left(\frac{Pop_{y,x,s}}{Pop_{y-1,x,s}}\right).$$

[14] For example, if we tabulated average initial benefit among new entitlements in each age-sex cell, we could decompose the growth in new awardee benefit expenditure growth into population growth, disability-insured rate growth, disability incidence rate growth, and average benefit growth. The share weights in that case would be the age-sex cell share of total new awardee benefits for the year.

Corresponding growth rates can be calculated for each age-sex cell for the other two components, the insured/population rate and the entitled/insured rate.

The weighted growth rate for all ages and both sexes combined will then be the weighted sum of the age-sex cell growth rates, using weights $w_{y,x,s}$ to be described below. For population, for example,

$$g_y(Pop) = \frac{\sum_{x,s} w_{y,x,s} \cdot g_{y,x,s}(Pop)}{\sum_{x,s} w_{y,x,s}}.$$

The same set of weights is used for all three components. The weights are derived from each age-sex cell's share of the total new entitlements in a year.

$$share_{y,x,s} = \frac{New\ DW_{y,x,s}}{\sum_{x,s} New\ DW_{y,x,s}}.$$

For the growth rate to year *y*, representing the growth from year *y-1* to year *y*, the weights are derived from an average of the shares in *y-1* and *y*.

The simplest such average is the Törnqvist weight proper, a straight arithmetic average:

$$w_{y,x,s} = \frac{share_{y,x,s} + share_{y-1,x,s}}{2}.$$

For this paper, however, a variant of the Törnqvist weight is used, the "Sato-Vartia" weight, more robust to small cell counts at ages where disability is rare. The Sata-Vartia weight is equal to zero if either share is zero, to either share if the two shares are equal, and to the "logarithmic mean" of the two shares if they are unequal and both non-zero:

$$w_{y,x,s} = \frac{share_{y,x,s} - share_{y-1,x,s}}{\log(share_{y,x,s}) - \log(share_{y-1,x,s})}$$

The Sato-Vartia weights summed over all ages and both sexes total very close to 1.0.[15]

Because the same weights are used for all three components, and because the growth rates are growth in logarithms, the growth in a ratio is simply the difference in the growth of the two components:

$$g_y\left(\frac{DI\ insured}{Pop}\right) = g_y(DI\ insured) - g_y(Pop).$$

For the decomposition of this paper, it is therefore sufficient to calculate three growth rates, those for *Pop*, *DI insured*, and *New DW*, to be able to calculate the growth in population, the insured rate, and the incidence rate, the components into which the growth in new disabled workers is divided:

$$g_y(New\ DW) = g_y(Pop) + g_y\left(\frac{DI\ insured}{Pop}\right) + g_y\left(\frac{New\ DW}{DI\ insured}\right).$$

For the decomposition by sex, the same formula as given above is used, but only the cells corresponding to the sex being averaged are entered. For males, for example,

$$g_{y,M}(Pop) = \frac{\sum_{x,M} w_{y,x,M} \cdot g_{y,x,M}(Pop)}{\sum_{x,M} w_{y,x,M}}.$$

The summed weights in the denominator will then be on the order of one half, representing the average share of the sex in total newly entitled workers that year and the preceding. It is these summed weights that are plotted in Chart 10.

---

[15] The Törnqvist index using the Sato-Vartia weights stems from Sato 1976, Vartia 1976, and Törnqvist et all. 1985. It is a discrete approximation to a Divisia index, and in some disciplines is called a Logarithmic Mean Divisia Index (LMDI), Ang et al., 1998.

The Social Security Trustees Report currently uses the age-sex distribution of the disability-insured population in 2000 to calculate the age-sex-adjusted incidence rate. In itself, the approach gives only one growth index, that for the disability incidence rate. Such fixed weight approaches can be extended to give growths as well for the disability-insured rate and for population itself, but those extensions will differ according to the order in which the components enter the calculation or, by not decomposing the total growth exactly, leave a residual component. The Törnqvist index is convenient in that it does not depend on the ordering of the components and gives an exact or almost exact decomposition with a negligible residual. As a chained index, it does not require specifying a base year. It is probably the case, however, that if these alternative fixed weight methods were presented in the same form as the measures in this article, namely, as cumulative log growth of the components, the resulting decompositions would lead to similar qualitative conclusions.

Selection of the reference points

Three reference years (1972, 1990, and 2008) are used in the discussion, in addition to the final data year (2019). The reference years are intended to be conveniently spaced years that are neither particularly high nor low with respect to the fluctuations of the age-sex adjusted incidence rate (Chart 9).

There is a middle range of incidence rates that is crossed eight times during the study period, namely rates between the 2002 rate at the low end and the 2006 rate at the high end. Sixteen of the annual incidence rates in the 50-year span fall into this middle range. The closest to the middle of the range is 1990, followed by 2004, 2008, 2001, 1978, and 1972. The reference years were chosen from this group, and divide most of the pre-decline years into two equal-length 18 year periods.

As it happens, these are the same three years that in our 2013 article were selected using a more complicated procedure.

Liebman reference is Jeffrey B. Liebman, “Understanding the Increase in Disability Insurance Benefit Receipt in the United States,” *Journal of Economic Perspectives*, volume 29, no. 2, Spring 2015, pages 123-150.

Sato, Kazuo (1976), The ideal log-change index number, The Review of Economics and Statistics, vol. 58, no. 2 (May), pp. 223-228.

Vartia, Yrjö O. (1976), Ideal Log-change index numbers, Scandinavian Journal of Statistics 3:121-126,.

Törnqvist, Leo, Pentii Vartia, and Yrjö Vartia (1985), How should elative changes be measured?, The American Statistician, vol. 39, no, 1 (Feb), 43-46.

Ang, B.W., F.Q. Zhang, and K.H. Choi (1998) Factorizing changes in energy and environmental indicators through decomposition. Energy, 23, 489-495., Kazuo