

Health Inequalities Among Danish Retirees 2004-2022

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Abstract

We examine income-related health inequalities among Danish retirees aged 60–79 between 2004 and 2022, using the Survey of Health, Ageing and Retirement in Europe. Analysis of functional, diagnosed, comprehensive, mental, and cognitive health measures across income deciles shows marked disparities, with higher-income groups consistently exhibiting better health outcomes. Notably, improvements in functional and comprehensive health were most pronounced among lower-income individuals, resulting in a reduction of health gaps for these domains. Mental health inequalities remained substantial throughout the period.

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1 Introduction

Over the past two decades, the dynamics of health inequalities have attracted growing attention in public health, economics, and social policy research (Marmot, 2005). While the existence of socioeconomic gradients in health is well documented, less is known about how these disparities evolve over time and across different health domains (Mackenbach et al., 2016). Understanding whether inequalities are widening, narrowing, or shifting in character is particularly important in aging societies, where longer working lives and policy reforms may interact with health trajectories in complex ways.

Denmark provides a valuable case study for filling this knowledge gap. Since the mid-2000s, a series of pension reforms have gradually increased the statutory retirement age and restricted access to early pension benefits. The 2006 Welfare Agreement (Ministry of Finance - Denmark, 2006) linked the pension age to life expectancy, while the 2011 Retirement Reform accelerated this timeline and shortened the voluntary early-retirement period from five to three years (Ministry of Finance - Denmark, 2011). The state pension age reached 67 by 2024–25 and is legislated to rise to 68 in 2030, 69 in 2035, and 70 in 2040, while new targeted early-exit pathways were introduced for individuals with long employment histories or reduced work capacity. These reforms primarily affect the duration of working life rather than direct medical costs, as Denmark’s universal, tax-financed health system ensures relatively low out-of-pocket expenses (approx. 13% of total health care expenditure). An important question, therefore, is whether longer exposure to work and delayed retirement have altered patterns of health inequality among older Danes.

This study examines the evolution of income-related health inequalities among residents of Denmark aged 60–79 between 2004 and 2022, using data from the Survey of Health, Ageing and Retirement in Europe – SHARE (Börsch-Supan et al., 2022). By exploiting measures of health, socioeconomic status, and demographic characteristics for the sample, our analysis traces temporal changes in the socioeconomic gradient of health. We consider five dimensions of health; functional, diagnosed, comprehensive, mental, and cognitive. First, we calculate the proportions reporting they are in good or very good health by income decile and investigate how the socioeconomic gradient in health changes over time. Second, we transform observed level differences in health into a metric that is directly comparable across health measures and can be easily interpreted as corresponding to age-related health decline. Finally, we use concentration curves, analogous to the Gini coefficient, to provide a distributional assessment of inequality over time.

We find that while functional and comprehensive health initially display wide gaps across the income distribution, equivalent to more than a decade of additional good health for higher-income individuals, these disparities narrow substantially over time, largely due to improvements

among lower-income groups. By contrast, diagnosed and cognitive health exhibit more modest and shifting gradients, often concentrated asymmetrically around the median of the income distribution. Mental health emerges as the most unequal domain, with persistent and substantial disparities translating into the longest catch-up times in terms of equivalent age-related decline. Taken together, these results suggest that health inequality is multidimensional: some physical health measures show convergence across income groups, while mental health disparities remain strikingly resilient.

To complement these findings, we also employ concentration curves and concentration indices to provide a distributional perspective on health inequality. Consistent with prior findings, these findings reveal that poor health is disproportionately concentrated among lower-income individuals, with the greatest inequality observed in functional and comprehensive health. However, the concentration indices show little systematic change over time, indicating stability in inequality patterns despite important domain-specific dynamics.

The remainder of the paper is organised as follows. In Section 2 we describe data and the methodical approach. Section 3 shows the main results. Section 4 provides a discussion, while Section 5 concludes.

2 Data and Methods

We analyze data from the Danish subsample of SHARE, a large, biennial longitudinal survey collecting detailed health, socioeconomic, and social information from individuals aged 50 and older across Europe (Börsch-Supan et al., 2013). Our primary sample includes retired respondents aged 60–79 at the time of interview across eight waves (1, 2, 4–9) spanning the years 2004–2022. Wave 3 is excluded as it contains retrospective rather than contemporaneous information on the variables of interest. Individuals may contribute multiple observations if they satisfy the age and retirement criteria in more than one wave. All analyses employ SHARE-provided cross-sectional weights to maintain representativeness.

We construct five distinct health indicators, each standardized such that higher values consistently reflect better health outcomes. This coding approach ensures comparability across measures and facilitates a more intuitive interpretation of results, as improvements in any indicator correspond to improvements in overall health status.

- **Functional Health:** We combine counts of Activities of Daily Living (ADL) proposed by Katz et al. (1963) and Instrumental Activities of Daily Living (IADL) Lawton and Brody (1969) where respondents report the number limitations due to physical, mental, emotional, or memory problems. ADLs measure basic self-care and complex daily tasks: (1) dressing, including putting on shoes and socks, (2) walking across a room, (3) bathing or showering,

(4) eating, such as cutting up food, (5) getting in or out of bed, (6) using the toilet, including getting up or down, (7) using a map to figure out how to get around in a strange place, (8) preparing a hot meal, (9) shopping for groceries, and (10) making telephone calls. IADLs capture physical functioning and mobility: (1) walking 100 meters, (2) sitting for two hours, (3) getting up from a chair, (4) climbing several flights of stairs, (5) climbing one flight of stairs, (6) stooping, kneeling, or crouching, (7) reaching or extending arms above shoulder level, (8) pulling or pushing large objects, (9) lifting or carrying weights over 5 kilos, and (10) picking up a small coin from a table. Since each domain contains 10 items, we construct our measure as 20 minus the total number of reported limitations, yielding a range of 0–20 where higher scores reflect greater functional independence.

- **Diagnosed Health:** We construct a measure of disease-free status using doctor-diagnosed chronic conditions from a standardized list consistently available across all survey waves. Respondents report whether a doctor has ever diagnosed them with any of the 11 conditions: (1) heart attack, (2) high blood pressure or hypertension, (3) high blood cholesterol, (4) stroke, (5) diabetes or high blood sugar, (6) chronic lung disease, (7) cancer, (8) stomach or duodenal ulcer or peptic ulcer, (9) Parkinson’s disease, (10) cataracts, and (11) hip fracture or femoral fracture. We deliberately exclude conditions with inconsistent availability across waves—specifically asthma, arthritis, osteoporosis, other fractures, Alzheimer’s disease/dementia, benign tumors, affective/emotional disorders, rheumatoid arthritis, osteoarthritis, and chronic kidney disease—to ensure temporal comparability. Thus, the variable counts the number of conditions the respondent does *not* have (11 minus the number of reported conditions), so higher values indicate better health status.
- **Comprehensive Health:** Constructed following the deficit accumulation approach ([Mitnitski et al., 2001](#)), comprehensive health is the ratio of the number of health deficits absent to the total number of possible deficits considered. Deficits are drawn from a broad set of SHARE health indicators, encompassing functional limitations, chronic conditions, sensory impairments, and self-rated health, each coded on a 0–1 scale. In our case, the index is constructed from 45 variables available in SHARE, as described in [Abeliansky and Strulik \(2019\)](#) and [Börsch-Supan et al. \(2021\)](#). Comprehensive health thus ranges from 0 (maximum deficits observed in the dataset) to 1 (no deficits), with higher values indicating better overall health.
- **Mental Health:** Measured using the 12-item EURO-D depression scale, which captures depressive symptoms such as sadness, pessimism, irritability, loss of interest, and fatigue. Each symptom is coded as present (=0) or absent (=1), and the total score ranges from 0 (all symptoms present) to 12 (no depressive symptoms). Higher values indicate better mental health. The EURO-D has been validated cross-culturally and is widely used in

gerontological research.

- **Cognitive Health:** We use the Cog30 index inspired by the work of [Harris and Dowson \(1982\)](#). It is a continuous measure ranging from 0 to 30, summarizing performance on immediate word recall (0–10 points), delayed word recall (0–10 points), verbal fluency (number of animals named in one minute, rescaled to 0–10 points), and numeracy (arithmetical problem-solving tasks). Higher scores reflect better cognitive functioning.

Next, we construct income deciles as our measure of socioeconomic position using equivalized household income that aggregates all individual income components.¹ The decile construction follows a multi-step procedure designed to ensure consistent socioeconomic positioning while accounting for SHARE’s complex panel structure and missing income data. Each respondent receives their permanent income decile assignment based on their position within the income distribution of their first sample appearance wave. We calculate deciles within each wave using all respondents present in that wave to ensure that income positions reflect the full sample distribution, rather than being influenced by the characteristics of new entrants.²

To address the common problem of missing income data in surveys of older adults, SHARE employs multiple imputation, generating five complete datasets with plausible values for the missing income components. We perform the entire decile construction procedure separately for each of the five imputation datasets, yielding five distinct decile assignments for each respondent. A respondent’s final income decile is their average decile assignment across these five imputation datasets, rounded to the nearest integer. This approach ensures each respondent maintains consistent income group membership throughout their panel participation while reflecting wave-specific economic conditions and properly handling missing income information through multiple imputation inference.

As a robustness check, we re-estimate our results on an alternative sample defined by age only, including all respondents aged 65–79 regardless of labor market status. This broader sample allows us to assess whether our results are sensitive to the restriction to retirees and to address potential selection effects related to retirement timing.

¹Equivalization applies a linear equivalence scale with the formula $0.5 + 0.5 \times \text{household size}$, where each additional household member contributes 0.5 to the equivalence factor.

²For example, someone first appearing in Wave 4 receives the decile corresponding to their position among all Wave 4 participants. Special adjustments accommodate SHARE’s survey design features. Wave 1 entrants have their position determined using the averaged Wave 1 and Wave 2 equivalized incomes, when both are available. Deciles are calculated among all respondents participating in both waves; those participating in only one wave receive deciles from that wave’s distribution. Wave 7 entrants use Wave 8 income data (or Wave 9 if Wave 8 is unavailable) due to the substantially reduced standard interview sample in Wave 7 resulting from SHARELIFE retrospective interviews.

2.1 Summary Statistics

Table 1, Panel A presents descriptive statistics for our analytical sample of 40,353 observations from retirees aged 60-79 across eight SHARE waves spanning 2004-2022. Panel A illustrates the effectiveness of our sampling approach in creating a relatively homogeneous comparison group across waves. Despite the 18-year observation window, the demographic and health characteristics remain remarkably stable. Mean ages vary narrowly between 69.2 and 71.8 years, while gender composition fluctuates modestly around 54-56% female. Most importantly, health outcomes exhibit consistent patterns across waves: functional health clusters tightly around 18.5-18.8, comprehensive health remains stable at 0.88-0.89, and mental health scores vary minimally between 10.1 and 10.4. This stability suggests that our restriction to retired individuals aged 60-79 successfully isolates a comparable population across the observation period, mitigating concerns about compositional changes that could confound temporal analysis.

The observed variation in mean income deciles from 5.2 to 6.8 across waves presents some challenges for our analytical framework, as this may reflect differential sample composition rather than within-individual changes. The modest variation in diagnosed health from 9.8 to 8.9 is similarly notable. However, both differences fall well within the standard deviations around these means, suggesting these differences are not practically significant.

Panel B reveals modest but systematic socioeconomic gradients across all health dimensions. The differences, while consistent in direction, vary considerably in magnitude across measures. For functional health, individuals in the lowest income decile score 18.1 on the scale compared to 19.1 for the highest decile—a difference that, while representing less than half a standard deviation, could translate into meaningful limitations in daily activities for affected individuals. Diagnosed health shows minimal variation across income groups (9.1 vs. 9.4 doctor visits), consistent with Denmark's universal healthcare system, which ensures equitable access to medical services regardless of socioeconomic status.

More pronounced gradients emerge for other health metrics. Comprehensive health spans 0.06 points between the bottom and top deciles (0.85 vs. 0.91). In contrast, mental health differences are evident in EURO-D scores (10.1 vs. 10.7), suggesting higher rates of depressive symptoms among lower-income retirees. The largest absolute difference appears in cognitive health, where the bottom decile scores 2.7 points lower than the top decile (17.4 vs. 20.1). However, when viewed against the substantial within-group variation—standard deviations ranging from 1.5 to 4.6 across measures—these between-group differences become statistically insignificant. This pattern suggests that while socioeconomic health gradients exist in the expected direction among retirees, they remain compressed relative to the overall health variation in the population, highlighting the importance of our longitudinal approach for detecting subtle but policy-relevant changes in health inequality over time.

Table 1: Sample Characteristics and Health Outcomes

Panel A: Descriptive Statistics by Survey Wave

Wave	Year	Obs.	Female (%)	Age	Income Decile	Functional Health	Diagnosed Health	Comp. Health	Mental Health	Cognitive Health
1-9	04-22	40,353	54.5	70.2 (5.0)	6.2 (2.9)	18.7 (2.5)	9.2 (1.5)	0.89 (0.10)	10.3 (1.8)	19.1 (4.1)
1	2004	3,142	53.6	69.2 (5.7)	5.2 (2.9)	18.5 (2.5)	9.8 (1.2)	0.88 (0.10)	10.4 (1.8)	–
2	2007	4,773	53.9	69.4 (5.4)	5.6 (2.9)	18.6 (2.6)	9.5 (1.4)	0.89 (0.10)	10.3 (1.8)	–
4	2011	3,974	54.4	69.5 (5.1)	6.3 (2.8)	18.8 (2.3)	9.3 (1.4)	0.89 (0.10)	10.4 (1.7)	18.9 (4.4)
5	2013	7,812	53.3	69.6 (4.8)	6.0 (2.9)	18.7 (2.5)	9.3 (1.4)	0.89 (0.10)	10.4 (1.8)	18.9 (4.0)
6	2015	7,194	53.7	70.1 (4.7)	6.3 (2.8)	18.6 (2.7)	9.1 (1.5)	0.88 (0.11)	10.3 (1.7)	19.2 (4.2)
7	2017	3,401	57.7	70.8 (4.6)	6.7 (2.8)	18.6 (2.7)	8.9 (1.6)	0.88 (0.11)	10.2 (1.8)	19.2 (4.0)
8	2020	5,077	54.9	71.3 (4.4)	6.7 (2.8)	18.8 (2.3)	9.0 (1.5)	0.89 (0.10)	10.3 (1.8)	19.2 (4.1)
9	2022	4,980	56.2	71.8 (4.3)	6.8 (2.8)	18.7 (2.3)	8.9 (1.5)	0.88 (0.10)	10.1 (1.9)	19.4 (4.1)

Panel B: Descriptive Statistics by Income Decile

Decile	Obs.	Female (%)	Age	Functional Health	Diagnosed Health	Comprehensive Health	Mental Health	Cognitive Health
1-10	40,353	54.5	70.2 (5.0)	18.7 (2.5)	9.2 (1.5)	0.89 (0.10)	10.3 (1.8)	19.1 (4.1)
1	3,141	60.1	71.4 (4.9)	18.1 (3.2)	9.1 (1.6)	0.86 (0.12)	10.1 (1.9)	18.3 (4.4)
2	2,661	57.9	72.0 (4.8)	17.9 (3.2)	9.0 (1.6)	0.85 (0.12)	9.9 (1.9)	17.4 (4.6)
3	3,180	60.3	71.4 (4.8)	18.1 (3.2)	9.0 (1.6)	0.86 (0.12)	10.0 (2.0)	18.1 (4.3)
4	3,508	58.8	71.0 (4.8)	18.4 (2.5)	9.1 (1.5)	0.87 (0.10)	10.1 (1.9)	18.4 (4.2)
5	3,530	57.3	70.5 (4.8)	18.6 (2.4)	9.2 (1.5)	0.88 (0.10)	10.2 (1.9)	18.3 (4.1)
6	3,966	54.5	70.4 (4.8)	18.8 (2.1)	9.3 (1.5)	0.89 (0.09)	10.3 (1.7)	19.0 (4.1)
7	4,251	52.5	70.1 (4.9)	18.9 (2.1)	9.2 (1.4)	0.89 (0.09)	10.4 (1.7)	19.7 (3.8)
8	4,550	53.1	69.4 (4.9)	18.8 (2.2)	9.4 (1.4)	0.89 (0.09)	10.4 (1.7)	19.5 (3.9)
9	5,324	52.8	69.4 (4.7)	19.1 (1.9)	9.3 (1.5)	0.90 (0.09)	10.4 (1.7)	19.7 (4.0)
10	6,221	48.2	68.9 (4.7)	19.1 (2.2)	9.4 (1.4)	0.91 (0.09)	10.7 (1.5)	20.1 (3.8)

Notes: Sample from SHARE waves 1, 2, and 4–9 (2004, 2007, 2011–2022). Wave 3 is excluded since information/questions on health were not recorded in this wave. All health measures are coded such that higher values indicate better health: (1) Functional health measures functional independence in Activities of Daily Living, with higher scores indicating fewer limitations in basic daily tasks; (2) Diagnosed health counts doctor visits using reverse-coded measure where higher values reflect lower healthcare utilization; (3) Comprehensive health is a composite measure (0-1 scale) capturing absence of chronic conditions and physical impairments; (4) Mental health uses the EURO-D Score from the European Depression scale reverse-coded so higher values indicate fewer depressive symptoms; (5) Cognitive health measures performance on cognitive tests (30-point scale) with higher scores reflecting better cognitive functioning. Cognitive scores are not available for waves 1 and 2. Income decile represents the mean household income decile position (1=lowest, 10=highest). Observations with missing income deciles are excluded. All statistics use sample weights.

Figure 1: Deaths by Age, Sex, and Birth Cohort



Note: From the Human Mortality Database ([HMD, 2025](#)) we present the conditional distribution of percentage deaths by age and sex, given survival to age 60 for birth cohorts 1984, 2004, and 2024.

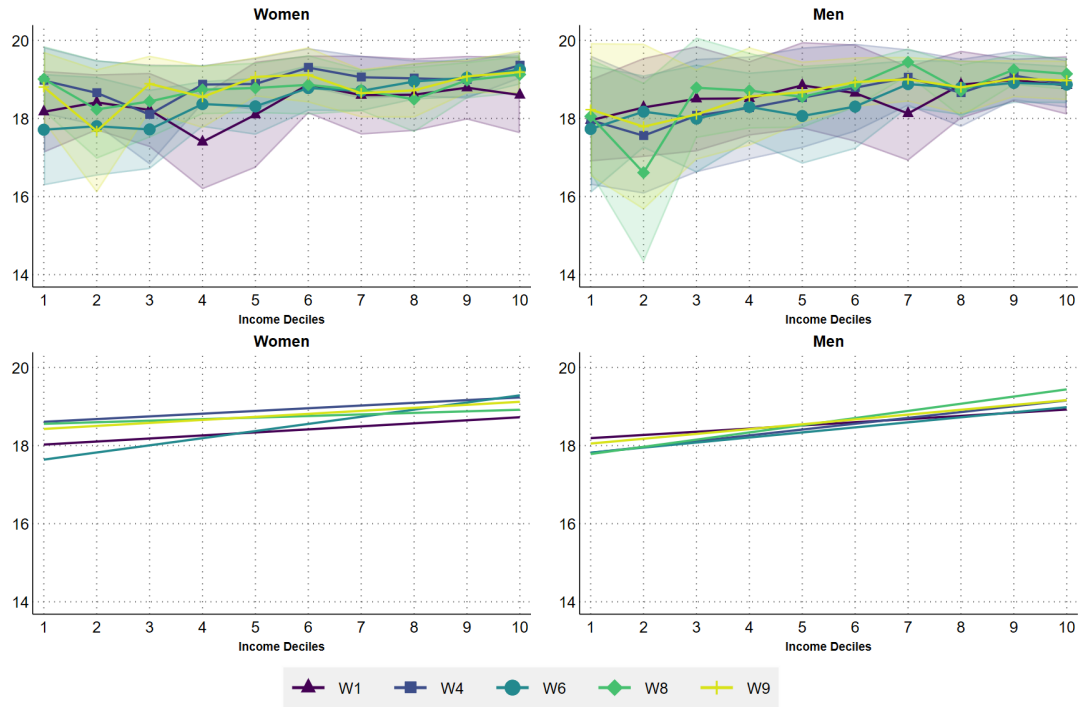
3 Results

Using data from the Human Mortality Database ([HMD, 2025](#)), we examine mortality patterns among retired Danes across three distinct cohorts (1984, 2004, and 2024). Figures 1a and 1b display the conditional distribution of deaths by age and sex, given survival to age 60. The results reveal pronounced shifts in the age-at-death profile over time, with mortality becoming increasingly compressed at older ages. In earlier cohorts (1984), deaths were more widely distributed across ages 70 to 90, while in later cohorts (2004 and especially 2024), deaths cluster more tightly around ages 78 to 85, suggesting an expansion of longevity and a narrowing of variation in survival. Sex differences remain evident: women show a more even mortality distribution and persistently higher survival probabilities into advanced ages compared to men, though both sexes experience similar temporal trends. These findings highlight not only improvements in life expectancy but also changing patterns of health inequality within the retired population, as later cohorts experience both delayed and more concentrated mortality.

Next, we examine health inequalities among retirees using data from SHARE. Our analysis focuses on five distinct health measures across income deciles to capture the socioeconomic gradient in health outcomes and its evolution over time among the retired population aged 60-79. For our primary analysis, we calculate the mean health measure by income decile and investigate how the socioeconomic gradient in health changes over time.

Functional Health: Figure 2 presents the combined measure of Activities of Daily Living and Instrumental Activities of Daily Living by household income decile across survey waves. The results reveal a consistent but modest socioeconomic gradient in functional independence

Figure 2: Functional Health



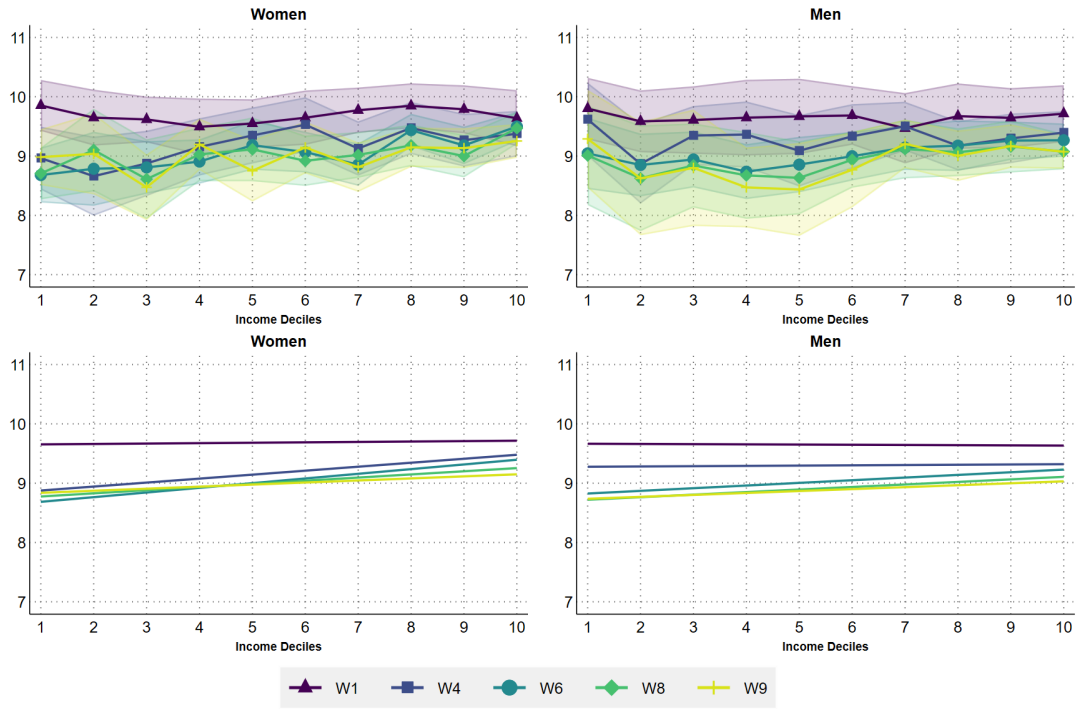
Note: Upper panels show health outcomes by income decile with 95% confidence intervals for women (left) and men (right). Lower panels display fitted linear trends across income deciles by wave. Higher scores indicate better functional independence (fewer limitations). Sample restricted to retired individuals aged 60-79. All estimates use SHARE sampling weights.

among retirees. Individuals in the lowest income deciles consistently report lower functional independence scores, indicating more limitations in basic and complex daily activities.

The gradient spans approximately 1-1.5 points on our 20-point scale between the lowest and highest income deciles. The 95% confidence intervals shown in the upper panes indicate reasonable precision in our estimates, although some uncertainty exists, particularly for the highest and lowest deciles where sample sizes are smaller. Results from a simple linear regression of mean health on income decile by wave (lower pane) highlight the remarkable stability of temporal trends across waves, with parallel lines suggesting that functional health inequalities among retirees have remained essentially unchanged over the 18-year observation period. Sex differences are evident but modest, with women showing slightly steeper gradients in some waves.

Diagnosed Health: Figure 3 displays the average number of chronic conditions absent (reverse-coded) by income decile and wave. The socioeconomic gradient for chronic disease burden among retirees is notably shallow, with the difference between income deciles spanning less than one condition on average. The confidence intervals in the upper panes show consid-

Figure 3: Diagnosed Health

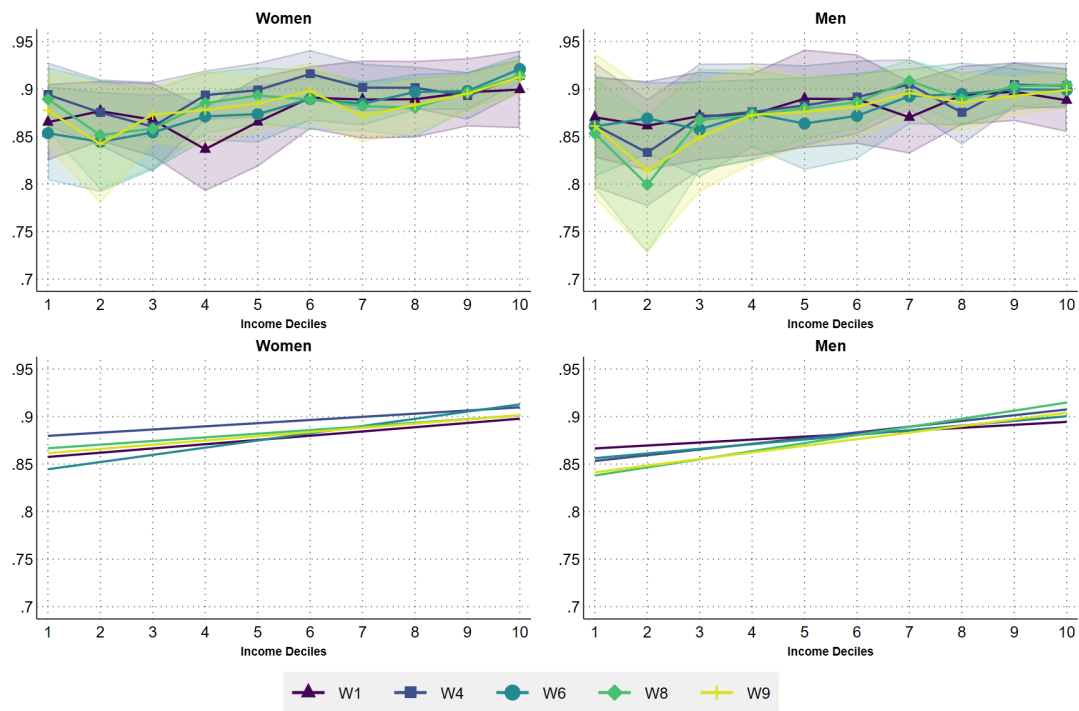


Note: Upper panels show health outcomes by income decile with confidence intervals for women (left) and men (right). Lower panels display fitted linear trends across income deciles by wave. Higher scores indicate fewer chronic conditions (better health). Chronic conditions include heart attack, hypertension, cholesterol, stroke, diabetes, lung disease, cancer, ulcer, Parkinson's, cataracts, and hip fracture. Sample restricted to retired individuals aged 60-79. All estimates use SHARE sampling weights.

erable overlap across income deciles, indicating substantial uncertainty around the gradient estimates for this health measure. Temporal patterns reveal interesting dynamics: while early waves (W1, W4) showed virtually flat gradients with wide confidence intervals, more recent waves demonstrate slightly steeper relationships between income and chronic disease burden; however, the overlapping confidence bands show that differences are insignificant.

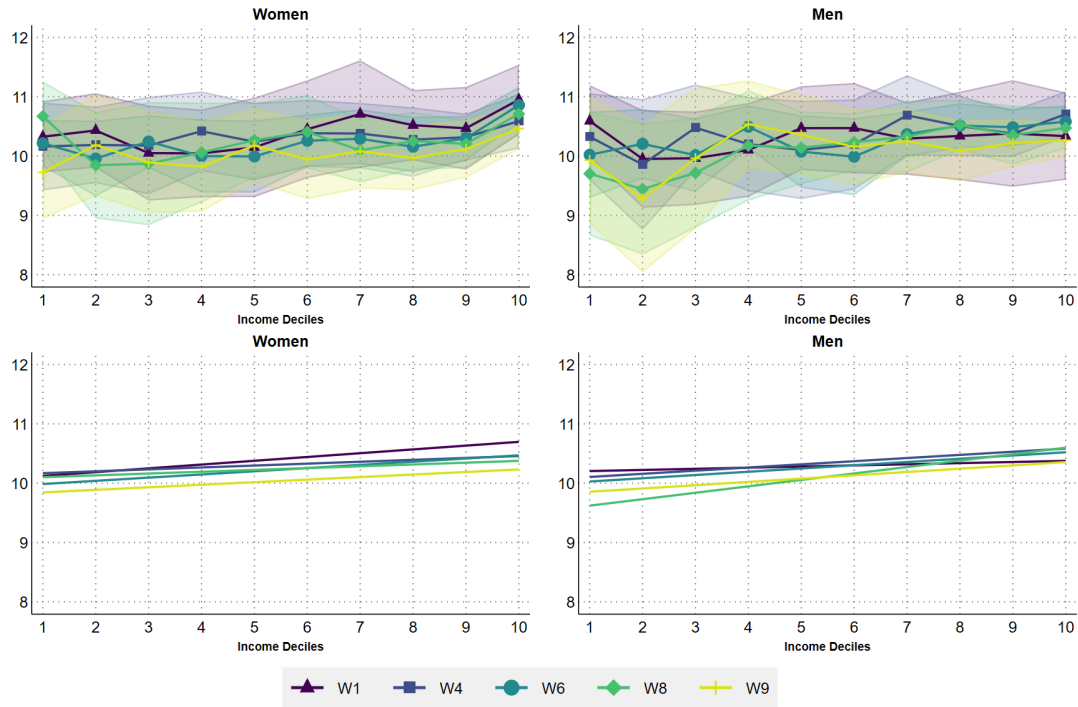
Comprehensive Health: Constructing a health deficiency index from 45 health variables provides the most comprehensive measure of health status in our analysis. Figure 4 demonstrates a clear socioeconomic gradient that has remained stable over time. The confidence intervals are notably tighter than those for other health measures, reflecting the comprehensive nature of this composite index; however, confidence intervals are typically overlapping. Higher-income retirees consistently score approximately 0.05 to 0.06 points higher on the index compared to their lower-income counterparts, indicating fewer health deficits. The gradient shows remarkable temporal stability, with parallel trends across income groups, providing evidence for persistent health inequalities among retirees throughout the observation period.

Figure 4: Comprehensive Health



Note: Upper panels show health outcomes by income decile with confidence intervals for women (left) and men (right). Lower panels display fitted linear trends across income deciles by wave. Health Deficiency Index ranges from 0 to 1, with higher scores indicating fewer health deficits (better overall health). Index constructed from 45 health variables following deficit accumulation approach. Sample restricted to retired individuals aged 60-79. All estimates use SHARE sampling weights.

Figure 5: Mental Health

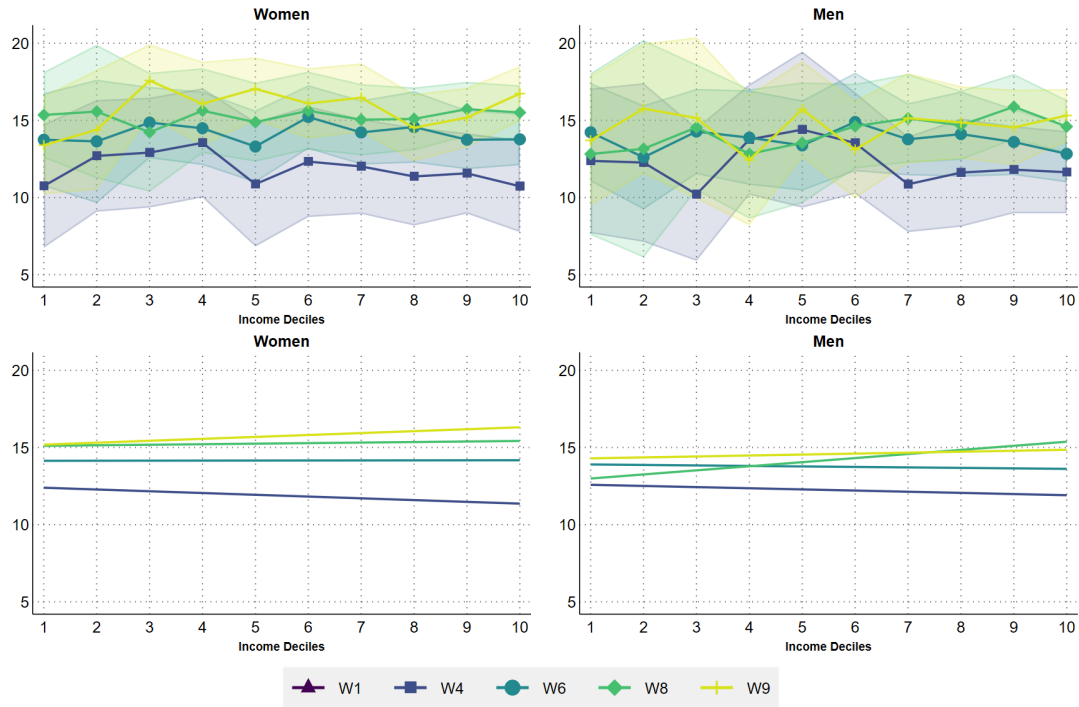


Note: Upper panels show health outcomes by income decile with confidence intervals for women (left) and men (right). Lower panels display fitted linear trends across income deciles by wave. EURO-D scale ranges from 0-12, with higher scores indicating better mental health (fewer depressive symptoms). Scale captures symptoms including sadness, pessimism, irritability, loss of interest, and fatigue. Sample restricted to retired individuals aged 60-79. All estimates use SHARE sampling weights.

Mental Health: Figure 5 presents mental health outcomes, as measured by the EURO-D depression scale, across income deciles. The socioeconomic gradient for mental health among retirees is modest but persistent, with higher-income individuals reporting consistently better mental health outcomes. However, the confidence intervals show considerable overlap across middle-income deciles, suggesting that differences between the highest and lowest deciles may primarily drive the gradient. The gradient spans approximately 0.5 to 0.8 points on the EURO-D scale between the lowest and highest income deciles. Temporal trends indicate relative stability across waves, although substantial uncertainty is evident in the fluctuations observed, particularly among low- and middle-income groups.

Cognitive Health: Cognitive functioning, measured by the COG-30 index, presents the most complex and inconsistent pattern among all health measures examined. Figure 6 reveals substantial instability in the socioeconomic gradient across waves, with gradients frequently reversing direction and showing little consistent relationship between income and cognitive performance.

Figure 6: Cognitive Health



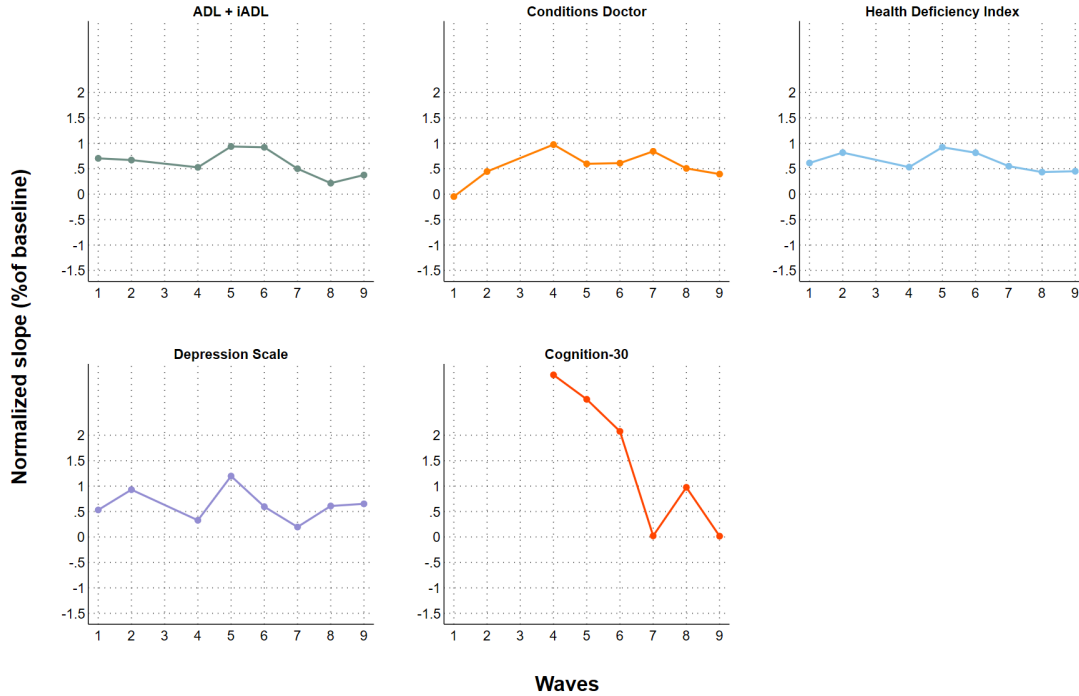
Note: Upper panels show health outcomes by income decile with confidence intervals for women (left) and men (right). Lower panels display fitted linear trends across income deciles by wave. COG-30 index ranges from 0-30, with higher scores indicating better cognitive functioning. Index combines immediate word recall (0-10), delayed word recall (0-10), verbal fluency (0-10), and numeracy tasks. Cognitive data not available for Waves 1 and 2. Sample restricted to retired individuals aged 60-79. All estimates use SHARE sampling weights.

The upper panes demonstrate extensive overlap in confidence intervals across income deciles, indicating high uncertainty in the estimates and limited statistical power to detect meaningful differences. Most notably, several waves exhibit counterintuitive patterns, where lower-income deciles outperform higher-income groups, contradicting the expected socioeconomic gradients. The fitted linear trends in the lower panels highlight this instability, with slopes varying dramatically across waves and even changing sign between survey periods.

This erratic pattern suggests that cognitive functioning among retirees may be less systematically related to income than other health measures, possibly due to measurement challenges, small sample sizes for cognitive assessments, or genuine heterogeneity in cognitive ageing processes that are not well captured by simple income-based stratification. The lack of a consistent gradient across waves makes it difficult to draw reliable conclusions about socioeconomic inequalities in cognitive health among this population.

To summarise the evolution of the slope in the health income gradient across health metrics, we graph the slopes of the regression lines from the income-health profiles for women and men

Figure 7: Income-Health Gradient for Women across Waves



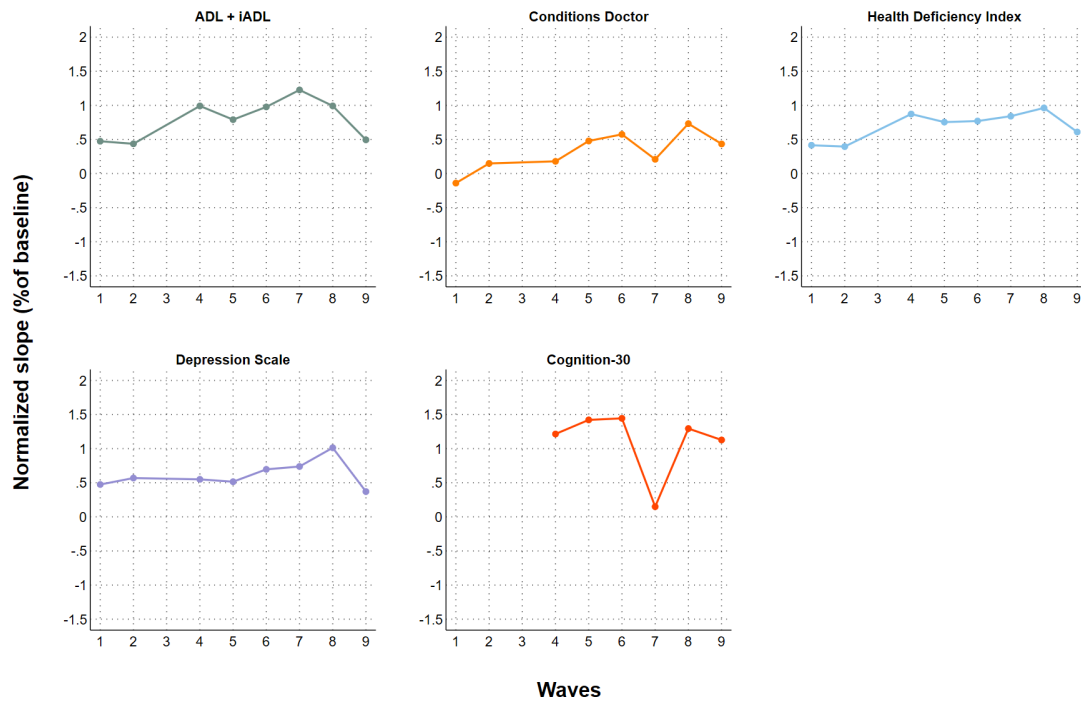
Note: Authors' own calculations based on SHARE release 9.0.0, with sampling weights applied. Slopes of income-health gradients from the regression lines for the metrics presented in Figures 9 through 13. The mean health outcome for each metric in wave nine normalises the slopes. Numbers on the horizontal axes represent survey waves.

in Figures 7 and 8, respectively. Except for female cognitive health, there is no discernible trend in income health gradients across health metrics for men or women. The cognitive-health-income gradient for women declines sharply from wave four (the first wave where it is assessed) to wave seven; however, cognitive health displayed the most inconsistent pattern across the income distribution of all health metrics, and this development over time may be an artefact of these inconsistent patterns.

3.1 Income-Health Gradients in terms of Age-Related Decline

In this subsection, we transform observed level differences in subjective health into a metric that is directly comparable across health measures and can be interpreted in real-world terms. Figure 9, based on functional health, illustrates the approach. Here, we define "good or very good" functional health as having a score above the 60th percentile in the overall distribution of individuals aged 65 to 89 in Wave One (2004). The left pane of the figure depicts how the percentage of individuals with good or very good functional health decreases with age, while the

Figure 8: Income-Health Gradient for Men across Waves



Note: Authors' own calculations based on SHARE release 9.0.0, with sampling weights applied. Slopes of income-health gradients from the regression lines for the metrics presented in Figures 9 through 13. The mean health outcome for each metric in wave nine normalises the slopes. Numbers on the horizontal axes represent survey waves.

Figure 9: Functional Health by Age, Year and Income Decile



Note: Authors' own calculations based on SHARE release 9.0.0, with sampling weights applied. The left panel reports the proportion of individuals in good or very good health—defined as the top 40 percent of the functional health distribution in 2004, disaggregated by age. The right panel displays the share of respondents in good or very good health across three income groups over time. The concept of catch-up time is illustrated in the 2006 data by comparing the health gap between income deciles 9 and 2: the red lines translate this gap into the equivalent number of years of aging required for lower-income individuals to reach the health level observed among higher-income individuals.

right pane tracks changes in this percentage over time for the second, fifth, and ninth income deciles.

To interpret these differences across the income distribution, we translate the income-related variation in the right pane into an equivalent measure expressed in years of age, as shown in the left pane. In other words, we calculate how much earlier an individual in a lower income decile, specifically the second, reaches the same health status as an individual in higher deciles, specifically the ninth. We refer to this measure as “catch-up time,” which represents the number of years a poorer individual would need to bridge to attain the same health level as a higher-income counterpart. In Figure 9, Wave 2 (2006) shows that individuals in the ninth income decile report an approximately 24 percentage-point higher probability of having good or very good functional health compared to those in the second decile, as shown in the right pane of Figure 9. Interpreted through the left pane, this gap corresponds to an additional 12 years spent in good or very good health for the higher-income group.

Catch-up time between the second and ninth income deciles remains constant during 2004-2011, before gradually narrowing to about three years in 2022, corresponding to an eight percentage point difference in the sample proportions with good or very good health. This reduction in catch-up time has been due to a growing proportion of good or very good functional health in income decile two, while the corresponding proportions for decile nine have been fairly constant. Splitting the income distribution at the median reveals that almost all of the narrowing of the overall gap was due to decile two improving functional health compared to decile five; indeed, from 2013 to 2022, the functional health of income deciles two and five is indistinguishable.

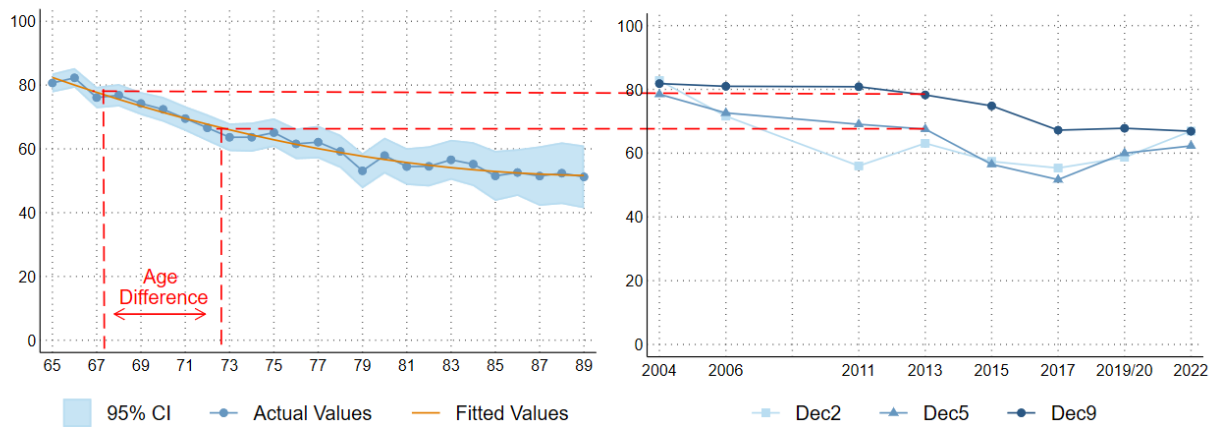
Figure 10 performs the same exercise of translating health differentials, now for diagnosed health, between income deciles in the cross-section into age-related decline. The figure depicts the percentage of the sample with diagnosed health to be good or very good. Wave 5 (2013) shows that individuals in the ninth income decile report an approximately 12 percentage-point higher probability of having good or very good diagnosed health compared to those in the fifth decile, as shown in the right pane of Figure 10. Interpreted through the left pane, this gap corresponds to an additional five years spent in good or very good health for the higher-income group.

The percentage of the sample in good or very good diagnosed health falls gradually over the sample period, from about 80 percent in 2004 to 65 percent in 2022. The income-diagnosed-health gradient begins in 2004 at a modest three percentage points and ends in 2022 at a similar level, but the gradient increases before declining during the intervening years. Except for 2011 (when there is a 12 percentage point difference in the proportion of those in good or very good health), diagnosed health is similar for the fifth and second income deciles; the income-diagnosed-health gradient is observed mostly in the upper half of the income distribution.

In Figure 11, we translate comprehensive health differentials between income deciles in the cross-section into age-related decline. The figure depicts the percentage of the sample with comprehensive health stated to be good or very good. Wave 7 (2017) shows that individuals in the ninth income decile report an approximately 16 percentage-point higher probability of having good or very good comprehensive health compared to those in the fifth decile, as shown in the right pane of Figure 11. Interpreted through the left pane, this gap corresponds to an additional eight years spent in good or very good comprehensive health for the higher-income group.

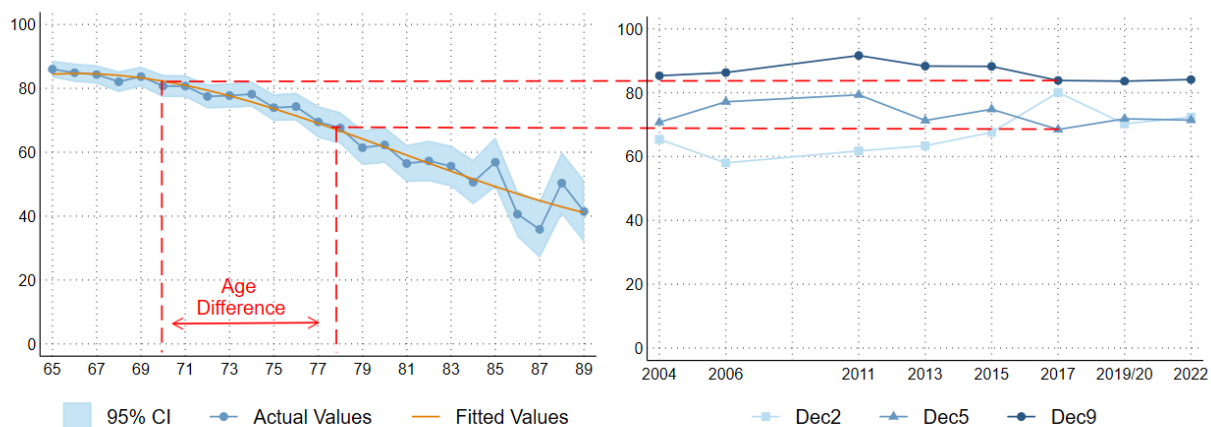
During the sample period, catch-up time for comprehensive health between income deciles five and nine remains fairly stable, with the percentages in good or very good comprehensive health rising by about ten percentage points to 2011 for both deciles, before falling back. The greatest change in comprehensive health across the income distribution is for decile two, with the catch-up time to decile five mostly decreasing over the sample period, and shrinking to zero by 2019. Hence, the reduction in the overall comprehensive health-income gradient is driven by

Figure 10: Diagnosed Health by Age, Year and Income Decile



Note: Authors' own calculations based on SHARE release 9.0.0, with sampling weights applied. The left panel reports the proportion of individuals in good or very good health—defined as the top 40 percent of the diagnosed health distribution in 2004, disaggregated by age. The right panel displays the share of respondents in good or very good health across three income groups over time. The concept of catch-up time is illustrated in the 2013 data by comparing the health gap between income deciles 9 and 5: the red lines translate this gap into the equivalent number of years of aging required for lower-income individuals to reach the health level observed among higher-income individuals.

Figure 11: Comprehensive Health by Age, Year and Income Decile



Note: Authors' own calculations based on SHARE release 9.0.0, with sampling weights applied. The left panel reports the proportion of individuals in good or very good health—defined as the top 40 percent of the comprehensive health distribution in 2004, disaggregated by age. The right panel displays the share of respondents in good or very good health across three income groups over time. The concept of catch-up time is illustrated in the 2013 data by comparing the health gap between income deciles 9 and 5: the red lines translate this gap into the equivalent number of years of aging required for lower-income individuals to reach the health level observed among higher-income individuals.

Figure 12: Mental Health by Age, Year and Income Decile



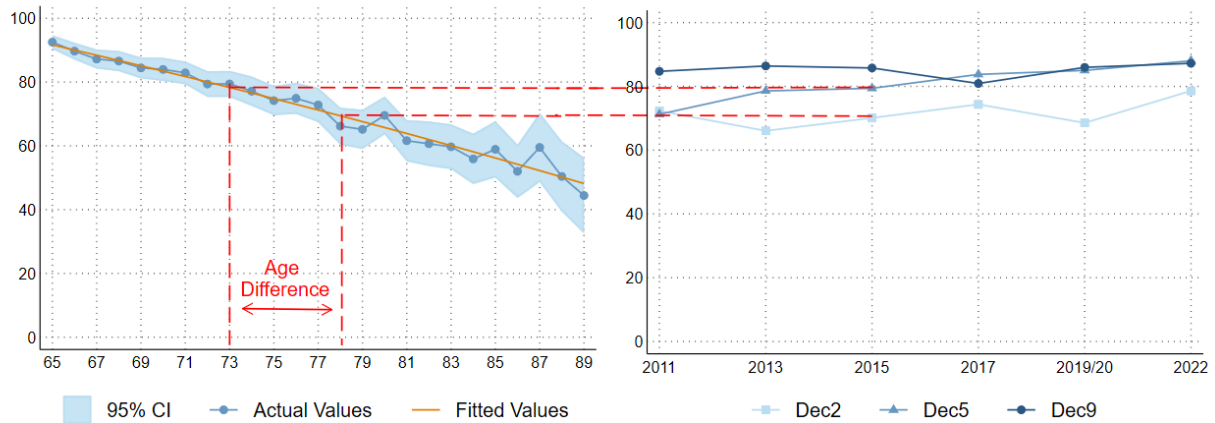
Note: Authors' own calculations based on SHARE release 9.0.0, with sampling weights applied. The left panel reports the proportion of individuals in good or very good health—defined as the top 40 percent of the mental health distribution in 2004, disaggregated by age. The right panel displays the share of respondents in good or very good health across three income groups over time. The concept of catch-up time is illustrated in the 2013 data by comparing the health gap between income deciles 9 and 5: the red lines translate this gap into the equivalent number of years of aging required for lower-income individuals to reach the health level observed among higher-income individuals.

improving health at the bottom of the income distribution.

Figure 12 translates mental health differentials between income deciles in the cross-section into age-related decline. The figure depicts the percentage of the sample with good or very good mental health. Wave 7 (2017) shows that individuals in the ninth income decile report an approximately 18 percentage-point higher probability of having good or very good mental health compared to those in the fifth decile, as shown in the right pane of Figure 12. This gap corresponds to an additional 19 years spent in good or very good health for the higher-income group. For all of the health metrics we consider, income inequality translates into the longest catch-up time for mental health because of the more gradual decline in mental health with age than with other measures of health.

Over the sample period, the difference in percentages between income deciles two and nine for good or very good mental health remains fairly constant at 20 percentage points (80-60). There are no evident asymmetries in the income-mental-health gradient above or below the

Figure 13: Cognitive Health by Age, Year and Income Decile



Note: Authors' own calculations based on SHARE release 9.0.0, with sampling weights applied. The left panel reports the proportion of individuals in good or very good health—defined as the top 40 percent of the cognitive health distribution in 2011, disaggregated by age. The right panel displays the share of respondents in good or very good health across three income groups over time. The concept of catch-up time is illustrated in the 2015 data by comparing the health gap between income deciles 5 and 2: the red lines translate this gap into the equivalent number of years of ageing required for lower-income individuals to reach the health level observed among higher-income individuals.

median.

In Figure 13, we translate cognitive health differentials between income deciles in the cross-section into age-related decline. The figure illustrates the percentage of the sample with cognitive health rated as good or very good. Wave 6 (2015) shows that individuals in the fifth income decile report an approximately 10 percentage-point higher probability of having good or very good cognitive health compared to those in the second decile, as shown in the right pane of Figure 13. Interpreted through the left pane, this gap corresponds to an additional five years spent in good or very good cognitive health for the higher-income group.

Over the sample period, the proportion of respondents reporting good or very good cognitive health increases slightly. While the ninth-second income decile difference in the percentage with good or very good cognitive health remains relatively consistent at around ten percentage points, the difference between deciles five and nine narrows, becoming indistinguishable from 2017 onwards. Hence, the cognitive-health-income gradient is only evident below median income for

the second half of the observation period.

The analysis shows that translating health disparities into age-related terms clarifies the extent of income-based inequality. Functional and comprehensive health initially displays large gaps between high- and low-income groups, equivalent to over a decade of additional good health. Still, these differences narrow substantially over time as lower-income groups improve. This catch-up dynamic suggests that inequality in certain aspects of physical health has decreased, primarily due to gains among the lower-income deciles.

In contrast, other domains reveal more persistent disparities. Diagnosed and cognitive health show modest, shifting income gradients that are asymmetric around median income, while mental health stands out as the most unequal, with broad and stable gaps translating into the longest catch-up times. Overall, health inequality remains multidimensional, with physical measures converging across income groups but mental health disparities proving far more resilient.

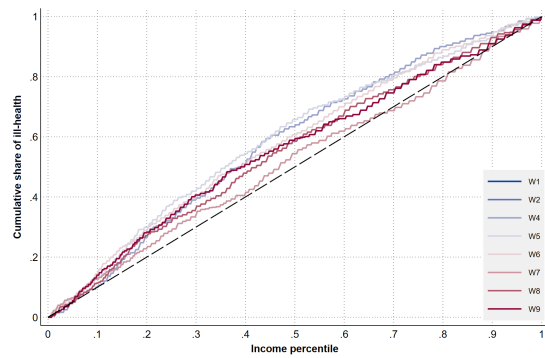
3.2 Health Concentration Indices

Another widely used approach to quantifying inequality relies on the *concentration curve*, which is conceptually related to the Lorenz curve but incorporates socioeconomic ranking into the analysis. Figure 14, panes a through e, presents the concentration curves constructed for each survey wave of the SHARE dataset. These curves depict the cumulative proportion of individuals reporting poor health status, ranked by income percentiles, against the cumulative distribution of the population. The 45-degree line serves as the line of equality, representing a hypothetical scenario in which poor health is distributed uniformly across the income distribution. Deviations from this benchmark indicate the degree of socioeconomic-related health inequality. Specifically, the further the concentration curve lies above and to the left of the line of equality, the greater the concentration of poor health among individuals in the lower income percentiles. Conversely, curves closer to the line of equality suggest a more even distribution of health outcomes across the income spectrum.

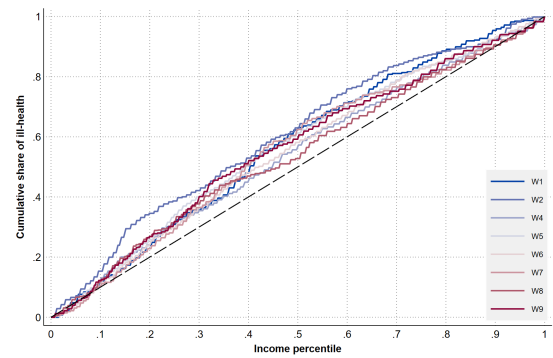
While there are no discernible differences in health concentration between waves, as demonstrated by the largely overlapping curves, the greatest health inequality by income is evident for functional and comprehensive health, as shown by the daylight between the lines of equality and all the concentration curves in panes d and e.

A summary measure derived from these curves is the *concentration index* (CI), directly comparable in interpretation to the Gini coefficient. Formally, the CI is defined as:

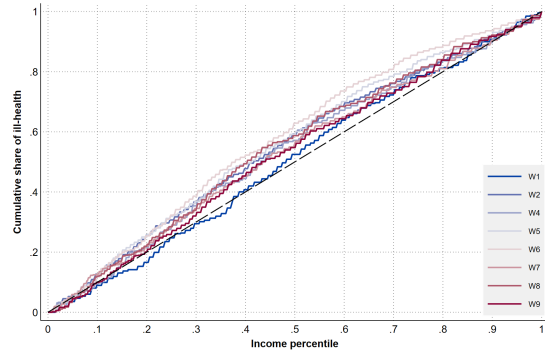
$$CI = \frac{1}{n\bar{h}} \sum_{i=1}^n h_i (2R_i - 1), \quad (1)$$



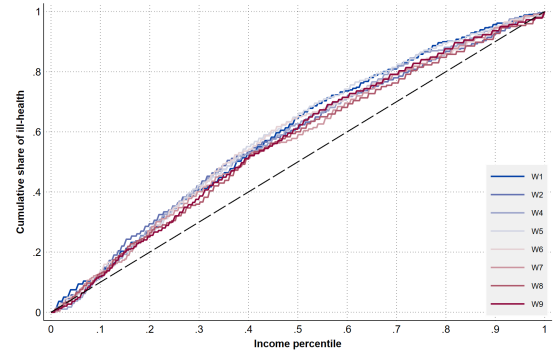
(a) Cognitive Health



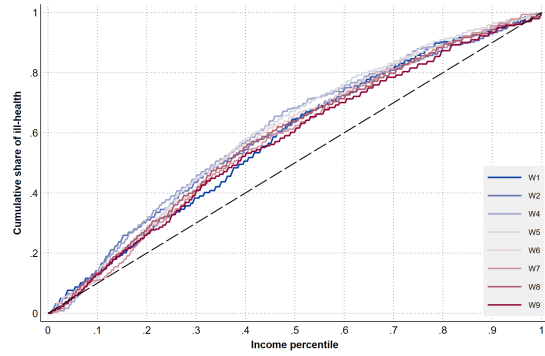
(b) Mental Health



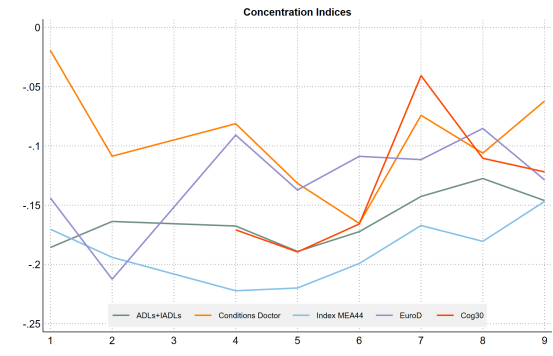
(c) Diagnosed Health



(d) Functional Health



(e) Comprehensive Health



(f) Health Concentration Indices

Figure 14: Health Concentration Curves

Note: Authors' own calculations based on SHARE release 9.0.0, with weights applied. The concentration curves depict the cumulative proportion of individuals reporting poor health across the income distribution. Equality in health outcomes would correspond to the 45-degree line; deviations to the left of this line indicate increasing inequality. The health concentration indices are summary measures of the concentration curves as defined in Equation 1. They are reported over time in pane f by health outcome, where lower values reflect greater inequality.

where h_i denotes the health status of individual i , $\bar{h}$ represents the mean health status across the sample, and R_i is the fractional rank of individual i in the income distribution (scaled between 0 and 1). A concentration index equal to zero denotes the absence of inequality, while increasingly negative values indicate larger degrees of inequality, reflecting stronger disparities in health associated with income rank.

Pane f of Figure 14 presents health concentration indices over time for each of the five health metrics. While health concentration is mostly lowest for diagnosed health, there is no clear pattern across waves in any of the health metrics.

This subsection applies the concentration curve and the corresponding CI to assess income-related health inequalities. The concentration curves illustrate that poor health is disproportionately concentrated among individuals with lower incomes, with the greatest inequality observed for functional and comprehensive health measures. However, the curves largely overlap across waves, indicating stability in inequality patterns over time. The CI, formally analogous to the Gini coefficient, provides a scalar summary of these distributions: values close to zero denote equality, whereas increasingly negative values reflect stronger inequality. Consistent with the curves, the indices reveal no clear time trend across waves and the lowest degree of concentration for diagnosed health.

4 Discussion

Our main analysis demonstrates robustness across alternative sample definitions and socioeconomic measures, illustrated in Online Appendix A.1. When changing our sample to include all individuals aged 65-79 regardless of retirement status, the patterns of modest, stable health inequalities persist, suggesting that our restriction to retirees does not artificially constrain the observed gradients. Similarly, replacing household income with net household wealth as our measure of socioeconomic position yields comparable results, with wealth-based deciles showing similar magnitudes and temporal stability in health disparities. This consistency across different socioeconomic indicators is particularly noteworthy given that income and wealth capture different aspects of economic resources—with wealth potentially reflecting longer-term economic security while income represents current economic flows.

Retirement reforms legislated in the mid 2000's and implemented since 2011 have gradually increased both early and normal retirement ages. The effects of postponing retirement on health are in general complex and mixed (see e.g., Kuhn (2018)). A priori it is not clear how the reforms in Denmark have affected health inequalities. One study investigating the effect of the retirement reform from 2011 on health and healthcare use finds a modest increase in GP visits around the early retirement age, and an increase in antidepressant use after, but small and insignificant

effects on comorbidities, painkillers and medication for cardiovascular disease. However, there is little heterogeneity in these impacts when the data are split by education ([Borgbjerg et al., 2024](#)).

A 2007 reform consolidating the municipality structure reduced the number of municipalities from 271 to 98. It concentrated specialised care into five broad regions instead of 14, possibly reducing access to care for individuals living in rural areas. It also gave incentives to municipalities to avoid referrals to the regional specialised hospitals. [Pedersen \(2007\)](#) reports evidence of only a modest substitution of about 2-5% referrals that were avoided as a result of the reform. There is little evidence on socioeconomic differences in the referrals avoided, although it is likely to be older individuals (say those residing in assisted living centres) and those with chronic illnesses who are most likely not referred on. On the other hand, because the regions no longer had to levy income and property taxes for financing healthcare and from 2007 on received block grants from the government, this may have had an equalising effect on access to care. In any case, according to [Pedersen \(2007\)](#), substituting municipal health care services for acute care under this reform is unlikely to have a substantial effect.

Another relevant reform during this time period is the plan to construct 16 "super hospitals" (university hospitals) dedicated to state-of-the-art, specialised care in the area of complex diseases. Since 2010, this has cost eight billion euros in 2023 prices ([Danish Ministry of Health, 2025](#)). Six of these super hospitals were constructed between 2012 and 2022. While comprehensive evaluation of this program has not been undertaken, some have raised equity concerns due to the increased distances to health care for rural populations after the centralization and the possible exclusion of marginalized groups such as the elderly and those with low health literacy, due to a greater reliance on digital health solutions ([Eriksen et al., 2023](#)).

Finally, the five cancer package reforms (In Danish: kræftpakke) enacted since 2000 have enforced a maximum waiting time of 14 days between a GP referral and assessment. [Khan et al. \(2023\)](#) conduct a before-and-after analysis on matched samples and find positive impacts on survival from breast cancer and a reduced risk of early retirement. While they find some evidence of lower income among patients observed after the reform compared to before, they caution that their findings may be influenced by survivor bias. Thus, there is currently little evidence to suggest that recent reforms to either the pension or healthcare system have significantly improved or worsened socioeconomic inequalities in health in Denmark.

5 Conclusion

We provide evidence on the evolution of health inequalities among retirees in Denmark from 2004 to 2022, utilising rich income and subjective health data from SHARE. By examining five distinct

dimensions of health—functional, diagnosed, comprehensive, mental, and cognitive—across income deciles, the analysis provides insight into socioeconomic gradients and their persistence over time. The findings highlight that, while certain physical health measures, such as functional and comprehensive health, have seen narrowing disparities owing to improvements among lower-income groups, mental health remains the domain with the most pronounced and enduring inequalities.

Temporal analysis reveals that the overall structure of health inequality is stable, with concentration indices showing little systematic change despite notable domain-specific dynamics. This stability suggests that recent pension and healthcare reforms in Denmark, including adjustments to retirement age and the expansion of specialised medical care, have not fundamentally altered patterns of socioeconomic health inequality among older adults. Moreover, the universal nature of Denmark's tax-financed health system continues to ensure minimal differences in healthcare utilisation across income groups, supporting the notion that observed health gradients largely reflect broader socioeconomic factors rather than differential access to services.

The study contributes to the literature by translating observed health disparities into interpretable, real-world terms using catch-up time, which expresses inequality as the equivalent years of health-related ageing needed for individuals in lower-income groups to match the health status of higher-income peers. This metric indicates that the gap in physical health outcomes has notably decreased. In contrast, gaps in mental health persist, requiring nearly two decades of additional healthy years to bridge the difference in some cases. Results further underscore the multidimensional nature of health inequality, with trends in cognitive health exhibiting considerable instability and inconsistent association with income, likely stemming from measurement and heterogeneity in cognitive ageing.

Robustness checks confirm the persistence of socioeconomic health gradients across various alternative specifications, including analyses using wealth-based deciles and samples that are not restricted to retired individuals. These supplementary results strengthen confidence in the generalizability of the main findings, indicating that the conclusion holds across different operationalisations of socioeconomic position and population groups.

The policy implications of these findings are clear. While Denmark's welfare and healthcare system provides a strong foundation for reducing physical health disparities, targeted interventions addressing mental health could be prioritised to achieve greater equity in health outcomes. The persistent gap in mental health suggests that there is scope for enhanced focus on psychosocial support, preventive mental health strategies, and accessible care for older adults, particularly among the socioeconomically disadvantaged. Further, continued monitoring of health gradients is warranted as future pension and healthcare reforms unfold in an ageing population.

In summary, this study highlights significant trends and persistent challenges in health

inequality among older adults, revealing both progress and remaining barriers to achieving equitable health across socioeconomic groups. The multidimensional approach offers valuable insights into the evolution of disparities within Denmark's policy context, emphasising the need for ongoing attention to mental health and the varying trajectories of health domains as societies navigate demographic change.

References

- Abeliansky, A. L. and Strulik, H. (2019). Long-run improvements in human health: Steady but unequal. *The Journal of the Economics of Ageing*, 14:100189. [5](#)
- Borgbjerg, A. K., Sigaard, H. S., Vejlin, R., and Svarer, M. (2024). Delayed retirement: Effects on health and healthcare utilization. In Sigaard, H. S., editor, *Estimating Individual Responses to Tax and Transfer Policies*, page Chapter 2. Aarhus Universitet, Aarhus. PhD thesis, Department of Economics and Business Economics, Aarhus University. Awarded 5 May 2024. ISBN 9788793943667. [26](#)
- Börsch-Supan, A., Brandt, M., Hunkler, C., Kneip, T., Korbmacher, J., Malter, F., Schaan, B., Stuck, S., and Zuber, Sabrina, o. b. o. t. S. C. C. T. (2013). Data resource profile: The survey of health, ageing and retirement in europe (share). *International Journal of Epidemiology*, 42(4):992–1001. [4](#)
- Börsch-Supan, A. et al. (2022). Survey of health, ageing and retirement in europe (share) release 9.0.0. SHARE-ERIC, Munich Center for the Economics of Aging (MEA). Release version: 9.0.0, published on 15.11.2022. [3](#)
- Börsch-Supan, A., Ferrari, I., and Salerno, L. (2021). Long-run health trends in europe. *The Journal of the Economics of Ageing*, 18:100303. [5](#)
- Danish Ministry of Health (2025). The super hospital programme: Structural reform of the danish healthcare sector. Technical report, Danish Ministry of Health. Accessed September 23, 2025. [26](#)
- Eriksen, J., Ebbesen, M., Eriksen, K. T., Hjermitsev, C., Knudsen, C., Bertelsen, P., Nøhr, C., and Weber, D. (2023). Equity in digital healthcare – the case of denmark. *Frontiers in Public Health*, 11:1225222. [26](#)
- Harris, S. J. and Dowson, J. H. (1982). Recall of a 10-word list in the assessment of dementia in the elderly. *British Journal of Psychiatry*, 141(5):524–527. [6](#)
- HMD, H. M. D. (2025). [9](#)
- Katz, S., Ford, A. B., Moskowitz, R. W., Jackson, B. A., and Jaffe, M. W. (1963). Studies of illness in the aged: The index of ADL: A standardized measure of biological and psychosocial function. *JAMA*, 185(12):914–919. [4](#)
- Khan, H., Rudolfson, J. H., Olsen, J., Borgquist, S., and Poulsen, P. B. (2023). Improvements in survival and early retirement rates – real-world evidence on danish breast cancer patients 2004–2018. *Cancer Management and Research*, 15:43–53. [26](#)
- Kuhn, A. (2018). The complex effects of retirement on health. *IZA World of Labor*, pages 430–430. [25](#)
- Lawton, M. P. and Brody, E. M. (1969). Assessment of older people: Self-maintaining and instrumental activities of daily living. *The Gerontologist*, 9(3):179–186. [4](#)

- Mackenbach, J. P., Kulhánová, I., Artnik, B., Bopp, M., Borrell, C., Clemens, T., Costa, G., Dikken, C., Kalediene, R., Lundberg, O., Martikainen, P., Menvielle, G., Strand, B. H., Wojtyniak, B., Lundberg, U., Nusselder, W. J., and the EURO-GBD-SE Consortium (2016). Changes in mortality inequalities over two decades: register based study of european countries. *BMJ*, 353:i1732. [3](#)
- Marmot, M. (2005). Social determinants of health inequalities. *The Lancet*, 365(9464):1099–1104. [3](#)
- Ministry of Finance - Denmark (2006). Stability and convergence programme 2006–2007: Denmark. Technical report, European Commission. Includes the Agreement on Future Prosperity, Welfare and Investments in the Future (“The Welfare Agreement”). [3](#)
- Ministry of Finance - Denmark (2011). Convergence programme 2011: Denmark. Technical report, European Commission. Includes the 2011 Retirement Reform. [3](#)
- Mitnitski, A., Mogilner, A., and Rockwood, K. (2001). Accumulation of deficits as a proxy measure of aging. *TheScientificWorldJournal*, 1:323–36. [5](#)
- Pedersen, K. M. (2007). Kommunalreformen og sundhedsvæsenet – en forbedring? *Ledelse & Erhvervsøkonomi*, (4). [26](#)

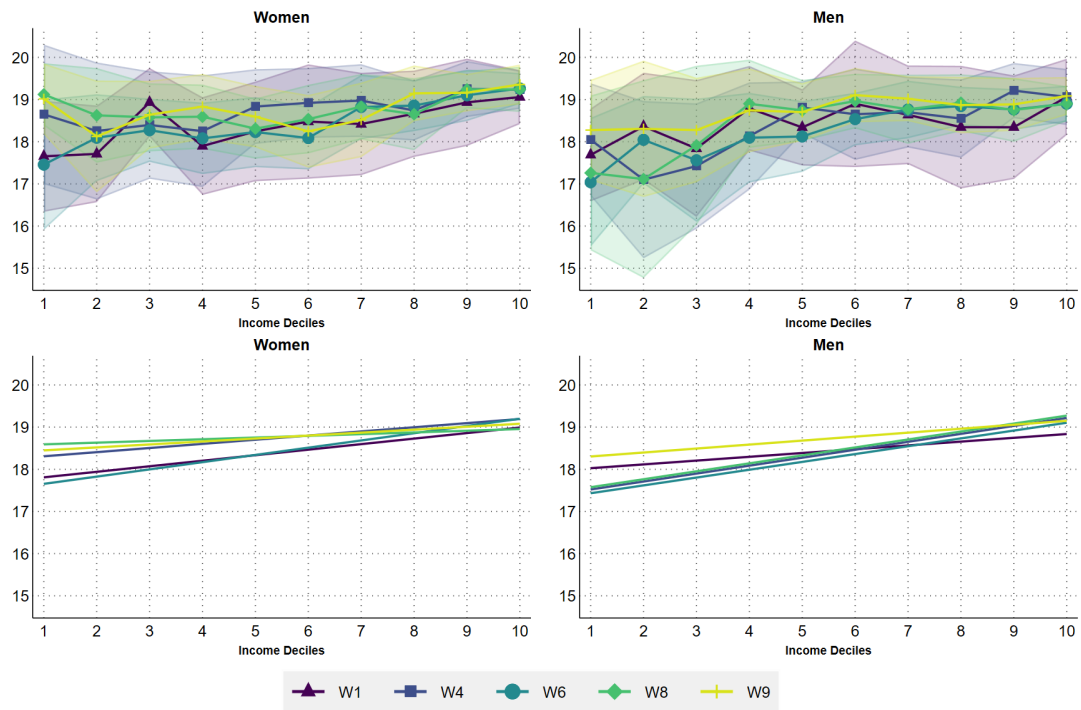
A Online Results Appendix

A.1 Robustness: Alternative Sample Definitions and Socioeconomic Measures

To test the robustness of our findings, we examine health gradients under two alternative specifications. First, we extend the sample to include all individuals aged 65-79 regardless of retirement status (Figures [A1](#) to [A5](#)). Second, we replace household income with net household wealth as our measure of socioeconomic position among retirees aged 60-79 (Figures [A6](#) to [A10](#)).

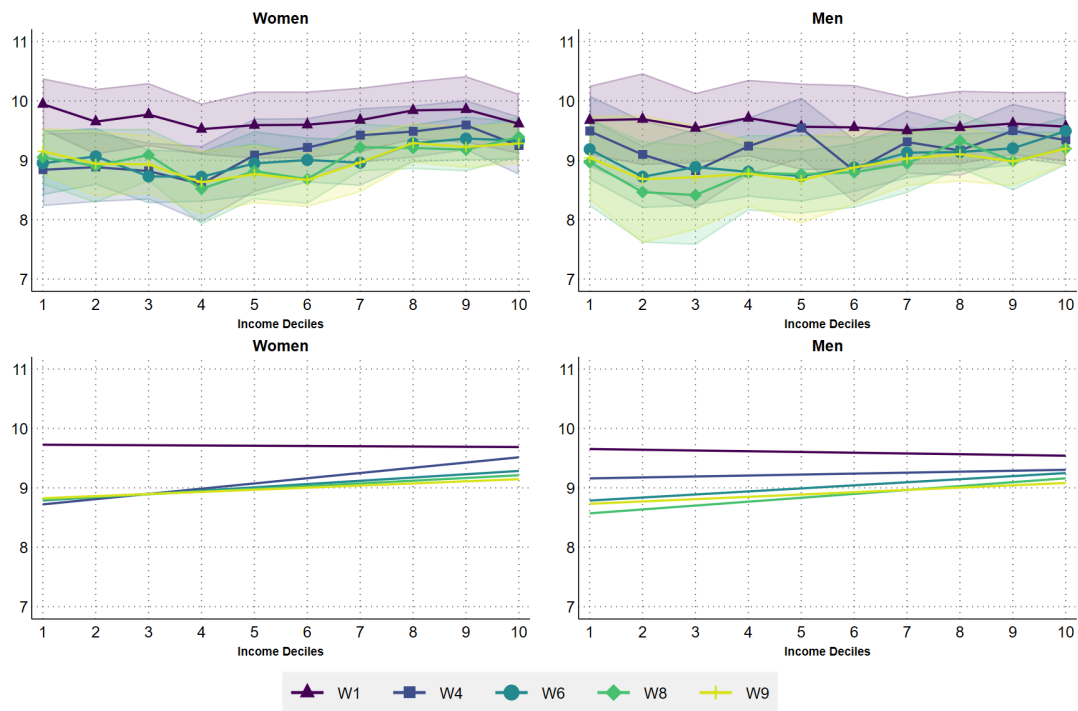
Both robustness checks confirm our main findings. The age-based sample shows similar patterns of health inequality across income deciles, suggesting that restricting to retirees does not drive our results. Using wealth instead of income reveals comparable socioeconomic gradients, indicating that our findings are not sensitive to the specific measure of economic resources. The persistence of health inequalities across these alternative specifications strengthens confidence in our core conclusions about the evolution of socioeconomic health disparities among older adults.

Figure A1: Functional Health



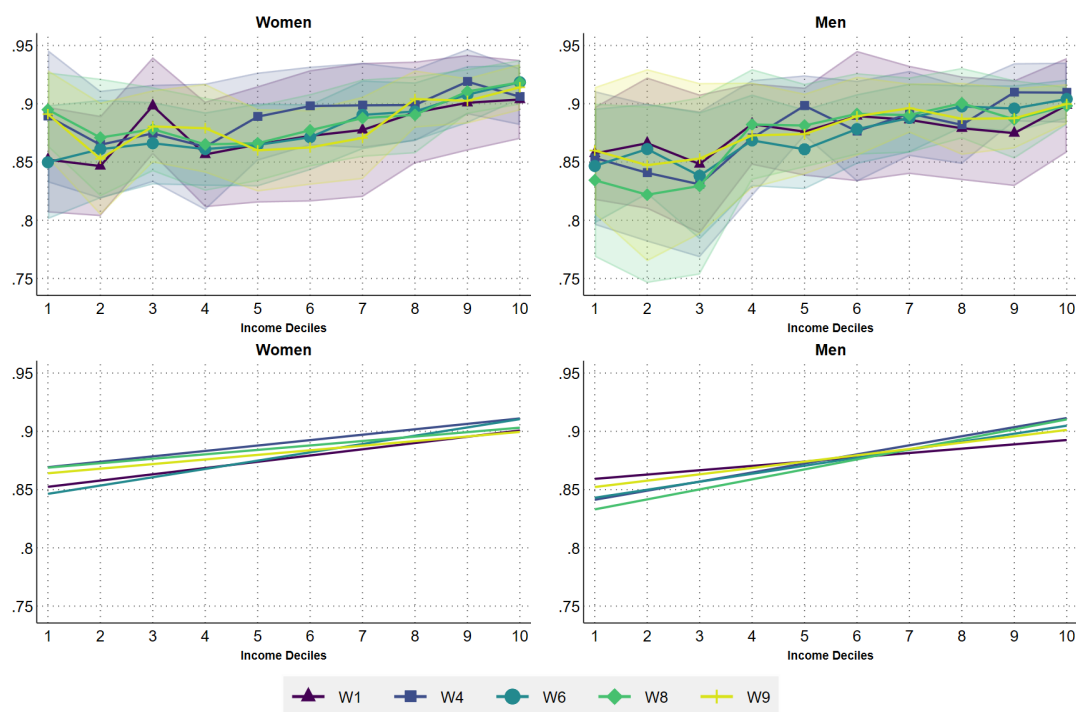
Note: Upper panels show health outcomes by income decile with 95% confidence intervals for women (left) and men (right). Lower panels display fitted linear trends across income deciles by wave. Higher scores indicate better functional independence (fewer limitations). Sample restricted to individuals above age 65-79. All estimates use SHARE sampling weights.

Figure A2: Diagnosed Health



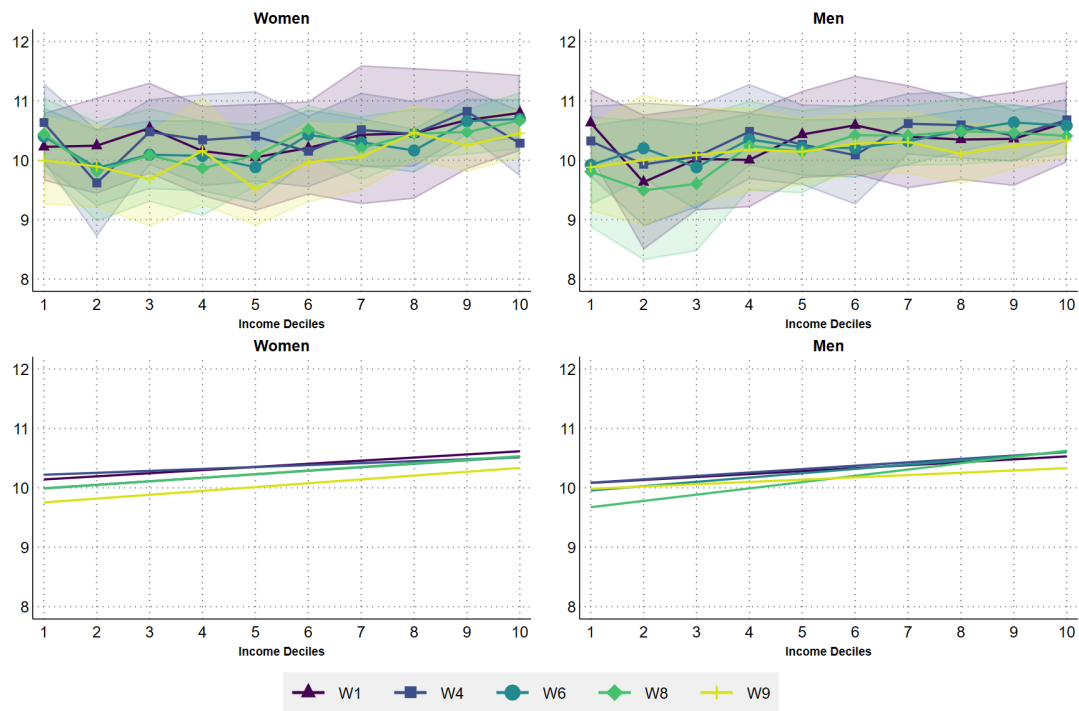
Note: Upper panels show health outcomes by income decile with confidence intervals for women (left) and men (right). Lower panels display fitted linear trends across income deciles by wave. Higher scores indicate fewer chronic conditions (better health). Chronic conditions include heart attack, hypertension, cholesterol, stroke, diabetes, lung disease, cancer, ulcer, Parkinson's, cataracts, and hip fracture. Sample restricted to individuals above age 65-79. All estimates use SHARE sampling weights.

Figure A3: Comprehensive Health



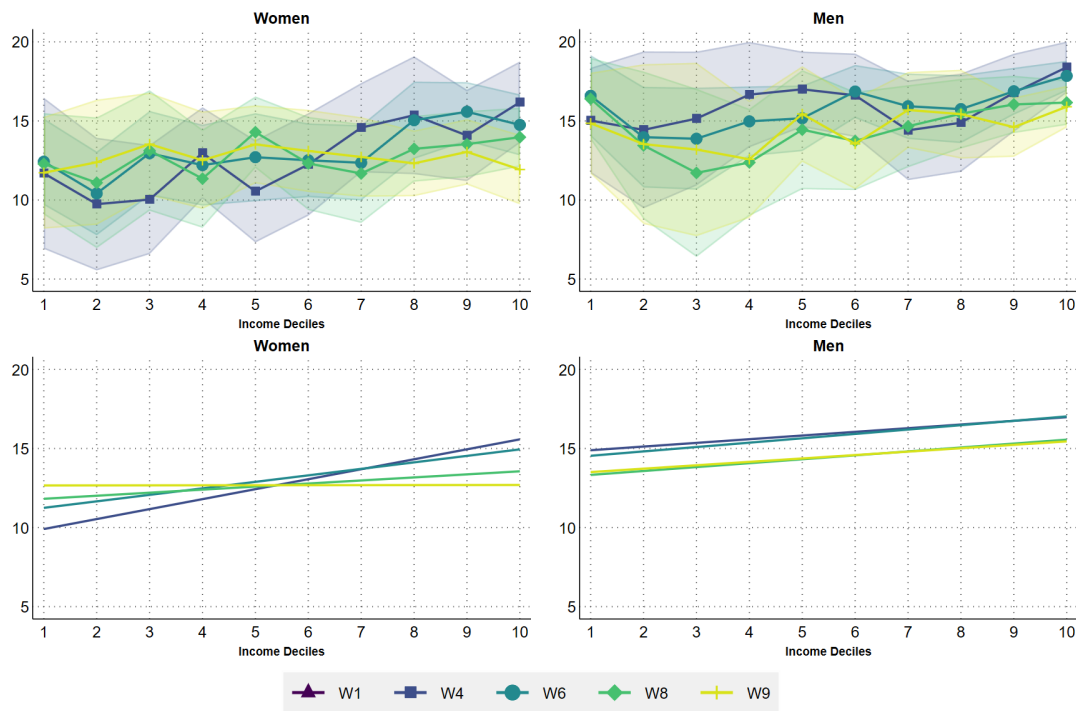
Note: Upper panels show health outcomes by income decile with confidence intervals for women (left) and men (right). Lower panels display fitted linear trends across income deciles by wave. Health Deficiency Index ranges from 0 to 1, with higher scores indicating fewer health deficits (better overall health). Index constructed from 45 health variables following deficit accumulation approach. Sample restricted to individuals above age 65-79. All estimates use SHARE sampling weights.

Figure A4: Mental Health



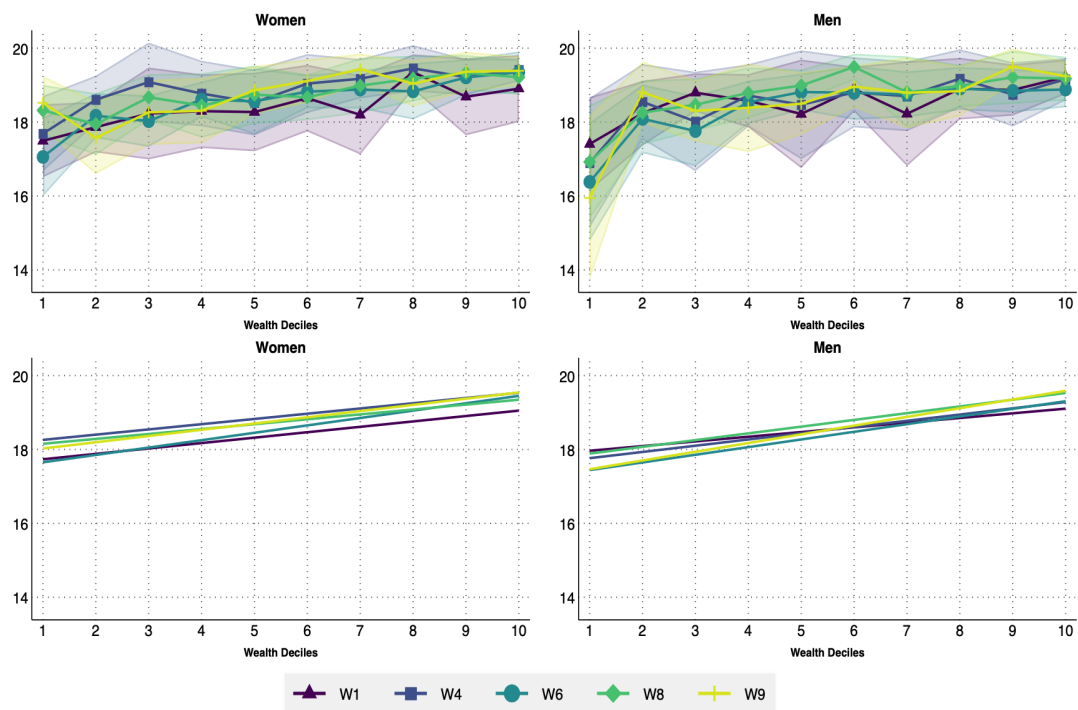
Note: Upper panels show health outcomes by income decile with confidence intervals for women (left) and men (right). Lower panels display fitted linear trends across income deciles by wave. EURO-D scale ranges from 0-12, with higher scores indicating better mental health (fewer depressive symptoms). Scale captures symptoms including sadness, pessimism, irritability, loss of interest, and fatigue. Sample restricted to individuals above age 65-79. All estimates use SHARE sampling weights.

Figure A5: Cognitive Health



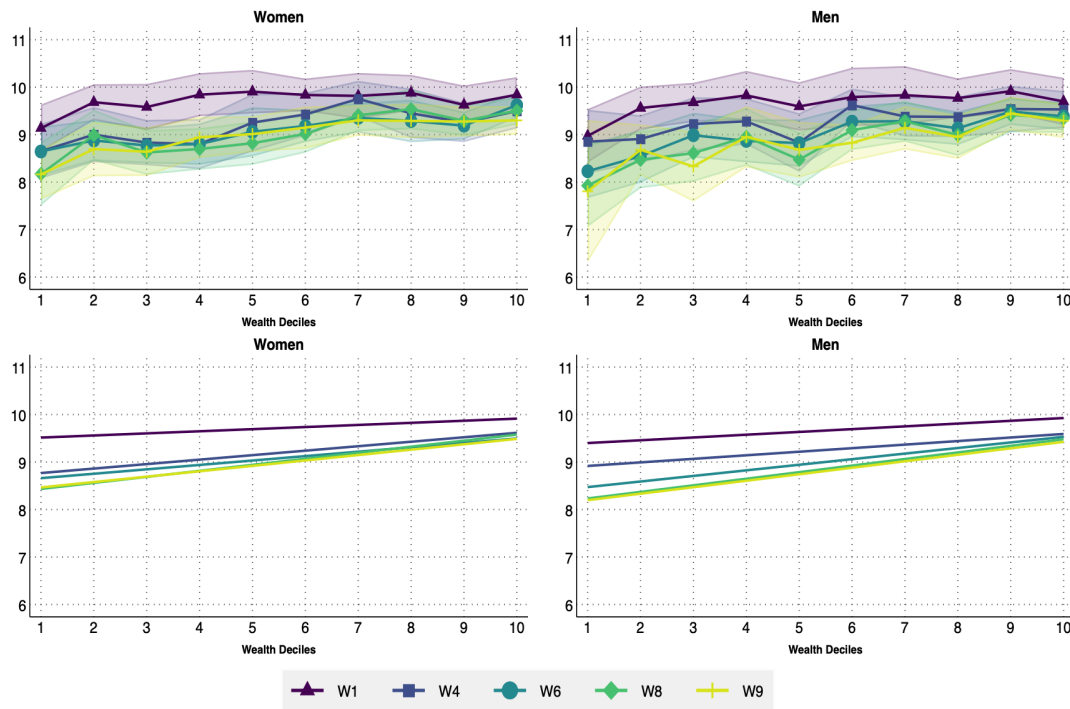
Note: Upper panels show health outcomes by income decile with confidence intervals for women (left) and men (right). Lower panels display fitted linear trends across income deciles by wave. COG-30 index ranges from 0-30, with higher scores indicating better cognitive functioning. Index combines immediate word recall (0-10), delayed word recall (0-10), verbal fluency (0-10), and numeracy tasks. Cognitive data not available for Waves 1 and 2. Sample restricted to individuals above age 65-79. All estimates use SHARE sampling weights.

Figure A6: Functional Health



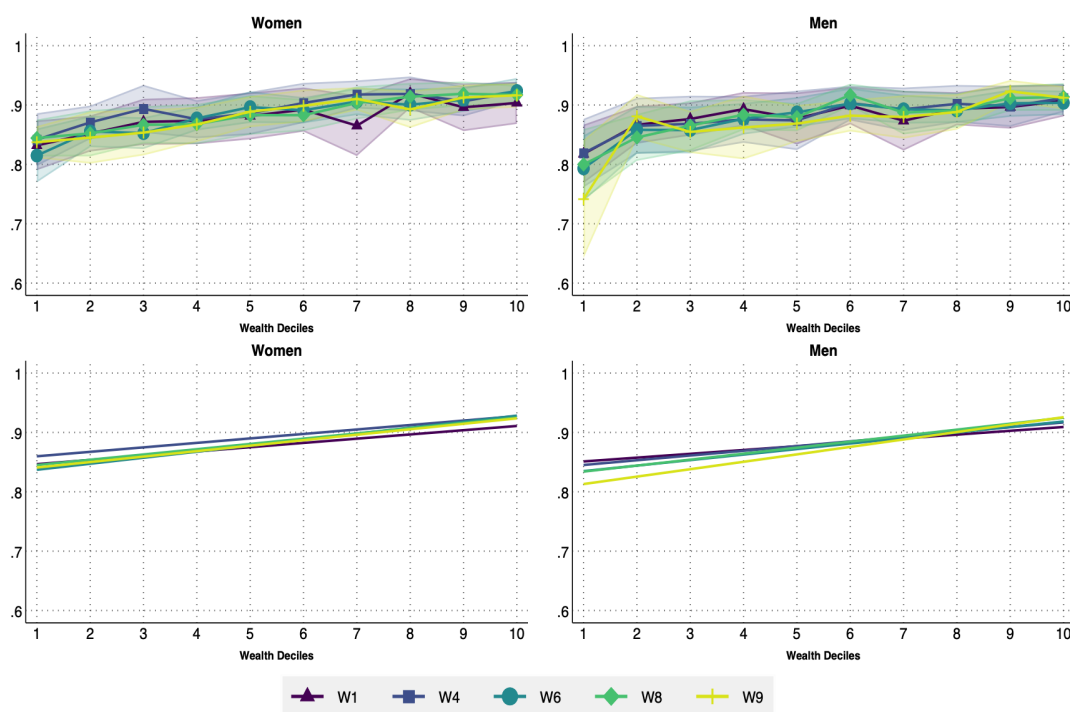
Note: Upper panels show health outcomes by wealth decile with 95% confidence intervals for women (left) and men (right). Lower panels display fitted linear trends across wealth deciles by wave. Higher scores indicate better functional independence (fewer limitations). Sample restricted to retired individuals above age 60-79. All estimates use SHARE sampling weights.

Figure A7: Diagnosed Health



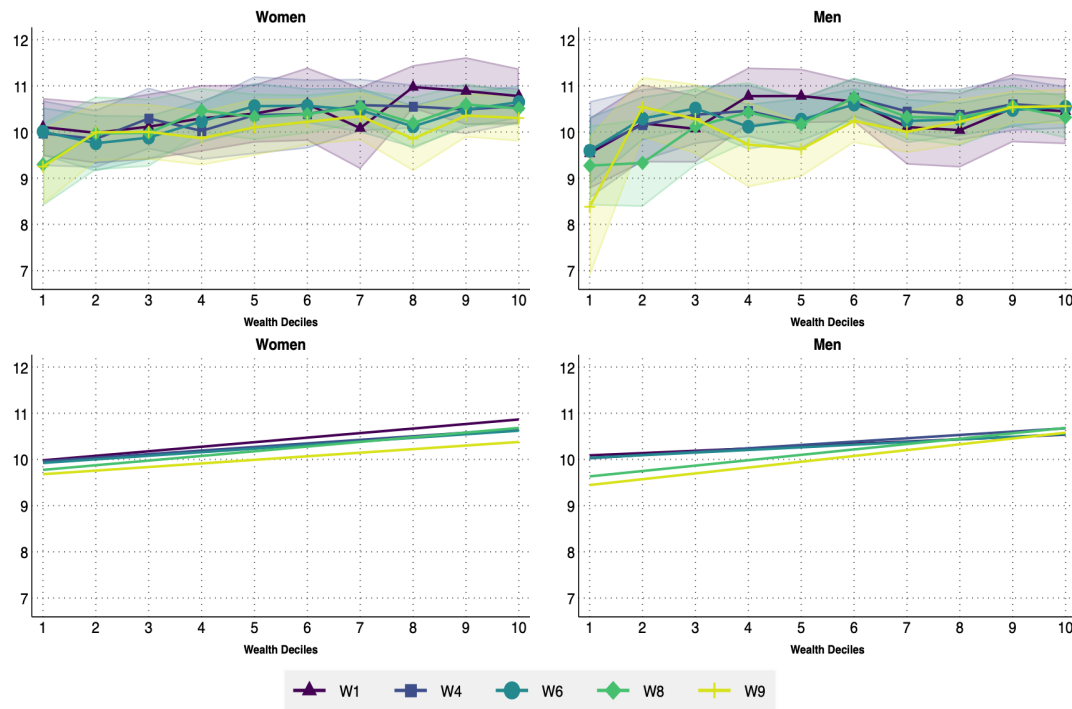
Note: Upper panels show health outcomes by wealth decile with confidence intervals for women (left) and men (right). Lower panels display fitted linear trends across wealth deciles by wave. Higher scores indicate fewer chronic conditions (better health). Chronic conditions include heart attack, hypertension, cholesterol, stroke, diabetes, lung disease, cancer, ulcer, Parkinson's, cataracts, and hip fracture. Sample restricted to retired individuals above age 60-79. All estimates use SHARE sampling weights.

Figure A8: Comprehensive Health



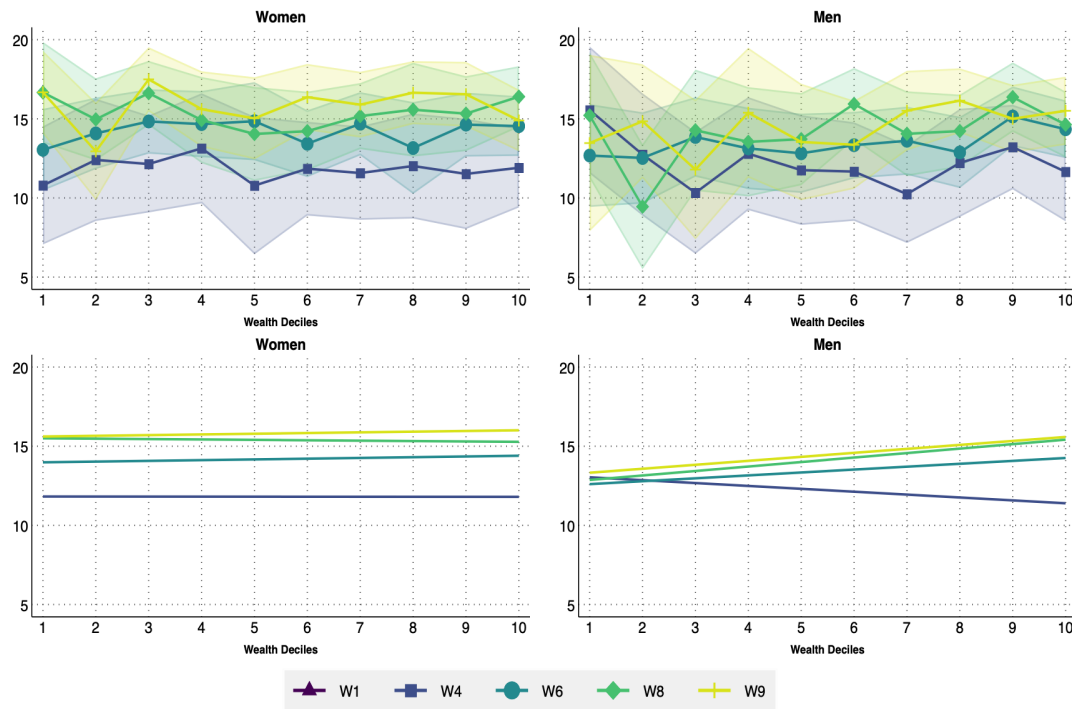
Note: Upper panels show health outcomes by wealth decile with confidence intervals for women (left) and men (right). Lower panels display fitted linear trends across wealth deciles by wave. Health Deficiency Index ranges from 0 to 1, with higher scores indicating fewer health deficits (better overall health). Index constructed from 45 health variables following deficit accumulation approach. Sample restricted to retired individuals above age 60-79. All estimates use SHARE sampling weights.

Figure A9: Mental Health



Note: Upper panels show health outcomes by wealth decile with confidence intervals for women (left) and men (right). Lower panels display fitted linear trends across wealth deciles by wave. EURO-D scale ranges from 0-12, with higher scores indicating better mental health (fewer depressive symptoms). Scale captures symptoms including sadness, pessimism, irritability, loss of interest, and fatigue. Sample restricted to retired individuals above age 60-79. All estimates use SHARE sampling weights.

Figure A10: Cognitive Health



Note: Upper panels show health outcomes by wealth decile with confidence intervals for women (left) and men (right). Lower panels display fitted linear trends across wealth deciles by wave. COG-30 index ranges from 0-30, with higher scores indicating better cognitive functioning. Index combines immediate word recall (0-10), delayed word recall (0-10), verbal fluency (0-10), and numeracy tasks. Cognitive data not available for Waves 1 and 2. Sample restricted to retired individuals above age 60-79. All estimates use SHARE sampling weights.

