University of Groningen

Faculty of Spatial Sciences

Population Research Center

Master Thesis

The Impact of Retirement on the Health of Older Adults & How Retirement Affects Social Inequality in Health

Supervisors:

Prof. Dr. Louise Meijering (University of Groningen)

Prof. Dr. Karsten Hank (University of Cologne)

Submitted by:

Ena Peters

M.Sc. Population Studies

Student number: S5750768

Date of submission: 12th of August 2024

Abstract

Due to population ageing, more people in Europe are transitioning from work to retirement while retirement ages are increasing to sustain pension systems. Based on the theoretical background of the accumulation model and the sensitive period model of the life course approach to health, this thesis investigates how retirement impacts the health of older adults and how retirement affects socioeconomic inequalities in health. To analyse the causal effect of retirement on older adults' self-perceived health, this thesis estimated multiple fixed-effects regression models using panel data from eight waves of the Survey of Health, Ageing and Retirement in Europe (SHARE). Results showed a significant positive within-person change in self-perceived health for individuals transitioning to retirement in anticipation of retirement, in the year of the event, and up to 2 years after. Moreover, the analysis suggested a health-preserving effect of retirement in the long term. Analysis revealed that the immediate impact of retirement on self-perceived health is comparable across individuals with a different socioeconomic status. Consequently, socioeconomic inequalities in health were not found to be affected by the event of retirement in a meaningful way. However, in the long term, the results suggested a decrease in the socioeconomic gap in health between individuals with a high and individuals with a low socioeconomic status.

Keywords: Retirement, Self-perceived health, Socioeconomic status, Inequality, Life course approach, Fixed-effects panel regression, SHARE

Word count: 18,720 (main text excluding tables and figures)

Table of Content

List of Tables

List of Figures

List of Abbreviations

AIC	Akaike information criterion
ATE	Average treatment effect
ATT	Average treatment effect on the treated
BIC	Bayesian information criterion
CI	Confidence interval
CVD	Cardiovascular disease
EU	European Union
FE	Fixed effects (regression)
GenAI	Generative artificial intelligence
H1/2/3a, b, c	Hypothesis 1/2/3/a, b, c
ISCED	International standard classification of education
M0/M1/M2…	Model 0, Model 1, Model 2…
n	Number of persons
N	Number of observations
RE	Random effects (regression)
SD	Standard deviation
SES	Socioeconomic status
SHARE	Survey of Health, Ageing and Retirement in Europe
SPH	Self-perceived health

1. Introduction

Background and Problem Statement

Worldwide the proportion of older people is increasing due to the demographic transition and population ageing. For the European Union, the European Commission estimates that life expectancy will increase further until 2070, increasing from an average life expectancy of 78.4 years for men in 2022 to 86.1 years in 2070 and for females from 84.0 years in 2022 to 90.4 years in 2070 (European Commission, 2023). This demographic shift to an older population structure leads to an increase in the share of retired people, who spend a longer time in retirement due to the increased average life expectancy (Eurostat, 2024; Grøtting & Lillebø, 2020). To sustain the public pension systems and lower the old-age dependency ratio, governments try to prolong working lives by increasing the statutory retirement age (European Commission & Social Protection Committee, 2021). Until 2070 the average statutory retirement age in the EU is expected to increase from around 65 to about 67 years (European Commission, 2024). However, the exact ages differ depending on the country. In Belgium, for example, the retirement age will be increased from 65 years in 2020 to 67 years in 2030 while Ireland will increase it from 66 years in 2020 to 68 years in 2028 (European Commission & Social Protection Committee, 2021). In 2022 the retirement ages in the EU (for a person who entered the labour force at 22) ranged from 62 years for males and females in Greece and Luxembourg (amongst others) to 66.6 years in the Netherlands (OECD, 2023). The average effective age at which EU citizens exit the labour market is usually lower than the statutory retirement age. Currently, people in the EU enter retirement on average at the age of 63.6, which is estimated to increase in parallel with the statutory retirement age by approximately 2 years until 2070 (European Commission, 2024). Despite these retirement reforms, retirement duration, which has decreased slightly since 2018 from an average of 21.0 years spent in retirement to 20.8 years, has been estimated to increase by 3 to 4 years until 2070 due to the expected increase in life expectancies (European Commission, 2024; European Commission & Social Protection Committee, 2021). This means that, on average, people will spend a larger share of their lifespan in retirement.

With more people transitioning from work to retirement and spending longer periods in retirement, but also with the retirement reforms in the EU, it is important to know how the event of retirement affects the health of older adults, to understand the underlying mechanisms and to be aware of potential health inequalities caused by retirement. Research on the effect of retirement on health is growing, but findings have been contradictory, as positive, negative and no effects of retirement on health have been reported (Grøtting & Lillebø, 2020). The heterogeneity in the relationship between retirement and health found in the research literature can be explained by differences between the studies, such as the measure of health used, the method of analysis applied, the timeframe observed or the country context (De Breij et al., 2020; Leimer & Van Ewijk, 2022; Nishimura et al., 2018).

Studies also show horizontal inequalities depending on, for example, a person's gender or migration status, and vertical inequalities depending on characteristics such as socioeconomic status (SES), income, and level of education (Hasselhorn, 2020). For the health outcome of self-reported health, which I used in this thesis, studies have generally found a positive effect of retirement on health (Garrouste & Perdrix, 2022; Gorry et al., 2018; Leckcivilize & McNamee, 2022; Nishimura et al., 2018; Rose, 2020; Westerlund et al., 2009). However, studies have been inconclusive as to whether the effect of retirement on self-perceived health[1] differs between individuals depending on their socioeconomic status (Heller-Sahlgren, 2017; Leckcivilize & McNamee, 2022; Leimer & Van Ewijk, 2022; Westerlund et al., 2009).

Objective and Research Questions

To contribute to this literature, my thesis aims to analyse the causal effect of retirement on the health measure of self-perceived health over time. Building on the widely known existence of a socioeconomic gradient in health (Hasselhorn, 2020), a further focus of this thesis lies in investigating inequalities in the effect of retirement on health depending on people's socioeconomic status. I use the life course approach to health as a theoretical background to explain the accumulation of health advantages and disadvantages until retirement. Furthermore, the theory also relates to the relevance of understanding retirement as a critical life event and a sensitive period for an individual's older age health trajectories. The main research question of this thesis asks: *how does retirement affect the health of older adults?* This general question is specified further by the three sub-questions: (1) *How does retirement affect health before, during and after the event?* (2) *How does the effect of retirement on health differ between people depending on their socioeconomic status?* (3) *How does retirement affect the socioeconomic inequality in health?*

[1] In this thesis, the terms self-perceived health, self-rated health, self-assessed health and the umbrella term subjective health are used synonymously.

To answer the research questions, my thesis uses eight waves of longitudinal data provided by the Survey of Health, Ageing, and Retirement in Europe (SHARE) from 2004/06 to 2021/22. The panel data allows me to model the effects of retirement over time by measuring the average change in an individual's self-perceived health as they transition from working life to retirement. The main method of analysis employed is fixed effects (FE) panel regression. Three specifications of the FE regressions are modelled to estimate the average effect of retirement on self-perceived health (1), to analyse the effect separately for individuals with different socioeconomic backgrounds (2), and to test if differences are significant by including an interaction term between socioeconomic status and retirement (3). Further, the third sub-research question is answered using graphical exploration.

Structure of this Thesis

The thesis is structured as follows: the following chapter introduces the life course approach to health and reviews the research literature on the impact of retirement on health, the socioeconomic gradient in health and inequalities in the effect of retirement on health, before presenting the conceptual model and developing the hypotheses tested in the analysis of this thesis. Chapter 3 provides a background on the SHARE dataset and explains the operationalisation of the main variables. I proceed to describe the method of analysis and the sample selection process. The chapter will further include my reflection on ethical considerations and a description of the use of Generative artificial intelligence (Gen AI) in my research and writing process. Chapter 4 presents the descriptive, and analytical results of this paper as well as a robustness check of the results. The last chapter discusses the main findings, relates them to the scientific literature, and integrates them with the life course approach to health. It further highlights the limitations and strengths before concluding this thesis with an outlook on the implications for policy and research.

2. Theoretical Framework

2.1 Theory: The Life Course Approach to Health

The main theory used in this thesis is the life course approach to health. Life course theory, also known as life course epidemiology, was developed in the 1960s as a response to the findings of longitudinal studies of child development launched in the 1920s and 1930s which were extended beyond childhood and whose results could not be explained by existing theories but needed a theory spanning over the life course (Elder, 1998). The life course approach to health has therefore been developed as an interdisciplinary and analytical framework for investigating how individuals' current health is influenced by their past exposures and experiences (Burton-Jeangros et al., 2015; Kuh et al., 2003). The approach thereby emphasises the dynamic nature of health and shows that health is a lifelong developmental process for each individual (Burton-Jeangros et al., 2015; Wadsworth, 1997). The approach therefore allows studies to focus on long-term effects on health (Kuh et al., 2003).

The theory recognises that while biological prerequisites can determine adult health parameters, an individual's biological development is embedded in the individual's social context (Bartley et al., 1997; Wadsworth, 1997). Socioeconomic factors, experienced in childhood and beyond, influence health parameters also in later life, as they may increase or reduce an individual's vulnerability and resilience (Wadsworth, 1997). By integrating biological and social risk factors and processes, the approach considers early life factors such as the family environment and conventional later life risk factors such as smoking (Kuh et al., 2003). The socioeconomic status of a child's parents can, for example, affect the child's birthweight while health in later life may be significantly affected by the socioeconomic circumstances and experiences of adulthood (Popay et al., 1998). Bartley et al. (1997, p. 1194) have described these interactional processes as a cross-sectional clustering and longitudinal accumulation of health-related advantages and disadvantages. In summary, life course theory aims to analyse and explain the complex interaction between biological risks and social, economic and psychological factors in order to understand social variations in health. The approach provides a foundation for exploring inequalities in health such as the socioeconomic inequality in the impact of retirement on health analysed in this thesis (Bartley et al., 1997; Popay et al., 1998).

Most of the literature on the life course approach differentiates between the pathway model, the accumulation model, and the critical period model which are specifications of the main theory (a.o.: Burton-Jeangros et al., 2015; Kuh et al., 2003). First, the pathway model emphasises that experiences and exposures over the life course can lead to one another while increasing the risk of disease or bad health creating a chain of risks. The model is therefore also called the chain of risk model (Ben-Shlomo et al., 2023). It further highlights the role of mediators such as educational achievement, lifestyle and healthy habits in the relationship between early life and health in later life (Burton-Jeangros et al., 2015). Second, the accumulation model focuses on the accumulation of health-influencing behaviours, circumstances and conditions over the life course (Burton-Jeangros et al., 2015). It emphasises the importance of exposure over time as well as the sequence of exposure (Lynch & Smith, 2005). In the literature accumulation models often either emphasise the accumulation of health risks or the accumulation of advantages and disadvantages (Burton-Jeangros et al., 2015).

The third model concentrates on the role of critical or sensitive periods that occur over the life course. A critical period refers to a limited time or developmental window in which a certain exposure affects a later disease outcome in a protective or disadvantageous way (Ben-Shlomo et al., 2023; Kuh et al., 2003). The critical or sensitive period model of disease captures this unique causation and focuses on the importance of the timing of exposure (Lynch & Smith, 2005). While the term critical period is usually associated with a biological circumstance, the term sensitive period is used when referring to the social context (Burton-Jeangros et al., 2015). The term sensitive period usually also refers to a time of rapid individual change, but the extent to which the effect can be influenced outside of the specific time window is larger compared to a critical period (Kuh et al., 2003). Sensitive periods in human development include, amongst others, leaving the parental home, transitioning into parenthood, the onset of a chronic illness, or retirement which marks the exit from the labour market and is the sensitive period[2] that this thesis focuses on (Bartley et al., 1997).

Looking at the literature on the life course approach to health, it seems that the theory can either be used to focus on specific diseases or illnesses connected to the physical development of humans, or it can be applied as a more holistic and social approach to health. My utilisation of the approach follows the latter and adds to the theoretical background of this thesis in two main ways. First, building on the accumulation model, the theory can add to the explanation of the development of inequalities in health depending on an individual's socioeconomic status. The

[2] I will follow the terminological differentiation between critical and sensitive periods and use the term sensitive period to describe the event of retirement and the transitional phase out of the labour market.

balance of advantages and disadvantages that determines a person's health at an older age is unique to the person but is also a product of the person's socioeconomic position (Blane, 1997). Looking at the exposure to materialistic factors, it is for example, likely that a child who grows up in a wealthy home is more likely to achieve a high education that provides access to a privileged position in the labour market, which can then offer a higher pension at older ages (Blane, 1997). The materialistic exposures accumulate over the life course which can explain the socioeconomic gradient in health and mortality introduced in the following Chapter 3 (Blane, 1997). Second, retirement marks the transition out of working life and can be interpreted as not only an important life course event but also as a sensitive period in human development that influences health (Bartley et al., 1997). This interpretation relates to the sensitive period model. By combining the two models of the life course approach to health, the theoretical background of this thesis embeds the life course transition of retirement into the individual's long-term life trajectories[3] (Elder, 1998; Kuh et al., 2003).

2.2. Literature Review

Mechanisms behind the Effect of Retirement on Health

Exploring the mechanisms behind the effect of retirement on health, both positive and negative effects seem plausible as retirement marks a complex change and transitional phase in an individual's life course that may affect health through different channels. On the one hand, factors that may explain a positive effect of retirement on health include improved healthy behaviours after retirement, such as increased physical activity and more frequent exercise due to the additional leisure time available (Celidoni & Rebba, 2017; Insler, 2014). Reduced mental stress, decreased physical fatigue (Barban et al., 2020; Garrouste & Perdrix, 2022) and increased sleep quality can also promote good health in retirement (Rose, 2020). On the other hand, retirement can lead to a loss of purpose, a disruption of the daily structure, a decrease in social contacts and a reduction in income, which all may affect health negatively (Garrouste & Perdrix, 2022; Shiba et al., 2017). In addition, individuals experience a shift in their social status and societal role, which can lead to heterogeneous health effects depending on how this change is perceived by the individual (Garrouste & Perdrix, 2022).

[3] Trajectories refer to the long-term perspective, transition describes short-term changes in the state of an individual (Kuh et al., 2003).

Since retirement is a planned life course event, individuals may change their habits and health-related behaviour before transitioning out of the labour market, causing an anticipation effect of retirement on health (Barban et al., 2020). A special emphasis in this literature review is therefore placed on longitudinal studies which allow the observation of the impact of retirement on health over time. This emphasises retirement as a transitional period and as a life course event that may affect health differently depending on the time frame before or after the event that is being observed.

Overview of the Effect of Retirement on different Measures of Health

Most studies reviewed used data from European countries or the United States. An exception to this is a study by Shiba et al. (2017) which used data from Japan and literature review studies (Garrouste & Perdrix, 2022; Nishimura et al., 2018) which also considered research articles using data from Japan, South Korea, and China. Therefore, the focus of this review lies in the Western context of the impact of retirement on different health outcomes. Several studies have used SHARE to investigate the effect of retirement on health (Celidoni & Rebba, 2017; Coe & Zamarro, 2011; De Breij et al., 2020; Heller-Sahlgren, 2017; Leimer & Van Ewijk, 2022; Mazzonna & Peracchi, 2017; Sohier et al., 2021; Vo & Phu-Duyen, 2023). In terms of data, method and measure of health, the studies by De Breij et al. (2020) and Leimer & Van Ewijk (2022) are most similar to my present thesis (see Appendix A for the overview table of the main literature reviewed).

For measures, studies have reported a positive effect of retirement on self-reported health (Garrouste & Perdrix, 2022; Gorry et al., 2018; Leckcivilize & McNamee, 2022; Nishimura et al., 2018; Rose, 2020; Westerlund et al., 2009). Coe & Zamarro (2011) have found that retirement temporarily decreases the probability of individuals indicating to be in ill self-reported health and leads to a long-lasting improvement in a health index[4] which can be described as a preserving effect of retirement on general health. Regarding life satisfaction, Gorry et al. (2018) reported an improvement in this measure of health, while Sohier et al. (2021) found a decline in life satisfaction two years after the transition to retirement, and instead found a positive effect of retirement on well-being (measured using a variable for agency freedom) that remained stable for at least two years after retirement.

[4] The health index captures multiple measures of health such as self-reported health, the number of chronic diseases, grip strength, or the number of mobility limitations (Coe & Zamarro, 2011).

Studies focusing on physical measures of health have reported no effect of retirement on Cardiovascular diseases (CVD) in the United States but a negative effect on CVD in Europe (Xue et al., 2020). Furthermore, no effect of retirement on hospitalisation or mortality has been found in the context of Norway, while the effect on a physical health score was positive (Grøtting & Lillebø, 2020). Van Zon et al. (2016) found that retirement has a positive effect on functional health (limitations in mobility and muscle function) as they observed that the increase in functional decline prevalent leading up to retirement slowed down after individuals transitioned to retirement. Opposingly, Dave et al. (2008) have found that the six-year post-retirement period can be associated with an increase in difficulties with mobility and daily activities as well as with an increase in illness conditions. Both studies used data from the United States. Regarding the effects of retirement on physical health, the results presented above should be treated with caution, since the reported impacts for this type of health measure are ambiguous and studies are often difficult to compare (Garrouste & Perdrix, 2022).

Concerning the effect of retirement on mental health, several studies have reported a positive effect of retirement on depression as the prevalence of depression has been found to decrease upon retirement (Garrouste & Perdrix, 2022; Gorry et al., 2018; Nishimura et al., 2018). More specifically Vo & Phu-Duyen (2023) found a positive effect on mental health in the anticipation period before retirement but this positive effect dissolved after individuals spent two years in retirement (Vo & Phu-Duyen, 2023). A study using data from Japan found that depressive symptoms increased as soon as people entered retirement (Shiba et al., 2017), which is contradictory to the studies that reported a reduction in depressive symptoms upon retirement. The negative effect on mental health was found to be especially prevalent for men from lower occupational classes (Shiba et al., 2017). With increasing time spent in retirement, mental health seems to decline as Heller-Sahlgren (2017), using SHARE data, has reported a negative long-term effect of retirement on depression that was found to be robust for individual's characteristics and socioeconomic status. Dave et al. (2008) have also found that mental health declines in the years after retirement. Further, the effect of retirement on cognitive performance and cognitive abilities seems to be negative (Garrouste & Perdrix, 2022) or to become increasingly negative with time spent in retirement even when controlling for age (Mazzonna & Peracchi, 2017). In contrast, Coe & Zamarro (2011) found no causal effect of retirement on depression or cognitive abilities.

The contradicting findings regarding the effect of retirement on physical and mental health cannot be explained by the context in which the studies were carried out since no clear pattern can be observed for the studies using data from the United States (Dave et al., 2008; Gorry et al., 2018), Japan (Shiba et al., 2017), Europe (Coe & Zamarro, 2011; Heller-Sahlgren, 2017; Vo & Phu-Duyen, 2023) or a mix of Asian, European and North American countries (Garrouste & Perdrix, 2022; Nishimura et al., 2018). The diverse results might instead be caused by different time lengths observed by the studies.

In summary, this review of existing research shows that heterogeneity in the relationship between retirement and health is a common theme in the literature. The effect of retirement on health may differ depending on the type of retirement observed[5] (Garrouste & Perdrix, 2022), the measure of health outcome used (Leimer & Van Ewijk, 2022), the country context (De Breij et al., 2020), the timeframe considered (anticipation period, short-term, and long-term effects on health) and the method of analysis applied (Nishimura et al., 2018). It has further been criticised that some studies do not adjust for the self-selection into retirement and also do not take the endogeneity of retirement adequately into account which might explain some of the opposing findings (Gorry et al., 2018).

Additionally, studies have found inequalities in the effect of retirement on health that can be linked to individual-level factors such as gender, type of previous occupation and inequalities depending on the individual's socioeconomic status (Baumeister et al., 2023; Hasselhorn, 2020).

The Socioeconomic Gradient in Health and Mortality

Studies have repeatedly found that social classes differ in their mortality rates which creates a gap between the lower mortality of higher social classes and the higher mortality rate of lower social classes (Antonovsky, 1967). The gap in mortality observed between social classes translates to gaps in morbidity, life expectancy and health found between groups with high and low socioeconomic positions. The socioeconomic position of a person or a unit of people is commonly indicated by measures such as income, education, or type of profession (Hasselhorn, 2020; Mackenbach et al., 1997). The existence of socioeconomic inequalities has also been

[5] The type of retirement can be differentiated between regular retirement, meaning entrance at the legal pensionable age, early retirement, entrance before the legal retirement age, and late retirement, entrance after the legal pensionable age. Since the legal retirement age differs between countries and occupations, the type of retirement often captures a combined effect of multiple factors.

reported for the measure of self-perceived health (Hu et al., 2016). Moreover, not only does a gap between the health of the highest and lowest socioeconomic groups exist but rather a graded association between socioeconomic status and health (Adler et al., 1994). Debiasi & Dribe (2020) report for Sweden that socioeconomic inequalities in mortality emerged during the 20th century. Especially after 1970, socioeconomic status became a central determinant of mortality. Socioeconomic inequalities in mortality and health have been observed in many countries around the world, including European countries, the United States and Canada. The extent of the inequalities has been reported to differ between countries and between measures of health and socioeconomic status (Dow & Rehkopf, 2010; Hernández-Quevedo et al., 2006; Mackenbach et al., 1997, 2008).

A large proportion of the socioeconomic gradient in mortality in European and North American countries can be explained by differences in health behaviours between socioeconomic groups such as alcohol consumption, smoking and lifestyle factors (Debiasi & Dribe, 2020; Mackenbach et al., 2008; Petrovic et al., 2018). The life course approach may additionally provide a background to how these behaviours accumulate as health risks over the life course. Further observations of trends in socioeconomic inequalities show that while absolute inequalities in mortality have decreased in European countries between the 1990s and 2000s, relative inequalities have increased simultaneously (Hu et al., 2016). Hu et al. (2016) observed a similar trend in self-assessed health, as absolute inequalities remained relatively constant, while relative inequalities in self-assessed health increased, with less good self-assessed health being more prevalent among groups with lower education and occupations requiring manual labour.

Looking at the development of the socioeconomic inequalities in mortality and health over the life course, inequalities have been reported to be the largest in the middle years of life (Antonovsky, 1967). However, disparities in mortality seem to remain at older ages and after retirement (Van Rossum, 2000).

Socioeconomic Inequality in the Effect of Retirement on Health

The previous section shows that the existence of a socioeconomic gradient in health is widely known. Studies that have investigated the topic of socioeconomic inequality in the effect of retirement on health, report – again – partly contradictory findings.

Grøtting & Lillebø (2020) found for Norway that the positive impact of retirement on subjective measures of physical health is stronger for individuals with a low socioeconomic status. This is similar to the findings of a study by Mazzonna & Peracchi (2017), which reported that the immediate effects of retirement on health, captured as an index, and cognitive abilities are positive for people who previously worked in physically demanding occupations. Further, a French cohort study by Westerlund et al. (2009) has found that workers transitioning out of poor working conditions (e.g. low occupational grade and high demand) show a stronger improvement in health compared to individuals transitioning from good working conditions to retirement which experienced no effect of retirement on health. While the prevalence of suboptimal health generally increases with age, the study found that the prevalence declined in the year before retirement and increased only slowly in the years after retirement (Westerlund et al., 2009). This suggests that retirement may be interpreted as a relief from the burden of ill health that is stronger for individuals with a low SES (Westerlund et al., 2009).

In contrast to these findings, a recent study has found that the immediate effect of retirement on health (measured by several outcome variables) is negative for blue-collar workers, which can be interpreted as an adjustment period, while retirement has a positive health-preserving effect in the long term for all occupational groups (Leimer & Van Ewijk, 2022). The same study observed further heterogeneities, as depressive symptoms were found to decrease mainly among white-collar workers, while blue-collar workers' health improved more for health outcomes such as self-assessed health, grip strength and mobility limitations (Leimer & Van Ewijk, 2022). A negative effect of retirement on the prevalence of depressive symptoms among men from low occupational classes has also been reported by Shiba et al. (2017). It has further been found that adiposity measures, which are risk factors for CVD, increase for individuals retiring from occupations with a high physical demand (Xue et al., 2020).

Barban et al. (2020) have found that the timing of retirement also affects individuals differently depending on their pre-retirement income. Early retirement has been found to affect the health of people with a low pre-retirement income negatively, as they appeared to be more affected by changes in income caused by retirement. People with a higher pre-retirement income were reported to be less affected by this change and even experienced a positive effect from early retirement on their health (Barban et al., 2020). These findings are supported by a systematic literature review, which found that positive effects of retirement on health are more often reported for high socioeconomic groups, particularly for early or statutory retirement transitions

(Schaap et al., 2018). Wealthy individuals may also profit more from the slowed-down increase in limitations in mobility and muscle functions caused by retirement (Van Zon et al., 2016).

In conclusion, while some studies suggest that retirement may act as a leveller for health inequalities between SES groups and could consequently reduce the socioeconomic gradient in health (Grøtting & Lillebø, 2020), other studies indicate a diverging pattern (Schaap et al., 2018) or a variation of the health gap over time (Leimer & Van Ewijk, 2022). The diverse results of the studies reviewed in this chapter are an example of the heterogeneity prevalent in the literature on retirement and health, which shows that more research is needed to investigate the relationship between retirement and health generally, and across the time of the transition.

2.3. Conceptual Model & Hypotheses

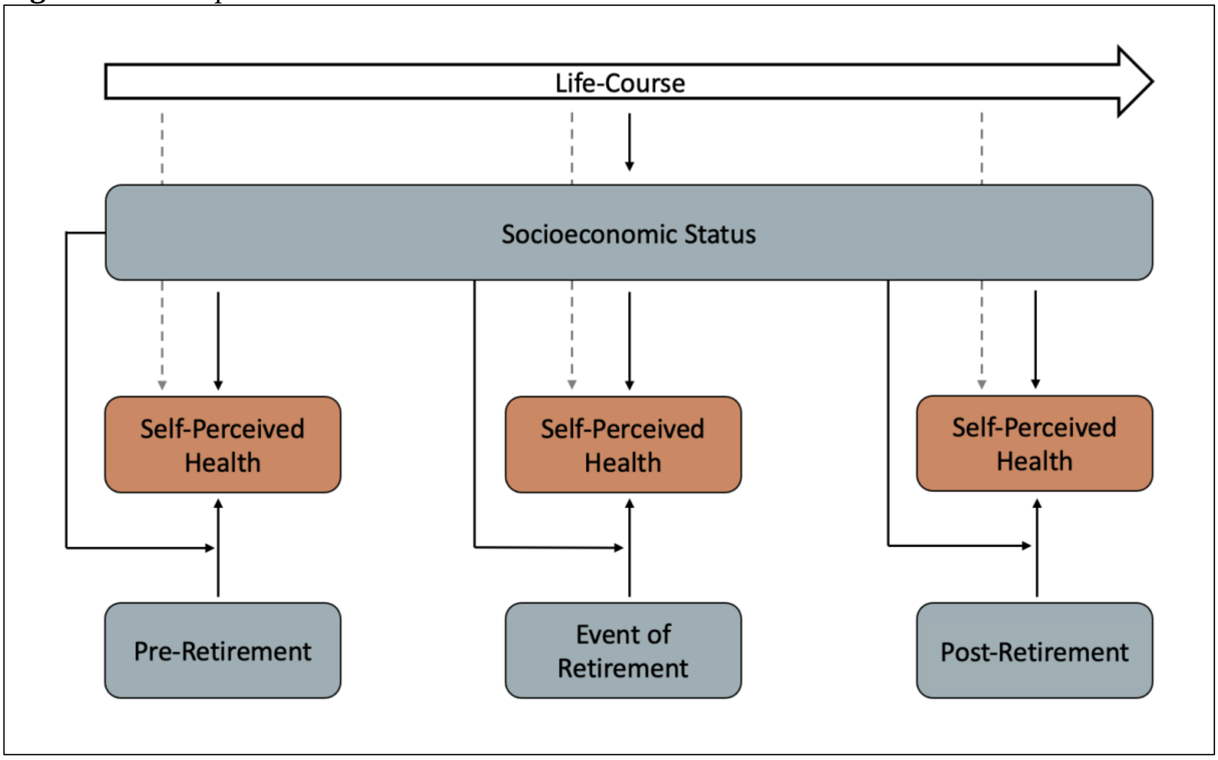
The Conceptual Model

The conceptual model depicted in Figure 1 visualises the main concept and relationships analysed in this thesis which are also the main variables included in the statistical analysis. The main concepts are *socioeconomic status* (independent variable), *retirement* (independent variable) and *self-perceived health* (dependent variable). Additionally, *life course* is included in the diagram of the conceptual model to visualise not only the past life course but also the component of time, symbolised by its arrow shape.

The socioeconomic status evolves over the life course, which is highlighted by the single arrow reaching from life course to SES. Since SES is measured by education, I expect SES to remain relatively stable for older adults. Therefore, SES is visualised as one constant variable. Central to this thesis is the understanding of retirement as a life course event. The impact of retirement on the outcome variable may differ over time. Therefore, retirement is visualised at three time point 'variables': pre-retirement, the event of retirement, and post-retirement. Pre-retirement is included in the model since the transition to retirement is often a planned life course event and individuals may therefore change their behaviour already before the event, causing an anticipation effect of retirement on health (Barban et al., 2020).

The dotted arrows from the life course to self-perceived health illustrate the influence of the life course on health using the accumulation model of the life course approach to health. As this relationship is not directly (statistically) included in the analysis of this thesis, the dotted lines are used to depict this theory-based relationship. The dependent variable self-perceived health is not only affected by the life course of an individual but also by their SES. The central relationships tested in this thesis are, first, the effect of retirement, before, during and after the event, on self-perceived health and, second, the impact of SES on the effect of retirement on health.

Figure 1: *Conceptual Modell*



Source: Own illustration.
Notes: The conceptual model visualised the effect of retirement and SES on self-perceived health over time. Independent variables are highlighted in grey/blue and dependent variables in orange. Dotted lines are used for theoretical relationships not directly tested in the analysis.

Hypotheses 1: The effect of retirement on health before, during, and after the event

The first hypothesis (H1) relates to the research question: *How does retirement affect health before, during and after the event?* Based on the findings of a study by Westerlund et al. (2009) which measured self-rated health before and after retirement, it can be expected that *the anticipation effect of retirement on health will start to increase self-perceived health about one year before retirement* (H1.*1*). Several studies have reported that retirement generally has a positive effect on self-perceived health (Garrouste & Perdrix, 2022; Gorry et al., 2018; Leckcivilize & McNamee, 2022; Nishimura et al., 2018; Rose, 2020; Westerlund et al., 2009). Additionally, Westerlund et al. (2009) observed a decrease in the prevalence of suboptimal self-rated health[6] up to about one year after retirement. However, Coe & Zamarro (2011) found that the impact of retirement on self-reported health appears to be temporary rather than not long-lasting.

Based on these findings it can be expected that the impact of retirement on self-perceived health is generally positive, meaning that retirement increases self-perceived health. It can be further hypothesised that the magnitude of the effect differs between the anticipation effect, the immediate effect and the effect occurring after the event of retirement. Based on the literature review I expect that *the effect is the strongest at the time of the event* (H1.2) and *fades in the years after the transition to retirement has been completed* (H1.3). The positive effect can be explained by retirees' change in health behaviours such as increased exercise due to additional leisure time (Insler, 2014) or increased sleep and reduced stress after retirement (Rose, 2020).

Hypotheses 2 & 3: The effect of retirement on health depending on the individual's socioeconomic status and how retirement affects the socioeconomic inequality in health.

Reviewing the literature on how retirement affects health differently depending on the socioeconomic status of retirees, the findings of the reviewed literature are partly contradictory. Therefore, three sets of hypotheses are developed for the second and third research questions. The second research question is: *How does the effect of retirement on health differ between people depending on their socioeconomic status?* And the third asks: *How does retirement affect the socioeconomic inequality in health?*

Studies that have reported a more positive effect of retirement on health for individuals with a high socioeconomic status include a systematic literature review by Schaap et al. (2018). The study has found that most of the reviewed studies report a more positive effect of early or statutory retirement on general, physical or mental health for individuals with a higher socioeconomic status (Schaap et al., 2018). This finding correspond to a study by Celidoni & Rebba (2017), which reported that the probability of not engaging in any physical activity after retirement decreases more strongly for individuals with a higher education. A stronger change in positive health behaviours after retirement for the high SES group could explain a more positive effect of retirement on health for this socioeconomic group. Based on these studies it

[6] Some studies, such as Westerlund et al. (2009), estimate self-perceived health as the prevalence of less than good, suboptimal, or poor self-perceived health. While this measure is calculated differently from a score of self-perceived health and may have a different meaning, this thesis assumes that the general direction of the results of the two measures are comparable.

can be expected that *the effect of retirement is more positive for individuals with a high SES* (H2a). And consequently: *the socioeconomic inequality in health increases after retirement* (H3a).

Contradictory to this, Grøtting & Lillebø (2020) have reported that retirement has a positive effect on the physical health of low-SES individuals but no effect on high-SES individuals. A possible explanation could be that factors such as blue-collar occupations and lower education are often associated with more physically straining work and less health-promoting activities. Therefore, later retirement may be more costly for low SES groups, while exiting work into retirement may level health inequalities between low and high SES groups (Grøtting & Lillebø, 2020). Based on this finding, the analysis will test the hypothesis that *the effect of retirement is more positive for individuals with a low SES* (H2b) and therefore, *the socioeconomic inequality in health decreases after retirement* (H3b).

Further, there is evidence of a varying difference in the effect of retirement on health depending on socioeconomic status over time. Leimer & Van Ewijk (2022) have found that blue-collar workers' health worsens in the adjustment period after retirement, which temporarily increases health inequalities. After an initial negative effect, health improves leading to a positive impact of retirement in the long term (Leimer & Van Ewijk, 2022). Therefore, H2c tests if *the effect of retirement is initially negative for individuals with a low SES but becomes positive in the long term.* Consequently, H3c expects that *socioeconomic inequality in health increases initially after retirement but decreases in the long term.* A visualisation of the hypotheses within the conceptual framework can be found in Appendix A: Literature Overview and Conceptual Model.

Overview Hypotheses

***H1.1**: The anticipation effect of retirement on self-perceived health is positive, self-perceived health increases in the year before retirement.*

***H1.2**: The immediate effect of retirement on self-perceived health is positive, self-perceived health increases the most in the year of retirement.*

***H1.3**: The effect of retirement on self-perceived health is positive in the years after retirement, but the effect weakens over time.*

***H2a**: The effect of retirement on self-perceived health is more positive for individuals with a high socioeconomic status.*

***H3a**: The socioeconomic inequality in health increases after retirement.*

***H2b**: The effect of retirement on self-perceived health is more positive for individuals with a low socioeconomic status.*

***H3b**: The socioeconomic inequality in self-perceived health decreases after retirement.*

***H2c**: The effect of retirement on self-perceived health is initially negative for individuals with a low socioeconomic status but becomes positive in the long term.*

***H3c**: The socioeconomic inequality in self-perceived health increases initially after retirement but decreases in the long term.*

3. Data and Methods

3.1 Data

To investigate the research questions and test the hypotheses, this thesis uses secondary data from the Survey of Health, Ageing, and Retirement in Europe (SHARE). SHARE collects data from European citizens age 50 and older covering the member states of the European Union, Switzerland, and Israel (SHARE. ERIC, 2023). The main objective of SHARE is to provide high-quality data that can be used to “study the effects of health, social, economic and environmental policies over the life course of European citizens and beyond” (Bergmann, Wagner, et al., 2024, p. 13). SHARE is transdisciplinary, longitudinal and comparable across European countries (Bergmann, Wagner, et al., 2024). These characteristics, along with the survey’s specific focus on health- and retirement-related topics and its European context, make SHARE the ideal survey for the study aim of my thesis. Currently, 9 survey waves are available with the latest wave conducted in 2021 and 2022 and released in March 2024. Fieldwork times differ between the countries. For the first wave, fieldwork was conducted between 2004 and 2006. For the second wave fieldwork was carried out in 2006/07 and in 2009/10 for Israel. Fieldwork for the third wave was done in 2008/09 and 2009/10/11 in Ireland. For wave 4 fieldwork was carried out in 2011, for wave 5 in 2013, for wave 6 in 2015, and for wave 7 in 2017. Fieldwork for wave 8 was done in 2019/20 and for wave 9 in 2021/2022 (SHARE, 2024). The SHARE panel covers about 16 to 18 years (SHARE, 2024). Over time more countries and respondents have been included in SHARE. In the first wave Austria, Belgium, Switzerland, Germany, Denmark, Spain, France, Greece, Italy, Netherlands, Sweden, and Israel participated in the survey. For the second wave the Czech Republic, Ireland, and Poland joined and in the fourth wave Estonia, Hungary, Portugal, and Slovenia. Luxembourg joined in wave 5 and Croatia in wave 6. The last group of countries added in wave 7 were Bulgaria, Cyprus, Finland, Latvia, Lithuania, Malta, Romania, and Slovakia. Since my thesis focuses on the context of Europe, I have excluded data from Israel from my dataset.

SHARE aims to draw representative samples applying best-practice probability sampling procedures (Bethmann & Bergmann, 2023). Further, SHARE ensures the representativeness of the samples by drawing refreshment samples (Bergmann, Bethmann, et al., 2024). Regarding the sample sizes of SHARE for wave 9, data was collected from 69,154 individual interviews in 47,957 households. For the individual countries, the sample sizes range from 731 observations for Cyprus to 4,802 observations for Poland (SHARE, 2024). After the sample selection, described in section 3.4, my final panel sample consists of 125,215 observations and 33,558 respondents.

The data for SHARE is collected using computer-assisted personal (face-to-face) interviews except for the SHARE Corona Survey, which used computer-assisted telephone interviews and paper and pencil questionnaires (SHARE. ERIC, 2023). To achieve high data quality, SHARE employs different measures of control in each step of the process of collecting and producing the data. They use validated survey instruments and collect preparatory data in a pretest and a field rehearsal before the main wave of data collection is carried out (Bethmann & Bergmann, 2023). During fieldwork, the authenticity of the interviewers is verified and interviews that have been recognised as suspicious are subject to a further review process (Hannemann & Bergmann, 2024).

SHARE datasets are accessible to the scientific community free of charge by registering with the SHARE Research Data Centre and agreeing to the conditions of use (SHARE. ERIC, 2023). This is also how I have accessed the SHARE dataset. The datasets available for personal download, are released in an anonymised form that ensures the confidentiality of respondents' data (SHARE. ERIC, 2023).

3.2 Operationalisation & Variables

Retirement

Retirement is measured using the SHARE respondent's self-description of their work status. The related question in the survey offers the following answer options: *1. Retired, 2. Employed or self-employed (including working for family business), 3. Unemployed, 4. Permanently sick or disabled, 5. Homemaker, 97. Other (specify).* Since retirement is a complex life course event, its operationalisation raises a few difficulties. The two main challenges are how to define the at-risk sample (the people in the position to transition into retirement) and how to deal with the endogeneity of retirement. When defining the at-risk sample, it is important to recognise that retiring is a heterogeneous and often not a linear process. Not everyone enters retirement immediately after full-time employment. Rather, many people experience a period of part-time employment or unemployment before transitioning (Wetzel et al., 2016). This makes it difficult to define the exact point at which the transition to retirement begins and affects the outcome of retirement on health (Wetzel et al., 2016).

Studies that have investigated how retirement affects individuals differently depending on the work situation they transition from, show that in the short term life satisfaction increases stronger for individuals who transition from unemployment into retirement compared to those transitioning from full-time employment (Hetschko et al., 2014; Wetzel et al., 2016). Wetzel et al. (2016) have attributed this observation to the status change that occurs when a person transitions from unemployment or full-time employment to retirement. The status change is more positive for previously unemployed individuals, leading to a more positive effect on life satisfaction in the short term (Wetzel et al., 2016). Similarly, Hetschko et al. (2014) have explained the more positive impact of retirement for previously unemployed individuals through the change in social norms, from expected to work to not working, that accompanies the transition. In the long term, the routines developed after retirement, which are built on individual resources, determine the effect of retirement on life satisfaction and lessen the advantages of retirement for previously unemployed individuals (Wetzel et al., 2016). Moreover, unemployment is generally associated with lower life satisfaction compared to employment, making it difficult to compare the transition to retirement from these two different initial situations (Hetschko et al., 2014).

Previous studies have applied a variety of approaches when defining retirement. Studies define individuals who were permanently unemployed, sick, or separated from the labour force as retired (Sohier et al., 2021) or exclude individuals with a job status other than retired or employed (Leimer & Van Ewijk, 2022). This is different from the approach of this thesis, which uses the self-definition of the respondents as the measurement of retirement. Due to these findings, it might on the one hand be too simplified to define the at-risk sample exclusively as people who are not (yet) retired, since not differentiating between different types of transitions to retirement could lead to an under- or overestimation of the effect of retirement. On the other hand, limiting the at-risk sample to individuals in full-time employment might be too restrictive, not representative of the actual transition patterns, and may also reduce the sample size. However, based on the findings that transitions from unemployment to retirement and from employment to retirement are not comparable as different mechanisms affect health (Hetschko et al., 2014; Wetzel et al., 2016), I have decided to exclude all participants who transition directly from unemployment to retirement.[7]

[7] Note that this procedure implies, that persons that are observed in unemployment at some time in the panel are kept if they are employed before transitioning to retirement. Observations in unemployment are not excluded generally.

The second difficulty of concern is the endogeneity of retirement. The relationship between unemployment and poor health is reciprocal, as poor health has been associated with not having paid employment (Alavinia & Burdorf, 2008). People with poor health (including self-perceived health) have also been shown to be more likely to leave employment through unemployment, disability, or to a lesser extent, early retirement (Van Rijn et al., 2014). This means that individuals may self-select into retirement due to poor health (Gorry et al., 2018; Leimer & Van Ewijk, 2022). To minimise the risk of measuring reverse causality, individuals who describe their situation before retirement as being 'permanently sick or disabled' and individuals who indicate that they transitioned to retirement 'due to ill health' are excluded from the sample. The fixed effects panel regression analysis, which controls for unobserved time-invariant heterogeneity, additionally controls for the endogeneity of retirement (Leimer & Van Ewijk, 2022).

Socioeconomic Status

The second independent variable used in the analysis of this thesis is socioeconomic status. Socioeconomic status can be understood as a latent construct and is commonly measured by variables that capture income, education, wealth and occupation or scales consisting of a combination of those (Baker, 2014; Cirino et al., 2002; Darin-Mattsson et al., 2017).

Zimmer et al. (2016) have found that while a high socioeconomic status at young ages can be associated with more advantageous morbidity trajectories and higher survival probabilities, the impact of SES in adulthood is additive. Socialisation, and especially the socialisation of health behaviours, has been identified as one of the main components that explain the relationship between SES and health (Baker, 2014). Furthermore, SES often determines structural factors, such as the neighbourhood in which a person grows up and the availability of healthy food. These structural factors also determine health behaviours (Baker, 2014).

Overall, there seems to be no consensus in the literature on which variables are best suited to measure SES as a determinant of health in older ages. Duncan et al. (2002) investigated various indicators of socioeconomic status (SES) to determine the best indicator of SES for health research. They found that economic indicators, such as family income and wealth, were as strongly or even more strongly associated with subsequent mortality than education and occupation. However, the study also revealed that the association was stronger among non-elderly individuals (Duncan et al., 2002), reducing its relevance for this thesis.

A study by Grundy & Holt (2001) focused on how to measure the SES of older adults in studies on health inequalities. The authors recognise that measuring SES in older adults can be difficult, but their results suggest that educational qualification or social class combined with an indicator of deprivation was the best pair of variables (Grundy & Holt, 2001). However, all indicators tested in the study showed a significant association with self-perceived health (Grundy & Holt, 2001). It has also been found that receipt of income support, which is a measure of poverty, can be associated with increased odds of poor health for older adults (Grundy & Sloggett, 2003).

Different to the study by Grundy & Holt (2001), Darin-Mattsson et al. (2017) reported that income is associated strongest with health at older age, independent of the other variables tested. However, both studies found an association between health and all individual-level SES variables tested, which included education, social class and occupational complexity (Darin-Mattsson et al., 2017; Grundy & Holt, 2001). Darin-Mattsson et al. (2017) recommended that if the aim of including a variable of SES in a study is not solely to adjust for SES inequalities but to analyse inequalities in health, then the choice of the variable should be based on the theory.

Since the theoretical framework of this thesis is the life course approach to health, education is a suitable measure of socioeconomic status. Education is usually obtained in childhood and early adulthood and affects income and occupation over the life course and into older adulthood and retirement. This is supported by Smith (2007), who found that education, rather than financial resources, is the primary SES dimension influencing health outcomes. I use the variable of the International Standard Classification of Education (ISCED-97) provided by SHARE to measure education. ISCED is designed to harmonise and classify educational programmes and qualifications internationally (Schneider, 2013). The variable is commonly used to measure educational attainment[8] and is maintained by the UNESCO Institute for Statistics (Schneider, 2013). ISCED-97 differentiates between seven levels of education: level 0 stands for pre-primary education, and level 1 captures primary education or the first stage of basic education. Level 2 responds to the lower secondary or second stage of basic education, level 3 to (upper) secondary education, and level 4 captures post-secondary non-tertiary education. The two highest levels, level 5 and 6, capture the first and second stage of tertiary education (*International Standard Classification of Education ISCED 1997*, 2006). Similar to

[8] The terms 'educational attainment' and 'education(al) level' are used synonymously in this thesis.

a study by Uccheddu et al. (2019), I summarised and recoded the international classification ISCED-97 into three groups of education levels: low (ISCED 0, 1, and 2), medium (ISCED 3 and 4), and high (ISCED 5 and 6).

Subjective Health

I used the variable *self-perceived health* from the SHARE dataset to measure health. SHARE captures the variable by asking the respondents the question: 'Would you say your health is…' and offering the answer options: *1. Excellent, 2. Very good, 3. Good, 4. Fair, and 5. Poor*.

Self-perceived health is a valid measure of morbidity as it is known for having high predictive validity of mortality (Benyamini & Idler, 1999; Idler & Benyamini, 1997). The relationship between poor self-perceived health and morbidity has been found to persist across different ethnic groups (Chandola & Jenkinson, 2000). Additionally, Schnittker & Bacak (2014) have reported that the association between self-perceived health and mortality appears to have increased between 1980 and 2002, suggesting that individuals have become better at assessing their health over the observed period.

Further, self-perceived health has been shown to have good overall reliability (Lundberg & Manderbacka, 1996). Idler & Benyamini (1997) have explored possible explanations for the high reliability of self-perceived health in predicting mortality and summarised them in four strands of interpretation. Their study suggests that self-perceived health might be a more inclusive and accurate measure of health compared to other measures because it can capture the complete range of a person's illnesses, as well as the personal perception of the severity of existing illnesses, and can also include family histories (Idler & Benyamini, 1997). The researchers further suggest that self-perceived health has the advantage of being a dynamic evaluation of the current health and health trajectories. Self-perceived health may also have an effect on health behaviours which in consequence influences the health status, and it can also capture the availability of resources a person has (Idler & Benyamini, 1997). A later study presents literature evidence for the four strands of explanations of the relationship between self-perceived health and mortality (Benyamini, 2011). Leinonen et al., (2002) have also found that self-perceived health captures a person's functional performance. For older individuals, self-perceived health has the additional advantage that it is already age-adjusted, as respondents consider their age in their judgement and perception of their subjective health status (Leinonen et al., 2002).

In summary, the advantage of self-perceived being an overall reliable, valid and holistic measure of health with a strong association with mortality, makes self-perceived health a suitable variable for the research aim of this thesis. However, the disadvantages of self-perceived health in measuring an individual's health status must be recognised and will be further explored in the discussion section of this thesis.

Control Variables

Since the statistical analysis employs fixed-effects panel regression, the model controls for all constant unobserved heterogeneities between individuals (Allison, 1994). Time-constant variables include, for example, personality traits, gender or country of birth. To analyse the total causal effect of retirement on self-perceived health, all potential confounders (variables influencing the independent and the dependent variables) that are time-variant must be controlled for (Ludwig & Brüderl, 2021). The analysis therefore controls for the variable age. Furthermore, cohort and period were explored as potential control variables, but no strong empirical implication was found to control for these in the FE regressions (see Appendix C). As recommended, mediating variables were not controlled for, to avoid overcontrol bias (Ludwig & Brüderl, 2021).

3.3 Method of Data Analysis: Fixed-Effects Panel Regression Models

To analyse the effect of retirement on health, I estimated fixed effects (FE) linear panel regressions modelling the causal effect of retirement on health using only within-variation over time (Brüderl & Ludwig, 2015). FE panel regression models can be used to study the impact of an event, such as retirement, even if it occurs at different time points for different people (Allison, 1994). Further, since FE models focus on the within-person change over time, they control automatically for all time-constant heterogeneities between individuals, independent of whether these confounders are observed (Allison, 1994; Ludwig & Brüderl, 2021). Therefore, selectivity bias is eliminated as long as the differences between the people who experience the event and those who do not are stable over time (Allison, 1994).

The requirement for identifying a causal effect is that the within variation must be exogenous (Brüderl & Ludwig, 2015). If this is not the case, estimates may be biased (Brüderl & Ludwig, 2015). Brüderl & Ludwig (2015) have discussed three main sources that could violate the exogeneity assumption: time-varying confounders, errors in measuring the treatment indicator, and simultaneity also known as reverse causality. Especially reverse causality is a known difficulty when analysing the effect of retirement on health, as poor health is often a reason for retirement. To reduce the probability of reverse causality, transitions due to poor health were excluded from the analysis (see Sample Selection).

To account for time, I incorporated a dummy impact function in the models, measuring the period before and after retirement in 1–2-year intervals. This is also referred to as an event time clock (Brüderl & Ludwig, 2015). Following the recommendations of Brüderl & Ludwig (2015), I used the number of cases as a criterion to determine how many years after retirement to include in the FE model. I only plotted the model over the first 5 years after retirement because after that the number of cases becomes too small which makes the estimate imprecise (see Appendix C, Table C1). The model includes an anticipation effect of retirement, as it is likely that health changes before retirement, since it is a planned life course event. Including the anticipation effect is crucial to accurately capture the true impact of retirement on health and to avoid a biased impact function. Without accounting for this, the anticipation effect might be incorrectly interpreted as the baseline estimate of heath (Ludwig & Brüderl, 2021).

The model includes three retirement-time dummies before retirement. The dummy '5 years before retirement or more' also includes the control group, the respondents who are not retiring. However including pre-treatment dummies in the regression model can cause some difficulties, as these dummies might capture self-selection or reverse causality (Brüderl & Ludwig, 2015). Therefore, the dummies are included in my model based on the theoretical framework of this thesis and existing literature that suggests the presence of an anticipation effect. The interpretation of these dummies must be done carefully considering potential limitations. Controlling for age in the estimation of treatment effects is especially important when working with panel data, as it allows to model the life course accurately and eliminate age as a confounder (Ludwig & Brüderl, 2021). The model controls for age as age is likely to influence health and to influence the time of entrance into retirement.

The function of the linear FE regression is displayed in the following equation (adapted from Leopold et al., 2017 and Ludwig & Brüderl, 2021):

$$SPH_{it} = \sum_{k=-3}^{3} RD_{it}^{k}\delta_k + \sum_{k=-3}^{3} RD_{it}^{k}\gamma_k \times Education + age_{it}\beta + \alpha_i + \varepsilon_{it}$$

Where the outcome variable self-perceived health (SPH) of person *i* at time *t* (SPH_{it}) is modelled as a linear function of seven retirement-dummy variables (RD) for the time before, during, and after retirement. RD_{it}^{k} = 1 if person *i* is retired for *k* year-categories at time *t*. *k* = -3 characterises 5 years or more before retirement, *k* = -2 characterises 3 to 4 years before retirement, and *k* = -1 characterises 1-2 years before retirement, and *k* = 0 denotes the year of retirement. *k* = 1 characterises 1-2 years after retirement, *k* = 2 characterises 3-4 years after retirement, and *k* = 3 characterises 4 years or more after retirement. The coefficient δ_k stands for the effect of each of the retirement dummy variables. In summary, the term $\sum_{k=-3}^{3} RD_{it}^{k}\delta_k$ depicts the effect of time before, during, and after retirement on self-perceived health. Part of the main specification is also the time-varying covariate age (age_{it}) and the vector β which specify that the FE regression models control for linear age. α_i represents the unobserved time-constant variables, and ε_{it} depicts the time-varying random error for person *i* at time *t*. In addition to the main specification, the interaction term of the retirement time dummies with the independent variable education (Education) $RD_{it}^{k}\gamma_k \times Education$ capturing the different effects of retirement according to the level of education.

I specify three main fixed effects models to answer the research questions of this thesis. While Model 1, does not include the retirement-time dummies, the first Model (Model 2) relevant for answering the research questions, estimates the average effect of retirement on self-perceived health over time, independent of socio-economic status and controlling for age. The second group of Models (Model 3a-c) are the same as Model 2 but estimate the effect of retirement on self-perceived health separately for high, medium and low educational attainment. Since the separate models do not estimate, if the difference between the education groups is significant (Lohmann, 2010), interaction effects between the retirement dummies and the education groups are included in a third main model (Model 4). The test statistics of the interaction effects are used to test the difference in the effect strength between the three education groups (Lohmann, 2010, pp. 693–694). Model 4 therefore estimates the differences in the effect of retirement between education over time. In terms of generalisability, the FE estimator cannot be generalised to the whole population but only to the treated units, meaning those who experience the event of retirement (Brüderl & Ludwig, 2015). This causal effect is called an average treatment effect on the treated (ATT) (Brüderl & Ludwig, 2015).

3.4 Study Population & Sample Selection

I used Stata Standard Edition 18.0 (StataCorp, 2023b) to conduct my data analysis. To be able to work with SHARE longitudinally, I first had to create a panel dataset containing all survey waves currently available (waves 1 to 9). As wave 3 collects SHARELIFE data, which is a retrospective survey on the respondent's life histories, wave 3 was excluded from the panel dataset used for analysis. Consequently, the panel dataset used for the analysis includes 8 waves of SHARE. The exact process of creating the panel dataset is documented in Appendix B. After creating the panel dataset, I prepared the data by defining the missing values, recoding existing variables and creating all new variables needed for the analysis. This included, for example. creating a grouped ISCED variable or changing the value order of the self-perceived health variable so that high values represent better health.

The target population of SHARE consists of individuals who are at least 50 years old and reside in one of the countries included in the survey. Individuals are excluded if they are not staying in the country during the survey period, do not speak the country's language, or have moved to an unknown address. Further, incarcerated or hospitalised individuals are also excluded, while people living in nursing homes are explicitly included SHARE (Bethmann & Bergmann, 2023).

To define the 'at-risk'-sample of those respondents who can experience the transition to retirement and to avoid reverse transitions in and out of retirement, I selected only respondents who were either employed or unemployed on their first observation in the survey. I removed all respondents who specified to be retired, a homemaker, permanently sick or disabled, or others from the sample. This restriction ensured that only transitions from employment to retirement were included in the final sample. All reverse transitions out of retirement were excluded, additionally, all respondents who indicated that they retired due to their ill health from the sample to address the endogeneity of retiring due to ill health. As explained before, I also excluded respondents transitioning directly from unemployment to retirement. Furthermore, I kept only respondents with at least two observations.

All further restrictions, as well as each reduction in sample size, are documented in Table 1. The share of missing data caused by nonresponses was small in the sample and missing data occurred at random. The final sample includes 33,558 respondents (persons) with 125,215 observations (person-years).

Table 1: *Sample Selection*

Restrictions	Remaining Sample Size Observations	Respondents
Start Sample: Panel dataset of wave 1-9, excluding wave 3	**459,946**	**158,764**
Excluding Israel	446,122	154,188
Excluding if the variable 'Current Job Situation' is missing	440,337	152,987
Excluding if the variable 'Self-perceived health' is missing	439,981	152,923
Excluding if the variable 'Education' is missing	436,672	151,584
Excluding if the variable 'Age' is missing	436,654	151,566
Excluding all respondents younger than 50 years of age	430,256	149,502
Defining 'at-risk sample': Only keeping respondents who are employed or unemployed on their first observation, excluding all other respondents (retired, homemaker, permanently sick or disabled, and other)	154,598	54,119
Excluding reverse transitions in and out of retirement	153,071	54,119
Excluding respondents who retire due to their ill health	148,167	52,993
Excluding direct transitions from unemployment to retirement	143,675	52,018
Final sample: Keeping only respondents with > 1 observation	**125,215**	**33,558**

Source: SHARE release 9.0.0; wave 1-9, excluding wave 3; own calculations

The remaining sample consists of two sub-samples. The control sample (17,776 persons, 52.97%) includes all respondents who did not transition to retirement in the observed time. The treated sample, which is also called the retiring sample (15,782 persons, 47.03%), captures all respondents who transitioned to retirement. It is important to keep the control group when estimating fixed-effects regression to avoid collinearity issues (Ludwig & Brüderl, 2021). The final sample is unbalanced with respondents observed for a minimum of 2 waves and a maximum of 8 waves.

Due to the specific statistical method of choice, FE regression models, and the use of panel data, I deliberately did not follow a strategy of maximising the number of observations included in the estimation sample, which is common in cross-section research designs (Ludwig & Brüderl, 2021). If such an approach is followed for a within-panel design, the treatment effect might be biased and the exogeneity condition of the method could be violated if, for example, the respondents already retired at their first observation were included in the control group (Ludwig & Brüderl, 2021).

Comparing the retiring and the control sample (Table 2) shows that while the control sample includes more persons (retiring sample: 15,782; control sample: 17,776), the retiring sample contains more observations (retiring sample: 71,276; control sample: 53,939). On average, respondents who transitioned to retirement participated in 4.52 (Standard Deviation (SD)=1.72) waves, while respondents who remained in employment or unemployment participated on average in 3.03 (SD=1.20) waves of SHARE. On average, people in the treated sample were observed over a longer period (Table 3). This can be explained by the fact that more people in the treated sample entered SHARE in the first 1 to 4 waves and could therefore be observed over a longer period (Table 2).

Table 2: *Overview of Entrances and Attrition rate for each wave of SHARE*

	Full sample		**Retiring Sample**		**Control Sample**	
Observations	125,215		71,276		53,939	
Respondents	33,558		15,782		17,776	
SHARE waves	Entrance % (n)	Attrition[a] % (n)	Entrance % (n)	Attrition[a] % (n)	Entrance % (n)	Attrition[a] % (n)
Wave 1	17.73 (5,951)	57.39 (3,415)	27.35 (4,316)	43.03 (1,857)	9.20 (1,635)	95.29 (1,558)
Wave 2	9.08 (3,046)	51.67 (1,574)	13.6 (2,142)	37.68 (807)	5.09 (904)	84.85 (767)
Wave 4	27.08 (9,087)	46.20 (4,198)	30.7 (4,851)	29.83 (1,447)	23.83 (4,236)	64.94 (2,751)
Wave 5	18.01 (6,044)	48.99 (2,961)	14.2 (2,244)	30.53 (685)	21.38 (3,800)	59.89 (2,276)
Wave 6	10.48 (3,518)	29.93 (1,053)	5.5 (872)	14.91 (130)	14.89 (2,646)	34.88 (923)
Wave 7	11.06 (3,712)	14.57 (541)	7.5 (1,188)	8.67 (103)	14.20 (2,524)	17.35 (438)
Wave 8	6.56 (2,200)	0	1.1 (169)	0	11.43 (2,031)	0
Full Panel (wave 1-9)		40.95 (13,742)		31.87 (5,029)		49.02 (8,713)

Source: SHARE release 9.0.0; wave 1-9, excluding wave 3; own calculations
Notes: Values may not add up to 100% due to rounding.
[a] *Attrition means that the respondents drop out of the SHARE survey before wave 9. Respondents who are observed in wave 9 do not have to participate in every wave since the panel is unbalanced.*

In terms of sample attrition, which measures the percentage of respondents who exited the panel before the most recent wave, 40.95% of the full sample dropped out before wave 9. Notably, the attrition rate was nearly 20% lower for the retiring sample (31.87%) compared to the control sample (49.02%). Table 2 presents a descriptive overview of the number of respondents entering the survey and the percentage of respondents who left the panel before wave 9 (attrition) separately for each wave of SHARE. The high rates of attrition observed for the control sample are concentrated in the early waves of SHARE. Since SHARE focuses on older adults, not many people remain part of the workforce during their whole time of participation in SHARE.

3.5 Ethical Considerations & GenAI Use

Ethical Considerations

Since I have not collected data myself, I must rely on the providers of the SHARE data to fulfil the ethical best practice standards. In SHARE's Data Management Plan (SHARE. ERIC, 2023), it is written that data collection for SHARE is continuously reviewed regarding ethical considerations. The ethics committee reviews the project before each data collection wave takes place and confirms that the project is in line with the legal norms and that all procedures agree with international ethical standards (SHARE. ERIC, 2023). When dealing with human subjects, SHARES's research is guided by ethical principles, such as the 'Respect Code of Practice for Socio-Economic Research' and the 'Declaration of Helsinki' (SHARE. ERIC, 2023). Further, all SHARE respondents are volunteers, and the data collection process is strictly based on informed consent. Throughout the whole research process, I have aimed to uphold myself to the fundamental principles of research ethics and I have reflected on my positionality throughout the research process.

GenAI Use

In working on my master's thesis, I used Grammarly (version 1.81.1.1) (Grammarly, 2023) for Microsoft Word to help me with language corrections, especially for correcting spelling, punctuation, and grammar in my texts. Further, I have experimented with tools that find and connect scientific research papers: Connected Papers (https://www.connectedpapers.com) and Litmaps (https://www.litmaps.com). I used these tools at the start of my literature research to find relevant research articles on my topic by either searching for the topic directly (prompt: 'effect of retirement on health') or by searching for relevant research articles that I had already read, to explore, how they related to other existing literature. However, I mainly used 'classical' strategies to find scientific literature using Google Scholar and citation-chaining (snowballing).

Further, I used ChatGPT (GPT-4) from OpenAI (2024) to help with writing code for data preparation and statistical analysis in Stata. Specifically, I used ChatGPT to understand codes, and solve coding errors. I used for example prompts such as “Explain the following code to me: [*insert Stata code*]”, “Stata produces the following error: ‘string variables not allowed in varlist’; what does this error code mean and how can it be solved?” or “What is the command to display all numeric variables?”. I did not use the AI to write my code for me or tell me each step of the process that I needed to do. I also did not trust it blindly. Instead, I used ChatGPT to understand the code that I already had from previous courses, or that was provided by SHARE resources, and to solve coding errors more efficiently. I was already familiar with most of the answers that it provided and could therefore confirm the answers using other resources (e.g. Stata do-files from previous classes). Lastly, I used the online tool DeepL Write (https://www.deepl.com/de/write) in the review process of my thesis. I looked up selected sentences from my thesis to check for grammar, punctuation, and spelling mistakes and to look for better-fitting synonyms.

I have aimed to make the GenAI use in my working process transparent and traceable by documenting and saving intermediary versions of my written thesis as well as my literature notes and the statistical codes. These are available upon request and will be stored for at least the time of grading.

4. Results

4.1 Descriptive Statistics

The descriptive statistics presented in Table 3 show, that after the sample selection, the final sample consists of 33,558 respondents and 125,215 observations. The retiring sample contains more men (51.91%) while the control sample includes more women (51.94%). The minor unequal gender distribution might be because more of the older women, who could have been part of the retiring sample, might have described their job situation as 'homemakers' and were therefore excluded from the sample. At the respondent's first observation in the panel, the mean age of the respondents in the treated sample is 3.84 years higher than the mean age of the control sample (retiring sample: 57.94; control sample: 54.10). Respondents who are retiring are expected to be on average older than those who are not. The comparison of the three education groups shows that the control sample contains fewer people with low education (19.15%) than the treated sample (25.86%). Furthermore, the descriptive table compares the mean value of self-perceived health between the two sub-samples and between all observations in the panel and the observations on respondents' first observation in SHARE. The mean value of self-perceived health is higher (3.33) for the respondent's first observation in the panel compared to the mean for all observations (3.23). On the first observation differences between control sample and the retiring sample are small with, the mean self-perceived health being only .05 scale points higher for the control group. The mean differs by .1 scale points between the retiring sample and the control sample if all observations are considered. Again, this difference can likely be explained by the higher average age of the retiring sample. The mean value standard deviations of self-perceived health are very similar between the sub-samples and observation periods and stay around 1.0. The average age of retirement is 64.94 years in the treated sample, which is similar to the average age of labour market exit of about 63.6 years in 2022 assumed by the European Commission (2024).

Table 3: Descriptive Statistics

	Full sample		Retiring Sample		Control Sample		
Observations	125,215		71,276		53,939		
Respondents	33,558		15,782		17,776		
Measures	% (n)	Mean (SD)	% (n)	Mean (SD)	% (n)	Mean (SD)	Description
Age		55.90 (4.47)		57.94 (4.68)		54.10 (3.35)	Range: 50-91
Gender							
Women	50.13 (16,822)		48.09 (7,589)		51.94 (9,233)		
Men	49.87 (16,736)		51.91 (8,193)		48.06 (8,543)		
Education							Highest level of education attained, measured by ISCED-97
low	22.31 (7,486)		25.86 (4,082)		19.15 (3,404)		ISCED-97: 0, 1, 2
medium	45.88 (15,396)		44.02 (6,948)		47.52 (8,448)		ISCED-97: 3 & 4
high	31.81 (10,676)		30.11 (4,752)		33.33 (5,924)		ISCED-97: 5 & 6
Self-perceived health		3.33 (1.00)		3.30 (1.00)		3.35 (1.00)	1=poor, 2=fair, 3=good, 4=very good, 5=excellent
Self-perceived health (all observations)		3.23 (.98)		3.19 (.98)		3.29 (.99)	
Age at retirement				64.94 (4.03)			
Length of observation (in survey waves)		3.73 (1.64)		4.52 (1.72)		3.03 (1.20)	Length of observation (in survey waves)

Source: SHARE release 9.0.0; wave 1-9, excluding wave 3; own calculations
Notes: All statistics (besides self-perceived health for all observations and age at retirement) are calculated for the respondent's first observation in the panel. The table displays percentages and observations (n) and the mean with the corresponding Standard Deviation (SD) in parentheses.

4.2 Fixed-Effects Panel Regression Models

For descriptive purposes, fixed effects (FE) and random effects (RE) regression models are estimated with and without controlling for age (Table 4). The table shows that the difference in self-perceived health between those who are retired and those who are not retired captured by the RE model, as well as the within-person change in self-perceived health upon retirement captured by the FE model, are significant. M0 and MRE show a significant on average negative effect of retirement on self-perceived health. While the effect of retirement on self-perceived health becomes positive when controlling for age in the FE model (M1), however, when doing the same for the RE model, the effect of retirement on self-perceived health remains negative (MRE2). When holding age constant, the self-perceived health of retirees is on average 0.125 scale points lower than the health of individuals who are employed or unemployed (MRE2). The RE regression is however likely to be full of confounders, while the FE model controls for all time-constant heterogeneities.

Table 4: *Comparison between Fixed Effects and Random Effects Panel Regression Models in the Effect of Retirement on Self-perceived health*

	M0: FE Model without controls	**MRE: RE Model without controls**	**M1: FE Model, linear age controlled**	**MRE2: RE Model without, linear age controlled**
Retired	-0.182***	-0.249***	0.0234**	-0.125***
	(-28.64)	(-16.23)	(2.95)	(-5.84)
Age			-0.0275***	-0.0101***
			(-36.54)	(-8.34)
Constant	3.285***	3.273***	4.897***	3.849***
	(1760.64)	(571.08)	(110.37)	(55.47)
Number of cases	125,215	125,215	125,215	125,215

Source: SHARE release 9.0.0; wave 1-9, excluding wave 3; own calculations
t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

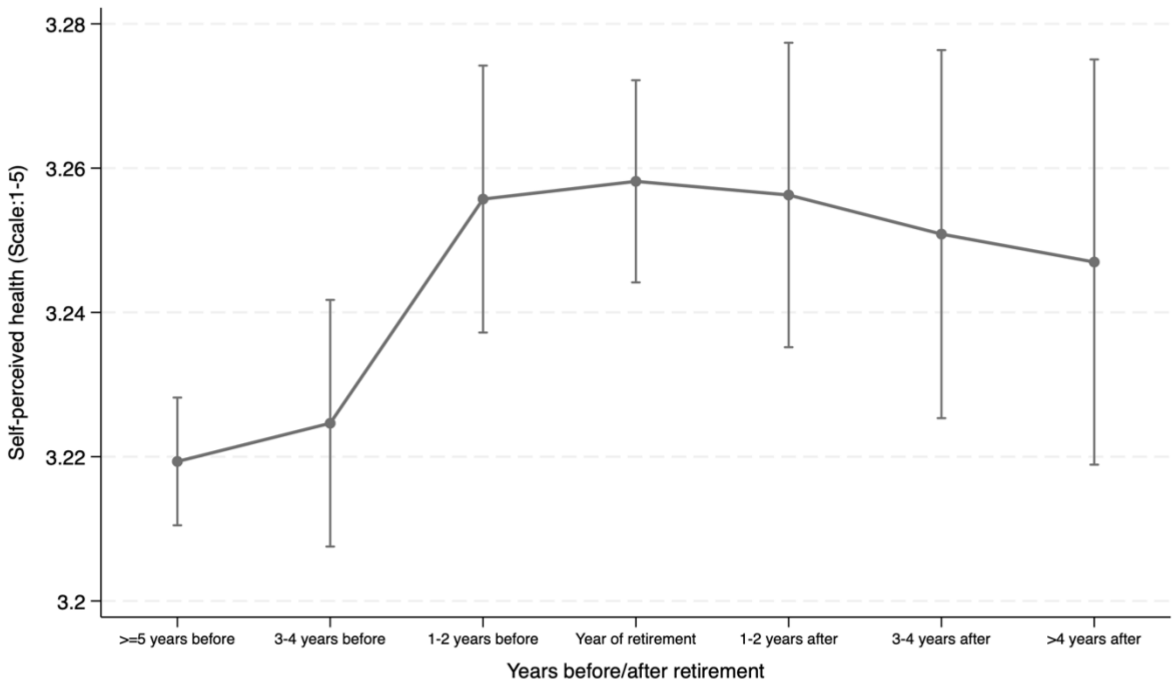
Based on the aim of this thesis, fixed effects regressions are more suitable for the present analysis (see Chapter 3). The decision to estimate FE models has also been confirmed by the Hausman test[9] which rejected the random effects specification (Prob > chi2 = 0.0002) (Jones et al., 2013, pp. 235–236). Further, running a modified Wald statistic showed the presence of groupwise heteroskedasticity. Therefore, all fixed-effect models were estimated using robust standard errors (Baum, 2001). The Zero model (M0) without controls shows that a within-

[9] The Hausman test estimates if the explanatory variables and the unit effects are not correlated (Hausman, 1978). While small values favour random effects models, large values accept the null hypothesis and favour fixed effects models (Halaby, 2004).

person change from working life to retirement is on average associated with a 0.182 ($p < 0.001$) scale point decrease in self-perceived health (Table 4). When linear age is controlled, Model 1 depicts that retirement can be associated with an average increase of 0.0234 ($p < 0.01$) scale points in self-perceived health, showing a significant small positive effect.

All further models control for linear age, as including age as a linear variable in the FE regression model has a sizable increase on the model fit, increasing adjusted-R^2 from 0.018 in the FE retirement dummy model without controls to 0.029 in the model controlling for linear age. Quadric, cubic and age dummies did not cause a sizable increase in the model fit. The calculated Akaike information criterion (AIC) and the Bayesian information criterion (BIC) also show that linear age improves the model fit (Table C2). No further time-variant variables such as cohort or period were controlled, as there was no strong theoretical or empirical implication for period or cohort effects (see Appendix C for the empirical exploration and descriptive plots). To illustrate the results of the FE regression, Figure 2 presents the margins plot[10] for the effect of retirement on self-perceived health over time.

Figure 2: *Margins plot Model 2, FE regression of retirement time dummies on self-perceived health, linear age controlled, robust standard errors*



[10] According to the Stata description "Margins are statistics calculated from predictions of a previously fit model at fixed values of some covariates and averaging or otherwise integrating over the remaining covariates" (StataCorp, 2023a, p. 1586). The results are plotted in the graph.

The fixed effects regression modelling the effect of retirement time dummies on self-perceived health shows, that when linear age is controlled, self-perceived health increases in anticipation of retirement (Table 5, 1-2 years before retirement: $\beta = 0.0364$, $p<0.01$). This finding supports Hypothesis 1.1 (*The anticipation effect of retirement on self-perceived health is positive, self-perceived health increases in the year before retirement*).

For individuals transitioning to retirement, their self-perceived health is on average $\beta = 0.0388$ ($p<0.001$) scale points higher in the year of retirement compared to 5 years or more before retirement. Self-perceived health is the highest in the year of retirement, but the difference compared to the 1-2 years before and after the event is small. Therefore, the second part of Hypothesis 1.2 (*The immediate effect of retirement on self-perceived health is positive, self-perceived health increases the most in the year of retirement*) is not fully supported by the results of the analysis, while the first part of the hypothesis is supported by my findings.

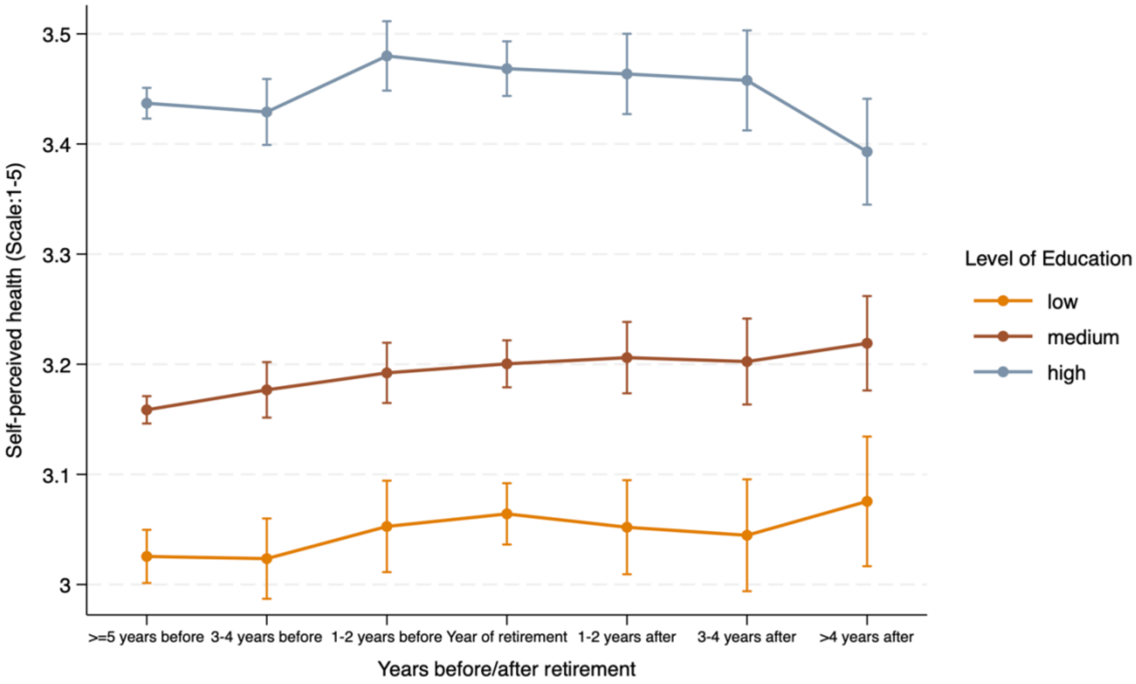
In the years after retirement, self-perceived health decreases slowly but remains at a higher average score compared to the time before retirement (>4 years after retirement: $\beta = 0.0276$, $p > 0.05$). However, assuming a Confidence Interval (CI) of 95% the effect of retirement on self-perceived health is not significant after respondents have been retired for more than 2 years (Table 5). The slow decrease in self-perceived health observed after retirement visualised in Figure 2 confirms Hypothesis 1.3 (The *effect of retirement on self-perceived health is positive in the years after retirement but the effect decreases in the long term*).

Retirement time dummies and age explain 2.9% of the within-variation in self-perceived health over time (within R^2: 0.0288) (see Table 5 for all FE regressions). Regarding the first research question on *how retirement affects health before, during and after the event*, it can be summarised that when a person transitions to retirement, their self-perceived health increases significantly 1-2 years before the transition to retirement and in the year of retirement. Self-perceived health decreases slowly after retirement but remains at a higher average score compared to 3 years or more before retirement.

To answer the second and third research questions of *how the effect of retirement on health differs between people depending on their socioeconomic status* and *how retirement affects the socioeconomic inequality in health*, three separate fixed effects panel regression models were estimated modelling the effect of retirement time dummies on self-perceived health for low-educated individuals (ISCED-97 0, 1, and 2), medium-educated individuals (ISCED 3 and 4) and high-educated individuals (ISCED-97 5 and 6). The regressions are visualised together in the margins plot in Figure 3 and control for linear age.

Figure 3 shows that all regressions depict a positive effect of retirement on self-perceived health, however, the effects differ in pattern, size and significance. Furthermore, it shows that the self-perceived health of the high-educated group is on average better than the self-perceived health of the low-educated group. There is a clear gap between the two groups in their average self-perceived health scores. The constant differs by about 0.575 (Table 5; constant low-educated: 4.636; constant high-educated: 5.211). The self-perceived health of the medium-educated group is more similar to that of the low-educated group than to that of the high-educated group.

Figure 3: *Margins plot Model 3a, b, c, FE regression of retirement time dummies on self-perceived health estimated separately for high, medium and low educated respondents, linear age controlled, robust standard errors*



The medium education group shows a relatively constant increase in self-perceived health over the observed time covering before, during, and after retirement (Figure 3). Assuming a CI of 95%, the average increase in self-perceived health in the year of retirement (β=0.0418), at 1-2 years after (β=0.0474) and at >4 years after retirement (β=0.0604) are significantly higher compared to the self-perceived health at more than 5 years before retirement. For individuals with a low level of education, self-perceived health increases on average by 0.0386 scale points in the year of retirement, compared to 5 years or more before retirement, and the average score remains at a higher level in the time after retirement (e.g. 3-4 years after: β=0.0315, p>0.05). None of the retirement-dummy effects are significant for the low educated group assuming a 95% CI (Table 5). For high educated individuals, the effect is significant at 1-2 years before retirement (β=0.0430, p<0.05), which is also the largest increase in self-perceived health compared to 5 years before retirement. For this group, self-perceived health shows the largest increase in anticipation of retirement and slowly decreases after retirement, until reaching the lowest self-perceived health at 5 years and more after retirement (β= -0.0440, p>0.05).

Table 5: *Comparison between FE Regression Models*

	M1: FE Model	**M2: FE Model, dummies**	**M3a: FE Model, low education**	**M3b: FE Model, medium education**	**M3c: FE Model, high education**
Retired	0.0234**				
	(2.95)				
Age	-0.0275***	-0.0279***	-0.0262***	-0.0277***	-0.0291***
	(-36.54)	(-29.04)	(-11.69)	(-19.13)	(-18.65)
3-4 years before		0.00529	-0.00202	0.0181	-0.00793
		(0.48)	(-0.08)	(1.13)	(-0.42)
1-2 years before		0.0364**	0.0272	0.0336	0.0430*
		(2.99)	(0.97)	(1.88)	(2.11)
Year of retirement		0.0388***	0.0386	0.0418*	0.0314
		(3.54)	(1.56)	(2.56)	(1.69)
1-2 years after		0.0369**	0.0265	0.0474*	0.0266
		(2.59)	(0.84)	(2.21)	(1.11)
3-4 years after		0.0315	0.0192	0.0438	0.0207
		(1.92)	(0.54)	(1.78)	(0.73)
>4 years after		0.0276	0.0500	0.0604*	-0.0440
		(1.52)	(1.22)	(2.22)	(-1.44)
Constant	4.892***	4.913***	4.636***	4.824***	5.211***
	(110.37)	(89.17)	(36.12)	(58.43)	(57.76)
R2-within	0.0287	0.0288	0.0239	0.0248	0.0398
Number of cases	125,215	125,215	28,154	56,044	41,017

Source: SHARE release 9.0.0; wave 1-9, excluding wave 3; own calculations
t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
Notes: The table displays the FE regression output for the different models of the effect of retirement on self-perceived health. Linear age is controlled in all models and all regressions include robust Standard Errors.

The FE regression models of age and retirement dummies explain 2.4% of the within-person variance in self-perceived health over time for the low-educated group, 2.5% for the medium-educated group and 4% for the high-educated group (R^2-within, Table 5). The R^2-within is 0.0293 for the interaction model.

Interaction Effect

To explore whether retirement-related changes in self-perceived health differ significantly between people with low, medium or high levels of education, I further estimated an FE model including an interaction between retirement time dummies and education. Figure D1 depicts that the effect of retirement is less positive for individuals with a high education at all time points compared to those with a low education (see Appendix D). More specifically, 1-2 years before retirement, the self-perceived health of all education groups is affected similarly, while in the year of retirement and the years after, the effect on self-perceived health is less positive for the highly educated group. Medium and low-educated individuals depict a similar pattern in the effect of retirement. However, the interaction effects show that only the effect for the high educated group at >4 years after retirement is significantly different compared to the low-education group (Appendix D, Table D1, β=-0.138, $p<0.001$). All other differences in the effect of retirement on self-perceived health depending on education level are statistically non-significant.

Both the separate FE regressions and the FE regression including the interaction effect show that the direction of the effect of retirement on self-perceived health is similar for people with a different socioeconomic status. All three groups experienced an increase in self-perceived health when transitioning to retirement. Comparing the high and low education groups, the interaction effect showed that the effect of retirement was less positive for high educated individuals at all time points, but the difference was only significant at 5 years after retirement. The graphical exploration of Figure 3 and Figure D1 (Appendix D) suggest a minimal reduction in the SES health gap in the years after retirement. Testing the second and third hypotheses, the results suggest a trend in the direction of Hypotheses H2b (*The effect of retirement on self-perceived health is more positive for individuals with a low SES)* and H3b *(The socioeconomic inequality in health decreases after retirement).* However, since all the effects of retirement on self-perceived health are very small and the differences between high and low-educated individuals are not significant, except for the effect more than 5 years after retirement, none of the hypotheses can be confirmed confidently.

4.3 Robustness

A common issue with SHARE data, and longitudinal data in general, is unit nonresponses in the samples of each wave and sample attrition occurring over the time of the panel (De Luca & Donni, 2024). Aside from including refreshment samples which counteract attrition, SHARE provides design weights that can be used to deal with the issues of unit nonresponse and sample attrition using the calibration approach of Deville and Särndal (1992) which aims to reduce selection effects (De Luca & Donni, 2024).[11] The target population to which the calibrated longitudinal weights provided by SHARE relate to is the cross-sectional population at the first survey wave that survives to the last wave considered (Bergmann & De Luca, 2018). Since this is not the target population of my thesis, the weights are only applied to perform a robustness check of the results and are not used in the main analysis.

It is important to address and adjust for attrition bias in the robustness check of the results, especially since the outcome variable of my thesis is health and it is a common issue that respondents leave panels due to their ill health. Further, including weights when estimating causal effects can correct for heteroskedasticity or endogenous sampling (Solon et al., 2015).

Studies similar to mine, using data from SHARE and employing fixed effects panel analysis, have not used one general strategy for reviewing the robustness of their results and for using weights. Sohier et al. (2021), for example, used the weights provided by SHARE while Baumeister et al. (2023) applied inverse probability weighting[12] in addition to using the weights provided by SHARE. Celidoni & Rebba (2017) did not mention the use of weights, but instead controlled for attrition bias and the robustness of their results by comparing the regression estimates between a balanced and an unbalanced sample.

---

[11] For panel analysis, SHARE release 9.0.0 provides calibrated longitudinal weights for all 8 couples of consecutive waves and the full panel. The full panel weights were calculated to represent each country's 50+ population in 2004, surviving up to 2021 (De Luca & Donni, 2024). For the individual calibrated weights, the sample is therefore fully balanced with individuals interviewed in each of the nine waves (De Luca & Donni, 2024). The calibration margins for the target population are based on regional demographic data provided by Eurostat and are restricted to 6 age groups for males and females (Bergmann & De Luca, 2018; De Luca & Donni, 2024).

[12] Inverse probability weighting aims to adjust for panel attrition, missing information or unequal sampling fractions by calculating weights for a complete case based on “the inverse of their probability of being a complete case” (Seaman & White, 2013, p. 278) or on the inverse of their “known probability of being sampled” (Seaman & White, 2013, p. 283).

Based on the varied methods carried out by previous studies, I tested the robustness of my results by performing two robustness checks. First, I followed the method used by Celidoni & Rebba (2017) and compared the FE linear regression estimates between my unbalanced sample and a fully balanced subsample to control the robustness of my main results and to test if sample attrition is a problem for the results. This is possible because a fully balanced sample does not suffer from attrition bias. I ran the same FE regression models described in the previous section (M1, M2, M3a/b/c, M4) using the balanced subsample. The balanced subsample produces similar results to mine in terms of the general pattern and direction of the effect of retirement on self-perceived health and regarding the effect of retirement on self-perceived health depending on SES (Appendix E). Similar to the main analysis, the interaction effects are not significant using the balanced sample suggesting that changes in self-perceived health are not significantly different between people with low, medium or high education levels. The graphical analysis suggests a decrease in the socioeconomic inequality in health during and after retirement. Since the results from the balanced sample are similar to the main results, my results appear to be robust and the findings suggest that sample attrition is not a significant problem for the results.

Second, I ran the same FE regression models using the balanced sample and additionally included the individual calibrated longitudinal weights provided by SHARE. Applying the same methods to the weighted balanced sample produced results that differed slightly from the main findings (see Appendix E). The effect of the retirement time dummies on self-perceived health is still positive but the effects are not significant. This could however be explained by the smaller sample size of the balanced panel as the balanced panel includes 8458 observations and 1128 respondents which is a notably lower sample compared to the main sample size of 125,215 observations and 33,558 respondents (see Appendix E). Further, in the separate FE regressions, the medium-educated group has the lowest average score of self-perceived health observed over most time points. The inequality in health between the high and the medium education group seems to increase during and after retirement. The gap between the high and the low-educated groups decreases after retirement, which supports the findings of the main results. Aside from the differences regarding the medium-educated group and the missing significance, the results of the balanced weighted sample are similar to the main results and therefore confirm the robustness of my results. The robustness of the main results is confirmed by the results of the balanced sample and the weighted balanced sample and attrition bias does not seem to be a problem for my results.

5. Discussion and Conclusion

5.1 Discussion

This thesis aimed to answer the main research question of *how retirement affects the health of older adults* by examining how the life course event of retirement impacts the health of older adults living in Europe and how retirement affects social inequalities in health. I found that self-perceived health increases when an individual transitions to retirement and that the observed effect is comparable for individuals with different socioeconomic backgrounds. The socioeconomic inequality in health was not impacted in a meaningful way when people transitioned to retirement. In the long term, at 4 years after retirement and beyond, the graphical analysis suggested a narrowing of the SES health gap driven by a decrease in the self-perceived health of individuals with a high level of education. To come up with these findings I used longitudinal data from 8 waves of SHARE (2004/06-2021/22) and analysed a total sample of 33,558 respondents and 125,215 observations which included a retiring sample of 15,782 respondents and 71,276 observations. As the main method of analysis, I employed fixed effects panel regressions, focusing on the intra-individual changes in self-perceived health throughout retirement.

To answer the main research question, I first investigated three sub-questions. The first question: *How does retirement affect health before, during and after the event?* focused on the effect of retirement on health over time and emphasised that retirement is commonly a planned life course event that may cause an anticipation effect before as well as a transitional phase after the event. When controlling for age, the positive effect of retirement on self-perceived was significant for 1 to 2 years before retirement, the year of retirement and for 1 to 2 years after retirement compared to the reference group of more than 5 years before retirement. However, with an average increase in self-perceived health of under 0.05 scale points on a 1 to 5 scale, the observed health improvements caused by retirement were overall small. After retirement, the model showed a slow decrease in self-perceived health, but the average score remained 0.0276 points higher ($p>0.05$, not significant) at more than 4 years after retirement compared to the reference time of 5 years or more before retirement (Table 5). These findings were mostly in line with my expectations formulated in hypotheses 1.1 (*The anticipation effect of retirement on self-perceived health is positive, self-perceived health increases in the year before retirement*) and hypothesis 1.3 (*The effect of retirement on self-perceived health is positive in the years after retirement but the effect weakens over time*). Surprisingly the effect of retirement was not significantly larger in the year of retirement as I expected in hypothesis 1.2 (*The immediate effect of retirement on self-perceived health is positive, self-perceived health increases the most in the year of retirement*). The positive anticipation and short-term effect of retirement on self-perceived health found in this thesis is consistent with the findings of previous studies (Coe & Zamarro, 2011; Gorry et al., 2018; Leimer & Van Ewijk, 2022; Nishimura et al., 2018; Rose, 2020; Westerlund et al., 2009). In contrast to the cross-sectional study by Coe & Zamarro (2011) that reported only a temporary effect of retirement on health, my present results suggest that retirement may have a preserving effect on self-perceived health, since the positive effect persists for 4 years or more after retirement. This supports the findings from longitudinal studies by Gorry et al. (2018), which found a positive effect of retirement on self-rated health for four years or more after retirement, and by Westerlund et al. (2009), who reported in their study that the decrease in the prevalence of ill self-rated health was maintained for seven years after retirement. My findings are therefore compliant with the results of other longitudinal studies. It must be recognised however that in my results, the effect on self-perceived health was not significant after 1-2 years after retirement. Furthermore, this emphasises that one has to be careful when comparing the findings of cross-sectional and longitudinal studies.

While this thesis does not explore the mechanisms that cause the effect of retirement on self-perceived health, explanations for the positive relationship can be found in previous literature. Studies have suggested that improvements in a range of different health behaviours, that occur after retirement, could explain the positive effect of retirement on health. These include for example that retirees might use their additional leisure time for more frequent exercise and could therefore be more physically active than in employment (Celidoni & Rebba, 2017; Insler, 2014). Further, self-perceived health might increase due to reduced mental stress, fewer symptoms of fatigue and better sleep quality (Barban et al., 2020; Garrouste & Perdrix, 2022; Rose, 2020). Since the positive effect on self-perceived health is already prevalent 1 to 2 years before retirement, people might change their behaviour in anticipation of the event or adjust their employment situation to prepare for the pending retirement. More precisely, people may reduce their monthly work hours or change from work positions with a high level of responsibility, workload and stress, to a different (less demanding) operational position before retiring (Barban et al., 2020). It has also been suggested that the change in health behaviours upon retirement may be dependent on the country-specific healthcare systems (Celidoni & Rebba, 2017). Further research could investigate which exact factors explain the positive effect of retirement on self-perceived health found in this thesis and if they differ between the European countries included in SHARE.

An unexpected result of this thesis was that the observed increase in self-perceived health was similar in the years before, during, and after retirement. While this might be caused by the imprecise measure of the year of retirement, which is discussed in the section on limitations, this finding could also propose a future research question regarding the specific mechanisms that affect health before, during and after the event of retirement.

The second research question investigated the heterogeneity in the effect of retirement depending on individuals' socioeconomic background. Namely, *how does the effect of retirement on health differ between people depending on their socioeconomic status?* Based on the contradictory findings of previous literature I tested three hypotheses: the first expected that the effect of retirement would be *more positive for individuals with a high SES* (H2a), the second hypothesis expected that the effect would be *more positive for individuals with a low SES* (H2b), and the third hypothesis anticipated that the effect of retirement would be *initially negative for individuals with a low SES but would become positive in the long term* (H2c). I investigated the second research question by conducting separate fixed effects panel regressions to model the effect of retirement on self-perceived health for individuals with a low, medium and high level of educational attainment. The results showed that while the effect of retirement on self-perceived health was positive 1-2 years before retirement, during retirement and up to 3-4 years after retirement for all groups, the groups differed in the size and the pattern of the effect of retirement. The additional FE regression which included interaction terms between the retirement time dummies and the level of education (Table D1) showed however, that only the difference between low-educated and high-educated individuals at more than 4 years after retirement is significant. Therefore, my findings suggest that the effect of retirement on self-perceived health is mostly similar for people across socioeconomic positions. Based on these findings, none of the three hypotheses is supported by my results. This is contradictory to studies that have reported a significant difference in the effect of retirement on health for different socioeconomic groups such as Leimer & Van Ewijk (2022) and Westerlund et al. (2009) for self-perceived health and Barban et al. (2020), Baumeister et al. (2023), Grøtting and Lillebø (2020), Leimer und Van Ewijk (2022), Mazzonna und Peracchi (2017), Schaap et al. (2018), Shiba et al. (2017), Van Zon et al. (2016), and Xue et al. (2020) for other health outcomes.

My results can be related to the literature in two main ways. First, my findings can be interpreted in support of studies that have also found no difference in the effect of retirement on health depending on one's socioeconomic status (Heller-Sahlgren, 2017; Leckcivilize & McNamee, 2022). These studies explicitly mentioned that they did not find a difference in the effect of retirement on health depending on the educational background of a person. Beyond the interpretation that retirement does not affect self-perceived health differently depending on one's level of education, my findings highlight the importance of the measure of SES used. While I did not find a significant difference using the measure of education, the studies that did find a different effect of retirement on self-perceived health found the difference between individuals who worked in physically demanding jobs compared to white-collar workers (Leimer & Van Ewijk, 2022) and individuals retiring from poor working conditions compared to those retiring from jobs with a high level of work satisfaction and occupational grade (Westerlund et al., 2009). The level of education might be a broader and less precise measure than the working conditions or the degree of physical strain of a job. This could explain the non-significant differences observed in my analysis. Beyond these two interpretations, it would be interesting to investigate why the difference between the high and the low education groups becomes significant in the long term, more than 4 years after retirement. Whether or not this finding is replicable could be investigated in future research.

Based on the existence of a socioeconomic gradient in health and as a consequence of the previous research question, the third research question asked: *how does retirement affect the socioeconomic inequality in health?* First, I found that the FE models depict a clear gap in the average score of self-perceived health between individuals with a low and those with a high level of education (Figure 3). As expected, my thesis confirms that the gap in health persists at older ages and after retirement, with higher average self-perceived health found for individuals with a high education (Van Rossum, 2000). The medium-educated group's average self-perceived health was between that of the low- and high-educated groups, but relatively closer to that of the low-educated group. Secondly, since my thesis did not find a significant difference in the effect of retirement on self-perceived health depending on an individual's socioeconomic status, the socioeconomic inequality in health was consequently not significantly affected by individuals' transition to retirement. This was analysed graphically and based on the FE interaction model.

The only exception was the already mentioned significant difference in the effect of retirement on self-perceived health between low and high-educated individuals more than 4 years after retirement. There, the model showed that the self-perceived health of the high-educated group decreases, while the health of the low-educated group increases. This development caused a narrowing in the health gap and suggests that health inequality may decrease as a long-term effect of retirement. These findings cannot be placed directly on the continuum of the proposed hypotheses which ranged from the expectation that *the socioeconomic inequality in health increases after retirement* (H3a) over *the expectation that the socioeconomic inequality in health increases initially after retirement but decreases in the long term* (H3c) to the proposition *the socioeconomic inequality in health decreases after retirement* (H3b). The findings of my thesis show that the socioeconomic inequality in health remained stable after retirement but decreased in the long term.

The reduction of socioeconomic inequalities in the long term also supports previous results by Grøtting & Lillebø (2020) who have suggested that retirement may act as a leveller for health inequalities. However, as the effect found in my thesis occurs more than four years after retirement, it cannot confidently be attributed to the event of retirement and raises further questions about the long-term impact of retirement. When exactly after retirement does the gap in health narrow? Do people with different SES become more similar regarding their health behaviours after retirement? Is the converging trend driven by a decrease in the health of high SES individuals, as suggested in this thesis, or rather by the preserved health of low SES individuals? Can this development be attributed to the transition from working life to retirement or are other factors more important? Future research should investigate these questions further.

5.2 Results in Relation to the Life Course Approach to Health

The results of this thesis can be interpreted further by relating them to the life course approach to health and embedding them in the theoretical framework of this thesis. The life course approach to health adds to the understanding of this thesis in the following ways. First, according to the sensitive period model of the theory, retirement can be understood as a sensitive period in the development of an individual's health, during which they experience a period of change as they transition from working life to retirement (Bartley et al., 1997). This corresponds to the significant positive within-person change in self-perceived health caused by retirement that has been found in the present analysis. Further, my findings showed that the positive effect of retirement on self-perceived health is not only prevalent at the exact time of retirement but persists beyond the year of the event. The sensitive period of retirement offers retirees the opportunity to change their habits and health behaviours in ways which may preserve and benefit their health in the long term. Further, the long-term effect of retirement on health can be connected to the understanding of health as a stock that increases through the change in health behaviours upon retirement and only gradually evolves or declines thereafter (Gorry et al., 2018; Rose, 2020).

Second, the accumulation model assumes that health risks and behaviours accumulate over the life course and determine health at older ages (Burton-Jeangros et al., 2015). I estimated individuals' socioeconomic status based on the level of education that the SHARE respondents attained. Usually, individuals obtain most of their education during childhood and early adulthood, but the results of my thesis show that health differences between people with a low and those with a high level of education persist up to older ages. While this thesis did not investigate the underlying reasons that may cause the differences in health, previous studies have found that health behaviours, habits and lifestyle factors differ between socioeconomic groups and can explain the socioeconomic gradient in health (Debiasi & Dribe, 2020; Mackenbach et al., 2008; Petrovic et al., 2018). The health gap between individuals with a high and those with a low level of education observed in the analysis, confirms that education can be used as an indicator of socioeconomic status even at older ages. Further, education can be interpreted as an indicator of materialistic exposures that accumulate over the life course (Blane, 1997). The socioeconomic gap in health may therefore not only persist but, according to the accumulation model, even widen over the life course as individuals with a higher education may, for example, also earn a higher income throughout their working life and receive a higher pension in retirement (Hasselhorn, 2020). Contradictory to this, the inequality in health observed in this thesis did not widen after retirement, but initially remained relatively constant. The effect was positive for all SES groups and the inequality in health did not change significantly around the year of retirement. If the extent to which health increases is similar for everyone around the year of retirement, the inequality between SES groups remains relatively stable. A life course event might not have enough influence to change health outcomes and socioeconomic differences in health that have accumulated over the whole life course. While daily habits might be altered and become more similar between people with different SES, circumstances like the living situation or the household income remain unchanged after retirement and cannot easily be 'levelled' by the transition to retirement.

In the long term, however, the results of this thesis did suggest a significant decrease in socioeconomic inequalities in health after more than four years after retirement. While the accumulation model can explain how socioeconomic inequalities in health develop over the life course and persist until older ages, this model of the life course approach cannot explain why the results of my thesis suggest a decrease in socioeconomic health inequality in the long term. This is where the sensitive period model can complement the accumulation model. The sensitive period model can explain the delayed effect of retirement on health, as socioeconomic groups may make different decisions and changes in their health behaviours and habits during the sensitive period of retirement, which may not affect health immediately but in the long term. While the event of retirement may not influence to affect the accumulated inequalities in health immediately, it could be hypothesised that retirement leads to a levelling effect or a de-accumulation of inequalities in the long term. This is the third way in which the results of this thesis relate to the life course approach.

5.3 Strengths and Limitations

First, my thesis contributes to the literature by combining the analysis of the effect of retirement on health with the question of how retirement affects socioeconomic inequality, and more specifically, the socioeconomic gap in health. To the best of my knowledge, these two aspects have not been explicitly combined in one study before. It is scientifically and socially relevant to understand how the transition to retirement affects health and interacts with socio-economic status, to prevent future pension reforms from widening the socioeconomic gap in health. Second, I used the newest release of SHARE (9.0.0) which was released in March 2024 and is the first release to include the 9th wave of the panel. Due to the recent release date, to my knowledge, no studies have been published yet that use the newest release and include the 9th wave of SHARE data in their analysis. Therefore, a second strength and scientific contribution of my thesis is, that it extends the timeline observed with the SHARE panel data and confirms previous findings of a positive effect of retirement on self-perceived health while using the newest release and most recent wave of SHARE.

Third, the longitudinal approach of my analysis allowed me to analyse the causal effect of retirement on health, rather than comparing retired and non-retired individuals cross-sectionally, which has been found to bias results (Xue et al., 2020). Even though one must be cautious in using the term ‘causal effect’, as there might be remaining time-varying heterogeneities which were not considered and controlled in the analysis of this thesis, the fixed effects approach does have the strengths that all time-constant heterogeneities are controlled for in the model. Further, the longitudinal approach allowed me to model the effect of retirement on self-perceived health over time and to separate the effects between the anticipation, the time during and the time after the transition to retirement. This provided a detailed insight into the health trajectories of older adults.

However, an important limitation of the retirement variable (retirement time dummies) is, that it does not capture the exact year of retirement. Instead, the variable assumes that the survey year in which a respondent first self-reports that their current work situation is retirement is equivalent to the respondent's actual year of retirement. Since SHARE is not carried out every year and not every respondent participated in every wave, the true year of retirement remains unknown. The actual time of retirement lies between the last survey year in which a respondent indicated to be employed and the first survey year in which the respondent reported to be retired. Even in a balanced panel, the actual year of retirement could vary by two years from the assumed year of retirement. This circumstance causes an inaccuracy in the measurement of the time of retirement. It might also be an explanation for the finding that the anticipation effect of retirement on self-perceived health at 1-2 years before retirement is similar to the effect at the year of retirement. This was also found in the robustness check using the fully balanced sample. The anticipation effect may therefore in some cases capture the actual effect of retirement better than the assumed year of retirement.

Besides this limitation of the retirement variable, the measurement used for retirement can also not capture the full complexity of the transition to retirement or consider individual retirement patterns. In my thesis partial or gradual retirement, in which retirees may still work for a few hours per week or month, cannot be differentiated from full retirement because the survey question only allows one response option, either working or retired (Croda & Callegaro, 2006; Wetzel et al., 2016). Further, I did not distinguish between the type of retirement (early, statutory, late) like other studies which have reported that early retirement appears to be beneficial for the health of individuals with a high income compared to those with a low income who experience negative effects (Barban et al., 2020).

As explained in the description of the operationalisation, I have explicitly chosen education as the measure of socioeconomic status since it can be well integrated into the life course approach to health and is a suitable proxy for socioeconomic status. Despite this, it has to be acknowledged as a limitation of this measurement choice, that the measure of education may be distorted as younger people have on average a higher level of educational attainment than older people, due to the development of the education expansion (Gómez-Costilla et al., 2022). While this may not be a major issue for my thesis, assuming that the respondents included in the study sample belong to the same or neighbouring generations, it will become more important to adjust for this with the increasing length of the SHARE panel. It can therefore be recommended that future studies include multiple measures of socio-economic status or test the robustness of the education measure. I measured education using the 1997 version of ISCED since this version of ISCED is available for all SHARE respondents while the revised 2011 version of ISCED is only available for the more recent survey waves. However, the earlier version of ISCED has been criticised for being too simplistic to capture socioeconomic status (Schneider, 2013).

Regarding the outcome variable self-perceived health, Blane et al. (2007) have criticised the use of self-rated health variables in life course analysis since it is unknown how exactly self-perceived health captures mental and physical health, and to which extent it is influenced by past and present experiences or future expectations. Analyses using the measure may therefore not be biologically reasonable (Blane et al., 2007). However, since this thesis aims to explore the health consequences of retirement more generally and does not claim to be biologically reasonable, this limitation of the chosen measure does not influence the informative value of the analysis in a meaningful way. As the utilisation of the variable self-perceived health is discussed frequently in literature, other studies have also questioned and criticised its use. Layes et al. (2012) have reported that self-perceived health not only measures latent health but also reflects the reporting behaviour of the respondent. This can reduce the variable's validity in measuring health. For example, the study found that in Canada, people over the age of 80 and those with lower levels of education and income were more optimistic in their reporting behaviours (Layes et al., 2012). Self-perceived health is also associated with an individual's personality (Goodwin & Engstrom, 2002; Suominen et al., 2001). This may lessen its informative value. However, since personality traits and reporting behaviours are relatively time-constant within one individual (time-constant heterogeneity), the fixed effects panel regression models control for them and ensure the validity of the self-perceived health measure.

Besides the limitations related to the choice of variables and the availability of variables in the chosen dataset, another topic of limitations concerns the sample selection. In aiming to capture the effect of retirement on self-perceived health I followed a strict sample selection process excluding, for example, reverse transitions in and out of retirement and people who transitioned directly from unemployment to retirement. While this is on the one hand a necessary step in the selection process to capture the effect that I am interested in, it makes my results on the other hand more artificial as it simplifies the process of entering retirement. Additionally, I have excluded participants who indicated that they transitioned to retirement due to their ill health. The reason for their exclusion from the sample was the known issue of violating the exogeneity assumption and not capturing the causal effect of retirement on health if people self-select into retirement due to their health in the first place (Barban et al., 2020). While this decision might have reduced the likelihood of violating the exogeneity assumption of my analysis, it may also introduce bias to the observed effect of retirement on health by overestimating the average health of the treated group before retirement and underestimating the effect of retirement on self-perceived health. Regarding the latter, it could be expected that the positive effect of retirement on health might be stronger for individuals who self-selected into retirement due to their ill health. These hypotheses should be tested in a future study.

Since I have found a positive long-term effect of retirement on self-perceived health, a limitation is the fact that long-term effects on health may be subject to selectivity bias due to mortality and sample attrition (Barban et al., 2020). However, the results of the FE regression using the fully balanced panel in the robustness check have confirmed that the positive effect on self-perceived health persists for more than four years after retirement, but the effect decreased compared to the year of retirement and was also not significant. Further, all regression models that have found a significant positive effect of retirement on self-perceived health, controlled for linear age. This means that for the real-life applicability of the present findings one has to consider that ageing and retirement occur simultaneously. Individuals should not expect a sudden boost in health upon retirement. Furthermore, the average within-person change in self-perceived health in the year of retirement was below an increase of 0,05 points on a 5-point scale, which is a very small effect.

Lastly, when using fixed effects models and focusing on the within-person variation, it must be emphasised that the results cannot be generalised to the general population, but only to those who retire, as they capture the average treatment effect on the treated (ATT) (Brüderl & Ludwig, 2015). Brüderl & Ludwig (2015) highlight that policy recommendations should not be based on an ATT but rather on an average treatment effect (ATE). This limitation to the generalisability of the results of this thesis should be considered in the following section.

5.4 Conclusion

In conclusion, this thesis found that retirement affects the self-perceived health of older adults living in Europe positively independent of the retiree’s socioeconomic status. The socioeconomic inequality in health was not impacted significantly before, during and in the immediate time after retirement, however in the long term, the results suggested a significant decrease in the socioeconomic gap in health between individuals with a high and individuals with a low socioeconomic status. Due to the planned increase of the statutory retirement ages and the expected increase in life expectancy in the upcoming decades, people living in the EU will retire at older ages and simultaneously spend a longer time in retirement (European Commission, 2024). These changes in the circumstances of retirement require researchers to reevaluate the influence of retirement on retirees’ health. A focus of future research should lie on the effect of the increased retirement age and the prolonged time spent in retirement on socioeconomic inequalities in health. Further, it might be useful to conduct separate research for the different EU countries, as exact retirement ages and the circumstances of retirement vary at the country level (European Commission & Social Protection Committee, 2021). Based on the life course approach, health policies should adapt to the individual’s changing needs throughout their life course and consider the special circumstances of retirement (Burton-Jeangros et al., 2015). As a sensitive period, retirement offers a window of opportunity that could be targeted by policies that may help to improve older adults’ health behaviours and provide support for adapting to this new life phase. However, more research is necessary to identify the circumstances under which retirement may function as a leveller of health inequalities. Such research should accompany the planned retirement reforms, as it can provide policymakers with information that can inform policies aimed at reducing inequalities and promoting active and equal ageing.

References

Adler, N. E., Boyce, T., Chesney, M. A., Cohen, S., Folkman, S., Kahn, R. L., & Syme, S. L. (1994). Socioeconomic status and health: The challenge of the gradient. *American Psychologist*, *49*(1), 15–24. https://doi.org/10.1037/0003-066X.49.1.15

Alavinia, S. M., & Burdorf, A. (2008). Unemployment and retirement and ill-health: A cross-sectional analysis across European countries. *International Archives of Occupational and Environmental Health*, *82*(1), 39–45. https://doi.org/10.1007/s00420-008-0304-6

Allison, P. D. (1994). Using Panel Data to Estimate the Effects of Events. *Sociological Methods & Research*, *23*(2), 174–199. https://doi.org/10.1177/0049124194023002002

Antonovsky, A. (1967). Social Class, Life Expectancy and Overall Mortality. *The Milbank Memorial Fund Quarterly*, *45*(2), 31. https://doi.org/10.2307/3348839

Baker, E. H. (2014). Socioeconomic Status, Definition. In W. C. Cockerham, R. Dingwall, & S. Quah (Eds.), *The Wiley Blackwell Encyclopedia of Health, Illness, Behavior, and Society* (1st ed., pp. 2210–2214). Wiley. https://doi.org/10.1002/9781118410868.wbehibs395

Barban, N., De Luna, X., Lundholm, E., Svensson, I., & Billari, F. C. (2020). Causal Effects of the Timing of Life-course Events: Age at Retirement and Subsequent Health. *Sociological Methods & Research*, *49*(1), 216–249. https://doi.org/10.1177/0049124117729697

Bartley, M., Blane, D., & Montgomery, S. (1997). Socioeconomic determinants of health: Health and the life course: why safety nets matter. *BMJ*, *314*(7088), 1194–1194. https://doi.org/10.1136/bmj.314.7088.1194

Baum, C. F. (2001). XTTEST3: Stata Module to Compute Modified Wald Statistic for Groupwise Heteroskedasticity. *Stata Journal*. 1, 101-104.

Baumeister, S.-E., Wesselmann, H., Nascimento, G. G., & Listl, S. (2023). Effect of retirement on self-rated oral health and dental services use: Longitudinal fixed-effects instrumental variable study in 31 countries. *Scandinavian Journal of Work, Environment & Health*. https://doi.org/10.5271/sjweh.4134

Ben-Shlomo, Y., Mishra, G. D., & Kuh, D. (2023). Life Course Epidemiology. In W. Ahrens & I. Pigeot (Eds.), *Handbook of Epidemiology* (pp. 1–31). Springer New York. https://doi.org/10.1007/978-1-4614-6625-3_56-1

Benyamini, Y. (2011). Why does self-rated health predict mortality? An update on current knowledge and a research agenda for psychologists. *Psychology & Health*, *26*(11), 1407–1413. https://doi.org/10.1080/08870446.2011.621703

Benyamini, Y., & Idler, E. L. (1999). Community Studies Reporting Association between Self-Rated Health and Mortality: Additional Studies, 1995 to 1998. *Research on Aging*, *21*(3), 392–401. https://doi.org/10.1177/0164027599213002

Bergmann, M., Bethmann, A., & De Luca, G. (2024). Continuation of Refreshment Samples in wave 9 after the Suspension of Fieldwork in wave 8 [Application/pdf]. In M. Bergmann, M. Wagner, & A. Börsch-Supan (Eds.), *SHARE Wave 9 Methodology: From the SHARE Corona Survey 2 to the SHARE Main Wave 9 Interview.* (Version 1.0, p. 180 pages). https://share-eric.eu/data/data-documentation/methodology-volumes

Bergmann, M., & De Luca, G. (2018). *Guidelines for computing longitudinal weights and sampling documentation*. *2.11*.

Bergmann, M., Wagner, M., & Börsch-Supan, A. (2024). *SHARE Wave 9 Methodology: From the Second SHARE Corona Survey to the Regular SHARE Interview*. 180 pages. https://doi.org/10.6103/MV.W09

Bethmann, A., & Bergmann, M. (2023). SHARE Sampling Guide 10. In *SHARE Working Paper Series 87-2023* (Version 1.0, p. 18 pages). https://doi.org/10.6103/WP.872023

Blane, D. (1997). Disease aetiology and materialist explanations of socioeconomic mortality differentials. *The European Journal of Public Health*, *7*(4), 385–391. https://doi.org/10.1093/eurpub/7.4.385

Blane, D., Netuveli, G., & Stone, J. (2007). The development of life course epidemiology. *Revue d'Épidémiologie et de Santé Publique*, *55*(1), 31–38. https://doi.org/10.1016/j.respe.2006.12.004

Brüderl, J., & Ludwig, V. (2015). Fixed-effects panel regression. In H. Best & C. Wolf (Eds.), *The SAGE handbook of regression analysis and causal inference*. SAGE Reference.

Burton-Jeangros, C., Cullati, S., Sacker, A., & Blane, D. (2015). Introduction. In C. Burton-Jeangros, S. Cullati, A. Sacker, & D. Blane (Eds.), *A Life Course Perspective on Health Trajectories and Transitions* (Vol. 4, pp. 1–18). Springer International Publishing. https://doi.org/10.1007/978-3-319-20484-0_1

Celidoni, M., & Rebba, V. (2017). Healthier lifestyles after retirement in Europe? Evidence from SHARE. *The European Journal of Health Economics*, *18*(7), 805–830. https://doi.org/10.1007/s10198-016-0828-8

Chandola, T., & Jenkinson, C. (2000). Validating Self-rated Health in Different Ethnic Groups. *Ethnicity & Health*, *5*(2), 151–159. https://doi.org/10.1080/713667451

Cirino, P. T., Chin, C. E., Sevcik, R. A., Wolf, M., Lovett, M., & Morris, R. D. (2002).

Measuring Socioeconomic Status: Reliability and Preliminary Validity for Different Approaches. *Assessment*, *9*(2), 145–155. https://doi.org/10.1177/10791102009002005

Coe, N. B., & Zamarro, G. (2011). Retirement effects on health in Europe. *Journal of Health Economics*, *30*(1), 77–86. https://doi.org/10.1016/j.jhealeco.2010.11.002

Croda, E., & Callegaro, L. (2006). The Employment and Pensions Module in SHARE Wave 1. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.948377

Darin-Mattsson, A., Fors, S., & Kåreholt, I. (2017). Different indicators of socioeconomic status and their relative importance as determinants of health in old age. *International Journal for Equity in Health, 16*(1), 173. https://doi.org/10.1186/s12939-017-0670-3

Dave, D., Rashad, I., & Spasojevic, J. (2008). The Effects of Retirement on Physical and Mental Health Outcomes. *Southern Economic Journal*, *75*(2), 497–523. https://doi.org/10.1002/j.2325-8012.2008.tb00916.x

De Breij, S., Huisman, M., & Deeg, D. J. H. (2020). Macro-level determinants of post-retirement health and health inequalities: A multilevel analysis of 18 European countries. *Social Science & Medicine*, *245*, 112669. https://doi.org/10.1016/j.socscimed.2019.112669

De Luca, G., & Donni, P. L. (2024). Chapter 8. Weights and Imputations in SHARE Wave 9. In *SHARE Wave 9 Methodology: From the Second SHARE Corona Survey to the Regular SHARE Interview* (pp. 142–159). https://share-eric.eu/data/data-documentation/methodology-volumes

Debiasi, E., & Dribe, M. (2020). SES inequalities in cause-specific adult mortality: A study of the long-term trends using longitudinal individual data for Sweden (1813–2014). *European Journal of Epidemiology*, *35*(11), 1043–1056. https://doi.org/10.1007/s10654-020-00685-6

Deville, J. C., & Särndal, C. E. (1992). Calibration estimators in survey sampling. *Journal of the American statistical Association*, *87*(418), 376-382.

Dow, W. H., & Rehkopf, D. H. (2010). Socioeconomic gradients in health in international and historical context. *Annals of the New York Academy of Sciences*, *1186*(1), 24–36. https://doi.org/10.1111/j.1749-6632.2009.05384.x

Duncan, G. J., Daly, M. C., McDonough, P., & Williams, D. R. (2002). Optimal Indicators of Socioeconomic Status for Health Research. *American Journal of Public Health*, *92*(7), 1151–1157. https://doi.org/10.2105/AJPH.92.7.1151

Elder, G. H. (1998). The Life Course as Developmental Theory. *Child Development*, *69*(1), 1–12. https://doi.org/10.1111/j.1467-8624.1998.tb06128.x

European Commission. Directorate General for Economic and Financial Affairs. (2023). *The 2024 ageing report: Underlying assumptions and projection methodologies.* Publications Office. https://data.europa.eu/doi/10.2765/960576

European Commission. Directorate General for Economic and Financial Affairs. (2024). *2024 ageing report: Economic & budgetary projections for the EU Member States (2022 2070).* Publications Office. https://data.europa.eu/doi/10.2765/022983

European Commission, & Social Protection Committee. (2021). *2021 pension adequacy report: Current and future income adequacy in old age in the EU. Volume 1.* Publications Office. https://data.europa.eu/doi/10.2767/013455

Eurostat. (2024). Population structure and ageing. *Eurostat Statistics Explained*. Available at: https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Population_structure_and_ageing

Garrouste, C., & Perdrix, E. (2022). Is there a consensus on the health consequences of retirement? A literature review. *Journal of Economic Surveys*, *36*(4), 841–879. https://doi.org/10.1111/joes.12466

Gómez-Costilla, P., García-Prieto, C., & Somarriba-Arechavala, N. (2022). Aging and Gender Health Gap: A Multilevel Analysis for 17 European Countries. *Social Indicators Research*, *160*(2–3), 1051–1069. https://doi.org/10.1007/s11205-020-02595-2

Goodwin, R., & Engstrom, G. (2002). Personality and the perception of health in the general population. *Psychological Medicine*, *32*(2), 325–332. https://doi.org/10.1017/S0033291701005104

Gorry, A., Gorry, D., & Slavov, S. N. (2018). Does retirement improve health and life satisfaction? *Health Economics*, *27*(12), 2067–2086. https://doi.org/10.1002/hec.3821

Grammarly. (2023). *Grammarly* (Version 1.81.1.1) [Computer software]. Available at: https://www.grammarly.com

Grøtting, M. W., & Lillebø, O. S. (2020). Health effects of retirement: Evidence from survey and register data. *Journal of Population Economics*, *33*(2), 671–704. https://doi.org/10.1007/s00148-019-00742-9

Gruber, S., Hunkler, C., & Stuck, S. (2014). Generating easySHARE: guidelines, structure, content and programming. *Working Paper Series*, *17*.

Grundy, E., & Holt, G. (2001). The socioeconomic status of older adults: How should we measure it in studies of health inequalities? *Journal of Epidemiology & Community Health*, *55*(12), 895–904. https://doi.org/10.1136/jech.55.12.895

Grundy, E., & Sloggett, A. (2003). Health inequalities in the older population: The role of personal capital, social resources and socio-economic circumstances. *Social Science & Medicine*, *56*(5), 935–947. https://doi.org/10.1016/S0277-9536(02)00093-X

Halaby, C. N. (2004). Panel Models in Sociological Research: Theory into Practice. *Annual Review of Sociology*, *30*(1), 507–544. https://doi.org/10.1146/annurev.soc.30.012703.110629

Hannemann, T.-V., & Bergmann, M. (2024). Chapter 7. Data Quality Back-Checks in SHARE Wave 9 (CATI & CAPI). In *SHARE Wave 9 Methodology: From the Second SHARE Corona Survey to the Regular SHARE Interview* (pp. 125–141). https://share-eric.eu/data/data-documentation/methodology-volumes

Hasselhorn, H. M. (2020). Social Inequality in the Transition from Work to Retirement. In T. Theorell (Ed.), *Handbook of Socioeconomic Determinants of Occupational Health* (pp. 105–130). Springer International Publishing. https://doi.org/10.1007/978-3-030-31438-5_32

Hausman, J. A. (1978). Specification Tests in Econometrics. *Econometrica*, *46*(6), 1251. https://doi.org/10.2307/1913827

Heller-Sahlgren, G. (2017). Retirement blues. *Journal of Health Economics*, *54*, 66–78. https://doi.org/10.1016/j.jhealeco.2017.03.007

Hernández-Quevedo, C., Jones, A. M., López-Nicolás, A., & Rice, N. (2006). Socioeconomic inequalities in health: A comparative longitudinal analysis using the European Community Household Panel. *Social Science & Medicine*, *63*(5), 1246–1261. https://doi.org/10.1016/j.socscimed.2006.03.017

Hetschko, C., Knabe, A., & Schöb, R. (2014). Changing Identity: Retiring from Unemployment. *The Economic Journal*, *124*(575), 149–166. https://doi.org/10.1111/ecoj.12046

Hu, Y., Van Lenthe, F. J., Borsboom, G. J., Looman, C. W. N., Bopp, M., Burström, B., Dzúrová, D., Ekholm, O., Klumbiene, J., Lahelma, E., Leinsalu, M., Regidor, E., Santana, P., De Gelder, R., & Mackenbach, J. P. (2016). Trends in socioeconomic inequalities in self-assessed health in 17 European countries between 1990 and 2010. *Journal of Epidemiology and Community Health*, *70*(7), 644–652. https://doi.org/10.1136/jech-2015-206780

Idler, E. L., & Benyamini, Y. (1997). Self-Rated Health and Mortality: A Review of Twenty-Seven Community Studies. *Journal of Health and Social Behavior*, *38*(1), 21. https://doi.org/10.2307/2955359

Insler, M. (2014). The Health Consequences of Retirement. *Journal of Human Resources*, *49*(1), 195–233. https://doi.org/10.3368/jhr.49.1.195

International standard classification of education ISCED 1997 (2006). UNESCO-UIS. Available at: https://uis.unesco.org/sites/default/files/documents/international-standard-classification-of-education-1997-en_0.pdf

Jones, A. M., Rice, N., Bago d'Uva, T., & Balia, S. (2013). *Applied health economics* (2nd ed). Routledge.

Kuh, D., Ben-Shlomo, Y., Lynch, J., Hallqvist, J., & Power, C. (2003). Life course epidemiology. *Journal of Epidemiology & Community Health*, *57*(10), 778–783. https://doi.org/10.1136/jech.57.10.778

Layes, A., Asada, Y., & Kephart, G. (2012). Whiners and deniers – What does self-rated health measure? *Social Science & Medicine*, *75*(1), 1–9. https://doi.org/10.1016/j.socscimed.2011.10.030

Leckcivilize, A., & McNamee, P. (2022). The Effects of Retirement on Health and Health Behaviour among Retirees and their Partners: Evidence from the English Longitudinal Study of Ageing. *Journal of Population Ageing*, *15*(2), 381–412. https://doi.org/10.1007/s12062-021-09337-3

Leimer, B., & Van Ewijk, R. (2022). No "honeymoon phase": Whose health benefits from retirement and when. *Economics & Human Biology*, *47*, 101171. https://doi.org/10.1016/j.ehb.2022.101171

Leinonen, R., Heikkinen, E., & Jylhä, M. (2002). Changes in health, functional performance and activity predict changes in self-rated health: A 10-year follow-up study in older people. *Archives of Gerontology and Geriatrics*, *35*(1), 79–92. https://doi.org/10.1016/S0167-4943(02)00017-1

Leopold, L., Leopold, T., & Lechner, C. M. (2017). Do Immigrants Suffer More From Job Loss? Unemployment and Subjective Well-being in Germany. *Demography*, *54*(1), 231–257. https://doi.org/10.1007/s13524-016-0539-x

Lohmann, H. (2010). Nicht-Linearität und Nicht-Additivität in der multiplen Regression: Interaktionseffekte, Polynome und Splines. In C. Wolf & H. Best (Eds.), *Handbuch der sozialwissenschaftlichen Datenanalyse* (pp. 677–706). VS Verlag für Sozialwissenschaften. https://doi.org/10.1007/978-3-531-92038-2_26

Ludwig, V., & Brüderl, J. (2021). What You Need to Know When Estimating Impact Functions with Panel Data for Demographic Research. *Comparative Population Studies*, *46*. https://doi.org/10.12765/CPoS-2021-16

Lundberg, O., & Manderbacka, K. (1996). Assessing reliability of a measure of self-rated health. *Scandinavian Journal of Social Medicine*, *24*(3), 218–224. https://doi.org/10.1177/140349489602400314

Lynch, J., & Smith, G. D. (2005). A LIFE COURSE APPROACH TO CHRONIC DISEASE EPIDEMIOLOGY. *Annual Review of Public Health*, *26*(1), 1–35. https://doi.org/10.1146/annurev.publhealth.26.021304.144505

Mackenbach, J. P., Kunst, A. E., Cavelaars, A. E., Groenhof, F., & Geurts, J. J. (1997). Socioeconomic inequalities in morbidity and mortality in western Europe. *The Lancet*, *349*(9066), 1655–1659. https://doi.org/10.1016/S0140-6736(96)07226-1

Mackenbach, J. P., Stirbu, I., Roskam, A.-J. R., Schaap, M. M., Menvielle, G., Leinsalu, M., & Kunst, A. E. (2008). Socioeconomic Inequalities in Health in 22 European Countries. *New England Journal of Medicine*, *358*(23), 2468–2481. https://doi.org/10.1056/NEJMsa0707519

Mazzonna, F., & Peracchi, F. (2017). Unhealthy Retirement? *Journal of Human Resources*, *52*(1), 128–151. https://doi.org/10.3368/jhr.52.1.0914-6627R1

Nishimura, Y., Oikawa, M., & Motegi, H. (2018). WHAT EXPLAINS THE DIFFERENCE IN THE EFFECT OF RETIREMENT ON HEALTH? EVIDENCE FROM GLOBAL AGING DATA. *Journal of Economic Surveys*, *32*(3), 792–847. https://doi.org/10.1111/joes.12215

OECD. (2023). *Pensions at a Glance 2023: OECD and G20 Indicators*. OECD. https://doi.org/10.1787/678055dd-en

OpenAI. (2024). ChatGPT (GPT-4) [Large language model]. Available at: https://chat.openai.com/

Petrovic, D., De Mestral, C., Bochud, M., Bartley, M., Kivimäki, M., Vineis, P., Mackenbach, J., & Stringhini, S. (2018). The contribution of health behaviors to socioeconomic inequalities in health: A systematic review. *Preventive Medicine*, *113*, 15–31. https://doi.org/10.1016/j.ypmed.2018.05.003

Popay, J., Williams, G., Thomas, C., & Gatrell, T. (1998). Theorising Inequalities in Health: The Place of Lay Knowledge. *Sociology of Health & Illness*, *20*(5), 619–644. https://doi.org/10.1111/1467-9566.00122

Rose, L. (2020). Retirement and health: Evidence from England. *Journal of Health Economics*, *73*, 102352. https://doi.org/10.1016/j.jhealeco.2020.102352

Schaap, R., De Wind, A., Coenen, P., Proper, K., & Boot, C. (2018). The effects of exit from work on health across different socioeconomic groups: A systematic literature review. *Social Science & Medicine*, *198*, 36–45.

https://doi.org/10.1016/j.socscimed.2017.12.015
Schneider, S. L. (2013). The International Standard Classification of Education 2011. In G. Elisabeth Birkelund (Ed.), *Comparative Social Research* (Vol. 30, pp. 365–379). Emerald Group Publishing Limited. https://doi.org/10.1108/S0195-6310(2013)0000030017
Schnittker, J., & Bacak, V. (2014). The Increasing Predictive Validity of Self-Rated Health. *PLoS ONE*, *9*(1), e84933. https://doi.org/10.1371/journal.pone.0084933
Seaman, S. R., & White, I. R. (2013). Review of inverse probability weighting for dealing with missing data. *Statistical Methods in Medical Research*, *22*(3), 278–295. https://doi.org/10.1177/0962280210395740
SHARE. (2024). *Release Guide 9.0.0*. Available at: https://share-eric.eu/fileadmin/user_upload/Release_Guides/SHARE_release_guide_9-0-0.pdf
SHARE. ERIC. (2023, August 31). *Survey of Health, Ageing and Retirement in Europe (SHARE) Data Management Plan*. Available at: https://share-eric.eu/fileadmin/user_upload/Other_Publications/Data_Management_Plan.pdf
Shiba, K., Kondo, N., Kondo, K., & Kawachi, I. (2017). Retirement and mental health: Does social participation mitigate the association? A fixed-effects longitudinal analysis. *BMC Public Health*, *17*(1), 526. https://doi.org/10.1186/s12889-017-4427-0
Smith, J. P. (2007). The Impact of Socioeconomic Status on Health over the Life-Course. *Journal of Human Resources*, *XLII*(4), 739–764. https://doi.org/10.3368/jhr.XLII.4.739
Sohier, L., Van Ootegem, L., & Verhofstadt, E. (2021). Well-Being During the Transition from Work to Retirement. *Journal of Happiness Studies*, *22*(1), 263–286. https://doi.org/10.1007/s10902-020-00228-6
Solon, G., Haider, S. J., & Wooldridge, J. M. (2015). What Are We Weighting For? *Journal of Human Resources*, *50*(2), 301–316. https://doi.org/10.3368/jhr.50.2.301
StataCorp. (2023a). Stata 18 Base Reference Manual. College Station, TX: Stata Press.
StataCorp (2023b). *Stata Statistical Software: Release 18*. College Station, TX: StataCorp LLC. [Computer Software].
Suominen, S., Helenius, H., Blomberg, H., Uutela, A., & Koskenvuo, M. (2001). Sense of coherence as a predictor of subjective state of health. *Journal of Psychosomatic Research*, *50*(2), 77–86. https://doi.org/10.1016/S0022-3999(00)00216-6
Uccheddu, D., Gauthier, A. H., Steverink, N., & Emery, T. (2019). Gender and Socioeconomic Inequalities in Health at Older Ages Across Different European Welfare Clusters: Evidence from SHARE Data, 2004–2015. *European Sociological Review*, *35*(3), 346–

362. https://doi.org/10.1093/esr/jcz007

Van Rijn, R. M., Robroek, S. J. W., Brouwer, S., & Burdorf, A. (2014). Influence of poor health on exit from paid employment: A systematic review. *Occupational and Environmental Medicine*, *71*(4), 295–301. https://doi.org/10.1136/oemed-2013-101591

Van Rossum, C. T. M. (2000). Employment grade differences in cause specific mortality. A 25 year follow up of civil servants from the first Whitehall study. *Journal of Epidemiology & Community Health*, *54*(3), 178–184. https://doi.org/10.1136/jech.54.3.178

Van Zon, S. K. R., Bültmann, U., Reijneveld, S. A., & De Leon, C. F. M. (2016). Functional health decline before and after retirement: A longitudinal analysis of the Health and Retirement Study. *Social Science & Medicine*, *170*, 26–34. https://doi.org/10.1016/j.socscimed.2016.10.002

Vo, T. T., & Phu-Duyen, T. T. (2023). Mental health around retirement: Evidence of Ashenfelter's dip. *Global Health Research and Policy*, *8*(1), 35. https://doi.org/10.1186/s41256-023-00320-3

Wadsworth, M. E. J. (1997). Health inequalities in the life course perspective. *Social Science & Medicine*, *44*(6), 859–869. https://doi.org/10.1016/S0277-9536(96)00187-6

Westerlund, H., Kivimäki, M., Singh-Manoux, A., Melchior, M., Ferrie, J. E., Pentti, J., Jokela, M., Leineweber, C., Goldberg, M., Zins, M., & Vahtera, J. (2009). Self-rated health before and after retirement in France (GAZEL): A cohort study. *The Lancet*, *374*(9705), 1889–1896. https://doi.org/10.1016/S0140-6736(09)61570-1

Wetzel, M., Huxhold, O., & Tesch-Römer, C. (2016). Transition into Retirement Affects Life Satisfaction: Short- and Long-Term Development Depends on Last Labor Market Status and Education. *Social Indicators Research*, *125*(3), 991–1009. https://doi.org/10.1007/s11205-015-0862-4

Xue, B., Head, J., & McMunn, A. (2020). The Impact of Retirement on Cardiovascular Disease and Its Risk Factors: A Systematic Review of Longitudinal Studies. *The Gerontologist*, *60*(5), e367–e377. https://doi.org/10.1093/geront/gnz062

Zimmer, Z., Hanson, H. A., & Smith, K. (2016). Childhood socioeconomic status, adult socioeconomic status, and old-age health trajectories: Connecting early, middle, and late life. *Demographic Research*, *34*, 285–320. https://doi.org/10.4054/DemRes.2016.34.10

SHARE: Further Resources

SHARE acknowledgements

This paper uses data from SHARE Waves 1, 2, 3, 4, 5, 6, 7, 8 and 9 (DOIs: 10.6103/SHARE.w1.900, 10.6103/SHARE.w2.900, 10.6103/SHARE.w3.900, 10.6103/SHARE.w4.900, 10.6103/SHARE.w5.900, 10.6103/SHARE.w6.900, 10.6103/SHARE.w7.900, 10.6103/SHARE.w8.900, 10.6103/SHARE.w9.900) see Börsch-Supan et al. (2013) for methodological details.(1) The SHARE data collection has been funded by the European Commission, DG RTD through FP5 (QLK6-CT-2001-00360), FP6 (SHARE-I3: RII-CT-2006-062193, COMPARE: CIT5-CT-2005-028857, SHARELIFE: CIT4-CT-2006-028812), FP7 (SHARE-PREP: GA N°211909, SHARE-LEAP: GA N°227822, SHARE M4: GA N°261982, DASISH: GA N°283646) and Horizon 2020 (SHARE-DEV3: GA N°676536, SHARE-COHESION: GA N°870628, SERISS: GA N°654221, SSHOC: GA N°823782, SHARE-COVID19: GA N°101015924) and by DG Employment, Social Affairs & Inclusion through VS 2015/0195, VS 2016/0135, VS 2018/0285, VS 2019/0332, VS 2020/0313 and SHARE-EUCOV: GA N°101052589 and EUCOVII: GA N°101102412. Additional funding from the German Ministry of Education and Research, the Max Planck Society for the Advancement of Science, the U.S. National Institute on Aging (U01_AG09740-13S2, P01_AG005842, P01_AG08291, P30_AG12815, R21_AG025169, Y1-AG-4553-01, IAG_BSR06-11, OGHA_04-064, BSR12-04, R01_AG052527-02, HHSN271201300071C, RAG052527A) and from various national funding sources is gratefully acknowledged (see www.share-eric.eu)

Data References

SHARE-ERIC (2024). Survey of Health, Ageing and Retirement in Europe (SHARE) Wave 1. Release version: 9.0.0. SHARE-ERIC. Data set. DOI: 10.6103/SHARE.w1.900

SHARE-ERIC (2024). Survey of Health, Ageing and Retirement in Europe (SHARE) Wave 2. Release version: 9.0.0. SHARE-ERIC. Data set. DOI: 10.6103/SHARE.w2.900

SHARE-ERIC (2024). Survey of Health, Ageing and Retirement in Europe (SHARE) Wave 3 – SHARELIFE. Release version: 9.0.0. SHARE-ERIC. Data set. DOI: 10.6103/SHARE.w3.900

SHARE-ERIC (2024). Survey of Health, Ageing and Retirement in Europe (SHARE) Wave 4. Release version: 9.0.0. SHARE-ERIC. Data set. DOI: 10.6103/SHARE.w4.900

SHARE-ERIC (2024). Survey of Health, Ageing and Retirement in Europe (SHARE) Wave 5. Release version: 9.0.0. SHARE-ERIC. Data set. DOI: 10.6103/SHARE.w5.900

SHARE-ERIC (2024). Survey of Health, Ageing and Retirement in Europe (SHARE) Wave 6. Release version: 9.0.0. SHARE-ERIC. Data set. DOI: 10.6103/SHARE.w6.900

SHARE-ERIC (2024). Survey of Health, Ageing and Retirement in Europe (SHARE) Wave 7. Release version: 9.0.0. SHARE-ERIC. Data set. DOI: 10.6103/SHARE.w7.900

SHARE-ERIC (2024). Survey of Health, Ageing and Retirement in Europe (SHARE) Wave 8. Release version: 9.0.0. SHARE-ERIC. Data set. DOI: 10.6103/SHARE.w8.900

SHARE-ERIC (2024). Survey of Health, Ageing and Retirement in Europe (SHARE) Wave 9. Release version: 9.0.0. SHARE-ERIC. Data set. DOI: 10.6103/SHARE.w9.900

Further Literature

Bergmann, M., T. Kneip, G. De Luca, and A. Scherpenzeel (2019). *Survey participation in the Survey of Health, Ageing and Retirement in Europe (SHARE), Wave 1-7*. Based on Release 7.0.0. SHARE Working Paper Series 41-2019. Munich: MEA, Max Planck Institute for Social Law and Social Policy

Börsch-Supan, A., M. Brandt, C. Hunkler, T. Kneip, J. Korbmacher, F. Malter, B. Schaan, S. Stuck, S. Zuber (2013). *Data Resource Profile: The Survey of Health, Ageing and Retirement in Europe (SHARE)*. International Journal of Epidemiology. DOI: 10.1093/ije/dyt088.

Börsch-Supan, A., S. Gruber (2022). easySHARE. Release version: 8.0.0. SHARE-ERIC. Data set DOI: 10.6103/SHARE.easy.800

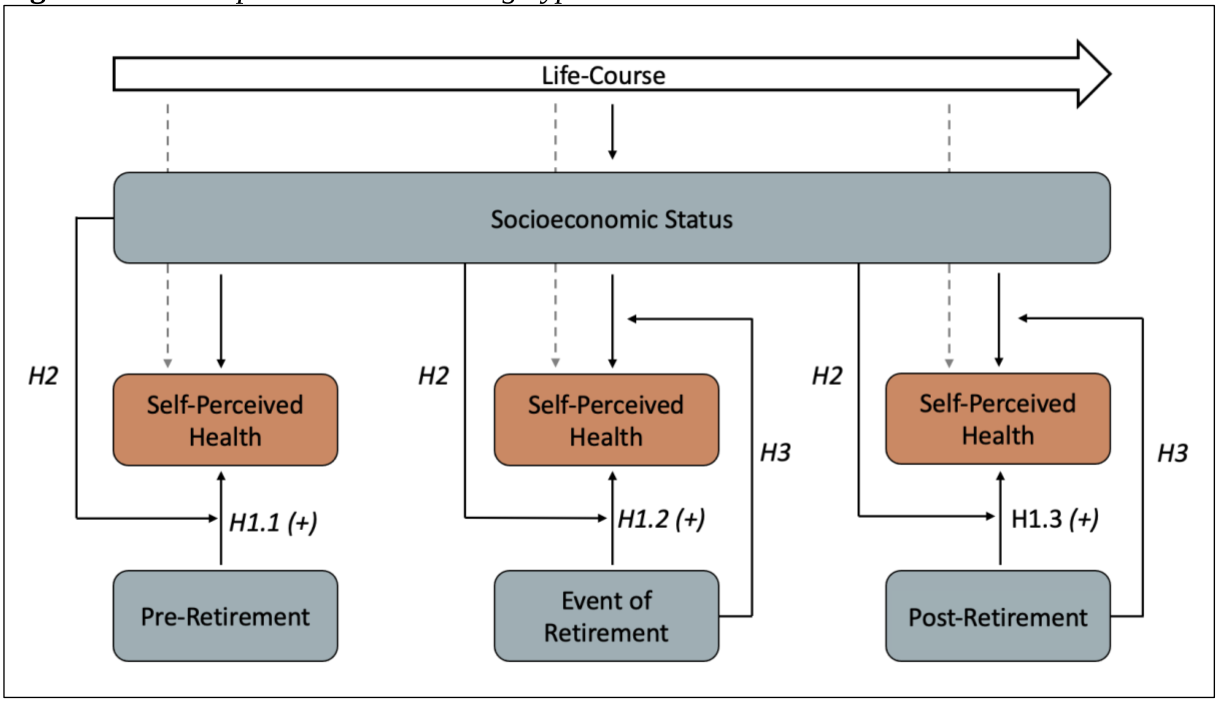
Forschungsdatenzentrum der Rentenversicherung, SHARE-ERIC (2022). *SHARE-RV*. Release version: 8.0.0. SHARE-ERIC. Data set. DOI: 10.6103/SHARE.SHARE-RV.800

SHARE-ERIC (2024). SHARE Job Episodes Panel. Release version: 9.0.0. SHARE-ERIC. Data set. DOI:10.6103/SHARE.jep.900

Appendix

Appendix A: Literature Overview and Conceptual Model

Figure A1: *Conceptual model including hypotheses*



Source: Own illustration.
Notes: Independent variables are highlighted in grey/blue and dependent variables in orange.

Table A1: Literature Overview

Reference	Data and Method	Countries	Measures of Health	Effect of retirement on health outcomes and behaviours
Dave et al., 2008	Health and Retirement Study (HRS) (7 waves, 1992-2005) a.o. individual FE regressions	United States	Physical and functional limitations, illness conditions, and depression	*Negative effects*: increase in difficulties with mobility and daily activities, increase in illness conditions, decline in mental health over post-retirement period (6 years
Westerlund et al. 2009	GAZEL cohort (gas and electricity cohort), yearly measurement 1989-2007 repeated-measures logistic regression with generalised estimating equations	France	Self-rated health	*Positive effect*: decrease in the prevalence of suboptimal health, maintained seven years after retirement, Greater improvement for those with poor working conditions and health complaints previous to retirement *No effect*: individuals with high work satisfaction, high occupational grade, and low demands
Coe & Zamarro, 2011	SHARE (wave 1) Ordinary Least Squares, Instrumental variable estimation	Austria, Germany, Sweden, the Netherlands, Spain, Italy, France, Denmark, Greece, Switzerland, and Belgium (10 European countries)	Self-reported health, Depression, cognitive ability, health index (multiple measures)	*Positive* effect: health-preserving effect on overall general health, decrease in the probability of reporting to be in fair, bad, or very bad health (temporary), improvement in the health index (long-lasting) *No effect*: No causal effect on depression or cognitive ability
Insler, 2014	HRS (10 waves, 1992-2010) Pooled Ordinary Least Squares, FE regression, RE regression,	United States	Health index (weighted sum of diagnosed and self-reported measures)	*Positive effect*: beneficial and significant effect on health index
Van Zon et al., 2016	HRS (10 waves, 1992-2012) Piecewise linear regression analyses with generalised estimating equations	United States	Trajectories of limitations in mobility and large muscle functions	*Positive effect*: slowed down increase in levels of limitations in mobility and large muscle functions after retirement Wealthy individuals experienced modified increase of limitations in mobility functions

Table A1 (continued)

Celidoni & Rebba, 2017	SHARE (wave 1,2, and 4) Fixed-effect two-stage least square estimation	10 European countries: Austria, Belgium, Denmark, France, Germany, Italy, the Netherlands, Spain, Sweden and Switzerland	Smoking, alcohol drinking, engagement in physical activity, visits to the general practitioner or specialist	*Positive effect*: Decrease in probability of not practicing in any physical activity (stronger for individuals with higher education)
Heller-Sahlgren, 2017	SHARE (wave 1,2, and 4) Individual-fixed effects design, with intuitions from the regression-discontinuity design literature	10 European countries	Mental health measured using Euro-Depression scale	*Negative effect*: no short-term effects on mental health, but the long-term impact is negative and large No difference between educational or occupational backgrounds
Mazzonna & Peracchi, 2017	SHARE (wave 1 and 2) Two-stage least square first differences estimation	10 European countries	Health index, cognitive functioning index	*Mixed effects*: average effects on health and cognitive abilities are negative, negative effects increase with years spent in retirement Immediate effect on health and cognitive abilities for people who worked in physically demanding occupations is positive
Shiba et al., 2017	Japan Gerontological Evaluation Study (2010 - 2013) First difference regression models	Japan	Mental health (Geriatric Depression Scale)	*Negative effects*: increase in depressive symptoms upon retirement, continuous retirement more negative for men from low occupational classes
Gorry et al., 2018	HRS (1992-2014) First stage regressions, Ordinary Least Squares, Instrumental variable estimation	United States	Self-reported health, index of health conditions, mental health score based on depression scale, life satisfaction, and health care utilisation	*Positive effect*: strong evidence that retirement improves self-reported health, mental health, and life satisfaction and leads to improvements in functional limitations in the long-term Effects prevalent four or more years after retirement

Table A1 (continued)

Nishimura et al., 2018	HRS, English Longitudinal Study of Ageing (ELSA), the Health Survey for England (HSE), SHARE, the Japanese Study of Ageing and Retirement (JSTAR) FE-Instrumental variable estimation	US, UK, Denmark, France, Switzerland, Germany, Japan, South Korea	Cognitive function, self-report of health, activities of daily living, depression, and body mass index	*Positive effects*: effect is positive for self-reported health, depression, and activities of daily living in many of the analysed countries
Barban et al., 2020	Swedish administrative registers (longitudinally, cohorts born from 1935 to 1946) Matching approach and sequence analysis	Sweden	Hospitalisation, survival rates	*Negative effects*: early retirement is associated with poorer health outcomes (higher hospitalization, lower survival rates), stronger negative effects for women and individuals with lower preretirement income
De Breij et al., 2020	SHARE (wave 5, wave 6 for the Netherlands) and ELSA (wave 7) multi-level linear regression analyses	18 European countries	Self-rated health	*Limited Positive effect*: Post retirement health better with higher total expenditure, higher expenditures on health, old age, housing, and other social policy areas
Grøtting & Lillebø, 2020	Administrative registers and survey data 2 stage least squares, regression discontinuity design	Norway	Acute hospital admissions, mortality, and composite physical health score	*Mixed effects*: *positive effect* on physical health, more positive for individuals with low SES *No effects* on acute hospitalizations or mortality, reduced likelihood of hospitalizations for individuals with low SES (*positive effect*)
Rose, 2020	Census records, inpatient records, mortality records, surveys (a.o. ELSA and Health Survey for England) Regression discontinuity design, FE-Instrumental variable estimation	England	A.o. Self-reported health, cognitive ability, depression score, mortality, health problem index, limitations to daily activities and health behaviours (e.g. smoking, alcohol consumption, exercise)	*Mixed effects*: *positive effect* on well-being and self-reported health, *No immediate effect* on behavioural outcomes, cognitive ability, health care utilization, or mortality

Table A1 (continued)

Sohier et al. 2021	SHARE (wave 2,4, and 5) FE regressions	9 European countries (Austria, Belgium, Denmark, France, Germany, the Netherlands, Spain, Sweden and Switzerland)	Well-being (measured as life satisfaction and agency freedom)	*Mixed effects*: *No immediate effect* on life satisfaction, *negative effect* on life satisfaction after 2 years of retirement compared to the beginning of retirement *Immediate positive effect* on agency- freedom, consistent in first 2 years of retirement.
Leckcivilize & McNamee, 2022	ELSA (wave 1 – 8 from 2002/3 to 2016/17) FE regressions	England	Self-rated health, depression scale, health behaviours (body size, physical activity, alcoholic drinking and healthy diet)	*Positive effect*: improvement of health outcomes, increases of probability to engage in more physical activity No differences by sex, education, wealth, and occupation, no significant impacts of partner retirement
Leimer & Van Ewijk, 2022	SHARE (wave 1, 2, 4, 5, and 6) FE-Instrumental variable estimation	10 European countries	Self-assessed health status, depression scale, cognitive ability, limitations in (instrumental) activities of daily living, limitations in mobility and maximum grip strength	*Positive effect*: improvement of all health aspects considered, robust for occupational groups, sexes Stronger improvement of cognitive performance, self-assessed health and grip strength for those who worked in physically demanding jobs; white collar workers experienced a decrease in depression scale Adjustment period of worse health for blue-collar workers after retiring, health preserving effect in the longer run
Baumeister et al., 2023	ELSA, HRS, SHARE FE-Instrumental variable estimation	31 countries (England, United States, and SHARE countries)	Self-rated oral health, dental service use	*Negative* effect on self-rated oral health (stronger for participants who previously worked in a physically demanding job) *Positive effect* on dental service use (stronger for participants without a physically demanding job)
Vo & Phu-Duyen, 2023	SHARE (wave 1-2 and 4-7) FE and FE-Instrumental variable estimation	21 European countries and Israel	Euro-D depression scale	*Mixed effect*: reduction in depression if retirement is based on aspirational motivations and positive circumstances, deterioration of depression if retirement occurs under negative circumstances Anticipation of retirement has *positive effect* on depression, increase of depression symptoms shortly after retirement

Table A1 (continued)

		Literature Reviews		
Schaap et al., 2018	Systematic literature review, 22 studies included	U.S., Canada, multiple European countries	General, physical or mental health and health behaviour	13 studies found a more positive effects of early/statutory retirement on health, mainly present in higher SES groups
Xue et al., 2020	Systematic literature review of longitudinal studies, 82 studies included	United States, European countries	Cardiovascular disease (CVD) and its risk factors (metabolic risk factors, blood biomarkers, physical activity, smoking, drinking, and diet)	*Context dependent*: *no significant effect* of on CVD in United States *negative effect* on CVD in European countries, except France Increase adiposity measures among those retired from physically demanding jobs found in United States, several European countries consistently show that retirement increase adiposity measures among those retired from physically demanding jobs
Garrouste & Perdrix, 2022	Literature review, 51 studies included	US, Canada, China, Australia, and multiple European countries,	Mortality, healthcare consumption, self-reported health, depression, cognitive abilities, physical health, pathologies, health index, and health-related behaviours	*Mixed effects*: *positive effect* on self-reported health, less depression, decrease in healthcare consumption *Negative effect*: decline in cognition, ambiguous effect on physical health.

Appendix B: Data Preparation

As a guide for the stata programming, I used the working paper "Generating easySHARE Guidelines, Structure, Content and Programming" provided by SHARE (Gruber et al., 2014). I adapted the code to fit my analysis and also added the waves released since 2014. Three main steps are needed to create a panel dataset from SHARE, namely selecting the relevant modules, merging the modules for each wave and combining the waves into one dataset. When downloading the SHARE data for Stata from the SHARE-Eric website, each wave is downloaded as a zip-file which contains several so-called modules, which are separate datasets sorted by the topic of the containing variables or their technical function (e.g. longitudinal weights). Therefore, the first step necessary was to select the modules needed for my analysis, and then extract and recode the variables from each module. This was done for each of the eight waves. By pre-selecting the variables, the final panel dataset was kept concise. I included the following modules: cv_r (Coverscreen), _dn (Demographics and networks), gv_isced (Generated variable ISCED-97/5), gv_health (Generated variables for health), _ep (Employment and pensions), an gv_imputations. In the second step, I merged all six modules for each wave using the command 'merge 1:1'. Module cv_r was used as the master module. As the last step in creating the panel dataset, I used the command 'append' to combine all 8 waves into one dataset.

Appendix C: Preparation of the Analysis and Model Fit

Preparation of the Analysis

Definition of the retirement-time dummies

Table C1: *Overview of the number of observations per retirement time dummy*

Retirement time dummy	Number of Observations	%
5 years before retirement or more	74,459	59.46
3-4 years before retirement	7,410	5.92
1-2 years before retirement	6,590	5.26
Year of retirement	15,782	12.60
1-2 years after retirement	6,509	5.20
3-4 years after retirement	4,911	3.92
>4 years after retirement	9,554	7.63
Total	125,215	100.00

Source: SHARE release 9.0.0; wave 1-9, excluding wave 3; own calculations
Note: Due to rounding values may not add up to 100%

Cohort and Period Effects

Theoretically, I thought about controlling for the COVID-19 pandemic years as period effects in my FE models as I expected that average self-perceived health might have been lower in these years. However, the graphical exploration of this hypothesis did not show such an effect or any strong implication for period shocks over the observed time. The shocks visible in Figure C1 are caused by the low number of observations for the years 2010, 2012, and 2018 and are not visible in Figure C2 which uses the SHARE waves as the period variable. The differences between cohorts visible in the graphs can probably be attributed to age differences. This is confirmed by Figure C3 and Figure C4, which depict the mean self-perceived health by interview year (Figure 3) and wave (Figure C4).

Figure C1: *Descriptive plot of mean self-perceived health, separated for every cohort group, survey year (2005-2022) as periods*

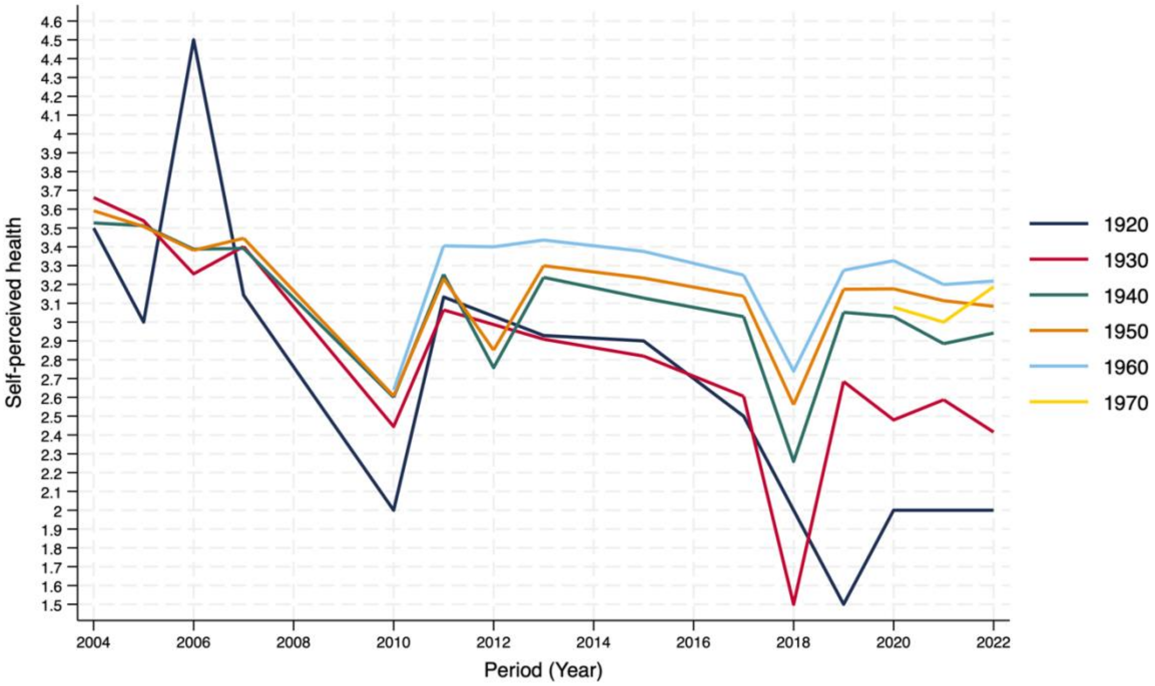


Figure C2: *Descriptive plot of mean self-perceived health, separated for every cohort group. SHARE waves (1-9) as periods*

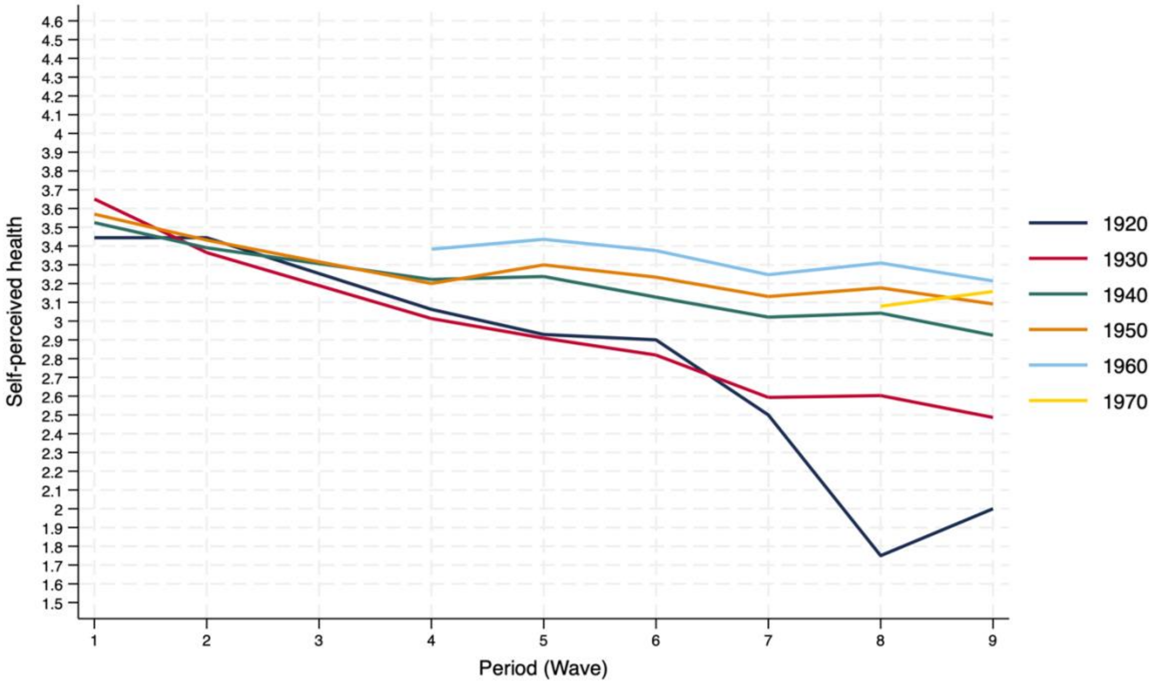


Figure C3: *Mean self-perceived health by interview year*

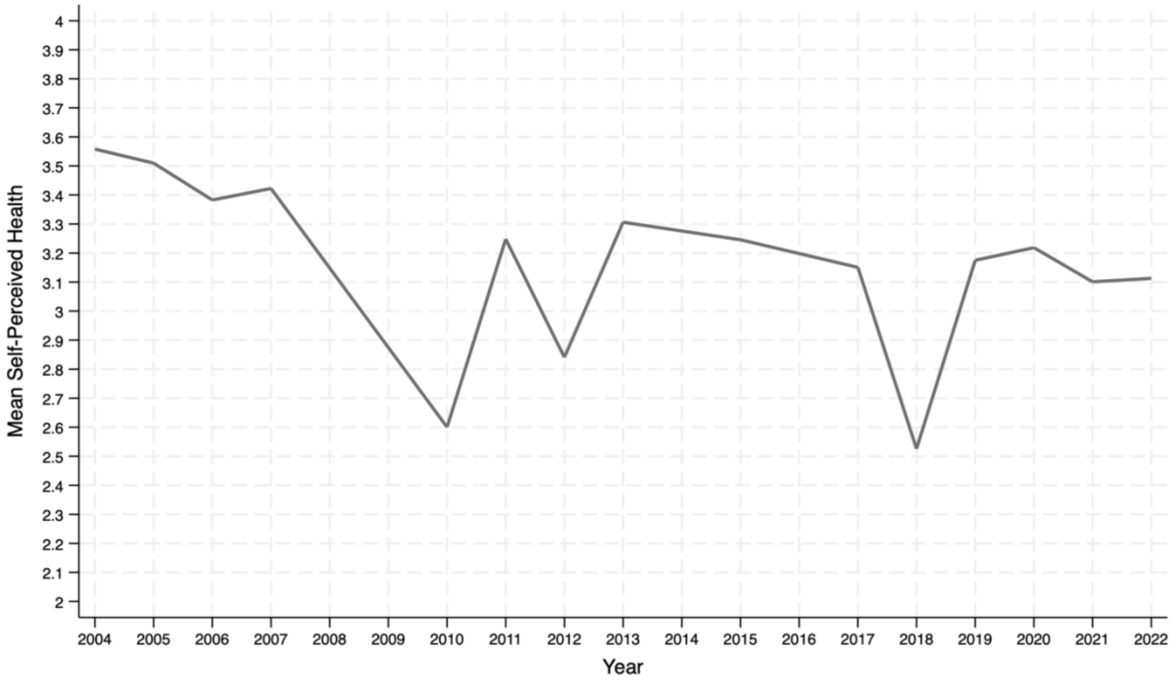
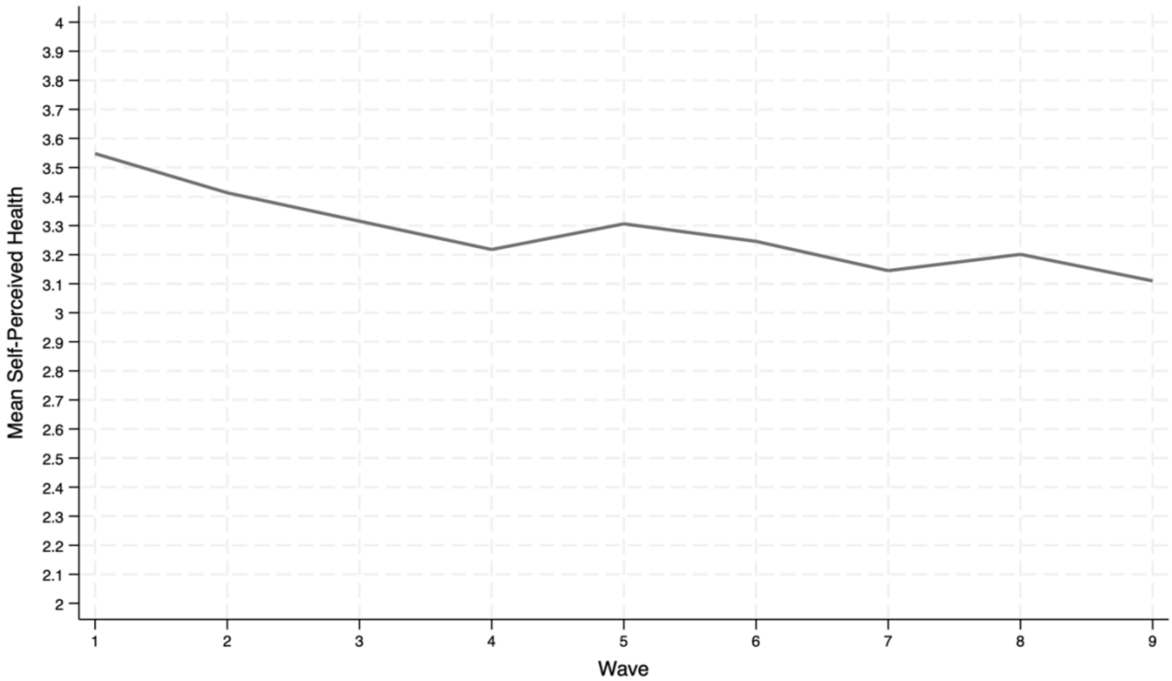


Figure C4: *Mean self-perceived health by wave*



Model Fit

Table C2: *Comparison of the Model-Fit*

	M0: FE Model without controls	M1: FE Model, linear age controlled	FE Model, quadric age controlled	FE Model, cubic age controlled	FE Model, age dummies controlled
Number of observations	125,215	125,215	125,215	125,215	125,215
adj. R-square	0.0180	0.0288	0.0301	0.0307	0.0314
BIC	217137.7	215768.5	215600.3	215533.7	215885.0
AIC	217079.2	215700.3	215522.4	215446.1	215398.2

Source: SHARE release 9.0.0; wave 1-9, excluding wave 3; own calculations

Notes: The table displays the model fits (adjusted-R^2, BIC, AIC) for the FE regressions modelling the effect of retirement time dummies on self-perceived health. The FE regressions differ exclusively by how the control variable age is included. The table shows that linear age has a sizable increase in the model fit. Therefore, all FE regressions were estimated controlling for linear age.

Appendix D: Interaction Effects

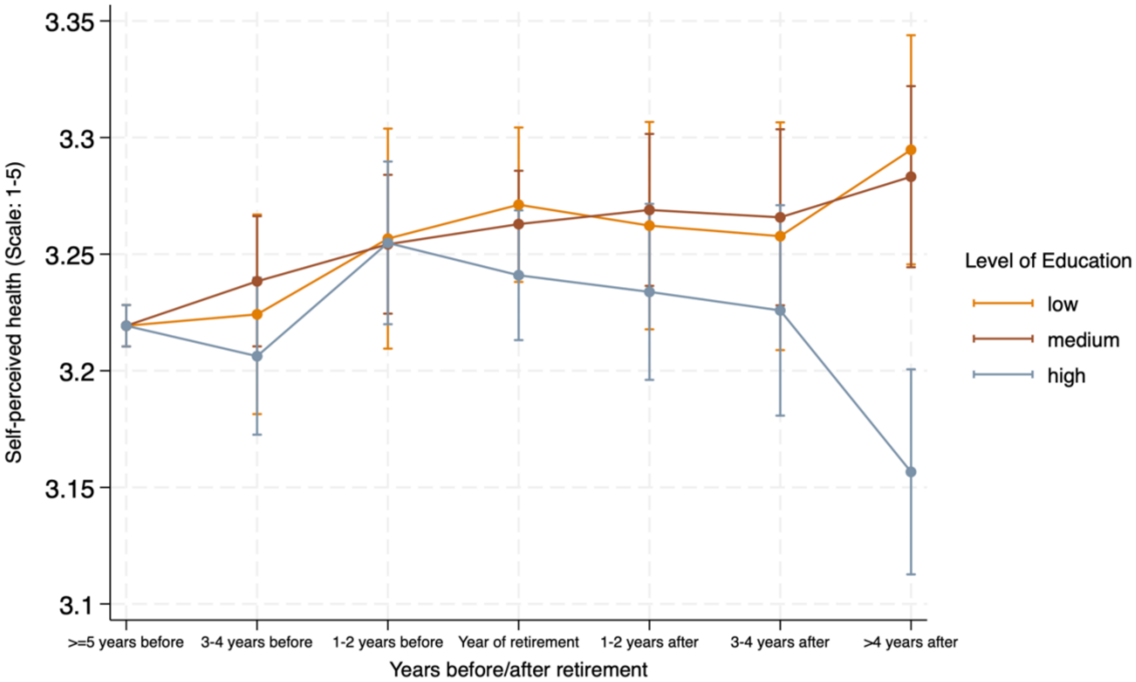
Table D1: *Comparison between all FE Regression Models, Interaction model included*

	M1: FE Model	**M2: FE Model, dummies**	**M3a: FE Model, low education**	**M3b: FE Model, medium education**	**M3c: FE Model, high education**	**M4: interaction dummies x education**
Retired	0.0234**					
	(2.95)					
Age	-0.0275***	-0.0279***	-0.0262***	-0.0277***	-0.0291***	-0.0279***
	(-36.54)	(-29.04)	(-11.69)	(-19.13)	(-18.65)	(-29.02)
3-4 years before		0.00529	-0.00202	0.0181	-0.00793	0.00490
		(0.48)	(-0.08)	(1.13)	(-0.42)	(0.21)
1-2 years before		0.0364**	0.0272	0.0336	0.0430*	0.0374
		(2.99)	(0.97)	(1.88)	(2.11)	(1.47)
Year of retirement		0.0388***	0.0386	0.0418*	0.0314	0.0519**
		(3.54)	(1.56)	(2.56)	(1.69)	(2.72)
1-2 years after		0.0369**	0.0265	0.0474*	0.0266	0.0429
		(2.59)	(0.84)	(2.21)	(1.11)	(1.74)
3-4 years after		0.0315	0.0192	0.0438	0.0207	0.0384
		(1.92)	(0.54)	(1.78)	(0.73)	(1.42)
>4 years after		0.0276	0.0500	0.0604*	-0.0440	0.0754**
		(1.52)	(1.22)	(2.22)	(-1.44)	(2.73)
medium						0
						(.)
high						0
						(.)
3-4 years before x medium						0.0142
						(0.52)
3-4 years before x high						-0.0179
						(-0.62)
1-2 years before x medium						-0.00241
						(-0.08)
1-2 years before x high						-0.00182
						(-0.06)
Year of retirement x medium						-0.00831
						(-0.39)
Year of retirement x high						-0.0302
						(-1.32)
1-2 years after x medium						0.00674
						(0.24)

1-2 years after x high						-0.0284
						(-0.94)
3-4 years after x medium						0.00810
						(0.26)
3-4 years after x high						-0.0318
						(-0.95)
>4 years after x medium						-0.0115
						(-0.39)
>4 years after x high						-0.138***
						(-4.37)
Constant	4.897***	4.913***	4.636***	4.824***	5.211***	4.913***
	(110.37)	(89.17)	(36.12)	(58.43)	(57.76)	(89.14)
Adjuste-r2	0.0287	0.0288	0.0239	0.0248	0.0398	0.0293
Number of cases	125,215	125,215	28,154	56,044	41,017	125,215

Source: SHARE release 9.0.0; wave 1-9, excluding wave 3; own calculations
t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
Notes: The table displays the FE regression output for the different models of the effect of retirement on self-perceived health. Linear age is controlled in all models and all regressions include robust Standard Errors.

Figure D1: *Predictive Margins plot of Model 4, FE regression of retirement time dummies and self-perceived health, including interaction between retirement and education, linear age controlled, robust standard errors*



Appendix E: Robustness

Balanced Panel

The following results use the same methods as presented in the in the main part of this thesis but use the data of the fully balanced panel. The balanced panel includes 8458 observations and 1128 respondents. The sub-sample includes 351 observations for the control sample and 8,107 observations for the retiring sample.

Table E1: *Comparison between all FE Regression Models, Interaction model included, balanced panel*

	M1: FE Model	**M2: FE Model, dummies**	**M2a: FE Model, low education**	**M2b: FE Model, medium education**	**M2c: FE Model, high education**	**M3: FE Model, interaction dummies x education**
Retired	0.0498					
	(1.74)					
Age	-0.0303***	-0.0299***	-0.0404***	-0.0306***	-0.0232***	-0.0299***
	(-12.98)	(-7.59)	(-4.67)	(-4.55)	(-4.03)	(-7.58)
3-4 years before		0.0434	0.0776	0.00436	0.0614	0.0309
		(1.16)	(0.95)	(0.07)	(1.14)	(0.42)
1-2 years before		0.123**	0.215*	0.167*	0.0247	0.147*
		(2.91)	(2.44)	(2.26)	(0.39)	(1.98)
Year of retirement		0.106*	0.218*	0.0546	0.0880	0.133*
		(2.52)	(2.47)	(0.74)	(1.42)	(2.00)
1-2 years after		0.0859	0.214*	0.0341	0.0608	0.107
		(1.74)	(2.06)	(0.40)	(0.82)	(1.42)
3-4 years after		0.0775	0.206	0.0374	0.0438	0.0826
		(1.38)	(1.79)	(0.38)	(0.52)	(1.12)
>4 years after		0.0468	0.202	0.102	-0.0956	0.0324
		(0.69)	(1.36)	(0.86)	(-0.98)	(0.38)
medium						0
						(.)
high						0
						(.)
3-4 years before x medium						-0.0299
						(-0.33)
3-4 years before x high						0.0622
						(0.71)
1-2 years before x medium						0.0151
						(0.17)
1-2 years before x high						-0.0781
						(-0.88)

Year of retirement x medium						-0.0843
						(-1.11)
Year of retirement x high						0.00995
						(0.13)
1-2 years after x medium						-0.0799
						(-0.95)
1-2 years after x high						0.0229
						(0.27)
3-4 years after x medium						-0.0536
						(-0.68)
3-4 years after x high						0.0408
						(0.52)
>4 years after x medium						0.0584
						(0.75)
>4 years after x high						-0.0198
						(-0.26)
Constant	5.344***	5.295***	5.735***	5.271***	5.093***	5.295***
	(37.94)	(23.47)	(11.56)	(13.87)	(15.22)	(23.45)
Number of observations	8458	8458	2301	3050	3107	8458
adj. R-square	0.0552	0.0571	0.0580	0.0501	0.0676	0.0581
BIC	16371.7	16395.6	4812.1	5936.3	5680.4	16482.9
AIC	16357.6	16346.3	4772.0	5894.1	5638.2	16349.1

Source: SHARE release 9.0.0; wave 1-9, excluding wave 3; own calculations
t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
Notes: The table displays the FE regression output for the different models of the effect of retirement on self-perceived health. Linear age is controlled in all models and all regressions include robust Standard Errors. The displayed models are calculated using the balanced panel.

Figure E1: *Margins plot Model 3a, b, c, FE regression of retirement time dummies on self-perceived health estimated separately for high, medium and low educated respondents, linear age controlled, robust standard errors, balanced panel*

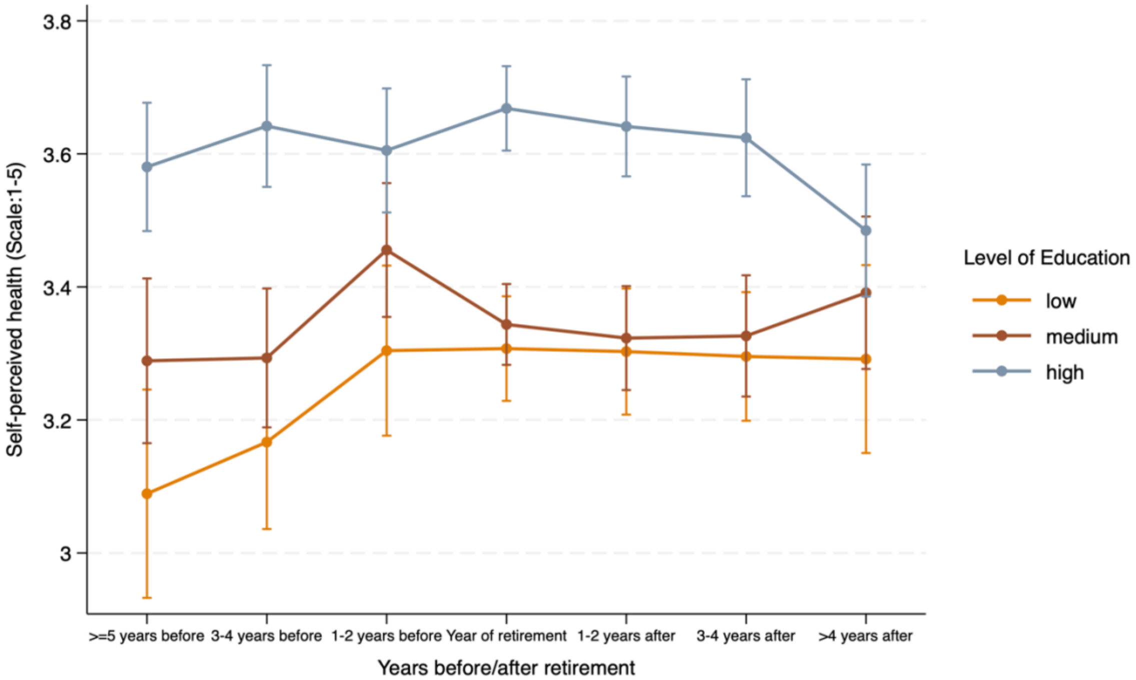
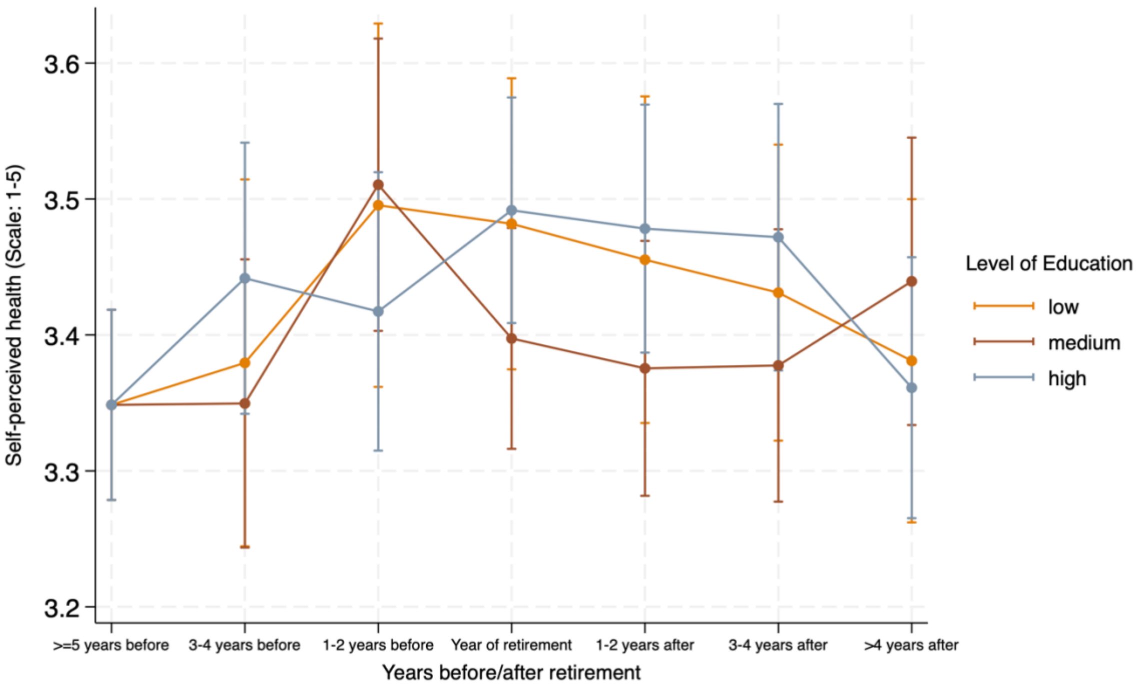


Figure E2: *Predictive margins plot, FE regression of retirement time dummies and self-perceived health, including interaction between retirement and education, linear age controlled, robust standard errors, balanced panel*



Weighted Balanced Panel

The following results use the fully balanced panel and include the calibrated longitudinal individual weights provided by SHARE release 9.0.0.

Table E2: *Comparison between all FE Regression Models, Interaction model included, weighted balanced panel*

	M1: FE Model	M2: FE Model, dummies	M2a: FE Model, low education	M2b: FE Model, medium education	M2c: FE Model, high education	M3: FE Model, interaction dummies x education
Retired	0.0476					
	(1.04)					
Age	-0.0257***	-0.0229***	-0.0374***	-0.0102	-0.0232***	-0.0228***
	(-7.67)	(-4.22)	(-3.78)	(-1.04)	(-4.03)	(-4.23)
3-4 years before		0.00838	0.103	-0.135	0.0614	0.0362
		(0.15)	(0.86)	(-1.45)	(1.14)	(0.33)
1-2 years before		0.0477	0.117	-0.0396	0.0247	0.0188
		(0.73)	(0.88)	(-0.32)	(0.39)	(0.15)
Year of retirement		0.0300	0.135	-0.0963	0.0880	0.0146
		(0.47)	(1.22)	(-0.82)	(1.42)	(0.14)
1-2 years after		0.0965	0.215	-0.0759	0.0608	0.0633
		(1.32)	(1.67)	(-0.56)	(0.82)	(0.58)
3-4 years after		0.0452	0.204	-0.131	0.0438	0.0300
		(0.54)	(1.47)	(-0.84)	(0.52)	(0.27)
>4 years after		-0.0122	0.166	-0.151	-0.0956	-0.0726
		(-0.13)	(0.88)	(-0.85)	(-0.98)	(-0.54)
medium						0
						(.)
high						0
						(.)
3-4 years before x medium						-0.113
						(-0.83)
3-4 years before x high						0.0360
						(0.28)
1-2 years before x medium						0.0237
						(0.15)
1-2 years before x high						0.0502
						(0.37)
Year of retirement x medium						-0.00891
						(-0.07)

Year of retirement x high						0.0495
						(0.41)
1-2 years after x medium						-0.0104
						(-0.08)
1-2 years after x high						0.101
						(0.78)
3-4 years after x medium						-0.0107
						(-0.08)
3-4 years after x high						0.0511
						(0.43)
>4 years after x medium						0.126
						(0.97)
>4 years after x high						0.0293
						(0.24)
Constant	4.802***	4.635***	5.441***	3.778***	5.093***	4.630***
	(23.96)	(15.01)	(9.62)	(6.92)	(15.22)	(15.12)
Number of observations	8133	8133	2228	2924	3107	8133
adj. R-square	0.0405	0.0419	0.0505	0.0240	0.0676	0.0435
BIC	15488.1	15516.2	4724.1	5635.5	5680.4	15599.0
AIC	15474.1	15467.2	4684.1	5593.6	5638.2	15465.9

Source: SHARE release 9.0.0; wave 1-9, excluding wave 3; own calculations
t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
Notes: The table displays the FE regression output for the different models of the effect of retirement on self-perceived health. Linear age is controlled in all models and all regressions include robust Standard Errors. The displayed models are calculated using the balanced panel and calibrated longitudinal weights.

Figure E3: *Margins plot Model 3a, b, c, FE regression of retirement time dummies on self-perceived health estimated separately for high, medium and low educated respondents, linear age controlled, robust standard errors, weighted balanced panel*

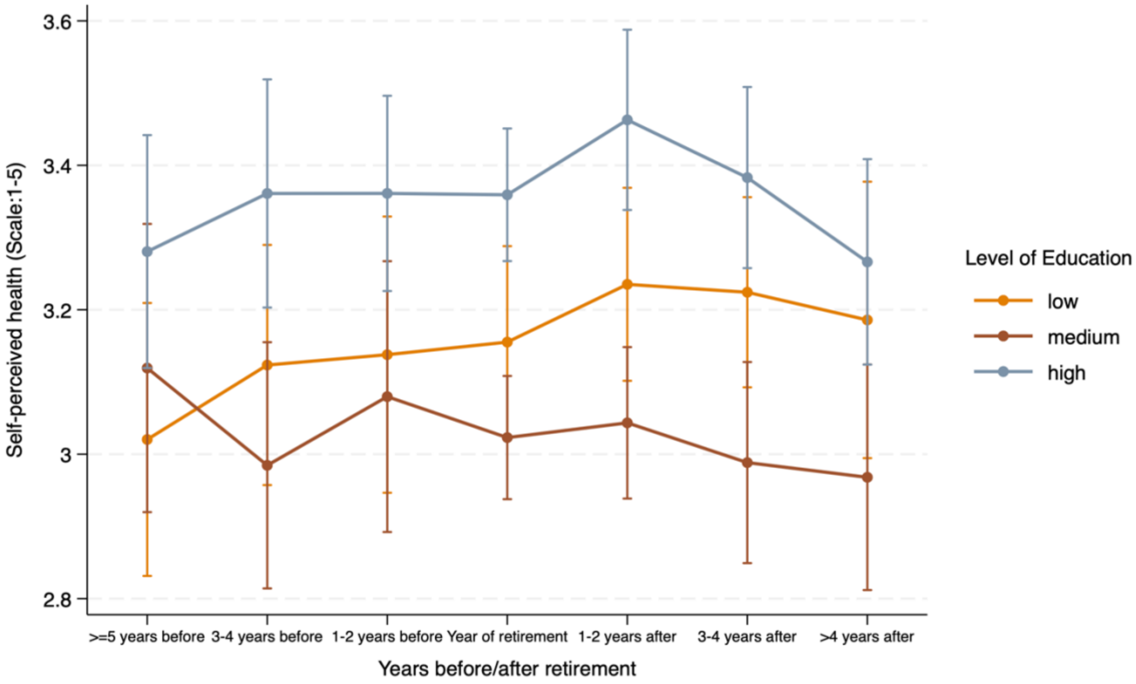


Figure E4: *Predictive margins plot, FE regression of retirement time dummies and self-perceived health, including interaction between retirement and education, linear age controlled, robust standard errors, balanced weighted panel*