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How Retirement Affects Mental Health, Cognitive Skills and Mortality; an Overview of Recent Empirical Evidence

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Abstract

Retiring is an individual labor market transition that affects the personal life of the workers involved and sometimes the life of their partners. This paper presents an overview of recent studies on the effects of retirement on mental health, cognitive ability and mortality. The results are all over the place but on average it seems like at retirement mental health improves, cognitive skills deteriorate and mortality is not affected. However, there is substantial effect heterogeneity. The range of outcomes is partly related to heterogeneity in terms of personal characteristics, type of job, institutional arrangements, and whether retiring was voluntary or mandatory. The variation in empirical findings makes it hard to see the forest for the trees and advocate evidence-based retirement policies that take health effects into account. Nevertheless, introducing more individual flexibility in the timing of retirement is a worthwhile policy alternative since this seems to be unambiguously beneficial for the health of workers retiring.

Keywords: Retirement, Mental health, Cognitive ability, Mortality

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1. Introduction

Retiring is a complex phenomenon and yet a simple event. Retirement is the transition from work to out of the labor force at the end of the working career. There are various types of retirement. The first type is statutory retirement, i.e., retiring at the standard retirement age. The second type is early retirement, i.e., retiring earlier than the statutory retirement age. A third type of retirement is indirect retirement, i.e., retiring through an intermediate stage of unemployment, sickness, or disability. As the name suggests, indirect retirement only has an indirect relationship with retirement, and these intermediate transitions are ignored here. Retiring usually means leaving the labor market to never return to work. Nevertheless, retirement is not necessarily an absorbing state. Workers may partially retire, i.e., they start collecting pension benefits but keep on working part time. Workers can also retire from the job they had for a long time but start a part-time (or full-time) job at another firm or become a self-employed worker who uses the retirement benefits as a basic income. Various ways exist to define/determine in a survey whether an individual is retired. This can be done by asking whether the individual is working, whether the individual receives retirement benefits, or whether the individual considers himself or herself to be retired.

This paper presents an overview of previous studies focusing on three types of health effects of retirement: mental health, cognitive ability and mortality. According to the World Health Organization, mental health is a state of mental well-being that enables people to cope with the normal stress of life, realize their abilities, learn well and work well, and contribute to their community. Cognitive ability is the ability to clearly think, learn and remember. There is an overlap between mental health and cognitive ability as mental health refers to behavioral, emotional but also cognitive wellbeing. Also, declining cognitive abilities may end in dementia. Nevertheless, in research on the effects of retirement mental health and cognitive abilities are usually separated as the two are measured differently. Whereas measures of cognitive ability focus on memory many mental health indicators relate to depression (see the Appendix for a detailed overview). The effects on mental health and cognitive ability may not be instantaneous, i.e., occurring shortly after retirement, but may gradually evolve and therefore duration in retirement needs to be considered. Similarly, the effect on mortality may not only be a long-run effect but may materialize soon after retirement. Nevertheless, one has to consider a time horizon of at least several years to actually observe effects on mortality since by nature deaths are rare events.

Retirement is often an expected transition from work to full-time leisure. If one stays employed until the standard retirement age, the time of the transition is known well in advance. The worker often does not have a choice about whether to make this transition. It is forced upon the worker, like it or not. Mandatory retirement may have negative health consequences if workers are forced to do something that they dislike. Thus, retirement may come with depression and anxiety. Nevertheless, while for some workers retirement is an unwanted transition, other workers look forward to use the option to retire early. This transition is not forced but voluntary, and these workers use it as soon as formal regulations allow. Because the transition is voluntary, positive health effects may be expected in terms of mental health. The mental health of an individual can be established in various ways. It can be done through self-reporting, i.e., by answering a range of questions or by a single questions on mood, depression,

and anxiety. Tests on speed of processing words, word reading, and recall measure cognitive ability. The "use it or lose it" theory suggests that working is more mentally stimulating than retirement. Cognitive decline may accelerate after retirement because of fewer opportunities to communicate or collaborate. After retirement, workers may lose the need for self-discipline. Rohwedder and Willis (2010) refer to this as the "unengaged lifestyle" explanation for the cognition effects of retirement, also mentioning a mental retirement effect related to human capital theory. Because workers have little incentive to invest in their human capital toward the end of their career the reduction in mental exercise may start before actual retirement, i.e., there is an "on-the-job" mental retirement effect.

The exact health consequences of retirement are an empirical matter. This holds for immediate health effects but also for long-term health consequences, including mortality.[2] The health effects of retirement may be interesting from a policy point of view because average retirement ages are going up due to institutional increases in standard retirement ages and disappearing early retirement programs (Boeri and Van Ours, 2021). The relationship between retirement and health is most often studied as going from retirement to health. Some studies focus on the reverse effect. French and Jones (2017) for example provide an overview of studies on how health affects retirement. They suggest that health is not the primary source of the decline in the retirement ages in the last decades of the 20th century. Furthermore, the decline of health as people grow older only explains a small share of the decline in employment near the retirement age. Blundell et al. (2022) find for England and the United States that declines in health explain between 3 and 15 percent of the decline in employment between ages 50 and 70. The effect is much stronger in the United States than in England as for institutional reasons unhealthy Americans have a strong incentive not to work.

To establish the causal effect of retirement on mental health, one must consider that association originates from joint observed and unobserved characteristics – of worker, job and retirement circumstances. It is also possible that reverse causality is the basis of the link between the two variables. An example of an unobservable characteristic is the preference for leisure time that may affect both mental health and the desire to retire. Unobserved characteristics can be time-invariant or time-varying. Reverse causality may play a role if the mental condition of a worker affects the retirement decision of that worker. Furthermore, in the analysis one has to take omitted variable bias and measurement errors into account. Measurement error can be classical or related to justification bias (in reporting health a retiree may justify having retired). To establish a causal effect of retirement on health three methods are generally used, instrumental variables (IV), regression discontinuity design (RDD) and differences-in-differences (DiD). Eligibility ages for early retirement or retirement-related social security benefits are popular instrumental variables. RDD analysis typically exploits the sudden increase in the retirement probability as soon as an individual attains the age for pension eligibility. A DiD approach is possible if the change in statutory retirement age applies to some workers but not to others. Studies using instrumental variables usually rely on age of eligibility for early retirement or statutory retirement. Sometimes this is accompanied by instrumental variables based on the years to or years since reaching the eligibility age. Cross-country studies

[2] Galama et al. (2013) present a theoretical model based on Grossman's (1972) health human capital framework. In their theory health is one of the determinants of the retirement decision.

can exploit cross-country variation in eligibility ages. Thus, even if there is only information from a cross-section there may be variation in instrumental variables which can be exploited in the analysis. Similarly, RDD studies mostly use discontinuities related to early or mandatory retirement ages. Because using eligibility ages for identification purposes is common, unless otherwise mentioned, when a reference is made to the use of instrumental variables or an RDD strategy these are based on ages of eligibility. Panel datasets support the identification of treatment effects of retirement on health outcomes. Some of these datasets facilitate multi-country studies because of the harmonization of questionnaires. Frequently used datasets are the U.S. Health and Retirement Study (HRS); the English Longitudinal Study of Ageing (ELSA); and the Survey of Health, Ageing and Retirement in Europe (SHARE).

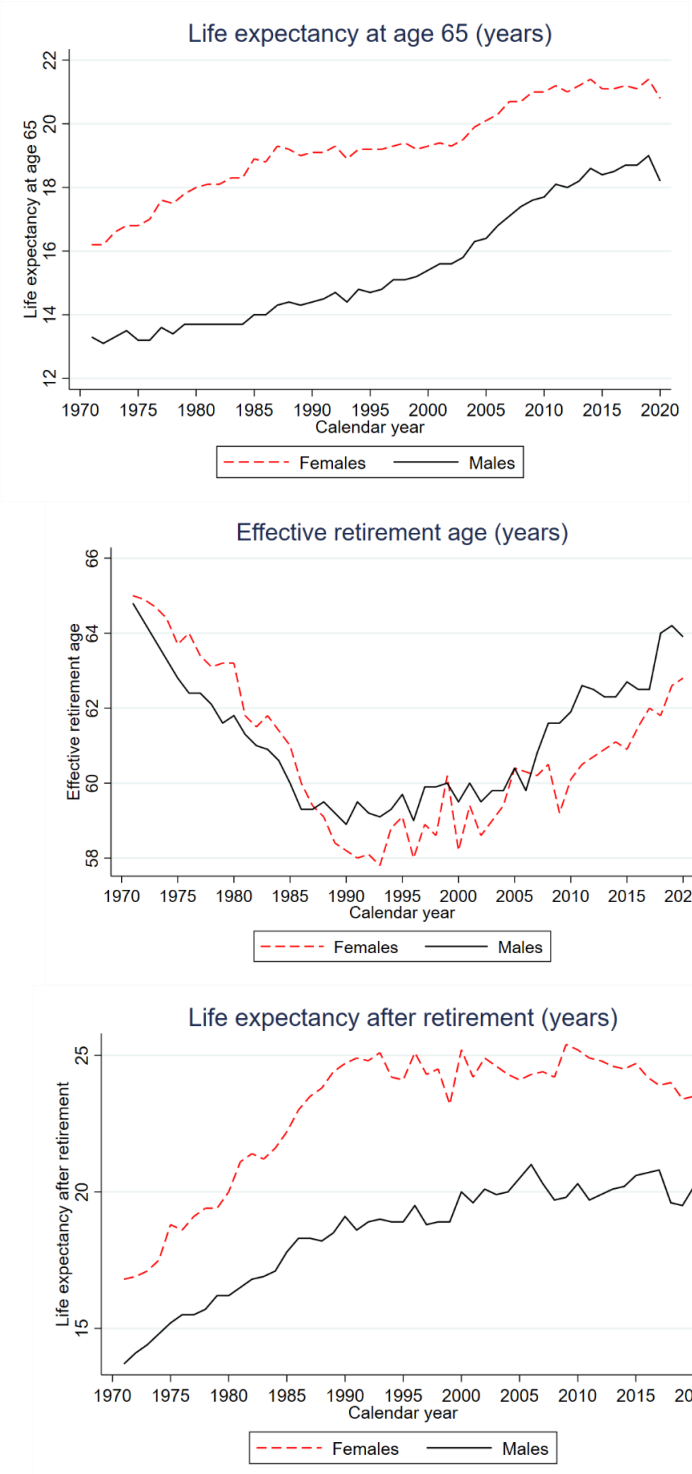
The number of studies on retirement and health is rapidly increasing. In order to keep the overview manageable some choices are made. First, the current paper focuses on the causal effect of retirement on health. This implies that studies that do not go beyond establishing the association between retirement and health are not discussed. Second, the overview focuses on mental health, cognitive skills and mortality as health indicators. To the extent that studies investigate the effects of retirement on other health indicators such as physical health, health care use or health related behaviors these studies – or part of these studies – are ignored. Finally, studies with a sole focus on life satisfaction, happiness, or well-being are ignored. These variables may relate to mental health and indeed some mental health summary measures include happiness. Nevertheless, well-being has a much wider meaning than health. These limitations are somewhat arbitrary but nevertheless the main conclusions from the analysis will be very much the same without them.

The paper is organized as follows. Section 2 provides an overview of retirement related information from the Netherlands over the past fifty years. This section also includes a cross-country comparison of retirement statistics including healthy years in retirement. The comparison is limited to the extent that it only presents information from 16 OECD-countries because comparable statistics are often collected in a harmonized way for these countries. Retirement ages and labor market outcomes show a substantial cross-country variation. Section 3 presents an overview of previous studies focusing on individual health effects of retirement. Some studies analyze the effects of earlier retirement or later retirement. The effects are reported such that they are reflecting the effects of retirement. If early retirement leads to worse health outcomes, the health effect of retirement is negative. Similarly, if later retirement improves health outcomes the effect of retirement is negative as well. The focus on mental health, cognitive abilities and mortality also implies that parts of some papers are ignored if they also present results of retirement on other health indicators.

The studies are organized in three parts. The first part discusses multi-country studies which use harmonized data from several countries. The second part is on studies using individual country data. The last part discusses the main findings from overview studies. All studies included are published from 2010 onward.[3] A brief presentation of studies that consider cross-partner effects of retirement follows in Section 4. Section 5 provides a broader discussion on the effects of retirement on health and concludes with thoughts about future research and potential policy implications.

[3] The overview studies discussed often include papers published before 2010.

Figure 1 Life Expectancy at age 65 (a), effective retirement age (b) and life expectancy after retirement (c); the Netherlands 1971-2020



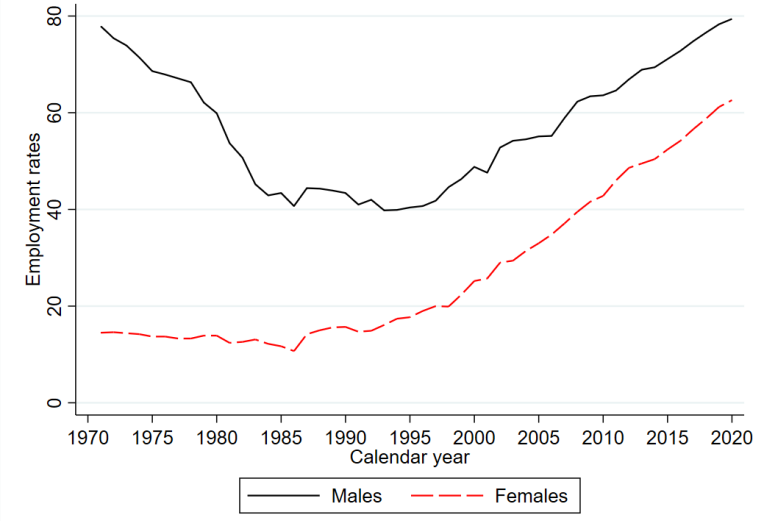
Note: Life expectancy at age 65 is the average number of years that a person of that age can expect to live, assuming age-specific mortality levels remain constant. The average effective age of labor force exit is calculated as a weighted average of (net) withdrawals from the labor market at different ages over a five-year period for workers initially aged 40 and over. Expected years in retirement is a calculation of remaining life expectancy from the time of effective age of labor force exit for men and women. Source: OECD-statistics

2. Setting the Stage

2.1 Developments in the Netherlands

Figure 1 provides an overview of developments in the Netherlands in life expectancy at age 65, effective retirement age, and life expectancy after retirement over a period of fifty years, i.e., 1971–2020. The figure shows that the developments for women and men are very similar, though at different levels. Panel a shows that life expectancy at age 65 is about three years longer for women than for men. Life expectancy increased steadily with almost five years for women and almost 6 years for men. In the last year – most likely due to Covid – life expectancy at age 65 dropped with 0.6 years for women and 0.8 years for men. Panel b shows that the developments of the effective retirement age are not very different for men and women.[4] The effective retirement age goes down until the mid-1980s to increase slowly until the early 21st century to increase stronger from then on. Over the whole period of 50 years, the effective retirement age dropped about 2 years for women and about 1 year for men. Panel c shows approximate life expectancy after retirement. Life expectancy after retirement is not a formal OECD statistic but calculated as 65 plus the years of life expectancy after age 65 minus the effective retirement age. The difference between life expectancy at age 65 and effective retirement age increased up to the early 21st century to remain approximately constant after that. Clearly, over the past decades the life perspective of retirement has changed a lot. On the one hand, workers retire much later than a couple of decades ago. On the other hand, life expectancy after retirement is constant with an average of 20 years for men and 25 years for women.

Figure 2: Employment rates workers age 55-64; the Netherlands 1971-2020



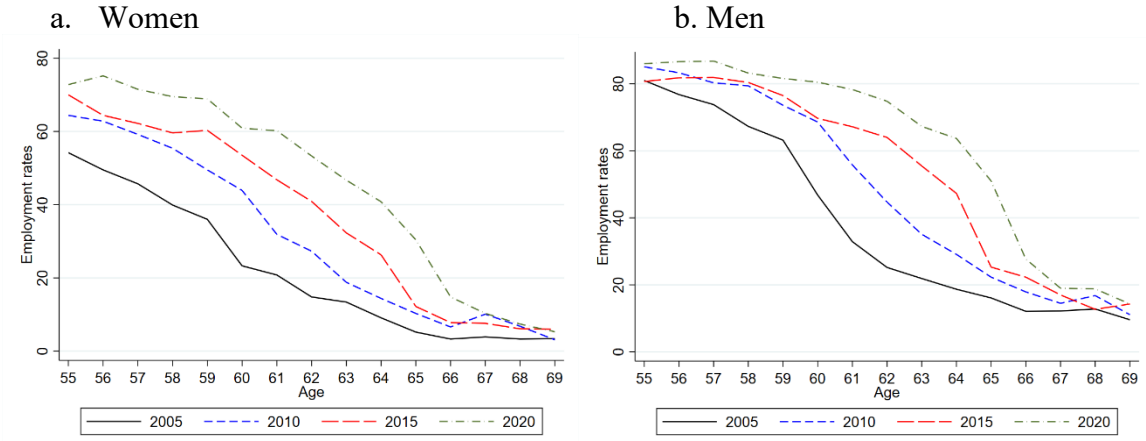
Note: Employment rate is employment as a percentage of the population. Source: OECD-statistics

[4] According to OECD statistics, the effective retirement age is defined as "the average age of exit from the labor force for workers aged 40 and over.

Figure 2 shows the developments of the employment rates of older workers. Clearly, there are major differences between men and women. For men the employment share of the population dropped from almost 80 percent in 1971 to 40 percent in the mid-1980s. Up to the year 2000 there was an increase in the employment rate to almost 50 percent whereas in 2020 almost 80 percent of the male population aged 55 to 64 had a job. The employment rate of older women was about 15 percent in 1971 and did not change much until the early 1990s. After that there was an increase to 25 percent in the year 2000 and a further increase to 63 percent in 2020.

Figure 3 provides more detailed information about the increase in employment rates among older workers in the Netherlands. Employment rates go down with age but the age-gradient changed a lot from 2005 to 2020 and over time employment rates increased at every age. For women the increase in employment rates is substantial and across the whole age range 55 to 65. Among women age 55 the employment rate increased from 54 percent to 72 percent, an increase of 18 percentage-points. For women age 60 the increase was even 38 percentage-points from 23 percent to 61 percent. At age 65 the increase in female employment rate was 25 percentage-points from 5 to 30 percent. At age 69 about 5 percent of the women was employed. Among older men, the increase in employment rates is predominantly in the range 60 to 65. The employment rate of men age 55 increased with 5 percentage-points from 81 to 86 percent whereas at age 60 the increase was 34 percentage-points from 47 to 81 percent. At age 65 the increase was 35 percentage-points, from 16 to 51 percent. At age 69 the employment rate of men was about 14 percent.

Figure 3: Employment rates older workers by age; the Netherlands 2005-2020



Note: Employment rate is employment as a percentage of the population. Source: Statistics Netherlands

Summarizing, the developments in retirement-related indicators are the following. Over the past decades the increase in life expectancy at age 65 has been accompanied by an increase in the effective retirement age such that life expectancy after retirement has been rather stable. Women at age 65 on average live about two-and-a-half years longer than men at that age and after retirement they live about three-and-a-half years longer. However, in relative terms the developments have been very much the same for men and women. The developments in employment rates of older individuals have been very different for men and women in the

1970s and 1980s. After that employment rates increased more for women than for men but the employment rate of older men is still substantially higher than the employment rate of older women.

All in all, the perspective of retirement in the Netherlands has changed fundamentally in the past decades. Life expectancy after retirement did not change so much but while at the start of the 21st century working beyond age 60 was a rare phenomenon twenty years later it is common. At the start of the 21st century retiring implied leaving a small group of same age workers joining the vast majority of non-working of that age. At the moment retiring implies leaving a big group of workers of the same age joining a much smaller group of that age outside the labor market. This development is driven partly by abolishing early retirement programs and increasing statutory retirement age but also could be partly driven by preferences of some workers who do not mind working in the labor market up to a high age.

2.2 Cross-Country Comparison

Many developments in retirement related indicators are similar internationally in terms of evolution but not so much in level. To put the position of older workers in the Netherlands in perspective, Tables 1 to 3 provide information about retirement related characteristics for 16 countries including the Netherlands.

Table 1 Life Expectancy at Age 65 (2019 or closest year)

	Women life expectancy at 65			Men life expectancy at 65		
Country	**Total**	**Healthy**	**With activity limitation**	**Total**	**Healthy**	**With activity limitation**
Austria	21.7	7.7	14.0	18.7	7.7	11.0
Belgium	22.1	10.7	11.4	18.9	10.5	8.4
Denmark	21.0	11.8	9.2	18.4	10.7	7.7
Finland	22.3	9.6	12.7	18.8	9.3	9.5
France	23.9	11.6	12.3	19.8	10.4	9.4
Germany	21.4	12.8	8.6	18.3	11.5	6.8
Ireland	22.1	14.1	8.0	19.4	13.1	6.3
Italy	22.9	10.2	12.7	19.7	10.6	9.1
Netherlands	21.4	9.6	11.8	19.0	10.2	8.8
Norway	21.9	15.8	6.1	19.6	15.8	3.8
Portugal	22.3	6.9	15.4	18.5	7.9	10.6
Spain	23.9	12.3	11.6	19.8	12.4	7.4
Sweden	22.1	16.6	5.5	19.6	15.9	3.7
Switzerland	23.0	10.5	12.5	20.3	11.2	9.1
United Kingdom	21.1	10.7	10.4	18.9	10.2	8.7
United States	20.9			18.4		
Average	22.1	11.4	10.8	19.1	11.2	8.0
Range	3.0	9.7	9.9	2.0	8.2	7.3

Note: Life expectancy at age 65 is the average number of years that a person of that age can expect to live, assuming age-specific mortality levels remain constant, 2019 (some countries 2018). Healthy life years are defined as the number of years spent free of long-term activity limitation (this is equivalent to disability-free life expectancy). Healthy life years are calculated annually by Eurostat based on life table data and age-specific prevalence data on long-term activity limitations. Source: OECD-statistics

Table 1 provides information about life expectancy at age 65, distinguishing between healthy and non-healthy years.[5] The bottom line of the table shows that on average life expectancy at age 65 is about 22 years for women and about 19 years for men. For both women and men from age 65 onward about 11 years of life expectancy are healthy years.

The higher life expectancy for women is mostly in terms of unhealthy years. Overall life expectancy at age 65 has a cross-country range of 2.9 years for women – from 21.0 years in Denmark to 23.9 years in Spain. For men the range is only 2 years, from 18.3 years in Germany to 20.3 years in Switzerland. However, Table 1 exhibits substantial cross-country differences in terms of healthy and unhealthy life expectancy. For women, the range in healthy life expectancy at age 65 is 9.7 years from a low 6.9 years in Portugal to a high 16.6 years in Sweden. For men, the range in healthy life expectancy at age 65 is 8.2 years, from a low 7.7 years in Austria to a high 15.9 years in Sweden. The information in Table 1 makes it clear that the perspective of retirement in terms of healthy years to come is very country-specific. Whereas for women in Portugal after age 65 less than 1 in 3 life expectancy years are healthy, in Sweden this holds for 3 in 4 years.

Table 2 Retirement ages and years in retirement, 2020

	Effective labor market exit age		**Expected years in retirement**	
Country	**Men**	**Women**	**Men**	**Women**
Austria	62.0	60.7	21.2	25.2
Belgium	60.9	60.1	22.2	26.2
Denmark	63.8	63.5	19.3	22.2
Finland	63.0	63.6	20.7	23.7
France	60.4	60.9	23.5	27.1
Germany	63.1	63.2	20.1	23.1
Ireland	63.6	63.8	20.5	22.5
Italy	62.3	61.3	22.1	26.2
Netherlands	63.9	62.8	20.2	23.5
Norway	64.9	63.1	19.4	23.7
Portugal	64.9	63.3	19.0	23.9
Spain	61.0	60.4	23.0	27.7
Sweden	65.8	64.9	19.0	22.1
Switzerland	65.4	64.1	20.0	23.8
United Kingdom	63.7	63.2	20.2	22.7
United States	64.9	64.7	18.6	21.3
Average	63.4	62.7	20.6	24.1
Range	5.4	4.8	4.9	5.8

Note: The average effective age of labor force exit is calculated as a weighted average of (net) withdrawals from the labor market at different ages over a five-year period for workers initially aged 40 and over. Expected years in retirement is a calculation of remaining life expectancy from the time of effective age of labor force exit for men and women. Source: OECD-statistics

[5] Note that one must be careful with cross-country comparisons of healthy and non-healthy years as the information on this is based on micro data from EU-SILC (Statistics on Income and Living Conditions). Cross-country data comparability is limited because of cultural factors and different formulations of questions in EU-SILC.

Table 2 presents an overview of cross-country differences in effective labor market exit age and life expectancy in retirement. Across the 16 countries, the average effective age of retirement for men is 63.4 and for women 62.7. There is substantial cross-country variation. Among men the range in age of retirement is 5.4 years with France having the low retirement age of 60.4 and Sweden with a high retirement age of 65.8. For women the age range in retirement is 4.8 years with a low 60.1 in Belgium and a high 64.9 years in Sweden. The average expected years in retirement is 3.5 years longer for women than for men. For men the range is 4.9 years from a low 18.6 in the US to a high 23.5 in France. For women the range is even 6.4 years; from a low 21.3 years in the US to a high 27.7 years in Spain.

Table 3 Employment rates older workers by age; 2020

Country	Men			Women		
	55-59	60-64	65-69	55-59	60-64	65-69
Austria	79.0	42.6	11.3	70.9	18.8	5.6
Belgium	75.9	39.4	7.6	65.3	29.3	4.2
Denmark	82.6	67.9	30.8	78.9	53.6	13.9
Finland	78.1	54.4	18.9	79.5	57.4	10.7
France	76.6	33.7	8.6	70.2	32.5	6.4
Germany	84.8	64.5	20.6	77.6	56.9	13.4
Ireland	76.0	62.4	30.9	63.5	43.9	16.8
Italy	77.5	49.2	17.8	54.1	33.5	9.5
Netherlands	84.9	73.2	26.5	71.6	52.6	13.9
Norway	83.5	68.5	36.3	76.8	60.9	21.0
Portugal	77.9	52.2	26.8	69.3	42.6	16.1
Spain	72.6	48.9	9.1	57.3	37.5	6.3
Sweden	86.1	73.0	30.6	84.4	65.9	20.6
Switzerland	86.9	70.1	28.2	78.5	54.4	17.1
United Kingdom	77.6	60.4	27.6	70.3	50.4	20.5
United States	73.3	59.0	35.9	61.7	47.8	25.8
Average	79.6	57.5	23.0	70.6	46.1	13.9
Range	13.6	39.5	28.7	30.3	47.1	21.6

Note: Employment rate is employment as a percentage of the population. Source: OECD-statistics

Table 3 presents separately for men and women employment rates for the age groups 55–59, 60–64, and 65–69. In line with the retirement ages the employment rates are substantially smaller for the higher age category. For men, average employment rate for the age group 55 to 59 is about 80 percent; for the age group 60 to 64 years the employment rate is about 58 percent while for the highest age group it is 23 percent. For women, there is a similar drop in employment rates by age. The average employment rate of the age group 55 to 59 is 70 percent, for the age group 60 to 64 it is 46 percent while for the highest age group it is about 14 percent. Again, there are substantial cross-country differences in employment rates in particular among older men and women. For men age 55 to 59 employment rates range from a low 73 percent in Spain to a high 87 percent in Switzerland. For men in the age range 60 to 64 employment rates vary from a low 34 percent in France to a high 73 percent in the Netherlands, a difference of almost 40 percentage-points. For the oldest men the employment rates range from a low 8 percent in Belgium to a high 36 percent in Norway. For women the cross-country differences are already substantial for the youngest age group from 55 to 59; from a low 54 percent in Italy

to a high 84 percent in Sweden. The difference for women in the age group 60 to 64 is huge, from a low 19 percent in Austria to a high 66 percent in Sweden. The differences in employment rates among women in the oldest age group are not so substantial. The lowest employment rate for women age 65 to 69 is 4 percent in Belgium and the highest of 26 percent is in the US.

Clearly, the perspective of retirement differs a lot from country to country. In some countries employment rates are high among older workers, in other countries working up to a high age is a rare phenomenon. Furthermore, life expectancy at a high age differs between countries especially life expectancy in good health. These differences are often not taken into account in empirical studies. Observationally equivalent individuals in terms of personal characteristics, retirement benefits and working conditions may face a different tradeoff between working and retiring if only because of life expectancy in good health.

3. How Retirement Affects Mental Health, Cognitive Skills and Mortality

This section provides an overview of recent studies on the effects of retirement on mental health, cognitive skills and mortality distinguishing between three types of studies: multi-country studies, single-country studies and overview studies.

3.1 Multi-Country Studies

Comparable data on retirement and health collected through HRS, ELSA, and SHARE facilitate cross-country studies. Which countries are included varies from study to study and is not important for this overview. What matters is that cross-country differences in retirement institutions can be exploited to identify causal effects even though cross-country heterogeneity often exists in the relevant relationships. All studies presented in Table 4 use an IV approach for identification.

Table 4 Summarizing multi-country studies

Reference	NoC	NoW	Dataset	Dep. variable	Sample – Effect
a. Mental Health					
Coe & Zamarro (2011)	11	1	S	Euro-D	Men 0
Belloni et al. (2016)	10	4	S	Euro-D	0, Blue collar men in recession +
Heller-Sahlgren (2017)	10	3	S	Euro-D	Short-run 0 Long-run –
Kolodziej & García-Gómez (2019)	11	4	S	Euro-D	+, smaller if poor MH
b. Cognitive skills					
Rohwedder & Willis (2010)	13	1	E-H-S	Word recall	–
Coe & Zamarro (2011)	11	4	S	Word recall & verbal	Men 0
Mazzonna & Peracchi (2012)	11	2	S	Various	–
Mazzonna & Peracchi (2017)	10	2	S	Index	–, physically demanding jobs +
Celidoni et al. (2017)	11	2	S	Word recall	ER +, StR –
Schmitz & Westphal (2021)	21	7-11	E-H-S	Word recall	ER 0, StR –

Note: all studies use an IV-approach with early and/or full retirement ages as instruments. Sometimes individual fixed effects are included in the estimates. NoC = number of countries. NoW = number of waves.Datasets: E = ELSA = English Longitudinal Study on Aging; H = HRS = (US) Health and Retirement Study; S = SHARE = Survey of Health, Aging and Retirement in Europe. See the appendix for an explanation of the various dependent variables. Effect: StR = Statutory Retirement; ER = Early Retirement

Table 4a shows the effect of retirement on mental health. Coe and Zamarro (2011) study only the retirement of men and find no significant effects on depression when they retire. Belloni et al. (2016) distinguish between men and women and find on average no effect of retirement on mental health. They also distinguish between blue-collar and white-collar workers. When experiencing an economic crisis depression increases for male blue-collar workers and retirement in an economic crisis comes as a relief. For female blue-collar workers there is no such effect. For white collar workers there are no economic crisis effects. In a sensitivity analysis the authors distinguish between retirement from work and retirement from unemployment. The crisis effects only occur when men retire from work. From this the authors conclude that the alleviation of job-related stress is the channel through which retirement in a recession reduces depression. Heller-Sahlgren (2017) focuses on regular state pension ages to study the effects of retirement on mental health. These turn out to be absent in the short run but large and negative in the long run. In fact, considerable negative mental health effects appear within a couple of years after retirement. The effects are not heterogeneous with respect to gender, educational attainment, and occupation. Kolodziej and García-Gómez (2019) find that the estimated mean mental health effect of retirement is significant positive. The effect is smaller for men than for women and smaller for white collar workers than for blue collar workers. Furthermore, the effect does not depend on marital status and is larger in the presence of children. Finally, the effect is largest for individuals in relatively good mental health.

Table 4b shows the effects of retirement on cognitive skills of the retirees. Rohwedder and Willis (2010) use as measure of cognitive skills immediate and delayed word recall. Early retirement has a significant negative impact of the cognitive ability of people in their early 60s. As indicated before, Coe and Zamarro (2011) study only retirement of men finding no significant retirement effects on their cognitive functioning as measured through word recall and verbal fluency. Mazzonna and Peracchi (2012) use various indicators of cognitive ability: orientation, memory, verbal fluency and numeracy. Their main finding is that the rate of decline of cognitive abilities increases after retirement, i.e., the loss caused by retirement is not one-time but increases with the length of the retirement spell. Mazzonna and Peracchi (2017) summarize the separate indicators of memory, verbal fluency and numeracy in a single measure of cognitive skills (through principal component analysis). As part of a heterogeneity analysis two types of jobs are distinguished: more physically demanding and less physically demanding. In the estimates distance from retirement is taken into account. The average effect of retirement on cognitive skills is negative and becomes larger as the number of years spent in retirement increase. For people who worked in more physically demanding jobs there is an immediate beneficial effect on cognitive abilities. In Celidoni et al. (2017) the variable of interest is based on word recall. The dependent variable is defined as the cognitive decline i.e. the percentage change in words recalled between waves. Cumulative years in retirement are taken into account in the analysis. Retirement improves cognition in the short-run and is detrimental for cognition in the long-run. The authors distinguish between early retirement and statutory retirement. For workers retiring early there is a beneficial effect on cognition while for statutory retirement there is an initial beneficial effect but a detrimental effect in the long run that gets worse over time. Schmitz and Westphal (2021) use word recall as the main indicator for cognitive ability. There are considerable negative average effects of retirement on word recall and there is heterogeneity in the effects. Those who retire early experience no negative effect while those

who retire late experience a big drop in their cognitive abilities. The authors use their empirical findings to advocate for freedom of choice of when to retire. If workers have a high preference for retirement they will not suffer in terms of their cognitive ability while individuals will a low preference for retirement may postpone the decay in their cognitive skills towards later ages.

3.2 Single-Country Studies

Studies on the relationship between retirement and health focusing on single countries mainly use three identification strategies to establish causality, i.e., IV, RDD and DiD. Table 5 presents a summary overview of the relevant studies distinguishing between the effects of retirement on mental health (panel a), cognitive skills (panel b) and mortality (panel c).

Table 5 Summarizing single-country studies on the health effects of retirement

	Method	Country	Measure	Health effect
a. Mental Health				
Behncke (2012)	IV	England	CES-D	0
Atalay & Barrett (2014)	IV	Australia	Various	Women +, men 0
Eibich (2015)	RDD	Germany	Mental health (SF12)	Higher educated +, lower educated 0
Fé and Hollingsworth (2016)	RDD, IV	UK	GHQ-12	0
Gorry et al. (2018)	IV	US	CES-D	+
Picchio & Van Ours (2020)	RDD	Netherlands	MHI-5	Partnered men +, singles 0, women 0
Rose (2020)	RDD	England	GHQ-12, CES-D	0
Carrino et al. (2020)	DiD	UK	GHQ-12, SF12	Women +
Martinez-Jimenez et al. (2021)	DiD	England	CES-D	–
Gorry & Slavov (2021)	IV	England	CES-D	+
Barschkett et al. (2021)	RDD, DiD	Germany	ICD-10 (F30-48)	Women +
Kettlewell & Lam (2022)	IV	Australia	MCS	Women +, men 0
b. Cognitive skills				
Coe et al. (2012)	IV	US	Various measures	Blue collar +, white collar 0
Bonsang et al. (2012)	IV	US	Word recall	–
Clouston & Denier (2017)	RDD	US	Word recall	–
Atalay et al. (2019)	IV	Australia	Various measures	Women 0, Men –
Rose (2020)	RDD	England	Word recall & verbal	0
c. Mortality				
Hernæs et al. (2013)	DiD	Norway	Up to age 70	0
Hallberg et al. (2015)	DiD	Sweden	Up to age 71	–
Bloemen et al. (2017)	DiD	Netherlands	Within 5 years	–
Fitzpatrick & Moore (2018)	DiD	US	Ages 61 & 62	Men +, Women 0
Hagen (2018)	DiD	Sweden	By age 69	0
Zulkarnain & Rutledge (2018)	DiD	Netherlands	5-year mortality rate	+
Nielsen (2019)	RDD/IV	Denmark	1-year mortality rate	0
Rose (2020)	RDD	England	Death counts by cohort	0
Kuhn et al. (2020)	DiD	Austria	By age 73	Men +, Women 0
Grøtting & Lillebø (2020)	RDD	Norway	Up to age 79	0
Bozio et al. (2021)	IV	France	Up to age 79	0

Note: IV = Instrumental Variables, RDD = Regression Discontinuity Design; DiD = Difference in Differences; PSM = Propensity Score Matching. See the Appendix for an explanation of the various mental health measures. Note mortality up to a certain age is the dominant dependent variable in the analysis; it could be that mortality up to other ages are also investigated.

3.2.1 Mental Health

Behncke (2012) uses three waves of ELSA data and CES-D as an indicator for mental health. In the analysis an IV-approach is used to account for selectivity in retirement. The main finding is that mental health of English workers is not influenced by their retirement. Atalay and Barrett (2014) use a reform of the retirement age for women to investigate the effect of retirement on their mental health. They use various indicators for mental health – anxiety, mood disorder, high stress – and an IV-strategy finding that retirement improves mental health of female retirees while having no effect on the mental health of male retirees. Eibich (2015) uses GSOEP (German Socioeconomic Panel) data and an RDD based on age-related financial incentives in the German pension system to establish the effects of retirement on mental health of German workers. Mental health is based on the SF12 measure. Because of financial incentives, discontinuities exist in the age-retirement profile at 60 and 65. The author finds on average positive effects on mental health, which he attributes to relief from work-related stress and strain and to an increase in sleep duration and a more active lifestyle. Especially for higher-educated workers mental health improves at retirement, for lower educated workers there is no effect. Fé and Hollingsworth (2016) use data from the BHPS (British Household Panel Survey) to establish the effect of retirement on mental health as measured by the GHQ-12 indicator. For identification of the short-run effect an RDD is used while the long-run effects are identified using an IV-approach. The main finding is that retirement has little effect on the mental health of retirees neither in the short-run nor in the long-run. Gorry et al. (2018) use data from the HRS and an IV-approach finding that retirement has a significant positive effect on mental health as measured by the CES-D indicator. Picchio and Van Ours (2020) use an RDD approach, data from the Netherlands and the MHI-5 as an indicator for mental health. They find that the effects are heterogenous according to gender and marital status. Partnered men retiring experience a positive mental health effect while for single workers or women – irrespective of their marital status – there is no mental health effect of retiring. Rose (2020) also uses an RDD approach and various English datasets to establish the mental health effects of retiring. As indicators for mental health the CES-D and GHQ-12 are used. The main finding is that retirement does not affect mental health. For women but not for men there was a reform of the State Pension age in the UK. For women, this age was increased for up to six years since 2010. The reform was implemented for women born after 1950 and caused an increase for some women of up to six years of the state pension age (from 60 to 66). Carrino et al. (2020) use a DiD approach comparing the mental health of female workers with male workers retiring and of females who were eligible for a state pension with females who were not. The indicators for mental health are GHQ-12 and SF-12. Postponing retirement causes an increase in mental health problems although for the SF-12 this effect is not significant. A longer postponement leads to worse mental health suggesting that retirement would have improved mental health. Especially women from lower socioeconomic groups suffered from the decline in mental health due to the postponing of the retirement age. The authors suggest that health deterioration especially occurs for women working in exposure jobs with high demand and low control at work although as an alternative explanation they also mention the possibility that the decline in health is related to the drop in income accompanying the increase of the statutory retirement age. Martinez-Jimenez et al. (2021) find opposite mental health effects for English workers retiring. Using the CES-D indicator and a DiD approach, they find that retirement leads to an

average deterioration in mental health but with considerable heterogeneity by gender and occupational status. The deterioration of mental health is significant for women and blue-collar workers but not for men and white-collar workers. The authors also find that retiring shortly after the Great Recession improved mental health of retirees living in the most affected regions. Using ELSA data, the CES-D score and an IV-approach Gorry and Slavov (2021) conclude that retirement of English workers had a positive and significant effect on mental health. Barschkett et al. (2021) use German administrative data on mental and behavioral disorders from the International Classification of Diseases. They exploit an age-related RDD and a DiD based on a pension reform for female workers in Germany in which early retirement programs were abolished for cohorts born after 1951. The main finding is that the postponement of the retirement age had negative mental health effects. Kettlewell & Lam (2022) use data on Australian partnered men and women and an IV-approach with the Mental Component Summary (MCS) of the SF-36 as an indicator for mental health. The main finding is that retirement improved mental health of female retirees but does not affect the mental health of male retirees.

3.2.2 Cognitive Skills

Table 5 panel b summarizes the single-country studies on the effect of retirement on cognitive skills. Coe et al. (2012) use HRS-data on cognitive ability on a range of indicators: self-rated memory, immediate, delayed and total word recall, working memory and numeracy. Using an IV-approach the authors conclude that in the US for white collar workers retirement duration does not affect any of the cognitive ability indicators while for blue collar workers retirement has a significant positive effect for most indicators. The authors speculate that it may be easier for blue-collar workers to be exposed to intellectually stimulating activities outside their job while this is not the case for white-collar workers. Bonsang et al. (2012) also use HRS-data focusing on word recall as an indicator of cognitive skills and using an IV-approach finding that retirement has a significant negative cognitive effect on US workers. Their findings seem to suggest that the effect of retirement on cognitive functioning is not instantaneous but appears with a lag. Nevertheless, most of the drop in cognitive functioning occurs shortly after retirement and stabilizes later on. Clouston and Denier (2017) have the same set-up in the use of HRS-data and the word recall indicator to establish cognitive skills. Using an RDD-approach they find that American workers who retire experience a more rapid decline in cognition than those who continue to work. Once retired, workers experience a more rapid decline in cognition, phrasing this as a cumulative “mental retirement” effect. Atalay et al. (2019) investigate the short-term effect of retiring using an IV-approach on a sample of elderly Australians. They use three dimensions of cognitive ability: word reading, working memory and speed of information processing. For women there is no cognitive ability effect of retirement while for men there is a significant negative effect for word reading but not for working memory and speed of processing. Rose (2020) also investigated the effects of retirement on cognitive skills using ELSA data with information on word recall and verbal scores. Retirement does not affect cognitive skills significantly.

3.2.3 Mortality

Studies on the effect of retirement on mortality use various indicators for the period over which mortality is measured. Table 5 panel c provides an overview. Hernæs et al. (2013) find that a retirement reform in Norway induced some workers to retire early, but the mortality of workers who retired early does not differ from those who did not retire early. Hallberg et al. (2015) analyzes the effects of an early retirement offer to Swedish army personnel, finding that mortality among early retirees is lower. Using a temporary change in the rules for early retirement of older civil servants in the Netherlands, Bloemen et al. (2017) find that early retirement reduces mortality within 5 years. Fitzpatrick and Moore (2018) use a change in eligibility for social security retirement insurance in the United States to establish the effects of retirement on mortality before and after the eligibility age. They find an increase in male mortality, which the authors attribute to retirement-associated changes in unhealthy behaviors. The increase is largest for unmarried men and men with low education levels. For women retiring, mortality does not increase significantly. Hagen (2018) exploits a Swedish retirement reform allowing local government workers to retire early, finding no effects on mortality. Zulkarnain and Rutledge (2018) exploit a policy experiment to study the relationship between extended working life and mortality. The policy experiment concerned a financial reward for older workers to keep on working. The main finding is that extending working life reduced mortality of older individuals from 8 to 6 percent over a five-year period. The study by Nielsen (2019) presented earlier also investigates the effect of retirement of Danish workers on their mortality. Using an RDD, the author finds no significant mortality effects of retirement. Rose (2020) finds no effect of retirement on the mortality of English retirees. Kuhn et al. (2020) use Austrian administrative data, finding that retirement increases mortality for men but not for women. Grøtting and Lillebø (2020) study the effects of retirement on health in Norway using administrative and survey data in an RDD based on the statutory retirement age of 67. They find no effect on mortality. Finally, Bozio et al. (2021) present evidence of the relationship between retirement and mortality in France. They study a 1993 pension reform – which provided financial incentives for workers to retire later – as an instrumental variable for retirement. The main conclusion is that the pension reform and the related delay in retirement did not affect mortality.

Table 6 Summarizing overview studies on retirement and health

				Effects		
Reference	**No**	**Type**	**Dependent variable**	**–-**	**0**	**+**
Van der Heide et al. (2013)	13	D	Mental health	0	23	77
Been et al. (2022)	126	FA	Mental health	13	56	44
Garrouste & Perdrix (2022)	12	D	Depression	8	75	17
Filomena & Picchio (2023)	105	FA	Mental health	12	57	31
Alvarez-Bueno et al. (2021)	15	D	Cognitive skills	27	73	0
Been et al. (2022)	90	FA	Cognitive skills	19	62	19
Garrouste & Perdrix (2022)	14	D	Memory	30	50	20
Been et al. (2022)	31	FA	Mortality	10	87	3
Garrouste & Perdrix (2022)	10	D	Mortality	13	67	20
Filomena & Picchio (2023)	42	FA	Mortality	19	76	5

Note: No = Number of estimates. Type: D = Descriptive; FA = Formal Analysis;
Effect: Percentage of total

3.3 Overview Studies

All empirical studies discuss prior studies. This discussion ranges from a brief presentation of the main findings to systematic tabulated overviews.[6] This section focuses on providing an overview of previous overview studies that did not make an empirical contribution themselves. Summaries of the main findings of these overview studies are given in Table 6. Similar to the previous tables, Table 6 is organized in chronological order by dependent variable, i.e., mental health, cognitive skills and mortality. However, the presentation is organized by study.

Van der Heide et al. (2013) discuss longitudinal studies concluding that the majority of studies find beneficial effects of retirement on mental health. Nevertheless, about one in four studies find no effect. Been et al. (2022) base their quantitative analysis of the findings in previous studies on estimates of which many are equal to zero. This holds for 43 percent of the mental health studies, 62 percent of the cognitive skills studies and almost 90 percent of the mortality studies. In their quantitative analysis they find no evidence of a publication bias. Garrouste and Perdrix (2022) present a descriptive analysis of previous studies of which many find no effect of retirement on mental health, cognitive skills or mortality. They conclude that it is not always clear whether a non-significant effect is due to a lack of statistical power or an absence of effect. Alvarez-Bueno et al. (2021) present an overview of studies on the effects of retirement on cognitive functioning. Based on 15 longitudinal studies they conclude that there is no negative effect of retirement on cognitive functioning. Finally, Filomena and Picchio (2023) present a quantitative analysis explaining the difference in outcomes of previous retirement studies. They consider 105 estimates of the effects of retirement on mental health of which more than half finds no effect and almost one-third finds a positive effect. They also investigate 42 estimates of the effects on mortality indicating that more than 75 percent finds no effect and only 10 percent has a positive effect. From their quantitative analysis they conclude that there is no evidence of publication bias. They also conclude that mandatory or involuntary retirement are associated with more negative mental health outcomes.

Not all overview studies on the health effects of retirement are presented in Table 6. Some of these overview studies are purely descriptive to the extent that they do not make a tabulated comparison between the various studies. These are not presented in Table 6. This does not imply that their conclusions are irrelevant. Bassanini and Caroli (2015) for example conclude as part of their general overview on the relationship between work and health that voluntary retirement often has a positive effect on mental health, whereas involuntary job loss has a negative effect on mental health. Nishimura et al. (2018) replicate well-cited economic studies on retirement and health. For cognitive abilities they focus on word recall while for mental health their dependent variable is depression as measured by CES-D and EURO-D. The aim of the study is to investigate to what extent differences in outcomes of previous studies are related to the research framework. Studies are pairwise compared. The authors find that conclusions on the effect of retirement on health are sensitive to the estimation method, the control variables and the surveyed country but not to the definition of retirement. In addition to investigating previous studies they also present an analysis of the retirement effects for seven countries. For depression they find positive effects for four countries and insignificant effects for three. For cognitive skills they find one country (US) with negative effects, one country (South Korea) with positive effects and five countries with insignificant effects.

[6] Hagen (2018) and Picchio and Van Ours (2020) present such overview tables.

4 Cross-Partner Effects of Retirement

Partnered individuals may make retirement decisions at the household level. Furthermore, the retirement decision of one partner may affect the health of the other partner. This implies that cross-partner effects may exist in decision making and in the effects of those decisions. For example, from an overview of the literature, Coile (2015) concludes that in about one-third of working couples' partners retire within one year of each other. Bloemen et al. (2019) also find cross-partner retirement effects of retiring in the Netherlands. By contrast, Picchio and Van Ours (2020) find no indication of coordinated retirement decisions in the Netherlands.

Cross-partner effects may be present not only in terms of retirement decisions but also in terms of health effects. Using Japanese data, Bertoni and Brunello (2017) find evidence of the so-called "retired husband syndrome" i.e., wives of retiring men experience a negative mental health shock. Müller and Shaikh (2018) use data from various European countries to investigate the causal health effects of the retirement of a partner. Based on an RDD they conclude that subjective health is negatively affected by the retirement of the partner and positively by own retirement. These effects are heterogeneous: male health is not affected by the retirement of his spouse, while female health is negatively affected by the retirement of her partner. Analyzing French labor force survey data, Messe and Wolff (2019) find no cross-partner spillover effects of retirement on health. Picchio and Van Ours (2020) study cross-partner effects of retirement on health in the Netherlands. Retirement of partnered men has positive effects on the mental health of their partner. Kettlewell and Lam (2022) use Australian data on partnered individuals finding no cross-partner mental health effects of retirement.

Table 7 Summarizing cross-partner studies on retirement and mental health

Reference	Country	Cross-partner effects
Bertoni & Brunello (2017)	Japan	Retiring men negative spillover effect -
Müller & Shaikh (2018)	Various	Retiring men negative spillover effect - Retiring women no spillover effect
Messe & Wolff (2019)	France	No spillover effects
Picchio & Van Ours (2020)	Netherlands	Retiring men positive spillover effect Retiring women no spillover effect
Kettlewell & Lam (2022)	Australia	No cross-partner effects

5 Discussion and Conclusions

The overview of the various studies of the effects of retirement on mental health, cognitive skills and mortality do not easily yield firm conclusions. The empirical evidence is mixed. Some studies find a positive effect, while other studies conclude there is no effect or a negative effect. If anything, the average health effect of retirement is found to be insignificant or small in many studies. The share of studies finding no retirement effects is higher for cognitive ability studies than for mental health studies and highest for studies on mortality. Other than that, it is hard to see the forest for the trees. Nevertheless, if I would be forced to formulate conclusions that go beyond the obvious 'it depends' my take on the recent empirical evidence on the health effects of retirement would be: Mental health improves, cognitive skills deteriorate and mortality is not affected. However, these are very general conclusions and not applicable across

the board. There is substantial effect heterogeneity. Even with many studies finding that average health effects are small and insignificant the question on the health effects of retirement is not irrelevant because there may be heterogeneity in the effects. Sometimes, the effects depend on the type of worker or the type of job, or on whether it is a male worker or a female worker retiring. For example, the type of work prior to retirement seems to matter. With stressful work or work in unhealthy situations retirement may benefit mental health. Nevertheless, having a job can be satisfying because the work is interesting and meaningful. If so, retiring may be harmful for mental health. Some of the differences in the mental health effects of retirement may have to do with the nature of the retirement decision, i.e., whether retirement is voluntary or mandatory. Some job are physically or mentally demanding and retirement may improve mental health. The nature of the retirement may also matter. With voluntary retirement there may be positive mental health effects while involuntary retirement may cause negative mental health effects. In other words, mental health effects of retirement may relate to the sense of control that people have over their retirement decision.

Retiring is a complex phenomenon and yet a simple event. A worker stops working at the end of his or her career. Nevertheless, international differences in the phenomenon of retirement are substantial. Not only does the age of retirement vary significantly, a wide variation also exists in the quantity and quality of expected years of life after retirement. Observationally equivalent workers face a different future. This different perspective is present when comparing individuals within countries for example according to the educational attainment of individuals but also between cohorts due to the increase in health life expectancy. But also in multi-country studies it may be an issue as the perspective of health life expectancy at a high age is country-specific.

With a further increase of the normal retirement ages more information will become available about the health effects of these increases. This will provide researchers with the opportunity to explore heterogeneity of the health effects in more detail. Because health effects of retirement are often ambiguous and heterogeneous researchers should make more efforts to reveal that heterogeneity. For example, it would be helpful if studies provided separate estimates by type of occupation (white collar – blue collar), type of work (physically or mentally demanding), income level (high – low), financial consequences of retiring (mild – severe) and so on. Furthermore, the use of retrospectively collected life-history information may allow researchers to study how early life events affect health. Such retrospective information on life histories is already collected in ELSA and SHARE (see Banks et al. (2020) for a discussion). With this retrospective information a more detailed analysis and interpretation of the health effects of later life events such as retirement can be provided.

Nevertheless, whether these new insights from research will stimulate the development of new policy ideas is doubtful. In recent decades, early retirement programs have slowly faded away while standard retirement ages have increased. On the one hand, retiring early has become more difficult for some workers, and they are forced to keep working up to a higher age. If retirement improves health for them, postponing retirement may not be welfare improving. On the other hand, other workers have been allowed to keep working up to a higher age according to their preferences. For them, the policy changes have been beneficial, and postponing retirement may have improved their health and by this probably increasing welfare.

Eligibility for retirement has gradually changed from a right to an obligation. Mandatory retirement is a clear example of institutional discrimination. Jecker (2022) argues that there are ethical arguments against mandatory retirement. The main argument is that workers are not treated individually but as a group. A highly productive worker can lose her job because from one day to the next that worker belongs to a specific age group. Jecker (2022) mentions the EU's Framework Directive 2007/78/EC, which generally prohibits discrimination based on age. Unfortunately, the Directive allows exceptions. Thus it provides a slippery slope that allows governments to discriminate older workers on the basis of their age and go against their preferences should they want to continue working. Discrimination in the labor market is a phenomenon that is present in many dimensions but hard to tackle in terms of magnitude and mechanisms and even more so in terms of effective policy measures. This also holds for age discrimination, which is institutional as many countries have mandatory retirement. Clearly, governments and unions are not averse to discrimination when it comes to age. In fact, they advocate age discrimination as a valid instrument of labor market policy. On the one hand, older workers are stimulated to keep working for a long time. On the other hand, they are forced to stop working if they reach a particular age irrespective of whether they are physically or mentally fit and irrespective of whether they themselves would prefer to keep working.

What can be done from a policy perspective to take health effects of retirement into account? Some economists advocate evidence-based policies. As a leading principle this is indeed worth recommending, but from a practical point of view it is not easy to implement as the evidence is often unclear and not always pointing in the same direction. This also holds for the relationship between retirement and mental health, cognitive ability and mortality. Different studies point in different directions. However, even if the effects of retirement on health were clearly identified and pointing in the same direction the policy implications are not immediately obvious. If postponing the retirement age would have negative mental effects policy implications depend on the magnitude and duration of the health effects and on the health effects of not postponing the retirement age. To the extent that not postponing the retirement age would lead to a negative income effect also for younger workers this negative effect may cause a decrease in mental health. All this does not mean that drawing policy conclusions is impossible. Flexible retirement combines a one-size-fits-all policy with a differentiated approach. There are various ins and outs of flexible retirement. Van Vuuren (2014) argues that flexible retirement opportunities provide insurance to individual workers. Health shocks can be absorbed through early retirement while a loss in pension wealth can be balanced by later retirement. Induced by union-supported collective agreements, the statutory eligibility of retirement age is often effectively a mandatory retirement age. Börsch-Supan et al. (2018) argue that relaxing mandatory retirement may stimulate some workers to retire later but other workers will use the flexibility to retire earlier. Furthermore, there is no economic reason why claiming a pension benefit must imply leaving the labor force. Pension benefits should be actuarially fair with the age of exit from the labor force depending on individual preference for work and leisure. Introducing flexible retirement may have substantial benefits. Hernæs et al. (2016) show for example that removing financial disincentives to continue working after retirement leads to an increase in labor supply and a more gradual withdrawal from the labor force. Flexible retirement could also hold at the intensive margin, i.e., allow workers to gradually retire rather than stop all of a sudden replacing a full-time working week by complete

leisure. By slowly reducing working hours workers can anticipate the consequences of their full retirement more gradually to the benefit of their mental health, cognitive skills and perhaps even their life expectancy.

References

Alvarez-Bueno, C., Cavero-Redondo, I., Estela Jimenez-Lopez, E., Visier-Alfonso, M.E., Sequi-Dominguez, I., and Vicente Martinez-Vizcaino, V. (2021). Effect of retirement on cognitive function: a systematic review and meta-analysis. *Occupational & Environmental Medicine*, 78: 761–768.

Atalay, K., and Barrett, G.F. (2014). The causal effect of retirement on health: New evidence from Australian pension reform. *Economics Letters* 125: 392-395.

Atalay, K., Barrett, G. F., and Staneva, A. (2019). The effect of retirement on elderly cognitive functioning. *Journal of Health Economics* 66: 37–53.

Banks, J., Brugiavini, A., and Pasini, G. (2020). The powerful combination of cross-country comparisons and life-history data. *Journal of the Economics of Ageing* 16: 100206.

Barschkett, M., Geyer, J., Haan, P. and Hammerschmid, A. (2021). The effects of an increase in the retirement age on health – Evidence from administrative data. *IZA Discussion Paper* No. 14893.

Bassanini, A., and Caroli, E. (2015). Is work bad for health? The role of constraint versus choice. *Annals of Economics and Statistics* 119/120: 13–37.

Been, J., Knoef, M., and Van Mourik, C. (2020). The causal effect of retirement on health: A meta-analysis. Tilburg: *Netspar Academic Series*, 2022-019.

Behncke, S. (2012). Does retirement trigger ill health? *Health Economics* 21(3): 282–300.

Belloni, M., Meschi, E., and Pasini, G. (2016). The effect on mental health of retiring during the economic crisis. *Health Economics* 25 (S2): 126–140.

Bertoni, M., and Brunello, G. (2017). Pappa ante portas: The effect of the husband's retirement on the wife's mental health in Japan. *Social Science & Medicine* 175: 135–142.

Bloemen, H., Hochguertel, S., and Zweerink, J. (2017). The causal effect of retirement on mortality: Evidence from targeted incentives to retire early. *Health Economics* 26(12): e204–e218.

Bloemen, H., Hochguertel, S., and Zweerink, J. (2019). The effect of incentive-induced retirement on spousal retirement rates: Evidence from a natural experiment. *Economic Inquiry* 57(12): 910–930.

Blundell, R., Britton, J., Costa Dias, M., and French, E. (2022). The impact of health of labor supply near retirement. *Journal of Human Resources*, forthcoming.

Boeri, T., and Van Ours, J. C. (2021). *The Economics of Imperfect Labor Markets*, third edition. Princeton, NJ: Princeton University Press.

Bonsang, E., Adam, S., and Perelman, S. (2012). Does retirement affect cognitive functioning? *Journal of Health Economics* 31(3): 490–501.

Börsch-Supan, A., Bucher-Koenen, T., Kutlu-Koc, V., and Goll, N. (2018). Dangerous flexibility—Retirement reforms reconsidered. *Economic Policy* 33(94): 315–355.

Bozio, A., Garrouste, C., and Perdrix, E. (2021). Impact of later retirement on mortality: Evidence from France, *Health Economics* 30(5): 1178-1199.

Carrino, L., Glaser, K., and Avendano, M. (2020). Later retirement, job strain, and health: Evidence from the new State Pension age in the United Kingdom. *Health Economics* 29(8): 891–912.

Celidoni, M., Dal Bianco, C., and Weber, G. (2017). Retirement and cognitive decline. A longitudinal analysis using SHARE data. *Journal of Health Economics* 56: 113–125.

Clouston, S. A. P., and Denier, N. (2017). Mental retirement and health selection: Analyses from the U.S. Health and Retirement Study. *Social Science & Medicine* 178: 78–86.

Coe, N. B., and Zamarro, G. (2011). Retirement effects on health in Europe. *Journal of Health Economics* 30(1): 77–86.

Coe, N. B., Von Gaudecker, H.-M., Lindeboom, M., and Maurer, J. (2012). The effect of retirement on cognitive functioning. *Health Economics* 21(8): 913–927.

Coile, C. C. (2015). Economic determinants of workers' retirement decisions. *Journal of Economic Surveys* 29(4): 830–853.

Eibich, P. (2015). Understanding the effect of retirement on health: Mechanisms and heterogeneity. *Journal of Health Economics* 43: 1–12.

Fé, E., and Hollingsworth, B. (2016). Short- and long-run estimates of the local effects of retirement on health. *Journal of the Royal Statistical Society Series A* 179(4): 1051–1067.

Filomena, M., and Picchio, M. (2023). Retirement and health outcomes in a meta-analytical framework. *Journal of Economic Surveys*, forthcoming.

Fitzpatrick, M., and Moore, T. (2018). The mortality effects of retirement: Evidence from social security eligibility at age 62. *Journal of Public Economics* 157: 121–137.

French, E., and Jones, J. B. (2017). Health, health insurance, and retirement: A survey. *Annual Review of Economics* 9: 383–409.

Galama, T., Kapteyn, A., Fonseca, R. and Michaud, P.C. (2013). A health production model with endogenous retirement. *Health Economics* 22: 883-902.

Garrouste, C., and Perdrix, E. (2022). Is there a consensus on the health consequences of retirement? A literature review. *Journal of Economic Surveys*, forthcoming.

Gorry, A., Gorry, D., and Slavov, S.N. (2018). Does retirement improve health and life satisfaction? *Health Economics* 27(12): 2067–2086.

Gorry, D., and Slavov, S.N. (2021). The effect of retirement on health biomarkers. *Economics and Human Biology* 40: 100949.

Grossman, M. (1972). On the concept of health capital and the demand for health. *Journal of Political Economy* 80(2): 223–255.

Grøtting, M.W., and Lillebø, O.S. (2020). Health effects of retirement: Evidence from survey and register data. *Journal of Population Economics* 33(2): 671–704.

Hagen, J. (2018). The effects of increasing the normal retirement age on health care utilization and mortality. *Journal of Population Economics* 31(1): 193–234.

Hallberg, D., Johansson, P., and Josephson, M. (2015). Is an early retirement offer good for your health? Quasi-experimental evidence from the army. *Journal of Health Economics* 44: 274–285.

Heller-Sahlgren, G. (2017). Retirement blues. *Journal of Health Economics* 54: 66–78.

Hernæs, E., Markussen, S., Piggott, J., and Vestad, O. L. (2013). Does retirement age impact mortality? *Journal of Health Economics* 32(3): 586–598.

Hernæs, E., Markussen, S., Piggott, J., and Knut Røed, K. (2016). Pension reform and labor supply. *Journal of Public Economics* 142: 39–55.

Jecker, N.S. (2022). The dignity of work: An ethical argument against mandatory retirement. *Journal of Social Philosophy*, forthcoming.

Kettlewell, N., and Lam, J. (2022). Retirement, social support and mental well-being: A couple-level analysis. *European Journal of Health Economics* 23:511–535.

Kolodziej, I.W., and García-Gómez, P. (2019). Saved by retirement: Beyond the mean effect on mental health. *Social Science & Medicine* 225: 85–97.

Kuhn, A., Staubli, S., Wuellrich, J.-P., and Zweimüller, J. (2020) Fatal attraction? Extended unemployment benefits, labor force exits, and mortality. *Journal of Public Economics* 191: 104087.

Martinez-Jimenez, M., Hollingsworth, B., and Zucchelli, E. (2021). Health, retirement and economic shocks. *IZA Discussion Paper* No. 14574.

Mazzonna, F., and Peracchi, F. (2012). Ageing, cognitive abilities and retirement, *European Economic Review* 56(4): 691–710.

Mazzonna, F., and Peracchi, F. (2017). Unhealthy retirement. *Journal of Human Resources* 52(1): 128–151.

Messe, P.-J., and Wolff, F.-C. (2019). The short-term effects of retirement on health within couples: Evidence from France. *Social Science & Medicine* 221: 27–39.

Müller, T., and Shaikh, M. (2018). Your retirement and my health behavior: Evidence on retirement externalities from a fuzzy regression discontinuity design. *Journal of Health Economics* 57: 45–59.

Nielsen, N.F. (2019). Sick of retirement? *Journal of Health Economics* 65: 133–152.

Nishimura, Y., Oikawa, M., and Motegie, 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.

Picchio, M., and Van Ours, J.C. (2020). Mental health effects of retirement. *De Economist* 168(3): 319–352.

Rohwedder, S., and Willis, R.J. (2010). Mental retirement. *Journal of Economic Perspectives* 24(1): 119–138.

Rose, L. (2020). Retirement and health: Evidence from England. *Journal of Health Economics* 73: 102352.

Schmitz, H., and Westphal, M. (2021) The dynamic and heterogeneous effects of retirement on cognitive decline, *Ruhr Economic Papers*, No. 918.

Van der Heide, I., van Rijn, R., Robroek, S., Burdorf, A., and Propper, K. (2013). Is retirement good for your health? A systematic review of longitudinal studies. *BMC Public Health* 13(1): 1180.

Van Ours, J.C. (2023). Retirement and health, in: Bloom, D. E. and Sousa-Poza, A., and Sunde, U. (eds.), *Handbook on the Economics of Ageing*, Routledge.

Van Vuuren, D. (2014). Flexible retirement. *Journal of Economic Surveys* 28(3): 573–593.

Zulkarnain A. and Rutledge, M.S. (2018). How does delayed retirement affect mortality and health? *Center for Retirement Research Discussion Paper* No. 11, Boston College.

Appendix Measures of mental health and cognitive skills.

A1. Measures of mental health

1. The General Health Questionnaire (GHQ-12) consists of 12 items, each assessing the severity of a mental problem over the past few weeks using a 4-point scale, with higher scores indicating worse conditions.
2. The Center for Epidemiological Studies-Depression (CES-D) is a 20-item measure in a self-report format measuring depressive symptoms experienced in the past week ranging from 0 (rarely or none of the time) to 3 (most or all of the time). High scores indicating greater depressive symptoms.
3. The Euro-D scale identifies existing depressive symptoms and consists of 12 items assessing depression, pessimism, suicidality, guilt, sleep, interest, irritability, appetite, fatigue, concentration, enjoyment, and tearfulness.
4. SF12: The Short Form Health Survey is a 12-item, patient-reported survey of patient health. It is a reduced size version of the SF-36.[7]
5. MHI-5: The mental health inventory (MHI)-5 is a five-question subscale of the general health measure SF-36. The MHI-5 includes questions referring to both positive and negative aspects of mental health, and questions referring to both depression and anxiety
6. ICD-10 (International Classification of Diseases) – Mental and behavioral disorders, codes F30-49: Mood (affective) disorders and neurotic, stress-related disorders and diseases.

A2. Measures of cognitive ability

Cognitive skills are brain-based skills which are needed in acquisition of knowledge, manipulation of information and reasoning. Often used measures are:

1. Self-rated memory: assessed based on the survey instrument 'How would you rate your memory at the present time? Would you say it is excellent, very good, good, fair, or poor?'
2. Word recall: Immediate and delayed word recall aim at assessing memory performance based on two word recall tasks; one immediate and one delayed.
3. Working memory: the ability to process and store information simultaneously. The working memory is assessed based on a serial subtraction test.
4. Numeracy is measured as the number of correct responses to three numerical problems.

[7] The SF-36 consists of eight scaled scores, which are the weighted sums of the questions in their section: vitality, physical functioning, bodily pain, general health perceptions, physical role functioning, emotional role functioning, social role functioning, mental health.