Why do Older Workers with Chronic Health Conditions Prefer to Retire Early?

Anushiya Vanajan, MSc,[1, 2] Ute Bültmann, PhD,[2] and Kène Henkens, PhD[1,2,3]

[1] Netherlands Interdisciplinary Demographic Institute

[2] University of Groningen, University Medical Center Groningen, Department of Health Sciences, Community & Occupational Medicine

[3] University of Amsterdam, Faculty of Social and Behavioural Sciences

Correspondence concerning this article should be addressed to Anushiya Vanajan, Netherlands Interdisciplinary Demographic Institute, Lange Houtstraat 19, 2511 CV The Hague, The Netherlands. Phone: +31 (0)70 3565227. E-mail: vanajan@nidi.nl

CONFLICTS OF INTEREST

We have no conflict of interest to declare.

Why do Older Workers with Chronic Health Conditions Prefer to Retire Early?

Abstract

Background. Older workers experiencing chronic health conditions (CHCs) are more likely to retire early. The different pathways through which CHCs stimulate retirement preferences, however, remain largely unexplored.

Objective. We present a more comprehensive model in which we test the different pathways through which four specific CHCs - arthritis, cardiovascular disease, sleep disorders, and psychological disorders - influence early retirement preferences. We hypothesize that the association between CHCs and early retirement preferences is differentially mediated by subjective life expectancy (SLE), perceived health-related work limitations (HRWL), and vitality.

Methods. We collected data from 5,696 wage-employed older workers (60–64 years) in the Netherlands in 2015. Regression models were estimated to examine the associations between CHCs and early retirement preferences. Mediation analysis with the Karlson, Holm and Breen method was used to examine potential mediation pathways.

Results. SLE, HRWL, and vitality mediated the association between CHCs and older workers' early retirement preferences. The dominant mediator differed depending on the CHC. Severe HRWL predominantly guided the retirement preferences of older workers with arthritis and cardiovascular disease. Lower vitality mainly mediated retirement preferences of older workers with sleep and psychological disorders. Lower SLE was a significant mediation pathway for older workers with cardiovascular diseases.

Conclusions. HRWL and vitality play a major role in determining retirement preferences of older workers experiencing CHCs. Since both mediators are modifiable, targeted interventions

may not only extend older workers' working lives, but also improve the quality of their working lives.

Keywords: chronic conditions, ageing workers, retirement, mediation

Introduction

The transition from work to retirement is an exceedingly complex process that occurs through various pathways [1]. Retirement preferences and decisions are influenced by multiple push and pull factors inside and outside the workplace [1]. Poor health is an especially well-known predictor of retirement preferences [2, 3] and retirement behaviour [4, 5]. Moreover, several studies reveal that chronic health conditions (CHCs) are associated with a stronger preference for retirement and a higher likelihood of early retirement [6, 7], with some studies explicitly demonstrating the effects of depression [8], musculoskeletal conditions [9], and diabetes [10] on retirement behaviour.

The different pathways through which CHCs stimulate retirement preference, however, remain largely unexplored. This study aims to explain *why* older workers with CHCs prefer to retire early by analysing the pathways through which this occurs (Figure 1). We focus our analysis on four CHCs - arthritis, cardiovascular disease, sleep disorders, and psychological disorders - as they are among the most prevalent and burdensome conditions among older workers [11, 12]. Based on current policies on state retirement age in the Netherlands [13] and the age of the participants in our study, we defined early retirement as retirement before the age of 65 years and 6 months. We hypothesize that 1) the four CHCs will influence early retirement preferences through separate pathways mediated by three health-related factors - subjective life expectancy (SLE), perceived health-related work limitations (HRWL), and vitality and 2) the relative contribution of each mediator will differ depending on which of the four CHCs the older worker experiences.

SLE is a concept that assesses individuals' expectations about their time horizon [14]. SLE has been found to predict mortality rates among older workers [15]. Past studies also show a lower SLE among older workers experiencing poor health [14, 15]. Since time spent in

retirement depends on age of retirement and death [16], SLE may guide how older workers plan their retirement and post-retirement life [17]. This is confirmed by a handful of studies which found SLE to be an important predictor of intended retirement age, even after controlling for known predictors of retirement [14, 18].

Vitality is defined as the feeling of aliveness, both in the physical (healthy, capable, and energetic) and mental (meaning and purpose) sense [19]. While CHCs have been shown to decrease the vitality of older adult [20] and patient populations [21, 22], worksite lifestyle and health interventions have been shown to improve the vitality of older workers [23]. Studies have also found increased vitality to predict career success, career satisfaction, and job performance among older workers [19]. While these positive work-related outcomes may encourage older workers to remain at work, we did not find evidence on the association between vitality and retirement preferences.

CHCs are associated with higher levels of perceived work limitations [24-26]. The extent of work limitations depend on the type of CHCs experienced [25, 27]. For example, Padkapayeva et al. found arthritis to have the strongest effect on increasing work limitations, followed by mood disorders and cardiovascular diseases [27]. Additionally, work limitations have been found to reduce labour force participation [28, 29] and increase early retirement preferences [6]. These studies, however, estimate a general measure of work limitations and not work limitations that are explicitly associated with CHCs [26].

This study contributes to the literature on the health-retirement nexus in three ways. First, it adds novel and comprehensive information by separating the different pathways through which CHCs of older workers may influence their retirement preferences. Thereby, our study might help answer the fundamental question - *why* older workers with specific CHCs prefer to retire early. Second, by studying modifiable health-related factors, our study provides

cues to extend and improve working lives of older workers experiencing CHCs. For example, employers might consider providing older workers with targeted worksite interventions, work accommodations, and health education programs. Third, this study focuses on older workers of pre-retirement age. In public health literature, research on this topic tend to concentrate more on patient populations, workers of all ages, older adults, and older workers of a wider age range [3, 30]. This study will provide information relevant to older workers who are most affected by CHCs and the need to make decisions about retirement.

Methods

Population

This study used data from the first wave of the NIDI Pension Panel Survey conducted in 2015 [31]. Data were collected among employed older workers enrolled in three of the largest Dutch Pension Funds using a stratified approach. The three pension funds together represent the government and education, health and welfare, and construction sectors which consists of about 49% of the wage employed workers in the Netherlands [32]. Though the data are not representative of the total Dutch workforce, it is representative of a large part of the workforce. Initially, a sample of organizations was selected from the files of the pension funds based on organizational size and sector. Thereafter, older workers (aged between 60-65 years who worked at least 12 hours a week) were randomly sampled from the selected organizations and asked to complete an anonymous questionnaire. A total of 15,470 questionnaires were sent out, of which 6,793 were completed and returned. This corresponds to an individual-level response rate of 44%. In 77% of the organizations at least one respondent returned the questionnaire. Compared to the base sample, the analytical sample was somewhat younger and comprised more of men. Construction and social workers had somewhat lower response rates than workers from other sectors. We found no variation in response rates among workers from small, medium, or large organizations. Older workers who received a shorter version of the questionnaire that did not include all relevant variables (N=499), who did not express their retirement preferences (N=60), and who will reach state pension age within the next year (N=538) were excluded from our sample. This resulted in a final study sample of 5,696 older workers between the ages of 60-64 years.

Measurements

Outcome variable

Preference to retire early was measured with the question "What would be your preferred work situation one year from now?". Responses were expressed on a five-point Likert scale (*1=strong preference to work, 2=weak preference to work, 3=no preference, 4=weak preference to retire early, and 5=strong preference to retire early*).

Primary explanatory variables

The explanatory variables of interest were the CHCs experienced by older workers. Specifically, we measured whether older workers suffered from 1) arthritis, 2) cardiovascular disease, 3) sleep disorders, and 4) psychological disorders. Respondents were asked "Do you have one or more of the following longstanding diseases (as diagnosed by a doctor)?", which was followed by a list of CHCs [33]. Older workers answered this question by indicating whether they had the particular CHC. Based on their responses, we created four dichotomized variables for the four CHCs of interest (*1=I have this CHC and 0=I do not have this CHC*).

Mediator variables

Older workers' SLE was assessed by inquiring "How likely are you to live beyond the age of 80?", with response categories ranging from *highly unlikely (1)* to *highly likely (5)* on a five-point Likert scale [14] . This variable was treated as a continuous measure with higher values indicating higher SLE.

HRWL were measured using the two-part LLSI question [33]. The LLSI has high validity and is a reliable measure of HRWL [33]. The LLSI first asks respondents "Do you have one or more of the following longstanding diseases (as diagnosed by a doctor)?", followed by "Do these longstanding diseases limit your performance at work?". Responses to the second question were made on a three-point Likert scale: *1=not limited or do not have a CHC,*

2=moderately limited, and *3=severely limited*. We treated this variable as a continuous measure of HRWL. Higher values indicate more severe HRWL.

Vitality was measured using the 4-item question "How much of the time during the past 30 days did you feel: a. Full of energy, b. tired, c. worn out, and d. full of pep", which was derived from the 36-item Short Form Health Survey [34]. Respondents answered each item on a six-point scale, ranging from *constantly (1)* to *never (6)*. This scale showed high reliability (Cronbach's alpha=0.81). Items a. and d. were reverse coded. Based on the responses, we constructed a single continuous measure of vitality that ranged from 1 to 6. Higher values indicate higher levels of vitality.

Covariates

We controlled for several established demographic covariates. Age, measured in years, was used as continuous variable. Gender (*1=male*) and presence of a partner (*1=partner present*) were represented by dichotomized variables. Educational attainment was first rated from *primary school (1)* to *university graduate (7)*. Thereafter, it was recoded in to low (1,2,3), medium (4,5), and high (6,7) educational attainment. Similarly, wealth was initially rated from *<5000 euros (1)* to *>500,000 euros (7),* and subsequently categorized into low (1,2,3), moderate (4,5), and high (6,7) levels of wealth.

Moreover, we controlled for job-related factors: manual work, supervisory position, full-time employment, organizational sector, and organizational size. Manual work, supervisory position, and full-time employment were dichotomized. Manual work was coded 1 if respondents' jobs were associated with manual work based on the International Standard Classification of Occupation [35]. Supervisory position was coded 1 if respondents said *yes* to the question "Do you have a supervisory position?". Full-time employment was coded 1 if older workers were employed for 36 hours or more per week. Both organizational sector and

size were categorical variables with three categories. The three categories of organizational sector are: government and education, construction, and health and welfare. Organizations were separated by size into small (<50 employees), medium (50-250 employees), and large (>250 employees).

Additionally, we controlled for comorbidity with other CHCs which was coded 1 if respondents experienced one or more CHCs in addition to arthritis, cardiovascular disease, sleep disorders, and psychological disorders.

Analyses

Item non-response was under 5% for any single item. This permitted the use of less vigorous missing data imputation methods [36]. Therefore, missing data were imputed using single stochastic regression imputation [37]. To deal with the multilevel structure of data (older workers were nested within organizations), we used clustered standard errors in all analyses (Stata 14: vce (cluster)).

The sample was described using means, standard deviations, and frequencies. We used ordinal least squares (OLS) regression analyses to estimate the impact of CHCs on mediator variables. All mediator variables were standardized. This allowed the interpretation of dichotomized variables as Cohen's *d* effect sizes.

To estimate the association between CHCs and early retirement preferences and mediation by SLE, HRWL, and vitality, ordered logistic regression models were used. Model 1 estimates the association between CHCs and early retirement preferences. Models 2, 3, and 4 also include SLE, HRWL, or vitality, respectively. Model 5 regressed the associations of all CHCs and all mediators with early retirement preferences. All models were controlled for all covariates.

We used the Karlson, Holm, and Breen (KHB) method (Stata 14: khb) to formally test whether SLE, HRWL, and vitality mediated the relationship between CHCs and early retirement preferences. The KHB method provides unbiased decompositions of total effects into direct and indirect effects for both linear and nonlinear models [38]. Within our study, the direct effect examines the association between CHCs and early retirement preferences, while indirect effects explores the mediation by SLE, HRWL, and vitality.

Results

Supplementary Table 1 describes the characteristics of our sample. The mean age of participants was 61.7 years (SD=1.4). While 49.2% of participants preferred to keep working, 41.5% of participants preferred to retire early. The most reported CHC was arthritis (43.6%), followed by sleep disorders (14.9%), cardiovascular disease (13.0%), and lastly psychological disorders (4.9%).

Table 1 depicts results of the OLS regression analyses on the associations between CHCs and SLE, HRWL, or vitality. All CHCs were significantly associated with SLE, HRWL, and vitality. These relationships, however, differed depending on the mediator variable. Although all four CHCs were associated with lower SLE, the association is most pronounced for older workers with cardiovascular disease (Cohen's d=-0.31, CI=-0.39–0.23). HRWL were predominantly related to arthritis (Cohen's d=0.71, CI=0.66–0.76) and psychological disorders (Cohen's d=0.78, CI=0.6–0.92). Vitality was most related to psychological disorders (Cohen's d=-0.66, CI=-0.77–0.56).

Table 2 presents results of the ordered logistic regression analyses on the associations between CHCs and older workers' preference to retire early, while also providing cues about the potential mediation pathways. Model 1 indicates that experiencing any of the four CHCs were significantly associated with a stronger preference to retire early. Model 2 reveals that high SLE was associated with a weaker preference to retire early (OR=0.87, CI=0.83–0.92). Model 3 shows that severe HRWL were significantly associated with a stronger preference for retirement (OR=1.43, CI=1.35–1.52). Model 4 demonstrates that high vitality was associated with a weaker preference to retire early (OR=0.62, CI=0.57–0.66). Additionally, Models 2 to 4 demonstrate that including any mediator variable in the analysis attenuated the effects of the four CHCs on early retirement preferences, as all odds ratios reduced in size and some lost

their significance. Lastly, Model 5 examined the associations between CHCs and preference to retire early, while accounting for all three mediators simultaneously. All mediators were independently associated with early retirement preferences. Severe HRWL were associated with a stronger preference for early retirement (OR=1.29, CI=1.21–1.38). Contrastingly, high vitality (OR=0.69, CI=0.63–0.74) and to a lesser extent high SLE (OR=0.95, CI=0.91–1.01) were associated with a weaker preference for early retirement. The effects of all four CHCs in Model 5 were small and not significant in the full model.

The KHB analyses confirmed that indirect effects accounted for the majority of the total effect of CHCs on retirement preferences (Table 3). The indirect effects of CHCs on retirement preferences were significant for older workers with arthritis (OR=1.32, CI=1.20–1.45), cardiovascular disease (OR=1.13, CI=1.04–1.23), sleep disorders (OR=1.33, CI=1.21–1.46), and psychological disorders (OR=1.58, CI=1.42–1.75), while all direct effects were not significant. These results suggest that the association between CHCs and early retirement preferences mostly ran via the mediators. The results further showed that the association was differentially mediated by SLE, HRWL, and vitality, depending on the CHC examined. The indirect effect of CHCs on early retirement preferences ran primarily via HRWL for older workers with arthritis (65.4%) and cardiovascular disease (45.9%). For older workers with sleep disorders (60.3%) and psychological disorders (55.0%), the indirect effect of CHCs on early retirement preferences was predominantly attributable to lower vitality. While SLE explained minor proportions of the indirect effect for most CHCs, it mediated a comparatively larger proportion (11.8%) of the indirect effect for cardiovascular disease.

Discussion

This study investigated the different pathways through which CHCs influence retirement preferences using data from 5,696 Dutch older workers in pre-retirement age. The study provides evidence that older workers experiencing arthritis and cardiovascular disease may prefer early retirement due to severe HRWL, while older workers with sleep and psychological disorders may prefer early retirement because of lower vitality. The mediation effect of SLE was minor for all CHCs, except for cardiovascular disease.

Our results clearly show that the nature of CHCs is reflected in the dominance of mediators. For example, sleep disorders may result in fatigue, reduced energy, muted enthusiasm, poor quality of life, and consequently, low vitality [39]. A common symptom of psychological disorders, such as depression and anxiety, is fatigue, which in turn decreases vitality [40]. Our study showed that this lower level of vitality is related to early retirement preferences. Similarly, arthritis and cardiovascular diseases may restrict the full range of activities that the older worker can perform [26]. Our results showed that these activity limitations are related to early retirement preferences. We were intrigued by how the mediation effect of SLE for older workers with cardiovascular diseases stood out compared to its mediation effect on the other three CHCs. Cardiovascular diseases are more life-threatening and they can occur suddenly and unexpectedly [41]. This may lead to apprehensions about mortality among patients of cardiovascular diseases. Studies have found that individuals adapt their SLE in response to new information, such as health changes or onset of disease [15]. In line with this, our results show that older workers with cardiovascular diseases take the nature of their disease and resulting worries about their mortality into account when considering retirement preferences.

This study is, however, not without limitations. Given the cross-sectional nature of the data, causal inferences (including reverse causation) are not possible. We also cannot capture the dynamic nature of CHCs. Hence, longitudinal studies are warranted that investigate causal mechanisms and changes over time. Moreover, we lack information on the severity of the CHCs experienced by older workers. Future research may possibly examine the effects of the severity of CHCs. We also do not examine retirement behaviour. The current Dutch retirement system provides older workers with relatively limited opportunities in defining their actual retirement age by containing career extension through mandatory retirement rules at the state retirement age and by imposing high financial penalties for retiring earlier than the state retirement age. Within this context, a multitude of factors may influence older workers to convert their retirement preferences in to behaviours: the study of which is an interesting avenue for future research. Further, we only sample older workers who are enrolled in a pension scheme. These workers may experience a broader choice in retirement than those who are not enrolled in a pension scheme, such as self-employed workers. Older workers experiencing CHCs, who are under the age of 60 years, may exit employment due to different mechanisms than the ones applicable to older workers between the ages of 60-65 years. Our study sample limits our ability to examine these mechanisms.

Extending working lives is a key public health and policy challenge in the western world. Our results showed that SLE, HRWL, and vitality mediated the association between CHCs and early retirement preferences. We suggest the provision of accommodations and interventions to older workers based on the specific CHC they experience. Employers may provide workplace vitality interventions, such as the empirically supported Vital@Work intervention [23, 42], for older workers with sleep and psychological disorders. Organizations could offer older workers with arthritis and cardiovascular disease with flexible work arrangements, such as flexible working hours, that has been found to be associated with lower

HRWL [26]. Health education programs that assist in correctly appraising SLE can be advantageous for older workers with cardiovascular disease. These accommodations and interventions may act as an impetus for the extension of working lives, the improvement in its quality, and the sustainable ageing of older workers.

References

1.   Szinovacz, M.E., *Contexts and pathways: Retirement as institution, process, and experience.* Retirement: Reasons, processes, and results, 2003: p. 6-52.
2.   Blanchet, D. and T. Debrand, *The sooner, the better? Analyzing preferences for early retirement in European countries.* 2008.
3.   Pond, R., C. Stephens, and F. Alpass, *How health affects retirement decisions: three pathways taken by middle-older aged New Zealanders.* Ageing & Society, 2010. **30**(3): p. 527-545.
4.   Robroek, S.J., et al., *Poor health, unhealthy behaviors, and unfavorable work characteristics influence pathways of exit from paid employment among older workers in Europe: a four year follow-up study.* Scand J Work Environ Health, 2013. **39**(2): p. 125-33.
5.   Schuring, M., et al., *The effect of ill health and socioeconomic status on labor force exit and re-employment: a prospective study with ten years follow-up in the Netherlands.* Scand J Work Environ Health, 2013. **39**(2): p. 134-43.
6.   McGarry, K., *Health and retirement do changes in health affect retirement expectations?* Journal of Human Resources, 2004. **39**(3): p. 624-648.
7.   Giang, L.T. and D.D. Le, *Working beyond the traditional retirement ages: How does chronic health condition influence older workers in Vietnam.* Ageing International, 2017: p. 1-16.
8.   Karpansalo, M., et al., *Depression and early retirement: prospective population based study in middle aged men.* Journal of Epidemiology & Community Health, 2005. **59**(1): p. 70-74.
9.   Yelin, E.H., L.S. Trupin, and D.S. Sebesta, *Transitions in employment, morbidity, and disability among persons ages 51–61 with musculoskeletal and non‑musculoskeletal conditions in the US, 1992–1994.* Arthritis & Rheumatism: Official Journal of the American College of Rheumatology, 1999. **42**(4): p. 769-779.
10.   Vijan, S., R.A. Hayward, and K.M. Langa, *The impact of diabetes on workforce participation: results from a national household sample.* Health services research, 2004. **39**(6p1): p. 1653-1670.
11.   OECD, *The labour market impacts of ill-health*, in *Health at a Glance: Europe 2016: State of Health in the EU Cycle.* 2016, OECD Publishing.
12.   WHO, *Global Health Estimates 2016: Disease burden by Cause, Age, Sex, by Country and by Region, 2000-2016.* 2018, World Health Organization: Geneva, Switzerland.
13.   van Solinge, H. and K. Henkens, *Living longer, working longer? The impact of subjective life expectancy on retirement intentions and behaviour.* Eur J Public Health, 2010. **20**(1): p. 47-51.
14.   van Solinge, H. and K. Henkens, *Subjective life expectancy and actual mortality: results of a 10-year panel study among older workers.* Eur J Ageing, 2018. **15**(2): p. 155-164.
15.   Elder, T.E., *The predictive validity of subjective mortality expectations: evidence from the Health and Retirement Study.* Demography, 2013. **50**(2): p. 569-89.
16.   Hesketh, B., B. Griffin, and V. Loh, *A future-oriented retirement transition adjustment framework.* Journal of Vocational Behavior, 2011. **79**(2): p. 303-314.
17.   Griffin, B., B. Hesketh, and V. Loh, *The influence of subjective life expectancy on retirement transition and planning: A longitudinal study.* Journal of Vocational Behavior, 2012. **81**(2): p. 129-137.
18.   Hennekam, S., *Vitality of older workers and its relationship with performance, career satisfaction and career success.* Management & Avenir, 2016(1): p. 15-32.

19.   Gallegos-Carrillo, K., et al., *Role of depressive symptoms and comorbid chronic disease on health-related quality of life among community-dwelling older adults.* Journal of psychosomatic research, 2009. **66**(2): p. 127-135.

20.   Finkelstein, F.O., et al., *Health-related quality of life and hemoglobin levels in chronic kidney disease patients.* Clinical Journal of the American Society of Nephrology, 2009. **4**(1): p. 33-38.

21.   Kyle, S.D., K. Morgan, and C.A. Espie, *Insomnia and health-related quality of life.* Sleep medicine reviews, 2010. **14**(1): p. 69-82.

22.   Strijk, J.E., et al., *A worksite vitality intervention to improve older workers' lifestyle and vitality-related outcomes: results of a randomised controlled trial.* J Epidemiol Community Health, 2012: p. jech-2011-200626.

23.   Munir, F., et al., *Work factors related to psychological and health-related distress among employees with chronic illnesses.* J Occup Rehabil, 2007. **17**(2): p. 259-77.

24.   Theis, K.A., et al., *Prevalence and correlates of arthritis-attributable work limitation in the US population among persons ages 18-64: 2002 National Health Interview Survey Data.* Arthritis Rheum, 2007. **57**(3): p. 355-63.

25.   Vanajan, A., U. Bültmann, and K. Henkens, *Work Limitations among Older Workers with Chronic Health Conditions - The Role of Flexible Work Arrangements and Organizational Climate.* The Gerontologist, In press.

26.   Padkapayeva, K., et al., *Male-Female Differences in Work Activity Limitations: Examining the Relative Contribution of Chronic Conditions and Occupational Characteristics.* J Occup Environ Med, 2017. **59**(1): p. 6-11.

27.   Quinn, J.F., *The extent and correlates of partial retirement.* The Gerontologist, 1981. **21**(6): p. 634-643.

28.   Boot, C.R., et al., *Predictors of having paid work in older workers with and without chronic disease: a 3-year prospective cohort study.* Journal of occupational rehabilitation, 2014. **24**(3): p. 563-572.

29.   de Wind, A., et al., *Predictors of working beyond retirement in older workers with and without a chronic disease-results from data linkage of Dutch questionnaire and registry data.* BMC public health, 2018. **18**(1): p. 265.

30.   Henkens, K., et al., *Design and codebook of the NIDI Pensioen Panel Study (NPPS) first wave, 2015.* The Hague, the Netherlands: Netherlands Interdisciplinary Demographic Institute, 2017.

31.   Bajekal, M., et al., *Review of disability estimates and definitions.* DWP In-house Report, 2004. **128**.

32.   Instrument Ware Jr, J. and C. Sherbourne, *The MOS 36-item short-form health survey (SF-36): I. Conceptual framework and item selection.* Medical care, 1992. **30**(6): p. 473-483.

33.   Schaufeli, W.B. and T.W. Taris, *A critical review of the Job Demands-Resources Model: Implications for improving work and health*, in *Bridging occupational, organizational and public health*. 2014, Springer. p. 43-68.

34.   Ganzeboom, H.B. *A new International Socio-Economic Index (ISEI) of occupational status for the International Standard Classification of Occupation 2008 (ISCO-08) constructed with data from the ISSP 2002-2007.* in *Annual Conference of International Social Survey Programme, Lisbon.* 2010.

35.   Little, T.D., et al., *On the joys of missing data.* J Pediatr Psychol, 2014. **39**(2): p. 151-62.

36.   Enders, C.K., *Applied missing data analysis.* 2010: Guilford press.

37.   Breen, R., K.B. Karlson, and A. Holm, *Total, direct, and indirect effects in logit and probit models.* Sociological Methods & Research, 2013. **42**(2): p. 164-191.

38.   Reimer, M.A. and W.W. Flemons, *Quality of life in sleep disorders.* Sleep medicine reviews, 2003. **7**(4): p. 335-349.
39.   Association, A.P., *Diagnostic and statistical manual of mental disorders (DSM-5®).* 2013: American Psychiatric Pub.
40.   Sara, J.D., et al. *Sudden cardiac death from the perspective of coronary artery disease.* in *Mayo Clinic Proceedings*. 2014. Elsevier.

Table 1.

Associations between Chronic Health Conditions and Subjective Life Expectancy, Health-related Work Limitations, or Vitality (N=5,696)

	Subjective life expectancy		Health-related work limitations		Vitality	
	Coef.	CI	Coef.	CI	Coef.	CI
Primary explanatory variables						
Arthritis	-0.16**	-0.21 – -0.11	0.71**	0.66 – 0.76	-0.24**	-0.27 – -0.20
Cardiovascular disease	-0.31**	-0.39 – -0.23	0.22**	0.14 – 0.29	-0.14**	-0.19 – -0.08
Sleep disorders	-0.21**	-0.29 – -0.13	0.40**	0.33 – 0.48	-0.45**	-0.51 – -0.40
Psychological disorders	-0.16*	-0.29 – -0.02	0.78**	0.63 – 0.92	-0.66**	-0.76 – -0.56
Covariates						
Age	0.05**	0.03 – 0.07	-0.03**	-0.05 – -0.02	0.05**	0.03 – 0.06
Male gender	-0.21**	-0.28 – -0.13	0.05	-0.00 – 0.11	0.01	-0.04 – 0.06
Education attainment	0.14**	0.10 – 0.18	-0.02	-0.05 – 0.02	0.05**	0.02 – 0.08
Wealth	0.09**	0.05 – 0.12	-0.04*	-0.07 – -0.01	0.07**	0.05 – 0.10
Partner present	0.08*	0.01 – 0.15	-0.03	-0.09 – 0.03	0.09*	0.04 – 0.15
Manual work	0.01	-0.07 – 0.10	0.24**	0.16 – 0.31	-0.08*	-0.15 – -0.02
Supervisory position	0.01	-0.06 – 0.07	0.02	-0.03 – 0.07	0.07*	0.03 – 0.12
Full-time employment	0.06	-0.00 – 0.13	-0.14**	-0.19 – -0.09	0.08*	0.03 – 0.13
Org. sector (ref. – Gov. and Edu.)						
Construction	0.01	-0.07 – 0.08	0.05	-0.02 – 0.11	-0.02	-0.07 – 0.04
Health and Welfare	0.01*	-0.06 – 0.09	0.04	-0.02 – 0.11	-0.03	-0.08 – 0.03
Org. size (ref. - <50 employees)						
50-250 employees	-0.05	-0.13 – 0.03	0.03	-0.04 – 0.10	-0.03	-0.09 – 0.03
More than 250 employees	0.09	0.03 – 0.15	-0.04	-0.09 – 0.02	0.07*	0.03 – 0.12
Comorbidity with other CHCs	-0.22**	-0.27 – -0.16	0.49**	0.43 – 0.54	-0.29**	-0.33 – -0.25
Adjusted R²	0.09**		0.32**		0.22**	

Note. * p < 0.05, ** p < 0.001. Coef. = Coefficient, CI = 95% confidence interval, ref. = reference category, Gov. and Edu. = Government and Education, Org. = organizational.

Table 2.

Associations between Chronic Health Conditions, Subjective Life Expectancy, Health-related Work Limitations, and Vitality on Older Workers' Preference to Retire Early (N=5,696)

Variables	Model 1		Model 2		Model 3		Model 4		Model 5	
	OR	CI	OR	CI	OR	CI	OR	CI	OR	CI
Primary explanatory variables										
Arthritis	1.27**	1.16 – 1.40	1.25**	1.14 – 1.37	0.99	0.89 – 1.09	1.14*	1.04 – 1.26	0.97	0.87 – 1.08
Cardiovascular disease	1.18*	1.03 – 1.36	1.13	0.99 – 1.30	1.10	0.96 – 1.26	1.10	0.96 – 1.27	1.05	0.91 – 1.20
Sleep disorders	1.35**	1.19 – 1.54	1.31**	1.15 – 1.50	1.17*	1.03 – 1.33	1.09	0.95 – 1.25	1.02	0.89 – 1.17
Psychological disorders	1.70**	1.37 – 2.10	1.67**	1.35 – 2.06	1.32*	1.07 – 1.63	1.27*	1.02 – 1.57	1.12	0.90 – 1.39
Covariates										
Age	1.43**	1.38 – 1.49	1.44**	1.38 – 1.50	1.45**	1.40 – 1.51	1.47**	1.42 – 1.53	1.49**	1.43 – 1.55
Male gender	1.22*	1.08 – 1.39	1.19*	1.05 – 1.36	1.20*	1.06 – 1.37	1.24*	1.09 – 1.41	1.21*	1.06 – 1.38
Educational attainment	0.91*	0.84 – 0.98	0.92*	0.85 – 0.99	0.91*	0.84 – 0.98	0.92*	0.86 –1.00	0.93	0.86 – 1.00
Wealth	1.07	1.00 – 1.14	1.08*	1.01 – 1.16	1.08*	1.01 – 1.16	1.11*	1.04 – 1.19	1.12*	1.04 – 1.20
Partner present	1.33**	1.16 – 1.51	1.34**	1.17 – 1.53	1.35**	1.18 – 1.53	1.40**	1.23 – 1.60	1.40**	1.23 – 1.60
Manual work	1.35**	1.16 – 1.58	1.36**	1.17 – 1.59	1.25*	1.07 – 1.46	1.30*	1.12 – 1.52	1.24*	1.06 – 1.45
Supervisory position	0.94	0.84 – 1.05	0.94	0.84 – 1.05	0.93	0.83 – 1.04	0.97	0.86 – 1.09	0.96	0.85 – 1.08
Full-time employment	0.77**	0.68 – 0.87	0.78**	0.69 – 0.88	0.81*	0.72 – 0.92	0.80**	0.70 – 0.90	0.82*	0.73 – 0.93
Org. sector (ref. – Gov. and Edu.)										
Construction	1.07	0.91 – 1.26	1.06	0.90 – 1.25	1.06	0.90 – 1.25	1.05	0.89 – 1.24	1.04	0.89 – 1.23
Health and Welfare	0.66**	0.58 – 0.75	0.67**	0.58 – 0.76	0.66**	0.58 – 0.76	0.68**	0.59 – 0.77	0.68**	0.59 – 0.78
Org. size (ref. - <50 employees)										
50-250 employees	1.22*	1.06 – 1.41	1.23*	1.07 – 1.41	1.21*	1.05 – 1.39	1.23*	1.07 – 1.42	1.22*	1.06 – 1.41
>250 employees	1.37**	1.18 – 1.60	1.38**	1.19 – 1.61	1.36**	1.17 – 1.58	1.39**	1.19 – 1.62	1.38**	1.18 – 1.60

RETIREMENT PREFERENCES OF OLDER WORKERS WITH CHCS

	OR	CI	OR	CI	OR	CI	OR	CI	OR	CI
Comorbidity with other CHCs	1.18*	1.07 – 1.31	1.15*	1.04 – 1.27	0.99	0.89 – 1.10	1.03	0.93 – 1.14	0.93	0.83 – 1.03
Mediator variables										
Subjective life expectancy			0.87**	0.83 – 0.92					0.95ª	0.91 – 1.01
Health-related work limitations					1.43**	1.35 – 1.52			1.29**	1.21 – 1.38
Vitality							0.62**	0.57 – 0.66	0.69**	0.63 – 0.74
Pseudo R²	0.04**		0.04**		0.05**		0.05**		0.05**	

Note. ª p<0.10, * p < 0.05, ** p < 0.001. Dependent variable is older workers' preference to retire early. OR = Odds ratio, CI = 95% confidence interval, ref. = reference category, Gov. and Edu. = Government and Education, Org. = organizational.

Table 3.

Indirect Effect of Chronic Health Conditions on Older Workers' Preference to Retire Early via Subjective Life Expectancy, Health-related Work Limitations and Vitality

(N=5,696)

Chronic health conditions	Total direct effect		Total indirect effect		Indirect effect via subjective life expectancy	Indirect effect via health-related work limitations	Indirect effect via vitality
	OR	CI	OR	CI	%	%	%
Arthritis	0.97	0.87 – 1.08	1.32**	1.20 – 1.45	2.6	65.4	32.0
Cardiovascular disease	1.05	0.91 – 1.20	1.13*	1.04 – 1.23	11.8	45.9	42.3
Sleep disorders	1.02	0.89 – 1.17	1.33**	1.21 – 1.46	3.4	36.3	60.3
Psychological disorders	1.12	0.90 – 1.39	1.58**	1.42 – 1.75	1.5	43.5	55.0

Note. * $p < 0.05$, ** $p < 0.001$. Dependent variable is older workers' preference to retire early. OR = Odds ratio, CI = 95% confidence interval, % = Attributable percentage.
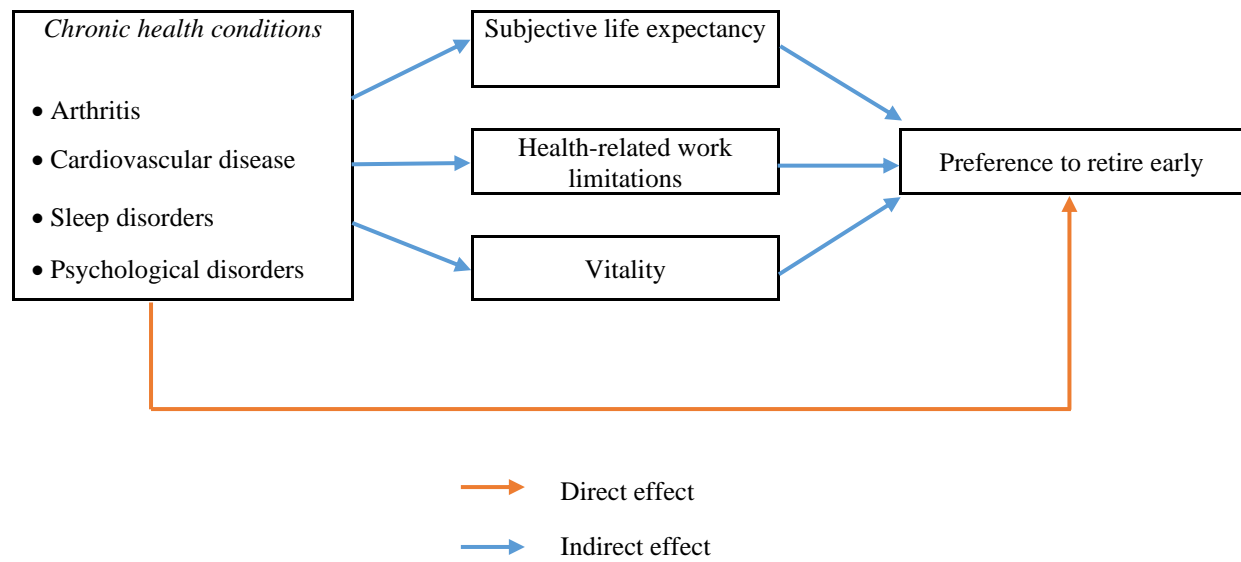
Figure 1.

Objective and Conceptual Framework

Supplementary Table 1.

Characteristics of the sample of Dutch Older Workers (N = 5,696)

Variables	Descriptive statistics
Age (mean, standard deviation)	61.7, 1.4
Male gender (%)	54.9
Educational attainment (%)	
Low (1-3)	27.5
Medium (4, 5)	26.6
High (6, 7)	45.9
Wealth (%)	
Low (1-3)	32.9
Medium (4, 5)	46.7
High (6, 7)	20.4
Partner present (%)	82.5
Manual work (%)	20.4
Supervisory position (%)	24.9
Full-time employment (%)	47.1
Organizational Sector (%)	
Government and Education	45.9
Construction	21.6
Health and Welfare	32.5
Organizational Size (%)	
Less than 50 employees	15.9
50-250 employees	44.3
More than 250 employees	39.8
Prevalence of chronic health conditions (%)	
Arthritis	43.6
Cardiovascular disease	13.0
Sleep disorders	14.9
Psychological disorders	4.9
Preference to retire early (%)	
Strong preference to work	34.5
Slight preference to work	14.7
No preference	9.3
Slight preference to retire early	15.7
Strong preference to retire early	25.8

RETIREMENT PREFERENCES OF OLDER WORKERS WITH CHCS

Subjective life expectancy (mean, standard deviation)	3.4, 0.9
Health-related work limitations (mean, standard deviation)	1.5, 0.6
Vitality (mean, standard deviation)	4.1, 0.8