To cite this Article: Mänty, M. ; Kouvonen, A. ; Lallukka, T. ; Lahti, J. ; Lahelma, E. & Rahkonen, O. (2018) Changes in physical and mental health functioning during retirement transition: a register-linkage follow-up study. European Journal of Public Health, published 6.2.2018.

doi: 10.1093/eurpub/cky013

URL: https://doi.org/10.1093/eurpub/cky013

Changes in Physical and Mental Health Functioning during Retirement Transition: a Register-linkage Follow-up Study

Minna Mänty, PhD[1,2], Anne Kouvonen, PhD,[3,4,5], Tea Lallukka, PhD,[1,6], Jouni Lahti, PhD[1], Eero Lahelma, PhD,[1]Ossi Rahkonen, PhD[1]

[1] Department of Public Health, University of Helsinki, Helsinki, Finland

[2] Laurea University of Applied Sciences, Department of Research, Development and Innovation, Vantaa, Finland

[3] Department of Social Research, University of Helsinki, Helsinki, Finland

[4] SWPS University of Social Sciences and Humanities in Wroclaw, Wroclaw, Poland

[5] Administrative Data Research Centre - Northern Ireland, Centre for Public Health, Queen's University Belfast, Belfast, UK

[6] Finnish Institute of Occupational Health, Helsinki, Finland

Corresponding author: Minna Mänty, Department of Public Health, Faculty of Medicine, P.O. Box 20 (Tukholmankatu 8B), 00014 University of Helsinki, Finland. Tel. +358503069102. Email: minna.manty@helsinki.fi

ABSTRACT

Background: Changes in health functioning over different retirement transitions are poorly understood. This study aimed to examine associations between transition into statutory, disability and part-time retirement, and changes in health functioning.

Methods: Survey data were collected among ageing employees of the City of Helsinki, Finland, at three phases: 1 (2000-2002), 2 (2007) and 3 (2012). Physical and mental health functioning were measured using the Short-Form 36 questionnaire at each phase. Retirees between phases 1 and 3 were identified from the national registers of the Finnish Centre for Pensions: full-time statutory retirement (n=1464), part-time retirement (n=404) and disability retirement (n=462). Generalized estimating equations were used to examine the associations.

Results: Disability retirees had poorer pre- and post-retirement health functioning compared to statutory and part-time retirees. Statutory and part-time retirement were associated with no or only small changes in physical health functioning during retirement transition (β 0.1, 95% CI -0.3 to 0.5 and -1.0, -1.8 to -0.1, respectively), whereas a clear decline in functioning was observed among disability retirees (-4.3, -5.4 to -3.2). Mental health functioning improved during the retirement transition among statutory and part-time retirees (1.9, 1.4 to 2.4 and 2.0, 1.0 to 3.0, respectively) whilst no change was observed for disability retirees.

Conclusions: Transition to disability retirement led to a decrease in physical health functioning, and statutory retirement to a slight improvement in mental health functioning. Evidence on changes in physical and mental health functioning during retirement transition process may provide useful information for interventions to promote healthy ageing.

Key words: Retirement; Functioning; Health; Survey; Register;

INTRODUCTION

Populations are ageing rapidly in most Western societies (1). In Finland and many other countries, a specific feature of this ageing process is the exceptionally large post-war baby-boomer generations that have just retired or are retiring from labor market (2). Retirement is one of the major life course transitions that is likely to affect people´s daily routines and have consequences also for health (3–5). Previous studies suggest that there is heterogeneity in the effects of retirement on health, but they have mainly focused on statutory retirement, and changes in general self-rated health (4,6) or clinical measures of morbidity, such as specific chronic conditions (3). In contrast, the impact of retirement on health-related functioning, an important indicator of individual´s abilities to function in everyday life, has been rarely investigated (7,8), especially among those who retired due to health reasons (7).

Disability retirement is a serious public health and social policy problem, and its incidence continues to be high in many Western European countries (9). Most of the previous studies have focused on risk factors for disability retirement, whereas changes in physical or mental health functioning during the disability retirement process have been little investigated (7). A previous study with repeat data suggested that health status improves after statutory retirement, whereas retirement due to ill-health was associated with poorer physical and mental health (7). However, the participants consisted mainly of non-manual employees of which the majority were men and cannot therefore be generalized to more diverse employee populations. Other longitudinal studies on the associations between statutory retirement and health have produced conflicting results, with some studies indicating that physical and mental health may improve (7,10,11) deteriorate (11,12) or they may not be affected after retirement (8). In sum, more longitudinal research on the health effects of retirement is needed, including research into different retirement types and determinants of health effects (11).

In this study, we examined the changes in physical and mental health functioning during retirement transition among Finnish municipal employees. In addition, we examined whether gender, occupational class, and different health related factors and behaviours affected these associations. We hypothesized that changes in health functioning differentiate between different retirement types and health functioning outcomes (mental versus physical). Furthermore, we expected to find important determinants affecting these associations in our exploratory analyses.

METHODS

Participants and assessment of retirement

This study is part of the Helsinki Health Study (HHS), which examines health and well-being among the ageing employees and retirees of the City of Helsinki, Finland. *Phase 1* data were collected by postal surveys in 2000, 2001 and 2002 among employees reaching 40, 45, 50, 55 or 60 years of age in each year (n=8960) (13). *Phase 2* follow-up survey was conducted in 2007 (n=7332, response rate 83%) and *Phase 3* in 2012 (n=6814, response rate 79%) among all baseline respondents, irrespective of their follow-up employment status. Data on retirement were obtained from the national registers of the Finnish Centre for Pensions (14) providing complete information on all retirement events. These data were linked to the survey data using unique personal identification numbers assigned to all permanent residents of Finland. The data linkage was done for Phase 1 respondents who gave their written consent for the linkage (74%). According to the non-response analysis, the Phase 1 and follow-up data, as well as the data for linkage consenters satisfactorily represent the target population (13,15).

In Finland, the general *statutory retirement* age was between 63 to 65 years until 2005 and 63 to 68 years from 2005 onwards. For some occupations, the retirement age may start from below 63 years (e.g. 60 years for primary school teachers and 58 years for practical nurses). In addition, persons who are at least 60 years old and who are transitioning from full-time work to part-time work may be granted *part-time pension*. Awarding *disability pension* is a complex process (16). To receive disability pension, work ability is assessed. A medical diagnosis is needed and working conditions as well as age and other factors are also considered. A full disability pension requires a 60 % reduction in work ability. Temporary benefits are granted up to 300 days rehabilitation period and the pension decision is normally made only after that. Disability pension can also be awarded part-time if the reduction in work ability is less than 60 % (16).

For the purposes of this study, we focused on those who retired due to old age (full-time statutory retirement) or ill health (partial or full disability retirement), and those who entered to part-time retirement not due to health reasons (part-time retirement) between Phases 1 and 2, that is *Period 1*, and between Phases 2 and 3, that is *Period 2*. Period 1 and Period 2 retirees were merged in the analysis (total n=3092; full-time statutory retirees n=1909, part-time retirees n=477, disability retirees n=706). Of these, 1573 full-time statutory retirees, 428 part-time retirees and 511 disability retirees participated in the pre-retirement (Phase 1 for Period 1 retirees and Phase 2 for Period 2 retirees) as well as post-retirement (Phase 2 for Period 1 retirees and Phase 3 for Period 2 retirees) surveys. Furthermore, respondents with missing information on health functioning before or after retirement (n=182) were excluded. This yielded 2330 participants (n=1464 full-time statutory retirees, n=404 part-time retirees, n=462 disability retirees). For supplementary analyses, we included also participants who remained employed from Phase 1 to Phase 3, stratified by age at Phase 1 (<50 years n=1923 and ≥50 years n=796).

The Helsinki Health Study was approved by the ethics committees of the Department of Public Health, University of Helsinki and the health authorities of the City of Helsinki, Finland.

Measurement of physical and mental health functioning

Physical and mental health functioning were measured by the physical (PCS) and mental (MCS) component summary scores of the Short-Form 36 (SF-36) health questionnaire (17) at each of the three phases. The PCS and MCS summaries are continuous scales, ranging from 0 to 100, with high scores indicating good health functioning. The SF-36 has a good construct validity as well as high internal consistency and test-retest reliability (17).

Covariates

The level of health functioning has been shown to be associated with age and gender (18,19), occupational class (20,21), comorbidity (22), weight (23) and health behaviours (24–26). In addition, some studies have indicated important changes in health behaviours during the transition to retirement (27–29). These factors were therefore treated as covariates. *Age, gender* and *occupational class* were obtained from the Phase before retirement. Other variables were measured before and after retirement, and were used as time-variant in the analyses of change. Information on *occupational class* was derived from the personnel register data of the City of Helsinki, including 1) managers (managerial and administrative work) and professionals (e.g. teachers and doctors), 2) semi-professionals (e.g. nurses, foremen and technicians), 3) routine non-manual employees (e.g. childminders and assistant maids), and manual workers (e.g. transport and cleaning work) (30). A structured checklist of self-reported major disease was used and *diseases* that are likely to affect physical or mental functioning (osteoporosis, osteoarthritis, rheumatoid arthritis, angina pectoris, heart attack, cerebral haemorrhage, intermittent claudication, asthma, depression, other mental illness, diabetes and cancer) and the following categories were used: 0, 1 or ≥ 2 diseases. *Body mass index* (BMI) was calculated using self-reported weight in kilograms divided by height in metres squared, and classified into three groups (31): BMI <25 kg/m2, BMI 25-29.9 kg/m2 and BMI ≥ 30 kg/m2. For descriptive purposes, BMI was classified into non-obese (< 30 kg/m2) and obese (≥ 30 kg/m2). *Smoking* was categorized as smoker vs. non-smoker. *Alcohol use* was measured by binge drinking, which implied drinking more than six units on a single occasion once a month or more often (32). *Leisure-time physical activity* was categorised into two levels: Inactive =14 metabolic equivalent (MET) hours or less per week and Active = over 14 MET hours or more per week (e.g. brisk walking for 30 minutes on five days per week equals 15 MET hours per week) (24). *Marital status* was dichotomized as married or cohabiting vs. other.

Statistical methods

Study population characteristics are reported as numbers and proportions. The effect of retirement on physical and mental health functioning during retirement transition was analysed using linear regression analyses with generalized estimation equations (GEE) using an exchangeable correlation structure to control for the intra-individual correlation between repeated measurements (33). *First,* adjusted PCS and MCS scores before and after retirement, and change from preretirement to postretirement were calculated for each retirement group (statutory, part-time, disability) by using the contrast statements in GEE models (Table 2). In addition, we performed supplementary analyses among participants who remained employed between Phases 1 and 3. In order to have similar follow-up time with the retirees, we used information on health functioning only from Phases 1 and 2, that is, Period 1 (Table S1). *Second,* we examined whether gender, chronic conditions, BMI, smoking, drinking, physical activity, occupational class or marital status were associated with change in physical and mental health functioning by using contrast statements in GEE models (Supplementary Tables S2 and S3). The results are reported as regression coefficients (β) and their 95% confidence intervals (95% CI). Men and women were pooled in the analyses as gender interactions on change in health functioning were statistically non-significant (p-value ranging between 0.3 and 1.0). The SAS 9.4 Statistical Package was used for all analyses (SAS institute Inc., Cary, NC, USA).

RESULTS

Characteristics of the study population are shown in Table 1. The mean age of the participants at baseline was 57.3 (SD 3.9); the mean age being the highest among statutory retirees (59.1, SD 2.4) and the lowest among disability retirees (52.9, SD 4.8). Compared to statutory and part-time retirees, a larger proportion of disability retirees had one or more chronic conditions and they were more likely to be physically inactive, obese, smokers and in the lowest occupational class at baseline (Table 1).

Physical health functioning

After adjustment for gender and age, disability retirees had poorer physical health functioning before retirement compared to statutory and part-time retirees (Table 2, Model 1). These differences increased further during the retirement transition as physical health functioning among statutory and part-time retirees did not change or declined only slightly (β 0.1, 95% CI -0.3 to 0.5 and -1.0, -1.8 to -0.1, respectively), whereas a clear decline was observed among disability retirees (-4.3, -5.4 to -3.2). Furthermore, our supplementary analyses showed that physical health functioning among participants who remained employed was better at baseline (Table S1) compared to any of the retiree groups. These differences narrowed during the follow-up as functioning declined more among employees than among statutory and part-time retirees. However, the differences remained staistically significant between the employed and the disability retirees.

Further adjustment for obesity, chronic conditions, physical activity, smoking, alcohol use, and occupational class and marital status somewhat attenuated the associations but they remained (Table 2, Model 2 and Table S1, Model 2). The associations of these factors with changes in physical health functioning are shown in Supplementary Table S2. Physical health functioning before retirement was lower among women, in those with more chronic conditions, in physically inactive and overweight

participants, and those with lower occupational class. In addition, higher occupational class before retirement and being physically inactive during the retirement transition were associated with greater decline in physical health functioning (Supplementary Table S2).

Mental health functioning

After adjustment for gender and age, compared to statutory retirees, disability retirees had poorer mental health functioning before retirement (Table 2, Model 1). These differences increased during the retirement transition as mental health functioning among statutory and part-time retirees improved during the retirement transition (1.9, 1.4 to 2.4 and 2.0, 1.0 to 3.0, respectively) whist no association was observed among disability retirees (-0.3, -1.7 to 1.0). Furthermore, our supplementary analyses showed that mental health functioning among participants who remained employed tended to be slightly better at baseline (Table S1) compared to any of the retiree groups. These differences narrowed during the follow-up but remained statistically significant between the the employed and disability retirees.

Further adjustment for obesity, chronic conditions, physical inactivity, smoking, alcohol use, and occupational class and marital status only slightly attenuated the observed associations (Table 2, Model 2 and Table S1, Model 2). The associations of these factors with changes in mental health functioning during the retirement transition are shown in Supplementary Table S3. Mental health functioning before retirement tended to be lower among women, smokers and in those with more chronic conditions. However, none of the factors predicted decline in mental health functioning during retirement transition (Supplementary Table S3).

DISCUSSION

Disability retirement was associated with poorer pre- and post-retirement health functioning compared with statutory and part-time retirement. Physical health functioning decreased among disability retirees during the retirement transition, while only small changes were observed among statutory and part-time retirees. Higher occupational class before retirement and being physically inactive during retirement transition were associated with greater decline in physical health functioning. Mental health functioning improved during the retirement transition among statutory and part-time retirees while no association was observed among disability retirees.

Previous studies on the effects of retirement on physical and mental health have produced somewhat mixed results (5,7,8,10–12). In addition, the impact of retirement on health functioning, especially among disability and part-time retirees, have been rarely investigated (7). Our results corroborate the previous studies that have shown no effects of statutory retirement on physical health (8) but improvements on mental health (7,11). However, our results expand the previous knowledge by providing new evidence on the changes in health related functioning also among part-time and disability retirees. The changes in physical and mental health functioning among part-time retirees were comparable to those observed among statutory retirees. These groups had very similar preretirement health characteristics, which may partly explain the correspondence between the results. It is also possible that shifting to part-time retirement has similar effects on perceived health due to reduced burden of work. Among disability retirees, our results are in line with a previous study showing poorer pre-and post-retirement health functioning compared to the other retirees (7). On the contrary, our study showed a clear decline in physical health functioning during retirement transition among disability retirees while no significant change was observed in the previous study (7). This may be partly due to differences in the study population characteristics, as the previous study

consisted only non-manual employees of which the majority were men while our study population was female dominated including also manual workers. Furthermore, the information on retirement in the previous study was based on self-report, while in our study, the starting days and type of retirement were ascertained from registers. Overall, our results together with the observations from the previous studies suggest that the associations between retirement and health functioning depend on the reason for retirement.

A previous systematic review and meta-analysis (11) showed a clear need for more longitudinal research into potentially influencing factors behind the health effects of retirement. We tested whether gender, occupational class, and different health related factors and behaviours had an effect on changes in health functioning during retirement transition. The results indicated that occupational class before retirement and physical activity during retirement transition may be important factors associated with changes in physical health functioning. Future studies should investigate the interaction between occupational class and retirement in more detail, and examine ways to promote physical activity during retirement transition.

When assessing the generalizability of the results, some characteristics of the data need to be considered. We studied an occupational cohort from the public sector with the majority of participants being women. However, the gender distribution reflects that of the employees of City of Helsinki and largely the Finnish municipal sector in general (34). Another limitation is that measure of health functioning and other health-related factors were based on self-reported data, and thus, the possibility for under- or over-reporting cannot be ruled out. Additionally, regression to the mean is a potential source of bias but it is unlikely to distort our results. Regression to the mean may cause only attenuation to the observed differences and, as a result, the true differences might be larger but not smaller than those observed in our study. Therefore, the results could be considered conservative. It

is also likely that changes in health functioning among disability retirees may vary depending on the diagnostic cause of disability, and thus, diagnosis specific analyses are warranted in future studies with a larger number of disability retirees. A further limitation is the availability of two measurements of health functioning; one before and one after retirement. The study would have benefitted from more frequent follow-ups to better detect the timing of the changes in physical health functioning during the retirement transition process. In addition, it cannot be ruled out that some pre-retirement changes (that were not addressed here) might have affected the associations.

Our study had several strengths. First, the longitudinal design allowed us to examine the association between retirement and changes in physical health functioning during retirement transition. However, although we study longitudinal associations, the causal pathways are complex and caution is needed in causal interpretations. Second, the retirement data were derived from complete national registers, which makes our measure of retirement valid and reliable. Third, we used the well-validated and widely used SF-36 physical and mental component summary scores to ascertain changes health functioning during the follow-up. Fourth, we used a large and well-characterized occupational cohort which included hundreds of different occupational titles. An additional strength is the availability of information on many potentially influencing factors behind the health effects of retirement.

CONCLUSIONS

Transition to disability retirement led to a decrease in physical health functioning, and statutory retirement to a slight improvement in mental health functioning. Evidence on changes in physical and mental health functioning during retirement transition process may provide useful information for interventions to promote healthy ageing.

FUNDING

This work was supported by the Finnish Work Environment Fund (grants 112231), the Academy of Finland (grants 1129225, 1257362, 1294514) and the University of Helsinki. MM was supported by the Finnish Work Environment Fund (grant 115182) and the Juho Vainio Foundation. TL was supported by the Academy of Finland (grant 287488 and 294096). JL was supported by the Academy of Finland (grant 294566) and the Finnish Work Environment Fund (grant 116178).

ACKNOWLEDGEMENTS

We thank the City of Helsinki, Finland and all the participating employees.

CONFLICT OF INTEREST

None declared

Key points

- Changes in health functioning over different retirement transitions are poorly understood
- The associations between retirement and health functioning depended on the reason for retirement
- Transition to disability retirement led to a decrease in physical health functioning, and statutory retirement to a slight improvement in mental health functioning.
- Evidence on changes in physical and mental health functioning during retirement transition process may provide useful information for interventions to promote healthy ageing.

REFERENCES

1 Christensen K, Doblhammer G, Rau R, Vaupel JW. Ageing populations: the challenges ahead. *Lancet* 2009;374:1196–1208.

2 Official Statistics of Finland (OSF): Population structure (online). ISSN=1797-5395. Helsinki: Statistics Finland. Available at:www.stat.fi/til/vaerak/index_en.html. Accessed April 1, 2017.

3 Westerlund H, Vahtera J, Ferrie JE, et al. Effect of retirement on major chronic conditions and fatigue: French GAZEL occupational cohort study. *BMJ* 2010;341:c6149.

4 Westerlund H, Kivimäki M, Singh-Manoux A, et al. Self-rated health before and after retirement in France (GAZEL): a cohort study. *Lancet* 2009;374:1889–96.

5 Henning G, Lindwall M, Johansson B. Continuity in Well-Being in the Transition to Retirement. *GeroPsych (Bern)* 2016;29:225–37.

6 Van Den Bogaard L, Henkens K, Kalmijn M. Retirement as a relief? The role of physical job demands and psychological job stress for effects of retirement on self-rated health. *Eur Sociol Rev* 2016;32:295–306.

7 Jokela M, Ferrie JE, Gimeno D, et al. From Midlife to Early Old Age. Health trajectories associated with retirement. *Epidemiology* 2010;21:284–90.

8 Mein G, Martikainen P, Hemingway H, Stansfeld S, Marmot M. Is retirement good or bad for mental and physical health functioning? Whitehall II longitudinal study of civil servants. *Am J Public Health* 2003;57:46–49.

9 OECD (2010), Sickness, Disability and Work: Breaking the Barriers: A Synthesis of Findings across OECD Countries, OECD Publishing, Paris.

10 Hessel P. Does retirement (really) lead to worse health among European men and women across all educational levels? *Soc Sci Med* 2016;151:19–26.

11 van der Heide I, van Rijn RM, Robroek SJ, Burdorf A, Proper KI. Is retirement good for your health? A systematic review of longitudinal studies. *BMC Public Health* 2013;13:1180.

12 Stenholm S, Westerlund H, Salo P, et al. Age-related trajectories of physical functioning in work and retirement: the role of sociodemographic factors, lifestyle and disease. *J Epidemiol Community Health* 2014;68:503–9.

13 Lahelma E, Aittomäki A, Laaksonen M, et al. Cohort Profile: The Helsinki Health Study. *Int J Epidemiol* 2013;42:722–30.

14 Finnish Center for Pensions. The Role of the Finnish Centre for Pensions in the Earnings-related Pension Scheme (online). Available at: www.etk.fi/en/the-pension-system-2/the-pension- system/administration-and-supervision/parties-to-pension-scheme/finnish-centre-for- pensions/. Accessed April 1, 2017.

15 Laaksonen M, Aittomäki A, Lallukka T, et al. Register-based study among employees showed small nonparticipation bias in health surveys and check-ups. *J Clin Epidemiol* 2008;61:900–906.

16 Statistical Yearbook of Pensioners in Finland 2016. Helsinki: Finnish Centre of Pensions and

The Social Insurance Institute of Finland, 2017. Available at: http://www.etk.fi/wp-content/uploads/statistical-yearbook-of-pensioners-in-finland-2016.pdf. Accessed November 22, 2017.

17 Ware J, Kosinski M, Keller, SDWare, J.E., Kosinski, M., Keller SD. SF-36 Physical and Mental Component Summary Measures: A User's Manual. The Health Institute, New England Medical Center, Boston, MA, 1994.

18 Aittomäki A, Lahelma E, Roos E, Leino-Arjas P, Martikainen P. Gender differences in the association of age with physical workload and functioning. *Occup Environ Med* 2005;62:95–100.

19 Lahelma E, Rahkonen O, Huuhka M. Changes in the social patterning of health? The case of Finland 1986-1994. *Soc Sci Med* 1997;44:789–99.

20 Pietiläinen O, Laaksonen M, Pitkäniemi J, Rahkonen O, Lahelma E. Changes of occupational class differences in physical functioning: a panel study among employees (2000-2007). *J Epidemiol Community Health* 2012;66:265–70.

21 Chandola T, Ferrie J, Sacker A, Marmot M. Social inequalities in self reported health in early old age: follow-up of prospective cohort study. *BMJ* 2007;334:990.

22 Stenholm S, Westerlund H, Head J, et al. Comorbidity and Functional Trajectories From Midlife to Old Age: The Health and Retirement Study. *J Gerontol A Biol Sci Med Sci* 2015;70:332–38.

23 Ul-Haq Z, Mackay DF, Fenwick E, Pell JP. Meta-analysis of the association between body mass index and health-related quality of life among adults, assessed by the SF-36. *Obesity* 2013;21:322–27.

24 Lahti J, Laaksonen M, Lahelma E, Rahkonen O. The impact of physical activity on physical health functioning--a prospective study among middle-aged employees. *Prev Med (Baltim)* 2010;50:246–50.

25 Powers JR, Young AF. Longitudinal analysis of alcohol consumption and health of middle-aged women in Australia. *Addiction* 2008;103:424–32.

26 Laaksonen M, Rahkonen O, Martikainen P, Karvonen S, Lahelma E. Smoking and SF-36 health functioning. *Prev Med (Baltim)* 2006;42:206–9.

27 Halonen JI, Stenholm S, Pulakka A, et al. Trajectories of risky drinking around the time of statutory retirement: a longitudinal latent class analysis. Addiction. 2017..

28 Stenholm S, Pulakka A, Kawachi I, et al. Changes in physical activity during transition to retirement: a cohort study. *Int J Behav Nutr Phys Act* 2016;13:51.

29 Hagger-Johnson G, Carr E, Murray E, et al. Association between midlife health behaviours and transitions out of employment from midlife to early old age: Whitehall II cohort study. *BMC Public Health* 2017;17:82.

30 Lahelma E, Martikainen P, Rahkonen O, Roos E, Saastamoinen P. Occupational class inequalities across key domains of health: results from the Helsinki Health Study. *Eur J Public Health* 2005;15:504–10.

31 World Health Organization. Obesity: Preventing and managing the global epidemic. Report of a WHOConsultation. WHO Technical Report Series 894. Geneva, Switzerland, 2000.

32 Salonsalmi A, Laaksonen M, Lahelma E, Rahkonen O. Drinking habits and disability retirement. *Addiction* 2012;107:2128–36.

33 Zeger S, Liang K. Longitudinal data analysis for discrete and continuous outcomes. *Biometrics* 1986;42:121–30.

34 Väänänen A, Kouvonen A, Kivimäki M, et al. Workplace social capital and co-occurrence of lifestyle risk factors: the Finnish Public Sector Study. *Occup Environ Med* 2009;66:432–437.

S1. Adjusted Means and Mean Change (β coefficients) of SF-36 Physical Health Functioning Score from Phase 1 to Phase 2 among participants who remained employed from Phase 1 to Phase 3.

	Phase 1		**Phase 2**		**Mean Change**	
	Mean	**95% CI**	**Mean**	**95% CI**	**β**	**95% CI**
PCS						
Employed Age <50						
Model 1	51.6	50.9 to 52.4	50.4	49.6 to 51.2	-1.2	-1.5 to -0.9
Model 2	48.1	47.4 to 49.0	47.0	46.2 to 47.8	-1.1	-1.4 to -0.8
Employed Age ≥50						
Model 1	50.5	49.9 to 51.1	49.2	48.6 to 49.9	-1.3	-1.8 to -0.7
Model 2	46.9	46.3 to 47.6	45.7	45.0 to 46.4	-1.2	-1.7 to -0.6
MCS						
Employed Age <50						
Model 1	52.9	52.0 to 53.7	52.7	51.8 to 53.6	-0.2	-0.6 to 0.3
Model 2	53.2	52.2 to 54.1	53.0	52.1 to 53.9	-0.2	-0.6 to 0.3
Employed Age ≥50						
Model 1	52.0	51.2 to 52.6	53.1	52.4 to 53.7	1.1	0.5 to 1.9
Model 2	52.2	51.4 to 52.9	53.2	52.6 to 54.6	1.2	0.5 to 1.9

NOTE. Number of participants: Employed Age <50 n=1923, Employed Age ≥50 n=796

Model 1 adjusted for gender and age at Phase 1

Model 2 Model 1 + obesity, chronic conditions, physical activity, smoking, alcohol use and marital status and occupational class during the follow-up from Phase 1 to Phase 2.

S2. Factors predicting change in Physical (PCS) Health Functioning (SF-36) Scores during retirement transition.

	Statutory retirees (n=1464)				Disability retirees (n=462)				Part-time retirees (n=404)			
	Before retirement		Mean Change		Before retirement		Mean Change		Before retirement		Mean Change	
	Mean	95% CI	β	95% CI	Mean	95% CI	β	95% CI	Mean	95% CI	β	95% CI
Gender												
Men	49.7	49.9 to 50.4	-0.2	-1.0 to 0.5	45.7	43.4 to 47.9	-4.3	-7.3 to -1.4	49.4	48.1 to 50.7	-0.5	-1.9 to 0.8
Women	47.5	47.0 to 48.0	0.2	-0.3 to 0.7	38.9	37.8 to 39.9	-4.3	-5.5 to -3.1	46.7	45.7 to 47.7	-1.1	-2.1 to -0.1
Chronic conditions												
0	50.6	50.1 to 51.0	0.5	0.0 to 1.1	45.0	43.6 to 46.4	-3.0	-5.0 to -1.0	49.6	48.7 to 50.5	0.2	-0.8 to 1.2
1	46.3	45.5 to 47.0	0.9	0.1 to 1.6	41.5	39.8 to 43.1	-3.2	-5.0 to -1.5	46.8	45.4 to 48.2	-1.1	-2.7 to 0.6
>1	42.9	41.5 to 44.3	0.9	-0.5 to 2.4	36.3	34.1 to 38.5	-2.6	-4.9 to -0.4	42.7	40.4 to 45.0	0.0	-2.7 to 2.7
Body mass index (kg/m^2)												
<25	50.3	49.7 to 50.9	-0.0	-0.6 to 0.5	44.3	42.6 to 46.1	-4.0	-5.9 to -2.1	49.9	48.7 to 51.0	-0.2	-1.8 to 1.3
25-29	48.1	47.4 to 49.0	0.6	-0.0 to 1.3	42.3	40.8 to 43.9	-4.1	-5.8 to -2.3	47.3	46.0 to 48.7	-1.1	-2.1 to -0.0
≥ 30	45.1	44.0 to 46.3	-0.6	-1.7 to 0.6	39.8	37.9 to 41.7	-4.5	-6.6 to -2.5	45.5	43.5 to 47.5	-1.8	-3.9 to 0.3
Smoking												
Yes	48.8	47.8 to 49.8	-0.6	-1.8 to 0.6	43.7	41.8 to 45.6	-4.0	-5.3 to -2.7	49.5	47.5 to 51.5	-2.3	-4.6 to -0.0
No	48.5	48.0 to 49.0	0.2	-0.3 to 0.6	41.8	40.5 to 43.0	-5.0	-7.3 to -2.9	47.9	47.0 to 48.8	-0.7	-1.6 to 0.2
Binge drinking												
Yes	48.6	47.8 to 49.0	0.4	-0.5 to 0.5	43.1	41.1 to 45.0	-4.4	-7.0 to -1.9	48.1	46.3 to 49.8	-1.1	-3.1 to 0.9
No	48.5	47.9 to 49.0	0.0	-0.4 to 0.5	41.9	40.6 to 43.3	-4.3	-5.5 to -3.0	48.2	47.2 to 49.2	-0.9	-1.8 to -0.0
Leisure-time physical activity												
Sedentary	46.8	46.0 to 47.7	-1.4	-2.5 to -0.4	39.9	38.2 to 41.6	-5.7	-7.6 to -3.8	47.1	45.6 to 48.6	-1.5	-3.5 to 0.6
Active	49.1	48.6 to 50.0	0.4	-0.0 to 0.9	43.4	42.1 to 44.6	-3.2	-4.4 to -1.6	48.5	47.6 to 49.4	-0.8	-1.7 to 0.1
Occupational Class												
Managers and professionals	50.1	49.5 to 50.7	-0.8	-1.4 to -0.1	40.9	38.6 to 43.3	-5.0	-7.8 to -2.3	49.7	48.2 to 51.2	-2.3	-4.1 to -0.4
Semi-professionals	48.9	47.9 to 49.9	0.1	-0.8 to 1.0	37.3	35.1 to 39.5	-4.9	-7.1 to -2.8	48.7	47.5 to 49.9	-1.4	-4.5 to 1.8
Routine non-manual employees	47.3	46.4 to 48.3	0.7	-0.1 to 1.5	37.6	35.6 to 39.6	-4.4	-6.1 to -2.7	46.6	44.8 to 48.3	-0.7	-1.8 to 0.4
Manual workers	46.2	45.0 to 47.3	1.1	0.1 to 2.1	36.4	34.7 to 38.1	-3.1	-5.5 to -0.7	46.1	43.5 to 48.8	-0.4	-1.9 to 1.1
Married or cohabiting												
Yes	48.2	47.7 to 48.7	0.3	-0.2 to 0.8	41.8	40.5 to 43.1	-4.4	-5.7 to -3.0	48.1	47.2 to 49.1	-0.6	-1.6 to 0.3
No	49.3	48.5 to 50.1	-0.4	-1.2 to 0.3	43.3	41.5 to 45.1	-4.3	-6.2 to -2.4	48.1	46.4 to 49.7	-1.0	-3.4 to -0.5

Notes: Each factor was analyzed separately, and the models were adjusted for gender and age. Age, gender and occupational class were obtained from the Phase before retirement. Other variables were measured before and after retirement, and were used as time-variant in the analyses of change.

S3. Factors predicting change in Mental (MCS) Health Functioning (SF-36) Scores during retirement transition.

	Statutory retirees (n=1464)				**Disability retirees (n=462)**				**Part-time retirees (n=404)**			
	Before retirement		**Mean Change**		**Before retirement**		**Mean Change**		**Before retirement**		**Mean Change**	
	Mean	**95% CI**	**β**	**95% CI**	**Mean**	**95% CI**	**β**	**95% CI**	**Mean**	**95% CI**	**β**	**95% CI**
Gender												
Men	54.0	53.2 to 54.9	1.0	0.2 to 1.9	46.4	43.1 to 49.8	0.7	-3.6 to 4.9	49.8	47.7 to 51.9	2.8	0.9 to 4.7
Women	52.5	52.0 to 53.1	2.2	1.6 to 2.7	48.6	47.3 to 49.8	-0.5	-1.9 to 0.9	51.0	49.8 to 52.2	1.7	0.5 to 2.8
Chronic conditions												
0	53.4	52.9 to 54.0	1.9	1.2 to 2.5	48.1	46.0 to 50.2	-1.0	-3.8 to 1.9	50.5	49.2 to 51.8	2.5	1.2 to 3.8
1	53.4	52.5 to 54.2	2.5	1.7 to 2.5	47.2	45.1 to 49.2	-0.0	-2.3 to 2.2	50.4	48.6 to 52.2	2.7	0.8 to 4.6
>1	50.3	48.4 to 52.2	2.0	0.0 to 3.9	47.8	45.3 to 50.3	0.1	-2.4 to 2.6	50.9	47.3 to 54.6	-1.1	-5.5 to 3.2
Body mass index (kg/m^2)												
<25	52.7	51.9 to 53.4	1.3	0.5 to 2.1	45.6	43.2 to 48.1	0.2	1.7 to 2.1	50.6	49.2 to 52.1	2.0	0.7 to 3.4
25-29	53.4	52.7 to 54.1	2.5	1.8 to 3.2	48.5	46.7 to 50.4	1.2	-1.5 to 3.8	50.0	48.1 to 51.8	2.4	0.6 to 4.1
≥ 30	53.6	52.4 to 54.8	1.9	0.6 to 3.1	48.7	46.3 to 51.0	-2.7	-5.5 to 0.1	51.4	48.8 to 54.1	0.9	-2.0 to 3.8
Smoking												
Yes	50.8	49.4 to 52.2	2.9	1.2 to 4.6	46.8	44.3 to 49.3	-1.9	-5.8 to 0.1	48.2	45.2 to 51.2	1.7	-1.0 to 4.4
No	53.5	53.0 to 54.0	1.7	1.2 to 2.2	48.1	46.4 to 49.8	0.3	-1.2 to 1.9	50.9	49.7 to 52.1	2.0	0.8 to 3.0
Binge drinking												
Yes	53.6	53.0 to 54.1	1.6	1.4 to 2.4	47.3	44.6 to 50.0	-0.7	-4.0 to 2.5	49.7	47.6 to 51.7	1.5	-0.9 to 4.0
No	51.8	50.7 to 53.0	1.9	0.3 to 3.0	47.9	46.3 to 49.6	-0.2	-1.8 to 1.3	50.9	49.6 to 52.2	2.1	1.0 to 3.2
Leisure-time physical activity												
Sedentary	52.3	51.3 to 53.2	1.6	0.4 to 2.8	46.3	43.9 to 48.6	0.6	-2.0 to 3.2	50.6	48.7 to 52.6	2.5	0.2 to 4.8
Active	53.3	52.9 to 53.9	2.0	1.4 to 2.5	48.3	46.7 to 50.0	-0.6	-2.4 to 1.2	50.5	49.2 to 51.8	1.8	0.7 to 2.9
Occupational Class												
Managers and professionals	52.8	52.1 to 53.5	2.5	1.7 to 3.2	45.2	42.0 to 48.3	0.9	-2.8 to 4.7	49.6	48.0 to 51.1	2.8	1.3 to 4.3
Semi-professionals	53.2	52.1 to 54.2	2.3	1.2 to 3.4	47.9	44.8 to 51.5	-0.1	-3.2 to 3.0	50.0	47.4 to 52.6	1.6	-0.9 to 4.1
Routine non-manual employees	53.6	52.6 to 54.6	1.4	0.5 to 2.3	47.6	45.4 to 49.8	-0.8	-2.9 to 1.3	51.7	49.4 to 53.9	1.4	-1.0 to 3.8
Manual workers	53.1	51.8 to 54.4	1.1	-0.0 to 2.3	49.9	47.6 to 52.3	-0.5	-3.1 to 2.0	53.4	50.6 to 56.1	1.2	-0.7 to 3.1
Married or cohabiting												
Yes	53.4	52.9 to 54.0	1.9	1.4 to 2.5	48.6	46.9 to 50.3	-0.1	-1.8 to 1.5	50.7	49.4 to 51.9	2.2	1.0 to 3.3
No	52.2	51.2 to 53.1	2.0	1.1 to 2.9	45.6	43.2 to 47.9	-0.6	-3.1 to 1.9	49.9	47.8 to 52.0	1.5	-0.4 to 3.4

Notes: Each factor was analyzed separately, and the models were adjusted for gender and age. Age, gender and occupational class were obtained from the Phase before retirement. Other variables were measured before and after retirement, and were used as time-variant in the analyses of change.