**How does job dissatisfaction interact with self-rated health in determining the risk of health-related job loss? Prospective findings from the Health and Employment After Fifty (HEAF) study**

S D’Angelo1

H Syddall1

G Ntani1,2

EC Harris1,2

C Linaker1,2

C Cooper1

M Stevens1

K Walker-Bone1,2

1 MRC Lifecourse Epidemiology Unit, University of Southampton,

2 MRC Versus Arthritis Centre for Musculoskeletal Health and Work, MRC Lifecourse Epidemiology Unit, University of Southampton

Correspondence and reprint requests to: Stefania D’Angelo, MRC Lifecourse Epidemiology Unit, University of Southampton, Southampton General Hospital, Southampton, SO16 6YD, UK. email: sd@mrc.soton.ac.uk

**Abstract (238 words)**

**Objectives**

Health and job satisfaction are key independent determinants of ability to work to older ages. We investigated the interaction of these two important factors on health-related job loss (HRJL) over two years of follow-up comparing male and female older workers.

**Methods**

A population sample of adults aged 50-64 years, recruited from 24 English general practices in the HEAF study, completed questionnaires at baseline with follow-ups at 12- and 24-months. Multiple-record Cox proportional hazards models were performed to explore the main effects of, and potential interactions between, job satisfaction and self-rated health (SRH) as predictors of time to first HRJL.

**Results**

Of the initial 8,134 participants, 5,143 were ever in work in the study period. Among men, 5.7% and 14.3% reported job dissatisfaction (those in good and poor SRH respectively), while among women these percentages were 4.6% and 12.9%. HRJL was reported by 106 men and 176 women. Men in good health dissatisfied with their job had a 6-fold (HR=6.4; 95%CI 3.3 to 12.4) increased risk of HRJL compared with men satisfied with their job (significant multiplicative interaction). Women dissatisfied with their job were more likely to have a HRJL within 2 years of follow-up irrespective of their SRH.

**Conclusions**

SRH and job dissatisfaction have important individual effects on the risk of stopping work for health amongst older workers. These findings point to the importance of job satisfaction in reducing health-related exit from paid work amongst older workers.

**Key words:** Older workers; health-related job loss; self-rated health; job satisfaction; interaction

What is already known about this subject?

* Poor health and job dissatisfaction are well known risk factors for disability retirement and premature exit from paid work.

What are the new findings?

* We looked at the interplay between self-rated health and job dissatisfaction as risk factors for leaving the job for a health reason (HRJL) and found a differential effect between sexes. Among men, being dissatisfied with the job was associated with an increased risk of HRJL only for those in good health. However, among women being dissatisfied was associated with an increased risk of HRJL irrespective of health.

How might this impact on policy or clinical practice in the foreseeable future?

* To encourage older workers to remain in work, policy-makers could incentivise employers to measure job satisfaction in their organisation regularly and promote jobs which employees rate as satisfying.

**Introduction**

Populations are ageing. According to United Nations data, 1 in 6 people in the world will be aged over 65 years by 2050 and 1 in 4 people living in Europe and North America could be aged > 65 years.[1] As a result of this, governments have been implementing policies to encourage workers to remain economically active to older ages.[2] However, also as a consequence of ageing, there is a growing proportion of people living with one or more long term conditions. Multimorbidity, defined as the co-occurrence of two or more conditions, has been estimated to affect up to 95% of the population aged 65 years and older but high rates have also been reported amongst working-age populations in a range of countries.[3] Recent English data suggest that the proportion of people aged 65 and over living with four or more diseases will almost double between 2015 and 2035, reaching 17% of that population.[4] Clearly, people in poor health are less likely to remain in paid work to older ages and more likely to be forced to exit paid work with a health-related job loss (HRJL).[5, 6]

Another factor which has been shown to be important in remaining in work at older ages is job satisfaction.[7, 8] What is currently less clear however, is to what extent high levels of job satisfaction might ameliorate the effects of poorer health and facilitate longer working lives and whether or not these effects may be different in male and female workers. Therefore, we explored the interaction between job dissatisfaction and self-rated health as determinants of HRJL over 2 years of follow-up, in a cohort of older workers in the Health and Employment After Fifty (HEAF) study.

**Methods**

The HEAF study is a cohort study of people who were aged 50-64 years when they were recruited in 2013-2014 using the sampling frame of 24 English General Practices. The full design and methods have been reported previously.[9] In the UK, almost everybody (an estimated 98% of the population) is registered with a General Practice, so that their registers provide as close as possible to a sample of the general population. Each practice mailed a baseline questionnaire, consent form and patient information sheet to all adults aged 50-64 years registered with their practice at that time point (excluding only a small number of those deemed by the GPs unethical to contact e.g. because of terminal illness). Respondents were asked to mail their signed consent form and baseline questionnaire directly to the study team, providing their contact details and their permission for us to send additional annual follow-up questionnaires. The baseline questionnaire enquired about: personal demographics, employment status, working conditions (physical and psychosocial), lifestyle, financial circumstances, and markers of health.

All those who gave permission were sent follow-up questionnaires at 12- and 24-months from the date of their baseline questionnaire. Follow-up questionnaires enquired about changes in employment status, and asked those who had changed their job to report about their new job and working conditions. Participants were also asked to report again about financial circumstances, lifestyle and the same markers of health. Participants in employment were asked about their working conditions which included the physical demands of their work (physical work activity score ranging from 0-6, with higher scores corresponding to higher physical work activity).

*Job satisfaction*

Overall job satisfaction was assessed with the question: ‘How satisfied have you been with your job as a whole, taking everything into consideration?’ If between follow-ups the participant had changed job, they were asked to report their job satisfaction relevant to the new job. Job satisfaction was analysed as a time-varying covariate, however, for people who remained in the same job since baseline, their baseline response to this question was used. Response categories were ‘very dissatisfied’, ‘dissatisfied’, ‘satisfied’, and ‘very satisfied’. Categories of ‘dissatisfied’ and ‘very dissatisfied’ were combined as were ‘very satisfied’ and ‘satisfied’, to generate a binary variable ‘dissatisfied versus not’, as we had in a previous paper. [10]

*Self-rated health*

Self-rated health (SRH) was assessed at baseline and each annual follow-up with a single 5-scale question with options ranging from ‘excellent’ to ‘poor’. As with job dissatisfaction, SRH was analysed as a time-varying covariate. Responses were dichotomised as ‘good or better’ versus ‘fair/poor’.

*Health-related job loss*

At baseline and each annual follow-up, participants were asked whether they were currently ‘employed’, ‘self-employed’, ‘unemployed’ or ‘retired’ and whether their employment position had changed since previously returning a HEAF questionnaire. If they indicated a job change, participants were asked to report the dates of leaving and starting a job in the intervening period and whether or not a health problem was or mainly or partly the reason for having left the previous job. The outcome variable for this analysis was: time until a participant left a job for a health reason (HRJL) during the first two years of follow-up. All other outcomes (including remaining in work, leaving work not for health reasons) were regarded as censored events (with censoring dates of the final annual follow-up if a person was still working, or the date that they exited employment not for health reasons).

*Statistical analysis*

For this analysis, we limited the sample to people in work at some point between baseline and follow-up 2 (approximately two years from baseline). Potential loss to follow-up bias was tested by describing baseline characteristics for everyone who returned only the baseline questionnaire and for participants with at least one of the two follow-up questionnaires. For descriptive purposes only, characteristics of respondents were described according to the combination of job satisfaction and SRH which was prevailing when the outcome of interest took place (i.e. first job exit due to HRJL (principal ‘failure’ event), first job exit for non-health reasons if no HRJL was experienced during 2 year follow-up (censoring event), or date of latest annual follow-up for people who remained employed in the same job throughout the study (censoring due to end of follow-up)).

We used a multiple-record Cox proportional hazards model to analyse the main effects of, and potential interactions between, job dissatisfaction and SRH as predictors of time to first health-related job loss. In common with previous studies, we regarded other work outcomes (remaining in employment, or job exits for other reasons) as censoring events. Effect estimates were expressed as hazard ratios (HRs) and 95% confidence intervals (95%CIs). We firstly presented results adjusted for age and finally we adjusted the estimates for the socio-demographic, lifestyle, and work factors which we have previously identified as important predictors of HRJL over 2 years of follow-up in the HEAF study (Syddall, under review with PLOS One). The adjustment factors were proximity to retirement, finances, physical work activity score, lack of physical activity (men), smoking and educational level (women). Rates of occurrence of HRJL per 1,000 person-years of employment time were calculated and shown as bar charts, by categories of job dissatisfaction, SRH and sex. Survival models were based on 2,368 men and 2,571 women with 106 and 176 HRJL events respectively.

To explore differences in the effect of job dissatisfaction on HRJL among older workers with good or poor health, an interaction term was entered between SRH and job dissatisfaction. A multiplicative interaction was considered statistically significant at the 95% level of confidence (p<0.05).

We explored if an additive interaction was present by calculating the relative excess risk due to interaction (RERI) and its 95%CI. The RERI is the excess risk attributed to interaction which is relative to the risk without an exposure. RERI was calculated with HRs as estimates of relative risks such that RERI = HR (poor SRH + job dissatisfaction) - HR (poor SRH + job satisfaction) – HR (good SRH + job dissatisfaction) + 1. A RERI which is different from 0 indicates that an additive interaction is present.[11] The paper by Andersson and colleagues explains the Stata procedure applied.[12]

We chose a priori to analyse the results for men and women separately, despite the fact that it would reduce statistical power but we felt that it is important since male and female workers are doing different types of jobs, have different profiles of health conditions and may have different caring responsibilities outside work.

All analyses were conducted using Stata v15.1.

Ethical approval was obtained from the National Health Service (NHS) Research Ethics Committee North West-Liverpool East (Reference 12/NW/0500) and all participants gave written informed consent.

**Results**

A total of 8,134 individuals completed the baseline questionnaire with consent to be followed up. Of these, 7,303 (90%) participants responded to at least one of the two follow-up questionnaires sent at 12- and 24-months. Amongst these, 5,143 (70%) participants were in work at some point between baseline and the second follow-up. Comparison of the demographic, socio-economic, lifestyle, health and work characteristics of the 7,303 participants that responded to at least one of the first or second follow-up questionnaires with those of the full sample (n=8,134) showed no significant differences (data not shown).

Overall, 7.2% of men and 6.1% of women reported job dissatisfaction. When stratified by categories of SRH, the proportion of men with job dissatisfaction was 5.7% and 14.3% for those who reported good and poor SRH respectively, while among women these percentages were 4.6% and 12.9%.

Table 1 (a and b) describes the socio-demographic and lifestyle characteristics of working HEAF participants collected at baseline as well as the work characteristics of their prevailing job for men and women respectively. These are presented stratified by poor and good SRH and by dissatisfied and satisfied with prevailing job. Overall, 78% of participants reported job satisfaction and good SRH, while 2.4% reported job dissatisfaction and poor SRH. Within our data, men with poor SRH were less likely to have a university degree; to be married or cohabiting; to own their own house; to report living comfortably financially; and to do some leisure time physical activity when compared with those with good self-rated health. They were also more likely to be obese and to be current/ex-smokers (Table 1a). Compared with men in the ‘satisfied & good health’ group, men in any other group were more likely to report that they were struggling to manage financially. For example, whilst only 5% of men in good health with job satisfaction reported that they were struggling financially, 39% of those who were dissatisfied and perceived their health as poor reported so. Moreover, men who reported dissatisfaction with their job and poor health were more likely than any other group to be further away from expected retirement, to say that they were not coping with the physical and mental demands of the job, and to report that their work entailed physically demanding activities.

In HEAF, we found that women who were dissatisfied with their jobs were less likely to be married than women satisfied with their job, irrespective of their self-rated health (Table 1b). A smaller proportion of women in the ‘satisfied & poor self-rated health’ group reported that they had a University degree compared with any other group. In total, half (52%) of the women in the ‘dissatisfied & poor self-rated health’ category reported that they were struggling financially (as compared with 6% of those in the ‘satisfied and good health’ group), and 95% of them reported difficulties coping with the physical demands of their job. In both categories of job satisfaction, women who perceived themselves to be in poor health were also more likely to be obese, to report doing no leisure time physical activity and to be current/ex-smokers.

*Relationships between self-rated health, job satisfaction and health-related job loss*

A total of n=106 (4.5%) men and n=176 (6.8%) women reported HRJL during the 2 years of follow-up. As shown in Table 2, SRH and job dissatisfaction were both associated with HRJL when they were explored as mutually- and fully-adjusted main effects in analyses for men, and for women (men: HR=3.1, 95%CI 2.0 to 4.9 for poor SRH; HR=3.5, 95%CI 2.1 to 5.8 for job dissatisfaction; women: HR=5.6, 95%CI 4.0 to 8.0 for poor SRH; HR=2.3, 95%CI 1.5 to 3.6 for job dissatisfaction).

Subsequently we examined multiplicative and additive interaction effects (Table 2). No statistically significant additive interaction (RERI) was found for these factors amongst men or women. However, a multiplicative interaction between job dissatisfaction and SRH as predictors of HRJL was evident among men (p=0.002). We therefore conducted analyses stratified by SRH (Table 3). In the fully adjusted models we found that among men reporting good SRH, those dissatisfied with their job had a 6-fold (HR=6.4; 95%CI 3.3 to 12.4) increased risk of HRJL when compared with men satisfied with their job. However, amongst men reporting poor SRH, job dissatisfaction did not significantly further increase the risk of HRJL (HR=2.0, 95%CI 0.9 to 4.5).

Women who were dissatisfied with their job were more likely to experience HRJL within 2 years of follow-up irrespective of their SRH, and with or without adjusting for potential confounders (Table 3).

The combined effects of SRH and job dissatisfaction as risk factors for HRJL in men and women are illustrated in Figure 1. Among men reporting good health, the incidence of HRJL was significantly higher if they also reported job dissatisfaction than if they did not (90.0/1,000 person-years (95%CI 54.2, 149.2) vs 12.9/1,000 person-years (95%CI 9.6, 17.4)); while among men with poor health the incidence of HRJL was similar, regardless of their level of satisfaction. Among women however, no matter how they rated their own health, there was a significantly higher incidence of HRJL amongst those reporting job dissatisfaction than among those who were satisfied with their job (76.3/1,000 person-years (95%CI 43.3,134.3) vs 19.6/1,000 person-years (95%CI 15.5,24.7) among women reporting good health; 237.1/1,000 person-years (95%CI 151.2,371.7) vs 114.3/1,000 person-years (95%CI 91.0,143.5) among women reporting poor health).

Although no statistically significant relative excess risk interaction (RERI) was found for men or women, the direction of the effects appeared to be different between them. Among men, we found a negative additive interaction which means that job dissatisfaction had less of an impact on HRJL among those with poor health than those in good health. However, among women, we found a positive additive interaction suggesting that the combined effect of job dissatisfaction and poor SRH was more than the sum of their individual effects.

**Discussion**

In this contemporary cohort study of older workers, we explored the interaction of job dissatisfaction and SRH on HRJL over two years of follow-up. Men rating their health as “excellent, very good or good” were found to have a 6-fold increased risk of HRJL if they were “dissatisfied or very dissatisfied” with their job as compared with those who reported being satisfied with their job. In contrast, if men reported poor SRH, we found no evidence of an additional effect of job dissatisfaction on the risk of HRJL. Among women, job dissatisfaction was associated with an increased risk of HRJL, no matter whether they rated their health as “excellent, very good or good” or “fair or poor”.

It may seem counter-intuitive that individuals may report themselves in good health and subsequently report HRJL. It should be borne in mind that the question about self-rated health was asked annually but that occurrence of job exit was collected the following year, at which point those who indicated that they had exited paid work were asked to report whether that exit was mainly or partly for health reasons. In some cases, the respondent will have had an acute onset of a new diagnosis or presented with a new acute pathology since they were last asked to report their self-rated health. Of course, the attribution of the exit to health is in the opinion of the respondent. In this respect, our outcome differs from that used in some studies, so-called “disability retirement”. In the UK “disability retirement” is not a formal mechanism eligible to all. Disability pensions are available to a minority who voluntarily pay insurance into disability pension funds or whose employer does so as a job benefit. Of course, people who would qualify for formal disability retirement in other countries can reasonably be expected to comprise a subset of those who self-report exit from work for health reasons.

We found the expected association between poor SRH and an increased risk of health-related exit from paid work amongst older workers. This finding is consistent with results of other studies, for example, a systematic review including 12 longitudinal studies[5] which showed that poor self-perceived health was a significant risk factor for transition into disability pension. Likewise, in the Korean Longitudinal Study of Ageing, poor self-reported health was strongly associated with early retirement on health grounds.[13] Self-rated health is of course a subjective and self-reported variable which will, at any point in time, reflect a complex interplay of self-perceived physical and mental capability, mood and perceptions about existing symptoms, disabilities, medical diagnoses and prescribed treatments.[14] However, it is probably the most widely used single measure of health status in epidemiology and economics research. It has been shown to very consistently predict mortality[15] and some studies have found that, although it correlates well with objective disease,[16] it can be a better predictor of mortality than more objective health parameters.[17] Interestingly, another study of determinants of retirement amongst Swedish employees aged 55-64 years also found SRH to be a better predictor of early retirement than diagnosed disease.[18] In relation to ability to work, it could be argued that, at least to some extent, individuals will include their personal assessment of how they are managing in their work within their assessment of their “health” creating some circularity in exploring how well this construct is associated with remaining at work. Certainly, it has been consistently shown to be an excellent predictor of the risk of stopping work. Given this, it is interesting that older workers, particularly women, who report that their jobs are satisfying are less likely to exit paid work over two years of follow-up for health reasons even if they report their own health to be poor.

Our results might suggest potentially important gender differences, even though being based on a limited number of cases, these would need replication in other cohorts. It seems that job satisfaction is important to older male and female workers but that men who report poor health will exit the workplace on health grounds no matter how satisfying they find their work. In contrast, men in good health are considerably more likely to exit their work if they are dissatisfied with it. Amongst women, job satisfaction is importantly associated with HRJL, no matter how they rate their health.

It is interesting to hypothesise as to why these differences might have been found. Amongst men with poor health, it may be that they are generally the main provider of income in their households and will stoically remain in paid work until health forces them out, no matter how they rate their job satisfaction. Conceivably women who are perhaps not responsible for the principal income in their household, or have other demands on their time including caring responsibilities, may find themselves more easily able to decide to exit paid work if they find their work unsatisfactory. In this case however, it is interesting that they opt to define their exit as “mainly or partly” because of their health. It could be that there is some guilt associated with work exit and women choose to attribute their exit to their health as an “acceptable” reason for stopping, Alternatively, these differences may reflect the type of work choices available to older workers if, for example, dissatisfied older female workers with/without health conditions have a more limited choice of alternative employment opportunities into which they can move and therefore choose to exit paid work altogether. Another possible explanation is that men in good health with jobs that they report unsatisfactory might exit the workplace because of mental ill-health or stress-related ill-health conditions such as cardiovascular disease. Thirdly, it may be that the type of health condition underlying poor self-rated health differs amongst men and women: for example, if men reporting poor health tend to have cardio-respiratory problems which are perhaps incompatible with any type of work and inevitably lead to HRJL whilst the health problems affecting this age group of women (musculoskeletal and mental health) can be effectively accommodated by some employers and such jobs are generally rated by women as satisfying. Our findings suggest that employers may need to consider the needs of older male and female workers differently.

Our findings that economic and social factors are important determinants of self-rated health are not new.[19] In an extensive systematic review, Moor and colleagues explored the relative contribution of material, psychosocial and behavioural factors to the socioeconomic gradient in SRH.[19] They reported that it was the material factors (defined as living/housing conditions; employment characteristics or financial issues) which contributed the most to differences in SRH, both through direct effects but also through indirect effects on psychosocial and behavioural factors. It is perhaps therefore unsurprising that in a meta-analysis of about 500 studies, SRH was found to be associated with job satisfaction. The pooled correlation coefficient between all health measures and job satisfaction was r=0.312.[20] We ourselves have previously reported cross-sectional data from HEAF showing that the odds of reporting poor health were 3-fold higher for older workers who reported being dissatisfied, rather than satisfied, with their job.[10] This might therefore suggest that poor SRH and job dissatisfaction are acting as “markers” of socio-economic disadvantage, with those with lowest educational attainment who are most likely to be struggling financially to also be in jobs in which: they feel under-appreciated; do not experience a feeling of achievement; are having difficulty with colleagues; are feeling unfairly criticised; or are in jobs which are insecure or imbalanced with respect to effort and reward. Importantly however, our results suggest that policy-makers and employers could potentially positively facilitate longer working livesby seeking to provide more satisfying jobs with better quality workplace social relationships.

When interpreting these findings some strengths and limitations should be taken into consideration. A major strength is the longitudinal design with excellent rates of retention (84% and 83% at the first and second year follow-ups respectively) amongst this contemporary cohort of older workers. Another notable strength is the population-based sampling strategy so that wide geographical spread has been achieved and all deciles of deprivation are included. However, we acknowledge that there are some limitations, which include the relatively low response rate at baseline (21%) and the fact that HEAF responders tended to be somewhat older, more affluent and more often female than non-responders.[9] Although this may make generalisability more limited, the excellent retention rates do allow valid internal comparisons, like those performed here. We have shown that the participants who responded to at least one of the first or second follow-up questionnaires did not differ from the baseline sample in terms of the main demographic, socio-economic, lifestyle factors, health variables and work characteristics (suggesting that attrition bias is minimal). Previous studies have demonstrated that self-rated health is a valid measure of objective health and can serve as a global measure of health status in the general population.[16, 21] In HEAF, job satisfaction has been assessed using a single item, while other studies have used much more complex scales to assess it. Although this is a limitation, it is encouraging that results of a meta-analysis have suggested that the correlation of the single-item and scale measures was moderately good (kappa =0.63).[22] Finally, it is important to bear in mind that people eligible for inclusion in these analyses had to be in paid work at either baseline or follow-up 1, when they were between approximately 50-64 years of age. To some extent, therefore, this is a “healthy worker” population and people who became too unwell to work before baseline are not included.

To conclude, these findings suggest that strategies designed to encourage work to older ages should consider the interaction of ill health and job satisfaction. Attempts to measure and enhance satisfaction at work could yield longer working lives.

**Acknowledgements**

We wish to thank the CPRD and the 24 general practices that have supported data collection; also, the staff of the MRC LEU who provided invaluable support with data administration, data entry and computing (notably Vanessa Cox and Ben Barton).

**Contributorship**

SD and KWB identified the study questions. KWB, CHL, ECH and MJS supervised data collection. SD, HES and GN planned the analyses and SD conducted the analyses. SD wrote the first draft of the paper. All authors contributed to the writing of subsequent and final drafts of the manuscript.

**Funding**

The HEAF study is funded by the Medical Research Council programme grant (MC\_UU\_12011/5), and by grant awards from Versus Arthritis (formerly Arthritis Research UK) (22090); and the Economic and Social Research Council and Medical Research Council jointly (ES/L002663/1).

**Competing interests**

Professor Cooper has received consultancy and honoraria from Alliance for Better Bone Health, Amgen, Eli Lilly, GSK, Medtronic, Merck, Novartis, Pfizer, Roche, Servier, Takeda and UCB. The remaining authors declared no conflict of interest.

**Data sharing/Data availability**

Data are available upon reasonable request. These are deidentified participant data and are available upon request from the "Arthritis Research UK/MRC Centre for Musculoskeletal Health and Work". The Centre Manager and Administrator are:

Dr Clare Harris: ech@mrc.soton.ac.uk

Mrs Sue Curtis: sc@mrc.soton.ac.uk

**Table 1a: Participant characteristics by categories of prevailing job satisfaction and self-rated health - Men1**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  |  | | MEN (n=2,348) | | |
| Baseline | Satisfied & good health (n=1,826) | Dissatisfied & good health  (n=110) | | Satisfied & poor health (n=353) | Dissatisfied & poor health  (n=59) | | |
| **Socio-demographic** |  |  | |  | | |
| Age at baseline (years)\* | 57.7 (4.2) | 56.9 (3.8) | | 58.1 (4.1) | 57.7 (3.8) | | |
| ***Proximity to expected retirement, n (%)*** |  |  | |  |  | | |
| <1 year | 88 (5.1) | 4 (3.8) | | 14 (4.2) | 6 (10.9) | | |
| 1 to <5 years | 430 (24.8) | 22 (21.0) | | 102 (30.5) | 6 (10.9) | | |
| 5 to <10 years | 581 (33.5) | 44 (41.9) | | 111 (33.1) | 16 (29.1) | | |
| 10 years or more | 636 (36.7) | 35 (33.3) | | 108 (32.2) | 27 (49.1) | | |
| ***Marital status, n (%)*** |  |  | |  |  | | |
| Married/civil partnership | 1,439 (78.9) | 83 (76.2) | | 253 (72.1) | 39 (66.1) | | |
| ***Highest educational qualification, n (%)*** |  |  | |  |  | | |
| No qualifications/school | 538 (29.5) | 30 (27.3) | | 119 (33.7) | 22 (37.3) | | |
| Vocational training certificate | 596 (32.6) | 36 (32.7) | | 137 (38.8) | 20 (33.9) | | |
| University degree/higher | 692 (37.9) | 44 (40.0) | | 97 (27.5) | 17 (28.8) | | |
| ***Housing tenure, n (%)*** |  |  | |  |  | | |
| Owned outright/ mortgaged | 1,626 (90.4) | 98 (90.7) | | 275 (78.6) | 46 (78.0) | | |
| ***How are you managing financially? n (%)*** |  |  | |  |  | | |
| Living comfortably/doing alright | 1,398 (77.7) | 63 (58.3) | | 198 (56.6) | 20 (33.9) | | |
| Just about getting by | 312 (17.3) | 33 (30.6) | | 110 (31.4) | 16 (27.1) | | |
| Finding it difficult/very difficult | 90 (5.0) | 12 (11.1) | | 42 (12.0) | 23 (39.0) | | |
|  |  |  | |  |  | | |
| ***Lifestyle*** |  |  | |  |  | | |
| ***Weekly physical activity, n (%)*** |  |  | |  |  | | |
| None | 220 (13.1) | 16 (16.0) | | 97 (31.0) | 15 (28.3) | | |
| ***Obesity, n (%)*** |  |  | |  |  | | |
| ≥30kg/m2 | 352 (19.7) | 25 (23.4) | | 144 (41.4) | 24 (40.7) | | |
| ***Alcohol intake per week, n (%)*** |  |  | |  |  | | |
| Low/no drinker (≤1unit pwk) | 203 (11.7) | 17 (15.7) | | 67 (20.6) | 7 (12.7) | | |
| Moderate (2-14 units pwk) | 916 (52.7) | 61 (56.5) | | 153 (46.9) | 32 (58.2) | | |
| Heavy (15+ units pwk) | 620 (35.7) | 30 (27.8) | | 106 (32.5) | 16 (29.1) | | |
| ***Smoker status, n (%)*** |  |  | |  |  | | |
| Ex/current | 853 (46.8) | 45 (40.9) | | 208 (59.4) | 29 (50.0) | | |
|  |  |  | |  |  | | |
| **Work factors2*, n (%)*** |  |  | |  |  | | |
| Not coping with physical demand of the job | 359 (19.7) | 46 (41.8) | | 203 (57.7) | 43 (74.1) | | |
| Not coping with mental demand of the job | 418 (23.0) | 64 (58.2) | | 156 (44.7) | 44 (75.6) | | |
| Physical work activities score (0-6) Ʇ | 1.0 (0,3.0) | 1.0 (0,3.0) | | 1.0 (0,4.0) | 2.0 (0,3.0) | | |

\* Mean (SD) Ʇ Median (IQR)

1Column percentages are based on non-missing values that might be different for each variable; 2Work factors described in this table refer to the job prevailing when HRJL or censoring event of interest took place

**Table 1b: Participant characteristics by categories of prevailing job satisfaction and self-rated health – Women1**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  | WOMEN (n=2,551) | | |
| Baseline | Satisfied & good health (n=1,998) | | Dissatisfied & good health  (n=96) | Satisfied & poor health (n=398) | | Dissatisfied & poor health (n=59) |
| **Socio-demographic** |  | |  |  | |  |
| Age at baseline (years)\* | 57.1 (3.9) | | 56.6 (4.1) | 57.3 (4.0) | | 56.5 (2.9) |
| ***Proximity to expected retirement, n (%)*** |  | |  |  | |  |
| <1 year | 111 (6.0) | | 2 (2.3) | 18 (5.0) | | 4 (6.9) |
| 1 to <5 years | 416 (22.5) | | 19 (22.1) | 70 (19.6) | | 8 (13.8) |
| 5 to <10 years | 695 (37.5) | | 30 (34.9) | 143 (40.1) | | 24 (41.4) |
| 10 years or more | 631 (34.1) | | 35 (40.7) | 126 (35.3) | | 22 (37.9) |
| ***Marital status, n (%)*** |  | |  |  | |  |
| Married/civil partnership | 1355 (68.5) | | 50 (52.6) | 248 (63.1) | | 27 (46.6) |
| ***Highest educational qualification, n (%)*** |  | |  |  | |  |
| No qualifications/school | 691 (34.6) | | 26 (27.1) | 168 (42.2) | | 16 (27.1) |
| Vocational training certificate | 598 (29.9) | | 32 (33.3) | 123 (30.9) | | 21 (35.6) |
| University degree/higher | 709 (35.5) | | 38 (39.6) | 107 (26.9) | | 22 (37.3) |
| ***Housing tenure, n (%)*** |  | |  |  | |  |
| Owned outright/ mortgaged | 1,754 (59.8) | | 87 (91.6) | 309 (79.8) | | 46 (80.7) |
| ***How are you managing financially? n (%)*** |  | |  |  | |  |
| Living comfortably/doing alright | 1,476 (75.5) | | 55 (57.3) | 204 (52.7) | | 10 (17.2) |
| Just about getting by | 355 (18.2) | | 30 (31.3) | 119 (30.8) | | 18 (31.1) |
| Finding it difficult/very difficult | 124 (6.3) | | 11 (11.5) | 64 (16.5) | | 30 (51.7) |
|  |  | |  |  | |  |
| ***Lifestyle*** |  | |  |  | |  |
| ***Weekly physical activity, n (%)*** |  | |  |  | |  |
| None | 279 (15.6) | | 22 (24.7) | 90 (27.1) | | 20 (37.7) |
| ***Obesity, n (%)*** |  | |  |  | |  |
| ≥30kg/m2 | 396 (20.3) | | 24 (25.3) | 151 (39.2) | | 26 (47.3) |
| ***Alcohol intake per week, n (%)*** |  | |  |  | |  |
| Low/no drinker (≤1unit pwk) | 479 (26.4) | | 27 (29.0) | 121 (37.2) | | 19 (36.5) |
| Moderate (2-14 units pwk) | 1,186 (65.4) | | 61 (65.6) | 184 (56.6) | | 29 (55.8) |
| Heavy (15+ units pwk) | 149 (8.2) | | 5 (5.4) | 20 (6.2) | | 4 (7.7) |
| ***Smoker status, n (%)*** |  | |  |  | |  |
| Ex/current | 800 (40.3) | | 42 (43.8) | 197 (50.4) | | 31 (52.5) |
|  |  | |  |  | |  |
| **Work factors2*, n (%)*** |  | |  |  | |  |
| Not coping with physical demand of the job | 404 (20.3) | | 44 (46.8) | 265 (66.9) | | 56 (94.9) |
| Not coping with mental demand of the job | 534 (26.8) | | 66 (69.5) | 190 (48.0) | | 51 (86.4) |
| Physical work activities score (0-6) Ʇ | 0 (0,1.0) | | 0 (0,2.0) | 1 (0,2.0) | | 1 (0,3.0) |

\* Mean (SD) Ʇ Median (IQR)

1Column percentages are based on non-missing values that might be different for each variable; 2Work factors described in this table refer to the job prevailing when HRJL or censoring event of interest took place

**Table 2: Cox regression analysis of association between job dissatisfaction, SRH and HRJL over 2 years of follow-up**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Men** | | **Women** | |
|  | HR (95%CI) | | | |
|  | Age-adjusted | Fully adjustedꞱ | Age-adjusted | Fully adjustedꞱ |
|  |  |  |  |  |
| Main effect of poor SRH\* | 3.6 (2.4,5.3) | 3.1 (2.0,4.9) | 5.3 (3.9,7.1) | 5.6 (4.0,8.0) |
| Main effect of job dissatisfaction\* | 3.3 (2.1,5.3) | 3.5 (2.1,5.8) | 2.6 (1.8,3.9) | 2.3 (1.5,3.6) |

p multiplicative interaction = 0.002 for men and 0.13 for women; SRH: Self-rated health

RERI = -4.3 (-11.2, 2.6) men; 5.2 (-1.8, 12.2) women

Ʇ Adjusted for age, proximity to retirement, finances, physical work activity score, no physical activity (men), smoking (women), educational level (women)

\* From a mutually-adjusted model

**Table 3: Association between job dissatisfaction and HRJL over 2 years of follow-up by categories of SRH**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Men** | | **Women** | |
|  | **Good SRH** | **Poor SRH** | **Good SRH** | **Poor SRH** |
|  |  |  |  |  |
| Effect of job dissatisfaction |  |  |  |  |
| Age-adjusted | 7.6 (4.2,13.8) | 1.7 (0.8,3.5) | 4.0 (2.2,7.4) | 2.3 (1.4,3.8) |
| Fully adjustedꞱ | 6.4 (3.3,12.4) | 2.0 (0.9,4.5) | 3.4 (1.7,6.9) | 1.8 (1.0,3.1) |

Ʇ Adjusted for age, proximity to retirement, finances, physical work activity score, no physical activity (men), smoking (women), educational level (women)

SRH: Self-rated health

**References**

1. United Nations. Ageing. Available from: <https://www.un.org/en/sections/issues-depth/ageing/> (accessed June 2020).

2. Cooke M. Policy changes and the labour force participation of older workers: evidence from six countries. *Can J Aging* 2006;25(4):387-400.

3. Violan C, Foguet-Boreu Q, Flores-Mateo G, Salisbury C, Blom J, Freitag M, Glynn L, Muth C, Valderas JM. Prevalence, Determinants and Patterns of Multimorbidity in Primary Care: A Systematic Review of Observational Studies. PLoS One. 2014; 9(7): e102149.

4. Kingston A, Robinson L, Booth H, et al. Projections of multi-morbidity in the older population in England to 2035: estimates from the Population Ageing and Care Simulation (PACSim) model. *Age Ageing* 2018;47(3):374-80.

5. van Rijn RM, Robroek SJ, Brouwer S, et al. Influence of poor health on exit from paid employment: a systematic review. *Occup Environ Med* 2014;71(4):295-301.

6. Borsh-Supan A, Brugiavini A, Croda E. The Role of Institutions and Health in European Patterns of Workand Retirement. *J Eur Soc Policy* 2009;19(4):341-58.

7. Kang MY, Myong JP. Job characteristics as risk factors for early retirement due to ill health: The Korean Longitudinal Study of Aging (2006-2014). *J Occup Health* 2019;61(1):63-72.

8. Schnalzenberger M, Schneeweis N, Winter-Ebmer R, et al. Job Quality and Employment of Older People in Europe. *Labour* 2014;28(2):141-62.

9. Palmer KT, Walker-Bone K, Harris EC, et al. Health and Employment after Fifty (HEAF): a new prospective cohort study. *BMC Public Health* 2015;15:1071.

10. D'Angelo S, Coggon D, Harris EC, et al. Job dissatisfaction and the older worker: baseline findings from the Health and Employment After Fifty study. *Occup Environ Med* 2016;73(8):512-9.

11. Knol MJ, VanderWeele TJ, Groenwold RHH, et al. Estimating measures of interaction on an additive scale for preventive exposures. *Eur J Epidemiol* 2011;26(6):433-8.

12. Andersson T, Alfredsson L, Kallberg H, et al. Calculating measures of biological interaction. *European Journal of Epidemiology* 2005;20:575-579

13. Kang MY, Yoon CG, Yoon JH. Influence of illness and unhealthy behavior on health-related early retirement in Korea: Results from a longitudinal study in Korea. *J Occup Health* 2015;57(1):28-38.

14. Jylha M. What is self-rated health and why does it predict mortality? Towards a unified conceptual model. *Soc Sci Med* 2009;69:307-16.

15. Idler EL, Benyamini Y. Self-rated health and mortality: a review of twenty-seven community studies. *J Health Soc Behav* 1997;38(1):21-37.

16. Wu S, Wang R, Zhao Y, et al. The relationship between self-rated health and objective health status: a population-based study. *BMC Public Health* 2013;13:320.

17. Mossey JM, Shapiro E. Self-rated health: a predictor of mortality among the elderly. *Am J Public Health* 1982;72(8):800-8.

18. Nilsson K, Rignell Hydbom A, et al. How are self-rated health and diagnosed disease related to early or deferred retirement? A cross-sectional study of employees aged 55-64. *BMC Public Health* 2016;16.

19. Moor I, Spallek J, Richter M. Explaining socioeconomic inequalities in self-ratedhealth: a systematic review of the relativecontribution of material, psychosocialand behavioural factors. *J Epidemiol Community Health* 2017;71:565-75.

20. Faragher EB, Cass M, Cooper CL. The relationship between job satisfaction and health: a meta-analysis. *Occup Environ Med* 2005;62(2):105-12.

21. Singh-Manoux A, Martikainen P, Ferrie J, et al. What does self rated health measure? Results from the British Whitehall II and French Gazel cohort studies. *J Epidemiol Community Health* 2006;60(4):364-72.

22. Wanous JP, Reichers AE, Hudy MJ. Overall job satisfaction: how good are single-item measures? *J Appl Psychol* 1997;82(2):247-52.

**Figure 1: Incidence of health-related job loss (HRJL) per 1,000 person-years worked by job dissatisfaction and SRH for men and women separately**