European Journal of Public Health, Vol. 17, No. 1, 62–68

doi:10.1093/eurpub/ckl084 Advance Access published on June 14, 2006

Quality of work, well-being, and intended early retirement of older employees—baseline results from the SHARE Study

Johannes Siegrist[1], Morten Wahrendorf[1], Olaf von dem Knesebeck[2], Hendrik Jürges[3], Axel Börsch-Supan[3]

Background: Given the challenge of a high proportion of older employees who retire early from work we analyse associations of indicators of a poor psychosocial quality of work with intended premature departure from work in a large sample of older male and female employees in 10 European countries. **Methods:** Baseline data from the 'Survey of Health, Ageing and Retirement in Europe' (SHARE) were obtained from 3523 men and 3318 women in 10 European countries. Data on intended early retirement, four measures of well-being (self-rated health, depressive symptoms, general symptom load, and quality of life), and quality of work (effort–reward imbalance; low control at work) were obtained from structured interviews and questionnaires. Country-specific and total samples are analysed, using logistic regression analysis. **Results:** Poor quality of work is significantly associated with intended early retirement. After adjustment for well-being odds ratios (OR) of effort–reward imbalance [OR 1.72 (1.43–2.08)] and low control at work [OR 1.51 (1.27–1.80)] on intended early retirement are observed. Poor quality of work and reduced well-being are independently associated with the intention to retire from work. **Conclusion:** The consistent association of a poor psychosocial quality of work with intended early retirement among older employees across all European countries under study calls for improved investments into better quality of work, in particular increased control and an appropriate balance between efforts spent and rewards received at work.

Keywords: demand-control, early retirement, effort–reward imbalance, European comparisons, quality of work

Early retirement from regular employment provides a major challenge to social and health policy in European countries. As people >60 years will comprise up to one-third of the population in several European countries in the next two decades, a shrinking number of economically active people will have to support a growing number of economically dependent elderly people. Currently, large variations in workforce participation rates are observed across European countries, e.g. in the age group 55–59. In recent years, this rate has fallen to <20% in Belgium, Italy, France, and The Netherlands, to ~35% in Germany, and to 40% in Spain, whereas this percentage is much higher in countries like Switzerland, Norway, Japan, and the United States.[1] Therefore, a major policy challenge is increasing the number of regularly employed people of older age by influencing the determinants of early retirement. At least three types of determinants have been identified: financial incentives, poor health, and poor quality of work. First, financial incentives to retire early, often in combination with economic pressure from employers, pension schemes with extended eligibility, and alternative income need to be mentioned. National policies vary quite substantially with respect to these regulations.[2] Poor health, chronic illness, and disability are important determinants of early exit from the labour market. This holds particularly true for occupations where working conditions cannot be modified or adjusted to a reduced work ability of employees.[3,4] Poor quality of work and employment is a third determinant of premature departure from working life. This has been observed in employees with physically or mentally demanding work, with monotonous, repetitive work, and other types of stressful experience.[5–8] Exposure to poor quality of work was also shown to increase intentions to leave and to reduce performance and motivation at earlier stages of employment trajectories.[9]

It is important to define poor psychosocial quality of work in terms of a theoretical model that allows for an identification of stressful aspects of work at a general level and, thus, can be applied to a wide range of different occupations. While several theoretical concepts of stressful work have been developed,[10,11] two models have received special attention recently: the demand-control model[12,13] and the effort–reward imbalance model.[14,15]

The former model identifies stressful work by job task profiles that are characterized by high demand in combination with low control (low decision latitude), whereas the latter model claims that an imbalance between high efforts spent and low rewards received in turn (money, esteem, career prospects, and job security) adversely affect health. This is mainly due to the fact that a basic principle of social exchange, reciprocity, is violated under such conditions.

So far, occupational research based on these models almost exclusively focussed on their adverse effects on health and well-being. Overall, prospective epidemiological investigations demonstrated significantly elevated risks of highly prevalent disorders among employees with high demand and low control, and among those with an imbalance between effort and reward.[16–19] While quality of work may indirectly influence intended retirement via reduced well-being, the direct effects of stressful work on the likelihood of prematurely giving up one's job adjusted for well-being have rarely been explored.

1 Department of Medical Sociology, University of Duesseldorf, Germany
2 Department of Medical Sociology, University of Hamburg, Germany
3 Mannheim Research Institute for the Economics of Aging, University of Mannheim, Germany
Correspondence: Johannes Siegrist, PhD, Department of Medical Sociology, University of Duesseldorf, PB 101007, D-40001 Duesseldorf, Germany, tel: +49 211 8114360, fax: +49 211 8112390, e-mail: siegrist@uni-duesseldorf.de

One such study documented an association of high demand and low control jobs with thoughts of early retirement, but was restricted to a group of social and health care workers in Finland.[9] As over 90% of the sample were women and mean age was ~44 years it is unknown to what extent these findings hold true for older employees, for men, for other occupational groups, and for the workforce of other countries.

Our investigation sets out to test associations of poor quality of work with intended early retirement in a range of European countries, focusing on employed men and women aged >50, an age period where premature retirement matters most. For the first time, we explore these associations by assessing quality of work in terms of an imbalance between efforts and rewards and in terms of a low level of control at work, adjusting for the impact of well-being.

Data, measurement, and method

Data

We use data from the first public release version of the 'Survey of Health, Ageing and Retirement in Europe' from 2004.[20,21] SHARE is the first cross-national research project exploring extensively and comparatively topics related to working conditions, health and well-being, and socioeconomic status among people aged 50 and older in 10 European countries (Austria, AT; Germany, DE; Sweden, SE; The Netherlands, NL; Spain, ES; Italy, IT; France, FR; Denmark, DK; Greece, GR; Switzerland, CH; further data is currently being collected in Belgium and Israel). Overall, the first data release contains more than 22 000 face-to-face interviews with participants from ~15 000 households. In each participating country probability samples were drawn. In this analysis we restricted the sample to all men and women aged 65 or less reporting to do any paid work (employed or self-employed), because we were interested in the quality of currently experienced work. This restriction resulted in a sample size of 6836 participants (3520 men; 3316 women).

Measures

Measures of quality of work: Quality of work was assessed by a short battery of items derived from (i) the Job Content Questionnaire measuring the demand-control model[13] and (ii) from the effort–reward imbalance model questionnaire.[15] The psychometric properties of both questionnaires were previously tested.[13,15,17,19] Given the constraints of a multi-disciplinary approach in the SHARE project the inclusion of the full questionnaires was not possible. Thus, items were selected on the basis of factor loadings on respective original scales. With regard to the first model, the measurement was restricted to the control dimension. This decision was based on evidence that the predictive power of 'control' by far exceeded the power of 'demand', and that tests of the interaction term 'demand' × 'control' had produced inconsistent results.[16,22] Low control at work was measured by the sum score of two Likert-scale items ranging from 2 to 8, with higher scores indicating lower control at work. Scores in the upper tertile were defined as representing poor quality of work in terms of low control.

To measure effort–reward imbalance, 2 out of 6 items measuring 'effort' and 5 out of 11 items assessing 'reward' at work were included. 'Effort–reward imbalance' was defined by a ratio of the sum score of the 'effort' items (nominator) and of the sum score of the 'reward' items (adjusted for number of items; denominator). As previous analyses showed that quality of work in terms of this model varies across countries under study in SHARE,[20] tertiles of the ratio were calculated for each country separately. Participants scoring in the upper tertiles of this ratio of imbalance were considered experiencing poor quality of work.

Intended retirement was assessed by a single question: 'Thinking about your present job, would you like to retire as early as possible?' Answer categories were yes and no.

Measures of well-being: We introduce four different binary indicators of well-being: self-perceived health, depressive symptoms, quality of life, and number of reported bodily symptoms. Self-rated health was measured by a single standard question that was repeatedly shown to explain morbidity and mortality, also among elderly populations.[23] Answers to this question were dichotomized into 'good health' (good or very good) and 'poor health' (less than good).

Second, in order to measure depressive symptoms we applied a short form of the Center for Epidemiologic Studies Depression (CES-D) scale, a widely used instrument in general population surveys.[24,25] 11 identical items from the original 20 item version with 4-point Likert scales had been incorporated in the SHARE questionnaire. The total score values range from 11 to 44, with higher scores indicating more depressive symptoms. In order to have a comparative measure taking country-specific variations into account, we calculated tertiles for each country sample separately. Participants with scores in the upper tertile were considered to suffer from depressive symptoms.

As a third indicator of well-being we measured the number of bodily symptoms reported by the respondents from a list of 12 common symptoms.[26] If two or more symptoms were indicated we considered the participants as suffering from reduced well-being.

Finally, quality of life in early old age was measured with the CASP-12 questionnaire, representing a psychometrically validated short version of the original 19 item version (CASP-19).[27] This approach assumes that quality of life refers to four conceptual domains of individual needs that are particularly relevant in later life: control (C), autonomy (A), self-realization (S), and pleasure (P). Items measuring the four respective scales assess the degree to which these aspects are perceived as being satisfied. As a common latent construct underlies the four scales, a summary measure was used to assess quality of life (range 12–48), with higher scores indicating better quality of life. Participants scoring in the lowest tertile were defined as exhibiting poor quality of life.[28] As with the CES-D scale we calculated country-specific tertiles.

Additional measures: We included additional measures mainly as confounders in multivariate models (age, gender, income, and education). Education was measured according to an international classification (ISCED-97)[29] where 'low' (pre-primary, primary, or lower secondary education), 'medium' (secondary or post-secondary education), and 'high education' (first and second stage of tertiary education) were defined. Income information was based on the total annual household income composed of the sum of different income components assessed in the questionnaire. Income measure is based on imputation where income components were missing.[20] To adjust for household size, we divided the value of income in accordance to the OECD equivalent—scale[29] and categorized it into country-specific tertiles.

Method of analysis

Following univariate and bivariate analyses binary logistic regression models were calculated for the total sample and for each country sample. The models for the total sample include country indicators to adjust for country specificities. Whereas sampling weights were adopted for descriptive analyses only, we used robust (Huber-White sandwich) estimators in logistic models taking account of the clustering into households.[30,31] Robust estimators assumed that observations are independent across clusters (households) but not necessarily independent within clusters.[32] Model I includes baseline variables (age, gender, income, and education). In model II we include the two

indicators of quality of work. We additionally explored a possible interaction of both variables. The third model examines the effect of the four indicators of reduced well-being on intended early retirement. Model IV includes all variables. Traditional model diagnostics were done based on residual analysis. In addition to odds ratios and 95% confidence intervals we assessed estimates of model fit (Adjusted Mc Faddens R2). Based on these estimates the relative improvement of each model can be compared, with higher values indicating a better model fit.[32]

Results

The sample of participants with full data consisted of 3520 men and 3316 women. The age distribution was as follows: 48.3% were <55 years, 35.4% were 55–59 years, and 16.3% were 60–65 years old. Mean number of weekly work hours in this sample was 33.2. Table 1 gives the prevalence of the two measures of low quality of work and of intended early retirement according to gender, age, socioeconomic status, and the four measures of well-being. Results indicate that almost half of the sample has considered leaving the job as early as possible, with higher prevalence among participants with low socioeconomic status and those with reduced well-being. The prevalence of intended retirement varies across countries from 29.7% in The Netherlands to 67.2% in Spain (results not shown). Low socioeconomic status and reduced well-being are strongly related to both indicators of poor quality of work.

Next, logistic models were calculated where odds ratios of intended early retirement were estimated in four consecutive models, using the total sample of 6836 participants with complete data. The first model was restricted to gender, age, and the two socioeconomic variables. Men were somewhat more likely than women to think about early retirement. The same was true for the age group 55–59, whereas among those aged >60 this was less often the case. Low education was associated with intended early exit from work. In the second model, the two indicators of poor quality of work were entered simultaneously. In either case, poor quality of work was strongly related to intended early retirement. No significant interaction effect was found (results not shown). In model III the four indicators of well-being were all related to an elevated risk of intended early retirement. It should also be noted that adding quality of work to the model (model II) contributes more to the model fit than adding well-being (model III). In model IV, all variables were analysed simultaneously. Interestingly, the odds ratios of poor quality of work remained almost unchanged, as was the case for well-being indicators. In model IV the relatively best model fit is observed. Results indicate that poor quality of work and reduced well-being represent two conditions that are independently associated with intended early retirement.

Finally, the association between quality of work and intended early retirement was analysed at country level using the significant variables of model IV. Results given in figure 1 demonstrate that in almost all countries odds ratios of the two indicators exceed the value of 1.0, although not always at a significant level, given large confidence intervals.

Table 1 Prevalence (%) of poor quality of work (effort–reward imbalance; low control), intended retirement by socio-demographic variables, and reduced well-being[a] (all countries; $N = 6836$)

Variables	Quality of work		
	Effort–reward imbalance	Low control	Intended retirement
Overall prevalence	30.7	42.6	48.7
Gender			
Male	30.8	40.4	49.5
Female	30.6	45.7	47.6
Age			
<55 years	30.4	42.9	47.6
55–59 years	32.3	43.9	51.8
60–65 years	28.1	39.3	44.6
Education			
Low education	36.5	57.2	57.6
Medium education	31.7	44.4	48.0
High education	23.4	25.0	40.3
Income			
Low income	33.7	54.2	50.3
Medium Income	31.4	46.8	50.4
High income	28.8	34.0	46.8
Self-perceived health			
Less than good	41.7	53.7	62.7
Good or better	27.6	39.5	44.8
CES-D upper tertile[a]			
Yes	44.9	53.2	56.9
No	25.6	36.7	45.7
CASP lower tertile[a]			
Yes	40.8	52.8	54.6
No	26.3	35.7	46.0
Symptoms (two or more)			
Yes	39.0	47.0	57.5
No	28.0	41.3	45.9

a: Tertiles calculated for each country separately

Discussion

This report based on the first public release version of data from the SHARE study documents independent associations of two measures of poor quality of work, effort–reward imbalance and low control, with intended early retirement in older employed men and women in 10 European countries. Findings show that this association remains almost unchanged after adjustment for indicators of reduced well-being. In other words, the results show that quality of work and well-being are independently associated with the intention to retire as early as possible. Elevated odds ratios are consistent across the countries and cannot be attributed to socio-demographic or socioeconomic influences. Findings support previous observations of an impact of poor quality of work on thoughts or intentions to quit the job prematurely.[6,9] However, to our knowledge for the first time, this association was demonstrated on the basis of two theoretical models of a health adverse psychosocial work environment, effort–reward imbalance and demand-control (control only), and across a range of European countries with different social policies and retirement regulations (table 2).

One interpretation of these results claims that the consistency of associations between different measures is due to common method variance.[33] Yet, additional analyses adjusting for psychological characteristics such as optimism or pessimism did not change the results in substantial ways.

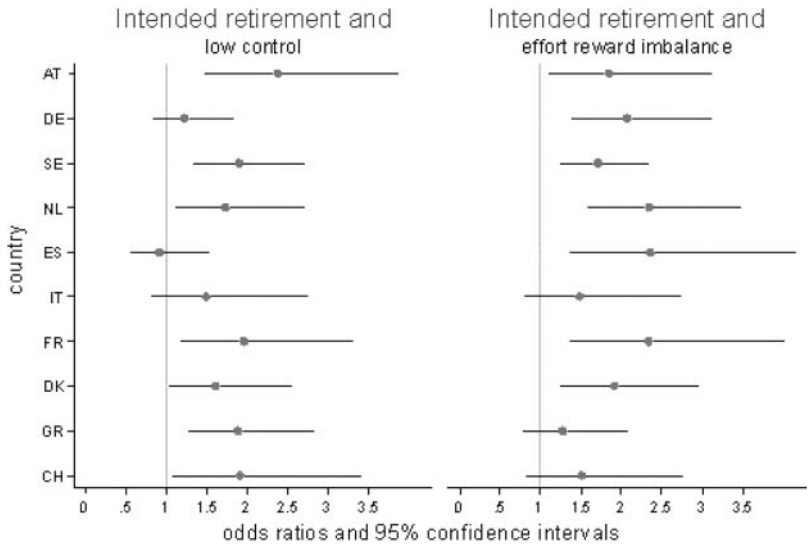

Figure 1 Association of poor quality of work (low control/effort–reward imbalance) with intended retirement, by country (Austria, AT; Germany, DE; Sweden, SE; The Netherlands, NL; Spain, ES; Italy, IT; France, FR; Denmark, DK; Greece, GR; Switzerland, CH) (odds ratios and 95% confidence intervals).

Supplementary analyses demonstrate that the association of poor quality of work with early retirement varies between northern and southern European countries, particularly in employed women. In southern countries, odds ratios of intended early retirement according to effort–reward imbalance at work are almost absent whereas they are pronounced in countries such as Denmark, The Netherlands, France, and Germany. It is more likely that this difference is interpreted in terms of gender role variations between northern and southern European countries than in terms of an unmeasured response bias.

Our results on associations of poor quality of work with reduced well-being are in line with those reported in earlier studies on depressive symptoms,[34–36] poor self-rated health,[37,38] symptom load,[39] and reduced health functioning.[40] The robustness of these associations is further underlined by a test of convergent validity, comparing the results based on the CES-D measure of depressive symptoms with the ones based on an alternative measure of depression, the EURO D-scale,[41] that was additionally applied. A high consistency between the two measures and respective associations with quality of work was found.

The interpretation of results of this study is restricted by several methodological limitations. First, results are derived from a cross-sectional study design, in combination with the fact that predicting and criterion variables are based on self-report data. Respondents with reduced well-being may be more likely to perceive and report their work as being stressful, or respondents with intended early retirement may justify their reasoning by attributing poor quality to their work. While we cannot rule out the argument of causation, it should be pointed out that results of studies that controlled for factors such as negative affectivity or distinct personality traits were not abolished by these latter adjustments.[16,17] Once panel data of the SHARE study will be available, it will be easier to answer this problem. Prospective information will also enable us to evaluate the relationship between intended early retirement and real retirement decisions.

A second limitation concerns the measure of the two work stress models and the statistical analyses performed with these variables. Clearly, a full test of the original scales of the two work stress models would have strengthened the case, but measurement constraints did not allow for this. The fact that one important dimension was omitted in each model ('demand' in the demand-control model; 'overcommitment' in the effort–reward imbalance model) points to a conservative estimate of observed effects. This is particularly the case for the demand-control model where at least one study showed a significant interaction term of the two components on thoughts about early retirement.[9] Although the shortened versions of the scales included in this analysis are subject to criticism, several previous large-scale studies, mostly prospective ones, were forced to use abbreviated versions or proxy measures of the scales measuring the two models and, nevertheless, produced substantial new results.[16,17,42] The decision of using the ratio of the effort and reward indicators was taken in accordance with previous studies where the effect size of the ratio exceeded that of single variables.[15,19,36–38]

Third, although the overall sample is large and represents the population of the respective age groups within countries quite well,[20] survey participation was not very high. The unweighted country-average of household response rate was 55.4% for the total sample, with considerable variations between countries (e.g. The Netherlands 61.6%, Switzerland 37.6%). Although this is above average by European standards, we cannot rule out that an unobserved selection bias affects reported results. We have no information about a healthy worker effect that may bias the findings although, in this case, underestimation rather than overestimation of the reported association is likely to occur due to the fact that employees suffering from health adverse work stress are underrepresented. Concerning socio-demographic representation comparative analysis showed that the final SHARE sample is well comparable with samples from three other prominent European surveys.[20] Finally, gender-specific differences in statutory retirement age may produce a small bias of results, although at least in 6 of the 10 countries under study this difference does not exist.

These limitations are balanced by several strengths. We tested associations between indicators of two established theoretical models of stressful quality of work with intended early retirement, adjusting for the effects of reduced well-being and major socio-demographic and socioeconomic factors in a large population sample in 10 European countries. The survey was conducted on the basis of a vigorously controlled study protocol, including standard procedures of translating the measures into different languages and of collecting and controlling data.[21]

Finally, what are the policy implications of our findings? Despite large variations in national retirement policies, we

Table 2 Associations of socio-demographic variables, quality of work [effort–reward imbalance (ERI); low control], and reduced well-being with intended early retirement: logistic regression models (odds ratios and 95% confidence intervals) for all countries ($N = 6836$)

	Model			
Variables	**I**	**II**	**III**	**IV**
Gender				
Female	1	1	1	1
Male	1.28 (1.16–1.41)	1.24 (1.12–1.37)	1.44 (1.27–1.62)	1.35 (1.19–1.54)
Age				
<55 years	1	1	1	1
55–59 years	1.13 (1.01–1.26)	1.13 (1.01–1.27)	1.05 (0.91–1.20)	1.05 (0.91–1.21)
60–65 years	0.74 (0.64–0.86)	0.76 (0.65–0.89)	0.61 (0.50–0.73)	0.61 (0.50–0.75)
Education				
Low education	1.63 (1.42–1.87)	1.39 (1.20–1.60)	1.52 (1.28–1.80)	1.33 (1.11–1.59)
Medium education	1.30 (1.14–1.46)	1.23 (1.08–1.40)	1.34 (1.16–1.56)	1.29 (1.11–1.51)
High education	1	1	1	1
Income				
Low income	0.98 (0.86–1.12)	0.92 (0.80–1.05)	0.89 (0.75–1.05)	0.88 (0.73–1.05)
Medium income	1.11 (0.98–1.26)	1.06 (0.93–1.21)	0.99 (0.85–1.15)	0.97 (0.82–1.14)
High income	1	1	1	
Effort–reward imbalance				
Yes		1.79 (1.54–2.08)		1.72 (1.43–2.08)
No		1		1
Low control				
Yes		1.51 (1.31–1.73)		1.51 (1.27–1.80)
No		1		1
Self-perceived health				
Less than good			1.37 (1.15–1.63)	1.30 (1.08–1.56)
Good or better			1	1
CES-D upper tertile[a]				
Yes			1.23 (1.03–1.46)	1.15 (0.96–1.38)
No			1	1
CASP lower tertile[a]				
Yes			1.28 (1.09–1.50)	1.21 (1.03–1.43)
No			1	1
Symptoms (two or more)				
Yes			1.28 (1.10–1.50)	1.27 (1.08–1.49)
No			1	1
Mc Faddens Adj. R^2	0.044	0.072	0.060	0.088

a: Tertiles calculated for each country separately

find a consistent association of poor quality of work with a desire to depart from work as early as possible. Moreover, poor quality of work is related to reduced well-being in older employees. If corroborated by prospective evidence, these findings underline the need to improve quality of work as a means of motivating elderly employees to stay at work. Investments into better quality of work provide additional pay-off as they were shown to reduce sickness absence and ill health.[11] Such investments can be guided by insights into stressful components of an adverse psychosocial work environment that need to be reduced. Increasing control at work and increasing economic and non-economic rewards in accordance with employees' achievements are practical measures that contribute to an improved quality of work. It is hoped that an implementation of such measures may

ultimately result in marked reductions of early retirement from regular work across Europe.

Acknowledgements

This research has been funded through the 5th framework programme under the project name of AMANDA ('Advanced Multidisciplinary Analysis of New Data on Ageing', QLK6-CT-2002–002426). The SHARE data collection has been primarily funded by the European Commission through the 5th framework programme (project QLK6-CT-2001-00360 in the thematic programme Quality of Life programme area). Additional funding came from the US National Institute on Ageing (U01 AG09740-13S2, P01 AG005842, P01 AG08291, P30 AG12815, Y1-AG- 4553-01, and OGHA 04–064). Data collection in Austria (through the Austrian Science Foundation, FWF), Belgium (through the Belgian Science Policy Administration), and Switzerland (through BBW/OFES/UFES) was nationally funded. The SHARE dataset is introduced in Börsch-Supan *et al.* (2005); methodological details are contained in Börsch-Supan and Jürges (2005).

Conflict of interest: None.

Key points

- Is there an association between poor quality of work and intended early retirement of older employees across European countries?
- Effort–reward imbalance and low control at work are consistently associated with intended premature retirement.
- In view of an aging workforce findings call for theory-based improvements of quality of work.

References

1 Brugiavini A. Early retirement in Europe. *Eur Rev* 2001;9:501–15.

2 Gruber J, Wise D. *Social Security and Retirement Around the World.* Chicago: University of Chicago Press, 1999.

3 Krause N, Lynch J, Kaplan GA, et al. Predictors of disability retirement. *Scand J Work Environ Health* 1997;23:403–13.

4 Blekesaune M, Solem PE. Working conditions and early retirement—a prospective study of retirement behavior. *Res Aging* 2005;27:3–30.

5 Henkens K, Tazelaar F. Early retirement of civil-servants in The Netherlands. *J Appl Soc Psychol* 1994;24:1927–43.

6 Mein G, Martikainen P, Stansfeld SA, et al. Predictors of early retirement in British civil servants. *Age Ageing* 2000;29:529–36.

7 Ekerdt DJ, DeViney S. Evidence for a preretirement process among older male workers. *J Gerontol* 1993;48:35–43.

8 Norregaard C. Retirement from work. The recent lowering of retirement age—causes and consequences. *Dan Med Bull* 1992;39:244–46.

9 Elovainio M, Forma P, Kivimaki M, et al. Job demands and job control as correlates of early retirement thoughts in Finnish social and health care employees. *Work Stress* 2005;19:84–92.

10 Cooper C, editor. *Theories of Organizational Stress.* Oxford: Oxford University Press, 1998.

11 Antoniou AS, Cooper C, editors. *Research Companion to Organizational Health Psychology.* Chelterham: Edward Elgar Publishers, 2005.

12 Karasek R, Theorell T. *Healthy Work.* New York: Basic Books, 1990.

13 Karasek R, Brisson C, Kawakami N, et al. The Job Content Questionnaire (JCQ): an instrument for internationally comparative assessments of psychosocial job characteristics. *J Occup Health Psychol* 1998;3: 322–55.

14 Siegrist J, Starke D, Chandola T, et al. The measurement of effort-reward imbalance at work: European comparisons. *Soc Sci Med* 2004;58:1483–99.

15 Siegrist J. Adverse health effects of high-effort/low-reward conditions. *J Occup Health Psychol* 1996;1:27–41.

16 Marmot M, Siegrist J, Theorell T. Health and the psychosocial environment at work. In: Marmot M, Wilkinson R, editors. *Social Determinants of Health.* Oxford: Oxford University Press, 2006: 97–130.

17 Belkic KL, Landsbergis PA, Schnall PL, Baker D. Is job strain a major source of cardiovascular disease risk? *Scand J Work Environ Health* 2004;30:85–128.

18 Tsutsumi A, Kawakami N. A review of empirical studies on the model of effort-reward imbalance at work: reducing occupational stress by implementing a new theory. *Soc Sci Med* 2004;59:2335–59.

19 van Vegchel N, de Jonge J, Bosma H, Schaufeli W. Reviewing the effort-reward imbalance model: drawing up the balance of 45 empirical studies. *Soc Sci Med* 2005;60:1117–31.

20 Börsch-Supan A, Brugiavini A, Jürges H, et al. editors. *Health, Ageing and Retirement in Europe. First Results from the Survey of Health, Ageing and Retirement in Europe.* Mannheim: Mannheim Research Institute for the Economics of Ageing, 2005.

21 Börsch-Supan A, Jürges H. *The Survey of Health, Aging and Retirement in Europe—Methodology.* Mannheim: Mannheim Research Institute for the Economics of Ageing, 2005.

22 Schnall P, Belkic K, Landsbergis P, Baker D, editors. The workplace and cardiovascular disease. *Occup Med* 2000;15:1–334.

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

24 Irwin M, Artin KH, Oxman MN. Screening for depression in the older adult: criterion validity of the 10-item Center for Epidemiological Studies Depression Scale (CES-D). *Arch Intern Med* 1999;159:1701–4.

25 Radloff LS. The CES-D scale: a self report depression scale for research in the general population. *Appl Psychol Meas* 1977;1:385–401.

26 van Wijk CMTG, Kolk AM. Sex differences in physical symptoms: The contribution of symptom perception theory. *Soc Sci Med* 1997;45: 231–46.

27 Hyde M, Wiggins RD, Higgs P, Blane DB. A measure of quality of life in early old age: the theory, development and properties of a needs satisfaction model (CASP-19). *Aging Ment Health* 2003;7:186–94.

28 von dem Knesebeck O, Hyde M, Higgs P, et al. Quality of life and well-being. In: Börsch-Supan A, Brugiavini A, Jürges H, Mackenbach J, Siegrist J, Weber G, editors. *Health, Ageing and Retirement in Europe. First Results from the Survey of Health, Ageing and Retirement in Europe.* Mannheim: Mannheim Research Institute for the Economics of Ageing, 2005:199–203.

29 Hoffmeyer-Zlotnik JHP, Wolf C. *Advances in Cross-National Comparison: A European Working Book for Demographic and Socio-Economic Variables.* New York: Kluwer Academic Publishers, 2004.

30 White H. A heteroskedasticity-consistent covariance matrix estimator and a direct test for heteroskedasticity. *Econometrica* 1980;48:817–30.

31 Rogers WH. Regression standard errors in clustered samples. *Stata Technical Bulletin* 1993;13:19–23.

32 Long JS, Freese J. *Regression Models for Categorical Dependent Variables Using Stata, Revised Edition.* College Station: Stata Press, 2003.

33 Chen PY, Spector PE. Negative affectivity as the underlying cause of correlations between stressors and strains. *J Appl Psychol* 1991;76: 398–407.

34 Niedhammer I, Goldberg M, Leclerc A, et al. Psychosocial factors at work and subsequent depressive symptoms in the Gazel cohort. *Scand J Work Environ Health* 1998;24:197–205.

35 Stansfeld SA, Fuhrer R, Shipley MJ, Marmot MG. Work characteristics predict psychiatric disorder: prospective results from the Whitehall II Study. *Occup Environ Med* 1999;56:302–7.

36 Pikhart H, Bobak M, Pajak A, et al. Psychosocial factors at work and depression in three countries of Central and Eastern Europe. *Soc Sci Med* 2004;58:1475–82.

37 Godin I, Kittel F, Coppieters Y, Siegrist J. A prospective study of cumulative job stress in relation to mental health. *BMC Public Health* 2005;5:67–77.

38 Niedhammer I, Tek ML, Starke D, Siegrist J. Effort-reward imbalance model and self-reported health: cross-sectional and prospective findings from the GAZEL cohort. *Soc Sci Med* 2004;58:1531–41.

39 Dragano N, Verde PE, Siegrist J. Organisational downsizing and work stress: testing synergistic health effects in employed men and women. *J Epidemiol Community Health* 2005;59:694–99.

40 Stansfeld SA, Bosma H, Hemingway H, Marmot M. Psychosocial work characteristics and social support as predictors of SF-36 health functioning: the Whitehall II study. *Psychosom Med* 1998;60: 247–55.

41 Dewey ME, Prince MJ. Mental health. In: Börsch-Supan A, Brugiavini A, Jürges H, Mackenbach J, Siegrist J, Weber G, editors. *Health, Ageing and Retirement in Europe. First Results from the Survey of Health, Ageing and Retirement in Europe*. Mannheim: Mannheim Research Institute for the Economics of Ageing, 2005:108–17.

42 Kivimaki M, Leino-Arjas P, Luukkonen R, et al. Work stress and risk of cardiovascular mortality: prospective cohort study of industrial employees. *BMJ* 2002;325:857.

Received 27 September 2005, accepted 24 April 2006