3. Chen LT, Lee JA, Chua BS, Howe TS. Hip fractures in the elderly: the impact of comorbid illnesses on hospitalization costs. Ann Acad Med Singapore 2007; 36: 784–7.
4. Aharonoff GB, Barsky A, Hiebert R, Zuckerman JD, Koval KJ. Predictors of discharge to a skilled nursing facility following hip fracture surgery in New York State. Gerontology 2004; 50: 298–302.
5. Cree AK, Nade S. How to predict return to the community after fractured proximal femur in the elderly. Aust NZ J Surg 1999; 69: 723–5.
6. Gruber-Baldini AL, Zimmerman S, Morrison RS *et al* Cognitive impairment in hip fracture patients: timing of detection and longitudinal follow-up. J Am Geriatr Soc 2003; 51: 1227–36.
7. Heruti RJ, Lusky A, Barell V, Ohry A, Adunsky A. Cognitive status at admission: does it affect the rehabilitation outcome of elderly patients with hip fracture? Arch Phys Med Rehabil 1999; 80: 432–6.
8. Lenze EJ, Munin MC, Dew MA *et al* Adverse effects of depression and cognitive impairment on rehabilitation participation and recovery from hip fracture. Int J Geriatr Psychiatry 2004; 19: 472–8.
9. Greenspan SL, Myers ER, Kiel DP, Parker RA, Hayes WC, Resnick NM. Fall direction, bone mineral density, and function: risk factors for hip fracture in frail nursing home elderly. Am J Med 1998; 104: 539–45.
10. Malone DC, McLaughlin TP, Wahl PM *et al* Burden of Alzheimer's disease and association with negative health outcomes. Am J Manag Care 2009; 15: 481–8.
11. Melton LJ, Beard CM, Kokmen E, Atkinson EJ, O'Fallon WM. Fracture risk in patients with Alzheimer's disease. J Am Geriatr Soc 1994; 42: 614–9.
12. Ranstam J, Elffors L, Kanis JA. A mental-functional risk score for prediction of hip fracture. Age Ageing 1996; 25: 439–42.
13. van Staa TP, Leufkens HGM, Cooper C. Utility of medical and drug history in fracture risk prediction among men and women. Bone 2002; 31: 508–14.
14. Weller I, Schatzker J. Hip fractures and Alzheimer's disease in elderly institutionalized Canadians. Ann Epidemiol 2004; 14: 319–24.
15. Johansson C, Skoog I. A population-based study on the association between dementia and hip fractures in 85-year olds. Aging Clin Exp Res 1996; 8: 189–96.
16. Nightingale S, Holmes J, Mason J, House A. Psychiatric illness and mortality after hip fracture. Lancet 2001; 357: 1264–5.
17. Hasegawa Y, Suzuki S, Wingstrand H. Risk of mortality following hip fracture in Japan. J Orthop Sci 2007; 12: 113–7.
18. Morris JC, Rubin EH, Morris ED, Mandel SA. Senile dementia of the Alzheimer's type: an important risk factor for serious falls. J Gerontol 1987; 42: 412–7.
19. Johnson DK, Consuelo HW, Morris JC. Accelerated weight loss may precede diagnosis in Alzheimer disease. Arch Neurol 2006; 63: 1312–7.
20. National Institute for Clinical Excellence (NICE). Clinical practice guideline for the assessment and prevention of falls in older people. http://www.nice.org.uk/nicemedia/pdf/CG021fullguideline.pdf (accessed 30 November 2009).

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Common health predictors of early retirement: findings from the English Longitudinal Study of Ageing

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Abstract

Background: facing the costs of population ageing, many governments aim to keep older people in employment for longer. Summary health measures predict early retirement, but more specific symptoms and conditions need to be identified to guide efforts to delay retirement.

Objective: to identify common symptoms and conditions that predict early work exit, at the population level.
Design: cohort study of community dwelling respondents to the English Longitudinal Study of Ageing.
Setting and participants: a total of 1,693 workers aged 50 and over at baseline who were younger than the contemporaneous retirement age (60 for women, 65 for men) at 4-year follow-up.
Results: a total of 308 (18.2%) individuals moved out of employment during the follow-up period. Advancing age, female gender, partner retirement, greater pension wealth, high alcohol consumption and fair or poor self-rated health were all associated with work exit. Accounting for these factors, reported difficulty walking a quarter mile was predictive of early work exit (odds ratio (OR) = 2.23; 95% confidence interval (CI) 1.42–3.52), especially where symptoms included lower limb pain and/or shortness of breath. Symptomatic depression (measured by Centre for Epidemiological Studies Depression scale) was also predictive of early work exit (OR = 1.52, CI 1.07, 2.18). About 50.8% of early retirees reported one or more of these specific health symptoms (depression, general pain, mobility limitations and leg pain when walking).
Conclusion: older workers who report depressive symptoms or impaired physical mobility, especially with lower limb pain and shortness of breath, are at increased risk of early transition out of work. Health interventions targeting these conditions may enable older workers to remain in the labour force.

Keywords: *early retirement, signs and symptoms, mobility limitation, pain, depression, elderly*

Introduction

Recent trends in population ageing and earlier work exit across the Organisation for Economic Co-operation and Development countries [1] have led to claims that future pension costs will be unsustainable [2]. Governments have therefore sought ways of encouraging older workers to stay in employment for a longer period [3]. Policy has been targeted at raising the effective retirement age by restricting access to early retirement schemes and/or reducing generosity of benefits [4].

Although poor health is a contributor to early work exit [5], relatively little attention has been paid to defining the potentially preventable or treatable symptoms of health-related conditions involved in early work exit at the national population level. The role of health status as a predictor of retirement has long been recognised: studies in the 1970s found health-related work limitation to be highly predictive of early retirement [6] and self-rated health has been cited as a significant predictor of early retirement [7]. Occupational studies such as the Whitehall II Study of British civil servants [8] and population-based cohort studies (for example Haahr *et al.* [9]) have reported poor health as predictive of early work exit. However, little population-based prospective research has been conducted to identify the specific symptoms and diseases related to early retirement, and this is clearly a prerequisite for interventions to prevent or manage the conditions that promote early work exit.

Work exit and retirement decision-making is influenced by a wide range of factors besides individual health [10]. Individual finance—in particular, pension wealth—is an important factor in early retirement [11]. Many studies have linked individual work factors such as personal attitudes to retirement, job satisfaction, poor working conditions and job demands and control, with early work exit and retirement planning [8, 12]. Dynamics within households are also important: partners' pension wealth and retirement decisions [13] and marital status [14] influence individuals' decisions. In addition, recent studies have suggested relationships between social networks and early retirement [15] and childhood adversities and early disability retirement [16].

We consider whether specific aspects of poor health and functional limitations of middle-aged workers at baseline are predictive of transitions out of employment during a 4-year follow-up, independent of pension wealth and other risk factors. The English Longitudinal Study of Ageing (ELSA) is a population-based study with contemporary data on health and work activities of middle-aged and older workers [17].

Methods

Data were from ELSA at baseline (in 2002), and from the 2- and 4-year follow-up waves (in 2004 and 2006). ELSA surveys people aged 50 and over living in private households in England and is described in detail elsewhere [17]. We restricted our analyses to respondents who were employed at baseline, present at both ELSA follow-ups, and aged below the contemporaneous state pension age for this cohort at 4-year follow-up (i.e. men under 65 and women under 60 years).

Employment status

Respondents were asked to choose the best description of their current situation: retired; employed; self-employed; unemployed; permanently sick or disabled; looking after home or family or other. We classified individuals as being in work if they answered 'employed' or 'self-employed', and not in work otherwise. Individuals who did not answer this question at baseline were excluded from our analyses (n = 54). Our outcome measure classified respondents into those who made the transition from working at baseline to not working at 4-year follow-up, and those who remained in employment throughout.

Baseline health predictors

We considered the following baseline self-reported health measures: general health (excellent, very good or good versus fair or poor); long-standing limiting illness (any long-standing illness, disability or infirmity which limits activities); activities of daily living (ADLs) (difficulty with any of the following: dressing; walking across a room; bathing or showering; eating; getting in or out of bed and, using the toilet); instrumental ADLs (IADLs) (difficulty with any of the following: map reading; preparing a hot meal; shopping for groceries; making telephone calls; taking medications; doing work around the house or garden; managing money).

Diagnosed diseases

Respondents were asked whether a doctor had ever told them that they have (or have had) any cardiovascular or chronic conditions. We restricted our analyses to conditions with a prevalence of 10% or more (asthma, hypertension, arthritis and any heart condition (from: angina; heart attack; congestive heart failure; heart murmur; abnormal heart rhythm; other heart trouble)). We also considered those with no diagnosed conditions compared with those with one, two or three or more conditions.

Baseline symptoms of poor health

Mobility problems

Respondents were asked about difficulties they had walking a quarter of a mile unaided. We dichotomised responses to compare individuals reporting no difficulty with those reporting any degree of difficulty or being 'unable to do this'. Respondents with problems were asked to choose which symptoms made walking difficult from a show-card of 17 symptoms, including leg or foot pain and shortness of breath.

Pain

Respondents were asked whether they were often troubled with pain, and if so to rate the severity of the pain (from 0 to 10) in their back, hips, knees and feet, when walking. We considered symptomatic pain when walking as a dichotomous variable (no pain versus any pain) and trends for pain severity. We also considered responses to questions about claudication, including whether individuals experienced pain in either leg that comes on when walking.

Depression

ELSA included the validated eight-item version of the Centre for Epidemiological Studies Depression (CES-D) symptoms index [18]. We considered three or more symptoms as identifying depression in line with previous studies that have used the eight-item scale [19].

Confounders of early work exit

Individuals were asked about income, wealth and pensions. We used the ELSA-derived financial variables to create baseline measures for net total (non-pension) wealth; pension wealth (private plus state pensions) assuming retirement at the state pension age, and income from employment.

We also considered the following factors as potential confounders for early work exit: partner retirement (whether respondents had a partner who retired during the follow-up period); education; activity level of job; smoking status; alcohol consumption frequency; body mass index.

Statistical modelling

All modelling was conducted in STATA version 10.1. We considered the predictive effects of potential confounders on risk of early retirement, in individual age- and sex-adjusted logistic regression models. Any traits with significant associations with $P < 0.1$ were included in a fully adjusted multivariable regression model. We used a backwards stepwise elimination procedure to select a more parsimonious model, using multi-parameter Wald tests to establish strength of association with each stage of the model selection. Final model covariates included: age; gender; individual pension wealth; alcohol consumption; self-rated health and partner retirement. The predictive effects of pain, mobility limitations and symptoms of depression were assessed by adding baseline measures of these symptoms to the derived model described above.

As in any such longitudinal study, attrition is a potential weakness of the ELSA study: if the characteristics of individuals who drop out of the study differ from those remaining in the study, inferences drawn at the population level may not be valid. To account for attrition, ELSA created longitudinal weights for individuals who were present at all three waves. These weights were based on a sequence of attrition models for each wave, which is multiplied by the weight created at the previous wave. The sequential nature of the weighting attempts to reduce any bias arising between each wave of ELSA. In addition to using survey weights to account for attrition, we tested whether the baseline outcomes investigated were different in our sample (baseline workers present at all study waves) compared with the baseline workers who dropped out of the study.

Results

There were 2,675 ELSA respondents who were working at baseline and would have been younger than the state pension age at 4-year follow-up. Of these, 1,693 answered questions on employment activity at both follow-up waves and these individuals formed the sample members for our analyses. In age- and sex-adjusted analyses accounting for attrition, we found no difference in any of the main

Table 1. Survey-weighted basic characteristics and health risks of ELSA sample members, and survey-weighted, age- and sex-adjusted ORs for early work exit

	Number	*n*	Control group: remaining in work	Transition group: moving out of work	OR, *P*-value
			1,385	308	1,693
	Age (years)	1,693	53.6 (53.5–53.7)	54.6 (54.3–54.9)	1.18, $P < 0.001$
	Gender (female)	658	38.1% (35.5–40.7%)	36.0% (30.7–41.7%)	1.27, $P = 0.114$
	Has partner who retires during 4-year follow-up	168	7.60% (6.30–9.10%)	18.4% (14.4–23.2%)	2.51, $P < 0.001$
	Underweight/normal (<25)	452	0.27% (0.24–0.29%)	0.24% (0.20–0.29%)	1
Body mass index (kg/m^2)	Overweight (25–30)	768	0.46% (0.43–0.48%)	0.45% (0.39–0.51%)	1.06, $P = 0.740$
	Obese (>30)	449	0.26% (0.24–0.29%)	0.29% (0.24–0.35%)	1.21, $P = 0.303$
	Missing	24	0.01% (0.01–0.02%)	0.01% (0.01–0.04%)	0.98, $P = 0.968$
	Never smoker	644	0.38% (0.35–0.40%)	0.38% (0.33–0.44%)	1
Smoking status	Ex-smoker	715	0.42% (0.39–0.45%)	0.38% (0.33–0.44%)	0.82, $P = 0.185$
	Current smoker	331	0.20% (0.18–0.23%)	0.23% (0.18–0.28%)	1.07, $P = 0.714$
	Missing	3	0.00% (0.00–0.01%)	0.00% (0.00–0.02%)	1.16, $P = 0.887$
	Never/special occasions	262	0.17% (0.15–0.19%)	0.14% (0.10–0.18%)	1
Alcohol consumption (frequency of drinking in past 12 months)	Once/twice per week/month	861	0.50% (0.47–0.53%)	0.54% (0.49–0.60%)	1.40, $P = 0.093$
	Daily or almost daily	508	0.30% (0.27–0.32%)	0.26% (0.21–0.31%)	1.06, $P = 0.790$
	Twice a day or more	59	0.03 (0.02%–0.04%)	0.06% (0.04–0.10%)	2.55, $P = 0.006$
	Missing	3	0.00% (0.00–0.01%)	0.00% (0.00–0.02%)	1.57, $P = 0.668$
	Excellent, very good or good	1,486	89.4% (87.6–91.0%)	79.1% (74.0–83.5%)	1
Self-rated general health	Fair or poor	203	10.4% (8.80–12.1%)	20.7% (16.3–25.8%)	2.14, $P < 0.001$
	Missing	4	0.20% (0.00–0.80%)	0.20% (0.00–1.60%)	n/a
	No	1,391	84.2% (82.1–86.0%)	74.8% (69.5–79.5%)	1
Self-reported longstanding limiting illness	Yes	301	15.8% (13.9–17.8%)	25.2% (20.5–30.5%)	1.73, $P < 0.001$
	Missing	1	0.10% (0.00–0.40%)	0	n/a
	No difficulties	1,589	94.4% (93.0–95.5%)	91.7% (87.9–94.3%)	1
Activities of daily living	Difficulty with one or more	101	5.50% (4.40–6.90%)	8.10% (5.50–11.8%)	1.45, $P = 0.138$
	Missing	3	0.20% (0.00–0.60%)	0.20% (0.00–1.60%)	n/a
	No difficulties	1,598	95.1% (93.8–96.1%)	91.1% (87.1–93.9%)	1
Instrumental activities of daily living	Unable-do one or more	92	4.80% (3.80–6.10%)	8.70% (5.90–12.7%)	1.96, $P = 0.011$
	Missing	3	0.20% (0.00–0.60%)	0.20% (0.00–1.60%)	n/a
	Asthma	166	8.40% (7.10–10.0%)	12.3% (9.00–16.5%)	1.48, $P = 0.051$
	Arthritis	304	17.1% (15.2–19.2%)	20.2% (15.9–25.2%)	1.15, $P = 0.407$
Self-reported physician diagnosis of…	High blood pressure/ hypertension	450	26.2% (23.9–28.7%)	26.9% (22.2–32.3%)	0.93, $P = 0.633$
	Any heart problem[a]	176	9.60% (8.10–11.3%)	13.4% (9.90–17.8%)	1.32, $P = 0.167$
	Any diagnosed condition[b]	933	53.4% (50.7–56.1%)	57.0% (51.2–62.6%)	1.06, $P = 0.658$
	None	760	46.6% (43.9–49.3%)	43.0% (37.4–48.8%)	1
Number of diagnosed conditions	1	584	34.9% (32.4–37.5%)	30.1% (25.1–35.5%)	0.88, $P = 0.420$
	2	261	14.1% (12.4–16.1%)	18.7% (14.7–23.6%)	1.28, $P = 0.180$
	3 or more	88	4.40% (3.40–5.60%)	8.20% (5.50–12.0%)	1.71, $P = 0.045$

[a]Any heart condition: any diagnosis of angina, heart attack, heart murmur, congestive heart failure, abnormal heart rhythm or other heart trouble.
[b]One or more diagnoses of: arthritis, osteoporosis, asthma, chronic lung disease, emotional problems, Alzheimer's disease, Parkinson's disease, dementia, cancer, high blood pressure or hypertension, stroke, diabetes and any heart condition.

outcomes considered in our study between our sample and baseline workers who dropped out of the study.

The ratio of men to women in employment at baseline was nearly 2:1 (Table 1). Between baseline and follow-up, 308 (18.2%) individuals made the transition out of work into other categories of non-working (retirement 63.3%; permanently sick or disabled 15.9%; looking after family or home 11.4%; or unemployed 9.4%).

In individual weighted regression analyses of potential confounders, adjusting for baseline age and gender, the following factors were significant predictors of early work exit: pension wealth (Table 2); increasing age; partner retirement; high alcohol consumption; fair or poor self-rated health; limiting long-standing illness; IADL difficulties; diagnosed asthma; having three or more doctor diagnosed conditions (Table 1). The stepwise procedure eliminated the last four of these factors from the final multivariable model. Gender was significant in fully adjusted models with women more likely to exit work early than men (odds ratio (OR) = 1.37; 95% confidence interval (CI) 1.01–1.87).

In fully adjusted logistic regression analyses, the odds of early work exit was higher for individuals with symptomatic depression (OR = 1.52; 95% CI 1.07–2.18). The OR for those with functional limitations, i.e. difficulties walking a quarter of a mile, was 2.23 (95% CI 1.42–3.52), and for the main symptoms associated with walking difficulties: pain in leg or foot OR = 2.33 (95% CI 1.41–3.84); shortness of breath OR = 4.24 (95% CI 1.83–9.80) (Table 3).

Table 2. Individual socio-economic characteristics of ELSA sample members which have previously been linked to early retirement, and survey-weighted, age- and sex-adjusted ORs for early work exit

	Number	*n*	Control group: remaining in work 1,385	Transition group: moving out of work 308	OR, *P*-value 1,693
Individual pension wealth quintiles (assuming retirement at normal SPA)	<£79K	334	21.1% (18.9–23.4%)	18.8% (14.6–23.8%)	1
	£79K–£113.5K	339	21.6% (19.4–23.9%)	16.5% (12.7–21.3%)	0.86, $P = 0.505$
	£113.5K–£182K	338	21.0% (18.8–23.3%)	17.7% (13.7–22.6%)	0.92, $P = 0.702$
	£182K–£282.9K	341	19.3% (17.3–21.5%)	19.4% (15.4–24.2%)	1.12, $P = 0.606$
	£282.9M–£1.85M	341	17.0% (15.2–19.1%)	27.6% (22.8–33.0%)	1.88, $P = 0.002$
Net total wealth (not including pension wealth) quintiles[a]	<£41.5	333	0.22% (0.20–0.24%)	0.19% (0.15–0.24%)	1
	£41.5K–£83K	335	0.21% (0.19–0.23%)	0.19% (0.15–0.24%)	1.04, $P = 0.844$
	£83K–£135.3K	343	0.20% (0.18–0.23%)	0.18% (0.14–0.23%)	1.02, $P = 0.913$
	£135.3K–£234.5K	330	0.18% (0.16–0.20%)	0.19% (0.15–0.24%)	1.23, $P = 0.335$
	£234.5K+	331	0.18% (0.16–0.20%)	0.23% (0.19–0.28%)	1.48, $P = 0.060$
	Missing	21	0.01% (0.01–0.02%)	0.02% (0.01–0.04%)	1.61, $P = 0.416$
Total weekly equivalised income from current employment (including self-employment) in quintiles[a]	<£150 per week	335	0.19% (0.17–0.22%)	0.23% (0.18–0.28%)	1
	£150–£230	334	0.21% (0.19–0.23%)	0.18% (0.14–0.23%)	0.74, $P = 0.148$
	£230–£300	337	0.21% (0.19–0.23%)	0.16% (0.13–0.21%)	0.67, $P = 0.057$
	£300–£403	332	0.19% (0.17–0.21%)	0.20% (0.16–0.25%)	0.95, $P = 0.815$
	£403 + per week	334	0.19% (0.17–0.21%)	0.21% (0.17–0.26%)	0.98, $P = 0.935$
	Missing	21	0.01% (0.01–0.02%)	0.02% (0.01–0.04%)	1.22, $P = 0.733$
Education (top qualification)	Degree/higher	646	34.7% (32.2–37.2%)	37.7% (32.4–43.3%)	1
	Intermediate	709	42.6% (39.9–45.3%)	37.0% (31.7–42.7%)	0.80, $P = 0.131$
	No qualifications	338	22.7% (20.4–25.2%)	25.3% (20.4–30.9%)	0.99, 0.976
Activity level of job	Sedentary	699	40.3% (37.6–42.9%)	38.5% (33.1–44.2%)	1
	Standing	503	29.4% (27.0–31.9%)	29.0% (24.1–34.4%)	1.01, $P = 0.932$
	Physical	378	23.2% (20.9–25.6%)	25.1% (20.4–30.5%)	1.07, $P = 0.677$
	Heavy manual	103	7.0% (5.7–8.7%)	5.9% (3.6–9.5%)	0.85, $P = 0.582$
	Missing	7	0.2% (0.0–0.6%)	1.5% (0.6–3.7%)	10.4, $P = 0.008$

[a]Equivalised income is derived at the 'benefit unit level'. This is a couple or a single person with any dependent children they may have. Note that the 'benefit unit' is different to a 'financial unit'. A couple who keep their finances separate will be defined as two financial units and each will answer income questions on their own behalf, and ELSA then combines the information reported by each member of the couple to obtain a benefit unit definition of income and wealth.

The prevalence of many of the individual symptoms was too low to draw inferences about their effects.

Being troubled by pain, in general, was not associated with early work exit, although there was evidence of an association with those who experienced knee pain when walking (OR = 1.45; 95% CI 1.02–2.06) (Table 3). Individuals who reported pain or discomfort in either leg which came on when walking were at higher risk (OR = 1.70; 95% CI 1.25–2.32) (Table 3). This finding was robust in sensitivity analyses excluding 39 individuals with symptomatic claudication (defined as having pain in the calf which came on when walking (not at rest) and disappeared within 10min of stopping walking), and in sensitivity analyses adjusting for diagnosed arthritis (Supplementary data are available in *Age and Ageing* online).

There were 50 people who were working at baseline and 4-year follow-up who reported being in a non-working category at 2-year follow-up. Our results were consistent when we removed these individuals.

About 50.8% (95% CI 45.0–56.5%) of individuals who left work early reported one or more of the symptoms considered (depression, pain in general, mobility limitations and leg pain when walking) compared with 42.1% (95% CI 39.4–44.8%) of those who remained in work. The OR for early work exit comparing individuals who reported two or more symptoms with those who reported no symptoms was 1.71 (95% CI 1.20–2.44) (Table 3).

Discussion

In this national sample of ageing workers, we found that symptomatic depression and reported difficulties in physical mobility, particularly caused by lower limb pain, were predictive of premature work exit, independent of self-rated poor health, pension wealth and other identified factors. The contribution of poor self-rated health to early work exit is well known, but to guide efforts to prevent or manage the conditions responsible, more specific data on symptoms and diseases are needed. While there have been occupationally based studies, there have been few studies at the national population level. The ELSA study is uniquely positioned to expand research in the area of health-related employment transitions. For example, previous research using ELSA data identified a link between the retirement transition and smoking cessation [20]. As well as detailed data on work, health and pensions, the study benefits from data on symptoms of health-related conditions, including symptomatic depression (CES-D scale), functional and mobility limitations and musculoskeletal pain.

Table 3. Symptoms of depression and mobility limitations with survey-weighted logistic regression results for early work exit, adjusted for age; gender; individual pension wealth; alcohol consumption; self-rated health and partner retirement

		n	Control group: remaining in work	Transition group: moving out of work	OR (95% CI), *P*-value
Number			1,385	308	1,693
Symptomatic depression (CESD > = 3)		263	14.7% (12.9–16.7%)	20.7% (16.4–25.8%)	1.50 (1.06–2.15), $P = 0.024$
Difficulty walking 1/4 mile (some, much or unable)		116	5.4% (4.3–6.7%)	14.2% (10.6–18.8%)	2.23 (1.42–3.52), $P = 0.001$
Symptoms reported to cause mobility limitation					
Pain in leg or foot		80	3.5% (2.6–4.7%)	10.6% (7.5–14.8%)	2.52 (1.53–4.16), $P < 0.001$
Shortness of breath		39	0.8% (0.5–1.5%)	5.0% (2.9–8.4%)	4.24 (1.83–9.80), $P = 0.001$
Swelling in leg or foot		19	0.8% (0.5–1.5%)	2.3% (1.1–5.1%)	1.78 (0.64–4.97), $P = 0.271$
Fatigue or tiredness		16	0.8% (0.4–1.5%)	1.6% (0.7–4.0%)	1.12 (0.35–3.54), $P = 0.846$
Balance/dizziness/fear of falling		15	0.2% (0.0–0.7%)	4.2% (2.3–7.4%)	19.8 (5.67–68.9), $P < 0.001$
Chest pain		12	0.4% (0.2%–0.9%)	2.8% (1.3–5.8%)	6.09 (1.90–19.5), $P = 0.002$
Any other symptom[a]		28	1.5% (0.9–2.3%)	3.1% (1.6–6.0%)	1.35 (0.55–3.36), $P = 0.512$
Pain/discomfort in either leg when walking		310	16.5% (14.6–18.6%)	27.1% (22.3–32.6%)	1.70 (1.25–2.32), $P = 0.001$
Often troubled by pain		442	25.3% (23.0%–27.7%)	30.3% (25.3–35.9%)	1.13 (0.84–1.51), $P = 0.420$
Any pain when walking on a flat surface[b]		360	20.8% (18.7–23.1%)	24.2% (19.6–29.6%)	1.04 (0.76–1.42), $P = 0.804$
Self-rated pain when walking on a flat surface by site of pain					
Back pain	% with any	228	13.2% (11.5–15.2%)	15.7% (11.9–20.5%)	1.05 (0.72–1.53), $P = 0.799$
	Trend for pain severity (0–10)				1.02 (0.95–1.10), $P = 0.608$
Hip pain	% with any	181	10.0% (8.5–11.7%)	13.8% (10.2–18.3%)	1.13 (0.75–1.71), $P = 0.568$
	Trend for pain severity (0–10)				1.08 (0.99–1.17), $P = 0.095$
Knee pain	% with any	216	11.9% (10.2–13.7%)	18.1% (14.1–23.0%)	1.45 (1.02–2.06), $P = 0.039$
	Trend for pain severity (0–10)				1.06 (0.99–1.14), $P = 0.093$
Foot pain	% with any	161	8.6% (7.2–10.3%)	13.6% (10.1–18.1%)	1.32 (0.88–1.99), $P = 0.185$
	Trend for pain severity (0–10)				1.07 (0.99–1.16), $P = 0.077$
Number of poor health symptoms reported	None		57.1% (54.4–59.8%)	48.8% (43.1–54.6%)	1
	1		26.7% (24.4–29.2%)	25.0% (20.4–30.3%)	1.07 (0.78–1.47), $P = 0.680$
	2 or more		14.8% (13.0–16.9%)	25.3% (20.6–30.7%)	1.71 (1.20–2.44), $P = 0.003$
	Missing		1.4% (0.8–2.3%)	0.8% (0.3–3.0%)	n/a

[a]From: tremor; incontinence or fear of incontinence; seeing difficulty; hearing difficulty; confusion; difficulty concentrating; memory problems; anxiety or fear; some other problem or symptom.
[b]Any report of any degree of pain experienced in back, hip, knee or feet when walking.

Our results confirm previous findings that pension wealth, partner status and self-rated health are predictive of early work exit in this cohort [13]. Banks reported that pre-existing health conditions are not associated with movements out of work, and our analyses of diagnosed conditions confirm this finding. However, our analyses suggest that certain symptoms and conditions are predictive of subsequent transitions out of work.

Many occupational studies have focused on back pain and early work exit. For example, studies of construction workers, and paper factory workers, have found back pain to be predictive of early retirement [21, 22]. These associations may be affected by higher prevalence of work-related musculoskeletal problems in certain occupations [23]. In contrast, a retrospective study of 141 early retirees from a Danish town found back pain to have no significant role in the retirement decision [24]. We found no association with symptomatic back pain and subsequent early retirement in the ELSA cohort in which only 6.1% were in occupations involving heavy manual labour.

A recent study suggested that multi-site musculoskeletal pain is associated with poor work ability and intentions to retire early among older workers [25]. However, our finding that mobility problems— and in particular, lower limb pain —among older workers are predictive of short-term early work exit is novel. Our findings were robust in analyses excluding individuals with symptomatic claudication, and adjusting for diagnosed arthritis, suggesting that associations with lower leg pain were specific to underlying musculoskeletal symptoms rather than pre-existing disability or vascular disease.

Our reported association between baseline depression and early retirement is consistent with previous studies that have considered symptomatic and diagnosed depression [26, 27], and in line with findings from a US study of $n = 2853$ older workers followed up for 8 years in the Health and Retirement Study [19], which uses the same CES-D scale as ELSA. The OR for retirement by symptomatic depression in the US study was 1.55 (1.21–1.99), compared with 1.52 (1.07–2.18) in our study. There is a well-documented strong association between depression and physical illness, and it has been reported that depression, alone or as a co-morbidity, has an extremely deleterious effect on overall health status [28].

A number of points should be kept in mind when considering these results. Our measure of work participation is based on respondents' self-reports, and our measure of retirement does not allow for examination of those who make a gradual transition out of the labour market over a period of time. The transition into retirement can involve a period of 'semi-retirement' where some form of bridge employment may take place [29]. A further consideration is that psychological and psychosocial aspects, such as individual's mood and the possible financial attractions of disability-based retirement, may influence an individual's reporting of symptoms [30]. This factor is probably reduced in our analysis, as data were collected prospectively, before the onset of retirement.

Our analyses account only for frequency of alcohol consumption as detailed data on volumes of alcohol consumed were not available. It should also be noted that although a well-validated indicator of symptomatic depression [18], the CES-D scale is based on an individual's perception of how they have been feeling during the past week, and does not account for factors such as whether the individual was sick leading up to their interview, for example.

In models accounting for attrition, we found no significant differences between our sample and those baseline workers who had dropped out of the study during the 4-year follow-up period for the health symptoms considered in our analyses.

Further research is needed to assess whether our findings are observed in studies with longer periods of follow-up, and whether they hold in other countries where attitudes to, and paths into, retirement may be different. These associations need to be considered in a larger cohort, as accurate estimation of many symptoms was not possible in our sample due to low prevalence.

Conclusion

Workers with more symptoms of lower limb pain and associated mobility difficulties, and more depressive symptoms, are more likely to make an early transition out of work than their 'healthier' counterparts in the short term. Occupational health interventions targeted at older workers with symptoms of depression and lower limb pain and associated mobility difficulties may promote extension of working lives in these groups.

Key points

- Governments are seeking ways of keeping older people in employment for longer.
- Summary health measures predict early retirement, but more specific symptoms and conditions need to be identified.
- We assessed health symptoms and conditions as predictors for early retirement in a group of workers followed up for 4 years.
- Older workers with depressive symptoms or mobility difficulties, especially with leg pain, are more likely to retire early.
- Health interventions targeting these conditions may enable older workers to remain in the labour force.

Supplementary data

Supplementary data mentioned in the text are available to subscribers in *Age and Ageing* online.

Conflicts of interest

None declared.

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References

1. Banks J, Smith S. Retirement in the UK. Oxf Rev Econ Policy 2006; 22: 40–56.
2. Bongaarts J. Population aging and the rising cost of public pensions. Popul Dev Rev 2004; 30: 1–23.
3. Wiatrowski WJ. Changing retirement age: ups and downs. Mon Lab Rev 2001; 124: 3–12.
4. Schils T. Early retirement in Germany, the Netherlands, and the United Kingdom: a longitudinal analysis of individual factors and institutional regimes. Eur Sociol Rev 2008; 24: 315–29.
5. Shultz KS, Morton KR, Weckerle JR. The influence of push and pull factors on voluntary and involuntary early retirees' retirement decision and adjustment. J Vocat Behav 1998; 53: 45–57.
6. Bixby LE. Retirement patterns in United States—research and policy interaction. Soc Secur Bull 1976; 39: 3–19.
7. Disney R, Grundy E, Johnson P. The Dynamics of Retirement: Analyses of the Retirement Surveys. London: The Stationery Office, 1997.
8. Mein G, Martikainen P, Stansfeld SA *et al* Predictors of early retirement in British civil servants. Age Ageing 2000; 29: 529–36.
9. Haahr JPL, Frost P, Andersen JH. Predictors of health related job loss: a two-year follow-up study in a general working population. J Occup Rehabil 2007; 17: 581–92.
10. Wang M, Shultz KS. Employee retirement: a review and recommendations for future investigation. J Manag 2010; 36: 172–206.
11. Samwick AA. New evidence on pensions, social security, and the timing of retirement. J Public Econ 1998; 70: 207–36.
12. Elovainio M, Forma P, KivimÃ¤ki 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.
13. Banks J. Extending working lives. In: Banks J, Breeze E, Lessof C, Nazroo J, eds. Living in the 21st Century: Older People in England the 2006 English Longitudinal Study of Ageing (Wave 3). London, UK: Institute for Fiscal Studies, 2008; 19–56.
14. Szinovacz ME, Deviney S. Marital characteristics and retirement decisions. Res Aging 2000; 22: 470–98.
15. van Solinge H, Henkens K. Involuntary retirement: the role of restrictive circumstances, timing, and social embeddedness. J Gerontol B Psychol Sci Soc Sci 2007; 62: S295–303.
16. Harkonmaki K, Korkeila K, Vahtera J *et al* Childhood adversities as a predictor of disability retirement. J Epidemiol Community Health 2007; 61: 479–84.
17. Marmot M, Banks J, Blundell R, Lessof C. Health, Wealth and Lifestyles of the Older Population in England: The 2002 English Longitudinal Study of Ageing. London: Institute for Fiscal Studies, 2003.
18. Kohout FJ, Berkman LF, Evans DA *et al* Two shorter forms of the CES-D (center for epidemiological studies depression) depression symptoms index. J Aging Health 1993; 5: 179–93.
19. Doshi JA, Cen L, Polsky D. Depression and retirement in late middle-aged U.S. workers. Health Serv Res 2008; 43: 693–713.
20. Lang IA, Rice NE, Wallace RB *et al* Smoking cessation and transition into retirement: analyses from the English Longitudinal Study of Ageing. Age Ageing 2007; 36: 638–43.
21. Astrand NE, Isacsson SO. Back pain, back abnormalities, and competing medical, psychological, and social factors as predictors of sick leave, early retirement, unemployment, labour turnover and mortality: a 22 year follow up of male employees in a Swedish pulp and paper company. Br J Ind Med 1988; 45: 387–95.
22. Rothenbacher D, Brenner H, Arndt V *et al* Disorders of the back and spine in construction workers. Prevalence and prognostic value for disability. Spine (Phila Pa 1976) 1997; 22: 1481–6.
23. Petersen JS, Zwerling C. Comparison of health outcomes among older construction and blue-collar employees in the United States. Am J Ind Med 1998; 34: 280–7.
24. Brendstrup T, Kristensen J, Schroll M *et al* [Early retirement among the 1914 population in Glostrup. Significance of social and health problems in choosing early retirement]. Ugeskr Laeger 1989; 151: 1976–80.
25. Miranda H, Kaila-Kangas L, Heliovaara M *et al* Musculoskeletal pain at multiple sites and its effects on work ability in a general working population. Occup Environ Med 2009.
26. Karpansalo M, Kauhanen J, Lakka TA *et al* Depression and early retirement: prospective population-based study in middle aged men. J Epidemiol Community Health 2005; 59: 70–4.
27. Pit SW, Shrestha R, Schofield D *et al* Health problems and retirement due to ill-health among Australian retirees aged 45–64 years. Health Policy 94: 175–81.
28. Saba M, Somnath C, Emese V *et al* Depression, chronic diseases, and decrements in health: results from the World Health Surveys. Lancet 2007; 370: 851–8.
29. Kim S, Feldman DC. Working in retirement: the antecedents of bridge employment and its consequences for quality of life in retirement. Acad Manag J 2000; 43: 1195–210.
30. Oliveira JT. [Behavioral aspects of chronic pain syndromes]. Arq Neuropsiquiatr 2000; 58: 360–5.

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