

## Appendix 1: Measurement of comorbidities.

Depression and anxiety were measured using the Hospital Anxiety and Depression Scale (HADS). Raw scores were categorised as free (0-7; absent) or possible/probable cases (8-21; present); onset was movement from free to a possible/probable case [Zigmond AS, Snaith RP. The hospital anxiety and depression scale, *Acta Psychiatr Scand* 1983; 67: 361-70.]. Cognitive impairment was measured using the Cognitive and Alertness behaviour subscale of the Functional Limitations Profile. Raw scores were categorised to no impairment (score of 0; absent) and cognitive impairment (score >0; present); onset was defined as movement from absent at baseline to present at three years [Bergner M, Bobbitt RA, Carter WB, et al. The sickness impact profile: the development and final revision of a health status measure, *Med Care* 1981;19:787-805.]. Widespread pain was identified using pain manikins; each participant was asked to shade where they had pain on a two-view (front and back) blank body manikin the location of their pain. At each time point participant's reports of pain were categorised to widespread pain (American College of Rheumatology definition [Wolfe F, Smythe HA, Yunus MB, Bennett RM, Bombardier C, Goldenberg DL, et al. The American College of Rheumatology 1990 Criteria for the Classification of Fibromyalgia. Report of the Multicenter Criteria Committee. *Arthritis Rheum* 1990; Feb;33(2):160-72.] or no widespread pain; onset was defined as no widespread pain at baseline and widespread pain at three year follow-up. Sleep quality was measured using a single item on non-restorative sleep from the Jenkins Sleep Questionnaire [Jenkins CD, Stanton BA, Niemcyrk SJ, Rose RM. A scale for the estimation of sleep problems in clinical research. *J Clin Epidemiol* 1988; 41(4): 313-21]. Onset of insomnia was defined as moving from feeling tired and worn out on none or some nights (absence) at baseline to most nights at follow-up (presence). The onset of stress and neurosis were identified using medical records; onset for both was defined as no consultation for the morbidity between 2000 and 2005 and one or more consultations for the morbidity between 2005 and 2008.

## Appendix 2: Association between education, income, area deprivation and the onset of new comorbidities.

	Onset of depression				Onset of anxiety				Onset of cognitive impairment							
	OR	95%CI	Adj.OR	95%CI	OR	95%CI	Adj.OR	95%CI	OR	95%CI	Adj.OR	95%CI				
Education																
Further education	1		1		1		1		1		1					
No further education	1.6	1.1,2.2	1.1	0.7,1.6	1.3	0.9,1.8	1.1	0.8,1.5	1.4	1.1,1.9	1.2	0.8,1.4				
Education unknown	1.9	0.7,5.2	1.2	0.4,3.3	1.2	0.4, 3.7	1.0	0.3,3.2	1.1	0.4,3.0	0.8	0.3,2.2				
Income																
Stayed adequate	1		1		1		1		1		1					
Stayed inadequate	2.0	1.6,2.7	1.4	1.0,1.8	1.8	1.4,2.3	1.4	1.0,1.8	2.2	1.7,2.8	1.8	1.3,2.3				
New inadequate	1.5	1.0,2.2	1.2	0.8,1.7	1.4	0.9,2.0	1.1	0.8,1.7	1.3	0.9,1.9	1.2	0.8,1.7				
New adequate	1.6	1.1,2.3	1.2	0.8,1.8	1.6	1.1,2.3	1.3	0.9,1.9	2.2	1.6,3.0	2.0	1.5,2.8				
Area level deprivation																
20% least deprivation	1		1		1		1		1		1					
Middle 60%	1.5	1.1,2.0	1.4	0.97,1.9	1.1	0.8,1.4	1.0	0.8,1.4	1.2	0.9,1.6	1.2	0.9,1.6				
20% most deprivation	1.9	1.3,2.7	1.3	0.9,1.9	1.4	0.99,2.0	1.2	0.8,1.7	1.6	1.1,2.1	1.3	0.9,1.8				
	Onset of insomnia				Onset of widespread pain				Onset of neurosis				Onset of stress			
	OR	95%CI	Adj.OR	95%CI	OR	95%CI	Adj.OR	95%CI	OR	95%CI	Adj.OR	95%CI	OR	95%CI	Adj.OR	95%CI
Education																
Further education	1		1		1		1		1		1		1		1	
No further education	0.9	0.6,1.3	0.8	0.5,1.2	1.2	0.9,1.5	1.0	0.7,1.3	1.1	0.7,1.8	1.1	0.6,1.8	1.0	0.7,1.5	0.9	0.6,1.4
Education unknown	1.1	0.3,3.6	0.7	0.2,2.7	0.7	0.3,1.8	0.7	0.3,1.7	2.3	0.8,7.2	2.2	0.7,7.5	1.0	0.3,3.2	0.9	0.3,3.1
Income																
Stayed adequate	1		1		1		1		1		1		1		1	
Stayed inadequate	3.0	2.2,4.1	1.9	1.4,2.7	1.9	1.5,2.3	1.3	1.0,1.6	1.4	0.99,2.1	0.8	0.5,1.2	1.1	0.8,1.5	0.9	0.6,1.2
New inadequate	1.1	0.7,1.9	0.8	0.5,1.5	1.3	.97,1.8	1.0	0.8,1.4	0.9	0.5,1.7	0.6	0.3,1.2	1.0	0.7,1.6	0.9	0.6,1.5
New adequate	1.5	0.9,2.5	1.3	0.8,2.1	1.4	1.0,1.9	1.1	0.8,1.6	1.1	0.6, 1.9	0.9	0.5,1.7	1.7	1.1,2.6	1.6	1.0,2.4
Area level deprivation																
20% least deprivation	1		1		1		1		1		1		1		1	
Middle 60%	1.2	0.8,1.8	1.1	0.7,1.6	1.1	0.9,1.4	1.0	0.8,1.3	1.6	0.99,2.7	1.6	0.9,2.7	2.2	1.4,3.5	2.2	1.4,3.5
20% most deprivation	1.6	1.0,2.4	1.1	0.7,1.7	1.7	1.2,2.2	1.3	0.9,1.7	2.2	1.3,3.8	1.7	0.9,3.1	6.0	3.6,9.7	6.0	3.6,10.0

**Appendix 3:** Association between stratified variables and onset of new comorbidity.

Association between osteoarthritis/income and the onset of cognitive impairment					
	Total sample (n=2126) n.	New onset n.	(%)	Adj. OR (95% CI)	
<i>Osteoarthritis &amp; income</i>					
No osteoarthritis, income stayed adequate	1069	183	17.1	1	
No osteoarthritis, income stayed inadequate	362	115	31.8	2.03	1.52, 2.70
No osteoarthritis, income became inadequate	183	37	20.2	1.10	0.73, 1.65
No osteoarthritis, income became adequate	172	53	30.8	2.06	1.42, 2.99
Osteoarthritis, income stayed adequate	138	41	29.7	1.51	0.99, 2.30
Osteoarthritis, income stayed inadequate	126	48	38.1	1.67	1.07, 2.59
Osteoarthritis, income became inadequate	30	13	43.3	2.23	1.01, 4.91
Osteoarthritis, income became adequate	46	20	43.5	2.94	1.57, 5.50
Association between osteoarthritis/education and the onset of widespread pain					
	Total sample (n=2852) n.	New onset n.	(%)	Adj. OR (95% CI)	
<i>Osteoarthritis &amp; education</i>					
No osteoarthritis, further education	399	53	13.3	1	
No osteoarthritis, school education only	1923	315	16.4	1.27	0.91, 1.77
Osteoarthritis, further education	38	29	50.0	5.22	2.81, 9.71
Osteoarthritis, school education only	428	160	37.4	2.87	1.95, 4.22
No Osteoarthritis, education unknown	37	5	13.5	1.01	0.37, 2.81
Osteoarthritis, education unknown	7	1	14.3	0.83	0.09, 7.68