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Epidemiology of back pain in older adults: Prevalence and risk factors for back pain onset

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Running header

Back pain in older people

Abbreviations

CI = Confidence Interval

RR = Relative Risk

CC75C = The Cambridge City over-75s Cohort study collaboration

Abstract

Objectives: To determine the prevalence of disabling and non-disabling back pain across age in older adults, and identify risk factors for back pain onset in this age group.

Methods: Participants aged ≥75 years answered interviewer-administered questions on back pain as part of a prospective cohort study (CC75C). Descriptive analyses of data from two surveys, 1988-89 and 1992-93, estimated prevalence and new-onset of back pain. Relative risks (RRs) and 95% confidence intervals (CIs) were estimated using Poisson regression, adjusted for age and gender.

Results: Prevalence of disabling and non-disabling back pain was 6% and 23%, respectively. While prevalence of non-disabling back pain did not vary significantly across age (Chi^2_{trend}: 0.90; p=0.34), the prevalence of disabling back pain increased with age (Chi^2_{trend}: 4.02; p=0.04). New-onset disabling and non-disabling back pain at follow-up was 15% and 5%, respectively. Risk factors found to predict back pain onset at follow-up were: poor self-rated health (RR: 3.8; 95% CI: 1.8-8.0); depressive symptoms (2.2; 1.3-3.7); use of health or social services (1.7; 1.1-2.7); and previous back pain (2.1; 1.2-3.5). From these, poor self-rated health, previous back pain and depressive symptoms were found to be independent predictors of pain onset. Markers of social networks were not associated with the reporting of back pain onset.

Conclusions: The risk of disabling back pain rises in older old age. Older adults with poor self-rated health, depressive symptoms, increased use of health and social services and a previous episode of back pain, are at greater risk of reporting future back pain onset.

Key words. Back pain, older people, epidemiology, prevalence, aetiology

Introduction

Musculoskeletal pain is common and associated with considerable disability and healthcare costs [1], with back pain the most prevalent regional musculoskeletal condition. It has been estimated that resultant healthcare costs in the UK alone in 2000 were £12.3 billion [2]. Back pain has a high prevalence and a severe impact on both society and the individual. It affects one in five people at any one time [3] and by the age of 30 half of the population will have experienced at least one episode of back pain [4].

Over the past century there has been a significant increase in life expectancy [5]. It is estimated that by 2031 the proportion of people over 65 years in the UK, will have increased from 16% to 22%, thus exceeding the population under 25 years of age [6]. For the first time in history people >60 now outnumber those aged <16 in developed countries [7]. With the elderly the fastest growing part of our population and with the majority of the population expecting to survive until their 8th and 9th decade, the impact of chronic back pain on society will be considerable. Its impact on physical and psychological health may be yet more detrimental.

Previous work looking at the epidemiology of back pain has focused on those of working age. It has been suggested that back pain affects people of working age more than other ages [8], primarily because of hypotheses relating back pain to work-related physical factors, implying that back pain should decrease after retirement. Indeed, many studies have supported this, reporting that back pain increases to approximately the 6th decade and decreases in the decade thereafter [4, 9, 10].

Dionne et al [11] recently completed a review of all epidemiological studies that examined back pain prevalence by age. Different people define disabling pain in different ways, Dionne et al [11] found that although older people experience a decrease in non-disabling back pain, described as benign or mild pain, they experience increased prevalence of disabling back pain, described as severe pain. This work is further supported by the findings of Thomas et al [12] who reported that the onset of pain which interferes with everyday life continues to increase with age. The available literature concerning back pain in older age is limited and studies to date have been small.

Only a few studies have examined risk factors for back pain in older age. The aetiology of back pain in the working population is relatively well known, with various risk markers well established, including

female gender, lower social class, poor psychological well-being and occupational physical and psychosocial factors [1, 4, 9, 10, 13, and 14]. However, there are reasons to believe that the aetiology of back pain may differ in older people. Generally, poor health is a known predictor of back pain [15, 16] so, as health status tends to decline with age, the older population may be at even greater risk. Hartvigsen et al [17] found poor self-rated health to be strongly associated with back pain in participants aged 70-102, however, despite having prospective data available, this was only examined cross-sectionally. They did however find, through prospective analysis that an active lifestyle protected against new onset back pain [18]. Carrington Reid et al [19] found that depression was significantly associated with the occurrence of disabling back pain in those aged 70 and older. However, they did not consider self-rated health or social contact/support which are potential path or confounding variables. There is currently no literature, that we are aware of, which investigates, prospectively, the relationship between depression and back pain in older people. With decreased health and mobility in the older population, social networks may have increased importance. Jacobs et al [20] conducted a prospective analysis investigating participants aged 70 and completing a follow-up at age 77. They identified a number of predictors of chronic back pain: female gender; loneliness; joint pain; hypertension; and pre-existing back pain. They further found that, of the subjects initially free of back pain at baseline, 42% reported chronic back pain onset at follow-up. However, the cohort considered for this aetiology analysis was small, 154 subjects pain free at baseline and 64 reporting back pain at follow-up, and they did not represent all older ages. Most analyses of the aetiology of back pain in older age have been cross-sectional precluding consideration of temporal relationships between exposure and outcome, and there are few large-scale prospective studies in this area.

Therefore, the aim of the current study was to examine, longitudinally, the epidemiology of back pain in older adults. Specifically we aimed to quantify back pain prevalence and new onset among persons ≥75 years old, and to determine the relationship between age, back pain and its modifiable risk factors in this age group. We hypothesised that while non-disabling back pain would decrease in older age, disabling back pain would continue to increase. Further, we hypothesised that, among those free of back pain, those with poor general health, depressive symptoms and reduced social networks would be at greater risk of back pain onset.

Methods

Population sample - Cambridge City over 75 Cohort Study (CC75C)

CC75C is one of the longest and largest population-based prospective cohort studies of the very old [21], for which comprehensive methods, including details of consent, are provided elsewhere (www.cc75c.group.cam.ac.uk). In brief, all men and women aged 75 or older from a selection of geographically and socially representative primary care practices in Cambridge were contacted of whom 95% were interviewed for Survey 1 (1985-87) in their own home or care home; 68% for Survey 2 (1988-89) and 83% for Survey 3 (1992-93). Successive interviews and assessments have been carried out since, following-up this same cohort of individuals. Due to differences in how back pain was recorded in Survey 1, compared with Survey 2 and Survey 3, the current analysis uses Survey 2 as baseline and Survey 3 as follow-up. The mean interval between individuals' interviews in these two surveys was 3.6 years (SD 0.3, range 2.4 – 5.0). Each CC75C study phase was approved by the local Research Ethics Committee and participants gave written informed consent at each survey.

At baseline, the interview administered study questionnaire gathered a wide range of information in addition to demographics (age; gender; marital status; place of residence; social class). Back pain was assessed by asking the participants, "Have you recently had an illness or condition which prevented you carrying out normal day to day routine?", then giving a list of conditions including back pain. If they responded "Yes" to any condition, they were then asked if it was "disabling" or "non-disabling". Disabling back pain was defined as back pain that interfered with daily tasks within the last month.

The study questionnaire also assessed a number of putative risk factors for back pain, including social and psychosocial factors (living alone; attendance at church and social groups; recent contact with friends and family; recent bereavement; loneliness) and information on health related factors (self-rated health; depression; disability; Mini Mental State Examination (MMSE) [22] score; use of health services). Depressive symptoms were assessed using questions derived from the CAMDEX diagnostic interview (Cambridge Mental Disorders of the Elderly Examination) [23], which have been previously reported as a Depressive Symptom Score [24]. Various symptoms were measured, such as irritability, trouble sleeping and loss of interest in regular activities, with individuals allocated a score between 0 and 13 by adding scores for each individual item, a higher score represents more severe depression. This score was then divided into quartiles for analysis (low; mild; moderate; severe) Disability was assessed in a range of

Instrumental Activities of Daily Living (IADLs; activities not necessary for fundamental functioning but allow individuals to live independently e.g. shopping, managing money) and basic Activities of Daily Living (ADLs; necessary self-care tasks e.g. personal hygiene, eating) [25]. From this assessment scale individuals were classed as either not disabled in any daily activities; disabled only in IADLs; or disabled in both instrumental and basic activities. The MMSE is an instrument used for screening cognitive function with lower scores in the 0-30 scale indicating more severe cognitive impairment. Previous disabling back pain was also considered as a risk factor for new onset back pain, using the self-report measure in CC75C study's Survey 1 conducted 2 years before the "baseline" survey in this analysis.

Follow-up analysis examined those free of back pain at baseline, to investigate who went on to develop back pain at the follow-up survey in which back pain was measured in the same manner as baseline.

Analysis

All analysis was conducted using Stata v10.1 (StataCorp LP, College Station, Texas) and Epi Info v3.5.1 (Centre for Disease Control and Prevention, www.cdc.gov/epiinfo).

Initially, cross-sectional analysis of baseline data examined the relationship between back pain prevalence and age. Age was divided into 4 categories for analysis (77-79; 80-84; 85-89; 90-100 years), based on participants' age at baseline (1988-1989). Poisson regression was used to examine the association between age and back pain prevalence. Relative risks (RR) with 95% confidence intervals (CI) were derived using robust estimates of standard error [26].

The relationship between potential risk factors and new onset back pain at follow-up was also examined using Poisson regression with robust estimates of standard error [26]. Estimates from univariate analyses were initially adjusted for age and sex, then used to build a multivariable model in which variables were included if the age and sex adjusted RR ≥1.25 (or its reciprocal, ≤0.8) or if significant at p≤0.2 (for dichotomous variables or for any category of categorical variables). This selection criterion ensured that all potential confounding factors that predicted outcome with even marginal significance were considered. The final multivariable Poisson regression model used forward stepwise modelling, with variables included at p=0.10 and eliminated at p=0.15.

Results

Demographic characteristics of the study sample

1177 patients participated at baseline. Of these individuals, back pain data was available for 1174 (99.7%). The mean age of participants was 83 years (SD 4.1, age range: 77.4–100.6) and 65% were female. The largest proportion of the population were widowed (47%), with the rest either married (39%), separated/divorced/other (3%) or single (11%). The majority still lived in their own home (86%) and most participants were classed as social class IIIM (i.e. previously in skilled manual occupations). The majority of the sample were currently taking medication (81%) and 483 (41%) reported disabling arthritis/rheumatism and 178 (15%) reported non-disabling arthritis/rheumatism in the last month.

Prevalence of back pain

Of the 1174 respondents with back pain data, 65 (6%) reported disabling back pain, 274 (23%) reported non-disabling back pain and 835 (71%) were free of back pain. There was a significant difference in the prevalence of disabling back pain between men (3%) and women (7%) (Difference: 4%; 95% CI: 1.9 – 6.7%) and for non-disabling back pain (men: 17%; women: 26%; difference: 9%; 95% CI: 4.1 – 13.8%).

The prevalence of any back pain, non-disabling back pain and disabling back pain, across age categories, is shown in Table 1. There was no difference in the prevalence of any back pain and non-disabling back pain across age (Table 1). However, the prevalence of disabling back pain, while more uncommon, rose with increasing age; the group of individuals who were ≥90 years had a prevalence more than double those aged 77-79 years.

<<Table 1 here>>

New onset back pain

Of those free of back pain at baseline and still alive and traceable at the time of follow-up (n=560), 458 were successfully followed up (82%), of whom 93 (20%) reported new onset back pain (15% disabling and 5% non-disabling back pain).

Demographic factors

There was no difference in back pain onset with increasing age and while females were slightly more likely to develop back pain, this was not significant (Adj RR: 1.4; 95% CI: 0.9-2.1) (Table 2). Nor were there any consistent or significant patterns to suggest that marital status, social class, level of education or place of residence were associated with risk of back pain (Table 2).

<<Table 2 here>>

Health factors

There was a dose-risk relationship found when examining self-rated health as a risk factor for back pain onset. Those reporting poor self-rated health at baseline had an almost four-fold increase in the reporting of back pain onset at follow-up compared to those who had previously reported very good health (Table 3). Participants who reported use of health or social services (e.g. home help; community nurse; meals on wheels) at baseline were at significantly greater risk of reporting back pain at follow-up (1.7; 1.1-2.7). Previously reported disabling back pain (prior to baseline) was associated with a doubling in the risk of back pain onset. Those at the most severe end of the Depressive Symptom Scale had a two-fold increase in the reporting of back pain onset at follow-up compared to those in the lowest score quartile (2.2; 1.3-3.7). However, there was no difference in risk of back pain associated with cognitive impairment or disability.

<<Table 3 here>>

Social and psychosocial factors

Objective measures of social contact were not associated with the reporting of back pain onset. Those who lived alone (1.1; 0.7-1.7) or who had not recently attended a social group or church (1.0; 0.6-1.8 and 1.2; 0.8-2.0, respectively) were no more likely to develop back pain than other individuals (Table 4). Similarly, those who had recently had a bereavement, or reduced contact with friends and relatives were no more likely to report new onset back pain than their peers. There was some evidence to suggest that those who reported feelings of loneliness were at greater risk of developing back pain (1.4; 0.8-2.3), however this did not reach statistical significance.

<<Table 4 here>>

Multivariable analysis

On multivariable analysis, three variables emerged as independent risk factors for back pain onset: poor self-rated health, a previous report of disabling back pain, and a high score on the depressive symptoms scale (Table 5).

<<Table 5 here>>

Discussion

We have demonstrated that while the prevalence of disabling back pain, though low, increases with age in those ≥75 years, the prevalence of non-disabling back pain does not. Further, we have shown that, among those free of back pain, poor self-rated health depressive symptoms and a previous episode of disabling back pain are independent predictors of future back pain onset. Finally, contrary to our hypothesis, we have shown that objective measures of social participation are not associated with future back pain onset.

When interpreting these findings, one must be aware of some methodological issues. Loss to follow-up can be an issue in prospective cohort studies conducted over many years as participants can drop out for reasons such as illness, death, moving away or refusing to continue with the study. Examining attrition between baseline and follow-up revealed that mortality accounted for most of the loss to follow-up as 76% of 'non-responding' participants had died prior to the follow-up survey. Attrition bias may occur if those who are followed-up are selectively different to those who have opted out of participation. Among those who were still alive and eligible, there were no significant differences in responders and non-responders with regards to sex ($p=0.34$). Older participants were significantly less likely to take part at follow-up ($p=0.02$): refusal, illness and unknown reasons together contributed to non-participation rates rising from 10% of those aged under 80 at baseline, through 18% aged 80-84, to 21% age 85 or older.

Secondly, while the CC75C study population was representative of the older population in Cambridge, this group may differ from those in other geographical areas, for example, in terms of socio-economic distribution and / or social class. While this may be true, the key point is whether this has influenced the occurrence of back pain, and its associated factors. We believe that this is unlikely: evidence from other

studies suggests that the occurrence of back pain is fairly similar across urban areas in the UK [10] and, in the current analysis, we found no association between back pain prevalence and social class.

We had many more women than men in our study as expected in a cohort of this age group given lower male life expectancy. At follow-up, the response rate was slightly higher in men than women (men: 85.5%; women: 79.7%; difference: 5.8%; p=0.09), but this relatively minor difference is unlikely to have introduced any major bias.

As in all pain research, any self-report method is inevitably subjective. While we defined disabling back pain as back pain which had interfered with daily activities within the last month, we put no definition of the specific back pain area or episode duration. The measure, by definition, records the participant's interpretation. In the previous back pain literature there is large variation in measurement and definitions used, such as the area of the back affected, pain severity or resultant disability and episode duration or frequency. Variation in these classifications can create problems when making and interpreting comparisons between studies but does not compromise the internal validity of the current study.

Back pain can be episodic or chronic. Episodes of back pain that occurred between surveys were not captured by the measures used and this is likely to have affected our findings in two ways, under-estimating both onset in the follow-up survey and the extent to which this was new. The baseline cohort are (by definition) free of back pain, at the time of the baseline survey, but this does not exclude any prior episodes of pain. While it would have been interesting to look at any prior back pain, the only measure available was previous disabling back pain 2 years prior to baseline. Prevalence was relatively low, however this is perhaps to be expected from a cohort completely free of back pain 2 years subsequently. Moreover, there was no measure of chronicity in the study. Chronic pain is generally defined as that which persists for ≥3 months, or continues beyond normal tissue healing time [9]. Although disability and chronicity are separate concepts, they are of course related. Therefore, it may be that those who reported disabling back pain were more likely to have reported pain experienced for longer time periods. However, the current study cannot examine whether this is the case. It would also have been interesting to conduct a sub-analysis of risk factors for disabling back pain, and in particular to examine whether baseline disability was an important predictor of back pain that is disabling, rather than non-disabling. While the power of the current study is limited in this regard a rudimentary analysis suggests that a higher

baseline disability score was no more common in those participants who went on to develop disabling back pain compared with non-disabling back pain.

One must consider that in an elderly population, it is highly likely that they might experience concurrent pain at various sites, which may result in back pain feeling more disabling. Therefore, although we report that disabling back pain increased with age, it may be that this increase is not directly associated with the individual's back pain per se, but rather a result of other pain or general frailty. Further, while back pain most commonly co-occurred with other illnesses or conditions, such as respiratory problems, it was not possible to examine separately the aetiology of back pain with or without other conditions in the current study.

Further measurement issues surround cognition when investigating a cohort of this age with higher levels of dementia and depression than in younger people [27]. However, when we conducted a sensitivity analysis substituting proxy informant data where available for missing subjective back pain data from the small minority of participants who were unable to answer all the questions, we found only the most minimal effect on our findings (not separately reported). Furthermore, it has been suggested that this age group are less likely to report pain and often have a higher pain threshold then the younger population [11]. However, if that is the case then this only strengthens our findings.

Caution is necessary in interpreting some of our findings – specifically, with reference to the social variables. We report data relating to "recent" attendance at social activities (church, or social club) and "recent" contact with friends and relatives. These exposures were measured at baseline and it might be argued that at follow-up, about four years later, a contemporary measure of social contact is more appropriate. One might hypothesise that, if these exposures are associated with an increase in the risk of back pain it will be over the short-term, and that the null effects observed in the current study are due to the longer time to follow-up than is appropriate to identify such increases. However, a separate cross-sectional analysis (results not shown) also found no consistent or significant associations between back pain and any indicators of (lack of) social contact.

There are also strengths to this study that make it a new contribution to the literature. The majority of previous work has used cross-sectional analysis when considering risk factors [16, 17, 28, 29-32]. The

major disadvantage with this approach is the impossibility of examining temporal relationships between associated exposure and outcome. CC75C's prospective cohort design enabled us to identify key factors which predicted back pain onset.

The current literature concerning back pain prevalence in old age is inconsistent. Brattberg et al [33] found that mild back and hip pain decreased until aged 85 then increased thereafter. They further found that severe back and hip pain decreased for females but increased for males, however the majority of these trends were not significant. Hartvigsen et al [34] found the prevalence of back pain in older age to be similar to that of the working age population. Badley et al [35] reported a decrease in back pain prevalence at 65-74 and a steady increase thereafter, while Cecchi et al [31] found a peak at age 75-84 and an decrease in those >85. The current study is the first, to our knowledge, which has looked at an older adult population, broken down into age groups, while also considering both disabling and non-disabling back pain separately within in the same population.

Findings from our prospective analysis confirm previous results from cross-sectional analyses in this age-group. Poor self-rated health has been found to be associated with back pain in older age in a number of cross-sectional studies [16, 17, 20, and 36]. Furthermore, Woo et al [32] and Hartvigsen et al [36] confirmed, using cross-sectional analysis, that older people with poor overall physical function are at greater risk of reporting back pain. To our knowledge no studies to date have examined previous back pain as a predictor of back pain in older age, although in adults, generally, this is one of the strongest predictors of onset. Our findings regarding self-rated health and previous disabling back pain amongst older people are also consistent with findings in the working-age population [15, 16]. Our results concerning depressive symptoms provide support for the findings of Carrington Reid et al [19], who reported a cross-sectional relationship between back pain and depression in older adults and provides supporting evidence to results reported by Carroll et al [37] examining the working age population, who found depression to be a strong and independent predictor for the onset of disabling neck and back pain. Our questions regarding depression were derived from the validated CAMDEX interview. Further questions would be required to allow a complete diagnosis of depression based on formal criteria, therefore we can only report on the effect of the depressive symptoms assessed as opposed to a clinical diagnosis of depression. Other factors, such as use of health and social services, were important predictors of back pain in the univariable analysis, although did not independently predict back pain after

adjusting for self-rated health previous back pain and depressive symptoms. It would have been interesting to examine the aetiology of disabling / non-disabling back pain separately, however the numbers were too small.

Jacobs et al [20], in their longitudinal cohort study, found that those who reported feelings of loneliness were at a significantly greater likelihood of developing back pain. However, the study population did not represent all older ages as individuals participating were all 70 at baseline and 77 at follow-up. Contrary to our hypothesis, objective measures of social participation were not found to be associated with future back pain onset in the current study. However, although the 50% increased risk found in CC75C to be associated with feeling lonely or very lonely was not significant in our sample size, the direction of effect was consistent with Jacobs et al [20], suggesting subjective markers of social isolation may play a part in the aetiology of back pain. However, following adjustment for age, sex and depressive symptoms, this relationship was removed (1.1; 0.6-2.0).

In summary, there is little research to date looking at the epidemiology of back pain in older ages and this is one of few large scale prospective cohort studies to examine the occurrence and risk factors for back pain among older people. We have shown that disabling back pain prevalence continues to rise with increasing age in those ≥75 years. Further, we have confirmed previous findings that aspects and indicators of physical health and a prior history of disabling back pain are important predictors of back pain onset in older people and have found, for the first time, that depressive symptoms are an independent predictor of back pain onset. In contrast, we have demonstrated that objective measures of social contact, such as church and club attendance, are not markers for an increased risk of back pain.

Key messages

- The prevalence of disabling back pain increases with age in those ≥75 years
- Indicators of physical health and depression are important predictors of back pain onset
- Objective markers of social networks are not associated with back pain onset

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Conflicts of interest

The authors declare that they have no competing interests.

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Author contributions

RED Conducted the analysis and produced first draft of the paper

JF CC75C study investigator. Commented on draft of paper – including comments on analysis, results and interpretation

CB CC75C study principal investigator. Commented on draft of paper – including comments on results and interpretation

JZ CC75C study investigator. Helped prepare data for analysis. Commented on draft of paper – including comments on results and interpretation

GJM Oversaw analysis. Commented on draft of paper

GTJ Supervised analysis and drafting of manuscript

Ethical approval

Each CC75C study phase was approved by Cambridge Research Ethics Committee (current reference numbers: 05_Q0108_308).

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Table 1. Prevalence of back pain at baseline across age categories

38.	Any back pain	Total	RR (95% CI)	Chi² trend
Age categories				
77-79	93 (27%)	344	1.0	
80-84	155 (31.1%)	498	1.2 (0.9-1.4)	Chi²: 0.015
85-89	70 (27%)	260	1.0 (0.8-1.3)	P=0.90
90-100	21 (29.1%)	72	1.1 (0.7-1.6)	
	Non-disabling back pain	**Total**	**RR (95% CI)**	**Chi² trend**
Age categories				
77-79	80 (23.3%)	344	1.0	
80-84	126 (25.3%)	498	1.1 (0.9-1.4)	Chi²: 0.905
85-89	54 (20.8%)	260	0.9 (0.7-1.2)	P=0.34
90-100	14 (19.4%)	72	0.8 (0.5-1.4)	
	Disabling back pain	**Total**	**RR (95% CI)**	**Chi² trend**
Age categories				
77-79	13 (3.8%)	344	1.0	
80-84	29 (5.8%)	498	1.5 (0.8-3.0)	Chi²: 4.021
85-89	16 (6.2%)	260	1.6 (0.9-3.3)	P=0.04
90-100	7 (9.7%)	72	2.6 (1.06-6.2)	

Table 2. Demographic factors for back pain onset at follow-up

Baseline characteristics		Yes onset n (%)	Total [a] n	Crude RR (95% CI)	Adj RR [b] (95% CI)
Age at baseline	77-79	37 (21.5)	172	1.0	1.0
	80-84	39 (19.6)	199	0.9 (0.6-1.4)	0.9 (0.6-1.4)
	85-89	12 (17.6)	68	0.8 (0.5-1.5)	0.8 (0.4-1.4)
	90-100	5 (26.3)	19	1.2 (0.5-2.7)	1.2 (0.5-2.6)
Sex	Male	28 (16.4)	171	1.0	1.0
	Female	65 (22.6)	287	1.4 (0.9-2.1)	1.4 (0.9-2.1)
Marital status	Married	36 (18.8)	191	1.0	1.0
	Widowed	45 (21.9)	205	1.2 (0.8-1.7)	1.0 (0.6-1.6)
	Separated/divorced/other	4 (25.0)	16	1.3 (0.5-3.3)	1.1 (0.4-2.8)
	Single	7 (15.6)	45	0.8 (0.3-1.7)	0.7 (0.3-1.6)
Social class	I	5 (20.8)	24	1.0	1.0
	II	17 (17. 0)	100	0.8 (0.3-2.0)	0.9 (0.4-2.1)
	IIIN	13 (21.7)	60	1.0 (0.4-2.6)	1.1 (0.5-2.7)
	IIIM	27 (17.8)	151	0.8 (0.4-2.0)	0.9 (0.4-2.1)
	IV	24 (25.3)	95	1.2 (0.5-2.8)	1.4 (0.6-3.2)
	V	5 (27.8)	18	1.3 (0.5-3.9)	1.4 (0.5-4.0)
Further education	Yes	8 (14.3)	56	1.0	1.0
	No	84 (20.9)	401	1.5 (0.8-2.9)	1.5 (0.8-2.9)
Residence	House/flat/granny flat	84 (20.1)	409	1.0	1.0
	Any supported setting [c]	9 (23.1)	37	1.2 (0.6-2.1)	1.2 (0.6-2.1)

[a] Total n=458 but numbers for individual analysis varies due to missing data

[b] Adjusted for age and sex (age adjusted for sex; sex adjusted for age)

[c] Sheltered accommodation, residential care, nursing home or long stay hospital

Table 3. Health factors for back pain onset at follow-up

Baseline characteristics		Yes onset n (%)	Total [a] n	Crude RR (95% CI)	Adj RR [b] (95% CI)
Self rated health	Very good	20 (13.0)	154	1.0	1.0
	Good	44 (21.1)	209	1.6 (0.9-2.6)	1.7 (0.9-2.6)
	Fair	24 (32.4)	74	2.5 (1.5-4.2)	2.6 (1.5-4.4)
	Poor	4 (44.4)	9	3.4 (1.5-7.9)	3.8 (1.8-8.0)
Previous disabling back pain	No	78 (20.1)	389	1.0	1.0
	Yes	8 (42.1)	19	2.1 (1.2-3.7)	2.1 (1.2-3.5)
Depression Symptom Scale	Low	22 (13.6)	162	1.0	1.0
	Mild	21 (21.7)	97	1.6 (0.9-2.7)	1.6 (0.9-2.7)
	Moderate	26 (21.9)	119	1.6 (0.9-2.7)	1.5 (0.9-2.6)
	Severe	23 (30.7)	75	2.3 (1.3-3.8)	2.2 (1.3-3.7)
Disability group	No disability	51 (19.4)	263	1.0	1.0
	Disability in IADL only	24 (19.2)	125	1.0 (0.6-1.5)	1.1 (0.7-1.8)
	Disability in IADL & ADL	18 (25.7)	70	1.3 (0.8-2.1)	1.4 (0.8-2.2)
MMSE score	Normal cognition (26-30)	59 (21.8)	270	1.0	1.0
	Mild impairment (22-25)	21 (16.8)	125	0.8 (0.5-1.2)	0.7 (0.5-1.1)
	Moderate impairment (18-21)	9 (18.4)	49	0.8 (0.4-1.6)	0.8 (0.4-1.5)
	Severe impairment (0-17)	3 (25.0)	12	1.1 (0.4-3.1)	1.0 (0.4-2.7)
Use of Health Services	No	68 (18.3)	371	1.0	1.0
	Yes	25 (30.1)	83	1.6 (1.1-2.4)	1.7 (1.1-2.7)

[a] Total n=458 but numbers for individual analysis varies due to missing data

[b] Adjusted for age and sex

Table 4. Social and psychosocial factors for back pain onset at follow-up

Baseline characteristics		Yes onset n (%)	Total [a] n	Crude RR (95% CI)	Adj RR [b] (95% CI)
Living alone	No	35 (18.1)	193	1.0	1.0
	Yes	49 (21.7)	226	1.2 (0.8-1.8)	1.1 (0.7-1.7)
Recent attendance at:					
Social club	Yes	12 (19.6)	61	1.0	1.0
	No	81 (20.4)	397	1.0 (0.6-1.8)	1.0 (0.6-1.8)
Church	Yes	17 (17.7)	96	1.0	1.0
	No	76 (21.0)	362	1.2 (0.7-1.9)	1.2 (0.8-2.0)
Compared to usual, recent contact with:					
Friends	More	4 (26.7)	15	1.0	1.0
	Same	79 (19.7)	401	0.7 (0.3-1.8)	0.8 (0.3-1.8)
	Less	10 (25.0)	40	0.9 (0.3-2.5)	1.0 (0.4-2.6)
Relatives	More	6 (20.0)	30	1.0	1.0
	Same	81 (20.2)	401	1.0 (0.5-2.1)	1.0 (0.5-2.1)
	Less	6 (23.1)	26	1.1 (0.4-3.1)	1.1 (0.4-3.1)
Recent bereavement	No	64 (20.5)	312	1.0	1.0
	Yes	29 (20.0)	145	1.0 (0.7-1.4)	1.0 (0.7-1.5)
Feel lonely	Not at all lonely	61 (19.0)	321	1.0	1.0
	Slightly lonely	18 (20.7)	87	1.1 (0.7-1.7)	1.0 (0.7-1.7)
	Lonely/very lonely	14 (28.6)	49	1.5 (0.9-2.5)	1.4 (0.8-2.3)

[a] Total n=458 but numbers for individual analysis varies due to missing data

[b] Adjusted for age and sex

Table 5. Multivariate forward stepwise regression model

Baseline characteristics		RR (95% CI)	p Value
Sex	Male	1.0	0.21
	Female	1.3 (0.9-2.0)	
Age	77-79	1.0	0.67
	80-84	1.0 (0.7-1.5)	
	85-89	0.8 (0.4-1.5)	
	90-100	1.4 (0.7-2.7)	
Self rated health	Very good	1.0	0.03
	Good	1.4 (0.8-2.3)	
	Fair	2.1 (1.2-3.8)	
	Poor	2.5 (1.1-5.8)	
Previous disabling back pain	No	1.0	0.05
	Yes	1.8 (1.004-3.1)	
Depression Symptom Scale	Low	1.0	0.04
	Mild	1.3 (0.7-2.4)	
	Moderate	1.3 (0.7-2.4)	
	Severe	2.1 (1.2-3.6)	

[a] Total n=395 but numbers for individual analysis varies due to missing data.

[b] Adjusted for age and sex, further adjusted for co-variants that were significant in univariate analyses