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

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The Cambridge City over-75s Cohort (CC75C) study collaboration

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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

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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 incidence of new-onset back pain. Relative risks (RRs) and 95% CIs were estimated using Poisson regression, adjusting 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 continued to increase with age (Chi^2_{trend}: 4.02; p=0.04). Incidence of new on-set 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: 3.2; 95% CI: 1.3-8.0); use of health or social services (1.8; 1.1-2.7); and previous back pain (2.1; 1.2-3.6). From these, poor self-rated health and previous back pain 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 poorer general health, as exemplified by use of health services, poor self-rated health 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 low back pain the most prevalent 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 low back pain [4].

Over the past 100 years there has been a significant increase in life expectancy [5]. It is estimated that by 2031 the proportion of people over 65 years within the British population, 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 children in developed countries [7]. With the elderly now the fastest growing part of our population, and with the majority of the population expecting to survive till their 8^{th} and 9^{th} 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, often ignoring the population aged over 65. It has been suggested that back pain affects people of working age more than other ages [8], implying that back pain should decrease after retirement. Indeed, many studies have supported this, reporting that back pain increases to approximately the 6^{th} 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. They found that although older people experience a decrease in non-disabling back pain, described as benign or mild pain, they experience increased prevalence of severe or disabling back pain. This work is further supported by the findings of Thomas et al [12] who discovered 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 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]. In a prospective analysis Carrington Reid et al [19] found that depression was a strong and independent predictor for disabling back pain in those aged 70 and older. However, they did not consider potentially confounding factors such as self-rated health or social contact/support. With decreased health and mobility in the older population, social networks may have increased importance. Jacobs et al [20] also 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; pre-existing back pain and lack of paid employment. They further found chronic back pain onset to be high among those aged 77 (42%). 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 incidence 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 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, which has been described in detail elsewhere (Fleming et al, 2007) (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. 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 (1985-87), compared to Survey 2 (1988-89) and Survey 3 (1992-1993), 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).

At baseline, the interview administered study questionnaire gathered a wide range of information besides 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; disability; Mini Mental State Examination (MMSE (Folstein & Folstein, 1975)) score; use of health services). Disability score was based on disability with 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). The MMSE is an instrument used for screening cognitive functions and can be used to indicate varying levels of cognitive impairment. Previous back pain was also considered as a risk

factor for new onset back pain, using back pain as measured (in Survey 1) before the interviews taken as baseline for this analysis (Survey 2).

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). 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 (Greenland, 2004).

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 (Greenland, 2004). 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 there were more females than males (65% females). 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).

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. The high proportion of older people who were free of any back pain – nearly three-quarters – was remarkably constant across age-bands, as was the prevalence of non-disabling back pain – about a fifth to a quarter. Disabling back pain was rare but rose with increasing age: individuals who were ≥90 years experienced more than a doubling in the occurrence of disabling back pain compared to 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 91 (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 (RR: 1.4; 0.9-2.0) (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 an increased 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 a more than three-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 (Adjusted RR: 1.8; 1.1-2.7). Previously reported back pain (prior to baseline) was associated with a doubling in the risk of back pain onset. 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; 0.6-1.7 and 1.3; 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; 0.8-2.4), however this did not reach statistical significance.

<<Table 4 here>>

Multivariable analysis

On multivariable analysis, two variables emerged as independent risk factors for back pain onset: poor self-rated health, and a previous report of back pain (Table 5).

<<Table 5 here>>

Discussion

We have demonstrated that while the prevalence of non-disabling back pain does not vary significantly across age in those ≥75 years, the prevalence of disabling back pain, though low, increases with age. Further, we have shown that among those free of back pain, participants with poorer general health, as exemplified by use of health services, poor self-rated health and a previous episode of back pain, were at greater risk of reporting 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 should not necessarily compromise the internal validity of the current study.

Further serious measurement problems are the issues surrounding cognition when investigating a cohort of this age with higher levels of dementia and depression than in younger people [21]. 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 finding that disabling back pain is more common with increasing age as, if there is under-reporting of pain, prevalence could be even higher then recorded.

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 on back pain in older people. The majority of previous work has used cross-sectional analysis when considering risk factors for back pain in the older population [16, 17, 22, 23-26]. 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 [27] 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 [28] found the prevalence of back pain at the end of life to be similar to that of the working age population. Badley et al [29] reported a decrease in back pain prevalence at 65-74 and a steady increase thereafter, while Cecchi et al [25] 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.

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 30]. Furthermore, Woo et al [26] and Hartvigsen et al [30] 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. Our findings regarding self-rated health and previous back pain amongst older people are also consistent with findings in the working-age population [15, 16]. Furthermore, the prevalence results provide some support for Dionne et al's [11] review as we confirm that disabling back pain increases with age.

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, their findings were based on odds ratios as opposed to relative risks, and therefore presented an artificial rate. Furthermore, 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 associated with feeling lonely or very lonely – CC75C's subjective measure of social contact – was not significant in our sample size, the direction of effect is consistent with Jacobs et al [20], suggesting subjective markers of social isolation may play a part in the aetiology of back pain.

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 back pain are important predictors of back pain onset in older people. 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. The findings regarding social isolation, indicated by loneliness, should be investigated further, as it may be that perceptions of social networks, and perhaps the value placed on them, are more important than actual networks in determining musculoskeletal health.

Key messages

- The prevalence of disabling back pain increases with age in those ≥75 years
- Indicators of physical health are important predictors of back pain onset in this group
- 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	PhD Co-supervisor. Oversaw analysis. Commented on draft of paper
GTJ	PhD Supervisor. 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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Figures and tables

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

	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	Crude RR (95% CI)	Adj RR [a] (95% CI)
Age at baseline	77-79	37 (21.8)	170	1.0	1.0
	80-84	37 (19.1)	194	0.9 (0.6-1.3)	0.9 (0.6-1.3)
	85-89	12 (18.8)	64	0.9 (0.5-1.5)	0.8 (0.5-1.5)
	90-100	5 (27.8)	18	1.3 (0.6-2.8)	1.2 (0.6-2.7)
Sex	Male	28 (16.7)	168	1.0	1.0
	Female	63 (22.7)	278	1.4 (0.9-2.0)	1.4 (0.9-2.0)
Marital status	Married	35 (18.7)	187	1.0	1.0
	Widowed	44 (22.2)	198	1.2 (0.8-1.8)	1.02 (0.6-1.6)
	Separated/divorced/other	5 (31.3)	16	1.4 (0.6-3.5)	1.2 (0.5-3.0)
	Single	7 (15.6)	45	0.8 (0.4-1.7)	0.7 (0.3-1.6)
Social class	I	5 (20.8)	24	1.0	1.0
	II	17 (17.4)	98	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 (0.5-2.8)
	IIIM	25 (17.4)	144	0.8 (0.4-2.0)	0.9 (0.4-2.1)
	IV	24 (25.8)	93	1.2 (0.5-3.0)	1.4 (0.6-3.3)
	V	5 (29.4)	17	1.4 (0.5-4.1)	1.5 (0.5-4.2)
Further education	Yes	8 (14.3)	56	1.0	1.0
	No	82 (21.1)	389	1.5 (0.8-2.9)	1.5 (0.8-3.0)
Residence	House/flat/granny flat	82 (20.1)	409	1.0	1.0
	Any supported setting [b]	9 (24.3)	37	1.2 (0.7-2.2)	1.2 (0.7-2.2)

[a] Adjusted for age and sex (age adjusted for sex; sex adjusted for age)
[b] 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	Crude RR (95% CI)	Adj RR [a] (95% CI)
Self rated health	Very good	20 (13.0)	154	1.0	1.0
	Good	44 (21.8)	202	1.7 (1.03-2.7)	1.7 (1.01-2.7)
	Fair	23 (32.9)	70	2.5 (1.5-4.3)	2.6 (1.5-4.5)
	Poor	3 (37.5)	8	2.9 (1.1-7.7)	3.2 (1.3-8.0)
Previous back pain	No	76 (20.0)	380	1.0	1.0
	Yes	8 (42.1)	19	2.1 (1.2-3.7)	2.1 (1.2-3.6)
Disability group	No disability	50 (19.4)	258	1.0	1.0
	Disability in IADL	24 (19.7)	122	1.0 (0.7-1.6)	1.1 (0.7-1.8)
	Disability in IADL & ADL	17 (25.8)	66	1.3 (0.8-2.1)	1.4 (0.8-2.2)
MMSE score	Normal cognition	59 (22.0)	268	1.0	1.0
	Mild impairment	21 (17.7)	119	0.8 (0.5-1.3)	0.7 (0.5-1.1)
	Moderate impairment	8 (17.4)	46	0.8 (0.4-1.5)	0.7 (0.4-1.5)
	Severe impairment	3 (25.0)	12	1.1 (0.4-3.1)	1.0 (0.4-2.6)
Use of Health Services	No	67 (18.4)	365	1.0	1.0
	Yes	24 (31.1)	77	1.7 (1.1-2.5)	1.8 (1.1-2.7)

[a] Adjusted for age and sex

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

Baseline characteristics		Yes onset n (%)	Total	Crude RR (95% CI)	Adj RR [a] (95% CI)
Living alone	No	34 (18.2)	187	1.0	1.0
	Yes	48 (21.6)	222	1.2 (0.8-1.8)	1.1 (0.7-1.7)
Recent attendance at:					
Social club	Yes	12 (20.0)	60	1.0	1.0
	No	79 (20.5)	386	1.0 (0.6-1.8)	1.0 (0.6-1.7)
Church	Yes	17 (17.7)	96	1.0	1.0
	No	74 (21.1)	350	1.2 (0.7-1.9)	1.3 (0.8-2.0)
Compared to usual, recent contact with:					
Friends	More	4 (26.7)	15	1.0	1.0
	Same	77 (19.7)	391	0.7 (0.3-1.8)	0.8 (0.3-1.8)
	Less	10 (26.3)	38	0.9 (0.4-2.7)	1.0 (0.4-2.6)
Relatives	More	6 (21.4)	28	1.0	1.0
	Same	79 (20.2)	392	0.9 (0.5-2.0)	0.9 (0.5-2.0)
	Less	6 (24.0)	25	1.1 (0.4-3.0)	1.1 (0.4-3.0)
Recent bereavement	No	62 (20.5)	303	1.0	1.0
	Yes	29 (20.4)	142	1.0 (0.7-1.5)	1.0 (0.7-1.5)
Feel lonely	Not at all lonely	59 (19.0)	310	1.0	1.0
	Slightly lonely	18 (20.9)	86	1.1 (0.7-1.8)	1.0 (0.7-1.7)
	Lonely/very lonely	14 (28.6)	49	1.5 (0.9-2.5)	1.4 (0.8-2.4)

[a] Adjusted for age and sex

Table 5. Multivariate forward stepwise regression model

Baseline characteristics		RR (95% CI)[a]	p Value
Sex	Male	1.0	0.15
	Female	1.4 (0.9-2.1)	
Age	77-79	1.0	0.55
	80-84	1.0 (0.6-1.5)	
	85-89	0.9 (0.5-1.6)	
	90-100	1.5 (0.7-3.1)	
Self rated health	Very good	1.0	0.01
	Good	1.5 (0.9-2.5)	
	Fair	2.5 (1.4-4.2)	
	Poor	2.6 (0.9-7.4)	
Previous back pain	No	1.0	0.05
	Yes	1.8 (1.01-3.1)	

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