SPINE Volume 28, Number 11, pp 1195–1202
©2003, Lippincott Williams & Wilkins, Inc.

Prevalence and Predictors of Intense, Chronic, and Disabling Neck and Back Pain in the UK General Population

Roger Webb, MA,* Therese Brammah, MD,† Mark Lunt, MSc,* Michelle Urwin, MSc,*‡
Tim Allison, MD,‡ and Deborah Symmons, MD*

Study Design. Multiphase cross-sectional survey of musculoskeletal pain.

Objectives. To estimate the prevalence of all reported and clinically significant spinal pain. To identify independent predictors of spinal pain.

Methods. A total of 5752 adults sampled from three general practice registers were mailed a screening questionnaire. Subjects who reported the spine as a predominant site of pain were sent a site-specific questionnaire (*i.e.*, back or neck) that asked about severity. Prevalence estimates were calculated and extrapolated to the general population. Predictors of spinal pain were identified using logistic regression with comprehensive adjustment for confounders (including pain at other anatomic sites).

Results. The 1-month–period prevalence of all reported spinal pain was 29% (95% confidence interval 27–31%), of which about half was intense, half was chronic, 40% was disabling, and 20% was intense, disabling, and chronic. Most people with back (75%) or neck (89%) pain also reported pain at other sites. Age, female gender (neck pain only), high body mass index, living in an area of raised material deprivation, and south Asian ethnicity were significant predictors of spinal pain with disability. The association between body mass index and deprivation and neck pain was lost after adjustment for pain at other sites. However, even after full adjustment, obesity (OR, 1.7; 95% confidence interval, 1.1–2.5) and high deprivation (OR, 1.7; 95% confidence interval, 1.1–2.7) were predictors of back pain with disability.

Conclusions. Adjustment for pain at other sites enabled assessment of whether observed associations were with spinal pain itself or with the other sites of pain. Obesity is an important independent predictor of back pain and its severity. This has implications for primary prevention. The prevalence of spinal pain with disability continues to rise into old age. This has implications for healthcare planning. [Key words: needs assessment, prevalence, spine, back pain, neck pain] **Spine 2003;28:1195–1202**

From the *ARC Epidemiology Unit, University of Manchester Medical School, Manchester; the †Department of Rheumatology, Tameside Acute Trust, Ashton-under-Lyne, Greater Manchester; and the ‡Department of Public Health Medicine, West Pennine Health Authority, Oldham, Greater Manchester, United Kingdom.
Acknowledgement date: May 21, 2002. First revision date: August 29, 2002. Acceptance date: September 19, 2002.
Supported by the Arthritis Research Campaign and the West Pennine Health Authority.
The submitted manuscript does not contain information about medical devices or drugs.
Institutional and foundation funds were received in support of this work. No benefits in any form have been or will be received from a commercial party related directly or indirectly to the subject of this manuscript.
Address correspondence to Professor Deborah Symmons, ARC Epidemiology Unit, University of Manchester Medical School, 2nd Floor, Stopford Building, Oxford Road, Manchester M13 9PT, United Kingdom; E-mail: Deborah.symmons@man.ac.uk

Musculoskeletal disorders are common and place a considerable burden on primary and secondary health care services. The Tameside Musculoskeletal Project was set up in 1996 in order to establish the healthcare needs of the population of the former West Pennine Health Authority. The project was composed of a three-phase community based cross-sectional survey. Phase I used a screening questionnaire to establish the prevalence of musculoskeletal pain in a variety of anatomic sites. Phase II was a site-specific questionnaire that asked about severity and associated disability. Phase III was an examination of selected individuals. Some of the results of phase I have been published.[1] Of the adult population, 48.5% had experienced musculoskeletal pain lasting for at least 1 week in the previous month. Low back pain was the most commonly reported symptom, with an estimated 1-month–period prevalence of 23%. The equivalent estimate for neck pain was 14%.

Several other population surveys have estimated the prevalence of back pain,[2,3,4] while the prevalence of neck pain in the community has been researched less extensively in the United Kingdom.[5] Many episodes of spinal pain detected in population surveys may be short-lived and associated with no functional disability. Such benign episodes of pain do not require any healthcare intervention. A Department of Health healthcare needs assessment document highlighted the need for population-based prevalence estimates of disability levels, pain intensity, and duration using explicit measures.[6] Hillman *et al*[2] provided estimates of chronicity and disability associated with low back pain but did not investigate factors predicting disability. Similarly, there are few data on disability associated with neck pain.

In this article, back and neck pain (spinal pain) are stratified by intensity, chronicity, and disability, providing estimates of clinically significant pain for healthcare needs assessment and service planning. Independent predictors of disabling pain are also investigated.

Patients and Methods

Setting. Subjects were sampled from three general practices with list sizes of over 10,000 adults in West Pennine, a predominantly urban area east of Manchester.

Survey Methods. Survey methods are reported in detail elsewhere.[1] In brief, the sample was divided into eight age-sex strata using age groups 16 to 44 years, 45 to 64 years, 65 to 74 years, and 75 years or older. Approximately 250 subjects per practice were sampled per stratum in order to achieve precise

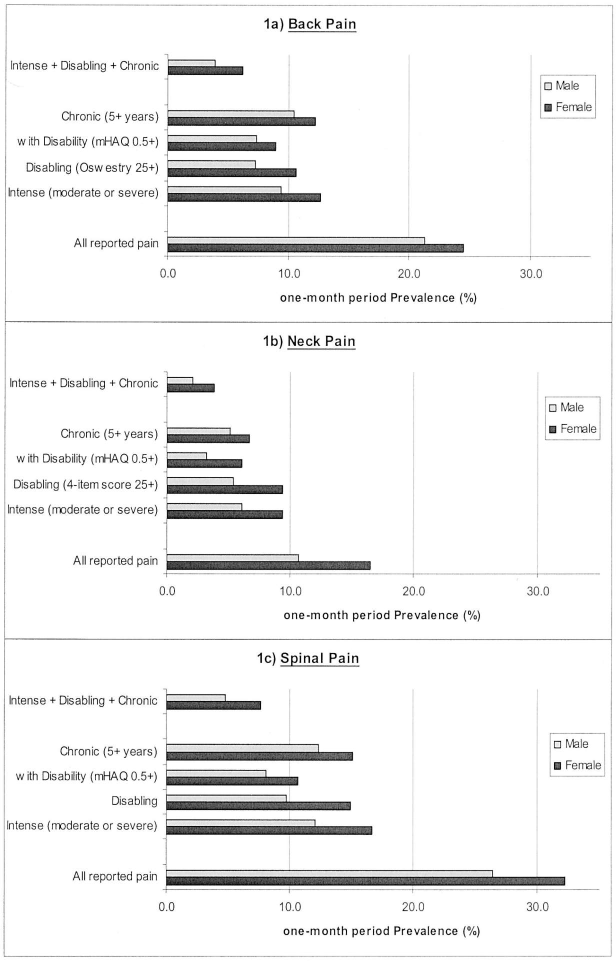

Figure 1. Prevalence estimates for all reported severity-stratified pain.

stratum-specific prevalence estimates. Each subject was sent a phase I screening questionnaire inquiring about musculoskeletal symptoms, height, weight, employment status, and sociodemographic data. Nonresponders were sent reminders at 4 and 8 weeks.

The Townsend index was used as an ecological marker for the socioeconomic status of individual subjects.[7] This index measures area-level material deprivation by combining four national census variables (percent of population unemployed, percent of households with no car, percent of households overcrowded, percent of households not owner-occupied) into a composite score. Precalculated scores were downloaded from the Census Dissemination Unit (http://census.ac.uk/cdu) and allocated to individual subjects by enumeration district (ED) of residence (the ED being the smallest unit of census geography). The subjects' scores were then categorized into quintiles (*i.e.*, division of a frequency distribution into five equal groups according to the 20th, 40th, 60th, and 80th percentiles) that were derived using the distribution of scores for all EDs in England and Wales. Carstairs scores[8] were used in our earlier analyses,[1] as Townsend scores could not be allocated at that time to the smallest level of census geography (the ED). Townsend scores were devised for England and Wales, whereas Carstairs were devised for Scotland, so the former measure was used in this study. Body mass index (BMI) was calculated in the standard way (*i.e.*, kg/m^2), and missing data were imputed using multivariate imputation.

Subjects were asked whether, over the last month, they had experienced pain lasting for more than 1 week in any of seven areas (back, neck, shoulder, elbow, hand, hip, knee) or in multiple joints. Subjects were asked to indicate their predominant ("most troublesome") pain site.

The phase I questionnaire included the modified Health Assessment Questionnaire (mHAQ),[9] composed of eight questions on physical function. Scores range from zero (no disability) to 3. The mHAQ is a shortened version of the Stanford Health Assessment Questionnaire,[10] which was developed for use in patients with rheumatoid arthritis. It has also been validated in patients with osteoarthritis[11] and other generalized musculoskeletal problems.[1] We used it to assess physical disability in the community and to enable comparison between different pain sites. We validated the use of the mHAQ in people with back or neck pain by examining the association between a number of definitions of spinal pain severity and mHAQ score. The employment status category "not working due to ill-health or disability" was used as another definition of disability.

Positive respondents at phase I were sent up to two site-specific phase II questionnaires. Subjects reporting pain in three or more areas or "pain in most joints" received a questionnaire on multiple joint symptoms plus a questionnaire regarding their predominant pain site. Intensity of pain was coded on an ordinal scale ("none" to "worst imaginable"). Intense pain was defined as a reported level of "moderate" or above. The phase II back pain questionnaire included the modified Oswestry Low Back Pain Disability score (*i.e.*, nine out of 10 components).[12] This validated measure of disability due to back pain is scored on a linear scale from 0 (no disability) to 100.[13] The Northwick Park Neck Pain Questionnaire,[14] which measures disability, was unavailable when this study was designed. However, four items from the Oswestry Questionnaire were adapted for neck pain (Appendix). A composite percentage score was calculated on the same basis as that for the Oswestry and Northwick Park scales. A score of 25% or more was used to define disability for both the Oswestry and four-item neck pain disability scales.[15] The phase II questionnaires included a question on chronicity (*i.e.*, years since the problem commenced).

Summary of Definitions

- *Spinal pain*, back or neck pain (1 week or more in last month)
- *Intense pain*, moderate (or worse)
- *Chronic pain*, first occurred 5 or more years ago
- *Disabling back pain*, Oswestry score $\geq$ 25
- *Disabling neck pain*, four-item neck pain score $\geq$ 25 (Appendix)
- *Spinal pain with disability*, pain plus mHAQ $\geq$ 0.5
- *Spinal pain with work disability*, pain plus unemployed due to ill health (age $<$ 65 years only)
- *South Asian*, subjects defining themselves as being of Indian, Pakistani, or Bangladeshi origin

Statistical Methods. Statistical analyses were performed using STATA version 6.0 (Stata Corp., College Station, TX) unless otherwise stated.[16] Survey estimation commands were used to take account of the unequal probability stratified sampling design,[17] having applied age-sex stratum specific sampling probability weights to each subject.

Table 1. Percentage (with 95% CI) of Respondents in Various Pain Categories by mHAQ Strata: Generated Using 'Survey Proportion' Estimator

	mHAQ score		
	0	≥0.5	≥1.0
Phase I Data			
No Musculoskeletal Pain Reported	93.8 (92.8–94.8)	1.8 (1.4–2.3)	0.8 (0.5–1.1)
All Back Pain	27.0 (23.5–30.4)	36.2 (32.8–39.7)	12.5 (10.3–14.8)
Back Pain (+ unemployed sick)	3.8 (0–7.8)	76.6 (67.4–85.8)	38.1 (27.7–48.5)
All Neck Pain	37.6 (33.1–42.0)	34.7 (30.6–38.9)	14.3 (11.3–17.3)
Neck Pain (+ unemployed sick)	12.1 (4.0–20.3)	75.1 (63.9–86.3)	35.3 (22.8–47.7)
Phase II Data			
Back Pain (Qu. returned)	32.8 (27.9–37.8)	28.9 (24.2–33.5)	8.1 (5.5–10.8)
Back Pain (Intense)	19.4 (12.8–26.0)	43.7 (36.0–51.5)	16.3 (10.6–21.9)
Back Pain (Disabling—Oswestry)	8.7 (4.2–13.2)	58.2 (49.9–66.6)	21.8 (14.7–28.9)
Neck Pain (Qu. returned)	55.4 (48.3–62.4)	19.6 (13.8–25.3)	3.5 (1.4–5.6)
Neck Pain (Intense)	35.1 (25.1–45.2)	37.1 (25.7–48.6)	5.2 (1.8–8.5)
Neck Pain (Disabling—4 item)	27.5 (17.8–37.3)	45.4 (33.4–57.5)	8.3 (2.8–13.7)

Phase I. Age-specific proportions were calculated, and survey estimator adjusted proportions were calculated across age strata. Prevalence rates for women, men, and all adults were extrapolated to the Health Authority population using direct standardization. Confidence interval (CIs) were calculated using the Confidence Interval Analysis package (BMJ Publishing Group, London, UK).[18] Logistic regression was used to test for interactions by gender in the age-specific prevalence trends. Multivariate logistic regression was used to model the independent predictors of all reported pain and pain with disability.

Univariate regression models were created for each independent variable. Adjustment was carried out at three levels: age and sex (level 1); age, sex, BMI, and Townsend quintile (level 2); and age, sex, BMI, Townsend quintile, and additional pain sites (level 3). The following independent variables were considered: age, sex, BMI, Townsend quintile, south Asian ethnicity, housing status (owner *vs.* nonowner occupied), and living alone status. BMI was categorized using the World Health Organization definitions (*i.e.*, < 20, underweight; 20–24.99, normal; 25–29.99, overweight; ≥ 30, obese).[19]

Phase II. Intensity, disability, and chronicity-stratified prevalence estimates were generated from the phase II data in several stages. As the phase II data represented a skewed subset of the phase I data, phase II probability estimates were modeled back to the phase I data and then extrapolated to the Health Authority population using direct standardization. The phase II probability estimates were calculated using multivariate logistic regression, followed by the "predict" command. The logistic regression models identified independent predictors of pain stratified by intensity, chronicity, and disability.

The (population) attributable fraction was calculated using the "aflogit" command, which estimates the proportion of cases in the population that can be attributed to a factor (or group of factors) having adjusted for covariates.[20,21]

Results

Phase I

Prevalence of All Reported Spinal Pain and Spinal Pain with Disability. The response rate to the phase I questionnaire was 78.5%. Of the 4515 responders, 1481 reported spinal pain, with 960 identifying this as their predominant pain site.

People with back or neck pain were more likely to have an mHAQ ≥ 0.5 or ≥ 1.0 than those with no pain at any site (Table 1). The association was strongest for back or neck pain with work disability; around three quarters of people in this category had an mHAQ score of 0.5 or greater. In phase II, the proportions with mHAQ 0.5 or greater were also high for disabling back pain (58%) and disabling neck pain (45%). These results validate the use of mHAQ 0.5 or greater as a marker of disability in people with spinal pain.

Approximately 24.5% of women and 21.3% of men in the Tameside population reported back pain for at least 1 week in the last month (Table 2). The equivalent figures for neck pain were 16.5% of women and 10.7% of men, and for spinal pain were 32.2% and 26.4%, respectively. The prevalence of spinal pain with disability (mHAQ ≥ 0.5) was substantially lower. The prevalence of spinal pain, in particular neck pain, was higher in women than men. Neck pain with disability was almost twice as common in women as men.

The peak prevalence of all reported back pain was 65 to 74 years in men and 45 to 64 years in women (LR χ^2 test for interaction, $P < 0.001$). There was strong evidence of a gender difference in the age-specific prevalence for back pain with disability (LR χ^2 test for interaction, $P = 0.007$). By contrast, there was no evidence for an interaction between sex and age group for all reported neck pain or for neck pain with disability.

Most people with back (74.8%) or neck (88.7%) pain also reported pain at other sites. Women reported pain at other sites more often (90.2% for neck pain, 78.5% for back pain) than men (86.4% for neck pain, 70.1% for back pain). The most common additional pain sites for those with neck pain were the shoulder, the back, and then the knee, and for those with back pain were the knee, the shoulder, and then the neck.

Predictors of Spinal Pain. Female gender, increasing BMI, increasing deprivation, and living alone were associated univariately with both back and neck (all reported) pain, and not being an owner-occupier was as-

Table 2. One-month Period Prevalence (%) of Pain Stratified Using Various Definitions of Severity (Intensity, Disability, & Chronicity): Data from Phases I & II Extrapolated to District Population

	Back				Neck				Spinal			
Age/Sex Stratum	All Reported	mHAQ ≥0.5	Unemployed Sick (<65y)	2+ Other Sites	All Reported	mHAQ ≥0.5	Unemployed Sick (<65y)	2+ Other Sites	All Reported	mHAQ ≥0.5	Unemployed Sick (<65y)	2+ Other Sites
Phase I Data												
F 16–44	20.1	6.0	2.7	6.6	12.2	3.7	2.3	6.0	25.7	6.9	3.3	–
F 45–64	26.9	10.1	6.5	14.5	19.3	7.4	5.2	13.3	36.0	11.8	7.9	–
F 65–74	32.1	11.8	–	19.9	23.9	8.8	–	15.9	42.7	14.7	–	–
F 75+	30.9	16.8	–	18.1	21.3	11.4	–	15.2	41.6	20.8	–	–
M 16–44	20.0	5.2	1.7	6.7	6.9	1.4	1.0	3.6	23.3	5.5	1.7	–
M 45–64	24.6	11.1	7.1	13.6	14.6	5.1	4.2	9.2	30.7	12.2	8.7	–
M 65–74	20.6	7.5	–	10.9	16.7	4.5	–	10.2	30.5	8.8	–	–
M 75+	17.4	8.5	–	10.3	17.8	8.2	–	9.9	27.9	12.4	–	–
all women:	24.5	9.0	4.0	11.5	16.5	6.1	3.3	10.1	32.2	10.7	4.9	–
(95% CI)	(22.1–26.8)	(7.6–10.3)	(2.9–5.2)	(10.0–13.0)	(14.6–18.3)	(5.0–7.2)	(2.3–4.4)	(8.7–11.5)	(29.5–34.9)	(9.2–12.1)	(3.6–6.2)	–
all men:	21.3	7.4	3.6	9.3	10.7	3.2	2.1	6.2	26.4	8.1	4.1	–
(95% CI)	(18.6–23.9)	(5.9–8.9)	(2.5–4.7)	(7.6–11.0)	(9.0–12.4)	(2.3–4.0)	(1.2–2.9)	(4.9–7.5)	(23.5–29.4)	(6.6–9.7)	(2.9–5.3)	–
all adults:	22.7	8.1	3.8	10.3	13.8	4.7	2.8	8.2	29.2	9.3	4.6	–
(95% CI)	(20.9–24.4)	(7.1–9.0)	(3.0–4.6)	(9.2–11.4)	(12.5–15.1)	(4.0–5.4)	(2.1–3.5)	(7.3–9.2)	(27.3–31.2)	(8.3–10.4)	(3.7–5.4)	–

	Back				Neck				Spinal			
Age/Sex Stratum	Intense	Disabling	Chronic	I, D, & C	Intense	Disabling	Chronic	I, D, & C	Intense	Disabling	Chronic	I, D, & C
Phase II Data												
F 16–44	8.3	5.1	6.6	2.6	5.1	5.4	2.7	0.8	11.0	6.8	7.8	2.8
F 45–64	14.9	12.7	16.5	8.1	12.8	11.6	10.5	5.9	19.6	16.2	21.0	10.3
F 65–74	19.6	19.4	21.1	11.6	15.9	15.8	13.2	9.2	25.3	24.8	26.2	15.0
F 75+	20.5	22.6	18.6	13.0	14.0	16.0	8.4	6.6	27.1	29.8	22.2	15.2
M 16–44	7.2	4.4	6.7	1.7	3.1	2.7	2.0	0.2	8.8	4.9	7.4	1.8
M 45–64	12.7	10.8	16.3	6.9	9.7	8.2	9.1	4.3	16.3	12.4	18.9	8.6
M 65–74	10.9	10.6	14.3	6.0	10.0	8.7	9.4	4.8	15.9	13.9	18.8	8.6
M 75+	10.6	11.7	11.7	6.3	10.8	11.6	7.4	4.4	16.4	16.7	15.4	8.6
all women:	12.7	10.7	12.3	6.2	9.4	9.4	6.7	3.8	16.7	14.9	15.1	7.6
(95% CI)	(10.4–15.1)	(8.6–12.8)	(10.2–14.3)	(4.6–7.9)	(7.1–11.7)	(7.1–11.8)	(4.8–8.6)	(2.2–5.4)	(14.2–19.2)	(12.5–17.2)	(12.9–17.3)	(5.9–9.3)
all men:	9.4	7.3	10.5	3.9	6.1	5.4	5.1	2.1	12.1	9.7	12.3	4.8
(95% CI)	(7.2–11.5)	(5.3–9.2)	(8.3–12.8)	(2.4–5.4)	(2.4–9.8)	(2.1–8.7)	(3.5–6.8)	(0.9–3.3)	(9.6–14.7)	(7.3–12.1)	(10.1–14.5)	(3.3–6.3)
all adults:	10.9	8.9	11.3	5.0	7.8	7.5	5.9	2.9	14.4	12.2	13.6	6.1
(95% CI)	(9.4–12.5)	(7.4–10.3)	(9.8–12.8)	(3.9–6.1)	(6.2–9.4)	(5.9–9.1)	(4.7–7.2)	(2.0–3.9)	(12.6–16.1)	(10.6–13.8)	(12.1–15.2)	(5.0–7.2)

sociated with back pain. Female gender lost significance following adjustment in the back pain models but remained an independent predictor in the multivariate neck pain models. After adjusting for age and gender, south Asian ethnicity predicted back and neck pain but lost significance when adjustment for additional pain sites was made. The associations of BMI and Townsend quintile with back pain persisted after adjustment, whereas these associations with neck pain were lost after adjustment for additional pain sites.

A similar but stronger pattern of predictors was seen for back or neck pain with disability (Table 3). Obesity (BMI $\geq$ 30) was a stronger predictor of back pain with disability than of back pain alone, and remained significant even at level 3 adjustment. Obesity was a strong predictor of neck pain with disability following level 2 adjustment but completely lost significance following adjustment for additional pain sites (level 3). Deprivation independently predicted back pain with disability at all levels of adjustment, whereas this association with neck pain with disability lost significance after adjustment for additional pain sites. South Asians were 3.25 times (95% CI, 1.58–6.68) more likely to report back pain with disability than whites and 5.35 times more likely (95% CI, 2.23–12.80) to have neck pain with disability than whites after adjustment for age and gender. Living alone predicted both back and neck pain with disability, but significance was lost following adjustment for age and gender.

The associations for spinal pain with work disability (confined to those younger than 65 years) were similar to those for mHAQ $\geq$ 0.5 and were generally stronger (Table 4). An association between deprivation and work disability was found in both back pain and neck pain sufferers, and this association remained highly significant even at level 3 adjustment in both back and neck pain models. A nonsignificant trend was seen toward women having a greater risk of work disability.

Body mass index was a strong univariate predictor of all three definitions of both back and neck pain. For all three back pain models, BMI remained significant following adjustment, whereas for the neck pain models, significance was lost at level 3 adjustment. This finding suggests that BMI is associated with back pain but not

Table 3. Independent Predictors of Spinal Pain with Disability (mHAQ ≥0.5)*; phase I data; Odds Ratios with 95% CIs

	Back Pain (& mHAQ ≥ 0.5)				Neck Pain (& mHAQ ≥ 0.5)			
Independent variable	Unadjusted	Adjusted (Level 1)	Adjusted (Level 2)	Adjusted (Level 3)	Unadjusted	Adjusted (Level 1)	Adjusted (Level 2)	Adjusted (Level 3)
Sex								
F	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
M	0.80 (0.62–1.04)	0.87 (0.67–1.12)	0.87 (0.67–1.13)	1.11 (0.82–1.50)	0.51 (0.37–0.70)	0.56 (0.40–0.78)	0.58 (0.42–0.81)	0.64 (0.44–0.95)
BMI								
<20	0.89 (0.52–1.52)	1.09 (0.63–1.90)	1.01 (0.58–1.77)	1.07 (0.58–1.98)	1.11 (0.63–1.97)	1.28 (0.71–2.33)	1.20 (0.67–2.17)	1.27 (0.65–2.49)
20–24.99 (baseline)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
25–29.99	1.72 (1.28–2.30)	1.53 (1.13–2.06)	1.51 (1.12–2.03)	1.44 (1.03–2.01)	1.33 (0.94–1.88)	1.19 (0.84–1.69)	1.17 (0.83–1.66)	0.92 (0.61–1.37)
≥30	2.98 (2.10–4.22)	2.53 (1.79–3.57)	2.30 (1.62–3.26)	1.68 (1.12–2.53)	2.84 (1.85–4.37)	2.33 (1.52–3.58)	2.12 (1.38–3.23)	1.27 (0.76–2.13)
	$P < 0.001$	$P < 0.001$	$P < 0.001$	$P = 0.049$	$P < 0.001$	$P = 0.002$	$P = 0.007$	$P = 0.575$
Townsend								
1	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
2	1.09 (0.69–1.72)	1.09 (0.69–1.72)	1.07 (0.67–1.69)	1.02 (0.62–1.67)	0.75 (0.43–1.29)	0.78 (0.45–1.36)	0.76 (0.44–1.33)	0.65 (0.34–1.24)
3	1.11 (0.69–1.77)	1.06 (0.66–1.69)	1.04 (0.65–1.67)	0.78 (0.45–1.34)	0.91 (0.53–1.58)	0.86 (0.49–1.51)	0.84 (0.48–1.47)	0.58 (0.30–1.13)
4	1.85 (1.22–2.82)	1.91 (1.25–2.91)	1.79 (1.17–2.74)	1.26 (0.80–2.00)	1.65 (0.99–2.74)	1.66 (0.98–2.81)	1.55 (0.92–2.61)	0.84 (0.46–1.53)
5 (most deprived)	2.24 (1.47–3.41)	2.45 (1.61–3.71)	2.33 (1.52–3.56)	1.74 (1.10–2.74)	1.89 (1.13–3.15)	2.04 (1.20–3.48)	1.91 (1.12–3.26)	1.20 (0.64–2.25)
	$P < 0.001$	$P < 0.001$	$P < 0.001$	$P = 0.009$	$P < 0.001$	$P < 0.001$	$P < 0.001$	$P = 0.082$
South Asian								
no	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
yes	2.19 (1.07–4.45)	3.25 (1.58–6.68)	2.61 (1.25–5.44)	1.87 (0.86–4.08)	3.15 (1.41–7.02)	5.35 (2.23–12.80)	4.30 (1.80–10.26)	3.02 (0.95–9.63)
Housing								
owner occ	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
non owner occ	1.74 (1.34–2.26)	2.15 (1.62–2.85)	1.66 (1.24–2.23)	1.58 (1.14–2.19)	2.06 (1.51–2.82)	2.38 (1.68–3.36)	1.85 (1.27–2.67)	1.83 (1.22–2.76)
Living alone								
no	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
yes	1.54 (1.19–2.00)	1.17 (0.87–1.57)	1.08 (0.81–1.45)	1.07 (0.77–1.49)	1.87 (1.37–2.54)	1.13 (0.79–1.62)	1.04 (0.73–1.49)	0.89 (0.59–1.36)

* Level 1 adjustment (age & sex); Level 2 adjustment (age, sex, Townsend, BMI); Level 3 adjustment (age, sex, Townsend, BMI, additional pain sites).

Table 4. Independent Predictors of Spinal Pain with Work Disability (<65 years)*; phase I data; Odds Ratios with 95% CIs

	Back Pain (& unemployed sick, <65 years)				Neck Pain (& unemployed sick, <65 years)			
Independent variable	Unadjusted	Adjusted (Level 1)	Adjusted (Level 2)	Adjusted (Level 3)	Unadjusted	Adjusted (Level 1)	Adjusted (Level 2)	Adjusted (Level 3)
Sex								
F	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
M	0.89 (0.59–1.36)	0.91 (0.59–1.39)	0.95 (0.61–1.47)	1.24 (0.76–2.01)	0.62 (0.37–1.04)	0.63 (0.38–1.06)	0.64 (0.38–1.08)	0.67 (0.38–1.20)
BMI								
<20	1.16 (0.41–3.31)	1.80 (0.61–5.29)	1.54 (0.50–4.72)	1.76 (0.44–7.09)	1.03 (0.30–3.59)	1.59 (0.45–5.67)	1.39 (0.38–5.11)	1.22 (0.27–5.42)
20–24.99 (baseline)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
25–29.99	2.28 (1.36–3.82)	1.89 (1.14–3.16)	1.91 (1.13–3.21)	1.85 (1.04–3.27)	2.29 (1.31–4.01)	1.95 (1.10–3.46)	2.00 (1.11–3.58)	1.66 (0.88–3.13)
≥30	4.66 (2.57–8.45)	3.53 (1.93–6.47)	3.01 (1.64–5.52)	2.42 (1.27–4.62)	3.37 (1.59–7.11)	2.42 (1.10–5.35)	1.99 (0.90–4.39)	1.20 (0.51–2.82)
	$P < 0.001$	$P < 0.001$	$P = 0.004$	$P = 0.047$	$P = 0.003$	$P = 0.073$	$P = 0.108$	$P = 0.481$
Townsend								
1	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
2	0.87 (0.38–2.02)	0.91 (0.39–2.10)	0.87 (0.38–2.00)	0.79 (0.32–1.95)	0.63 (0.24–1.66)	0.68 (0.26–1.80)	0.67 (0.25–1.77)	0.63 (0.22–1.84)
3	0.77 (0.30–2.00)	0.80 (0.31–2.05)	0.76 (0.30–1.96)	0.58 (0.21–1.62)	0.28 (0.08–1.03)	0.29 (0.08–1.09)	0.29 (0.08–1.05)	0.22 (0.06–0.83)
4	2.68 (1.34–5.37)	3.11 (1.55–6.24)	2.84 (1.42–5.70)	1.80 (0.88–3.67)	2.59 (1.20–5.56)	3.09 (1.44–6.66)	3.00 (1.40–6.45)	1.73 (0.76–3.95)
5 (most deprived)	3.34 (1.70–6.59)	4.19 (2.13–8.24)	3.88 (1.94–7.74)	2.63 (1.27–5.45)	2.81 (1.31–6.00)	3.65 (1.72–7.72)	3.52 (1.66–7.47)	2.45 (1.05–5.70)
	$P < 0.001$	$P < 0.001$	$P < 0.001$	$P = 0.002$	$P < 0.001$	$P < 0.001$	$P < 0.001$	$P = 0.001$
South Asian								
no	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
yes	3.62 (1.53–8.54)	5.03 (2.06–12.24)	3.45 (1.38–8.59)	2.47 (0.83–7.35)	4.17 (1.57–11.07)	5.96 (2.09–17.00)	3.75 (1.34–10.44)	2.61 (0.67–10.16)
Housing								
non-owner occ	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
non owner occ	2.18 (1.39–3.44)	3.56 (2.19–5.79)	2.21 (1.32–3.69)	2.12 (1.21–3.73)	2.51 (1.49–4.23)	4.31 (2.55–7.31)	2.84 (1.66–4.86)	3.02 (1.67–5.47)
Living alone								
no	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
yes	2.36 (1.38–4.03)	2.10 (1.21–3.63)	1.79 (1.01–3.17)	1.80 (0.94–3.46)	1.84 (0.96–3.51)	1.61 (0.83–3.11)	1.32 (0.66–2.62)	1.41 (0.65–3.05)

* Level 1 adjustment (age & sex); Level 2 adjustment (age, sex, Townsend, BMI); Level 3 adjustment (age, sex, Townsend, BMI, additional pain sites).

Table 5. Independent Predictors of Various Severity Definitions (Among Those Reporting Back Pain—Phase II Data), Adjusted for Age, Sex, BMI, & Townsend—Odds Ratios with 95% CIs

	Intense Pain (Moderate/Severe)		Disabling Pain (Oswestry ≥25)		Intense, Disabling & Chronic Pain	
Independent variable	Unadjusted	Adjusted (Level 2)*	Unadjusted	Adjusted (Level 2)*	Unadjusted	Adjusted (Level 2)*
BMI						
<20	1.13 (0.59–2.16)	1.17 (0.59–2.31)	1.80 (0.94–3.46)	1.83 (0.84–4.01)	1.77 (0.82–3.82)	1.71 (0.76–3.86)
20–24.99 (baseline)	1.00–	1.00–	1.00–	1.00–	1.00–	1.00–
25–29.99	1.44 (0.97–2.12)	1.55 (1.03–2.31)	1.32 (0.88–1.97)	1.49 (0.95–2.33)	1.69 (1.03–2.77)	1.92 (1.15–3.21)
30+	2.35 (1.38–4.01)	2.31 (1.34–4.00)	2.59 (1.52–4.43)	2.69 (1.50–4.83)	2.24 (1.22–4.14)	2.21 (1.17–4.19)
	$P = 0.011$	$P = 0.012$	$P = 0.004$	$P = 0.007$	$P = 0.039$	$P = 0.035$
AF (population)	–	14.2% (3.6–23.6)	–	16.0% (4.6–26.0)	–	26.6% (7.3–41.9)
Townsend						
1	1.00–	1.00–	1.00–	1.00–	1.00–	1.00–
2	0.93 (0.51–1.70)	1.05 (0.56–1.93)	0.78 (0.40–1.51)	1.09 (0.52–2.27)	0.94 (0.40–2.22)	1.14 (0.47–2.76)
3	1.01 (0.54–1.90)	1.07 (0.56–2.05)	1.80 (0.92–3.51)	2.29 (1.10–4.81)	2.16 (0.95–4.95)	2.48 (1.06–5.84)
4	1.29 (0.73–2.30)	1.31 (0.72–2.37)	1.96 (1.06–3.61)	2.50 (1.26–4.98)	1.90 (0.88–4.13)	2.10 (0.94–4.70)
5 (most deprived)	2.00 (1.12–3.59)	2.17 (1.19–3.97)	2.49 (1.34–4.64)	3.65 (1.82–7.33)	2.13 (0.98–4.66)	2.53 (1.12–5.69)
	$P = 0.025$	$P = 0.027$	$P < 0.001$	$P < 0.001$		
AF (population)	–	13.7% (0–33.2)	–	33.3% (6.7–52.3)	–	38.5% (0–64.3%)
AF (BMI + Townsend combined) (population)	–	27.6% (0.7–47.2)	–	46.8% (20.7–64.4)	–	56.9% (18.5–77.2)

AF, attributable fraction.

neck pain *per se*. Obese people (BMI ≥ 30) had a much higher prevalence of spinal pain than people in the other three BMI categories. The age-sex adjusted odds ratios for obesity were especially high for pain with disability models. With the exception of all reported neck pain, underweight people (BMI < 20) had a higher prevalence of spinal pain than people of normal weight, but these differences were not significant.

Phase II

The phase II response rates were 83.7% for back pain and 85.6% for neck pain. Allowing for the sampling design (Table 2), approximately 12.7% of women in the population had intense back pain, 10.7% had disabling back pain (Oswestry ≥ 25), 12.3% had chronic back pain, and 6.2% had intense, disabling, and chronic back pain. The figures for men were lower: 9.4%, 7.3%, 10.5%, and 3.9%, respectively. Neck pain was less common. The prevalence of disabling spinal pain rose sharply with age; the rate was approximately 4.5 times higher for women 75 years and older compared with those age 16 to 44 years, and for males, the difference was over 3.5-fold. Approximately half of all reported spinal pain was intense, half was chronic, 40% was disabling, and 20% was intense, disabling, and chronic.

Regression models were used to identify independent predictors of pain intensity, chronicity, and disability (Table 5). Small numbers precluded analysis of some variables (such as south Asian ethnicity). Age was the only significant predictor of any category of neck pain. Gender was not associated with any back pain category. BMI was a strong predictor of intensity, chronicity, and disability among those with back pain, while deprivation was a strong predictor of intense and disabling back pain. These associations remained after adjustment. There was no association between deprivation and chronicity. The underweight BMI group (< 20) had a higher prevalence of all the categories of back pain than those with normal BMI, and the highest prevalence for each back pain category was again in the obese BMI group (≥ 30). The strongest association with deprivation was found with disabling back pain (Oswestry score ≥ 25):-quintile 5 *versus* 1 adjusted OR = 3.65 (1.82–7.33). The (population) attributable fractions show that nearly 30% of intense, disabling, and chronic back pain can be attributed to abnormal BMI (either overweight or underweight), and nearly 40% can be attributed to deprivation. Fifty-seven percent (95% CI, 19–77%) can be attributed to the combined effects of BMI and deprivation.

■ Discussion

This is the first UK study to investigate the prevalence and predictors of clinically significant (intense, disabling, or chronic) spinal pain. It had a cross-sectional design and therefore was limited in its potential to assess causality. However, an important innovative aspect was adjustment for the confounding effects of additional reported pain sites. In the United Kingdom, the overwhelming majority of the population is registered with a primary care physician, so conducting surveys using general practice registers is virtually equivalent to sampling from the general population.

Although the associations for back pain were stronger than for neck pain (Table 1), there was evidence to validate using the mHAQ score as a proxy for disability among spinal pain sufferers.

The intensity, disability, and chronicity stratified prevalence estimates (Table 2) provide an indication of the proportion of all reported cases that are clinically relevant. The prevalence of spinal pain with disability has a different age profile from that for all reported pain. The prevalence of pain with disability continues to rise with age, whereas all reported pain tends to peak at younger age groups. This finding has important implications for health service planning, especially given the aging of the UK population. Badley and Tennant[22] found a similar difference between the age profiles of all reported and disabling joint pain.

Despite the large number of epidemiologic studies that have assessed the association between obesity and low back pain, the evidence of a causal association is equivocal.[23] We found a significant and independent association between obesity and back pain. However, the association between obesity and neck pain was lost at level 3 adjustment, suggesting that it can be explained by subjects who have both back and neck pain. This was confirmed by adjustment for back pain only (rather than all other reported pain sites). The Mini-Finland Health Survey also found a weak association between being overweight and neck pain prevalence after adjustment.[24] The authors concluded that this new finding could reflect an indirect association with a true (but as yet unidentified) causal factor. Our findings suggest that the true causal factor could be comorbid low back pain, because BMI was strongly associated with increased levels of intensity, disability, and chronicity among those who reported back pain, and because over half of subjects who reported neck pain also reported back pain.

Our findings also provide strong evidence of an independent association between deprivation and back pain with disability (both mHAQ ≥ 0.5 and work disability) and neck pain with work disability. The relation between socioeconomic factors and back pain has been extensively researched,[25] but to a lesser extent for neck pain. It has been suggested that chronic low back pain has become a diagnosis of convenience for people who are disabled for socioeconomic, work-related, or psychologic reasons.[26] This may explain the especially strong association between deprivation and back and neck pain with work disability. Studies from Finland[24] and the United States[27] have found that chronic or disabling neck pain is associated with previous injury to the spine or shoulder (especially from road traffic accidents), with comorbidity, and with stress at work.

The strong and independent association between spinal pain with disability and south Asian ethnicity is a new finding. The small number of south Asians in the sample (n = 71) precluded more detailed analysis. A further study focusing on people from ethnic minorities has now been conducted in Tameside and inner city Manchester.[28]

In conclusion, this study provides generalizable estimates of back and neck pain prevalence stratified into various categories of severity. We have demonstrated that BMI is an important independent predictor of back pain and its severity, and that deprivation is an important predictor of disabling back pain.

Key Points

- In this survey of the general population, approximately 20% of all reported spinal pain was intense, disabling, and chronic.
- Adjustment for additional pain sites enables assessment of whether observed associations were with spinal pain *per se* or with other reported sites.
- Prevalence estimates for significant pain are of value for service planning and needs assessment.

Acknowledgments

The authors acknowledge the contribution of Professor Gareth Williams (formerly at the University of Salford Public Health Research and Resource Centre).

Appendix

The following questions were used to calculate a four-item disability index for subjects reporting that they were suffering from neck pain. The index was derived by dividing the aggregate number of points actually scored by the total possible score (*i.e.*, 24) and by converting this result to a percentage. A score of 25% or more was used to indicate moderate (or greater) degree of severity.

Please tick the box which best describes the pain intensity in your neck today:

0 = "I have no pain at the moment"
1 = "The pain is very mild at the moment"
2 = "The pain is moderate at the moment"
3 = "The pain is fairly severe at the moment"
4 = "The pain is very severe at the moment"
5 = "The pain is the worst imaginable at the moment"

Sleeping:

0 = "My sleep is never disturbed by pain"
1 = "My sleep is occasionally disturbed by pain"
2 = "Because of pain I have less than six hours sleep"
3 = "Because of pain I have less than four hours sleep"
4 = "Because of pain I have less than two hours sleep"
5 = "Pain prevents me from sleeping at all"

Lifting:

0 = "I can lift heavy weights without extra pain"
1 = "I can lift heavy weights but it gives extra pain"
2 = "Pain prevents me from lifting heavy weights off the floor, but I can manage if they are conveniently positioned (*e.g.*, on a table)"
3 = "Pain prevents me from lifting heavy weights but I can manage light to medium weights if they are conveniently positioned"
4 = "I can lift only very light weights"
5 = "I cannot lift or carry anything at all"

■ Social life:

0 = "My social life is normal and causes me no extra pain"

1 = "My social life is normal but increases the degree of pain"

2 = "Pain has no significant effect on my social life apart from limiting my more energetic interests (*e.g.*, sport, *etc.*)"

3 = "Pain has restricted my social life and I do not go out as often"

4 = "Pain has restricted my social life to my home"

5 = "I have no social life because of pain"

References

1. Urwin M, Symmons D, Allison T, et al. Estimating the burden of musculoskeletal disorders in the community: the comparative prevalence of symptoms at different anatomical sites, and the relation to social deprivation. *Ann Rheum Dis* 1998;57:649–55.
2. Hillman M, Wright A, Rajaratnam G, et al. Prevalence of low back pain in the community: implications for service provision in Bradford, UK. *J Epidemiol Commun Health* 1996;50:347–52.
3. Papageorgiou AC, Croft PR, Ferry S, et al. Estimating the prevalence of low back pain in the general population. *Spine* 1995;20:1889–94.
4. Walsh K, Cruddas M, Coggan D. Low back pain in eight areas of Brain. *J Epidemiol Commun Health* 1992;46:227–30.
5. Palmer KT, Walker-Bone K, Griffin MJ, et al. Prevalence and occupational associations of neck pain in the British population. *Scand J Work Environ Health* 2001;27:49–56.
6. Croft P, Papageorgiou A, McNally R. Low back pain. In: Stephens A, Raftery J, eds. *Health Care Needs Assessment: The Epidemiologically Based Needs Assessment Reviews*. Vol. 1. Series 2. Oxford, UK: Radcliffe Medical Press; 1997:129–81.
7. Townsend P, Phillimore P, Beattie A. *Health and Deprivation and the North*. London, UK: Croom Helm; 1988.
8. Carstairs V, Morris R. *Deprivation and Health in Scotland*. Aberdeen, UK: Aberdeen University Press; 1991.
9. Pincus T, Summey JA, Soraci SA, et al. Assessment of patient satisfaction in activities of daily living using a modified Stanford Health Assessment Questionnaire. *Arthritis Rheum* 1983;26:1346–53.
10. Fries JF, Spitz P, Kraines RG, et al. Measurement of patient outcome in arthritis. *Arthritis Rheum* 1980;23:137–45.
11. Brazier JE, Harper R, Munro J, et al. Generic and condition-specific outcome measures for people with osteoarthritis of the knee. *Rheumatology* 1999;38:870–7.
12. Fairbank JCT, Couper J, Davies JB, et al. The Oswestry Low Back Pain Disability Questionnaire. *Physiotherapy* 1980;66:271–3.
13. Fritz JM, Irrgang JJ. A comparison of a modified Oswestry Low Back Pain Disability Questionnaire and the Quebec Back Pain Disability Scale. *Phys Ther* 2001;81:776–88.
14. Leak AM, Cooper J, Dyer S, et al. The Northwick Park Neck Pain Questionnaire, devised to measure neck pain and disability. *Br J Rheumatol* 1994;33:469–74.
15. Seferlis T, Nemeth G, Carlsson AM. Prediction of functional disability, recurrences and chronicity after 1 year in 180 patients who required sick leave for acute low-back pain. *J Spinal Disord* 2000;13:470–7.
16. Stata Corp. *Stata Statistical Software: Release 6.0* [computer software]. College Station, TX: Stata Corp.; 1999.
17. Stata Corp. *Stata User Guide: Release 6.0*. College Station, TX: Stata Corp.; 1999.
18. Gardner MJ, Gardner SB, Winter PD, et al. *Confidence Interval Analysis (CIA) Version 2.0.0* [computer program]. London, UK: BMJ Publishing Group; 2000.
19. World Health Organization. *Measuring Obesity: Classification and Description of Anthropometric Data: Report on a WHO Consultation on the Epidemiology of Obesity*. Copenhagen, Denmark: WHO Regional Office for Europe, Nutrition Unit; 1988.
20. Greenland S, Drescher K. Maximum likelihood estimation of the attributable fraction from logistic models. *Biometrics* 1993;49:865–72.
21. Benichou J. A review of adjusted estimators of attributable risk. *Stat Methods Med Res* 2001;10:195–216.
22. Badley EM, Tennant A. Changing profile of joint disorders with age: findings from a postal survey of the population of Calderdale, West Yorkshire, United Kingdom. *Ann Rheum Dis* 1992;51:366–71.
23. Leboef YC, Kyvik KO, Bruun NH. Low back pain and lifestyle, part II: obesity: information from a population-based sample of 29,424 twin subjects. *Spine* 1999;24:779–83; discussion 783–4.
24. Makela M, Heliovaara M, Sievers K, et al. Prevalence, determinants, and consequences of chronic neck pain in Finland. *Am J Epidemiol* 1991;134:1356–67.
25. Croft PR, Rigby AS. Socioeconomic influences on back problems in the community in Brain. *J Epidemiol Commun Health* 1994;48:166–70.
26. Andersson GB. Epidemiological features of chronic low back pain. *Lancet* 1999;354:581–5.
27. Cote P, Cassidy JD, Carroll L. The factors associated with neck pain and its related disability in the Saskatchewan population. *Spine* 2000;25:1109–17.
28. Allison TR, Symmons DPM, Brammah T, et al. Musculoskeletal pain is more generalised among people from ethnic minorities than among white people in Greater Manchester. *Ann Rheum Dis* 2002;61:151–6.