

Changing profile of joint disorders with age: findings from a postal survey of the population of Calderdale, West Yorkshire, United Kingdom

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Abstract

A survey of the age-sex specific prevalence of joint problems in a population and associated features such as disablement and use of treatment was carried out in 1986 in Calderdale, West Yorkshire, United Kingdom. A postal questionnaire was sent to 25 168 households; 87% were returned, representing households containing 42 826 people aged 16 years and over. Positive answers to a question about pain, swelling, or stiffness in the joints, neck, or back were given by 10 246 subjects, 24% of the population aged 16 years and older, of whom 6181 (60.3%) were women. The rate of reporting of joint problems increased markedly with age, from 5% for subjects aged 16-24 years to 54% for those aged 85 years and older. The joint sites most often reported as affected were the knee and the back, with a frequency in the population of about 10%. The increase in joint problems with age was accompanied by an increase in reported morning stiffness of more than half an hour, taking drugs, and disability, but not in reporting seeing a specialist for these conditions. Of those aged 85 years and older who reported joint problems, most also had difficulty or dependence in activities of daily living. The increasing prevalence of joint problems with age has implications for the provision of care, both in the community and in hospitals, especially in view of the aging of the population as a whole. The planning of health services for those with rheumatic disorders needs to take into account the high incidence of joint problems in the population.

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Rheumatic disorders are a major cause of morbidity and disability in the population. Epidemiological studies,¹⁻⁴ data on medical consultations,⁵ and surveys of disablement⁶⁻⁹ all point to an increase in the prevalence of musculoskeletal disorders with age. Many developed countries are experiencing a shift in the demographic structure of their population, leading to an increase in the proportion of elderly people, and in the United Kingdom, an increase within the elderly population of those aged more than 85 years.^{10 11} This is likely to have implications for those working in rheumatological and other services for people with musculoskeletal disorders, as well as for those who care for people with disabilities.^{11 12}

Most studies have been about what might be considered to be established diagnostic groups. Although the increase in the prevalence of musculoskeletal disorders with age is found

overall, the pattern is different for different disorders. Although the arthropathies increase with age, spinal conditions tend to have a peak prevalence in middle life.^{1 5 13} Relatively few studies have considered the overall picture in terms of the pattern of joints affected.

A survey of disability in the population, which included a postal screening questionnaire asking about joint problems, has allowed us to examine the age-sex specific prevalence of joint symptoms in the population, and to study associated aspects such as the use of treatment and disablement in those reporting problems. This allows further consideration of the implications of an aging population for the provision of care in the community and in hospitals, including the potential need for specialist medical services.

Methods

A survey was carried out in 1986 in the population of Calderdale, West Yorkshire, United Kingdom. One of the three main objectives was to study the distribution of joint problems in the population.⁶ Calderdale is in the Pennines in the north of England, with a population at the 1981 census of 189 402. The demographic structure of Calderdale at the census, with 23% of its population aged under 16, 61% aged 16-64, 10% aged 65-74, and 6% aged over 75 years, was virtually identical with that of England and Wales at that time.

A two stage methodology was used, similar to that in other surveys of disablement in the population.^{7 14} The first stage consisted of a postal questionnaire to every third household in the area, using the domestic rating list as the sampling frame. The sample size was determined by the need to provide meaningful analysis for a rare group in the population, namely those very severely physically disabled aged 16-64 years, based on an estimate of 12 per 10 000 people.⁸

Screening questionnaires were sent to 25 168 occupied dwellings in Calderdale and 21 889 were returned, a response rate of 87%. This was achieved by the original posting (first wave, 57% response), two further postal follow ups (second and third waves, taking the response to 73 and 81% respectively), and a final postal follow up (the fourth wave). The response represents 42 826 people aged 16 years and older.

The four page screening questionnaire used in phase 1 elicited demographic characteristics of the household and information about subjects within the household who experienced disablement in selected activities of daily living as a

Table 1 Reported joint problems in the Calderdale population by sex. The estimated number and percentage prevalence is given by age group (numbers in parentheses give the 95% confidence intervals (CI) when added to and subtracted from the prevalence)

	Age group (years)								
	All ages	16-24	25-34	35-44	45-54	55-64	65-74	75-84	85+
Subjects*									
Number	10246	350	777	1396	1621	2227	2161	1408	306
Prevalence (95% CI) (%)	23.9 (0.4)	4.9 (0.5)	10.4 (0.7)	20.1 (0.9)	26.0 (1.1)	37.3 (1.2)	39.7 (1.3)	45.5 (1.8)	53.6 (4.1)
Men									
Number	4048	134	371	637	701	953	840	355	57
Prevalence (95% CI) (%)	20.0 (0.4)	3.8 (0.4)	10.0 (0.7)	19.7 (0.9)	23.1 (1.0)	34.3 (1.2)	35.0 (1.3)	33.0 (1.7)	39.6 (4.0)
Women									
Number	6181	216	406	757	912	1272	1318	1051	249
Prevalence (95% CI) (%)	27.4 (0.4)	6.1 (0.6)	10.7 (0.7)	22.4 (1.0)	28.5 (1.1)	39.9 (1.3)	43.3 (1.3)	52.1 (1.8)	58.3 (4.0)

*Includes 17 subjects with unstated sex.

result of health problems or disabilities which were likely to continue. Disability questions asked about six activities of daily living which often cause difficulties for people with arthritis: getting up and down stairs; gripping or holding things or using arms, hands, or fingers; doing up buttons or zips; putting on shoes, socks, or stockings; brushing or combing hair; and getting out of a low chair. Dependence was defined as requiring help with four activities of daily living; getting in or out of bed, dressing, getting to and using the toilet, and getting out of the house. An enquiry was made about the nature of the main illness or cause of disability.

The questionnaire also asked 'does anyone in your household suffer from any pain, swelling or stiffness in their joints, neck or back?', and asked the number of people in the household who had joint problems. For each subject with problem joints the questionnaire asked for the site of the joints affected to be recorded on a chart. Eighteen possible joint sites were included: the neck, back, and left and right shoulder, elbow, wrist, hand or fingers, hip, knee, ankle, and foot or toes. No distinction was made between the type of joint problem experienced, nor between individual joints in the hands or fingers and feet or toes. No reference was made to the time period over

which the joint problems had been experienced. Respondents were also asked to enter the cause of the joint problems, with 17 of the most common rheumatic disorders listed. Further questions asked about morning stiffness lasting for more than half an hour, whether anyone regularly took drugs because of problem joints, or had seen a hospital specialist because of these problems.

Results

Positive answers to the question about pain, swelling, or stiffness in the joints, neck or back were given by 10 246 subjects, 24% of the population aged 16 years and older, of whom 6181 (60.3%) were women (table 1). The rate of reporting of joint problems increased markedly with age (shown by non-overlapping confidence intervals (CI) for prevalence estimates), ranging from 4.9% (95% CI 4.4 to 5.4%) for ages 16-24 years, to 53.6% (95% CI 49.5 to 57.7%) for those aged 85 years and older. This increase was particularly marked for women. The increase in prevalence of joint problems with age was seen overall and for the number of joints affected (fig 1). The severity, as expressed by the number of joints reported, also increased with age; the prevalence of those reporting five or more joints affected increased significantly from 0.4% (95% CI 0.3 to 0.6%) of those aged 16-24 years to 16.8% (95% CI 13.8 to 19.9%) of subjects aged 85 years or more. The overall median number of sites with joint problems was 1.8.

The joint sites most often reported as affected were the knee and the back, with a frequency in the population of around 10% (table 2). The shoulder, hand, neck, hip, foot, and ankle were less often reported and the wrist and elbow were the least often reported. The pattern of change in prevalence with age varied for different joint sites (table 2, fig 2). The pattern for the joints of the arms and legs is illustrated in fig 2A. The increase in prevalence with age was greatest for the knee, and less for the shoulder, hand, hip, ankle, and foot, which showed similar gradients. The change was least for the wrist and elbow. The back and neck showed an increasing prevalence in the 55-64 year old age group, then levelled out (fig 2B).

There was an increase with age in reported morning stiffness and regular taking of drugs for

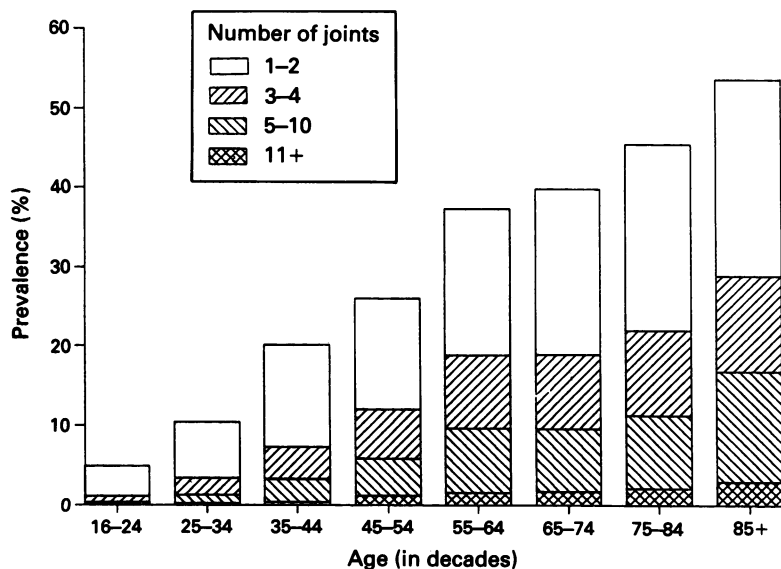


Figure 1 Prevalence of joint problems in the population, overall and for number of joints affected for 10 year age groups.

Table 2 Reported joint problems in the Calderdale population for individual joint sites. Estimated number and percentage prevalence by age group (numbers in parentheses give the 95% confidence intervals (CI) when added to and subtracted from the prevalence)

Joint affected	Occurrence	Age group (years)								
		All ages	16-24	25-34	35-44	45-54	55-64	65-74	75-84	85+
<i>Limb joints</i>	Knee	4339	156	283	459	579	970	996	716	180
	Prevalence (95% CI) (%)	10.1 (0.3)	2.2 (0.3)	3.8 (0.4)	6.6 (0.6)	9.3 (0.7)	16.8 (1.0)	18.3 (1.0)	23.1 (1.5)	31.5 (3.8)
	Shoulder	2945	47	170	378	511	682	659	407	91
	Prevalence (95% CI) (%)	6.9 (0.2)	0.7 (0.2)	2.3 (0.3)	5.5 (0.5)	8.2 (0.7)	11.8 (0.8)	12.1 (0.9)	13.2 (1.2)	15.9 (3.0)
	Hand	2809	38	148	268	398	726	674	447	110
	Prevalence (95% CI) (%)	6.6 (0.2)	0.5 (0.2)	2.0 (0.3)	3.9 (0.5)	6.4 (0.6)	12.6 (0.9)	12.4 (0.9)	14.4 (1.2)	19.3 (3.2)
	Hip	2221	45	98	238	380	495	537	342	86
	Prevalence (95% CI) (%)	5.2 (0.2)	0.6 (0.2)	1.3 (0.3)	3.4 (0.4)	6.1 (0.6)	8.6 (0.7)	9.9 (0.8)	11.1 (1.1)	15.1 (2.9)
	Foot	2050	30	80	193	331	520	495	322	79
	Prevalence (95% CI) (%)	4.8 (0.2)	0.4 (0.1)	1.1 (0.2)	2.8 (0.4)	5.3 (0.6)	9.0 (0.7)	9.1 (0.8)	10.4 (1.1)	13.8 (2.8)
Ankle	1763	41	92	142	270	410	439	290	79	
Prevalence (95% CI) (%)	4.1 (0.2)	0.6 (0.2)	1.2 (0.2)	2.0 (0.3)	4.3 (0.5)	7.1 (0.7)	8.1 (0.7)	9.4 (1.0)	13.8 (2.8)	
Wrist	1430	31	95	158	227	349	313	205	52	
Prevalence (95% CI) (%)	3.3 (0.2)	0.4 (0.1)	1.3 (0.3)	2.3 (0.4)	3.6 (0.5)	6.1 (0.6)	5.8 (0.6)	6.6 (0.9)	9.1 (2.4)	
Elbow	1315	21	60	179	296	319	261	137	42	
Prevalence (95% CI) (%)	3.1 (0.2)	0.3 (0.1)	0.8 (0.2)	2.6 (0.4)	4.7 (0.5)	5.5 (0.6)	4.8 (0.6)	4.4 (0.7)	7.4 (2.1)	
<i>Spine</i>	Back	4262	139	380	705	777	939	767	465	90
	Prevalence (95% CI) (%)	10.0 (0.3)	2.0 (0.3)	5.1 (0.5)	10.2 (0.7)	12.4 (0.8)	16.3 (1.0)	14.1 (0.9)	15.0 (1.3)	15.8 (3.0)
Neck	2539	31	131	349	447	657	563	308	53	
Prevalence (95% CI) (%)	5.9 (0.2)	0.4 (0.1)	1.7 (0.3)	5.0 (0.5)	7.2 (0.6)	11.4 (0.8)	10.3 (0.8)	10.0 (1.1)	9.3 (2.4)	

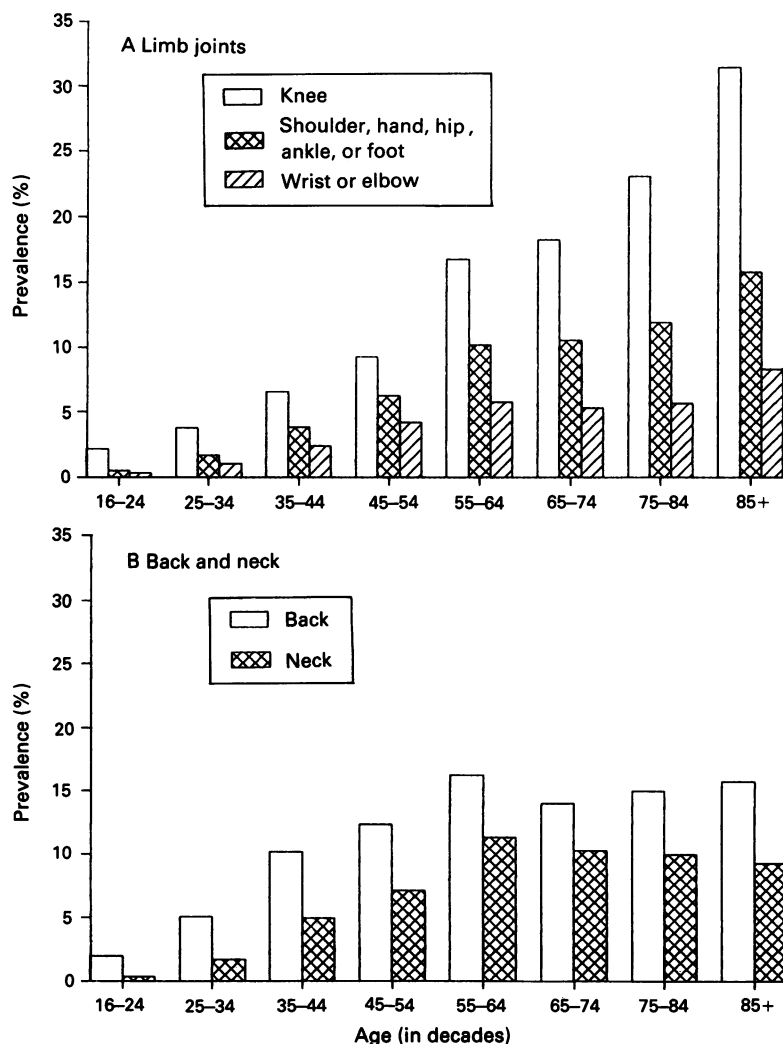


Figure 2 Changing prevalence of joint, back and neck problems with age.

problem joints (table 3). In contrast, the increase in the prevalence with age of those reporting seeing a hospital specialist because of these problems was only found up to the 55-64 year decade, after which it was fairly constant. As the prevalence of joint problems, other than the back and neck, continued to rise after this age, this implies a decline in the proportion seeing a specialist in the older age groups.

The overall prevalence of disablement in association with joint problems in the population was 9.6% (95% CI 9.3 to 9.9%). A prevalence of 7.0% (95% CI 6.8 to 7.2%) was found for reported difficulty, and 2.6% (95% CI 2.4 to 2.8%) for reported dependence; the rates increased with age (table 4). Figure 3 shows the changing prevalence with age of reported disability and dependence for those who reported joint problems. The rate of reporting of disablement increased more steeply with age than that for joint problems as a whole. In the 16-34 year age group only 10% of those with joint problems reported disablement; this increased to 90% for the subjects older than 85 years, which is reflected by the hatched area covering 90% of the bar representing these subjects. For those with disabilities, the ratio of reported dependence to disability also increased steeply with age, so that for subjects older than 85 years, 60% of those with joint problems were dependent. When adjustments are made so that only those who specifically mention rheumatic disorders as the cause of disability are included, the prevalence of disablement decreases to 7.2% (95% CI 7.0 to 7.5%), with 5.6% (95% CI 5.3 to 5.8%) reporting difficulties, and 1.7% (95% CI 1.5 to 1.9%) reporting dependency.

Table 3 Reported morning stiffness, regular taking of drugs, and seeing a hospital specialist because of problem joints, by subjects reporting joint disorders in the Calderdale population. Estimated number and percentage prevalence by age group (numbers in parentheses give 95% confidence intervals (CI) when added to and subtracted from the prevalence)

Reported result of joint problem	Occurrence	Age group (years)									
		All ages	16-24	25-34	35-44	45-54	55-64	65-74	75-84	85+	
Morning stiffness	Number	3367	79	218	465	568	741	673	479	144	
	Prevalence (95% CI) (%)	7.9 (0.3)	1.1 (0.2)	2.9 (0.4)	6.7 (0.6)	9.1 (0.7)	12.9 (0.9)	12.4 (0.9)	15.5 (1.3)	25.2 (3.6)	
Regular drugs	Number	3889	58	161	333	534	833	1005	801	164	
	Prevalence (95% CI) (%)	9.1 (0.3)	0.8 (0.2)	2.2 (0.3)	4.8 (0.5)	8.6 (0.7)	14.4 (0.9)	18.5 (1.0)	25.9 (1.5)	28.7 (3.7)	
Seen specialist	Number	4137	140	297	563	723	897	875	553	89	
	Prevalence (95% CI) (%)	9.7 (0.3)	2.0 (0.3)	4.0 (0.4)	8.1 (0.6)	11.6 (0.8)	15.6 (0.9)	16.1 (1.0)	17.9 (1.4)	15.6 (3.0)	

Table 4 Reported difficulty and dependence by subjects reporting joint problems in the Calderdale population. Estimated number and percentage prevalence by age group (numbers in parentheses give 95% confidence intervals (CI) when added to and subtracted from the prevalence)

Reported difficulty or dependence	Occurrence	Age group (years)									
		All ages	16-24	25-34	35-44	45-54	55-64	65-74	75-84	85+	
Difficulty only	Number	2986	23	88	213	371	734	884	584	89	
	Prevalence (95% CI) (%)	7.0 (0.2)	0.3 (0.1)	1.2 (0.2)	3.1 (0.4)	5.9 (0.6)	12.3 (0.8)	16.3 (1.0)	18.9 (1.4)	15.6 (3.0)	
Dependence only	Number	1110	10	14	41	71	143	247	399	185	
	Prevalence (95% CI) (%)	2.6 (0.2)	0.2 (0.1)	0.2 (0.1)	0.6 (0.2)	1.1 (0.3)	2.4 (0.4)	4.5 (0.6)	12.9 (1.2)	32.4 (3.8)	
Difficulty and dependence	Number	4096	33	102	254	442	877	1131	983	274	
	Prevalence (95% CI) (%)	9.6 (0.3)	0.5 (0.2)	1.4 (0.3)	3.7 (0.4)	7.1 (0.6)	14.7 (0.9)	20.8 (1.1)	31.8 (1.6)	48.0 (4.1)	

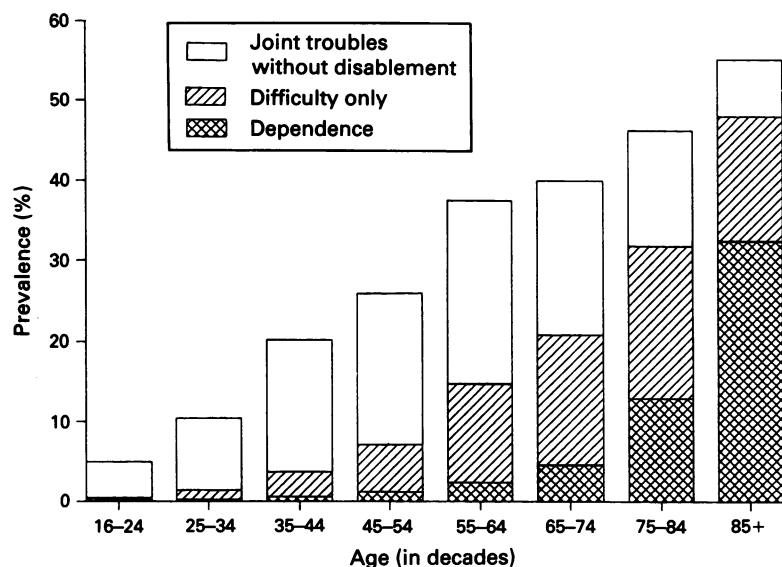


Figure 3 Prevalence of reported dependence and difficulty in activities of daily living and reported joint problems by age.

Discussion

The results of this study confirm the high overall prevalence of joint disorders in the population, and highlight the increase in prevalence which occurs with increasing age. The joint problems in this survey were ascertained from reports of the respondents or their family members. This was a postal questionnaire survey and there was no confirmation by examination. However, the US HANES1 survey showed good overall agreement of self reported symptoms with anomalies observed by a doctor, with the prevalence of self reported joint symptoms tending to be slightly higher.¹

Few other population studies have considered reported joint symptoms. The HANES1 study

of a sample of the US population aged 25-74 years gives an estimate of 29.7% for people reporting pain, swelling, or morning stiffness.¹ The age range in the Calderdale survey was wider; the comparable figure for the 25-74 age group is 25.5%, which is of a similar order of magnitude. Comparison of joint problems by site shows a slightly lower reported prevalence for back and knee disorders in the Calderdale survey. These remain lower even when the difference in the age of the populations is taken into account.

Data from Calderdale are in line with those reported from other population surveys. The US National Health Interview Survey, which is designed to be representative of the US population aged 16-64 years, indicates that 10.6% of the population report symptoms of arthritis (pain or swelling in the hip, knee, ankle, foot, shoulder, elbow, or hand).¹⁵ This figure does not include symptoms originating from the back or neck. In the Canadian health survey the estimated prevalence of reported arthritis, rheumatism, or back or limb and joint disorders in the population aged 16 years and older was 20.6%.⁴

There are reasons to suppose that the Calderdale estimates may be conservative.¹⁶ The data were collected from a household survey where the information about all household members was obtained on the same questionnaire. The reporting of information may thus be subject to a proxy effect as the questionnaire could be completed by one household member on behalf of all others, though we have no indication about the extent of any consultation that may have taken place. As part of our methodological evaluation of the survey we compared responses from households with one adult member only with those from households with two or more adults.¹⁶ After allowing for

differences in the age and sex composition of the two types of household, the findings are compatible with a proxy effect in the reporting of joint symptoms. Investigation of the interaction of the two parts of the questionnaire suggested that reporting of important disability had an 'overshadowing effect' on the reporting of joint problems when the questionnaire was completed by a proxy. It is difficult to estimate the magnitude of any proxy effect and to make corrections in view of the very different demographic characteristics of those who live alone and with others. It implies, however, that the findings from this study should be viewed as minimum estimates.

Relatively little is known about the change in the pattern of joint symptoms with age. Other studies indicate that although the occurrence of arthropathies increases with age, spinal conditions tend to have a peak prevalence in middle life.^{1 5 13} This is consistent with the pattern of joint symptoms found in this study, which shows an increase with age in the prevalence of joints symptoms, but a plateau with age for the neck and back.

Although the presence of joint symptoms alone cannot indicate the severity of the effect on the subject, the indications are that the increase in prevalence of symptoms is paralleled by an increase in the extent to which the subject is affected. This is shown by the increase in reporting of multiple joint problems with age. The rate of reported taking of drugs and of morning stiffness also increases in a similar way to reported joint symptoms.

The prevalence of those reporting seeing a specialist because of joint problems does not follow the overall pattern, but declines with age. There may be several reasons for this. In the first instance these findings may reflect a cohort effect. When the current cohort of elderly people first experienced problems with their joints (perhaps as much as 20 years previously) there were few specialists to whom they could have been referred; since then they have lived with their problems as part of 'growing old'. Secondly, it is difficult to know whether it is a real effect or whether it might be a function of factors such as lesser recall with increasing age, or an increasing propensity to under-report consultation as age increases. However, a study in Aberdeen, Scotland, showed that, whereas 35.5% of people aged more than 60 years reported arthritis and rheumatism, only 19.9% reported being referred to an outpatient department and 4.3% being admitted to hospital for these conditions.¹⁷ Thirdly, data on consultation from this particular part of the United Kingdom may reflect the fact that the level of service provision in rheumatology was only 39% of the optimum input.¹⁸ This might affect both the rate of referral to specialists by general practitioners, and, if patients have to travel some distance to see a rheumatologist, then their ability to do so may decline with increasing age.

The overall reported prevalence of disablement, ascertained by a positive answer to any of the questions on activities of daily living, for respondents with joint problems was 9.6% (95% CI 9.3 to 9.9%), or 7.2% (95% CI 7.0 to

7.5%), excluding those who reported a non-rheumatic cause for their disability. This is of a similar order of magnitude to that found in the population of the USA, although disablement is very differently defined in different studies. Analysis of the US Health Interview Survey suggests that musculoskeletal impairments (chronic or permanent defects representing a decrease or loss of ability to perform various functions) affect about 10% of the population, and that impairments due to the back or spine are almost half of these.² Reported data from the HANES1 survey allows an estimation that 6.3% of the population in the 24-75 year age group have joint symptoms and moderate to severe activity restriction.¹ The prevalence of rheumatic disorders in the Swedish population aged 16-74 years which are a cause of long term illness, any handicap, or other debility is of the order of 12-13%, and increases markedly with age.⁹

The prevalence of disablement in the Calderdale survey is slightly higher than the recent OPCS survey of disability in Great Britain, which suggests that for adults living in private households the prevalence of disability due to disorders attributable to the musculoskeletal system is 6.2%.⁷ It is also much higher than the prevalence of 3% found in the earlier government survey of handicap and disability in Great Britain (the Harris survey).^{8 19} Once again, problems arise in direct comparison because of different definitions and different methods of ascertainment of disability. The higher prevalence in the current survey may reflect the fact that our screening questionnaire was made more sensitive to disability associated with the rheumatic diseases by including activities such as combing and brushing hair, and getting out of a low chair. It also attempted to elicit gross mobility in terms of being able to get out of the house without help. The Harris survey screening questions^{8 19} were more directed to need for personal assistance and to be looked after.

There is a pronounced age related increase in the reporting of disablement in those with joint symptoms. This has been found in other studies of rheumatic disablement in the population.^{1 19} It is not possible to attribute the cause of the disablement solely to the joint problems, as many people reported more than one medical condition, a fact consistent with the general distribution of comorbidity in the population, particularly in those in older age groups.^{20 21} It is, however, likely that the functional consequences of joint disorders contribute to the experience of disablement.

The increasing proportion with age of those reporting both joint troubles and disablement, particularly dependence, is of concern in the context of the aging population. Although the total number of people in the population of the United Kingdom is expected to change relatively little in the coming decades, the proportion of those aged 65 years and older is estimated to increase by a quarter from 15% in 1985 to 21% by 2030.^{10 11} The older age groups contain a disproportionate number of women; the increase in prevalence of joint problems with age is also

more marked for women. As the proportion of older people in the population increases this will have implications for the prevalence of rheumatic disorders in the population and the provision of care in the community and hospitals. The increasing prevalence of disablement in terms of dependence is of special concern as a large proportion of those who are 65 years and older live alone; at the time of the 1981 census almost a third of older people lived alone and almost half lived with a spouse only.¹² If the lesser rate of seeking specialist help in those who are in the older age groups is real, this also raises questions about whether these people have had adequate intervention from the health care system which might modify or postpone the onset of disablement.

The increasing prevalence of joint symptoms and disablement with age has ramifications for the provision of appropriate resources, particularly in the light of projected changes in the demographic structure of the population. Guidelines for rheumatological provision may have to be reconsidered as the prevalence rises. It is also likely to affect the work patterns of health professionals caring for people with rheumatic disorders. Awareness of the high increase of joint problems in the population is of importance in planning health services for the rheumatic disorders.

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