

## RHEUMATIC COMPLAINTS IN A RURAL POPULATION

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The geographic distribution of disease is a subject in which increasing interest has been shown in recent years. Cobb and Lawrence (1957) summarized the findings in nine surveys of the prevalence of rheumatoid arthritis in different countries and discussed some of the factors which might contribute to the varying results reported. The prevalence of rheumatic complaints other than rheumatoid arthritis has received less attention. Kellgren, Lawrence, and Aitken-Swan (1953), in a study of rheumatic complaints in Leigh in Lancashire, included accounts of the prevalence of osteo-arthritis, disk lesions, and other conditions. De Blécourt (1954) included osteo-arthritis, ankylosing spondylitis, and "rheumatism of the soft tissues" in his report from Holland.

The present study was undertaken to investigate the prevalence of rheumatic complaints in an isolated rural community in England, in which the majority of the population were born in the district and had lived and worked there all their lives, and amongst whose ancestors there had been much inter-marriage. It was thought that such a study might offer a useful comparison with others of populations with different genetic, environmental, and occupational backgrounds.

This paper reports the prevalence of rheumatic complaints in two groups of people, those born in the district and those coming into it from other parts of the country, and discusses some features of inflammatory polyarthritis found in these groups.

### **The District and the People**

Wensleydale is in the North Riding of Yorkshire. The valley runs from West to East and at its upper end is about 850 ft. above sea level, the fells rising steeply to over 2,000 ft. on either side. The rock

formation is sandstone and shale, with bands of limestone. The soil is glacial lake silts and boulder clay, with peat on the fell tops, above millstone grit. The land in the valley is rough pasture and the only crop is hay. The sea is 25 miles distant at its nearest point and the nearest towns are 30 to 40 miles away.

The area is close to the Pennine watershed and is subject to violent rainstorms. There is usually heavy snow at some time during the winter. The mean monthly rainfall varies from 5.42 in. at the head of the Dale, to 3.72 in. at Bainbridge, 10 miles down the valley (range 0.33-11.13). The mean monthly sunshine figure is 101.3 hrs (range 14.5-251.5). The mean maximum and minimum temperatures are 75° F. and 18° F. (mean 44.1° F.).

The water is hard, with temporary and total hardness of 140 parts/million and a pH of 7.3.

The area chosen for the survey covers 87.5 square miles. The total population in this area is 2,362, giving a mean population density of 0.04 per acre. 48 per cent. of the people live in three large villages, 21 per cent. in eleven smaller villages and hamlets, and the remaining 31 per cent. in scattered farms in the main dale and three branch dales.

The population of the Dale is slowly decreasing and there has been little new building. Nearly all the houses are built of local stone with stone floors. 63 per cent. are over 100 years old, 28 per cent. are between 10 and 100 years old, and only 9 per cent. are under 10 years old. 47.6 of the houses were classified as damp in a rural housing survey and in many this is only too obvious. The average number of persons per household is 3.04 and the average density per room is 0.61. A density of more than 2 per room was found in less than 4 per cent. of the houses (1951 Census report).

The age distribution of the population over the

age of 14 years is shown in Table I, where it is related to sex and place of birth. The small group born in neighbouring Dales came from an area within a radius of 7 miles from the head of the Dale, which is very similar to Wensleydale and with whose people there had always been a good deal of communication. This group is considered with the Dalespeople in later Tables. Among the men 77 per cent. belong to the Dales and 23 per cent. have come from other areas, and among the women 65 per cent. belong to the Dales and 35 per cent. come from other areas. Among the Dalespeople 46 per cent. of the men and 50 per cent. of the women are over the age of 44 years. Those coming from other parts of the country form an older population, 64 per cent. of men and 60 per cent. of women being over the age of 44 years. Among the Dalespeople, 65 per cent. of men and 79 per cent. of women had lived there all their lives. Those who had left the Dale for a time, had been away for a mean period of 8.7 years. Movement within the area was fairly common and many had lived in several farms or villages during their lives.

The majority of incomers had come as young adults, but 31 per cent. had been over the age of 40 years when they arrived. Among the men, 46 per cent., and among the women, 39 per cent., had lived in the Dale for less than 10 years, though 10 per cent. of men and 14 per cent. of women had lived there for more than 40 years.

Most of the people lead active lives. About 90 per cent. of the women are engaged solely in domestic work, and the remainder work in shops or hotels, or as clerks, teachers, or nurses. There is no difference between women born in the Dales

and those from other areas in respect of occupation.

Among the men there is greater diversity of work. The majority of youths aged 15 to 19 years are engaged in farm service, and when this is finished a number of them are forced to leave the Dale to seek work elsewhere. Among those over the age of 19 years, 53 per cent. of Dalesmen and 27 per cent. of those from other areas are, or have been, farmers, farm-workers, or dairy-men. A similar proportion of Dalesmen (30 per cent.) and incomers (33 per cent.) are, or have been, employed in transport, road or railway maintenance, public services, building, or quarrying. Thus 83 per cent. of Dalesmen and 60 per cent. of incomers have led active outdoor lives, frequently exposed to wet. Trading occupies 14 per cent. of local men, and 12 per cent. of those from other areas, but only 3 per cent. of local men compared with 26 per cent. of those from other areas are, or have been, engaged in professional work.

At present, the economic state of the people is good, but many of the older ones can tell of long days worked for a very small wage on a diet consisting largely of bread and butter. Their diet still includes a great deal of bread and pastry, but is reasonably good, though lacking in fresh fruit and vegetables.

#### Method of Inquiry

The current Electoral Roll was used as a basis for defining the population, and was amended by personal inquiry during the course of the survey.

Before visiting in each of the three main villages and their surrounding districts, permission was sought to address the local Women's Organizations, to explain the purpose of the survey and to ask for

TABLE I  
AGE DISTRIBUTION OF POPULATION OVER 14 YEARS RELATED TO SEX AND PLACE OF BIRTH

Age Group (yrs)	Place of Birth						Total	
	Wensleydale		Neighbouring Dales		Other Areas			
	Males	Females	Males	Females	Males	Females	Males	Females
15-24	126	96	5	16	17	34	148	146
25-34	92	74	14	22	15	37	121	133
35-44	101	79	20	23	37	61	158	163
45-54	105	73	23	21	46	57	174	151
55-64	67	77	12	14	25	54	104	145
65-74	60	59	3	14	32	59	95	132
75 +	24	31	9	6	22	32	55	69
No information	8	9	—	1	6	2	14	12
Total .. ..	583	498	86	117	200	336	870	951

co-operation. In addition, a letter was sent to all adults, shortly before they were visited, telling them of the proposed visit and again explaining the purpose of the survey.

At each house the number of occupants was recorded, and also certain particulars about the building. Information about age, sex, birthplace, length of residence in the Dale, past and present occupation, illnesses, and rheumatic complaints, was obtained about all over the age of 19 years. Inquiry was made concerning a family history of rheumatism, particularly among members of the household aged 15 to 19 years, and names and addresses of first-degree relatives living in the area were recorded.

During the first part of the survey, covering 66 per cent. of the population, 85 per cent. of the people over the age of 19 years were seen by the physician (J.M.B.). Those not seen were mostly young adults, about whom information was obtained from their relatives. During the remaining period, assistance was available from Miss Joan Hainsworth, Social Worker in the Empire Rheumatism Council Field Unit, and a number of people who gave no past or present history of rheumatism were not seen by the physician. During this period the ages of those between 15 and 19 years in each household were also recorded and later this information was obtained for the whole population.

All persons over the age of 14 years, with a history or complaint in any way suggestive of rheumatic disease, were seen by the physician, a more detailed history was taken, and a brief clinical examination of the joints was made. In all, information was obtained about 98.6 per cent. of the adult population.

This work was used in the selection of an area for a detailed survey, including radiological and serological investigation, by the Empire Rheumatism Council Field Unit. An area was chosen to give a representative sample of the population and to include half those considered to have inflammatory polyarthritis or generalized osteo-arthritis. It was later enlarged to include two more areas of scattered farms, so that the Area Sample finally included nearly all the farms in the district, and consisted of 1,025 persons over the age of 14 years, of whom 891 (86.7 per cent.) were examined. The author took part in this work, and also re-examined 46 persons from the remaining districts who had definite or doubtful signs or a past history suggestive of inflammatory polyarthritis. These people were examined radiologically and gave blood for serological investigation.

At the clinical examination the joints were

examined, the blood pressure was recorded, and a sample of blood was withdrawn.

X rays were taken, according to the following plan:

Age (yrs)	Site
15-34	Hands, feet, and cervical spine
35-54	As above, plus knees, and dorsal and lumbar spine
55 +	As above, plus pelvis

In a few cases the people were examined in their own homes with portable apparatus, and films of the dorsal and lumbar spine and the pelvis had to be omitted.

In the clinical and radiological examination five grades were recorded for each condition:

- 0 = None
- 1 = Doubtful
- 2 = Mild
- 3 = Moderate
- 4 = Severe

The sensitized sheep cell test (S.S.C.T.) was performed on sera from 858 persons (82.7 per cent.) in the Area Sample and from the 46 persons from the remaining districts described above, using the method of Ball (1950) in the laboratory of the Rheumatism Research Unit, University of Manchester.

In the present paper, the diagnoses are those made during the study of rheumatic complaints, confirmed or modified by radiological and serological evidence, in 91 per cent. of cases of inflammatory polyarthritis and in 61 per cent. of cases of other conditions. All films were read by one observer (J.M.B.). Radiological evidence of inflammatory polyarthritis does not include the changes in the cervical spine described by Sharp, Purser, and Lawrence (1958).

## Results

### Past Complaints

A number of people gave a history of some rheumatic complaint in the past.

*Acute Disk Prolapse.*—Among the Dalespeople, 5.5 per cent. of men and 1.7 per cent. of women and among those from other areas, 8.2 per cent. of men and 3.6 per cent. of women gave a history suggestive of an acute disk prolapse. In five women, this had occurred shortly after childbirth.

*Past Polyarthritis.*—Among the Dalespeople, four men (0.6 per cent.) and ten women (1.6 per cent.)

gave a history of joint pain and swelling lasting from a few weeks to a few months. In five women, the attack followed shortly after an infection. Two men and three women associated the illness with some physical or mental stress. In one woman it followed a miscarriage, and in another it occurred shortly after childbirth.

A similar history was given by two men (1 per cent.) and twelve women (3.5 per cent.) from other areas. Among these people, one man and six women had a history of preceding infection. The other man and three of the other women associated the episode with some stress.

In all cases the attack was mild and none had residual signs of arthritis. The mean age at the time of the attack was 35 years (range 10 to 77) and all had remained symptom-free for a mean period of 13.9 years (range 1 to 40). Radiological and serological investigation was carried out in seventeen cases (61 per cent.). None had evidence of erosive arthritis and none had a positive S.S.C.T.

*Arthralgia associated with Erythema Nodosum.*—Six Daleswomen gave a history of joint pains associated with an attack of erythema nodosum. In three cases, the joint symptoms lasted a few weeks only, in one case preceding the rash, but three had more persistent pains. One still had minimal symptoms, but no signs when she was seen, 7 years after her illness, but the others were symptom-free. Radiological examination in four cases showed no abnormalities in their joints, nor did they have a

positive S.S.C.T. The mean age at the time of illness in this small group was 30.5 years (range 21 to 39) and the mean length of time since the attack was 7.9 years (range 1 to 15).

### Present Complaints

*Rheumatic Complaints.*—The prevalence is shown in Table II, where it is related to age, sex, and place of birth. The diagnoses are not mutually exclusive. In some cases, one individual had evidence of more than one condition, the commonest association being between osteo-arthritis and degenerative disk lesions. The complaints were mild in the majority of cases and only about 10 per cent. were seriously handicapped by their rheumatism.

*Minor Complaints.*—Minor aches and pains were mentioned by 12.9 per cent. of men and 11.7 per cent. of women born in the Dale, and by 11.2 per cent. of men and 9.6 per cent. of women from other areas. These pains were intermittent, but in some cases had recurred over a period of several years. People of all ages suffered from these pains, which fell into four well-defined groups:

- (i) Pain in the shoulder. In some cases localizing signs could be found, but often they were absent.
- (ii) Pains in the back or neck, usually in the upper dorsal region and associated with tenderness of the trapezius.
- (iii) A variety of pains, in which no common factor could be found.

PREVALENCE OF RHEUMATIC COMPLAINTS

Age Group (yrs)	In the Dales												
	No. in Group		Rheumatic Complaints										
			Inflammatory Polyarthritides				Osteo-Arthritis				Disk Lesions		Other Conditions
	M	F	M	F	Local		Generalized		M	F	M	F	
15-34	237	208	3 (1.3)	1 (0.5)							1 (0.5)		2 (0.9)
35-54	249	196	6 (2.4)	15 (7.7)	25 (10)	10 (5.1)	4 (1.6)	9 (4.5)	20 (8)	13 (6.6)	4 (1.6)	3 (2)	
55 +	175	201	6 (3.4)	27 (13.4)	24 (13.7)	25 (12.4)	20 (11.4)	65 (32)	22 (12.5)	22 (10.9)	4 (2.3)	3 (1.5)	
No Information	8	10											
Total Seen	661	605	15 (2.3)	43 (7.1)	49 (7.2)	35 (5.8)	24 (3.7)	74 (12.3)	42 (6.4)	36 (5.9)	8 (1.4)	8 (1.8)	

Numbers in brackets are percentages.

(iv) Recurrent mild joint pains. 22 men (3.4 per cent.) and 22 women (3.6 per cent.) born in the Dale, and three men (1.5 per cent.) and six women (1.8 per cent.) from other areas, complained of recurrent mild joint pains, with little swelling or stiffness, and no objective signs at the time of examination. In two men and nine women only the larger joints were affected, and these people were markedly weather sensitive. Among the others, the hands were frequently involved. Radiological examination in 52 cases showed no evidence of erosive arthritis, but thirteen had minimal signs of osteo-arthritis. A positive S.S.C.T. was found in one Daleswoman and one incomer. The mean age at onset of symptoms was 35.6 years (range 10 to 81), and the mean duration was 4.7 years (range 1 to 18).

Though the prevalence of these complaints is higher among the Dalespeople, the differences between the groups are not significant ( $p = >0.05$ ).

*Other Conditions.*—Included in this group are three men suffering from ankylosing spondylitis, and one case each of disseminated lupus erythematosus, gout, and psoriatic arthropathy.

There were two cases of juvenile rheumatoid arthritis, a man now aged 31 years, and a woman now aged 40 years. Both were Dalespeople, who had developed symptoms at the ages of 11 and 12 years respectively. Both had had considerable disability for 1 or 2 years, but had thereafter

improved and now had minimal residual signs, though the woman continued to complain of joint pains. She had no abnormality of the joints x-rayed and her S.S.C.T. was negative. The man was not available for these tests.

In two cases, a Dalesman and an incoming woman, a diagnosis of psychogenic rheumatism was made. Both had been investigated in hospital where no objective evidence of disease had been found, and both admitted that their pains were worse when they were worried.

In two cases, no final diagnosis was made. One, a Dalesman aged 66 years, developed arthritis of the hips at the age of 27 years, and the other, an incoming woman aged 37 years, had developed a moderate arthritis of one knee at the age of 19 years. In both, radiological investigations showed only osteo-arthritic changes and the S.S.C.T. was negative.

Finally, a small group of twelve people (five men and seven women) complained of joint pains with little swelling or stiffness affecting the large joints, which had recurred ever since they had had an attack of rheumatic fever. None had objective signs of inflammatory polyarthritis, though four had signs of osteo-arthritis. Radiological examination in eight cases showed no signs of erosive arthritis, though five had signs of osteo-arthritis. None had a positive S.S.C.T. The mean age of these people at the time of their acute illness was 23 years (range 16 to 41) and the mean duration of

II  
RELATED TO AGE, SEX, AND PLACE OF BIRTH

Minor Complaints		No. in Group		In Other Areas											
				Rheumatic Complaints											
				Inflammatory Polyarthritis		Osteo-Arthritis				Disk Lesions		Other Conditions		Minor Complaints	
M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
18 (8.9)	24 (11.5)	32	71	1 (3.3)	1 (1.4)						1 (1.4)	1 (3.3)	2 (2.8)	3 (9.9)	11 (15.4)
49 (19.6)	37 (18.8)	83	118	2 (2.4)	8 (6.9)	6 (7.2)	3 (2.5)	2 (2.4)	8 (6.7)	3 (3.6)	11 (9.3)	1 (1.2)	3 (2.5)	12 (14.4)	16 (13.4)
17 (9.6)	13 (6.5)	79	145	3 (3.8)	12 (8.3)	10 (12.6)	16 (11)	8 (10)	56 (38)	12 (12.6)	21 (14.5)	1 (1.3)		7 (8.8)	5 (3.4)
		6	2												
84 (12.9)	72 (11.7)	194	334	6 (3.1)	21 (6.3)	16 (8.2)	19 (5.7)	10 (5.1)	64 (19.1)	15 (7.7)	33 (9.9)	3 (2)	5 (1.5)	22 (11.2)	32 (9.6)

their joint symptoms was 28·6 years (range 15 to 33).

There is no significant difference between the Dalespeople and those from other areas in the distribution of these cases ( $p = >0.05$ ).

**Osteo-Arthrosis and Degenerative Disk Lesions**

Osteo-arthrosis giving rise to symptoms was found in 10·9 per cent. of men and 18·0 per cent. of women born in the Dale, and in 13·3 per cent. of men and 24·8 per cent. of women born in other areas. The prevalence of the localized form of the disease was higher among the younger Dalespeople, otherwise there was little difference between them and those coming into the Dale. The high overall prevalence of this condition may be related to the proportion of older people in this population, which is high, particularly among those coming into the Dale.

Symptoms due to degenerative disk lesions were found in 6·6 per cent. of men and 5·9 per cent. of women born in the Dale, and in 7·7 per cent. of men and 9·9 per cent. of women from other areas.

The true prevalence of these two conditions cannot be ascertained from symptomatic cases. It is to be reported and discussed more fully elsewhere (Lawrence and Bremner, in preparation).

**Inflammatory Polyarthritis**

Evidence of inflammatory polyarthritis was found in fifteen men (2·3 per cent.) and 43 women (7·1 per cent.) born in the Dales, and in six men (3·1

per cent.) and 21 women (6·3 per cent.) born in other areas. There is little difference between the sexes in the younger age groups, and the prevalence rises only slightly with age in both groups of men. There is a much greater rise with age among women, especially those born in the Dale. Of the incomers, eight (29 per cent.) had developed symptoms before they came to the district.

In Table III, these people are divided into different categories according to the evidence of disease which they show, and these are related to age, sex, and place of birth. Eight men (1·2 per cent.) and 23 women (3·8 per cent.) born in the Dale and two men (1 per cent.) and ten women (3·0 per cent.) from other areas, had evidence of inflammatory polyarthritis confirmed radiologically, with or without a positive S.S.C.T. One Daleswoman also had psoriasis. Among the Dalespeople seven men (1·1 per cent.) and seventeen women (2·8 per cent.), and among those from other areas three men (1·5 per cent.) and seven women (2·1 per cent.) had clinical signs of disease, without radiological signs or a positive S.S.C.T.

In addition, eight people who had clinical signs of the disease were not available for radiological or serological investigation. Of these, one Daleswoman had severe progressive disease, and another was moderately disabled. One woman from outside the area had mild but definite disease, and two others in this group, a man and a woman, had a history of considerable disability lasting 1 to 2 years, 16 and 8 years previously, with complete remission of symptoms but minimal residual signs. The remainder had very mild disease.

TABLE III  
EVIDENCE OF INFLAMMATORY POLYARTHRITIS RELATED TO AGE, SEX, AND PLACE OF BIRTH

Age Group (yrs)	Place of Birth																								
	In the Dales												In Other Areas												
	No. in Group		Evidence of Disease								No. in Group		Evidence of Disease												
			Clinical and Radiological				Clinical						Clinical and Radiological				Clinical								
Positive S.S.C.T.	Negative S.S.C.T.									Positive S.S.C.T.	Negative S.S.C.T.														
M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F				
15-34	237	208			1		2	1				1·3	0·5	32	71					1	1			3·3	1·4
35-54	249	196		2	2	6	4	6		1	2·4	7·7	83	118	1		2	1	5		1		2·4	6·9	
55 +	175	201		4	5	11	1	10		2	3·4	13·4	79	145		1	1	7	1	1	1	3	3·8	8·3	
Total Percentage	661	605		6	8	17	7	17		3	2·3	7·1	194	334	1	1	1	9	3	7	1	4	3·1	6·3	
				1	1·2	2·8	1·1	2·8		0·5						0·5	0·3	0·5	3	1·5	2·1	0·5	1·2		

There is no significant difference between the two groups in the prevalence of this disease, though it is higher in all categories among the older Daleswomen.

In Table IV, certain features of inflammatory polyarthritis are shown in relation to the clinical, radiological, and serological evidence of disease.

In all categories the mean age at onset is similar, within a similar wide range. The mean duration also is similar, except among those showing only clinical signs of disease, a group which contains the largest number of early cases. Again, the range is wide, but similar for all categories. The proportion of cases with an acute onset is also similar in all except in those with only clinical signs, in which it is much lower.

In all, eight people (9.4 per cent.) had had their disease for too short a time for its course to be defined. Only six (8 per cent.) had rapidly progressive disease, and another small group of sixteen (19 per cent.) had had a series of exacerbations and remissions. The largest group, comprising 31 people (37.6 per cent), had mild disease which had deteriorated little over the years. Another fairly large group of 24 people (28 per cent.) had finally improved steadily after an initial illness lasting for varying periods. Among them, six men and five women form a well-defined group. All gave a history of severe disability lasting from 1 to 2 years, followed by gradual recovery to complete remission

which had lasted for a mean time of 18.3 years (range 5 to 40). All had minimal residual signs when they were seen, and three had fairly severe clinical osteo-arthritis. Radiological examination in nine cases showed signs of erosive arthritis in six and of osteo-arthritis in seven. None had a positive S.S.C.T. at the time of examination. The mean age at onset in this group (46.4 years, range 23 to 64) was the same as that in the rest of the cases. Only four cases had had hospital treatment, and two others had been given gold. The rest had been treated at home. Seven were Dalespeople and four came from other areas.

At the time of examination, 62 people (74 per cent.) had mild disease, but a number had been much more severely ill in the past. Eighteen people (20 per cent.) had moderate disease, and only five people (6 per cent.) were severely affected. Their disease caused no disability in 49 people (57 per cent.) and a further 28 (33 per cent.) maintained their independence with varying degrees of difficulty. Seven people (8.2 per cent.) were to some extent dependent on others, but only one, a woman of 74 with a long history of rapidly progressive disease and a strongly positive S.S.C.T., was entirely incapacitated.

When these features are considered in relation to evidence of disease, those whose course tended to ultimate remission were present in similar proportions in all categories. In other respects, the small

TABLE IV

CLINICAL FEATURES OF INFLAMMATORY POLYARTHRITIS RELATED TO EVIDENCE OF DISEASE

Evidence of Inflammatory Polyarthritis	No. in Group	Mean Age at Onset (yrs) (Range)	Mean Duration (yrs) (Range)	Type of Onset		Type of Course					Severity of Disease			Grade of Functional Capacity			
				Sudden	Insidious	1	2	3	4	5	Mild	Moderate	Severe	1	2	3	4
Clinical Radiological Positive S.S.C.T.	8	49 (30-62)	11.8 (2-34)	3	5	2	1	2	3	0	1	4	3	0	5	2	1
Clinical Radiological	35	44.2 (17-79)	15.3 (1-51)	13	22	12	8	10	2	3	23	11	1	18	14	3	0
Clinical	34	42.2 (16-70)	8 (1-37)	6	28	7	7	16	0	4	32	2	0	27	7	0	0
No Radiological or Serological Examination	8	48.5 (37-68)	13.9 (1-30)	2	6	3	0	3	1	1	6	1	1	4	2	2	0
Total .. ..	85	44.5 (16-79)	11.9 (1-51)	24	61	24	16	31	6	8	62	18	5	49	28	7	1

KEY: Types of Course

- 1 = Steady improvement after initial attack
- 2 = Exacerbation and remission
- 3 = Slowly progressive
- 4 = Rapidly progressive without remission
- 5 = Undefined, as duration of symptoms too short.

Grades of Functional Capacity

- 1 = No disability
- 2 = Slight disability, but independent
- 3 = Moderate disability, with some dependence on others
- 4 = Marked disability, with complete dependence on others.

sero-positive group fared far worse than the others. They included half the cases with a rapidly progressive course, more than half those with severe disease, and nearly half those in the lower two grades of functional capacity.

In Table V the same features of inflammatory polyarthritis are shown in relation to sex. When the sexes were divided into those born in the Dale and those coming into the area, little difference was found except in the age at onset among males, which was much lower among the Dalesmen, twelve of whom (80 per cent.) had developed their disease before the age of 40 years. As they form the majority of the small group of men, the mean age at onset among males (39.8 years) is lower than that among females (46.7 years), though the range is the same in both sexes.

The proportion of those whose disease ran an ultimately more benign course is much higher among the men, of whom eleven (52 per cent.) had had a more or less complete remission of symptoms compared with thirteen women (23 per cent.). This

difference between the sexes is significant ( $p < 0.02$ ). None of the men had severe disease when they were seen, and none were dependent on others, though ten (48 per cent.) had been so at some time in the past. Among the women with little or no disability when they were seen, eight (12.5 per cent.) had been more seriously handicapped in the past.

In Table VI clinical and radiological signs of osteo-arthritis are shown in relation to clinical, radiological, and serological evidence of inflammatory polyarthritis in those cases in which these investigations were performed. Clinical signs of osteo-arthritis were found in 12.5 per cent. of the small sero-positive group, and in 14.3 and 14.7 per cent. of the two sero-negative groups. This is slightly lower than the prevalence in the general population (16 per cent.), but the numbers are small and the difference is not significant. Radiological evidence of osteo-arthritis was mild in the majority of cases, and was found twice as frequently as clinical signs in all groups.

TABLE V  
CLINICAL FEATURES OF INFLAMMATORY POLYARTHRITIS RELATED TO SEX

Sex	No. of Cases	Mean Age at Onset (yrs) (Range)	Mean Duration (yrs) (Range)	Type of Onset		Type of Course					Severity of Disease			Grade of Functional Capacity			
				Sudden	Insidious	1	2	3	4	5	Mild	Moderate	Severe	1	2	3	4
Male .. .. .	21	39.8 (16-77)	12.4 (1-47)	7	14	11	5	4	0	1	16	5	0	16	5	0	0
Female .. .. .	64	46.9 (17-79)	11.8 (1-51)	17	47	13	11	27	6	7	46	13	5	33	23	7	1
Total .. .. .	85	44.5 (16-79)	11.9 (1-51)	24	61	24	16	31	6	8	62	18	5	49	28	7	1

KEY: *Types of Course*

- 1 = Steady improvement after initial attack
- 2 = Exacerbation and remission
- 3 = Slowly progressive
- 4 = Rapidly progressive without remission
- 5 = Undefined, as duration of symptoms too short.

*Grades of Functional Capacity*

- 1 = No disability
- 2 = Slight disability, but independent
- 3 = Moderate disability, with some dependence on others
- 4 = Marked disability, with complete dependence on others.

TABLE VI  
CLINICAL AND RADIOLOGICAL SIGNS OF OSTEO-ARTHRITIS ASSOCIATED WITH INFLAMMATORY POLYARTHRITIS

Evidence of Inflammatory Polyarthritis	No. in Group	Radiological Signs				Clinical Osteo-Arthritis	
		None	Erosive Arthritis	Erosive Arthritis + Osteo-Arthritis	Osteo-Arthritis	No.	Per cent.
Clinical Radiological Positive S.S.C.T.	8		6	2		1	12.5
Clinical Radiological	35		25	10		5	14.3
Clinical	34	26			8	5	14.7
Total .. .. .	77	26	31	12	8	11	14.2



### The Sensitized Sheep Cell Test

This test was performed on sera from 392 males and 466 females in the Area Sample and from the 46 persons in the remaining districts described previously. The test was positive in two of the latter, both of whom had definite inflammatory polyarthritis.

The distribution of positive tests among persons in the Area Sample is shown in Table VII, where it is related to age, sex, and place of birth. The test was positive in sera from five men (1·3 per cent.) and fifteen women (3·2 per cent.). Four of the five men were Dalesmen; none had evidence of inflammatory polyarthritis, but two of the four were relatives of people with definite or doubtful signs of the disease. The remaining man was a Belgian, who had lived for many years in the Dale and who had longstanding inflammatory polyarthritis. Among the women, eight (2·8 per cent.) had been born in the Dale. Of these, five had definite inflammatory polyarthritis and one had had several episodes of arthralgia. The remaining two women had no clinical or radiological signs of the disease, but one was the daughter of a woman with severe sero-positive arthritis. Among the seven women (3·8 per cent.) who came from other areas, one had doubtful clinical signs of inflammatory polyarthritis and two had doubtful radiological signs of the disease. The remainder had no evidence of the disease.

The prevalence of a positive S.S.C.T. is thus lower among males than among females, and does not rise with age among them as it does among the

women. Among the Daleswomen, the prevalence is equal (5 per cent.) in all age groups over the age of 45 years. Among women coming from other areas, the total prevalence is slightly higher, and rises more sharply to 9 per cent. in the oldest age group.

The numbers are too small for the differences to be significant.

### Occupation and Rheumatic Complaints

In this population, there were no occupational differences among the women. Among the men, the different occupational groups are represented among those with inflammatory polyarthritis in the same proportions as among the general population. Osteo-arthritis occurred in a higher proportion of farmers, and disk lesions somewhat more frequently among road-workers, railway gangers, and quarrymen, than in the rest of the population. The differences are not large enough to be significant.

### Discussion

The two groups within this population differ in several respects. The Dalespeople have lived in the same environment for the greater part of their lives, and many share a common heredity. Those who have come to the Dale have come from all parts of the country. Nearly half have lived there for a relatively short time and nearly one-third were over the age of 40 years when they arrived. It may be supposed, therefore, that, for the majority, their principal environment would be different from

TABLE VII  
DISTRIBUTION OF A POSITIVE S.S.C.T. IN THE AREA SAMPLE IN RELATION TO  
AGE, SEX, AND PLACE OF BIRTH

Age Group (yrs)	Place of Birth								
	In the Dales				In Other Areas				
	Males		Females		Males		Females		
	No. Tested	No. Positive	No. Tested	No. Positive	No. Tested	No. Positive	No. Tested	No. Positive	
-24	50	2	48	—	17	—	21	—	
-34	48	—	42	1	9	—	23	1	
-44	57	2	50	—	17	—	39	1	
-54	55	—	40	2	25	1	34	—	
-64	35	—	37	2	14	—	24	1	
65+	42	—	64	3	23	—	44	4	
Total	No. . .	287	4	281	8	105	1	185	7
	Per cent. . .		1·4		2·8		0·9		3·8

their present surroundings and it is certain that few share any hereditary factors.

There is less difference between the groups in respect of occupation. Men coming to the Dale form the majority of the small group of professional workers in the district, and few are engaged in farming, but in other respects there is little difference between the groups.

Only minor differences were found in the prevalence of rheumatic complaints in these two groups. In both, the prevalence of inflammatory polyarthritis and disk lesions among males, and of minor complaints in both sexes, shows no significant difference from that found by Kellgren, Lawrence, and Aitken-Swan (1953) in Leigh. The prevalence of inflammatory polyarthritis among both groups of women is higher than in Leigh, significantly so in the case of the Daleswomen. This may be partly due to the fact that the women in the Dale are an older population than that particular sample of the population of Leigh. This may also be a factor in the higher prevalence of osteo-arthritis and disk lesions among them. That this may be so is suggested by the closer agreement shown between the figures for inflammatory polyarthritis and generalized osteo-arthritis in the oldest age group in the present study and those in Table II in the report by Kellgren and Lawrence (1956) of a study of the 55 to 64 age groups in Leigh. The figures for "confirmed" inflammatory polyarthritis among males are similar to those found by Miall, Ball, and Kellgren (1958) among men in South Wales. Higher figures were found among both groups of women in the Dale than were found in South Wales, the difference being significant in the case of women in the Rhondda. These observations in four very different districts suggest that there is little variation in the prevalence of inflammatory polyarthritis among males, but that more marked differences occur among women. However, the fact that there is no significant difference between the Daleswomen and a group of women from many parts of the country suggests that these variations, at least in Great Britain, are nowhere very large.

The fact that comparison between a population in which many people are related, and one in which there can be no common hereditary factors, has shown no significant difference in the prevalence of inflammatory polyarthritis suggests that genetic influences do not play a large part in determining its prevalence. This is of interest in view of the familial aggregation in this condition shown by several workers (Barter, 1952; Stecher, Hersh, Solomon, and Wolpaw, 1953; Miall, 1955; Lawrence and Ball, 1958).

The small group with joint symptoms associated with erythema nodosum illustrates several of the points made by Truelove (1960), though his finding of a high prevalence of low-titre agglutination in the S.S.C.T. was not confirmed in those in whom the test was done. The people who complained of persistent joint pains after rheumatic fever form a well-defined group. They show some of the clinical features of "chronic rheumatic fever" described by Thomas (1955), but not the radiological changes in the spine. Those persons who gave a history of a brief episode of joint pains are a more homogeneous group than that described by Lawrence and Bennett (1960) as suffering from "benign polyarthritis", but their long period of freedom from symptoms would entitle them to that designation.

The clinical picture of inflammatory polyarthritis found in this population differs from that seen in hospital practice. The low prevalence of arthritis associated with a positive S.S.C.T. (19 per cent. in those with radiological signs) contrasts with 60 to 80 per cent. found in most hospital series. However, the more serious prognosis associated with a positive S.S.C.T. found by Duthie, Brown, Knox, and Thompson (1957) is strikingly confirmed. The better prognosis among men found by these workers and by Short, Bauer, and Reynolds (1957) is also confirmed. It is possible that the low prevalence of a positive S.S.C.T. among men in this population is associated with their more benign disease. A group of particular interest is that with an acute onset of severe disease with ultimate complete remission. One may note the similarity of their history to that of the group of cases admitted within one year of onset, described by Duthie and others (1957), in whom a similar benign outcome was found. Lewis-Faning (1945), Lewis-Faning and Fletcher (1945), and Short, Bauer, and Reynolds (1957) also reported a better prognosis in cases admitted to hospital within one year of onset. The latter workers comment that there is insufficient evidence to conclude that this is the result of treatment, rather than the natural course of that particular form of the disease. The fact that only two of the eleven people in this group had in-patient treatment, yet all did well, supports this opinion.

The distribution of a positive S.S.C.T. in that part of the population included in the Area Sample, does not conform closely to the pattern described by Kellgren and Lawrence (1956), and Lawrence and Ball (1958), who found an equal prevalence in both sexes, and an overall prevalence of 5 per cent. in all over the age of 14 years, rising to 13 per cent. in those aged 65 years and over, in samples of the population of Leigh. The total prevalence is lower,

particularly among the Dalespeople, and among both groups of men, among whom the rise with age is not seen. The closest resemblance is found among women coming into the Dale. The numbers are small, but the fact that considerable differences were found in the prevalence of a positive S.S.C.T. in two recent studies of relatives of persons suffering from inflammatory polyarthritis (Lawrence and Ball, 1958; Bremner, Alexander, and Duthie, 1959) suggests that such variations are not rare.

This account of rheumatic complaints in a rural community shows how common they are and how mild in the majority of cases. Among the Dalespeople, the outstanding features are the early onset and benign course of inflammatory polyarthritis among males and the close association of a personal or family history of clinical inflammatory polyarthritis among those with a positive S.S.C.T., of whom 50 per cent. had definite or doubtful clinical disease, and a further 25 per cent. had relatives suffering from it. This observation contrasts with those in some other populations, in one of which only 17 per cent. of those with a positive S.S.C.T. had clinical disease (Lawrence, 1960). Miall, Ball, and Kellgren (1958) comment on the milder character of the cases of inflammatory polyarthritis which they saw in the Vale of Glamorgan, another rural area, when compared with those in the Rhondda. It is possible that study of such variations in clinical course in different areas, may help to throw light on the nature of this disease.

### Summary

(1) A survey of rheumatic complaints was carried out in a rural area of Yorkshire with a population of 1,821 people over the age of 14 years. The results were used in the selection of an Area Sample, which was investigated radiologically, serologically, and clinically by the Empire Rheumatism Council Field Unit. This sample consisted of 1,025 persons over the age of 14 years of whom 891 were examined.

(2) The people were divided into two groups, those born in the Dale and those coming into the district. No significant difference was found in the prevalence of rheumatic complaints in these two groups, nor between them and other reported population studies.

(3) Some features of inflammatory polyarthritis were considered in relation to sex and to evidence of disease. An earlier onset and a better prognosis was found among men. The small group with arthritis associated with a positive S.S.C.T. fared worse than all other groups.

(4) The results are discussed in relation to other

population studies and studies of the course of inflammatory polyarthritis.

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### Manifestations rhumatismales dans une population rurale

#### RÉSUMÉ

(1) On a procédé à une enquête sur les manifestations rhumatismales dans une zone rurale de Yorkshire, ayant une population de 1.821 personnes âgées de plus de 14 ans. On s'est servi de résultats obtenus pour déterminer l'Echantillon de la Zone, qui a été étudié du point de vue clinique, sérologique et radiologique par un organe (*Field Unit*) de l'*Empire Rheumatism Council*!

Cet échantillon consistait de 1.025 personnes âgées de plus de 14 ans; 891 d'entre elles ont été examinées.

(2) La population a été divisée en deux groupes, ceux nés dans la vallée et ceux venus d'ailleurs. On n'a pas noté de différence appréciable en ce qui concerne la fréquence des manifestations rhumatismales entre les deux groupes, ni entre ces groupes et d'autres relevés dans les rapports sur des enquêtes similaires.

(3) On considère certains traits de la polyarthrite inflammatoire par rapport au sexe et à la symptomatologie. Un début à un âge plus jeune et un pronostic meilleur a été observé chez les hommes. Le petit groupe avec l'arthrite et une réaction positive d'agglutination des érythrocytes sensibilisés de mouton allait pire que les autres groupes.

(4) On discute les résultats par rapport aux autres enquêtes sur la fréquence morbide et aux études de l'évolution de la polyarthrite inflammatoire.

#### **Manifestaciones reumáticas entre una población rural** SUMARIO

(1) Una investigación de las manifestaciones reumáticas fué llevada a cabo en un area rural de Yorkshire con una

población de 1.821 individuos de edad superior a 14 años. Los resultados se utilizaron para la selección de una Muestra de Zona, que fué investigada clínica, serológica y radiológicamente por un grupo (*Field Unit*) del *Empire Rheumatism Council*. Dicha muestra consistió de 1.025 personas de edad superior a 14 años de las cuales 891 fueron examinadas.

(2) La población se dividió en dos grupos, los nacidos en Dale y los demás. No se apreció diferencia significativa en cuanto a la frecuencia de manifestaciones reumáticas entre dichos grupos, ni entre ellos y los encontrados en otros estudios de poblaciones.

(3) Algunos rasgos de la poliartritis inflamatoria se consideran en relación con el sexo y la evidencia de enfermedad. Un comienzo más temprano y un mejor pronóstico fué encontrado en varones. El pequeño grupo con artritis y una reacción de aglutinación de eritrocitos sensibilizados de carnero positiva presentó un peor pronóstico que los demás grupos.

(4) Se discuten los resultados en relación con otros estudios de la incidencia de enfermedad entre poblaciones y con estudios de la evolución de la poliartritis inflamatoria.