DECLINE OF ACUTE RHEUMATISM*

BY

R. A. N. HITCHENS

Cardiff

(RECEIVED FOR PUBLICATION APRIL 17, 1956)

The purpose of this communication is to present the statistics of acute rheumatism in school children as they have appeared in the records of the local rheumatism service in one large city (Cardiff) during the 20-year period 1931-50. The particular circumstance which gives point to the study is the well-known change which community experience of the disease has undergone in recent times: a progressive fall in mortality at ages 5-15 in England and Wales, and a reduction in the clinical severity of the acute manifestations.

Glover (1946) described rheumatic fever as an obsolescent disease as far back as the early 1930s and has referred subsequently (Glover, 1952) to the remarkable fall in mortality. For rheumatic heart disease, however, the trend of mortality has been somewhat less clear-cut. Knowelden (1949) studied mortality from rheumatic fever and heart disease in England and Wales during the years 1920-38, distinguishing separately the experience of three age groups, 5-14, 15-24, and 25-34. Rheumatic fever showed a steady decline at all ages and in both sexes, but for heart disease the trend was not uniform. In the adult age group, for men an improvement was apparent only in the early part of the period, and for women there was virtually no improvement at all. In children, the death rates declined, but the trend showed a slight setback in 1933-35 with a sharper fall thereafter.

In the context of its decline, many epidemiological features of acute rheumatism raise points of considerable interest. The association with streptococcal infection relates rheumatism to the problem of infectious diseases generally and of other streptococcal infections in particular, and the disease has a notable association with inferior living standards. Explanations of the declining mortality have been sought particularly in relation to these facts, and it is

generally believed that both a change in the biology of streptococcal infection and a progressive improvement in the social condition of the population at large have contributed to the observed decline.

A number of important questions remain unanswered. What aspects of social change have been concerned in bringing about the decline in acute rheumatism? Was it, for instance, mainly due to improving material resources, to improved housing, or to better medical care? And, to consider a question of practical importance, if the country were to experience an economic depression in the near future does past experience suggest that this would be accompanied by a recrudescence of acute rheumatism? With these questions in mind the present inquiry—a retrospective study of acute rheumatism in Cardiff school children—was undertaken.

Conclusive answers cannot as a rule be expected from local inquiries, but local figures have a special importance when, as is the case with acute rheumatism, morbidity statistics on a national scale are lacking.

Source of Data and Method

The local circumstance which made the present inquiry practicable was the existence in Cardiff since 1929 of a special clinic for the observation of rheumatic children and a special hospital for "early cases of rheumatism", operated jointly by hospital consultants and medical officers of the School Health Service. Since 1931 ascertainment of rheumatic heart disease was considered to have been fairly complete, and it was especially so from 1934 onwards, when the clinic was used also for the follow-up of children discharged from the paediatric wards of local hospitals. From the beginning general practitioners were encouraged to send patients to the clinic, and cases were also referred from the education and other departments of the local authority and from the fever hospital.

Throughout the 20-year period, it was the unvarying

* This paper is an abridged version of a thesis submitted for the degree of Doctor of Medicine in the University of Wales.

policy of the school health service to refer all children suspected of rheumatism or rheumatic heart disease to the clinic; integration with the local hospitals and the co-operation of local agencies has remained a feature throughout; and it is fair to assume that the level of ascertainment in more recent years has been at least as good as it was in the early 1930s.

The clinic records dating back to 1931 were intact and included all cases under observation in that year. As it happened, the medical staff remained almost unchanged throughout, so that records were as uniform as is compatible with the medical advances which have occurred during the period. It was the custom to make a record of clinical findings on each occasion a child attended the clinic and to include a summary of progress during a stay in hospital.

Most children referred to the clinic proved to be non-rheumatic and to be suffering from postural pains, tics, and other conditions which may simulate rheumatism. Moreover, in the early years of the service, the grounds on which rheumatic fever and heart disease were diagnosed would not be acceptable by modern standards. The initial problem was therefore to make a retrospective diagnosis based on the available records of each child who had attended the clinic. This diagnosis took account only of the physical signs reported on the records; no child was considered rheumatic on the evidence of recorded history alone.

Despite the high standard of clinical recording, retrospective review was not easy. The considerable advances in methods of cardiological diagnosis and in our knowledge of the pathogenesis of acute rheumatism sometimes made the interpretation of earlier records difficult; and the criteria adopted for defining rheumatic patients had to take account of conflicting requirements:

- (1) They had to be sufficiently precise for objectivity, yet elastic enough to allow for the clinical diversity of acute rheumatism.
- (2) They had to be acceptable in the light of modern views, yet suitable for the categorization of cases over a 20-year period.
- (3) They had to have regard for advances in diagnostic techniques, and yet they had to be applied uniformly.
- (4) Due weight had to be given to the opinion of examining physicians, yet cases diagnosed on inadequate grounds had to be excluded.

These requirements are not wholly reconcilable and a compromise had to be reached, which admitted certain defects in method. There was a subjective element in assessment; the criteria employed would not satisfy a stringent modern diagnostic standard; the categorization of more recent cases took account of radiological and other special findings, while that of earlier cases was usually made on clinical grounds alone.

One circumstance partly compensated for these drawbacks. The great majority of cases were under observation for at least one year, so that the final assessment was usually made not on the results of a single examination or of a short stay in hospital, but after a substantial period of observation.

Commonly, two types of case were referred to the Rheumatism Service: those with suspected active manifestations of acute rheumatism, and those thought to have established heart disease. Separate criteria were required for these two phases of the rheumatic process.

In this retrospective survey to determine which patients had acute rheumatic manifestations, the criteria, adopted with certain modifications, were those laid down for the M.R.C. Cortisone/Aspirin Trial (M.R.C. and Nuffield Foundation, 1954, 1955), which in turn had been adapted from the classification of Duckett Jones (1944). Rheumatic manifestations were divided into major and minor types; the major included carditis, polyarthritis, chorea, nodules, and erythema marginatum, and the minor included fever, a raised erythrocyte sedimentation rate, previous streptococcal infection within one month of the rheumatic attack, a history of rheumatic fever, and (where an E.C.G. had been done) a prolonged P-R interval. A diagnosis of acute rheumatism was considered to have been established by the presence of two major manifestations or one major and two minor.

Rigid adherence to criteria designed primarily for a clinical inquiry proved, however, to be impracticable, and modifications had to be introduced. Children were sometimes first seen in the late stage of an acute episode when signs of acute carditis remained but other manifestations had subsided. Provided the signs of carditis were unequivocal, such cases were included in the rheumatic category.

In the absence of clear cardiac involvement, it proved difficult to distinguish rheumatic pains from conditions simulating them and probably this form of rheumatism was underestimated in the review. Chorea in its florid form was more readily categorized.

Criteria for those with established heart disease had necessarily to be mainly clinical in character, though, where special investigation had been carried out, these results were taken into account. Except for the post-war years, however, cardiac involvement, both acute and chronic, had usually been diagnosed on clinical grounds alone.

For this particular series of cases, cardiac murmurs proved in practice to be the most important criteria. The main problem of interpretation centred in the loud apical systolic murmur without other abnormal signs. In the early period of established heart disease following an acute rheumatic episode this is often the only abnormal sign; and in the presence of a rheumatic history it was accepted for inclusion in the category of rheumatic heart disease. In the absence of a rheumatic history, interpretation is difficult. Sometimes observation revealed acute rheumatic manifestations or changes characteristic of mitral valve involvement. There remained, however, a small group of cases in which the systolic murmur was the only evidence of heart disease throughout, and the only practicable solution was to follow the opinion of the examining physician. Cases in which any doubt as to rheumatic pathology had arisen were excluded from the rheumatic groups.

Having differentiated the rheumatic patients by these criteria, two separate rheumatism groups were dis-

tinguished, according to whether cardiac involvement was observed or not:

- (1) Acute rheumatism with carditis, and patients with rheumatic heart disease.
- (2) Acute rheumatism without definite heart disease.

The groups are not wholly comparable. The first provides the basis of a best available estimate of actual levels of morbidity during the period under review: ascertainment appeared to have been fairly complete; cases not recognized as such in the acute phase could often be included later; and the retrospective review was not too rigorous to be compatible with reasonable precision. The second group does not purport to represent the true amount of acute rheumatism without definite cardiac involvement: ascertainment was much less complete; cases unless seen in an acute episode could not be included later; and a precise retrospective assessment of rheumatic polyarthritis proved impracticable. Analysis and arguments are therefore based primarily on the characteristics of the Group I cases, data from the second group being used only for comparison and support.

Apart from categorization it was necessary also to estimate the date of onset. Although cases were not admitted to a rheumatism category on the basis of history alone, the history was of course accepted for dating the onset of the disease. Thus the accepted date of onset for a child first seen in 1933 with chorea and having a history of a similar attack in 1931 would be 1931.

A general reservation must be made regarding these estimates because an acute episode may have been preceded by sub-clinical rheumatism. Further, even in children, a patient with established rheumatic heart disease not infrequently has no rheumatic history, and in computing morbidity indices it was necessary to adopt a convention for this type of case.

Indices of Incidence.—In calculating incidence—*i.e.* the number of persons suffering from these diseases for the first time in any year, per 1,000 of the population at risk, or in current terminology “inception rates (persons)” —the number of persons becoming ill in any given year is counted. Alternative indices are obtained according as cases with an indefinite date of onset first coming under observation in the given year are or are not included. Both methods have been used.

These numbers when related to the mid-year school populations gave relatively rough absolute measures of sickness. For a school population, though composed predominantly of children aged 5 to 15 (5-14 before 1947), includes a proportion above this age attending grammar schools and a smaller number below 5 attending nursery schools and classes. Anomalies apply also to the age distribution of cases; in about 6.5 per cent. the illness began before the age of 5, probably before the patients had started school; and the age distribution shows a tailing off at ages 12+.

These defects detract from the value of our indices as absolute measures of sickness, but their value for com-

parative purposes is less affected, since similar anomalies apply to each annual rate.

Indices of Prevalence.—Prevalence rates (persons)—*i.e.* the number of persons suffering from a disease in a given year (including those whose illness started in an earlier year) per 1,000 of the population at risk—have a somewhat more restricted meaning in the present context, since they are based only on the number of persons *under observation* in any given year (including those whose illness began in an earlier year). It was remarkable how frequently patients once referred to the clinic continued under observation until they left school, with only an occasional defaulter. Nevertheless, this index—“observational prevalence”—is a low estimate of the true prevalence.

The population at risk to which these numbers ought to be related is the total number of children attending school during the same year, but this figure is unobtainable. As in the case of inception rates, the mid-year school population is used, a fact which tends to overestimate the prevalence. To what extent these two opposing tendencies counteract one another cannot be ascertained.

A more fundamental consideration relates to the natural history of rheumatic carditis. Not infrequently signs of carditis subside, and in some cases the heart becomes clinically normal. In relation to prevalence, therefore, the question arises whether patients should form the basis of rates only while abnormal signs remain, or whether they should be included throughout the period of observation once abnormal signs have developed.

On clinical grounds a case could be made out for either alternative. From a statistical standpoint, the first is so difficult technically and of such limited advantage that the latter procedure was adopted.

Preliminary Analysis

It proved impracticable to obtain data from outside sources which would enable such questions as the completeness of ascertainment of rheumatic cases to be studied. No objective external evidence can be presented. This section is concerned with internal analyses bearing on the validity of the data, and with certain aspects of rheumatic cases with cardiac involvement—the main group for the present purpose.

Table I (opposite) shows the result of the review of the clinic records. The categories are mutually exclusive.

Cases with a known or suspected dual pathology (Table II, opposite) were classified as follows:

- (a) A definite diagnosis was preferred to a doubtful one;
- (b) Definite rheumatic carditis was preferred to other diagnoses.

Categories 3 to 8 are of importance in the present context only in so far as they enabled tests to be

TABLE I

CASES ATTENDING 1931-53, BY DIAGNOSTIC CATEGORY

	Category	Boys	Girls	Total
†1	Acute Rheumatism with Carditis ..	208	304	512
2	Acute Rheumatism without Carditis ..	110	285	395
3	Possible Acute Rheumatism with or without possible Carditis ..	56	94	150
4	Rheumatoid Arthritis ..	5	5	10
*5	Congenital Heart Disease ..	45	57	102
*6	Possible Congenital Heart Disease ..	6	16	22
7	Heart Disease of undetermined aetiology ..	14	2	16
8	Possible Heart Disease of undetermined aetiology ..	6	6	12
9	Other cases—a one in five sample ..	485	714	1,199

* Not an indication of incidence. Cases of congenital heart disease were supervised at the clinic only in recent years.

† Because this total includes cases attending up to 1953, it is greater than those in Tables V and VI.

TABLE II

CLASSIFICATION OF CASES WITH KNOWN OR SUSPECTED DUAL PATHOLOGY

Diagnosis	Classification	Boys	Girls
Rheumatic Carditis superimposed on Congenital Lesion	Rheumatic Carditis	—	2
Rheumatic Carditis superimposed on possible Congenital Lesion	Rheumatic Carditis	2	1
Subacute Bacterial Endocarditis superimposed on Rheumatic Carditis	Rheumatic Carditis	—	1
Rheumatoid Arthritis with Rheumatic Carditis	Rheumatic Carditis	2	—
Rheumatoid Arthritis with possible Cardiac Involvement	Rheumatoid Arthritis	4	—
Possible Rheumatism superimposed on Congenital Heart Lesion	Congenital Heart Disease	2	3
Total		10	7

made to determine if over the period there was a "transfer" of cases from one diagnostic category to another. For instance, a relative increase latterly in the size of Category 4 might have suggested a tendency for diagnosis to become more circumspect. In fact, no such evidence of a substantial "transfer" was found.

The 1,199 cases in Category 9 represent a 1 in 5 sample of by far the largest group—those which could not be assigned to Categories 1 to 8. A measure is thus provided of the ascertainment during the period of conditions which simulated rheumatism—predominantly postural pains, nervous tics, and minor anomalies of heart sounds. Because the clinic records included cards made out for persistent defaulters, the category provides also a measure of the children who failed to attend the clinic after referral.

Only 46 records out of 1,199 related to defaulters, showing that about five times this number—some 230 children—failed to attend the clinic after referral. The reason for referral was usually noted and in most cases did not suggest serious rheumatic disease. If the defaulting group contained the same proportion of true acute rheumatism and heart disease as was found in children actually examined, then Categories 1 and 2 together are not deficient from this circumstance by more than about thirty cases. Distribution by year of referral does not differ materially from that by year of entering supervision.

Table III, based only on patients whose illness began in 1931-50, shows the age-sex distribution at

TABLE III

CASES WITH ONSET IN 1931-50, BY SEX AND AGE AT ONSET

Age at Onset (yrs)	Acute Rheumatism with Carditis (Category 1)		Acute Rheumatism without definite Carditis (Category 2)		Doubtful Rheumatism (Category 3)		No Definite Evidence of Rheumatism (Category 9)	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
Under 3	—	—	—	—	—	—	8	7
3—	5	8	1	—	3	4	8	13
4—	12	7	3	7	—	7	24	25
5—	6	24	4	12	5	6	36	44
6—	14	17	12	13	7	9	37	49
7—	24	22	14	30	4	8	35	46
8—	21	20	11	28	6	5	43	48
9—	14	34	7	38	7	15	37	84
10—	21	29	12	36	2	8	30	61
11—	14	15	8	28	3	9	25	57
12—	7	13	8	27	4	6	21	49
13—	6	6	10	21	1	1	4	31
14—	3	2	1	2	—	—	3	1
15+	1	1	—	3	—	—	—	—
Totals	148	198	91	245	60	94	322	519
Age not Assessable ..	19	42	—	5	13	13	85	78
Mean	8.8±0.22	8.7±0.18	9.3±0.27	9.8±0.16	7.9±0.35	8.4±0.27	8.3±0.16	9.1±0.11
S.D.	2.7	2.5	2.6	2.5	2.7	2.6	2.8	2.6

onset for Categories 1, 2, 3, and 9. Apart from Category 2, all show a tailing off at the older ages. In each category, girls are markedly in excess, particularly in Category 2 which is due to the heavy weighting with chorea.

For Category 9, representing the largest section of the clinic population, girls were in excess throughout the period, but for the groups of true rheumatism the sex ratio fluctuated curiously (Table IV).

Among cases with heart disease, girls were in excess in 1931-35 and 1941-45, but not in the other two quinquennia. Among cases without definite heart disease, the excess of girls was most marked in 1936-40. No administrative circumstance could be found which might have biased sex representation during the period.

Since the trend is not uniform, the changing sex ratio is difficult to interpret. It will be recalled that individual surveys have shown variations of the sex ratio in regard to acute rheumatism ranging for instance from two boys to three girls in Belfast (Stevenson and Cheeseman, 1953) to less than four boys to five girls in the notification areas in England and Wales (Conybeare, 1951). If there are regional variations, temporal changes in the experience of one community might not be unexpected.

Turning to certain clinical aspects of the rheumatic carditis group, Table V shows the condition of the heart on entry into observation, distinguishing duration of history; 81 per cent. of those seen within

one year of apparent onset and 94 per cent. of those seen later showed definite signs of carditis from the start.

Table VI (opposite) shows the cardiac condition at the end of the period of observation, distinguishing rheumatic activity on first attendance. In a substantial proportion, the signs of carditis were modified or had disappeared by the end of supervision. The larger proportion showing cardiac damage at the end, which is seen in the group who were non-active when first observed, is a consequence of the method used in the present inquiry. Since only *observed* signs of rheumatic disease qualified for classification in the rheumatic groups, cases entering observation with a history of rheumatism were included only if they presented signs. In a high proportion of these, permanent cardiac damage was already present when first seen.

There is also an interesting sex difference. For both groups of cases, signs of permanent cardiac damage were more frequent in girls than in boys. For the total of all cases and for those seen initially in an acute stage, the differences are significant at the customary level (9.5 ± 3.9 per cent. and 13.0 ± 6.2 per cent. respectively).

Two implications of these findings must be mentioned:

(i) Because cases in Category 1 did not necessarily display signs of heart disease throughout the period,

TABLE IV
CATEGORY 1, CATEGORY 2, AND CATEGORY 9. SEX RATIOS (BOYS AS PERCENTAGE OF TOTAL)
ACCORDING TO QUINQUENNIAL OF ONSET WHERE ASSESSABLE, AND OF ASCERTAINMENT,
1931-50

Quinquennium		1931-35	1936-40	1941-45	1946-50
of Onset (where assessable)	Category 9	39	38	36	39
	Category 1	37	51	40	51
	Category 2	28	17	29	42
of Ascertainment	Category 9	41	38	41	41
	Category 1	35	49	40	48
	Category 2	29	17	28	41

TABLE V
CASES WITH RHEUMATIC CARDITIS UNDER OBSERVATION 1931-50:
CONDITION OF HEART ON ENTRY INTO OBSERVATION, BY SEX

Cases Seen	Cardiac Signs	Boys	Girls	Total
Within one year of apparent onset	Nil abnormal	15	6	21
	Doubtful significance	9	25	34
	Definite Carditis	93 (79.5%)	135 (81.3%)	228 (80.6%)
		117	166	283
One year or more after apparent onset	Nil abnormal	—	2	2
	Doubtful significance	5	7	12
	Definite Carditis	83 (94.3%)	121 (93.1%)	204 (93.6%)
		88	130	218

TABLE VI

CASES WITH RHEUMATIC CARDITIS: CONDITION OF HEART AT END OF OBSERVATION PERIOD ACCORDING TO ACTIVITY OF RHEUMATIC PROCESS AT FIRST ATTENDANCE, BY SEX

Sex	Activity of Rheumatism on First Attendance	Cases under Observation up to 1950	Average Duration of Supervision	Signs of Chronic Carditis		Equivocal Signs	No Apparent Abnormality
				No.	Per cent.		
Boys	Acute	104	4.1	58	55.8	19	27
	Not acute	101	3.2	88	87.1	10	3
Girls	Acute	144	4.0	99	68.8	19	26
	Not acute	152	3.0	140	92.1	9	3
Persons	Acute	248	4.0	157	63.3	38	53
	Not acute	253	3.1	228	90.1	19	6

of supervision, criteria for the computation of observational prevalence rates are placed in doubt (see above). In fact, the definition adopted was the number of cases under observation in a given year who had at any time shown signs of carditis as a ratio of the population at risk.

(ii) This implication has a bearing on the completeness of ascertainment. Signs of carditis may disappear completely when an acute rheumatic episode subsides. In this inquiry, if such a case were seen in the acute stage, the patient was included in Category 1. If the case were seen afterwards when the signs had subsided, the patient could only be so included if there were a recurrent episode or if signs of established heart disease appeared later. It follows that earlier referral leads to a more complete assessment in an inquiry of this kind.

A classification of the records in four quinquennia according to length of history before ascertainment shows that as the years went by a rising proportion of patients were seen within one year of onset. Hypothetically, this might be attributable to a falling off in case-finding of established heart disease in the later years. There may possibly have been such a falling off during the war years, but taking the period as a whole it is much more likely that ascertainment became steadily more complete. To the extent that this is so, the actual decline in rheumatic heart disease will be understated by the indices employed.

Statistical Findings

Broadly the analyses it is proposed to introduce under this heading bring out two main facts:

- (1) There was a substantial decline in the incidence of acute rheumatism and rheumatic heart disease during the 20-year period. The fall was most rapid during the 1930s.

- (2) The trend in rheumatism differs from the apparent trend in the large group of non-rheumatic conditions which came to the notice of the clinic. Distortion of the rheumatic trend by administrative circumstances is therefore unlikely.

The trend is discussed in the context of relevant epidemiological facts.

Prevalence and Inception.—Table VII shows the observational prevalence of rheumatic heart disease among Cardiff school children during the 20-year period. The prevalence reached an apparent peak in 1934-36, and declined steadily and substantially until 1944, after which it remained relatively stationary until 1950. The rate by the end of the period was less than one half the level during the peak year. The apparent rise to a peak in 1934 is probably an artefact, since the Rheumatism Service came into operation only in 1929 and case-finding was not at first fully effective. From the end of 1933

TABLE VII

ACUTE RHEUMATISM WITH HEART DISEASE.
ANNUAL OBSERVATIONAL PREVALENCE RATES, 1931-50

Year	Cases under Observation			Annual Prevalence Rates per 1,000 School Population
	Boys	Girls	Total	
1931	51	78	129	3.35
1932	53	108	161	4.14
1933	59	115	174	4.37
1934	69	124	193	5.08
1935	74	125	199	5.19
1936	78	112	190	5.24
1937	75	93	168	4.72
1938	74	88	162	4.64
1939	63	73	136	3.98
1940	52	56	108	3.23
1941	44	48	92	3.56
1942	39	45	84	2.76
1943	36	41	77	2.51
1944	34	40	74	2.38
1945	32	47	79	2.49
1946	35	43	77	2.45
1947	35	42	77	2.40
1948	39	37	76	2.25
1949	37	39	76	2.23
1950	36	43	79	2.27

onwards, consultant supervision became a feature of the Rheumatism Service. At the time this meant a modification of the diagnostic categories employed, which must in some measure have been reflected in the statistics now presented despite retrospective review. There are certain clear-cut features, however, which are unlikely to have been falsified by this circumstance.

The annual inception rates for rheumatism are shown in Table VIII, together with the annual apparent inception rates for cases in the non-rheumatic category. There is an interesting contrast between the trend for the rheumatic groups on the one hand and that for the non-rheumatic conditions on the other.

Considering first the trend in incidence of rheumatic heart disease, three features are noteworthy:

(i) The striking decline; by 1950 the inception rate was only one-third of the level of that in the early 1930s.

(ii) Both measures of incidence show that the fall was most marked in the earlier part of the period.

(iii) This feature is shown clearly only by incidence rate (a). The year 1935 appeared to mark a turning

point; incidence which had remained at a high level, though fluctuating widely during the preceding 4 years, fell abruptly by one-half and never regained its former high level. It is significant that this feature is obscured in incidence rate (b) by the relatively large number of cases with insidious onset entering observation in 1935 and 1936. These almost certainly mainly represent children who acquired their rheumatic disease with little or no overt clinical disturbance during the period of high incidence up to 1934.

The main features of the incidence of acute rheumatism without definite carditis are strikingly similar, having regard for the known deficiencies of ascertainment in this group. The overall decline, though not so marked, was continuous and again the rate of fall was greatest in the earlier years. Furthermore, as with rheumatic heart disease, a sharp fall was recorded in 1935.

The trend in the apparent incidence of cases regarded as non-rheumatic differs. There was a substantial decline taking the period as a whole, but this was less marked in the 1930s than subsequently; the peak year of inception was not reached until 1936; and it was only after 1938 that there was an unmistakable fall. The factors responsible for this fall—chiefly a decline in the

TABLE VIII

ACUTE RHEUMATISM WITH CARDITIS (CATEGORY 1) AND WITHOUT DEFINITE CARDITIS (CATEGORY 2). ANNUAL INCEPTION RATES (a) AND (b) COMPARED WITH INDEX OF APPARENT ANNUAL INCEPTION RATES (a) AND (b) OF CONDITIONS SIMULATING ACUTE RHEUMATISM (CATEGORY 9), 1931-50

Year	Acute Rheumatism with Carditis (Category 1)				Acute Rheumatism without Carditis (Category 2)				No Definite Evidence of Rheumatism (Category 9)			
	(a)		(b)		(a)		(b)		(a)		(b)	
	Annual Inception Rate per 1,000	Average Rate in Quinquennium	Annual Inception Rate per 1,000	Average Rate in Quinquennium	Annual Inception Rate per 1,000	Average Rate in Quinquennium	Annual Inception Rate per 1,000	Average Rate in Quinquennium	Annual Inception Rate per 1,000	Average Rate in Quinquennium	Annual Inception Rate per 1,000	Average Rate in Quinquennium
1931	0.83	0.86	1.01	1.04	0.91	0.73	0.93	0.74	1.79	1.68	1.95	1.91
1932	1.31		1.42		0.80		0.80		1.44		1.60	
1933	0.60		0.73		0.58		0.60		1.81		1.99	
1934	1.02		1.21		0.95		0.95		1.68		1.89	
1935	0.55		0.81		0.42		0.44		1.67		2.14	
1936	0.58	0.44	0.83	0.54	0.41	0.49	0.44	0.50	2.10	1.46	2.57	1.78
1937	0.45		0.59		0.37		0.37		1.66		2.08	
1938	0.54		0.60		0.54		0.54		1.49		1.80	
1939	0.35		0.38		0.56		0.59		1.17		2.26	
1940	0.30		0.30		0.57		0.57		0.90		1.17	
1941	0.39	0.35	0.43	0.37	0.43	0.36	0.43	0.36	1.32	1.05	1.59	1.28
1942	0.26		0.33		0.13		0.13		1.15		1.45	
1943	0.36		0.39		0.42		0.42		1.21		1.37	
1944	0.22		0.22		0.52		0.52		0.71		1.00	
1945	0.50		0.50		0.32		0.32		0.88		0.98	
1946	0.19	0.29	0.22	0.34	0.41	0.34	0.41	0.34	0.75	0.62	1.00	0.80
1947	0.37		0.44		0.34		0.34		0.81		1.15	
1948	0.30		0.33		0.36		0.36		0.44		0.50	
1949	0.32		0.32		0.38		0.38		0.65		0.76	
1950	0.29		0.37		0.20		0.20		0.46		0.60	

(a) Based on cases with known onset in a given year.

(b) Based on cases with known onset plus those with unspecified onset first entering observation in a given year.

incidence of postural pains, and, with advancing knowledge, increasing selectivity in the type of case referred—produced an apparent trend quite different from that observed in acute rheumatism.

The differing apparent trend of non-rheumatic cases—based on patients comprising the great majority of referrals to the clinic—suggests that there was no serious distortion of the rheumatic trend through administrative circumstances.

The observed incidence of rheumatic heart disease in the years 1948-50 did not much differ from the rates reported from notification areas in other parts of England and Wales. In 1948, for instance, the inception rate in Cardiff was 0.30 per 1,000 children compared with 0.26 per 1,000 in the notification areas. This supports the view that the ascertainment in Cardiff in later years was fairly satisfactory.

Epidemiological Comparisons.—There is obvious interest in comparing the observed trend of rheumatism with the trends in other streptococcal illnesses on the one hand and with socio-economic tendencies on the other.

The first comparison is with the trend in notification figures for scarlet fever in the city, the only useful data relating to streptococcal illness. The abrupt fall in the incidence of rheumatism in 1935 after a period of relatively heavy morbidity suggests the operation of a single factor and focuses attention on the possibility of a contemporaneous change in some characteristic of the streptococcus or its distribution.

The notification figures for scarlet fever (Table IX) appear at first sight to support this view. Notifications, which had been exceptionally heavy from 1931 to 1934, dropped sharply in 1935. But the significance of this finding becomes less clear when the figures are compared with those for rheumatism over the whole period. At no stage was there a consistent relationship. Further, whereas from 1931 to 1934 scarlet fever was epidemic in Cardiff, there is no reason to suppose that the incidence of acute rheumatism was substantially greater than before 1931.

An equally interesting comparison is with the trend in the severity of scarlet fever. Here it is necessary to turn to national statistics. Annual mortality and case fatality rates for England and Wales are shown in Table X. Once more the isolated fact emerges that 1935 was a year of change. Since 1912 deaths had fallen steadily to reach by 1927 a figure in the 500s. During the next 7 years, when scarlet fever notifications increased, there were fluctuations with a substantial rise in mortality during 1933 and 1934. In 1935, however, mortality

TABLE IX

ACUTE RHEUMATISM WITH AND WITHOUT CARDITIS. ANNUAL PERCENTAGE CHANGE IN INCEPTION RATE(a) COMPARED WITH ANNUAL PERCENTAGE CHANGE IN THE NUMBERS OF CASES OF SCARLET FEVER NOTIFIED (CARDIFF, 1931-50)

Year	Scarlet Fever		Acute Rheumatism with Carditis		Acute Rheumatism without Carditis	
	Cases Notified	Annual per cent. Change	Inception Rate(a)	Annual per cent. Change	Inception Rate(a)	Annual per cent. Change
1931	632		0.83		0.91	
1932	726	+15	1.31	+58	0.82	-10
1933	1308	+80	0.60	-54	0.58	-29
1934	905	-31	1.02	+70	0.95	+64
1935	378	-58	0.55	-53	0.42	-56
1936	361	-5	0.58	+5	0.44	+5
1937	495	+37	0.45	-22	0.39	-11
1938	841	+70	0.54	+20	0.57	+46
1939	786	-7	0.35	-35	0.59	+4
1940	293	-63	0.30	-15	0.57	-
1941	184	-37	0.39	+30	0.43	-25
1942	318	+73	0.26	-33	0.16	-63
1943	590	+86	0.36	+38	0.42	+162
1944	602	+2	0.22	-39	0.52	+24
1945	309	-49	0.50	+127	0.32	-38
1946	331	+7	0.19	-62	0.47	+47
1947	434	+31	0.37	+95	0.34	-28
1948	595	+37	0.30	-19	0.36	+6
1949	301	-49	0.32	+7	0.41	+14
1950	289	-4	0.29	-9	0.20	-51

TABLE X

SCARLET FEVER. ANNUAL NUMBER OF NOTIFICATIONS, DEATHS AND CASE FATALITY RATES, ENGLAND AND WALES, 1911-50

Quinquennium or Year	Notifications	Deaths	Fatality Rate (per 100 cases)
1911-15	634,543	11,236	1.8
1916-20	374,607	5,820	1.6
1921-25	506,934	5,556	1.1
1926	81,672	677	0.83
1927	84,450	579	0.68
1928	102,611	580	0.57
1929	120,232	717	0.60
1930	111,077	740	0.67
1931	81,569	540	0.66
1932	84,982	530	0.62
1933	129,436	729	0.56
1934	151,867	963	0.63
1935	120,317	573	0.48
1936	104,710	495	0.47
1937	95,569	349	0.37
1938	98,815	311	0.31
1939	77,591	181	0.23
1940	63,804	152	0.24
1941	58,072	131	0.23
1942	83,847	100	0.12
1943	113,931	129	0.11
1944	90,616	105	0.12
1945	72,187	82	0.11
1946	56,124	41	0.07
1947	57,264	42	0.07
1948	73,947	37	0.05
1949	70,207	18	0.03
1950	65,889	33	0.05

returned to its former level and from then onwards an annual decline in the number of deaths has continued almost without interruption. Similarly, case fatality rates, which had declined steadily from 1911 onwards, remained relatively stationary from

1928 to 1934, but in 1935 the decline was resumed. These relationships in 1935 may or may not have been coincidental; no final conclusions are possible from the present data.

The next comparison is with local figures of unemployment and recourse to poor relief (Table XI). It is well known that Cardiff, in common with other "depressed areas" was late in registering an improvement. No real advance was, in fact, made until 1937, but it is noteworthy that the incidence of rheumatism in the city had fallen 2 years before this improvement was registered.

TABLE XI
UNEMPLOYMENT OF MALES AGED 18-65 (1931-40)
AND POOR RELIEF (ANNUAL RATE, 1931-39)

Year	Men on Unemployment Register (at Mid-year)	Unemployment Rate per 1,000 Males	Poor Relief Annual Rate (at Mid-year) per 10,000 estimated population (including dependants)
1931	14,579	234	378
1932	15,115	244	431
1933	15,870	257	505
1934	14,909	243	530
1935	14,338	242	503
1936	13,320	216	508
1937	10,540	172	442
1938	9,793	158	431
1939	7,438	119	416
1940	3,892	62	—

Other social improvements which occurred during the 1930s are not easily expressed in numerical terms. Housing programmes, relief of overcrowding, and improved welfare services for mothers and children were all measures which might theoretically have influenced the rate of occurrence of the disease. Such benefits were not, however, on a scale or of a kind which might have been expected to produce a relatively dramatic fall in the incidence of rheumatism, and many were hardly begun in the first half of the decennium, and although advances were taking place in Cardiff during the 1930s, it is difficult to believe that they played a major role in the decline of the disease at the time.

Finally, chemotherapeutic agents came into increasing, and subsequently, widespread use from the late 1930s onwards; they may well have contributed latterly to the decline in rheumatism, but it is clear that they were not among the principal causes of the decline.

Social Differentials.—In an effort to study the problem further, rheumatic cases were classified according to a social grouping. Recording of father's occupation was insufficiently precise to enable cases to be allocated to the Registrar-General's social class grouping. The only available

methods of studying social differentials were by reference to schools attended and to the Wards of the City in which patients resided. Both methods gave similar results and the former is now briefly described (grammar schools and special schools excluded).

Schools were grouped on a simple four-point social scale:

- I. Predominantly working class.
- II. Predominantly working class (new housing estates).
- III. Mixed working and middle class.
- IV. Predominantly middle class.

Ascertainment rates of the two designated forms of rheumatism (defined as the average annual number of cases ascertained per 1,000 of the average annual school population) were then computed for each group in the two decennia 1931-40 and 1941-50 (Table XII). In the first decennium the rate for carditis in the middle-class schools was significantly lower than the rates for the other three groups, Group I being slightly in excess. In the second decennium a gradient remained, though the gap between the middle-class schools and the other schools was somewhat narrower. The percentage decline was very similar for Groups I to III.

TABLE XII
ACUTE RHEUMATISM WITH AND WITHOUT DEFINITE CARDITIS. COMPARISON OF ASCERTAINMENT RATES ACCORDING TO TYPE OF SCHOOL ATTENDED,* 1931-50

Acute Rheumatism	School Group	I	II	III	IV
With Carditis	Cases ascertained 1931-40	177	48	98	19
	1941-50	46	19	16	11
	Ascertainment Rate (a) 1931-40	1.18	0.95	1.08	0.50
	(b) 1941-50	0.43	0.35	0.37	0.27
Without Carditis	Rate (b) as percentage of Rate (a)	36	37	34	54
	Cases ascertained 1931-40	118	35	69	15
	1941-50	48	21	27	9
	Ascertainment Rate (a) 1931-40	0.78	0.69	0.76	0.40
	(b) 1941-50	0.45	0.38	0.38	0.22
	Rate (b) as percentage of Rate (a)	58	55	50	55

* Children attending grammar schools and special schools excluded.

For other forms of rheumatism there was a similar pattern. Rates for the first three groups were high compared with middle-class schools, and again Group I was the highest of the three but not significantly so. Comparing decennia, the extent of decline was about the same for all four groups.

A geographical study of the location of patients' dwellings showed little noteworthy aggregation of cases in any one part of the city. There were, however, 29 clear instances in which two or more rheumatic siblings had attended the clinic during the period considered.

The conclusions which can be reached from a relatively rough social study of this kind are limited, but three points are worthy of mention:

- (1) There is a relation with socio-economic status. The occurrence of rheumatism was consistent with the view that the less well-to-do experienced a relatively high incidence. It is possibly noteworthy that there was not a straightforward social gradient, the "mixed" schools having similar rates to the predominantly working-class groups.
- (2) Comparing decennia, for rheumatic heart disease, the social differential was somewhat less marked in 1941-50, but for other forms of rheumatism it remained the same. There was no dramatic change of the kind which might have been expected had incidence levels been closely related to the widespread lack of material resources which was a feature of the 1930s.
- (3) Rates for children representing the experience of those living on new housing estates were rather consistently a little lower than the rates for other working-class children, but in no case was the difference significant statistically. It did not appear that residence on a new housing estate, *per se*, influenced the risk of a child acquiring rheumatism to any considerable extent.

Discussion

The years 1931-50 witnessed a remarkable change in mortality from acute rheumatism and heart disease at ages 5-15. From the beginning of the 20th century up to 1930 the death rate had been falling slowly. The decline was halted temporarily in the early 1930s to be resumed in 1936, after which date it fell continuously and more steeply than before.

The setback in 1931-35 occurred at a time of industrial depression and the resumption of the decline coincided with a return to national prosperity. The war years, though they meant a deterioration in housing and for many a disruption of ordinary home life, brought higher wages for a large section of the working population, and high wages and full employment have been so far maintained in the post-war period.

These temporal associations, taken together with the well known poverty relationship of rheumatism, suggest that the recent history of the disease might have been closely related to economic trends. This

view is supported in an inquiry by Morris and Titmuss (1944), who studied mortality from rheumatism in the county boroughs of England and Wales during the 1930s, in conjunction with changes in unemployment figures. Their conclusion was that unemployment was an important factor *per se* in determining levels of mortality.

These findings cannot, however, be interpreted in isolation from the trend in total mortality at ages 5-15 over the same period. As with certain individual causes of death such as acute rheumatism, there is a general relationship between poverty and total mortality in childhood. It is therefore important to notice that the trend in total mortality in England and Wales at ages 5-15—a steady decline—was uninterrupted during the worst years of depression (Tables XIII and XIV).

TABLE XIII

AVERAGE ANNUAL DEATH RATES PER 1,000 LIVING AT AGES 0-20 BY AGE GROUPS, AND INFANT MORTALITY (1901-50), ENGLAND AND WALES

Age Group (yrs)		0—	5—	10—	15-20	Deaths under 1 year per 1,000 Live Births
Quin-quennium	1901-05	50.2	3.74	2.19	3.11	138
	1906-10	41.7	3.38	2.03	2.87	117
	1911-15	37.5	3.39	2.08	2.88	110
	1916-20	31.4	3.81	2.48	3.77	90
	1921-25	24.4	2.48	1.71	2.61	76
	1926-30	20.8	2.37	1.57	2.49	68
	1931-35	18.1	2.18	1.41	2.33	62
	1936-40	15.6	1.84	1.20	2.01	55
	1941-45	14.0	1.50	1.08	1.96	50
	1946-50	9.33	0.77	0.62	1.18	36

TABLE XIV

AVERAGE ANNUAL DEATH RATES PER 1,000 LIVING AT AGES 0-20 BY AGE GROUPS, AND INFANT MORTALITY (1906-50) EXPRESSED AS PERCENTAGES OF RATES IN 1901-05, ENGLAND AND WALES

Age Group (yrs)		0—	5—	10—	15-20	Infant Mortality
Quin-quennium	1901-05	100.0	100.0	100.0	100.0	100.0
	1906-10	83.1	90.4	92.7	92.3	84.8
	1911-15	74.7	90.6	95.0	92.6	79.7
	1916-20	62.5	101.9	113.2	121.2	65.2
	1921-25	48.6	66.3	78.1	84.0	55.1
	1926-30	41.4	63.4	31.7	80.0	49.3
	1931-35	36.1	58.3	64.4	74.9	44.9
	1936-40	31.1	49.2	54.8	64.6	39.9
	1941-45	27.9	40.1	49.3	63.0	36.2
	1946-50	18.6	20.6	28.3	37.9	26.1

Two facts in particular might be emphasized:

- (i) Mortality from the infectious diseases which were of importance in the early part of the century and together accounted for a major part of total mortality, was falling dramatically;

(ii) The areas most affected by the economic slump shared in the general improvement.

The first point has an important implication. Apart from the special circumstances which can explain the decline in mortality from certain individual infectious diseases, the fact that they all declined simultaneously strongly suggests that socio-economic betterment was also an important factor. It would be stretching coincidence too far to suggest contemporaneous changes in a number of host-parasite relationships all favourable to the host.

The second point was brought to light by an inquiry described in a Report of the Chief Medical Officer to the Ministry of Health (1932). The inquiry failed to disclose any deterioration in health which could be clearly related to industrial distress and unemployment. The general death rate and infant mortality in certain representative depressed areas were higher than in the remainder of the country, but the proportionate decline in mortality in the depressed areas in the period of economic depression was actually greater than in the country as a whole. The inference drawn was this:

... We cannot escape the conclusion that there is at present no available evidence of any general increase in physical impairment or in mortality as the result of economic depression or unemployment.

During the slump period housing conditions did not deteriorate, but were in fact gradually improving as local authorities developed their housing programmes. Unemployment might have been expected to have other unfortunate consequences; there was, for instance, less money for food, fuel, and clothing, and it would not have been surprising if loss of morale had resulted in a lowering of the standard of child care. In the event, although deterioration in clothing and footwear was reported, nutritional standards were well maintained so far as school children were concerned, and the incidence of lousiness—a useful rough and ready index of child care—continued to decline. The evidence suggests that for this age group the intimate environment of the home deteriorated surprisingly little.

There are many difficulties in the interpretation of these facts. For instance, the steady fall in the average size of family since the beginning of this century both facilitates a higher standard of child care and is likely to reduce the risk of infection in the home. Standards of housing, though well known to be closely related to many health problems, do not appear to have a significant bearing on the juvenile mortality trend.

An hypothesis postulating a close relationship between incidence of disease and current economic

conditions places rheumatism in a special category.

This is the context in which the trend of morbidity in Cardiff is now considered. Interpretation is limited by a number of circumstances. The period under review is relatively short and nothing is known of incidence before 1931; the experience is local so that random fluctuations cannot be ruled out; the relevant epidemiological data are not complete. Our conclusions must necessarily be tentative, but three features of the trend appeared particularly significant:

- (1) Comparing average annual rates in quinquennia there was a consistent decline throughout the period.
- (2) The sharpest part of the fall occurred during the 1930s when economic improvement was least evident, and the decline had started 2 years before any substantial improvement in employment had been registered at all.
- (3) The decline began with an abrupt fall in 1935 after a period of high, though fluctuating, incidence.

There is no support here for the view that economic conditions *per se* were an important cause of the decline. Taking all the known facts into account, the trend agrees best with the hypothesis that a sharp decline brought about by some change in the properties or distribution of the streptococcus was superimposed on a progressive fall due to steady social improvement.

The general improvement in child health during 1931-50 occurred in a manner which suggests that, in so far as they are separable, socially determined factors such as the quality of maternal care were of greater importance than either economic standards *per se*, or the physical factors customarily thought important in disease causation. Such an explanation would be consistent also with the trend of rheumatism observed in Cardiff over the period surveyed. The assessments and other information required to establish the fact, however, are not obtainable.

If the decline in rheumatism were, indeed, so determined, it would follow that an economic catastrophe, even on the scale of the industrial depression of the 1930s, would be unlikely to reverse the present trend in the disease.

Summary

(1) Local statistics of the incidence of acute rheumatism and rheumatic heart disease for the years 1931-50 were derived from a retrospective

review of the records of the Cardiff Rheumatism Service for school children.

Le déclin du rhumatisme aigu

RÉSUMÉ

(2) The following facts emerge from this study:

- (a) A substantial decline occurred over the 20-year period.
- (b) The greatest rate of decline occurred in the 1930s before there had been substantial local economic improvement.
- (c) The decline began abruptly in 1935, coinciding perhaps fortuitously with a sharp drop in the notification figures for scarlet fever in the city and a resumption of the decline in national mortality from that disease.
- (d) The social analysis was consistent with the view of a poverty relation. Comparing the two decennia 1931-40 and 1941-50, there was some change in the social differential of rheumatic heart disease, but none in that of other forms of acute rheumatism. Residence in a new housing estate conferred little advantage.

(3) On the basis of these local figures and more general considerations, reasons for the decline in the disease are discussed. It is suggested that social causes of the decline are related more closely to such factors as an improving quality of maternal care than to straightforward economic or physical factors. If this view is correct, the present trend of the disease is unlikely to be reversed by an economic slump.

Acknowledgements are due to the Medical Officer of Health to the City of Cardiff for access to the records; to Dr. C. W. Anderson, Deputy Medical Officer, for information concerning the organization and practice of the Rheumatism Service; and to Messrs. V. E. Bevan and Philip Williams for the information required for certain analyses. I am indebted to Professor A. G. Watkins for help with clinical aspects and to Dr. E. Lewis-Faning for help with statistical aspects of this study, and to Professor F. Grundy for guidance and criticism throughout.

REFERENCES

- Conybeare, E. T. (1951). *J. roy. sanit. Inst.*, 71, 300.
 Glover, J. A. (1946). *Monthly Bull. Minist. Hlth*, 5, 222.
 — (1952). In "History of the Second World War. Medicine and Pathology", ed. V. Zachary Cope, p. 113. H.M.S.O., London.
 Jones, T. Duckett (1944). *J. Amer. med. Ass.*, 126, 481.
 Knowelden, J. (1949). *Brit. J. Soc. Med.*, 3, 29.
 Ministry of Health (1932). "13th Annual Report of the Ministry of Health, 1931-32." H.M.S.O., London.
 Morris, J. N., and Titmuss, R. M. (1944). *Med. Offr.*, 72, 69, 77, 85.
 M.R.C. and Nuffield Foundation (1954). *Brit. med. J.*, 1, 1223.
 — (1955). *Ibid.*, 2, 695.
 Stevenson, A. C., and Cheeseman, E. A. (1953). *Ann. Eugen. (Camb.)*, 17, 177.

(1) Les statistiques locales de la fréquence du rhumatisme aigu et de la maladie de Bouillaud pour les années 1931-50 ont été établies d'après les archives du Service de Rhumatisme de Cardiff pour les écoliers.

(2) Cette étude fait apparaître les faits suivants:

- (a) Un déclin substantiel s'est produit durant cette période de 20 ans;
- (b) Le déclin le plus marqué est survenu après 1930, avant que se fût produit une substantielle augmentation du niveau de vie local;
- (c) Le déclin s'amorça très abruptement en 1935, coïncidant, peut-être fortuitement, avec une chute brusque du nombre des cas déclarés de scarlatine dans la ville, et avec un nouveau déclin de la mortalité due à cette maladie pour l'ensemble du pays.
- (d) L'étude des conditions sociales confirma une relation avec le paupérisme. En comparant les deux décennaires 1931-40 et 1941-50, on constata un certain changement dans le rapport "niveau social—maladie de Bouillaud", mais non dans celui des autres formes de rhumatisme aigu. Le fait de loger dans une nouvelle cité conférait peu d'avantage.

(3) Sur la base de ces chiffres locaux et de considérations plus générales, on discute les raisons du déclin de cette maladie. Il est suggéré que les causes sociales de ce déclin seraient liées plus étroitement à des facteurs tels qu'une amélioration de la qualité des soins maternels que simplement à des facteurs économiques ou physiques. Si ce point de vue est correct, l'actuelle tendance de régression de cette maladie ne semble pas devoir être renversée par une crise économique éventuelle.

Baja del reumatismo agudo

SUMARIO

(1) Las estadísticas locales de la frecuencia del reumatismo agudo y del reumatismo cardiaco para los años 1931-50 fueron establecidas según los archivos del Servicio de Reumatismo de Cardiff para los niños de escuela.

(2) Este estudio revela los hechos siguientes:

- (a) Una baja considerable tuvo lugar durante este periodo de 20 años;
- (b) La más importante baja ocurrió después de 1930, antes de manifestarse una aumentación substancial del nivel de vida local;
- (c) La baja empezó muy abruptamente en 1935, coincidiendo, quizás fortuitamente, con una caída repentina del número de los casos declarados de escarlatina en la ciudad y con la continuación de la baja de la mortalidad debida a esta enfermedad en el país entero.
- (d) El estudio de las condiciones sociales confirma una relación con la pobreza. Al comparar los dos decenios 1931-40 y 1941-50, se nota un cierto cambio en la relación "nivel social—reumatismo cardiaco" pero ninguno en las demás formas del reumatismo agudo. El hecho de vivir en casas municipales nuevas otorgó poca ventaja.

(3) A base de estas cifras locales y de consideraciones generales se discuten las razones de la baja de esta enfermedad. Se sugiere que las causas sociales de esta baja estarían ligadas más estrechamente a factores domésticos, tales como mejores cuidados maternos,

que simplemente á factores económicos o físicos. Al ser correcto este punto de vista, la tendencia presente de regresión de esta enfermedad persistiría a pesar de una crisis económica eventual.