

CLINICAL AUDIT  
THE COST OF RHEUMATOID ARTHRITIS

E. McINTOSH

Health Services Research Unit, Department of Public Health, Drew Kay Wing,  
Polwarth Building, Foresterhill, Aberdeen AB9 2ZD

SUMMARY

This paper uses the Cost of Illness (COI) framework to estimate the cost of rheumatoid arthritis (RA) to society in the year 1992/93. By doing so, a clear insight is given into the many cost elements of RA treatment and monitoring. This paper estimates point prevalence rates of 2.06 and 6.94/1000 persons at risk for men and women, respectively, showing that prevalence is three times higher amongst women than men. Further to this, prevalence increases with age in both sexes, resulting in very high prevalence rates for RA amongst the elderly. The total economic impact of RA in England was estimated to be £1.256 billion in 1992, of which 52% was a result of production loss caused by RA disability.

KEY WORDS: Rheumatoid arthritis, Cost of Illness, Direct costs, Indirect costs, Economic impact.

COST of Illness (COI) studies have been popular over the years, with more than 200 separate COI studies since the early 1960s [1]. Some of these are national in scope but, as Rice *et al.* [2] point out, most are limited to a selected population or geographical area, and all but a few are restricted to one or a few disease categories. In the early days of health economics, COI studies were used to argue for more resources to be devoted to health care by pointing out the economic consequences of various diseases. More recently, they have been used by pharmaceutical companies and clinicians in specialist fields to highlight particular diseases [3]. When carrying out a COI study, the perspective taken depends upon the audiences targeted. For the purpose of this paper, a societal perspective will be taken whereby total costs to all parties will be included; in doing so, an overall picture of the social, clinical and economic effects of the disease to all segments of society will be achieved. To date, there have been no studies looking at the cost of rheumatoid arthritis (RA) to society. This is a crippling disease, many of the effects of which are underestimated by many. By undertaking a COI study in this area, the intention is to document the total economic burden in financial terms as a proxy for the impact this illness has upon society.

Rice [4] outlined a methodology which considered the cost of illness to consist of three components: direct costs, indirect costs and intangible costs.

Direct costs are those for which actual payments are made, such as those costs borne mainly by the health care sector in treating the disease. Direct costs include health care and social care. In addition to direct medical costs, there are also direct non-medical costs, such as, for RA patients, modifications to the home, special transportation and specialist equipment to aid them in their everyday activities.

Indirect costs are those where no direct payments are actually made, but for which resources are lost. There are two forms: morbidity and mortality costs. Morbidity costs include the value of production losses of those who are unemployed or restricted from working as a result of illness. Mortality costs are calculated as the present value of lost production due to premature death caused by illness.

Illness and disease can cause a vast number of deteriorations in the quality of life. Sufferers of illness and disease, families, friends, co-workers and carers may all be affected. Victims of RA may suffer disability, pain, frustration and lack of self-esteem caused by forced dependency upon others. To date, no one has successfully quantified this dimension of illness. There are, however, some health status measures which can be used to estimate quality of life; one such measure is the Arthritis Impact Measurement Scale (AIMS). Because these intangible costs are virtually impossible to estimate, they are omitted from the cost estimates here. However, it is worth noting their importance, especially for an illness such as RA where physical pain is such a major factor. For further studies on quality of life measures in RA, see Liang and Katz 1992 [5].

There are two main approaches to COI studies: incidence based and prevalence based. Neither method is 'better', both measures have their limitations and provide different but complementary information. Incidence-based studies concentrate only on those cases of the disease developing for the first time in a given year, while prevalence-based studies account for all cases existing in a given year. COI studies based on incidence are useful for monitoring changes in annual burden over a period of time. COI studies based on prevalence have the advantage of relating to measures of total annual health care expenditure, thus being able to give the annual costs of disease for all patients in all disease stages. In their cost of depression study, Jönsson and Bebbington [6] show that a prevalence-based approach is particularly relevant for a recurrent

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disease like depression, where treatment is needed for long periods. For the same reasons, a COI study of RA is best carried out using the prevalence-based approach, especially since, like depression, RA is a disease which can be recurrent in many people and treatment is often required for long periods.

The method used for identifying costs must also be considered carefully before undertaking any COI study. The two main approaches are referred to as top-down and bottom-up. The top-down approach divides the total national cost of illness between different diseases. The bottom-up method consists of assigning costs to a disease based upon an agreed diagnostic criterion; it does this by concentrating on the selection of a group of patients who can be thoroughly investigated [6]. It is this latter approach which has been adopted in this paper. The bottom-up approach requires the inclusion of health care utilization and costs in all relevant settings, e.g. in a hospital or residential care setting. The advantage of adopting this method is that it gives detailed information on medical care utilization which can be used in cost-effectiveness studies. This method, used in conjunction with a prevalence-based approach, will give a good estimate for the total annual health care costs for RA for all patients in all disease states in England.

#### METHOD

Two sources of data were used: the Morbidity Statistics from General Practice 1981-82 [7] and the OPCS Surveys of Disability in Great Britain [8, 9]. The steps undertaken to address the research question are as follows.

- (1) Undertaking a literature search on Medline to identify relevant COI and RA literature. Using references from this initial survey, a search of unpublished data was carried out. Unpublished data sought included drafts of work in progress and discussion papers, of which none were relevant to this study.
- (2) Calculation of prevalence rates for persons with RA in England living in private households and combining these prevalence rates with OPCS population estimates for England to produce figures for expected numbers of cases for adults with RA living in private households. Initially it was presumed that for RA sufferers living in private households, two separate prevalence rates would have to be calculated, namely one rate for the disabled<sup>1</sup> RA sufferers and one for non-disabled RA sufferers, the assumption being that they would have differing rates of service utilization, i.e. with disabled RA sufferers requiring more

<sup>1</sup>The OPCS uses the definition of disability given by the International Classification of Impairments Disabilities and Handicaps (ICIDH), namely 'Any restriction or lack (resulting from an impairment) of ability to perform an activity in the manner or within the range considered normal for a human being' [9].

<sup>2</sup>For costing purposes, only those persons over the age of 16 are included in this paper.

services than non-disabled RA sufferers. Estimates of prevalence for non-disabled RA sufferers were taken from the 1981 GP Morbidity Survey [7]. However, only one prevalence rate was required for this group of adults; this is due to the fact that when the two prevalence rates were calculated they were almost identical, implying that everyone with RA has some form of disability. It was thus decided that one uniform rate was a sufficient proxy with which to calculate service utilization. Since most people with RA experience a lifetime sequence of remission and flare-ups, it was decided that the most accurate estimation of prevalence was a point prevalence, since due to the nature of the illness a period prevalence may be inaccurate for costing purposes. Thus, point prevalence rates were estimated by subtracting the incidence rate from the period prevalence rate. The issue of severity is dealt with by adopting the approach suggested by Goldberg and Huxley [10]. The methodology for this paper is an adaptation of the Kavanagh *et al.* Cost of Depression Study [11]. Thus, it is assumed that any person suffering from RA occupies only one level of service utilization at any one time, namely disabled adults<sup>2</sup> with RA living in private households or disabled adults living in communal establishments.

- (3) Calculation of prevalence rates for persons with RA in England living in communal establishments.
- (4) Establishing the accommodation status of those living in communal establishments.
- (5) Compilation of a package of service utilization for persons with RA using data from the OPCS disability surveys. A specially designed questionnaire to be used with medical specialists was also used to estimate service utilization. This questionnaire was completed by two rheumatologists and one specialist rheumatology practice nurse; it contained questions about the average number of visits made to specialists by RA sufferers, and questions relating to the tests and procedures required for disease monitoring.
- (6) Extraction of information on the use of aids and adaptations using the above-mentioned questionnaire.
- (7) Allocation of costs to the various aspects of service utilization. This includes annuitization of the various aids and adaptations. Data on the use of aids and adaptations by RA sufferers were collected by means of a specially designed questionnaire which was completed by two rheumatologists and one specialist rheumatology nurse practitioner.
- (8) Estimation of production loss as a result of disability caused by RA. After examining various studies of work disability and RA [16-18], it was decided that a work disability rate of 50% would be applied to those people suffering from RA. These cross-sectional studies indicate that about half of persons of working age with RA who had worked before the onset of RA are out of the labour force at any one time due to RA. For accuracy, the natural unemployment rate was applied to the population of persons of working age with RA first and foremost.

TABLE I  
Point prevalence rates for disabled persons with RA living in private households (England)

	Age							
	All	0-4	5-14	15-24	25-44	45-64	65-74	75+
Males								
Rate (000)	2.06	0	0.1	0.22	0.72	4.0	7.73	7.2
Females								
Rate (000)	6.94	0	0.1	0.9	2.38	10.9	20.5	23.2

## RESULTS

The research question posed was: 'What is the cost of RA in England?' Owing to the nature of COI studies, this section consists of reporting costs. Not only are the direct and indirect costs reported separately, the individual costs themselves are disaggregated wherever possible by agency and service. The Discussion consists of assessing these findings in light of other COI studies.

### Prevalence

As discussed earlier, this study adopted a prevalence-based approach to estimate costs. Two separate prevalence rates must be calculated: one for adults living in private households and another for adults living in communal establishments. This is a result of their different packages of service utilization arising from their different accommodation status. The results are shown in Tables I-III and Fig. 1.

Table I and Fig. 1, showing the prevalence trends for adults in private households, give a clear picture of the disparity between rates for males and females. The prevalence rate among females is approximately three times higher than that among males, but the rates increase with age in both sexes. Table II shows that there were ~225 077 adults with RA living in private households in England in 1992. Table VII shows that the estimated number of disabled persons with RA living in communal establishments (by accommodation type) is 7748. As shown in Table III, the prevalence rates of RA in communal establishments are much higher than those in private households. This is due to the high concentration of elderly people (>65 yr) in communal establishments.

### Direct costs

*Use of health services.* Using OPCS data, mean annual service utilization estimates for persons with RA were made. Table IV gives a summary of the results.

The majority of ambulatory visits were to GPs, at a cost of £7.46/surgery visit. Table IV shows that nurse

visits, hospital days and home-help hours all increased with age, as would be expected due to the increased severity of RA over time. OPCS data showed that visits to specialists decreased with age. For costing purposes, a more detailed analysis of out-patient visits was carried out. The results are summarized in Table V.

With an estimated 225 077 people with RA living in private households in 1992, the total cost for specialist visits was £38.9 million.

*Drug costs.* The total cost for non-steroidal anti-inflammatory drugs (NSAIDs), disease-modifying anti-rheumatic drugs (DMARDs) and steroids for RA patients in 1992 in England was £35.5 million. This figure is based on the assumption that ~80% of all RA sufferers use NSAIDs, with DMARD usage between 2 and 33%, depending on which DMARD was used. Intra-articular steroids are used by 40% of RA sufferers only once in the course of their disease; therefore, a proxy for annual usage was estimated at 0.8%. Systemic steroids are used by 13% of people at some point during the course of their disease, with ~3% of people actually using them at any one time. Dosage estimates and costs were derived from the Monthly Index of Medical Specialties (MIMS) [15] and personal correspondence with Pfizer Ltd and Cambridge Pharma-Consultancy. Estimates of cost involved in the administration of the drugs were not included in this paper due to a lack of reliable data. It is estimated, however, that these costs may be substantial in some circumstances. The total drug cost of £35.5 million is an estimate for all persons with RA living in private households and those living in communal establishments, less those living in NHS nursing homes (as the cost of drug acquisition is included in the weekly fee).

*Management of toxicity—laboratory tests.* The above estimate for drug costs of £35.5 million does not include the costs for the numerous laboratory tests which RA patients must undergo for toxicity management. Tests and costs are summarized in Table VI.

The cost estimates for management of toxicity were based on the assumption that 80% of RA patients

TABLE II  
Expected numbers of cases with RA living in private households in England (1992)

	All	0-4	5-14	15-24	25-44	45-64	65-74	75+
Male	50 045	0	0	745	5190	20 936	14 842	8332
Female	175 032	0	0	289	16 791	58 064	47 689	52 199
Total	225 077	0	0	1049	21 981	79 000	62 531	60 531

TABLE III  
Point prevalence rates for disabled adults with RA living in communal establishments (England)

Persons Rate (000)	Age band		
	55-64	65-74	75+
	15.7	20.6	25.8

undergo management. Owing to insufficient data, this estimate does not include the costs for tests which are only carried out on diagnosis, tests carried out when a particular problem occurs or when surgery occurs. Further to this, insufficient information was available on the expenses incurred by patients (and their carers) travelling to and from the clinic to have these various tests, and therefore these costs have also been omitted.

*Aids and adaptations.* The use of daily living aids by persons with RA is summarized in Appendix 1. The total annual cost for these items was £10.8 million. The most commonly used aids were special utensils, teapot hoists, non-slip place mats, tap-turners, hand splints, bath rails and helping hand aids. Disability affecting the hands and wrists is potentially the most debilitating as RA weakens the joints in the hands and wrists dramatically. Kitchen adaptations are essential as this can potentially be a very dangerous area for persons with weak joints and reduced grip strength.

*Disabled adults living in communal establishments.* Using OPCS data, disabled adults with RA were identified by accommodation status. The results are summarized in Table VII.

The total cost (excluding drug costs) for persons with RA living in communal establishments in England in 1992 was £131.5 million. The cost elements of the above types of accommodation are summarized in Table VIII.

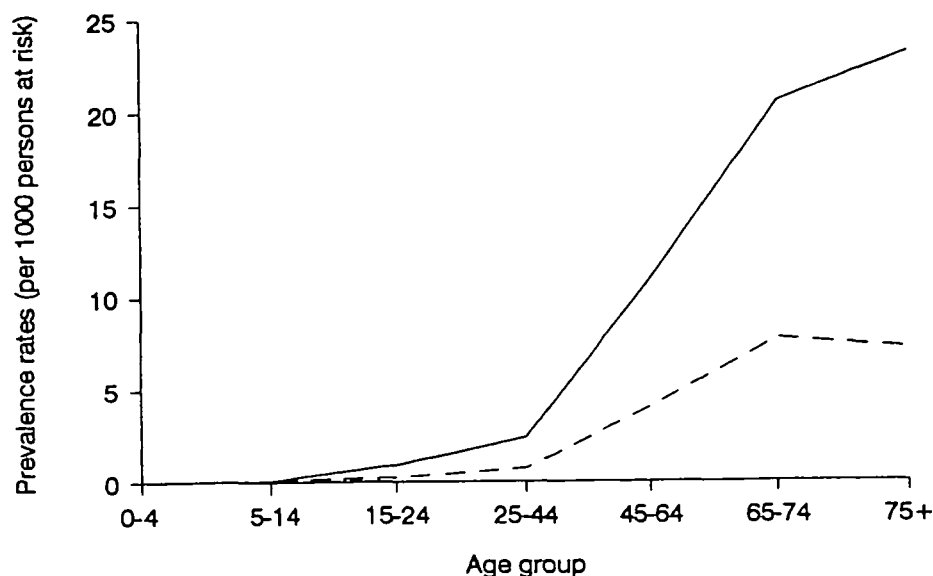


FIG. 1.—Point prevalence trends for disabled persons with RA living in private households (England). --- Males; — females.

TABLE IV  
Mean annual service utilization estimates (£) 1992

	Service utilization estimates (per age group)		Annual cost (£) 1992
	16-64 yr	65 yr +	
GP visits	9.6 (P/A)	8.3 (P/A)	14 917 512
Hospital days*	5.8 (P/A)	6.2 (P/A)	170 752 014
Out-patient visits	8.6 (P/A)	4.3 (P/A)	38 901 997
Nurse visits	(For costing purposes see specialist visits)		
	0.4 (P/W)	0.8 (P/W)	83 203 184
Home-help hours	0.2 (P/W)	1.0 (P/W)	60 426 688
Total			368 201 395

P/A, per annum.

P/W, per week.

Unit costs from Netten [12].

\*Unit costs from CIPFA (Rheumatology and General) [13].

The direct costs discussed in the above section totalled £604.5 million in England in 1992. A breakdown of direct costs is shown in Fig. 2.

*Indirect costs—production losses arising from disability*

The morbidity costs resulting from production loss to England as a result of RA in 1992 were estimated to be £651.5 million. This figure does not include production lost through mortality resulting from RA or production lost through reduced performance at work resulting from RA disability. Lost production among females and males was £474.3 million and £177.2 million, respectively, the higher loss among the female population is a result of the higher prevalence rates among females.

TABLE V  
Annual visits to specialists

Specialist	Approximate consultation time	Visits per year	Cost per visit (£) 1992	Total annual cost per person (£) 1992
Rheumatologist	20 min	3	36.25	108.75
Occupational therapist	20 min	2	11.09	22.18
Optician	20 min	2	9.21	18.42
Chiropodist	20 min	3	7.83	23.49
Total annual cost per person (£) 1992				172.84

Unit costs for occupational therapist and chiropodist from Netten [12]; unit cost of rheumatology consultation from CIPFA Health Database [13]; unit cost for optical services from Beecham [14].

### Summary—total economic impact

As shown in Table IX, RA imposed a £1.256 billion burden upon England in 1992. Direct costs accounted for £604.6 million or 48.1% of total costs, with indirect costs in the form of lost earnings totalling £651.5 million or 51.9% of total costs. This figure of £1.256 billion excludes any amount quantifying the intangible costs of pain, suffering and frustration borne by persons afflicted with this crippling disease.

### DISCUSSION

A prevalence-based, bottom-up approach was used to estimate the total economic cost of RA in England from a societal perspective. These costs amounted to £1.256 billion (1992 prices), with direct and indirect costs of £604.5 million and £651.5 million, respectively. Indirect costs accounted for a larger proportion of costs than direct costs. This does, in fact, correspond with general opinion on the costs of RA.

### Prevalence

Point prevalence rates for males and females (disabled adults living in private households) were estimated at 2.06 and 6.94/1000 persons, respectively. This is a prevalence rate of ~0.5% for adults living in private households in England. This figure does not include adults living in communal establishments. Given that it is generally agreed that the overall adult prevalence for RA is ~1%, this figure would appear to be quite low. However, when we consider that the separate prevalence rate for adults living in communal establishments is ~2%, this figure seems quite reasonable. Finally, it must be remembered that this is a point prevalence, not a period prevalence, and thus is actually more representative. Point prevalence and period prevalence are very often used interchangeably, and this is incorrect. It is generally assumed that in most published studies prevalence rates are reported as point prevalences; however, on closer examination, many of these studies in fact use period prevalences.

Various studies report prevalence estimates in the range 0.35–2.08% (figures taken from Table III, Wyles [19]). There have been no prevalence studies of RA in the UK since the studies in Leigh and Wensleydale over 20 yr ago, where a prevalence rate of 1.1% for definite RA was found [20]. Overall, there is a marked sex difference, the female to male ratio being ~3:1, with

rates of 1.6 and 0.5% for definite RA in females and males, respectively, in the UK [20]. Our estimates show that prevalence increases with age and is three times more common among females, this being in agreement with the great majority of prevalence studies of RA.

### Cost of illness and RA

Many studies have been carried out in the USA documenting the direct and indirect costs of RA. Lubeck *et al.* [21] estimated the annual medical costs for 940 RA patients, the results are summarized in Table X. This table shows the extensive medical treatment RA patients must undergo in the monitoring of their disease progression. In another study, Lubeck (adapted from Wolfe and Pincus [22]) compiled a table showing four studies of annual resource expenditures for RA in 1990 dollars. The results are shown in Table XI.

The results of this paper show that direct costs account for 48% of the total economic cost of RA. Hospital costs constitute the largest cost at ~28.3% of total direct costs, followed by adults in communal establishments, drug costs, nurse visits, home-help visits and GP surgery visits. To allow comparison between the individual components of direct costs in this paper and the other studies in Table XI [21, 23–25], the costs estimated in this study are allocated to the various subheadings used in these other studies. Thus, under the title 'out-patient care', the following costs from this study will be allocated: GP visits, specialist visits (out-patient), drugs and toxicity management, assistive devices, nurse visits and a token amount from adults in communal establishments (1%). 'In-patient care', as reported in Table XI, consists of hospital days and again a token amount for adults living in

TABLE VI  
Laboratory tests for management of toxicity

Test	Times per year	Cost per test (£)	Total annual cost (£) 1992
Full blood count	12	8.81	19 027 975
Erythrocyte sedimentation rate	12	8.81	19 027 975
Urea and electrolytes	3	4.89	2 642 774
Liver function test	12	4.89	10 571 097
Urinalysis	12	0.06	126 853
X-ray hands and feet	1	29.35	5 285 548
Total cost (£) 1992			56 682 222

TABLE VII  
Accommodation status of disabled adults with RA living in communal establishments

Who administers the accommodation	Accommodation type		
	Residential home	Nursing home	Total
National Health Service (NHS)	n/a	1391 (18.6%)	1391 (18.6%)
Local authority	2348 (31.4%)	n/a	2348 (31.4%)
Voluntary or charitable organization	434 (5.8%)	606 (8.1%)	1040 (13.9%)
Privately run	867 (11.6%)	1832 (24.5%)	2699 (34.1%)
Total	3649 (48.8%)	3829 (51.2%)	7478 (100%)

communal establishments (2%). Omitting the section entitled 'miscellaneous expenditure' given in Table XI, as these costs are undefined, we can calculate in-patient and out-patient costs as percentages of total medical expenditure for all studies including this one. Total medical expenditure for this study comprises the following: nurse visits, specialist visits (out-patient), GP surgery visits, hospital days, drug costs, daily living aids and a small percentage for adults in communal establishments. Within this study, in-patient costs accounted for 57% of total medical expenses. The studies in Table XI reported costs of in-patient care ranging from 46 to 70%. For out-patient care, this study estimated a figure of 43%. The other studies calculated percentages of between 30 and 54%. The results of this study appear to follow the same pattern as the various other studies mentioned, with in-patient costs being fractionally higher than out-patient costs. In fact, if one calculates the average in-patient/out-patient split for the four studies in Table XI, the average split is actually 57/43, which is exactly the split calculated within this study. The results obtained in this paper correspond most closely with the two most recent studies given in Table XI.

Using the same comparative methods as above, drug costs within this paper were estimated to be 39% of the total medical costs (as defined). Comparing this figure to those in Table XI as a percentage of total medical costs, Lubeck *et al.* [21] estimate a near-identical figure of 38% of total medical costs, while the remaining studies report lower estimates ranging from 23% down to 9% of total medical costs. In all studies, including this one, hospitalization appears to be the largest component of direct costs.

#### Indirect costs

The indirect costs estimated in this paper using the human capital approach accounted for 52% of the total economic cost. This figure is believed to be an underestimate since insufficient data were available to calculate the other remaining elements of indirect costs, namely mortality costs and costs of production lost through reduced performance at work. Yelin (adapted from Wolfe and Pincus [22]) documents the indirect costs of three RA studies as proportions of the total economic costs; these are 75% [23], 85% [26] and 82% [27], all of which are higher than the 52% documented in this study. The results show that one of the main areas of sensitivity to the assumptions made in this study applies to the work disability rate. Table IX shows that the estimate of 50% work disability among RA sufferers of working age gives an annual cost of £651.5 million. However, if the work disability rate was 72%, as documented by Pincus *et al.* [18], this cost would rise to £938 million or 61% of total economic costs. Rapidly increasing medical costs and an ever-growing ageing population in the 1990s, causing major increases in direct costs, accentuates this lack of full and complete reporting of indirect costs. Consequently, one of the main limitations of this study was the restriction imposed by data, resulting in only one form of indirect costs being estimated.

Many authors believe that COI advocates rely too much on the human capital approach to valuing economic costs and benefits. The problem, according to some critics, is that the human capital approach relies on earnings data with which to value productive capability. As a result, there is bias towards those diseases which affect white, middle-class males in

TABLE VIII  
The annual resource cost for disabled adults with RA living in communal establishments

Accommodation type	Cost per resident per week (£)	Annual cost (£) per person	Annual cost in England (£) 1992 for RA sufferers living in communal establishments
NHS nursing home	449	23 348	32 477 068
LA residential home	327	17 004	39 925 329
Private residential care	241	12 521	10 855 403
Private nursing home	338	17 576	32 199 232
Voluntary or charitable residential care	241*	12 532	5 438 888
Voluntary or charitable nursing home	338*	17 576	10 651 056
Total			131 547 039

Unit costs from Netten [12].

\*The costs for private residential and private nursing homes, respectively, were used as proxies for voluntary/charitable residential and nursing homes.

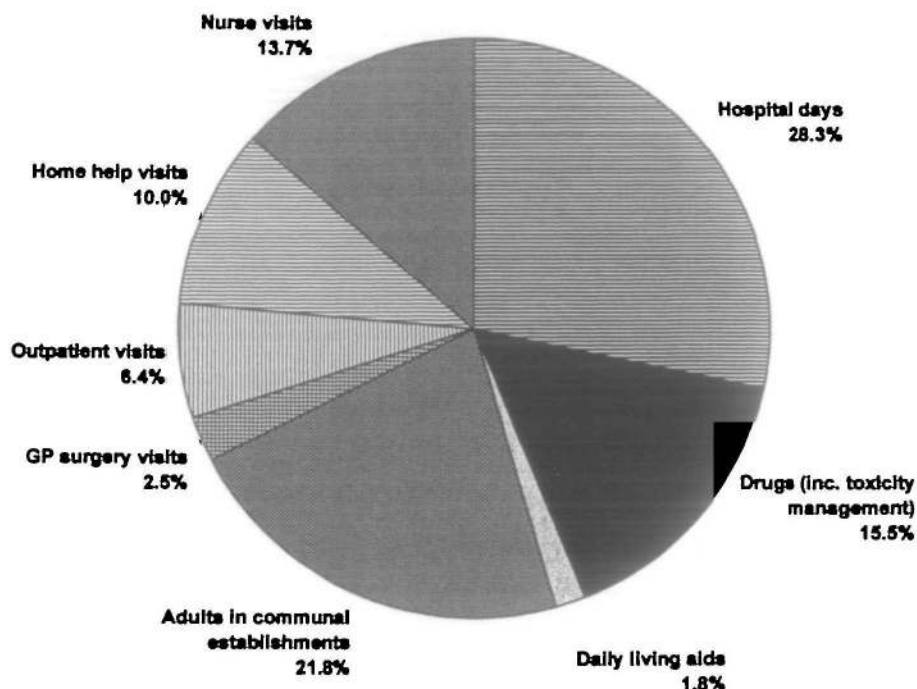


FIG. 2.—The direct costs of rheumatoid arthritis (%).

employment [28]. However, many COI studies, when calculating morbidity costs, do calculate a value for those persons too sick to perform, for example, their normal housekeeping services. An alternative method is the willingness-to-pay method, where human life is valued according to the amount people are willing to spend to obtain reductions in the probability of contracting a disease, or death. Objections to this approach are that the value of individual lives depends on the income distribution—with the rich able to pay more than the poor. An alternative is to omit indirect costs from studies altogether and report only direct costs within COI studies.

In COI studies, it is important to report direct and indirect costs separately, as well as the aggregate amount. This is because opinions differ about the relevance of including indirect costs, but also because

the different components of cost often fall on different budgets. It is often informative to identify the separate elements of direct costs so that decision makers can identify those budgets on which the major economic burden falls. For example, Davies and Drummond [28] showed that the vast majority of the direct costs of treating schizophrenia in the UK were due to institutionalization, with only 3% of the total being spent on drugs. This implied that a policy of expanded community care could be cost-effective even if it required slightly more expensive drugs.

In their COI study, Gray and Fenn [29] showed that the total economic costs of Alzheimer's disease

TABLE IX  
Total economic impact—rheumatoid arthritis in England 1992

Direct costs	Cost (£) 1992
Adults in private households—service utilization	
GP surgery visits	14 917 512
Specialist visits	38 901 997
Home-help costs	60 426 688
Nurse visits	83 203 184
Hospital days	170 752 014
Total	368 201 395
Drug costs	35 687 541
Management of toxicity	58 157 026
Aids (adults in private households)	10 844 049
Adults in communal establishments	131 547 039
Total direct costs	604 437 050
Indirect costs (lost earnings)	651 464 298
Grand total	1 255 901 348

TABLE X  
Total annual medical costs for 940 rheumatoid arthritis patients

Category	Means \$	% Total
Out-patient costs	1092	42.8
Physician visits	206	8.1
Allied health professionals	71	2.8
Medications	406	16.0
Injections	30	1.2
Laboratory tests	217	8.6
Radiographs	116	4.6
Non-traditional therapies	22	0.9
Assistive devices	24	1.0
In-patient costs*	913	36.0
Miscellaneous costs	527	20.8
Transportation	(75)	(3.0)
Domestic assistance	(397)	(15.7)
Other	(55)	(2.2)
Total costs	2532	100%

\*In-patient costs are average hospital, emergency room and out-patient surgery costs for the entire study population.  
Source: Lubeck *et al.* [21].

TABLE XI  
Annual resource expenditures on RA by study (in 1990 dollars)

Category of service	Study			
	Lubeck <i>et al.</i> [21]	Meenan <i>et al.</i> [23]	Jacobs <i>et al.</i> [24]*	Thompson <i>et al.</i> [25]
In-patient care	1826 (36%)	3840 (66%)	1162 (60%)	614 (46%)
Out-patient care	2184 (43%)	1619 (28%)	796 (40%)	2464 (44%)
Physicians visits	412 (8%)	470 (8%)	166 (8%)	897 (16%)
Medications	872 (17%)	420 (7%)	114 (6%)	796 (14%)
Diagnostic tests	66 (13%)	485 (8%)	67 (3%)	363 (6%)
Miscellaneous expenditures	1054 (21%)	321 (6%)	—	555 (10%)
Total costs	5064	5780	1958	5633

\*The study by Jacobs *et al.* [24] was based on costs of treatment for RA in a Medicaid population. All others were based on fee-for-service care.

Source: Wolfe and Pincus [22].

amounted to around £1039 million in 1990/91 in England: a major area of care expenditure. They show how different indices of the relative importance of a disease, e.g. they discuss how a chronic non-fatal disease may rank relatively low in terms of number of deaths, but high in terms of days off work or health service costs. The same can be said for an illness such as RA. Gray and Fenn show that it is, therefore, very important to obtain as wide a range of indices as possible when conducting this form of analysis. They believe that by revealing the diagnostic groups or conditions that impose the heaviest burdens, and by monitoring such burdens over time, this approach can provide economic data that may be relevant to decisions about health planning, prevention and treatment.

Finally, Gray and Fenn discuss how changing the mode of care, e.g. from in-patient to out-patient, could be estimated within the burden of illness framework. For a disease such as RA, where the prevalence does not generally fluctuate, one could show the changing pattern of costs resulting from a change in the mode of care provision.

The results of this paper, as with any COI study, must be interpreted with caution. Their purpose is not to stand alone, but to be used in conjunction with other evidence. Analysis of the burden imposed by a disease should not be used singularly to assess priorities for health care and research, rather, it should act as a tool to aid policy makers in their decision making. Gray and Fenn [29] discuss how mechanisms for determining priorities should include information on the efficacy and cost-effectiveness of interventions. This method of combining COI and cost-effectiveness was carried out by Jönsson and Bebbington [6]. By estimating the overall economic cost of depression in the UK, and by developing a model that permits the calculation of the cost-effectiveness of treatment with different pharmacological agents, Jonsson and Bebbington not only give a socially valuable indication of the economic significance of the 'obligation' to treat depression, but also provide a context for the evaluation of cost-effectiveness. The role of COI studies in cost-effectiveness analysis is ignored by the majority of COI critics, including Shiell *et al.* [30]; however, Hodgson

[31] discusses their importance: 'COI are a prominent component of cost-effectiveness analyses'.

As discussed earlier, there are limitations to COI studies, not least their inability to quantify intangible costs. The COI framework, however, if used correctly and imaginatively, can be a valuable tool in cost-effectiveness analysis. By documenting the disaggregated costs of illness, as is done in this paper, annual COI estimates can help policy makers examine resource utilization and cost patterns. It may also be possible to use COI studies to investigate the impact of different treatment packages once the separate components of direct costs have been identified. The changing patterns of service utilization can be studied in detail e.g. in RA, the effects of increased use of hip and knee replacements may be monitored within the COI framework, the effects being possible reductions in nurse and home-help visits, out-patient visits and aids to daily living. Also, if a new, more expensive, but more effective drug for RA were to enter the market, examining the effects within a COI framework may highlight corresponding cost reductions. These reductions may come in the form of reduced hospital stays, nurse visits, home-help visits and GP consultations. Finally, health service cost-cutting procedures resulting in reduced nurse and home-help visits may well reflect an unwanted increase in hospitalization and GP consultations, ultimately resulting in a policy reversal. These patterns can be monitored within the COI framework and provide invaluable information on shifting resource utilization and the resulting cost effects.

## CONCLUSION

RA is a chronic disease of uncertain aetiology which causes severe disability and chronic pain. Prevalence increases with age in both sexes and RA is three times more common in women. This study estimated point prevalence rates of 2.06 and 6.94/1000 for men and women, respectively, resulting in a total economic impact of RA in England of £1.256 billion in 1992-93. By reporting the direct service costs in a disaggregated manner, a clear insight into the various resource utilization aspects is given. Direct costs amount to £604.5 million, with hospitalization by far



the largest expenditure, accounting for almost 30% of direct costs. Nurse visits and home-help visits combined make up 24% of direct costs, with drugs, including toxicity management, accounting for 15% of the total.

More significant are the indirect costs which RA places on society. Mortality costs due to RA are very low compared to many other diseases, causing many to underestimate its unpleasant effects. Morbidity costs, however, are exceptionally high, with reported work disability rates as high as 72%. This paper has identified considerable costs in terms of lost production in the economy as a result of morbidity. These costs, amounting to £651.5 million or 52% of total economic costs, do not include mortality costs or costs resulting from reduced performance at work, nor the costs of lost production through carers taking time off work. Further, costs of informal care, travel and miscellaneous expenditure incurred by patients and their carers were omitted from this study due to the inherently difficult task of collecting, measuring and valuing them, and the retrospective nature of this exercise.

The information assembled in this paper should, it is hoped, identify new research questions for cost-effectiveness studies. It may also be possible to use this type of COI study to investigate the impact of different treatment packages. Until COI studies conform sufficiently in their methods, data and assumptions to constitute a consistent state of practice, comparisons of 'burden' cannot be made. However, if used cleverly and imaginatively, individual COI studies can provide very useful information on the various cost elements of disease and their relative economic importance.

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### APPENDIX I

#### Aids and adaptations

Aid/adaptation	RA sufferers using aid/adaptation (%)
Bed hoist	1-5
Bed poles and ladders	1-5
Orthopaedic mattress	1-5
Bed blocks	5
Commode	1-5
Bath seat	20
Bath hoist	1 (very expensive commodity)
Special chair	60
Special crockery	20 (increases as disease becomes more chronic)
Special cutlery	20 (increases as disease becomes more chronic)
Special utensils	80 (e.g. can opener)
Tap-turner	80
Special door handles	50
Dressing aids	10
Gadget to summon help	5
Special switches/dials	2-5
Hand splints	80
Wheelchair	Very rarely used nowadays due to improved surgical techniques
Walking stick	45
Zimmer frame	10
Helping hand (long handle)	80
Crutches	4
Raised toilet seat	40
Bath rails	80
Adaptations to pens/utensils	65
Kitchen adaptation	95