



OXFORD
ECONOMICS

The economic costs of arthritis for the UK economy

Oxford Economics

Final Report

March 2010

Oxford Economics
121, St Aldates, Oxford, OX1 1HB
☎: 01865 268900, 📠: 01865 268906
🌐: www.oxfordeconomics.com

Contents

EXECUTIVE SUMMARY	2
1. INTRODUCTION	5
2. PREVALENCE OF ARTHRITIS	7
2.1. General Issues estimating arthritis prevalence.....	7
2.2. Varying estimates of arthritis prevalence	8
2.3. Prevalence estimate chosen for this report	11
3. DIRECT COSTS OF ARTHRITIS	13
3.1. Direct medical expenditure	13
3.2. Estimation of OA costs.....	13
3.3. Estimation of RA costs.....	15
3.4. Total direct costs.....	17
4. INDIRECT COSTS OF ARTHRITIS	18
4.1. Permanent Retirement.....	18
4.2. Absenteeism.....	20
4.3. Reduced productivity	21
4.4. Informal carers.....	22
4.5. Summary	24
5. QUALITY OF LIFE COSTS	25
5.1. Estimating the quality of healthy life lost	25
5.2. Estimating the value of healthy life lost	26
6. CONCLUSION	28
APPENDIX 1 : COSTS ASSOCIATED WITH BROADER DEFINITION OF ARTHRITIS	30

Executive Summary

This report, prepared by Oxford Economics¹, investigates the annual economic costs of arthritis to the UK economy. The report considers the economic costs of arthritis, adopting the cost of illness methodology outlined by Rice, Hodgson and Kopstein (1985)². This methodology identifies three sets of costs: direct, indirect and intangible (quality of life) costs.

The following broad categories were therefore used in defining costs in this study:

- **Direct costs** – which include costs of hospital and other medical care including drug costs;
- **Indirect costs** – which include inability to work, absenteeism, reduced productivity and the costs of informal care. These costs involve a permanent loss of resources for the economy but no direct monetary payments; and
- **Quality of life costs or intangible costs** - which included the value of years of healthy life lost. These costs encapsulate changes in a patient's quality of life (as well as similar changes in the quality of life of friends and families) due to an illness.

Costs in this report are expressed in £2008³ unless otherwise indicated.

For the costing purposes of this study “arthritis” is defined as including the conditions of osteoarthritis (OA) and rheumatoid arthritis (RA). These are, by far, the two most prevalent forms of arthritis in the UK and the most straightforward to quantify⁴. Such an approach is also consistent with a conservative “at least” principle in attempting to quantify the prevalence and economic costs of arthritis.

This report estimates that there are some 6.7 million people in the UK with OA, and approximately 400,000 with RA. So in total, some 7.1 million people in the UK are estimated to be affected by arthritis under the definition offered in this report (i.e. the sum of those experiencing the conditions of OA and RA).

While there may be some elements of “double counting” (i.e. co-morbidity) between these conditions this is unlikely to be materially significant from a cost perspective. Co-morbidities can be legitimately added for some categories (e.g. quality of life costs) whereas in others (such as direct and indirect costs) they are likely to result in higher unit costs than the average assumed in this report (e.g. higher inpatient unit

¹ www.oxfordeconomics.com

² Rice, D., P., Hodgson, T., A., Kopstein, A., N., (1985), “The economic costs of illness: replication and update”, *Health Care Financing Review*, p.61-80

³ That is, adjusted to 2008 values in pounds sterling, allowing for inflation and currency conversions at Purchasing Power Parity (PPP) where relevant.

⁴ A broader definition including RA and OA as well as gout, juvenile idiopathic arthritis, ankylosing spondylitis and systemic lupus erythematosus is offered in Appendix 1

costs per person due to treatment of more than one condition, higher absenteeism rates per person due to having more than one condition).

Given this, by collating the direct, indirect and quality of life cost estimates, it is possible to derive total cost estimates for the cost of arthritis in the UK.

Table ES-1 below summarises the total direct cost estimates developed for this study. **Total costs of arthritis are estimated as some £30.7 billion per annum. This equates to an annual social cost burden of approximately £500 for every man, woman and child living in the UK. Put another way, this total is more than the government spent on transport and environmental protection combined (£30.1 billion) and nearly as much as the government spent on public order and safety in fiscal year 2007/8 (£31.4 billion).**⁵

Chart ES-1 presents these cost categories in graphical form.

Table ES-1: Annual arthritis costs for the UK (2008)

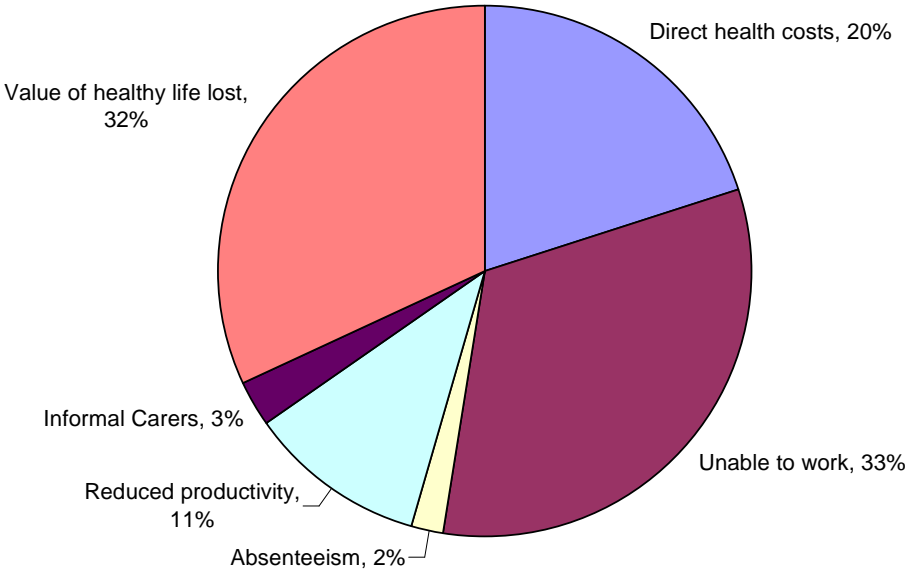
Cost Category	Arthritis costs (OA and RA, £ billion)	Percentage of total (%)
Direct Costs	6.1	20
Hospital and other health costs	6.1	20
Indirect Costs	14.8	48
Individuals unable to work	10.0	33
Absenteeism	0.6	2
Reduced productivity	3.3	11
Informal Carers	0.9	3
Quality of life costs	9.8	32
Value of healthy life lost	9.8	32
TOTAL COSTS	30.7	100

NB Figures may not sum to totals due to rounding

Source: Oxford Economics

⁵ HM Treasury, (2009), *Public Expenditure Statistical Analysis 2009*. Note that the total costs of arthritis estimated for this report include both market values (e.g. direct hospital spending) and non-market values (e.g. quality of life costs). Non-market values do not directly impact on spending or Gross Domestic Product (GDP). Providing an overall monetised cost estimate for arthritis, however, allows for the use of a common yardstick for comparative purposes.

Chart ES-1: Breakup of annual arthritis costs for the UK (2008)



Total: £30.7 billion per annum

Source: Oxford Economics

1. Introduction

This report, prepared by Oxford Economics⁶, investigates the economic costs of arthritis to the UK economy. The report considers the economic costs of arthritis, adopting the cost of illness methodology outlined by Rice, Hodgson and Kopstein (1985)⁷. This methodology identifies three sets of costs: direct, indirect and intangible (quality of life) costs.

Direct costs are those which involve monetary payments including hospital care and drugs. Indirect costs are defined as costs that involve a permanent loss of resources for the economy but no monetary payments. For example, individuals who would be willing to work but are unable to work due to an illness represent an indirect cost of the illness to the UK economy. Quality of life costs encapsulate changes in a patient's, their friends and families quality of life due to an illness.

This report considers each of these three costs areas in turn before coming up with an overall estimate of the costs of arthritis for the UK economy.

It should be noted that this report focuses on cost estimates for a given year. Both prevalence and unit costs may vary over time. Obesity and old age are two factors that raise the probability that an individual will suffer from osteoarthritis, in particular. These factors have become increasingly important for the UK population over recent years.⁸ For example, the number of men and women with a Body Mass Index (BMI) over 30 (classified as obese) increased from 13.4% and 17.8% in 1993 to 22.9% and 25.4% respectively in 2005.⁹ Arthritis, and the issues connected with it, may also be of increasing importance in future years as the average age of the population rises.

Furthermore, direct medical costs such as drug treatments, imaging techniques (x-ray versus costlier magnetic resonance imaging) and the number of individuals who receive joint operations have increased over time. For example, the total number of annual hip and knee joint replacement operations has risen from 107,000 in 2004/5 to 160,000 in 2008/9.¹⁰

Therefore both prevalence and unit cost trends suggest that the overall social costs of arthritis may rise in future years. However, there are currently no time-series data available that may be used to accurately assess changing prevalence or unit costs rates over time.

The rest of this report is structured as follows:

⁶ www.oxfordeconomics.com

⁷ Rice, D., P., Hodgson, T., A., Kopstein, A., N., (1985), "The economic costs of illness: replication and update", *Health Care Financing Review*, p.61-80

⁸ www.nhs.uk

⁹ National Health Service Information Centre, (2005), *Health Survey for England 2005* The BMI compares an individual's weight with their height

¹⁰ National joint registry for England and Wales, (2009) *6th Annual Report*

- Chapter 2 looks at issues surrounding definitions and attempts to estimate the prevalence of arthritis. A working definition of UK arthritis prevalence is then estimated;
- Chapter 3 focuses on the direct costs of arthritis to the UK economy. In particular, costs to the UK healthcare system;
- Chapter 4 analyses the indirect costs of arthritis for the UK economy, including individuals who are temporarily or permanently absent from work due to suffering from arthritis;
- Chapter 5 discusses the quality of life or psychological costs of arthritis, focusing on the literature around Disability Adjusted Life Years (DALYs) and Quality Adjusted Life Years (QALYs); and
- Chapter 6 presents total economic cost estimates for arthritis in the UK.

2. Prevalence of arthritis

At the time of writing, there are no definitive estimates of overall arthritis prevalence in the UK.

The Arthritis Research Campaign (**arc**) uses the term “arthritis” in a broad sense to describe a range of conditions affecting muscles, bones and joints. **arc’s** definition includes all specific forms of arthritis as well as those disorders which cause pain in muscles, bones and joints.

In practice, it can be difficult to determine if a given person suffers from “arthritis”, given definitional differences between different surveys along with the fact that some surveys are incomplete in scope and/or imprecise in terminology. Accordingly, this chapter reviews the issues people have faced when attempting to measure the prevalence of arthritis including definitional and data quality issues as well as the numbers that have been produced to date.

In light of this discussion, a working definition of arthritis (based on osteoarthritis (OA) and rheumatoid arthritis (RA) prevalence only) is used to carry out the costing analysis in the rest of the study. Using this definition, it is estimated that 7,067,000 people suffered from arthritis in the UK in 2008. The rest of this chapter describes the derivation of this figure.

2.1. General Issues estimating arthritis prevalence

The Arthritis Research Council’s (**arc**) (2002) “Arthritis: The Big Picture” publication attempted to estimate the prevalence of arthritis in the UK economy but found that there is a “paucity of specific and accurate data on the different types of arthritis and related conditions, of which there are more than 200 different types”.¹¹ For example, researchers at the University of Manchester’s Epidemiology Department who were commissioned by the **arc** to carry out work for this study found “because of this lack of available information” they were “unable to present specific current prevalence figures for the number of people with osteoarthritis” whilst there was “no reliable information on the prevalence of osteoporosis”.¹² The National Institute for Health and Clinical Excellence (NICE) (2008) costing report for OA notes that “there is little definitive data on the prevalence of the disease because of problems of defining the disease and how to determine its onset”.¹³ As well as problems defining and identifying different types of arthritis, there are issues around adding together different prevalence estimates. In particular, someone may suffer from OA at more than one area of their body or suffer from at least two distinctively different forms of arthritis.

¹¹ The Arthritis Research Campaign, (2002), *Arthritis: The Big Picture*, **arc**, Chesterfield, p.4

¹² The Arthritis Research Campaign, (2002), *Arthritis: The Big Picture*, **arc**, Chesterfield, p.4 and p.13

¹³ The National Institute for Health and Clinical Excellence (NICE), (2008), *Osteoarthritis, Costing report, Implementing NICE guidance*, NICE, London, p.8

2.2. Varying estimates of arthritis prevalence

Estimates of arthritis prevalence come from a variety of sources, including individuals self-reporting health problems, general practice consultation records, x-ray evidence as well as detailed surveys and clinical examinations of small populations. These are described below.

2.2.1. Self reported illness - General Household Survey

The General Household Survey (GHS) is “a multi-purpose sample survey on approximately 9,000 households and about 16,000 adults aged 16 and over. Data are collected on five core topics; namely education, employment, health, housing, and population and family information.”¹⁴ One set of questions within the GHS looks at individuals’ health and one of the categories of long-standing illness an individual may report is “arthritis or rheumatism”. This category is broader than just arthritis and would include all individuals who believe they have problems with their joints or connective tissue. The results are likely to be inaccurate, as individuals without medical knowledge may mis-diagnose their problem or describe problems that are only temporary.

Results from the 2002 GHS suggest that the rate of long standing arthritis and rheumatism in the UK is 159 per 1000 people. Assuming this ratio stays the same, by this definition it is estimated that 9.76 million people had arthritis or rheumatism in 2008.

2.2.2. Self reported illness - Labour Force Survey

The Labour Force Survey (LFS) is a quarterly survey of around 60,000 UK households including those whose occupants are inside and outside the labour force. It focuses on individuals aged 16 and over as the primary purpose of the survey is to provide detailed information about the UK labour market. Several questions ask individuals about health problems they may be having, although the categories of problem are extremely broad. As discussed with the GHS, individuals may (deliberately or otherwise) erroneously report their type of health problem. The category of health problems that arthritis would fit into is “problems or disabilities (including arthritis and rheumatism) connected with arms, legs, hands, feet, back and neck”.

Results from the 2009, Quarter 2 LFS suggest that 13.32 million people reported “problems or disabilities (including arthritis and rheumatism) connected with arms, legs, hands, feet, back and neck”.

2.2.3. General Practice Consultations - Royal College of General Practitioners Annual Prevalence Report

The Royal College of General Practitioners (RCGP) publishes data on “the annual prevalence of disease (disease groups) reported by practices contributing to the Weekly Returns Service (WRS) of the Royal College of General Practitioners. Doctors and their employed practice nurses are required to enter the

¹⁴ www.statistics.gov.uk

morbidity, which they encounter at every consultation on to the individual patient specific electronic medical record"¹⁵ Data is gathered from 64 general practices and a population of approximately 622,000 people.

The most recently published report is for 2007 and data are published on prevalence by age groups and gender with diseases categorised using ICD9 (International Classification of Disease revised 9) definitions.

Table 2-1 summarises prevalence rates per 10,000 persons from the 2007 report. Estimates for total UK population numbers with musculoskeletal disease and several common forms of arthritis in 2008 were calculated using these 2007 figures, assuming that these rates remained unchanged.

Table 2-1: Prevalence estimates from the RCGP Annual Prevalence Report 2007

ICD 9 - code	Disease name	Prevalence per 10,000 persons in 2007	Prevalence in 2008 (persons)
710-739	Musculoskeletal or connective tissue disease	1659	10,200,000
714	Rheumatoid arthritis and inflammatory polyarthritis	30	184,000
715	Osteoarthritis and allied disorders	188	1,150,000
720	Ankylosing spondylitis and inflammatory spondylopathy	5	31,000
274	Gout	47	289,000

The RCGP annual prevalence data suggest that 10.2 million people saw a GP or practice nurse with a musculoskeletal or connective tissue disease in 2008 (Table 2-1). Over 1.15 million saw a GP or nurse with OA, and 184,000 for RA.

These data are likely to be an underestimate of prevalence. There is plenty of anecdotal evidence suggesting that people with mild degrees of OA do not go and seek medical treatment at first though, given the long-term nature of the illness, it is likely they would seek such treatment at some point. Furthermore, these data are only the numbers of people who saw a GP or practice nurse in one year but people may have seen a GP in earlier years or seek other forms of medical support such as specialists.

2.2.4. X-ray evidence of OA

Using data from a US based study,¹⁶ analysis conducted by the University of Manchester's Epidemiology Unit for the *arc* (2002) estimates that "at least 4.4 million people in the UK have X-ray evidence of

¹⁵ Royal College of General Practitioners – Birmingham Research Unit. (2007), *Weekly returns service: annual prevalence report*

¹⁶ Maurer K., (1974) "Basic data on arthritis knee, hip and sacro-iliac joints in adults aged 25-74 years", *United States 1971-5 Vital Health Statistics*. (NHANES I) Series 11, Number 213. USDHEW

moderate to severe osteoarthritis (OA) of their hands; 550,000 have moderate to severe OA of the knees and 210,000 have moderate to severe OA of the hips¹⁷

A separate study on x-ray evidence of arthritis finds that there were over 8.5 million people with x-ray evidence of OA of the spine in the UK in 2007¹⁸.

2.2.5. Small population analysis

Peat et al (2004) set up a study to examine the prevalence of knee pain and knee OA known as CAS(K) (the Clinical Assessment Study of the Knee).¹⁹ CAS(K) involved sending a postal questionnaire to all patients within three general practices in North Staffordshire aged over 50. The respondents who indicated that they had had knee pain over the past 12 months were invited for a detailed clinical assessment. This was followed by a further review of their future general practice medical records and another postal questionnaire over the next 18 months. Looking at data from this study and scaling to the UK population as a whole it's estimated that "more than 6 million people in the UK have painful osteoarthritis in one or both knees".²⁰

Symmons et al (2002) used data from the Norfolk Arthritis Register (NOAR) to investigate the prevalence of RA. The NOAR is a "primary-care based inception cohort of adults with inflammatory arthritis" based on data from 11 general practices with a population of around 60,000 across the Norwich Health Authority.²¹ They sent a screening questionnaire to 7,050 individuals then to the 1,025 individuals who gave a positive response to the questionnaire, and then carried out a follow up clinical examination. Extrapolating to the UK population as a whole, they estimated the overall minimum prevalence of RA in the UK to be 1.16% in females and 0.44% in males. Assuming prevalence rates remain the same, and using 2008 population data, these results suggest there were 417,000 people with RA in the UK in 2008.

Odding et al. (1998) interviewed 2,895 individuals living in the district of Rotterdam, Holland about the impact of OA of the hips and knees on their ability to perform every day activities.²² In 2008, using the prevalence results of this study and applying them to the UK population, the **arc** estimated that "more

¹⁷ The Arthritis Research Campaign, (2002), *Arthritis: The Big Picture*, **arc**, Chesterfield, p.8

¹⁸ Pye S.,R., Reid D.,M., Smith R., Adams J.,E., Nelson K., Silman A.,J., and O'Neill T.W., (2004), "Radiographic features of lumbar disc degeneration and self-reported back pain, *Journal of Rheumatology*, 31(4), p.753-8

¹⁹ Peat, G., Thomas, E., Handy, J., Wood, L., Dziedzic, K., Myers, H., Wilkie, R., Duncan, R., Hay, E., Hill, J., and Croft, P., (2004), "The Knee Clinical Assessment Study – CAS(K). A prospective study of knee pain and knee osteoarthritis in the general population", *BMC Musculoskeletal Disorders*.

²⁰ Arthritis Research Campaign (**arc**), (2008), *UK arthritis facts - at a glance*, **arc**, Chesterfield

²¹ Symmons D, Turner G, Webb R, Asten P, Barrett E, Lunt M, Scott D., and Silman A., The prevalence of rheumatoid arthritis in the United Kingdom: new estimates for a new century. *Rheumatology* 2002; 41(7), p.793-800

²² Odding E, Valkenburg HA, Algra D, Vandenouweland FA, Grobbee DE, Hofman A., (1998), "Association of radiological osteoarthritis of the hip and knee with locomotor disability in the Rotterdam study", *Annals of the Rheumatic Diseases*, 57 (4), p.203-8

than 650,000 in the UK have painful osteoarthritis in one or both hips”.²³

2.3. Prevalence estimate chosen for this report

A conservative “at least” principle has been adopted when conducting the analysis of arthritis prevalence and economic costs for this study.

OA and RA are the two most well known forms of arthritis and the two most frequently studied in the literature. These conditions are also, by far, the two most prevalent forms of arthritis in the UK and the most straightforward to quantify. Our estimate for arthritis prevalence therefore only looks at those individuals with OA and RA²⁴.

Following discussion with an epidemiologist at the Manchester Epidemiology Unit and reviewing the NICE costing reports, there appears to be a general consensus that Symmons et al (2002) provides the most reliable and accurate estimates of RA prevalence currently available in the UK. Applying the prevalence proportions from Symmons et al (2002) to 2008 population data produced by the Office for National Statistics it is estimated that 417,000 people in the UK had RA in 2008.

Numbers published on the **arc** website and derived from studies that adopt a similar small-population analysis methodology as Symmons et al (2002) are used to estimate the prevalence of OA in the UK. In particular, the results of Peat et al (2004) on OA of the knee and Odling et al (1998) on OA of the hip are utilised. There are no recently released estimates for OA of the hand and a number of issues with including OA of the spine in our estimate,²⁵ so these two forms of OA are excluded. Adding the results of the Peat et al (2004) and Odling et al (1998) studies together it's estimated that 6,650,000 people had OA in 2008.

Our estimate of arthritis prevalence in the UK economy in 2008 is therefore 7,067,000 people²⁶.

²³ Arthritis Research Campaign (**arc**), (2008), *UK arthritis facts - at a glance*, **arc**, Chesterfield

²⁴ A broader definition including RA and OA as well as gout, juvenile idiopathic arthritis, ankylosing spondylitis and systemic lupus erythematosus is offered in Appendix 1

²⁵ Data on the **arc** website “UK arthritis facts: at a glance” suggest 8.5 million people have x-ray evidence of OA of the spine, adding this to our estimate of those affected by OA and RA would suggest over 15 million people in the UK have arthritis, This number is more than numbers very broadly defined in the GHS (9.76 million people report arthritis or rheumatism) and the LFS (13.31 million people report problems with their arms, legs, hands, feet, back and neck) and would certainly contradict the conservative approach being adopted for this study.

²⁶ It is possible to apply a “reasonableness test” to this figure, using data from another Western country (Australia). Access Economics' (2007) *Painful realities: The economic impact of arthritis in Australia 2007* details the results of Australia's *National Health Survey* for 2004-05, from which Australian prevalence rates for RA and OA in 2007 were derived. Based on this data, Access Economics indicates that a total of some 2.1 million Australians (or 10.3% of the population) is affected by these conditions. Applying this same ratio to the UK implies a combined RA and OA prevalence of 6.3 million people (using a UK population figure of 61.46 million for 2008, drawn from Oxford Economics' UK macroeconomic model). This suggests our figure of 7.1m is broadly reasonable. While it is higher than what might be expected based on a “raw” comparison, it should be noted that the UK's median age (41.3) is also higher than Australia's (38.1) (CIA Factbook estimates for 2009 as reported at

Oxford Economics appreciates concerns that different types of arthritis should not strictly be added together as individuals may suffer from more than one type of arthritis. However, double counting is not too great an issue for this study as the focus here is on costs associated with arthritis and not just on measures of prevalence. The propensity of an individual to seek medical treatment and the probability an individual will be absent from work is likely to be higher for someone who suffers from more than one type of arthritis than someone who suffers from just one type. The resultant higher unit costs could be expected to counteract any “double counting” of raw numbers.

Data for RA used by this study are already split by age groups for those aged 16 or over. However, the prevalence numbers this study sources for OA are not split by age. To resolve this issue, for OA, the total prevalence number is broken down using age splits in the RCGP data for OA.

Table 3-2 breaks down and summarises Oxford Economics’ estimates for arthritis prevalence in the UK in 2008 across different age groups. The prevalence figure of 7.1 million is used in Chapters 3 and 4 of this study to derive direct and indirect cost estimates.

Table 2-2: The number of people suffering from arthritis in the UK in 2008

Age	Arthritis prevalence
Total Prevalence	7,067,000
Under 16	-
16-44	129,000
45-64	2,318,000
65-74	2,040,000
75+	2,580,000

Source: Oxford Economics, various

<https://www.cia.gov/library/publications/the-world-factbook/fields/2177.html>). Since arthritis prevalence tends to rise with age, it would be expected that the figures for the UK should be somewhat higher than for that of a comparable but “younger” Western country.

3. Direct costs of arthritis

3.1. Direct medical expenditure

The direct costs of arthritis are typically defined as those relating to primary and secondary health care and, in some cases, related social care within the community. There is no single, consistent source of data for current health care costs within the UK. However, past analyses of direct medical expenditures on arthritis often allow for the following core elements:

- Visits to (or other consultations with) GPs and/or nurses;
- Hospital inpatients, and outpatients;
- Other specialist services including physiotherapists, chiropractors, osteopaths and other specialists; and
- Prescription medication.

In addition, allowance is sometimes made for elements of community and/or social services such as “Home Help” services.

The discussion below indicates the approach used to estimate medical costs for OA and RA.

3.2. Estimation of OA costs

There are several sources of estimates for OA direct costs.

Richardson and Hawkins (2006)²⁷ provide details of mean resource use and costs for a group of 103 people experiencing knee osteoarthritis and undertaking a home-based exercise program. (This group was set as the control group in order to estimate of the benefits of undertaking a separate, class-based exercise program.)

Medical costs and resource utilisation (including GP and nurse costs, day hospital and case attendances and inpatient and outpatient attendances) were estimated for this group, with average annual cost of £445 (in 1999/2000 terms).

Likewise Patel et al. (2009)²⁸ specified a control group based on a survey of 812 patients experiencing various forms of osteoarthritis, aged 50 and over and recruited from 74 primary care practices across the

²⁷ Richardson G. and Hawkins N. (2006) “Cost-effectiveness of a supplementary class-based exercise program in the treatment of knee osteoarthritis” *International Journal of Technology Assessment in Health Care*, Vol. 22, No. 1

²⁸ Patel, A., Buszewicz M., Beecham J., Griffin, M., Rail, G., Nazareth I., Atkinson, A., Barlow, J., Haines, A. “Economic evaluation of arthritis self management in primary care”, *British Medical Journal*, Sep 22;339:b3532. doi: 10.1136/bmj.b3532

UK. Although data disaggregation in the original paper was limited, the analysts provided the three-monthly resource use of the control group for hospital, GP/nurse, specialist and other community services (e.g. home help, social workers) along with a data sheet specifying unit costs used in the study.

This allowed for an estimate of three-monthly and (by extrapolation) annual direct costs associated with this group. Mean three-monthly estimates (in 2002/03 values) of £134 per person (excluding community services) or £145 per person including community services were derived from these data. These equate to £534 and £579 per person per annum, respectively.

In addition, Access Economics (2007)²⁹ developed OA costs per person based on Australian OA prevalence in the general population and Australian inpatient, outpatient, aged care, out of hospital and other professional costs. Estimates based on these figures indicate that the annual unit cost in 2007 for Australians experiencing OA was \$1,256 per person (excluding “pharmaceutical” costs), equivalent to £528 if converted at purchasing power parity (PPP) rates.

As indicated in Table 3-1, all of these values lie within a similar range when converted to £2008 values.

These estimates omit the cost of prescription drugs. Patel et al report an overall three monthly OA cost of £172 per person including health care, social costs and “drug” costs. This appears to reflect costs of prescription medicines, though it is unclear if this estimate includes other social cost elements, not already accounted for above. Comparing this estimate with the £145 per person (excluding drugs costs) calculated above, suggests drugs may add (up to) 19% to the base costs of OA care.

Likewise, Access Economics calculates average costs per person with OA including “pharmaceutical” costs. When compared to the estimate above excluding prescription drugs this suggests that pharmaceuticals add 12% to base health care costs.

In order to derive unit cost values of OA for this study the following approach was adopted:

- Base OA average costs per person (excluding drugs costs) were converted to £ 2008 values using the Hospital and Community Health Services Pay and Prices Index (HCHSPPI)³⁰ and PPP (where appropriate)³¹.
- The average of the direct medical costs from the Richardson and Hawkins and Patel et al studies was used to derive an average cost for OA direct costs (excluding drugs and community services). An allowance for community services was then estimated based on Patel et al and added to this figure.
- The average of the two drugs cost proportional “add-on” estimates above were used

²⁹ Access Economics (2007) *Painful realities: The economic impact of arthritis in Australia 2007*

³⁰ As reported in Curtis, L. *Unit Costs of Health and Social Care 2008*, Personal Social Services Research Unit (PSSRU), University of Kent

³¹ As reported in OECD (2009) *Main Economic Indicators*, December 2009

to derive an average drugs cost add on n (i.e. $(19\%+12\%)/2 = 16\%$). Base costs excluding drugs were then adjusted to derive an average cost of direct care per person including drugs.

This process suggests that the average direct care cost per person with OA is £783 per year or some £5.2 billion per annum in total, given 6.7 million people in the UK experiencing OA. Tables 3-1 and 3-2 indicate the various figures used to derive this final estimate.

Table 3-1 Estimated annual OA unit costs per person

Study/Category	Unit cost (£ per annum 2008 values)
(1) Richardson & Hawkins (2006)	607
(2). Patel et al (2009)	641
(3) Access Economics (2007)	546
(4) Average of (1) and (2)	624
(5) Community services costs (Patel et al 2009)	53
(6) Sub-total OA unit costs (ex drugs) (4)+(5)	677
(7) Estimated drugs "add on" factor	1.16
(8) Implied drugs unit costs	105
(9) Total OA unit costs (6) + (8)	783

NB Figures may not sum to totals due to rounding

Table 3-2 Estimated total annual OA costs

Study/Category	Value
(1) Unit cost of OA per annum (£)	783
(2). OA population (m)	6.65
(3) Total OA costs per annum (£ billion) (1)*(2)	5.2

NB Figures may not sum to totals due to rounding

3.3. Estimation of RA costs

RA direct costs were derived from several sources, in a manner similar to the derivation of OA costs.

The National Audit Office's (NAO) *Services for People with Rheumatoid Arthritis* (2009) provides recent estimates for NHS expenditure in England on RA³². These include visits to GPs, tests carried out by GPs, drug costs in primary care, NHS rheumatology unit costs as well as surgery costs and total £557 million per annum. The NAO estimates that there are 580,000 RA sufferers in England, implying unit costs of £960 per person with RA.

These costs appear to be much lower than those estimated by McIntosh (1996)³³ in one of the most

³² National Audit Office (2009) *Services for people with rheumatoid arthritis*

³³ McIntosh E., (1996) "The cost of rheumatoid arthritis", *British Journal of Rheumatology*, Vol. 35, No. 8

comprehensive prior surveys of the cost of RA in England. McIntosh estimated that there were some 225,077 persons with RA in England living in private households in 1992. Using the most comparable sub-components of McIntosh's analysis, and adjusting for price changes using the HCHSPP direct health care costs for people with RA total some £2,584 per person. (This figure excludes home help costs, toxicology testing, costs for people in communal establishments and the cost of RA aids, which were also separately calculated by McIntosh.)

There may be many reasons for these differences, although McIntosh's figures appear similar to other past international studies of unit RA costs, including, a Western European average for RA medical costs per person calculated by Lundkvist et al (2008)³⁴ and a recent study by Franke et al. (2009).³⁵

Nonetheless, as the NAO data are much more recent than McIntosh's and in keeping with a conservative approach to cost estimation, the following approach was adopted in deriving unit cost values for RA.

- The NAO figure of £557 million has been retained as a base estimate, and inflated by the ratio of UK to England population (1.20) to derive a UK-wide annual cost measure for RA (£670 million).
- The UK-wide cost was assumed to relate to the estimated 417,000 people with RA within the UK (rather than the 580,000 for England alone estimated by the NAO). This implies a unit cost of £1,607 per person.
- The NAO figures do not allow for any social support services outside the medical system. An additional allowance was therefore made for home help services (which were distinguished by McIntosh from informal carers). A home help unit cost estimate, derived from McIntosh's data (equivalent to £459 per person in today's prices) was therefore added to the per person estimate from NAO data, calculated above. This home help estimate is somewhat conservative when compared to international data collected by Frankel et al.

This process suggests that the average direct care costs per person with RA in the UK is £2,065 per year or some £861 million per annum in total, Table 3-4 indicates the compilation of this final estimate.

³⁴ Kundkvist J., Kastang F, Kobelt G., (2008) "The burden of rheumatoid arthritis and access to treatment: health burden and costs", *The European Journal of Health Economics*, Vol. 8, Supplement 2

³⁵ Franke, L., Ament A., van de Laar, M., Boonen, A., Severens, J., (2009) "Cost-of-illness rheumatoid arthritis and ankylosing spondylitis", *Clinical and Experimental Rheumatology*, Vol. 27, Supplement 55

Table 3-3 NAO (2009): Estimated direct health care costs of RA to the NHS

Category	Cost (£m)
GP visits – unidentified costs prior to specialist referral	6
Tests carried out by GPs prior to specialist referral	2
GP visits – diagnosed cases	146
Monitoring tests carried out by GPs following diagnoses	17
Drug costs in primary care	102
NHS rheumatology units	260
Surgery	24
Total costs	557

NB Figures may not sum to totals due to rounding

Table 3-4 RA cost estimates for the UK

Category	Value
(1) NHS total RA costs p.a. (England) (£m)	557
(2) UK “gross up” factor	1.2
(3) Estimated RA costs p.a. (UK) (£m) (1)*(2)	670
(4) RA population (UK) (m)	0.42
(5) Implied unit costs per person (ex home care) p.a. (£) (3)/(4)	1,607
(6) Estimated unit home care unit costs per person p.a. (McIntosh 1996) (£)	459
(7) Total RA unit costs per person p.a. (£)	2,065
(8) Total RA costs p.a. (£ b)	0.9

NB Figures may not sum to totals due to rounding

3.4. Total direct costs

Table 3-5 below summarises the total direct cost estimates developed for this study. As indicated, total direct costs for arthritis in the UK (i.e. RA and OA combined) are estimated as some £6.1 billion per annum.

Table 3-5: Annual direct arthritis costs for the UK (2008)

Cost Category	Direct arthritis costs (OA and RA, £ billion)
Total costs	6.1

NB Figures may not sum to totals due to rounding

4. Indirect costs of arthritis

Indirect costs of arthritis result in a permanent loss of resources for the economy but do not involve monetary payments. Four distinct areas of indirect costs are considered by this chapter. These include individuals who are unable to work at all (permanent retirement), temporarily absent from work (absenteeism) or are less productive at work (reduced productivity) due to suffering from arthritis; as well as people who leave work to care for others with arthritis (informal carers).

4.1. Permanent Retirement

Arthritis can reduce an individual's ability to work, to the extent that they are unable to participate in the labour force at all. Data published by the Department for Work and Pensions (DWP) showed that 404,000 people who had diseases of the musculoskeletal system and connective tissue claimed incapacity benefit in February 2009.³⁶ Musculoskeletal and connective tissue disease includes (but is not limited to) all those with arthritis as discussed in the previous chapter.

Focussing just on RA, Barrett, Scott, Wiles and Symmons (2000)³⁷ look at patients who recently contracted RA in Norfolk, UK. They look at two cohorts of individuals who were in employment before showing symptoms of RA between 1989 and 1992, and 1994 and 1997, respectively. They find that a third of the patients who showed symptoms between 1989 and 1992 had left work due to ill-health by 1995; whilst for patients who showed symptoms between 1994 and 1997, a third had left work due to ill-health two years from the symptoms' onset.

Two approaches may be adopted when estimating the economic costs of individuals unable to participate in the labour force due to suffering from arthritis. The human capital approach assumes individuals who previously worked but have now left the workforce cannot be replaced and the output they would have contributed to the economy is permanently lost. In contrast, the frictions approach assumes output is lost from an economy when an individual leaves their job due to suffering from arthritis but the loss in output is only temporary as another individual is eventually employed to perform the same job. Oxford Economics believes the human capital approach is most appropriate as individuals who become unable to work due to arthritis represent a permanent reduction in the potential output of the economy.

Economic theory suggests that in perfectly competitive markets, firms will increase their workforce until the marginal benefit that an individual contributes to a firm is equal to their marginal cost. In other words,

³⁶ Up until 27th October 2008, individuals could start claiming for incapacity benefit if they were aged between 16 and 60/65, incapable of working, their statutory sick pay had finished and they had paid sufficient National Insurance (NI) contributions. This was subsequently replaced by Employment Support Allowance (ESA) but no data are currently published on ESA claimants by condition.
<http://www.dwp.gov.uk/>

³⁷ Barrett, E., M., Scott, D., G., I., Wiles, N., J., and Symmons, D., P., M., (2000), "The impact of rheumatoid arthritis on employment status in the early years of disease: a UK community-based study", *British Society for Rheumatology*, p.1403-1409

that a worker's contribution to a firm's value added is exactly equal to their wage rate. Assuming this theory to be true, then the loss in potential output from a worker being unable to work due to arthritis may be estimated as the time they would have worked multiplied by their wage.

There are no specific data or papers that have attempted to estimate the employment rate of people in the UK with arthritis. However, the quarterly LFS does report the number of people in employment, unemployment and economically inactive who report a number of different health problems. One set of self-reported health problems are "problems or disabilities connected with arms, legs, hands, feet, back or neck (including arthritis and rheumatism)". This definition is very broad and although including people with arthritis, people who report a wide range of other non-arthritic problems would fit into this category.

However, a comparison between prevalence figures for people with "problems or disabilities connected with arms, legs, hands, feet, back or neck (including arthritis and rheumatism)" and our arthritis prevalence definition suggest the latter may be considered as a sub-set as the former. As such, this suggests "employment rates" for people with arthritis may be proxied for by "employment rates" for people with "problems or disabilities connected with arms, legs, hands, feet, back or neck (including arthritis and rheumatism)" reported by the LFS.

According to the LFS 2009, Quarter 2 data, the employment rate for people with "problems or disabilities connected with arms, legs, hands, feet, back or neck (including arthritis and rheumatism)" aged between 16 and 64 is 56%; compared with an overall population employment rate of 71% for this age group.

Splitting the data into three age groups (16-44, 45-64 and 65+) the differences in employment rates are calculated for people who report "problems or disabilities connected with arms, legs, hands, feet, back or neck" and the general population. These differences are then multiplied by our UK arthritis prevalence numbers to estimate the number of people who would have been in employment if they didn't suffer from arthritis. This methodology assumes that there is direct causality between people leaving the workforce and suffering from arthritis. The estimate for the number of people who are unable to work due to arthritis is then multiplied by the median annual gross wage, taken from the Annual Survey of Hours and Earnings (ASHE), to estimate the value of the lost production in 2008.³⁸

It's estimated that 594,000 people would have been in employment but are unable to work due to suffering from OA or RA. Permanent retirement due to suffering from OA or RA is estimated to cost £10 billion in 2008.

³⁸ The median in preference to the mean wage is chosen as although the probability an individual suffers from arthritis may be unrelated to their income, its assumed arthritis is more likely to cause low wage workers, typically in manual labouring jobs, to leave their job than high wage workers. Using the mean would distort our wage numbers upwards reflecting the impact of high wage earners who we assume are relatively less likely to stop working due to arthritis.

4.2. Absenteeism

Individuals might not permanently leave the labour force due to suffering from arthritis but may have several spells of temporary, arthritis-caused absence over the course of a year, referred to as absenteeism. In the same way that individuals who permanently leave the workforce due to suffering from arthritis cost the economy, absenteeism represents a permanent loss of output for the UK economy. The same assumptions are made in this section as are used to estimate the cost of people who permanently leave the labour force in Section 4.1.

Assuming the LFS employment rate of individuals who report “problems or disabilities with arms, legs, hands, feet, back and neck” is a proxy for the “employment rate” of people with arthritis, 1,471,000 people with OA or RA were estimated to be in employment in 2008.

There is no definitive number for the average number of days an individual with arthritis takes off work a year in the UK due to suffering from arthritis. The Health and Safety Executive (HSE) publish data on the average number of days people have off a year due to musculoskeletal diseases (MSD) caused or made worse by work. However, this would not include all people who suffer from arthritis and is likely to be an over-estimate of the per sufferer days of work. Table 4-1 displays the HSE number and the results of studies in the US, Canada and elsewhere that estimate the number of days individuals with arthritis take off work a year due to arthritis or certain types of arthritis (RA and OA). This is a wide variety of estimates displayed in Table 4-1 ranging from 2.7 days per sufferer per year to 82 days per sufferer per year. The numbers appear particularly large for those who suffer from RA and this is not surprising given the severity of the diseases’ impacts for its sufferers (particularly if they don’t receive adequate treatment) compared with many other forms of arthritis.

Only two estimates consider arthritis as a whole, Stewart et al (2003)³⁹ and Goetzel et al (2004).⁴⁰ The former paper is a one off-study whilst the latter collates the results from six different studies that adopt different methodologies to calculate the productivity costs of various health conditions. However, the numbers generated by these two papers for days off work a year caused by arthritis are relatively similar (4.2 and 5.9 respectively) so the average of these two estimates (5.1) is used by this study.⁴¹

Unfortunately these data are based on the US labour market, as there does not appear to be any similar and suitable estimates for absence from work due to arthritis in the UK. It might be expected that results for the UK would differ, given variations in benefit structures. However, as discussed in the following section, reduced productivity data are also drawn from US sources. It is possible that, while UK absenteeism rates might be higher than that implied by US data, this could be offset by the fact that

³⁹ Stewart, W., F., Ricci, J., A., Chee, E., Morganstein D. and Lipton R., (2003), “Lost Productive Time and Cost Due to Common Pain Conditions in the US workforce”, *Journal of the American Medical Association*, 290 (18), p.2443-2454

⁴⁰ Goetzel, R., Z., Long, S., R., Ozminkowski, R., J., Hawkins, K., Wang, S., and Lynch, W., (2004) “Health, Absence, Disability, and Presenteeism Cost Estimates of Certain Physical and Mental Health conditions Affecting U.S. Employers”, *Journal of Occupational and Environmental Medicine*, 46 (4), p.398-412

⁴¹ Stewart et. al. (2003) estimate that the average hours per week workers with arthritis are absent from work is 0.7 hours. This number is scaled up assuming that these workers work 8 hours a day and 48 weeks a year.

reduced productivity rates may be lower.

Table 4-1: Estimates for average number of days a year taken off work by individuals with arthritis

Study	Year	Country	Disease	Average number of days off work a year
Liang et al	1984	US	RA and OA	30
Stewart et al	2003	US	Arthritis	4.2
Goetzel et al	2004	US	Arthritis	5.9
HSE	2008	UK	MSD	16.4
Clarke et al	1997	Canada	RA	6.5
Lubeck et al	1986	US	RA	2.7
Merkesdale et al	2001	Germany	RA	82
Crickatt et al	2008	Various	RA	39
Osterhaus et al	2009	Austria, Germany, Czech Republic	RA	27
Mittendorf et al	2008	Germany	RA	25
Zhang et al	2008	Canada	RA	34

Assuming that workers take 5.1 days a year off work due to arthritis and multiplying by the number of people with arthritis in employment, 7,429,000 working days a year were lost due to absenteeism associated with OA or RA; in 2008. Multiplying the number of days lost by the average, economy wide daily wage given by the *Annual Survey of Hours and Earnings* (ASHE), it is calculated that absenteeism due to OA and RA cost the UK economy £0.6 billion in 2008.

4.3. Reduced productivity

In addition to preventing people from participating in the labour force, either temporarily or permanently, arthritis may cause people to become less productive at their job. When individuals continue to work despite an illness and are less productive as a consequence of an illness, this is referred to as “presenteeism”. Furthermore, there is evidence suggesting that “presenteeism” appears to be a much costlier problem than its counterpart, absenteeism”.⁴²

Productivity has traditionally been a difficult concept for economists to define and measure, particularly in the case of many service industries.⁴³ As a consequence, several different methods have been adopted to look at the impact of illness on “on-the job” productivity losses

Stewart et al (2003) estimate that individuals with arthritis in the US who continue to work (despite being less productive due to their arthritis) work the equivalent of 4.5 less hours a week due to their reduced

⁴² Hemp, P., (2004), “Presenteeism: At Work – But Out of It”, *Harvard Business Review*

⁴³ Goetzel, R., Z., Long, S., R., Ozminkowski, R., J., Hawkins, K., Wang, S., and Lynch, W., (2004) “Health, Absence, Disability, and Presenteeism Cost Estimates of Certain Physical and Mental Health conditions Affecting U.S. Employers”, *Journal of Occupational and Environmental Medicine*, 46 (4), p.398-412

productivity compared to when they didn't have arthritis.⁴⁴ Whilst Goetzel et al (2004), summarising the results of six different US studies, estimate that workers lose the equivalent of 0.9 hours a day due to arthritis impeding their productivity⁴⁵. Assuming an 8 hour working day and 5 day working week, these two numbers are the same. Allowing for a 48 week working year, the reduced productivity of workers who remain in work despite suffering from arthritis is calculated to be the equivalent of 27 days worth of work per individual suffering from arthritis per year. These two estimates are from US-based studies. While it would be preferable to use UK studies, no equivalent UK data appear to be available. It may be argued that differences in the benefits system between the UK and US may mean workers are more likely to be absent from work than remain in work in the UK. However correspondingly, workers in the UK who are present for work may be more productive than in the US.

As indicated above, 1,471,000 people with OA or RA were estimated to be in employment in 2008. Multiplying the number of individuals with arthritis who are in employment by 27, it's estimated the equivalent of 39,721,000 working days were lost a year from people being less productive at their jobs due to suffering from OA or RA in 2008. Multiplying the number of days lost by the average, daily wage from the ASHE, it's estimated that reduced productivity due to OA and RA cost £3.3 billion in 2008.

4.4. Informal carers

People with arthritis, especially if it is acute, will often receive unpaid care from friends or relatives who accompany them to medical appointments, stay with them at hospitals and provide them with medical care as well as more general assistance for every-day tasks at home such as cleaning. Although not paid, the individuals who provide informal care are forgoing time they could have spent working or partaking in leisure activities. The value of informal care may be estimated in two ways. The opportunity cost approach looks at wages informal carers would have earned from working and the value of their leisure time. The replacement cost approach considers the cost of buying services from carers in the formal care sector.⁴⁶ Oxford Economics has judged the opportunity cost approach, given available data, to be the most accurate.

The England and Wales, Scotland and Northern Ireland Censuses (2001) provide data on the number of informal carers in the UK and how many hours of care they provide by different age groups. These data suggest there were 5,859,000 people providing some form of informal care in the UK in 2001. However, the UK census data do not split informal carers by the condition of the person(s) they are caring for.

⁴⁴ Stewart, W., F., Ricci, J., A., Chee, E., Morganstein D. and Lipton R., (2003), "Lost Productive Time and Cost Due to Common Pain Conditions in the US workforce", *Journal of the American Medical Association*, 290 (18), p.2443-2454

⁴⁵ Goetzel, R., Z., Long, S., R., Ozminkowski, R., J., Hawkins, K., Wang, S., and Lynch, W., (2004) "Health, Absence, Disability, and Presenteeism Cost Estimates of Certain Physical and Mental Health conditions Affecting U.S. Employers", *Journal of Occupational and Environmental Medicine*, 46 (4), p.398-412

⁴⁶ Access Economics, (2007), *Painful realities: The economic impact of arthritis in Australia 2007*

Data from a comparable Western country may assist in determining arthritis carer numbers. The Australian Bureau of Statistics (ABS) produced a specific dataset, based on its 2003 *Survey of Disability, Ageing and Carers* publication for Access Economics. Access Economics (2007) then used this to estimate the number of informal carers for people suffering from arthritis in Australia.⁴⁷ ABS (2003) suggests there were 219,000 informal carers for individuals with arthritis and 2,558,000 informal carers in total in Australia in 2003. Assuming the number of informal carers grows at the same rate as the population as a whole and that the ratio of informal carers for people with arthritis to all informal carers is the same in the UK and Australia; it's estimated that there were 522,000 people caring for individuals suffering from "arthritis" (using the broader definition of "arthritis", employed by Access Economics (2007)) in the UK in 2008. Using estimates for the prevalence of different forms of arthritis it is estimated that there were 290,000 informal carers for people suffering from OA and RA in the UK in 2008.

It is also necessary to derive the average hours per carer to estimate total costs. The hours people spend undertaking informal care for individuals suffering from arthritis in Access Economics (2007) are split over three time ranges for a week; less than 20 hours, 20 to 40 hours and more than 40 hours. It's assumed that the shares of informal carers in these three time categories are the same in the UK as in Australia (39%, 24% and 37% of carers respectively). It's also assumed the average time spent caring by those who care for between 20 and 40 hours per week is 30 hours and for those who care for more than 40 hours is 40 hours. Using the same methodology as a University of Leeds study for Carers UK (2008) which looks at all informal carers in the UK⁴⁸, it is estimated that, of the 39% of people who care for less than 20 hours per week, 31% provided 15 hours of care, 31% provided 7 hours of care, and 38% provided 2 hours of care. Estimates based on these calculations indicate that an informal carer for someone with arthritis spends, on average, 10 hours a week caring.

People who forgo paid employment to care for somebody suffering from arthritis are likely to have (at least) earned the minimum wage. This can also be seen as a reasonable estimate for their value of the leisure time they may have forgone to engage in caring.⁴⁹ Costs of informal carers are therefore calculated by multiplying the numbers of informal carers by, the average number of hours they spend caring a week (10), the number of weeks in a year (52) and the National Minimum Wage (£5.80 per hour). On this basis, it is estimated that informal care for people suffering from OA and RA cost the UK economy £0.9 billion in 2008.

⁴⁷ Access Economics, (2007), *Painful realities: The economic impact of arthritis in Australia 2007*, p.41

⁴⁸ Carers UK, University of Leeds (2008), *Valuing Carers-valuing the cost of unpaid care*, Carers UK, London

⁴⁹ The National Minimum Wage for those aged 22 years and older at the time of writing this report is £5.80 per hours - see www.hmrc.gov.uk/nmw/#b .

4.5. Summary

Arthritis creates indirect costs for the UK economy through four channels - permanent retirement, absenteeism, reduced productivity and informal care. The total indirect cost of OA and RA for the economy is estimated to be £14.8 billion in 2008 (Table 4-2).

Table 4-2: Annual indirect arthritis costs for the UK (2008)

Cost Category	Indirect arthritis costs (OA and RA, £ billion)
Total costs	14.8
Permanent retirement	10.0
Absenteeism	0.6
Reduced productivity	3.3
Informal carers	0.9

Source: Oxford Economics

5. Quality of life costs

5.1. Estimating the quality of healthy life lost

Those impacted by arthritis often experience a reduced quality of life. The loss of quality of life and the associated pain, suffering and premature mortality can be measured using what are known as Disability Adjusted Life Years (DALYs).

The DALY approach was developed by the World Health Organisation (WHO), World Bank and Harvard University. A DALY of 0 represents a year of perfect health, while a DALY of 1 represents death. Values in between these represent impaired health. For example a DALY of 0.20 would represent the equivalent of losing 20% of a year of healthy life due to some disease or injury.

The WHO has used DALYs to measure the impact of arthritis on people in countries around the world, including the UK, as a part of its *Global Burden of Disease 2004 Update* (2008) (“the GBD”)⁵⁰. Data from this study indicates how many DALYs per year were incurred due to the presence of arthritis in the UK. The DALYs include both years of health life lost due to disability (YLD) and years of life lost due to premature deaths associated with arthritis (YLL). The data presented for the UK provide a total DALY figure for musculoskeletal diseases, and allow for an effective breakdown of conditions between rheumatoid arthritis, osteoarthritis and other arthritic conditions.

Note a person with more than one adverse health condition will have a higher DALY. In other words, “double counting” or overlap is not an issue in estimating DALYs, as they legitimately reflect the negative effects of compounding negative health conditions. For example, a person with rheumatoid and osteoarthritis would typically have a lower quality of life (higher DALY) than a person with only one of these conditions (e.g. exactly the same rheumatoid arthritis condition) – and this additional burden would be correctly allowed for in the DALY for such a person.

UK data is reproduced in the table below.

Table 5-1 MSD DALY estimates for the UK (2004)

Category	DALYs (000)	Proportion of all MSD DALYs (%)
RA	62	20
OA	165	52
Sub-total RA and OA	227	72
Other MSD	90	28
Total MSD	317	100

Source: WHO

NB Figures may not sum to totals due to rounding

⁵⁰ World Health Organisation (2008) *The Global Burden of Disease 2004 Update*

As indicated Table 5-1, RA and OA account for the great majority of DALYs attributable to musculoskeletal disease.

The 2004 DALY estimates have been slightly adjusted to allow for population increase between 2004 and 2008. This approach suggests that the number of DALYs attributable to arthritis in the UK may be in the order of at least 233,000 per annum, as indicated in Table 5-2, below.

Table 5-2 Annual arthritis DALY estimates for the UK (2008)

Category	Annual DALYs (000)
RA	64
OA	169
Total Arthritis	233

Source: WHO, Oxford Economics

NB Figures may not sum to totals due to rounding

5.2. Estimating the value of healthy life lost

DALYs themselves do not provide a monetary figure for the value of healthy life lost due to conditions such as arthritis. This can be derived however from other data which provides a value for statistical life (VSL). The VSL is based on people's willingness to accept mortality and morbidity risk.

Mason et al. (2009)⁵¹ point out that the most commonly accepted VSL in the UK is that developed by the Department for Transport, as reported in Highways Economic Note No.1 (2007). This figure equates to £1.42 million in 2005 terms⁵² This value is used by the DfT, the rail industry, DEFRA and a number of other government agencies (Mason et al 2009). This value relates to a transport fatality and includes:

- The value of lost output in the event of the fatality;
- Human costs including pain, grief suffering and the loss of enjoyment of life (based on willingness to pay measures); and
- Ambulance costs and the costs of hospital treatment

Mason et al develop a simple approach (which they label as "Approach 1") to deriving the value of a single life year from this VSL. Using an estimated discount rate of 1.5% based on pure time preference and a period of 32 years (based on life expectancy resulting from avoidance of premature death) they estimate the value of a life year to be £56,331 (in 2005 prices).

A similar approach has been adopted for this study. However, only the "human costs" component is used

⁵¹ Mason, H., Jones-Lee, M., Donaldson, C., (2009) "Modelling the monetary value of a QALY: A new approach based on UK data", *Health Economics*, Vol. 18, No. 8

⁵² Department for Transport (2007) *Highway Economic Note No.1, 2005 Valuation of the Benefits of Prevention of Road Accidents and Casualties*

as an indicator, since output losses are already accounted for elsewhere in this analysis, as are hospital costs specific to arthritis.

Highways Economic Note No.1 estimates the “human costs” component of the VSL as £936,380. Assuming that this represents the present value of a stream of annual values over 32 years and employing a discount rate of 1.5%, this implies that the raw value of a life year is £37,059.

Some adjustment is also made for changing prices and values since 2005. Highways Economic Note No.1 indicates the methodology for indexing values, based on changes in nominal GDP over time. This method has been applied to the raw life year value above, to derive an adjusted (2008) value of £41,926 per life year.

This value can then be applied to the DALY data, discussed above, to derive the annual value of healthy life lost due to arthritis. An overall estimate of £9.8 billion per year is obtained for RA and OA (combined). These values are indicated in Table 5-3 below.

Table 5-3 Annual value of health life lost due to arthritis in the UK (2008)

Category	Value of healthy life lost (£ billion)
RA	2.7
OA	7.1
Total arthritis	9.8

Source: WHO, Oxford Economics

NB Figures may not sum to totals due to rounding

6. Conclusion

This report examined the annual costs of arthritis in the UK.

The definition of those affected by arthritis was restricted to people experiencing osteoarthritis (OA) and rheumatoid arthritis (RA).

As discussed above, this report estimates that there are some 6.7 million people in the UK with OA, and approximately 400,000 with RA. So in total, some 7.1 million people in the UK are estimated to be affected by arthritis using the definition employed in this report

Given this, and collating the direct, indirect and quality of life cost estimates discussed above, it is possible to derive total estimates for the annual cost of arthritis in the UK.

Costs in this report are expressed in £2008⁵³ unless otherwise indicated and included the following:

- The direct cost of hospital and other medical care;
- The indirect costs including inability to work, absenteeism, reduced productivity and the costs of informal care; and
- “Quality of life costs” (the value of years of healthy life lost)

While there may be some elements of “double counting” (i.e. co-morbidity) between OA and RA this is unlikely to be materially significant from a cost perspective. Co-morbidities can be legitimately added for some categories (e.g. quality of life costs) whereas in others (such as direct and indirect costs) they are likely to result in higher unit costs than those assumed in this report (e.g. higher inpatient unit costs per person due to treatment of more than one condition, higher absenteeism rates per person due to having more than one condition).

Table 6-1 below summarises the total direct cost estimates developed for this study. **the total direct cost estimates developed for this study. Total costs of arthritis are estimated as some £30.7 billion per annum. This equates to an annual social cost burden of approximately £500 for every man, woman and child living in the UK. Put another way, this total is more than the government spent on transport and environmental protection combined (£30.1 billion) and nearly as much as the government spent on public order and safety in fiscal year 2007/8 (£31.4 billion).**⁵⁴

Chart 6-1 presents these cost categories in graphical form.

⁵³ That is, adjusted to 2008 values in pounds sterling, allowing for inflation and currency conversions at Purchasing Power Parity (PPP) where relevant.

⁵⁴ HM Treasury, (2009) *Public Expenditure Statistical Analysis 2009*. Note that the total costs of arthritis estimated for this report include both market values (e.g. direct hospital spending) and non-market values (e.g. quality of life costs). Non-market values do not directly impact on spending or Gross Domestic Product (GDP). Providing an overall monetised cost estimate for arthritis, however, allows for the use of a common yardstick for comparative purposes.

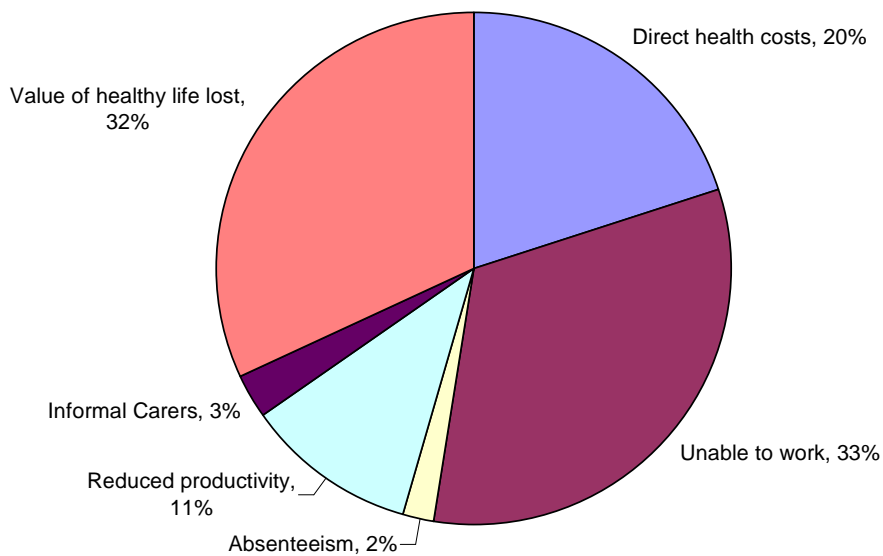
Table 6-1: Annual arthritis costs for the UK (2008)

Cost Category	Arthritis costs (OA and RA, £ billion)	Percentage of total (%)
Direct Costs	6.1	20
Hospital and other health costs	6.1	20
Indirect Costs	14.8	48
Individuals unable to work	10.0	33
Absenteeism	0.6	2
Reduced productivity	3.3	11
Informal Carers	0.9	3
Quality of life costs	9.8	32
Value of healthy life lost	9.8	32
TOTAL COSTS	30.7	100

NB Figures may not sum to totals due to rounding

Source: Oxford Economics

Chart 6-1: Breakup of annual arthritis costs for the UK (2008)



Total: £30.7 billion per annum

Source: Oxford Economics

Appendix 1 : Costs associated with broader definition of arthritis

The analysis above has quantified annual arthritis costs on the basis of the prevalence and costs of OA and RA.

It is also possible to adopt a broader definition of arthritis to include other conditions, commonly associated with the term. These conditions include:

- Gout;
- juvenile idiopathic arthritis (JIA),
- ankylosing spondylitis (AS); and
- systemic lupus erythematosus (SLE)

The data on the prevalence and costs of such conditions is generally scarcer than is the case for OA and RA and an additional range of assumptions is required in order to produce such estimates. Nonetheless, this task has been attempted below.

The method of deriving prevalence and cost estimates for such conditions is indicated below. Combined estimates (i.e. including OA, RA, gout, JIA, AS and SLE) of prevalence and costs are also provided below.

Prevalence

Estimates for individuals with gout and AS are based on data from the RCGP report on consultations with doctors and practice nurses at general practices in 2007, discussed in Chapter 2, above (see Table 2-1). However, as is the case with OA and RA, these data are likely to be an underestimate of prevalence as people may not seek medical treatment or may have seen their GP but not in the year recorded by the 2007 report. The ratios between the number of people we estimate have RA and OA in 2008 (417,000 and 6,650,000) and the numbers who saw a GP or practice nurse in 2007 with the aforementioned conditions (184,000 and 1,150,000) are 44% and 17% respectively. Taking a simple, unweighted average of these two ratios (31%) and applying this ratio to scale up the gout and AS RCGP numbers, it's estimated that 932,000 people had gout and 100,000 people had AS in 2008⁵⁵.

An estimate for the number of individuals with JIA is given by **arc** (2002) sourced from the "Epidemiology

⁵⁵ No "presentation weighting" is applied to the ratios as the intention here is simply to develop gout and AS presentation ratios based on two independent samples, without pre-judging which would be the more applicable for these conditions.

of Rheumatic Disease” (2001).⁵⁶ Whilst the same **arc** publication also gives an estimate for the prevalence of SLE in the UK taken from a small-population based epidemiological study in Leicester.⁵⁷ Using these two numbers, it’s estimated that 12,000 people suffered from JIA and 10,000 people suffered from SLE in 2008.

Our combined estimate of arthritis prevalence in the UK in 2008 (i.e. including OA, RA gout, AS, SLE and JIA) is therefore 8,121,000 people. This is some 1.1 million people more than the prevalence estimate provided in the main report above. Note, however, that gout is by far the largest contributor to this total figure with an estimated 932,000 people being affected by this condition, annually.

Direct costs

There is only limited data on costs for gout, AS, SLE and JIA which, together with their diverse character makes precise cost estimates difficult.

It has been assumed that such costs are at least equal to OA unit costs, discussed above, on an annual basis – i.e. £677 per person. Given just under 1.1 million people with these conditions, this implies a total cost of £847 million per annum in total for gout, AS, SLE and JIA.

The above unit cost figure may be an underestimate in some cases. For example, past US data for employed workers experiencing gout suggest an annual medical cost (including prescription drug costs) equivalent to £1,181 per person per year (Wu et al 2008)⁵⁸. Franke et al⁵⁹ suggest AS health care costs per person (including prescription drugs) of some £1,532 per person per annum (in 2006 prices), though as noted above, these authors also estimate much higher RA unit costs per person than those implied by NAO figures. Bernatsky et al.’s (2007)⁶⁰ analysis of Canadian data based on outpatient clinic surveys suggests annual costs of JIA as equivalent to £701 per patient in 2005 prices.

Nonetheless, using these OA unit costs, combined direct costs of arthritis (i.e. including OA, RA gout, AS, SLE and JIA) are estimated as £6.9 billion per annum.

Indirect costs

⁵⁶ Silman A., J., and Hochberg, M., C., (2002) *Epidemiology of the Rheumatic Diseases* 2nd Edition, Oxford Medical Publications

⁵⁷ Samantha A., Roy, S., Feehally, J., and Symmons, D., (1992) “The prevalence of diagnosed systemic lupus erythematosus in Whites and Indian Asian migrants in Leicester city, UK”, *British Journal of Rheumatology*, 31, p.679-82

⁵⁸ Wu, E., Patel, P., Yu, A., Mody, R., Cahill K., Tang J., Krishnan E, (2008) “Disease-Related and All-Cause Health Care Costs of Elderly Patients with Gout”, *Journal of Managed Care Pharmacy*, Vol. 14, No. 2

⁵⁹ Franke, L., Ament A., van de Laar, M., Boonen, A., Severens, J., (2009) “Cost-of-illness rheumatoid arthritis and ankylosing spondylitis”, *Clinical and Experimental Rheumatology*, Vol. 27, Supplement 55

⁶⁰ Bernatsky, S., Duffy, C., Malleson, P., Feldman, D., St. Pierre., Y, Clarke A., (2007) “Economic Impact of Juvenile Idiopathic Arthritis”, *Arthritis & Rheumatism*, Vol. 57., No.1

No separate and comprehensive measure for estimating the indirect costs of gout, AS, SLE and JIA exists in the UK. Accordingly, the methodology for determining the costs of permanent retirement, absenteeism, reduced productivity and informal carer costs for OA and RA, described in the main report was applied to gout, AS, SLE and JIA. This produces an annual combined arthritis cost estimate (i.e. including OA, RA, gout, AS, SLE and JIA) of £17.0 billion.

Table A1 summarises the resulting combined cost estimates using this approach.

Table A1: Broad definition annual indirect arthritis costs for the UK (2008)

Cost Category	OA + RA+ gout + JIA + SLE + AS (£ billion)
Total costs	17.0
Permanent retirement	11.1
Absenteeism	0.8
Reduced productivity	4.1
Informal carers	1.0

Source: Oxford Economics

Quality of life costs

DALYs

Quality of life costs for gout, AS, SLE and JIA were estimated in a similar way to RA and OA in the main report, with some additional complications as indicated below.

As indicated Table 5-1, RA and OA account for the great majority of DALYs attributable to musculoskeletal disease. The other MSDs (residual conditions) include AS, SLE and JIA among many others. Estimation of the DALYs for the other arthritic conditions of interest to this study poses some challenges, however these can be overcome using a few simplifying assumptions.

Although the GBD does not provide more detailed breakdown of arthritic conditions for the UK, the study does report a slightly more detailed breakdown for musculoskeletal diseases in Europe (essentially the wealthier 27 European countries including the UK known as “Europe A”). The breakdown for Europe A also provides information on the total regional DALYs for gout and lower back pain, along with rheumatoid and osteoarthritis. The combined DALYs for rheumatoid and osteoarthritis represent 72% of total musculoskeletal DALYs for the UK, while the equivalent figures for Europe A as a whole is 73%. This implies that Europe A may be a reasonable guide to the breakup of the “residual” DALYs for the UK, such as gout. As gout makes up some 30% of the residual DALYs in Europe A, it was assumed that it would account for a similar proportion of the residual DALYs in the UK.

The DALYs for AS, SLE and JIA, in turn, were estimated by reference to the DALYs estimated for gout (and the implicit assumption that losses in quality of life were similar). As it is known that 289,000 people visit their GP each year due to gout, and it is known that 31,000 visit their GP per annum due to AS (Table 2-1), the loss of DALYs due to AS was assumed to be 11% that of gout (i.e. $31,000/289,000 = 0.11$). A similar approach was adopted for the smaller numbers affected by SLE and JIA.

While this approach provides only rough estimates for the effects of these conditions, the small numbers of individuals involved suggest that this is unlikely to be a material issue.

In addition, a small adjustment has been made to all WHO 2004 DALYs to allow for population increase between 2004 and 2008.

This approach suggests that the number of combined (OA, RA, gout, AS, SLE and JIA) DALYs may be in the order of at least 265,000 per annum, as indicated in Table A2, below.

Table A2 Broad definition annual DALY estimates for the UK (2008)

Category	Annual DALYs (000)
RA	64
OA	169
Sub-total RA and OA	233
Gout	28
AS, SLE, JIA	4
Total Arthritis	265

Source: WHO, Oxford Economics

NB Figures may not sum to totals due to rounding

Costs

Estimation of DALY costs for gout, AS, SLE and JIA was derived using the methodology described in the main report for OA and RA. This produces an annual combined (OA, RA, gout, AS, SLE and JIA) value of healthy life lost of £11.1 billion.

Table A3 Broad definition annual value of health life lost due to arthritis in the UK (2008)

Category	Value of healthy life lost (£ billion)
RA	2.7
OA	7.1
Sub-total RA and OA	9.8
Gout	1.2
AS, SLE, JIA	0.2
Total Arthritis	11.1

Source: WHO, Oxford Economics

NB Figures may not sum to totals due to rounding

Total costs

Table A4 summarises the annual combined costs of OA, RA, gout, AS, SLE and JIA. This estimate totals £35 billion per annum - some £4.3 billion higher than the estimated for RA and OA alone, provided in the main report.

Table A4: Broad definition annual arthritis costs for the UK (2008)

Cost Category	Annual costs (OA+RA+gout+JIA+SLE+AS, £ billion)
Direct Costs	6.9
Hospital and other health costs	6.9
Indirect Costs	17.0
Individuals unable to work	11.1
Absenteeism	0.8
Reduced productivity	4.1
Informal Carers	1.0
Quality of life Costs	11.1
Value of healthy life lost	11.1
TOTAL COSTS	35.0

NB Figures may not sum to totals due to rounding

Source: Oxford Economics