



The economic burden of back pain in the UK

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Abstract

This paper reports the results of a 'cost-of-illness' study of the socio-economic costs of back pain in the UK. It estimates the direct health care cost of back pain in 1998 to be £1632 million. Approximately 35% of this cost relates to services provided in the private sector and thus is most likely paid for directly by patients and their families. With respect to the distribution of cost across different providers, 37% relates to care provided by physiotherapists and allied specialists, 31% is incurred in the hospital sector, 14% relates to primary care, 7% to medication, 6% to community care and 5% to radiology and imaging used for investigation purposes. However, the direct cost of back pain is insignificant compared to the cost of informal care and the production losses related to it, which total £10668 million. Overall, back pain is one of the most costly conditions for which an economic analysis has been carried out in the UK and this is in line with findings in other countries. Further research is needed to establish the cost-effectiveness of alternative back pain treatments, so as to minimise cost and maximise the health benefit from the resources used in this area. © 2000 International Association for the Study of Pain. Published by Elsevier Science B.V.

Keywords: Back pain; Economic burden

1. Introduction

Back pain may not be a life threatening condition, but it constitutes a major public health problem in Western industrialised societies and exhibits epidemic proportions (Deyo, 1998). It affects a large number of people each year and is the cause of great discomfort and economic loss. International studies have reported point prevalence rates between 12% and 35% and lifetime prevalence rates ranging from 49% to 80% (Biering-Sorensen, 1982, 1983; Frymoyer et al., 1983; Deyo and Tsui-Wu, 1987; Waddell, 1987; Frymoyer, 1988; Loeser and Volinn, 1991; Rossignoll et al., 1993; Walsh et al., 1993; Clinical Standards Advisory Group (CSAG), 1994; Croft et al., 1994; Office of Population Censuses and Surveys (OPCS), 1994; Scovron et al., 1994).

Because of its high prevalence, back pain is a leading reason for physician visits, hospitalisations and other health and social care service utilisation. Additionally, it creates disability and work loss, which in recent years have increased more rapidly than any other common form of incapacity in Britain: between 1986 and 1992 back pain disability rose by 104%, whereas disability for other reasons

rose by 60% (Moffett et al., 1995). As a result, in 1994–1995 116 million production days were lost due to incapacity to work related to back pain (Department of Social Security (DSS), 1998). Recent surveys also indicate that back pain results in restrictions of social and other activities and has substantial impact on the life style of those affected (Office of Population Censuses and Surveys (OPCS), 1997; Walsh et al., 1993; Croft et al., 1994). Similar findings have been reported in other countries (Andersson et al., 1983; Grazier et al., 1984; Abenhaim et al., 1985; Spitzer et al., 1987; Waddell, 1987; Frymoyer and Cats-Baril, 1991; van Turder et al., 1995).

This substantial epidemiological and economic impact of back pain on society is expected to increase further, due to a combination of changing attitudes and expectations, changing methods of medical management and changing social provision. It therefore seems appropriate to attempt an accurate assessment in monetary terms of the current burdens imposed by back pain on patients, the health care system and society as a whole in the UK, within a 'cost of illness' framework. Cost of illness studies indicate the relative significance of particular conditions and show the configuration of costs across different parties, thus indicating the potential scope for reduction in the burden of the disease and the main targets of health research and policy measures.

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They may also be used longitudinally to assess the impact of policies designed to reduce the burden of a particular disease or to reconfigure the pattern of services. One early application of the approach was to help prioritise research effort (Black and Pole, 1975), and the strengths and weaknesses of cost of illness studies have been well-aided (Hodgson and Meiners, 1982; Rice, 1994). The overall approach is fairly well established and relatively straightforward, and many studies have been published in the literature looking at the costs of different diseases (Laing and Williams, 1989; O'Brien, 1989; Griffin and Wyle, 1991; Davies and Drummond, 1994; Gray et al., 1995; Hart and Guest, 1995; Guest and Morris, 1996; Griffin, 1996; McIntosh, 1996; Maniadakis and Rayner, 1998). Previous attempts have been made to identify and value the burden of back pain in the UK (Wells, 1985; Coyle and Richardson, 1994; Moffett et al., 1995; Department of Health (DoH), 1996a). The present evaluation has been able to make use of more precise and recent data, and aims to be more comprehensive.

2. Methods

Cost (burden) of illness analysis attempts to indicate the impact of a particular disease on society by estimating its overall burden expressed in economic terms. Typically, the use of a range of health services attributable to a disease is estimated and valued. The use of other services such as social care or private practitioners may also be assessed, and some studies also attempt to quantify the impact of morbidity or mortality on employment and on informal carers.

Three methodological issues have to be resolved when conducting such studies. Firstly, the analysis can be based either on the incidence or the prevalence of the disease; secondly, it can be conducted either following a 'top-down' or 'bottom-up' approach; and thirdly it may include direct costs, employment-related costs or intangible costs, which in turn can be estimated in different ways. The choice of the methodology to be used depends on the nature of the disease under evaluation, the purpose of the evaluation and on data availability.

The present evaluation is prevalence based, and estimates the annual cost of the condition for the whole UK in 1998. To achieve this we combine epidemiological, service utilisation and unit cost data coming from various sources, to estimate the direct costs of preventing, detecting and treating back pain within the National Health Service, social services and the private sector. Employment-related costs are quantified in terms of production losses due to absenteeism from productive employment and due to informal care at home. Based on the human capital approach, production losses are proxied by earning losses. Compensation costs are not considered, because these consist of payment transfers rather than production losses or expenses. To update estimates from previous years to 1998 we use the Hospital and

Community Health Services Price Index reported by the NHS Executive (Netten et al., 1998). Data referring to England (and Wales) are extrapolated to the entire UK using the UK/England (and Wales) population ratio (Office of National Statistics (ONS), 1998).

Here we define back pain as pain experienced in the spine area or more specifically between the inferior angle of the scapula and the gluteal folds, or between the buttocks and the vertebrae prominens. The condition is described in more detail elsewhere (Fairbank and Pynsent, 1992; Clinical Standards Advisory Group (CSAG), 1994; Croft et al., 1996; Evans and Richards, 1996). The paper is concerned with those conditions that relate to codes 720–724 and 846–847 in the International Classification of Diseases (ICD-9). There are many alternative sources of prevalence and resource utilisation data associated with back pain. For consistency and validity purposes most estimates in the present study are based on a survey conducted recently in the UK by the Office of Population Censuses and Surveys (Office of Population Censuses and Surveys (OPCS), 1997) in order to investigate the epidemiology and resource utilisation associated with back pain. In this survey a representative and randomly selected sample of 6000 adults of the population in Great Britain were asked detailed questions about their condition and how it had affected their lives. The present study makes substantial use of this survey in combination with other sources of information; where possible, the study's findings are cross-checked with evidence from other sources.

Because the baseline estimates of the cost of back pain in the UK are based on data from a range of sources, inevitably they are subject to some uncertainty concerning the sources, methods and assumptions used. This issue is addressed in the study by performing a 'sensitivity' analysis, in which aspects of the study such as unit prices are systematically varied over a plausible range to assess the consequent change in overall results. To ensure that all components of the study are subjected to this exercise, the results report the change in the estimated total cost of back pain resulting from a 10% change in either the volume or the unit price of each of the components making up the total. All prices are quoted in 1998 UK £s.

3. Results

3.1. Direct cost

3.1.1. Annual prevalence

Two recent surveys reported an annual prevalence rate of back pain in the UK of 36% (Walsh et al., 1993) and 37% (Office of Population Censuses and Surveys (OPCS), 1997). The 1% difference in the two surveys could be explained by the fact that the first focused on a population of 20 to 59 years of age and the second on those aged 16 and above. There are no significant differences between men and

women or between regions, but prevalence does rise with age. For 20% of sufferers the pain had started within the previous 12 months and 19% had had it during the whole year (Office of Population Censuses and Surveys (OPCS), 1997). Applying these OPCS figures to the UK adult population of 47.7 million (Office of National Statistics (ONS), 1998) suggests that the annual incident population experiencing back pain is about 3.5 million and the prevalent population experiencing back pain is 17.3 million, with 3.1 million adults suffering during the entire year.

3.1.2. *Costs of general practice*

Population surveys report that 12% to 16% of all adults visit their GP every year due to back pain (Office of Population Censuses and Surveys (OPCS), 1997; Walsh et al., 1993; Consumers' Association, 1985). However, it is likely that such surveys may overestimate true consultation rates due to the fact that back pain consultations may often be confounded with other types of consultations. Studies based on GP medical records suggest lower consultation rates. In particular, a survey of 500 GP records (Intercontinental Medical Statistics (IMS), 1993) reported that 9.4% of adults above 15 years of age consult with back pain. A well validated and widely used survey in the UK, the fourth national study on Morbidity Statistics from General Practice (Office of Population Censuses and Surveys (OPCS), 1996), reported that each year 8.4% of adults consult in general practice due to back pain and on average they have 1.66 consultations with a doctor and 0.06 consultations with a nurse (1.73 consultations per adult consulting). Data from this survey are available by age group of patients consulting and by whether the consultation was in surgery or at home. Applied to the UK population, these data suggest 5.0 million adults consulting, 7.5 and 0.7 million consultations with a doctor in surgery or home respectively, and 0.30 and 0.004 million consultations with a nurse in surgery or home respectively. In 1997–1998, the cost of a consultation with doctor in surgery was £14 and at home was £46; and the cost of a consultation with nurse in surgery was £9 and at home £12 (Netten et al., 1998). Thus, the total cost of primary care related to back pain in 1998 is £140.6 million, of which £108.2 million relates to care at surgery and £32.4 million to formal care at home.

3.1.3. *Costs of private consultants*

About 3% of those suffering from back pain visit a private consultant and 2% visit a doctor/nurse at their work place (Office of Population Censuses and Surveys (OPCS), 1997). This implies that about 0.52 million adults visit a private consultant and 0.35 million visit a doctor/nurse at work. Assuming consultation rates similar to those in general practice (i.e. 1.73 consultations per adult consulting) gives 0.90 million consultations with private consultants and 0.60 million consultations with doctors/nurses at work. The cost of a private consultation in 1993 was £70 (Coyle and Richardson, 1994), which in 1998 prices is £81. It is assumed

that the ratio and costs of consultations with a doctor or nurse at work is the same as those in general practice. These figures yield a cost of £72.7 million for private consultations and £9.2 million for consultations at work.

3.1.4. *Costs of physiotherapists*

About 9% of those suffering from back pain visit a (NHS or private) physiotherapist (Office of Population Censuses and Surveys (OPCS), 1997). This implies that 1.6 million adults receive physiotherapy per annum. Patients on average attend between 6 to 11 sessions (Croft et al., 1994). Assuming 7 visits per patient gives an estimate of 10.9 million sessions of physiotherapy. Based on combined information from other studies (Office of Population Censuses and Surveys (OPCS), 1997; Moffett et al., 1995), it was estimated that 77% of physiotherapy visits are within the NHS (Clinical Standards Advisory Group (CSAG), 1994). In 1997–1998, the cost of a physiotherapy session in a clinic was £18 and for a domiciliary visit was £40 (Netten et al., 1998). Applying the first unit cost to NHS physiotherapy sessions and the second to private ones gives an estimate of £150.7 million and £100.5 million respectively.

3.1.5. *Costs of osteopaths*

About 5% of those suffering from back pain visit an osteopath (Office of Population Censuses and Surveys (OPCS), 1997) and the typical course has been reported to be 5 sessions (Clinical Standards Advisory Group (CSAG), 1994). These figures imply 0.86 million adults consulting and 4.3 million sessions. Taking into account the growth of population the last estimate is consistent with the 1992 estimate of the Osteopathic Information Service, which reported that two thirds out of a total of 5 million osteopathic sessions were due to back pain (Pringle and Tyreman, 1993). We assume that the cost of a visit to an osteopath, but also that of a visit to allied practitioners, is the same as the cost of a visit to an occupational therapist, which in 1997–1998 was £40 (Netten et al., 1998). These figures give a total cost of £172.8 million for osteopathy.

3.1.6. *Costs of chiropractors*

About 2% of those suffering from back pain visit a chiropractor (Office of Population Censuses and Surveys (OPCS), 1997) and the typical course is 5 sessions (Clinical Standards Advisory Group (CSAG), 1994). These imply 0.35 million adults consulting and 1.7 million sessions, which is in line with the estimate of the Working Party for Chiropractors (1993) which estimated a total of 3.9 million consultations in the UK of which 50% are due to back pain. An estimated cost of £40 per visit yields a total cost of £69.1 million.

3.1.7. *Costs of other specialists*

Approximately 1% of back pain sufferers visit an occupational therapist, 1% an acupuncturist and 2% another specialist (Office of Population Censuses and Surveys (OPCS),

1997) each year. This gives a total of 0.69 million adults and assuming 4 sessions per person consulting it implies 2.8 million sessions per annum. At an average cost of £40 per visit this yields a total cost of £110.6 million for such services.

3.1.8. *Costs of hospital out-patient visits*

It has been reported that about 10% of those with back pain attend an outpatient clinic during a year (Office of Population Censuses and Surveys (OPCS), 1997; Croft et al., 1994). This figure implies 1.7 million attendees. About 55% of those visiting an outpatient department had one visit, 44% had two and 4% had three or more appointments (Coulter et al., 1991). Thus, assuming on average 1.5 appointments per attendee gives 2.6 million visits. Based on Walsh et al. (1993), it is also estimated that 53% of patients are seen in the orthopaedic clinic (£57.9), 18% in a rheumatology clinic (£60.0), 7% in a pain clinic (£68.6), 7% in general medicine (£55.0), 9% in urology/gynaecology (£55.7), and 6% in neurosurgery (£84.6). The unit costs in parentheses were obtained from the 1996–1997 financial returns of approximately 244 hospitals (Department of Health (DoH), 1998) and are consistent with those reported elsewhere (Netten et al., 1998; Chartered Institute of Public Finance and Accountancy, 1988; Cost Book Data Retrieval System (CBDRS), 1999). After adjustment for inflation these figures combined give an estimate of £159.2 million.

3.1.9. *Costs of accident and emergency attendances*

About 2% of back pain sufferers visit an accident and emergency department for a reason related to back pain. This figure gives 0.47 million attendances, which is very close to the one reported in Clinical Standards Advisory Group (CSAG) (1994). In 1996–1997 the average cost of a consultation in an accident and emergency department was £55.0 (Department of Health (DoH), 1998), which after adjustment for inflation yields a total cost of £26.5 million.

3.1.10. *Costs of in-patient days and day cases*

About 55 677 day cases and 526 918 bed days (69 535 admissions) related to back pain (as defined in Section 1) were recorded during 1994–1995 in England (DoH, 1996b). These are for manipulations and injections in the spine as well as for fusions and other disc operations and decompressions. From hospital admission statistics in Scotland it was found that 37% of bed days due to back pain were in orthopaedic wards (£298), 9% in neurosurgical wards (£358), and 54% in other wards (£356) (Clinical Standards Advisory Group (CSAG), 1994). The average cost of a day case was £1586 in 1996–1997 (Department of Health (DoH), 1998). After extrapolation to the UK level and adjustment for inflation, these figures imply that the cost of inpatient care related to back pain was £217.7 million and the cost of day cases was £108.9 million.

3.1.11. *Costs of radiology and imaging*

About 10% of those suffering from back pain have an X-ray (Office of Population Censuses and Surveys (OPCS), 1997), which yields 1.72 million X-rays. From those visiting a GP 22% are referred for an X-ray (Office of Population Censuses and Surveys (OPCS), 1997). Assuming that all the A&E attendees will be also X-rayed suggests that approximately 1.5 million X-rays, i.e. 90% of the total, are performed within the NHS. In addition, there will be about 160 MRIs and CT scans per 100 000 adults (Croft et al., 1996) and this gives a total of 92 800 for the entire UK. The cost of a spinal X-ray in 1998 was £40.0 (Nuffield Department of Orthopaedic Surgery, 1998). The average cost of an MRI in 1995–1996 was £185.4 and of a CT scan £91.1 (Cost Book Data Retrieval System (CBDRS), 1999) and thus an average unit cost of £138.2 is assumed. These figures combined give an estimate of £13.2 million for MRIs and CT scans and £71.2 million for X-rays, of which £64.1 million relates to those performed in the NHS. It is likely however that these are conservative estimates as in many cases sufferers are X-rayed more than once (Clinical Standards Advisory Group (CSAG), 1994; Coulter et al., 1991).

3.1.12. *Costs of prescriptions*

About 64% of GP consultations for back pain result in a prescription (Clinical Standards Advisory Group (CSAG), 1994; Croft et al., 1994; Office of Population Censuses and Surveys (OPCS), 1997). Applying this rate to the estimated number of GP consultations gives 5.3 million initial prescriptions. The average prescription cost per consultation in 1997–1998 is £17.8 (Netten et al., 1998). This figure reflects 2.1 prescriptions per consultation, due to repeat prescriptions arising from original consultations. Some evidence suggests that a high proportion of patients with persistent back pain continue taking medication (Croft et al., 1996) and thus 2.1 items per prescription is probably a conservative assumption. This approach implies a total cost of £93.7 million for prescribed medication.

3.1.13. *Costs of over the counter medication*

About 51% of adults who suffer from back pain do not consult anyone about their condition (Office of Population Censuses and Surveys (OPCS), 1997). A large percentage of these individuals pursue self treatment, including the use of medication (18.8%) and local creams and sprays (35.6%) which they buy over the counter (Croft et al., 1994). Thus it is estimated that 8.8 million adults with back pain do not see anyone about it. Of those, 1.7 million buy medicines and 3.1 million buy creams and sprays over the counter. The weighted cost of creams, sprays and gels for pain (based on market shares from Intercontinental Medical Statistics (IMS), 1998 and prices from the Chemist and Druggist Monthly Price List, 1998) was £3.62 in 1998, and the weighted average price of non-steroidal (i.e. ibuprofen) and analgesic (i.e. paracetamol) agents on the market was

£3.55. Thus, assuming one cream, spray or gel per adult and 2.1 medications, the cost of over-the-counter medication related to back pain is £23.5 million. Again, this may be a conservative estimate as in reality sufferers may use more medications. It should also be noted that patients often buy various aids and items such as corsets and heat lamps (Croft et al., 1996), whose costs are difficult to calculate.

3.1.14. Costs of community health and social services

It is rather difficult to estimate the cost of community and social services using the prevalence, bottom-up approach used so far, because relevant information is limited. It was previously estimated that, during 1992–1993 in England, back pain was responsible for 0.6% of total expenditure on community health services and for 0.9% of social services expenditure on adults (Department of Health (DoH), 1996a). Total expenditure in that year was £2905.7 million for the former and £5360.1 million for the latter. After extrapolation to the entire UK and adjusting for inflation the above figures combined yield a cost of £92.8 million for community health and social care.

3.2. Employment and informal care costs

3.2.1. Production losses due to morbidity

During 1994–1995 in Great Britain, about 116 million days of certified incapacity to work related to back pain (Department of Social Security (DSS), 1998). These included 75.5 million days of male adults and 40.5 million days of female adults. In 1997 male adults were working 41.8 h per week and earned on average £408.7 per week (Department of Employment (DoE), 1997). These figures imply 8.4 working hours and £81.7 average earnings per day. Similarly, women were working 37.6 h and earned on average £297.2 per week, which in turn imply 7.5 working hours per day and £59.4 average daily earnings. After adjusting for inflation and extrapolating to the UK, these figures combined imply that in 1998 £9090 million were lost due to incapacity to work attributed to back pain. Of the last figure, £6538 million relate to male adults and £2552 million to female adults. This estimate is probably an upper limit to the ‘real’ production loss associated with back pain morbidity, and will be accurate only if absent back pain sufferers are not replaced at work. However, it is often likely that after a ‘friction period’, absent employees are replaced (Koopmanschap and van Ineveld, 1992), and the real production losses will be much lower. As accurate information is not available on the duration of the ‘friction’ period, most studies rely on estimates such as the one derived above. However, we can make a tentative estimate as follows: the 116 million days of incapacity to work noted above are due to 322 200 male spells and 168 300 female spells, which implies that on average each spell of incapacity lasts 232 days. If the ‘friction’ period during which losses occur equals the average time it takes to fill vacancies (Koopmanschap and van Ineveld, 1992), or approximately

90 days in the UK, production losses would fall to £3440 million, which is much lower than the earlier figure of £9090 million but still represents a very substantial burden.

3.2.2. Informal care

There are at least two major ways in which informal care to individuals experiencing back pain may be considered a burden. First, some informal carers may have given up paid employment in order to provide informal care, and thus society experiences a production loss; second, informal carers may not have given up the opportunity of paid employment (for example, if they are beyond retirement age), but nevertheless be sacrificing leisure time to provide a caring service that otherwise might have to be obtained from formal carers. In this section we set out an approach to estimating the costs of both of these burdens. First, prevalence rates reported in the General Household Survey (Office of Population Censuses and Surveys (OPCS), 1995) of those with long-standing physical conditions were applied to the UK population to estimate the number of sufferers per age group. Then the prevalence rates of caring (Office of Population Censuses and Surveys (OPCS), 1994) were applied to obtain the number of carers looking after dependants with physical conditions. Information from the same OPCS study was then employed to obtain the distribution of carers by the age group of dependants, and hence the ratio of carers to those with long-standing physical illness. This ratio indicates the likelihood that a dependant in a particular age group is receiving informal care. It is assumed that these prevalence rates apply also to dependants suffering from back pain. The estimated rates of informal care were then applied to the number of back pain sufferers to estimate the number of carers looking after a dependant with back pain. This estimate was adjusted based on the carer/dependant ratio (Office of Population Censuses and Surveys (OPCS), 1994). Because foregone output is measured in terms of foregone earnings, we then adjusted for average economic activity and unemployment rates (Office of Population Censuses and Surveys (OPCS), 1988). Based on information from the Office of Population Censuses and Surveys (OPCS) (1994) study, the average caring hours per week for all age groups was estimated at 19.57, and this in turn gives an estimate of 86.51 million caring hours. The net hourly earnings for all adults was £9.1 in 1997, and after adjusting for inflation this implies that the production loss due to informal care for back pain is £811 million.

Secondly, we pursue the argument that unpaid activity such as the informal care from non-economically active and unemployed individuals can be quantified using a ‘shadow cost’, because had the service not been provided informally some formal services would have had to be obtained (Posnett and Jan, 1996). The average hourly earnings of manual employees in the Health and Social Work sector was £5.1 (Department of Employment (DoE), 1997), and this plus our estimate of informal care time by indivi-

Table 1
The economic burden of back pain in the UK, 1998

Services utilised (unit of measurement)	Units of resources (million)	Average unit cost	Total cost (million £s)
General practice and home care (consultations)	8.55	20.20	141
Out-patient care (attendances)	2.59	64.34	159
A and E care (attendances)	0.47	55.00	26
Day care (day cases)	0.06	1585.62	109
Inpatient care (finished consultant episodes)	0.60	356.00	218
NHS Radiology (X-rays, CT scans, MRIs)	1.65	89.00	77
Prescribed medication (prescriptions)	5.27	17.80	94
NHS Physiotherapy (sessions)	8.30	18.00	151
Community care			93
Total NHS and community care cost			1067
Private consultants (consultations)	0.90	81.03	73
Doctor/nurse at work (consultations)	0.60	10.00	10
Private physiotherapists (sessions)	2.51	40.00	100
Osteopaths (sessions)	4.32	40.00	173
Chiropractors (sessions)	1.73	40.00	69
Other specialists (sessions)	2.76	40.00	111
Radiation (X-rays)	0.02	40.00	7
Over-the-counter medication (items bought)	4.74	3.58	24
Total cost of private services			565
Total direct cost of back pain			1632
Morbidity (days of incapacity to work)	119.35	70.59	9090
Morbidity (work-days lost using friction method)	46.36	70.59	3440
Informal care (hours of caring by active carers)	231.41	7.12	1578
Total employment-related cost of back pain: upper estimate			10 668
Total employment-related cost of back pain: conservative (friction method) estimate			5018
Total costs of back pain: upper estimate			12 300
Total costs of back pain: conservative (friction method) estimate			6650

duals who would not otherwise be in employment implies that the shadow cost of informal care for back pain is £767 million.

The results of the above analyses are summarised in Table 1. The total direct cost associated with the care and treatment of back pain is £1632 million, of which 35% relates to services provided in the private sector. Thus, a large portion of the direct cost of back pain is most likely incurred directly by sufferers and their families. From the total direct cost associated with back pain, 37% is related to physiotherapy and allied services, 31% is related to care provided in the hospital sector, 14% to primary care, 7% is related to medications, 6% to community care, and 5% to radiology and imaging respectively.

Combining these direct cost estimates with the employment and informal care costs gives a total of £12 300 million if the upper estimate of production loss costs is used, and £6650 million if the more conservative 'friction' method of estimating production losses is used.

These baseline estimates of the cost of back pain in the UK are based on data from a wide range of sources, and inevitably are subject to some uncertainty concerning the sources, methods and assumptions used. One way of addressing this issue is to perform a 'sensitivity' analysis, in which aspects of the study such as unit prices are systematically varied over a plausible range to assess the consequent

change in overall results. In this way, the sensitivity of the results to small or large changes in assumptions or data used can be assessed. Fig. 1 reports the results of the sensitivity analysis, by showing the percentage change in the estimated total costs of back pain resulting from a 10% change in either the volume or the unit price of each of the components making up the total. For example, a 10% increase (decrease) in the unit price or volume of general practice and home care consultations would increase (decrease) the total estimated cost of back pain by approximately 1.6%. This sensitivity analysis indicates that general practice, outpatient and inpatient care, physiotherapy, and care provided by osteopaths are the areas where uncertainties in our estimates are most likely to affect the total cost, although the overall magnitude of that impact is small due to the many other services involved in the treatment of back pain. It is unlikely that all these values are simultaneously overestimated or underestimated, but if that were the case the total direct costs of back pain would range between £1460 and £1805 million; similarly an error of 20% produces a range of £1291 to £1981 million. It is notable that even if we have overestimated the cost of back pain by 20%, the resulting figure is still very substantial.

It is clear from the results that the main burden imposed by back pain is in the form of production losses due to incapacity to work and informal care at home. In particular,

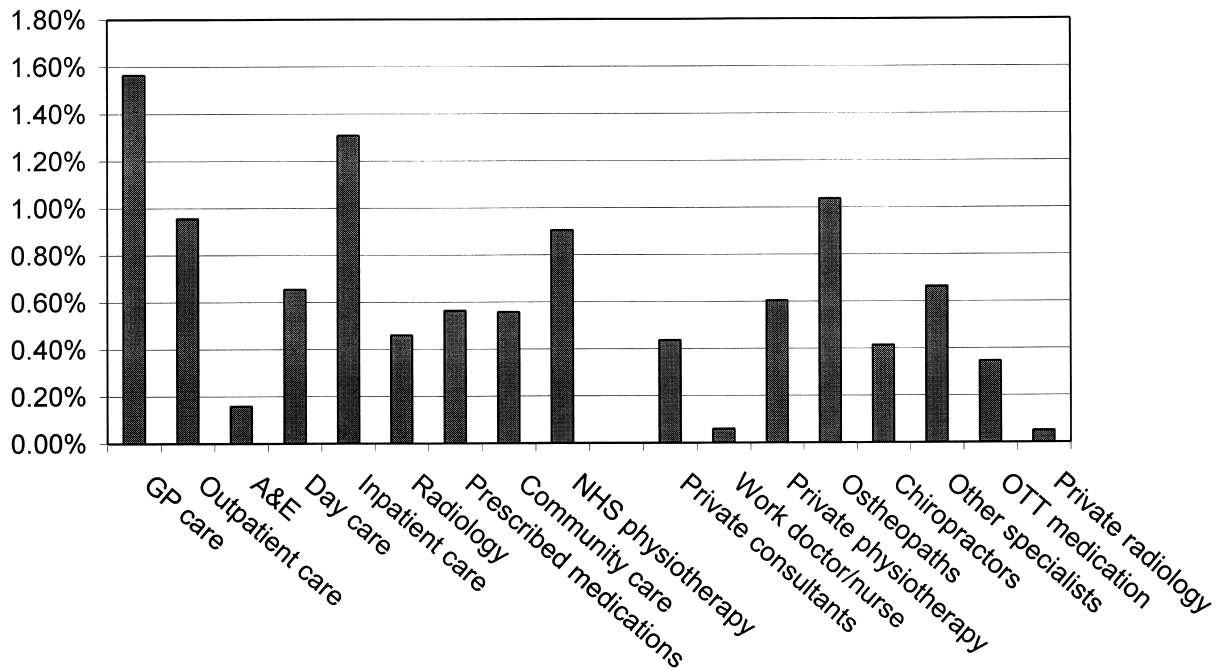


Fig. 1. Sensitivity analysis: percent change in total cost to a 10% change in the cost or volume of each component.

the costs of back pain attributable to incapacity to work can conservatively be estimated at £3440 million and could be as high as £9090 million.

Overall, back pain imposes a greater economic burden than any other disease for which economic analysis has been carried out in the UK. In particular, as shown in Fig. 2, back pain is more costly than coronary heart disease (Maniadakis and Rayner, 1998), Alzheimer's Disease (Gray and Fenn, 1996), stroke (Dale, 1989), arthritis (Wyles, 1992), insulin dependent diabetes mellitus (Gray et al., 1995), epilepsy (Griffin and Wyle, 1991), benign prostatic hyperplasia (Davies and Drummond, 1994), diabetes (Laing and Williams, 1989), multiple sclerosis (O'Brien, 1989) rheumatoid arthritis (McIntosh, 1996), lower respiratory tract infections (Guest and Morris, 1996), deep vein thrombosis and pulmonary embolism (Griffin, 1996), depression (Jonsson and Bebbington, 1994), critical limb ischaemia (Hart and Guest, 1995) and migraine (Blau and Drummond, 1991). (In Fig. 2 the original estimates were inflated to 1998 and when necessary extrapolated to a UK level.)

The results of this study indicate a higher direct cost of back pain than found in two previous UK studies (Coyle and Richardson 1994; Moffett et al., 1995). Making fairly crude adjustments to aid comparability, the direct cost of back pain according to these studies in 1998 terms ranges between £613 million and £1018 million and the 'best' estimate is £774 million. The employment-related costs of back pain in these studies range from £2968 to £5822 million with a 'best' estimate of £4338 million. The differences between these earlier estimates and the current study may be due in part to changing treatment methods, take-up rates

or morbidity patterns, but are also due to different assumptions and data used, and to the fact that some of the main unit prices relevant to back pain treatment have recently increased more rapidly than the overall health services price index which is used here to inflate their estimates.

Comparison of the results of the present study with international studies is difficult due to differences in health, health care systems, and socio-economic patterns. The direct cost of back pain in The Netherlands during 1991 was estimated at US\$367.6 million (7% of total back pain costs) and the employment-related costs at US\$4.4 billion (93% of the total) (van Turder et al., 1995). Similarly, studies in the USA have shown that the costs of back pain exceed the costs of many other conditions and diseases (Grazier et al., 1984; Deyo et al., 1991; Frymoyer and Cats-Baril, 1991).

4. Discussion

Although not life-threatening, back pain constitutes a significant epidemiological and economic problem, which appears to be growing despite improvements in diagnosis and therapy. There is little consensus or evidence on what is most appropriate cost-effective and for whom. Most evaluations so far have involved small sample sizes and study designs that are subject to bias, hence much of the current evidence is subject to uncertainty and conflicting interpretations. Rigorous study designs such as randomised controlled trials are needed to establish the effectiveness and cost-effectiveness of back pain treatments, and some such studies, for example the UK Medical Research Council

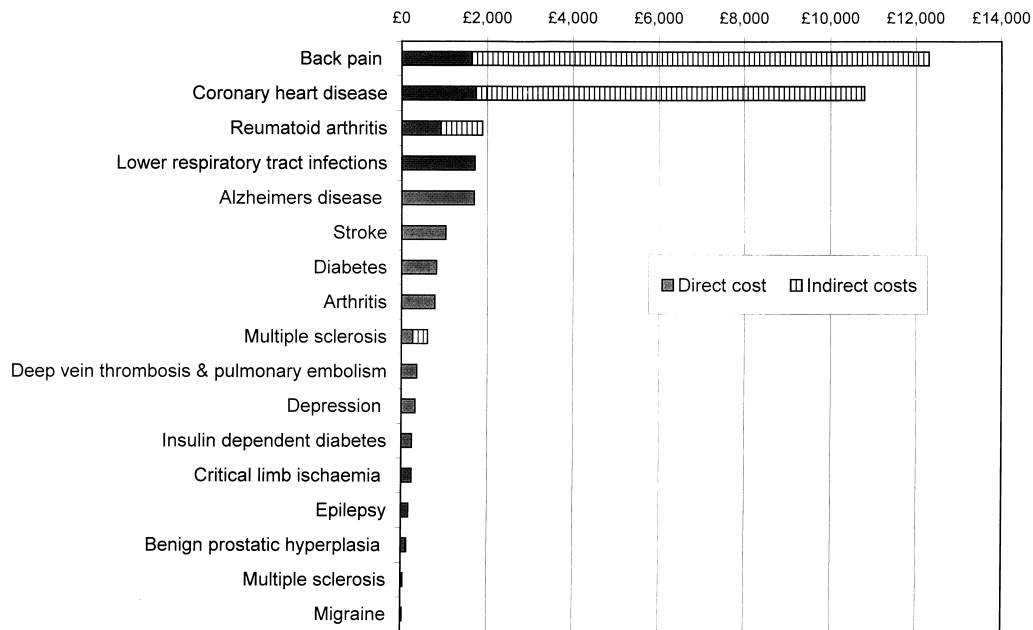


Fig. 2. Economic burden of selected diseases in the UK (£s 1998).

Spine Stabilisation Trial comparing surgery with rehabilitation therapy, are now under way. Further evaluations are needed in this area. Cost of illness studies cannot in themselves answer questions concerning the effectiveness or cost-effectiveness of therapies, and so cannot be used to determine if too much or too little is being spent in any particular area. However, by indicating the magnitude and pattern of expenditure they can help to guide research priorities and indicate how much scope exists to improve the efficient use of scarce health care resources. The results of this study suggest that research into cost-effective interventions to prevent and treat back pain should be a priority.

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