SCIENCE AND SOCIETY

The individual and socioeconomic impact of osteoarthritis

David J. Hunter, Deborah Schofield and Emily Callander

Abstract | Osteoarthritis (OA) is a highly prevalent, disabling disease, with a commensurate tremendous individual and socioeconomic burden. This Perspectives article focuses on the burden of OA for the individual, the health-care system and society, to draw attention to the magnitude of the current problem with some reference to projected figures. We have an urgent opportunity to make fundamental changes to the way we care for individuals with OA that will have an effect upon the direct and indirect costs of this disease. By focusing on the burden of this prevalent, disabling, and costly disease, we hope to highlight the opportunity for shifts in health-care policy towards prevention and chronic-disease management.

Hunter, D. J. *et al. Nat. Rev. Rheumatol.* **10**, 437–441 (2014); published online 25 March 2014; doi:10.1038/nrrheum.2014.44

Introduction

Osteoarthritis (OA) is a leading cause of disability among older adults, and affects upwards of one in eight adults.[1,2] This highly prevalent disease and the attendant disability have a formidable effect on individuals and on society. The disease burden of OA is typically measured in direct and indirect costs, and also in less well-defined intangible costs such as pain and reduced quality of life (Figure 1). Increasing the need for urgent attention to this disease burden is the indication from societal trends in population ageing, obesity prevalence and joint injury that the number of people affected by OA will increase by about 50% over the next 20 years (with the caveat that past projections have underestimated future burden).[3–5] In this context, this Perspectives article has been written to draw focus to the major public health issue of the increasing individual and socioeconomic burden of OA. By highlighting the current and projected impact of OA, we hope to attract attention to the need for refocusing energy on disease prevention and thoughtful delivery of care,[3] lest health-care systems and economies are overwhelmed and the burden on the individual is not alleviated.

Competing interests
The authors declare no competing interests.

Epidemiology

Approximately 10–12% of the adult population have symptomatic OA.[1,2] The risk of mobility disability (defined as needing help walking or climbing stairs) attributable to knee OA alone is greater than that attributable to any other medical condition in people aged 65 years and older.[6,7] Estimates published in 2012 suggest that 250 million people worldwide are affected by knee OA.[8] According to the Global Burden of Disease (GBD) Study 2010, OA accounted for approximately 0.6% of all disability-adjusted life-years (DALYs) and 10.0% of DALYs due to musculoskeletal conditions.[9] OA also accounted for 2.2% of global years lived with disability (YLDs) and 10% of all YLDs from musculoskeletal disorders.[8,9] As a group, musculoskeletal disorders cause 21.3% of all YLDs, second only to mental and behavioural disorders.[8] OA is the fastest increasing major health condition in terms of YLD ranking; OA accounted for slightly over 17 million YLDs worldwide in 2010, an increase of 64% from 1990 (Figure 2).

Individual burden

For individuals, the burden of OA includes pain, activity limitations and markedly reduced quality of life. OA is a disease that does not resolve and is typically accompanied by chronic pain. This pain comes in two common forms: one that is intermittent but generally severe or intense, and another that is persistent background pain or aching.[10] OA pain is best placed in a biopsychosocial framework, which posits that biological, psychological and social factors all have a substantial role in OA pain.[11,12] Psychosocial factors that can predispose an individual to altered symptoms (such as pain and functional limitation) include self-efficacy, pain catastrophizing and the social context of arthritis (social support, pain communication), all of which are important considerations in understanding the pain experience. The consequences of OA pain include activity limitations and participation restriction,[13] in addition to negative effects on quality of life, mood, fatigue and sleep.[14] Poor sleep occurs in ~70% of older persons with OA and is linked with fatigue.[15]

An estimated 7% of the older adult population experience limitations in activity due to OA.[7] Much of the focus of OA disability is on knee OA because of its high prevalence and attendant disability.[16] According to the GBD study, OA of the knee accounts for 83% of the total OA burden.[8,9] About 80% of persons with OA have some degree of movement limitation and 25% cannot perform major activities of daily living; moreover, 11% of adults with knee OA need help with personal care and 14% require help with routine needs.[7] Because a cure for OA is not currently available, the disease can be present for decades, leading to further substantive individual and societal burden.

Studies suggest that mortality is increased in patients with OA compared with the general population (standardized mortality ratio for all-cause mortality of 1.55 [95% CI 1.41–1.70]);[17] however, the mechanism for this increased mortality is unclear. Hence, the burden of OA on individuals is best captured in terms of its effect on their quality of life. Losina *et al.*[18] reported in 2011 that individuals aged 50–84 years with knee OA experienced losses in quality-adjusted life years (QALYs) over the remainder of their lives ranging from a mean of 1.9 QALYs in nonobese individuals with knee OA to 3.5 QALYs for individuals with knee OA who are obese. In the USA alone, 15 million QALYs are lost annually due to OA. These

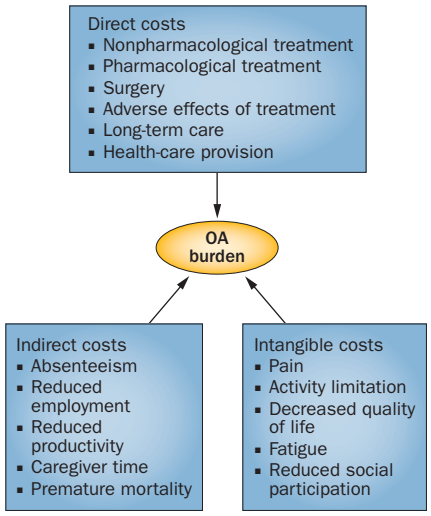

Figure 1 | The disease burden of OA. The burden of OA is measured in not only direct and indirect financial costs, but also in intangible costs to the individual. Abbreviation: OA, osteoarthritis.

QALY losses are comparable to those experienced by patients with other highly morbid conditions such as cardiovascular disease and cancer.[18] Internationally, the 2010 global estimates of YLDs mentioned earlier ranked musculoskeletal conditions second, with low back pain, neck pain, and knee OA being the three most common such conditions.[9]

Population-based estimates suggest that about 6% of adults aged over 30 years and 13% of persons aged 60 years and over have symptomatic knee OA.[19] Whilst OA is common in the knee, it is even more prevalent in the hands, especially the distal and proximal interphalangeal joints and the base of the thumb (carpometacarpal [CMC] joint).[20] When symptomatic, especially so for the CMC joint, hand OA is associated with functional impairment, substantial pain, instability, deformity and loss of motion.[20] Over the age of 70 years, approximately 5% of women and 3% of men have symptomatic OA affecting the CMC joint with corresponding impairment of hand function.[20] The prevalence in men and women of symptomatic hip OA is about 9%.[21]

Socioeconomic burden

Directly comparing costs between countries is sometimes challenging due to different methods of cost estimation, health-care systems, labour workforces and currencies. One staggering statistic that conveys meaning, irrespective of one's location, is that the cost of OA in the USA, Canada, UK, France and Australia has been estimated to account for between 1% and 2.5% of the gross national product of these countries.[22] Data from a Canadian cohort found an average annual cost of US$12,200 per patient with OA in 2002.[23] Although much attention is given to direct health-care costs, the overwhelming majority of the cost of OA is indirect (some studies suggest that indirect costs could be up to eightfold greater than the direct costs) and, consequently, the true burden of OA is often underestimated.[23] The substantial variability in methods used to estimate indirect costs makes comparison challenging; however, current estimates suggest we might just be measuring the tip of the iceberg.

Direct costs

Health-care costs are apportioned to individuals and to payer organizations, and vary dramatically by country. Data from the US Medicare Expenditure Panel Survey (1996–2005) was used to compare health expenditures of patients with and without OA.[24] Women with OA had $4,833 greater annual expenditures charged to insurers and an additional $1,379 in out-of-pocket expenditures compared with women without OA. Costs for men with OA exceeded those of their non-OA counterparts in annual insurance charges and out-of-pocket costs by $4,036 and $694, respectively. These data suggest that OA is associated with large health-related expenditure, much of which is absorbed by insurers. The authors estimate that, in the USA, $185.5 billion in annual insurer expenditures are attributable to medical care for patients with OA.[24]

A US population-based study of health-care utilization in individuals with knee OA demonstrated, on average, six more physician visits and 3.8 more non-physician visits every year than the cohort that did not have OA.[25] The OA cohort also had 28% more hospital stays, a difference largely attributable to total joint replacement procedures.

In general, pharmaceutical costs account for only about 10% of all direct costs of OA. This area, including the cost-effectiveness of different agents, has been reviewed in detail elsewhere.[26] Development of disease-modifying OA drugs (DMOADs) that might both slow disease progression and relieve symptoms are an area of great research interest.[27] At present, no DMOADs have regulatory approval, but if they were to be approved, effective pain relief seems to be a major determinant of their cost-effectiveness.[28]

Most of the direct costs of OA are usually attributed to hospital stays and specifically elective orthopaedic surgery, with smaller proportions accounted for by medications, physician visits, other health professional visits and diagnostic procedures (Figure 3), as revealed by studies in France, Italy and Spain.[29–31] In the French cohort, only 3% of patients incurred hospital admissions but those admissions contributed to 50% of the direct costs of OA.[29] In turn, the direct costs of OA accounted for ~2% of all health-care costs, similar to the proportion for coronary artery disease.[29] It is also important to note that, in these studies,[29–31] out-of-pocket expenses were typically around 30% of total expenses. Additionally, these studies were conducted before widespread use of and access to MRI, which can further drive up diagnostic costs. As health-care costs in many countries are leading to a substantial fiscal burden in tight economic times, methods to address these costs need to be implemented,[32] including ways to address the considerable waste that can be driven by physician self-referral.[33]

The bulk of hospitalizations for OA involve total joint replacement. Over the past decade, the number of joint replacement procedures has doubled in the USA such that over 1 million are now performed annually, at an estimated total cost of $15 billion.[34] The costs of OA are expected to rise in the coming years at a faster rate than would be predicted by population growth alone, largely due to expanding indications for the procedure, particularly amongst relatively young adults. Kurtz and colleagues[35] project that the number of total knee replacement procedures will increase to over 3 million annually in the USA by 2030. Given that joint replacements are being performed in younger populations, the number of revision procedures will continue to increase, and the length of hospital stay and costs associated with revision are over double that of initial surgery.[34,35]

Indirect costs

In addition to the health-care costs of OA, substantial indirect costs are also incurred. These indirect costs are attributed to productivity losses from absenteeism (time lost from work, for example sick days), presenteeism (disease-related loss in productivity that occurs even when the person is at work), premature death and early retirement (income loss and reduced taxation revenue), as well as to compensation for household work performed by others (Figure 4).[36]

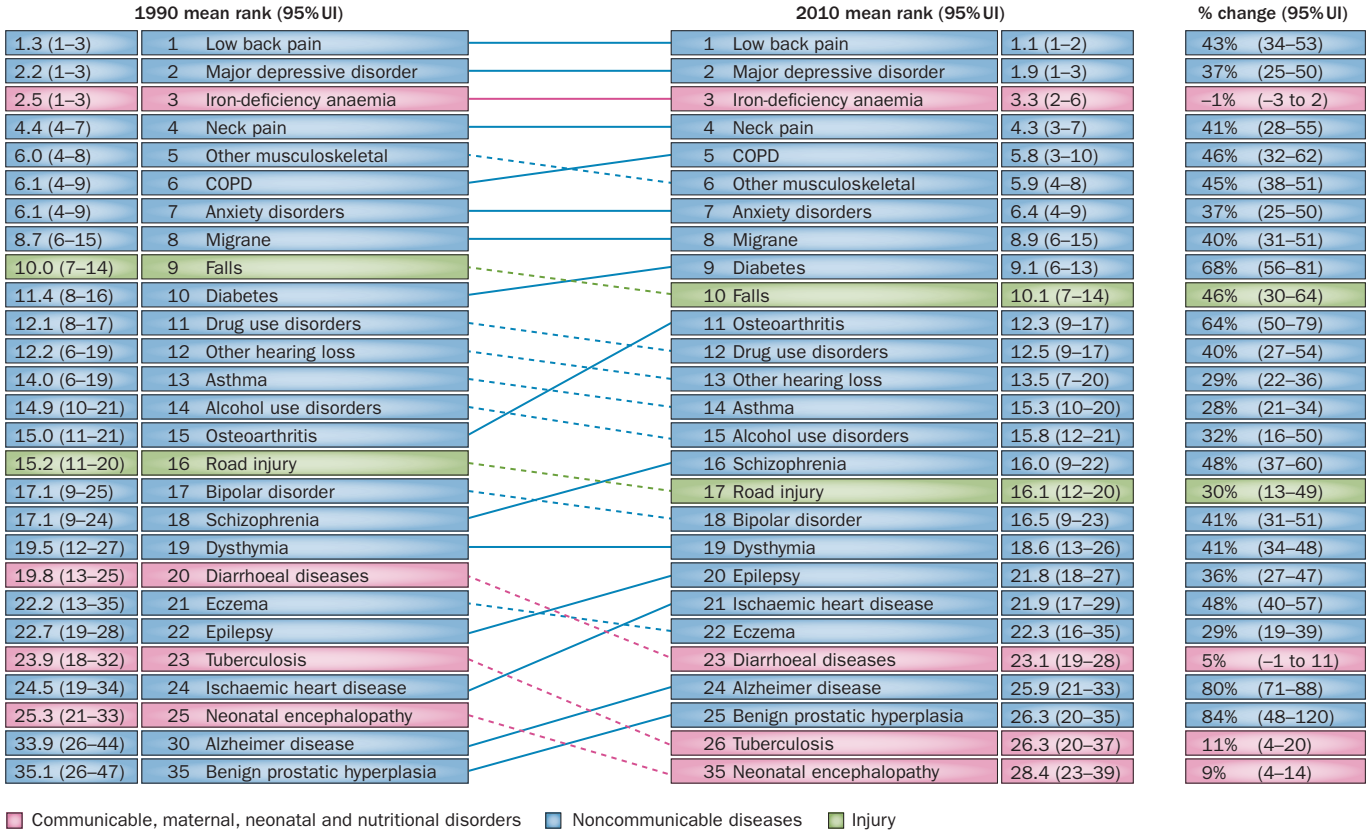

Figure 2 | Ranking of burden of disease by YLDs in 1990 and 2010. The change in leading causes of YLDs from 1990 to 2010 illustrates the increasing global burden of osteoarthritis over this time period. This visualization of data from the Global Burden of Disease Study was produced by the Institute for Health Metrics and Evaluation.[49] Abbreviations: COPD, chronic obstructive pulmonary disease; UI, uncertainty interval; YLD, year lived with disability.

Workforce absenteeism has been reported to comprise a substantial proportion of the burden of OA in numerous countries, including Canada and the USA.[36,37] With an ageing population and the prevalence of OA increasing with age, OA is a growing source of absenteeism.[38] With regards to temporary absenteeism, data from the US Medicare Expenditure Panel Survey found that workers with OA were 1.7 to 1.9 times more likely to miss days at work than workers without OA.[39] Persons with OA missed an average of three workdays per year because of health issues, translating to approximately $500 per worker per year in lost wages. The aggregate annual costs of absenteeism across all workers in the USA with OA exceeded $10 billion. As a frame of reference, annual absenteeism costs are $5 billion for persons with asthma, $12 billion for migraines, and $18 billion for hypertension.[39]

Reporting of absenteeism varies markedly, however, with a different study indicating that adults with knee OA reported more than 13 days of work lost because of health issues.[40] Another study indicated that 2% of all sick days in the population were attributable to knee OA.[41]

The estimates of presenteeism varied widely, from $700 to $7,000 per worker per year, according to the instruments chosen.[42] Irrespective of their variability, these estimates are cause for great concern: even at the lowest end of the spectrum, the estimated costs of presenteeism are higher than those of temporary absenteeism.

Owing to its effect on functional ability, arthritis (in this context, 'arthritis' means general articular disease including not only OA but also other rheumatic diseases such as rheumatoid arthritis, gout, systemic lupus erythematosus, and so on) is associated with decreased labour force participation rates.[36] Arthritis is also the condition responsible for the second highest number of older Australian workers retiring from the labour force prematurely.[43] Of those aged 45–64 years who identify arthritis as their main health condition, 50% are not in the labour force.[43] This makes them three times more likely to be out of the labour force than those with no chronic health condition.[43] Using a purpose-built microsimulation model of the economic impacts of health, in 2009 it was estimated that about 80,000 workers were missing from the Australian labour force due to early retirement as a result of arthritis.[38] These retired individuals, aged 45–64 years, had a median total weekly income of AU$260, whereas those who were employed full-time were likely to earn on average more than five times this amount. Nationally,

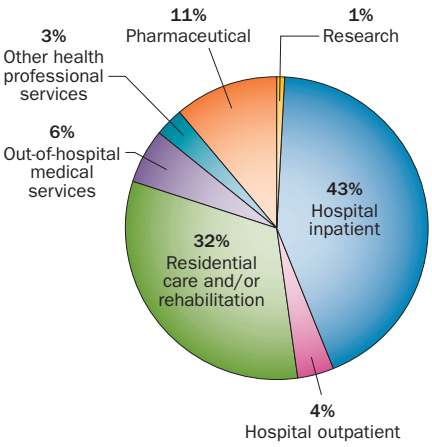

Figure 3 | Distribution of direct costs of OA by type. Using estimates of the economic impact of OA in Australia,[50] this pie chart shows the allocation of the direct costs of the disease. Abbreviation: OA, osteoarthritis.

AU$3.8 billion in private income was lost to these retired individuals annually, and they received an additional AU$291 million in social security payments and paid AU$394 million less in personal income tax.[44] Arthritis contributed 17% of the total AU$2.1 billion of taxation revenue lost to government in Australia in 2009 from illness-related early retirement, and 19% of the total AU$1.5 billion in government support payments to those who retired early due to illness.[45] The national aggregate impact of early retirement due to arthritis includes AU$9.4 billion in lost gross domestic product, attributable to arthritis through its effect on labour force participation.[44]

The loss of income due to forced early retirement as a result of arthritis leads to decreased savings for retirement. People who retired from the labour force early due to arthritis were estimated to have a median value of total savings at age 65 years of as little as AU$300 (mean AU$84,400) for men aged 45–54 years and a median of AU$7,800 (mean AU$60,300) for men aged 55–64 years.[44] This figure is far lower than the median value of savings for those males aged 45–54 who remained in the labour force full-time, who would have an estimated AU$339,100 (mean AU$504,900) at age 65 years. To provide perspective and underlining the importance of adequately measuring and including indirect costs of arthritis, the cost of lost earnings is estimated to be almost twice that of direct health costs.[46]

Conclusion

Given the large number of people affected, the burden of OA at a population level is substantial. As a single disease, it has a major effect on productivity and places an enormous burden on the health-care system, in addition to its effects on individuals through pain, disability and reduced quality of life. Sociodemographic changes are driving an increase in the prevalence of OA, such that the burden of the disease is increasing more rapidly than any other health condition. The socioeconomic costs of managing this condition and its effects on productivity, as well as other financial costs, are already enormous. Urgent action is needed to focus attention on opportunities to reduce the individual and socioeconomic burden of OA.

The two most important risk factors for OA—obesity and joint injury—are readily modifiable, and reducing their impact could reduce the prevalence of knee OA by as much as 70%.[47] At this point, little effort has been made to achieve this goal despite its appeal.

Despite OA being a typical chronic disease characterized by long duration, substantial impact on quality of life and multiple comorbidities, current management practices are best described as reactive and palliative. The vast majority of health-care costs are expended on a small minority of individuals and, despite a strong rationale for implementing new service models that will reduce both disability and cost, there has been little shift in policy or practice.[48] It is critical that we identify individuals at a high risk of incurring high costs to provide targets for public health efforts aimed at reducing the socioeconomic impact of the disease, thereby contributing to efficient allocation of precious health-care resources. Given that health-care systems and resources are not unlimited, both the current economic climate and the rapidly increasing burden from OA call for urgent attention to this pressing matter.

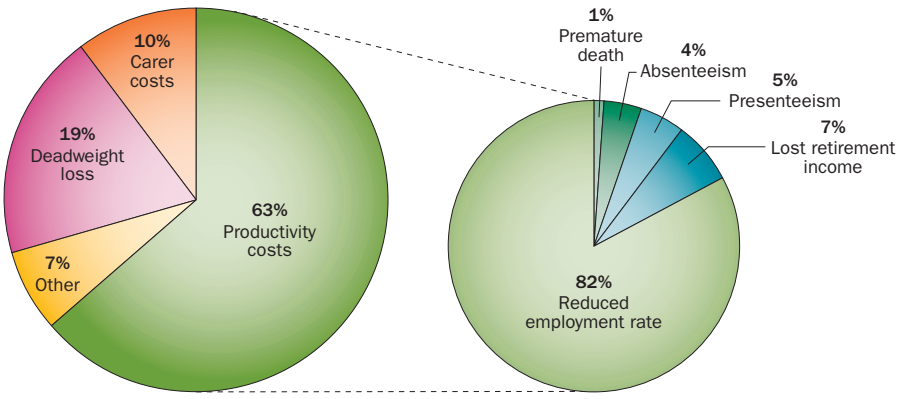

Figure 4 | Distribution of indirect costs for OA by type. Using estimates of the economic impact of OA in Australia,[50] the pie chart on the left shows the allocation of the indirect costs of the disease, and the pie chart on the right further breaks down the costs associated with productivity losses due to OA. Abbreviation: OA, osteoarthritis.

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Acknowledgements
D.J.H.'s work is funded by an Australian Research Council Future Fellowship (FT0991246). The comments and editorial expressed in this article represent those of the authors and do not reflect those of any official scientific role or institution that the authors may hold or be affiliated with.

Author contributions
D.J.H. and E.C. researched data for the article, and D.J.H., D.S. and E.C. made substantial contributions to discussion of the content, writing, and review/editing of the manuscript before submission.