

# Cost of Musculoskeletal Diseases: Impact of Work Disability and Functional Decline

Studies of the cost of musculoskeletal conditions in general and of specific diseases within this larger rubric in particular have been of 2 kinds. In the first, researchers have used population-based data to provide estimates of the economic impact of musculoskeletal disease or all forms of arthritis. Such studies have traditionally been based on an amalgam of data sources on ambulatory care, inpatient services, longterm care, and employment rather than by following specific individuals and enumerating all the costs these individuals incur. In each of the data sources used in such studies, researchers have been forced to allocate costs to specific disease rubrics on the basis of the first-listed diagnosis. This method no doubt resulted in some underestimation, as when an individual was institutionalized with dementia but also had arthritis, and some overestimation, as when arthritis was listed as the reason for a nursing home stay but the absence of a spouse was the true reason for such an admission. However, the development of new data sources has recently allowed researchers to track actual costs incurred by individuals and to estimate the increment in total costs attributable to arthritis.

In the second kind of cost of illness study, researchers have generally used clinical samples to provide estimates of the costs associated with specific conditions. Most of these studies have concerned rheumatoid arthritis (RA), but there is now a growing literature on systemic lupus erythematosus (SLE), osteoarthritis (OA), and ankylosing spondylitis (AS).

The results of both the population-based studies of all forms of musculoskeletal disease or arthritis and the clinical-based studies of specific ones indicate that indirect costs associated with work loss account for a relatively large fraction of the total economic impact of these conditions. In the studies of RA, total joint replacement surgery also accounts for a large proportion of costs. However, the advent of new, expensive medical treatments for the inflammatory arthropathies may fundamentally alter the economics of these conditions. In turn, payors may demand evidence that the initiation of treatment with these medications will result in lowered rates of surgery, work loss, and functional decline.

In this article, I review the extant studies of the costs associated with all forms of musculoskeletal disease and then present the results of a study designed to improve upon the methods of the prior research. I then turn my attention to the research on the economic impact of RA, showing the distribution of costs prior to the recent evolution of treatment, the impact of gender bias on estimates of such costs, and the preliminary evidence that effective treatment with new agents may fundamentally alter the economics of this

disease by dramatically increasing short term costs, but with the potential to reduce longterm costs.

## **COSTS OF ALL FORMS OF MUSCULOSKELETAL DISEASE**

In a series of studies beginning in the early 1960s, Dorothy Rice and colleagues have provided estimates of the economic impact of all forms of musculoskeletal disease, including all forms of arthritis<sup>1-4</sup>. These estimates were performed using relatively constant methods based on the system of national health accounts described above. Figure 1 summarizes the results by denominating estimates across time in common terms — as a percentage of gross domestic product (GDP) by year. The total economic impact of musculoskeletal conditions has increased from just slightly more than one-half of one percent of GDP in the early 1960s to just under 3% in 1995 (the 3% amounted to US\$215 billion). The US National Arthritis Data Task Force has concluded that about half of the increase was the result of an increase in the prevalence of musculoskeletal disease due to the aging of the population and higher costs per case, while the other half was due to improved accounting methods in each of the data sources used by Rice and colleagues in the studies.

The proportion of costs attributable to direct medical expenditures and indirect costs due to wage losses has shifted over time. During the 1970s, the proportion attributable to medical care increased dramatically due to rapid medical care inflation in those years, while in the 1990s, the proportion attributable to indirect costs increased as real wages began to rise, while medical care inflation was temporarily in check; at that time, 58% of the total was due to indirect costs.

With the development of the Medical Expenditures Panel Survey (MEPS), it became possible to track costs incurred by individuals with specific conditions rather than to allocate total costs to those conditions from multiple data sources<sup>5-7</sup>. In 1997, the 56.4 million persons with musculoskeletal conditions were responsible for medical care expenditures that averaged US\$4251, which aggregates to about US\$240 billion, or about 2.9% of GDP<sup>8</sup>. The 38.4 million persons with some form of arthritis were responsible for medical care expenditures that averaged US\$4865, for a total of US\$186.9 billion, or 2.3% of GDP. Thus, the direct accounting of the medical care utilization resulted in a substantially larger estimate of direct costs than the methods of prior studies; indeed, the direct cost estimates alone were almost as large as the estimates of total costs from the prior studies. Were the US to institute universal health insurance

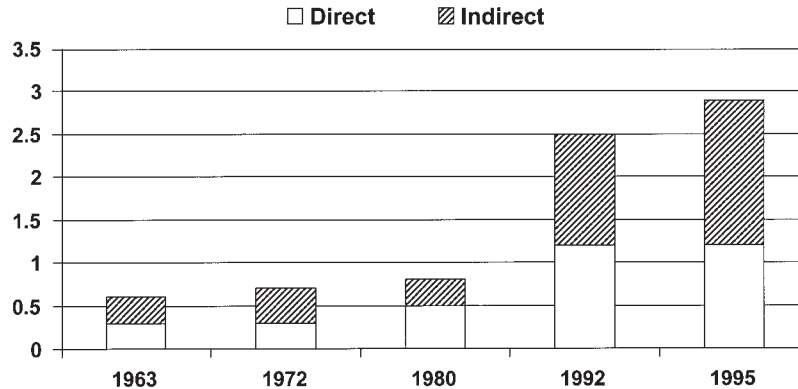


Figure 1. Direct and indirect costs of musculoskeletal conditions as a percentage of GDP, by year. With permission from Yelin E and Callahan L. *Arthritis Rheum* 1995;38:1351-66<sup>25</sup>; and Praemer A, Furner S, Rice D<sup>26</sup>.

coverage, the costs of musculoskeletal disease would rise dramatically. In 1997, expenditures averaged US\$1560 among persons with musculoskeletal conditions who lacked insurance and US\$4493 among such persons with insurance, even after taking into account differences between the 2 groups in demographic characteristics and health status<sup>9</sup>.

Some of the medical care expenditures of persons with musculoskeletal conditions would have occurred in the absence of the conditions. Using econometric techniques, we estimated that persons aged 18 years and older with all forms of musculoskeletal conditions incurred an increment in costs of US\$1453 per case beyond those that would have been expected in the absence of these conditions, for a total of US\$77.3 billion, or 0.9% of GDP for 1997. Persons these ages with all forms of arthritis incurred an increment in expenditures of US\$1348 per case, for a total of US\$49.5 billion, or 0.6% of GDP<sup>8</sup>.

In 1997, persons with all forms of musculoskeletal disease who were of working ages (18 through 64) had an employment rate that was 9.5 percentage points lower than such persons without these conditions; this lower employment rate as well as lost hours among those still working translated into an earnings gap of US\$98.2 billion. After taking into account differences between the 2 groups in demographic characteristics, health status, and work history, persons 18 to 64 with musculoskeletal conditions had an employment rate that was still 5.8 percentage points lower than those without these conditions; this employment rate as well as lost hours among those still working translated into a net earnings gap of US\$90.6 billion. Persons 18 through 64 with arthritis reported employment rates 11.4 percentage points lower than such persons without arthritis, resulting in an earnings gap of US\$73.2 billion; after adjustment for demographic characteristics, health status, and work history, the earnings gap remained US\$65.2 billion. Thus, almost all of the earnings gap would have occurred in the absence of the musculoskeletal conditions (or all forms of arthritis),

another indication of the importance of indirect costs to the economics of musculoskeletal disease (or arthritis)<sup>8</sup>.

#### COSTS OF SPECIFIC CONDITIONS

There have been many studies of the costs of RA, but the results are remarkably consistent in showing that the direct costs are between US\$4000 and 6000 a year (average \$5425), while indirect costs associated with lost wages are between US\$9000 and 24,000 a year (average \$9744)<sup>10,11</sup>. Hospital admissions account for between 40 and 60% of the direct cost total, even though only about 10% of persons with RA report hospital admissions in any year. Indeed, hospital admissions are responsible for more than 90% of the direct costs of cases in the highest 5 percentiles of costs. In contrast, drugs are the largest component of the direct costs of those in the lowest 5 percentiles of costs<sup>12</sup>.

All else being equal, indirect costs of RA are likely to rise in the decades to come as women continue to make gains in achieving equality in the labor market. Currently, women continue to have lower labor force participation rates, work fewer hours, and have lower wages per hour even after holding constant for education and work experience despite their gains of the last several decades. Were women to achieve equality in employment rates, hours, and wages, the indirect costs of RA would almost double (Figure 2).

Further, there is new evidence that the advent of biological agents and the cyclooxygenase 2 inhibitors are resulting in a dramatic increase in the direct costs of RA. Messer and colleagues<sup>13</sup> reported estimates of the lifetime direct costs of RA that were much higher than the most recent prior estimates of lifetime costs and concluded that the increase was due to the use of the new treatment modalities.

Thus, growing equality between the sexes is likely to result in an increase in the indirect costs of RA, while the development of new agents has already resulted in such an increase on the direct-cost side of the ledger. On the other hand, although indirect costs are likely to increase in the

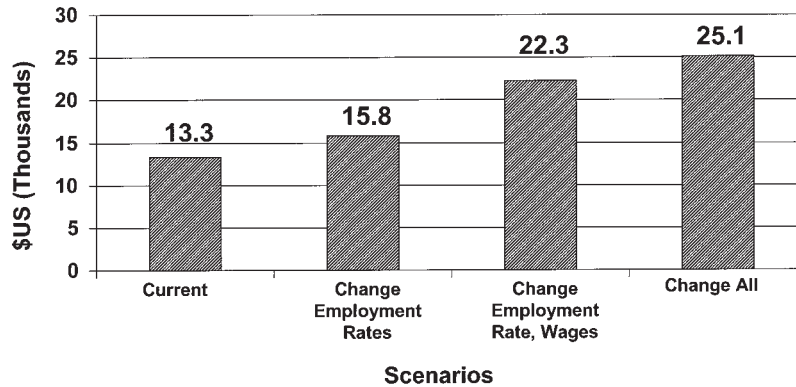


Figure 2. The impact of gender equality in employment rates, wages, and hours on indirect costs of RA, based on the author's calculations.

short term, the advent of the biological agents may reduce both direct and indirect costs in the longer term. Randomized clinical trials provide evidence that such agents reduce functional decline for the tenure of the trials<sup>14-17</sup>. Were the new agents or combinations of old and/or new agents to reduce the rate of functional decline over a longer time frame, they would probably result in lower rates of work disability.

Two recent clinical trials and one observational study show promising results with respect to work outcomes. In the first, Puolakka and colleagues reported that combination disease modifying antirheumatic drug (DMARD) therapy reduced productivity losses over 5 years when compared with the use of a single DMARD<sup>18</sup>. And Bresnihan and colleagues reported that persons with RA randomized to receive anakinra gained a significantly larger number of work days than those receiving placebo<sup>19</sup>. Finally, in an observational study, Yelin and colleagues reported that persons using etanercept had a lower probability of stopping work than those not taking this medication, even adjusting for differences in health status, demographic characteristics, work history, and the selection bias associated with participating in a clinical trial<sup>9</sup>. Although it also stands to reason that effective treatment modalities would reduce the frequency of such expensive medical cost items as total joint replacement surgery, we could find no evidence that specific treatments do so.

The evidence with respect to the costs of other specific rheumatic conditions is sparser. Sutcliffe and colleagues reviewed the literature on the costs of SLE, and reported that the direct costs of this condition were £ 2613, while indirect costs were £ 5299, roughly the same ratio as in RA, which should not be surprising given that both conditions arise in young adulthood<sup>20</sup>. In studies of the costs of AS, direct costs ranged from € 1309 to € 2686, while indirect costs ranged from € 2517 to as much as € 8862. Maetzel and colleagues summarized the literature on the costs of low back pain and

concluded that the costs of this condition were comparable to those associated with heart disease, depression, diabetes, and headache, with the majority due to indirect costs<sup>21</sup>. In contrast, in studies of OA, which typically affects those near or beyond retirement age, Gabriel and colleagues reported that direct costs, at US\$1388, were 3 times as great as indirect costs (US\$824)<sup>22,23</sup>. Similarly, although juvenile rheumatoid arthritis has much higher costs, because it affects a population not yet of working age, direct costs, at US\$7905, were almost 4 times as great as the other costs of this illness (principally wage losses for parents)<sup>24</sup>.

## SUMMARY AND CONCLUSIONS

Persons with all forms of musculoskeletal conditions incur total medical care expenditures of about US\$240 billion, or about 2.9% of GDP. Of this total, approximately US\$77 billion, or about 0.9% of GDP, would not have occurred in the absence of the musculoskeletal conditions. Such persons had lower labor force participation rates, resulting in indirect costs of about US\$98 billion; of this amount, almost all (over US\$90 billion) remained after taking into account characteristics other than the presence of a musculoskeletal condition that might result in lower earnings. Thus, the majority of direct costs incurred by persons with musculoskeletal conditions would occur in the absence of the conditions, but the wage losses would not occur were the conditions to be eradicated.

The importance of indirect costs in the economics of musculoskeletal conditions is underscored by the studies of the costs of specific diseases. In all but OA, indirect costs are at least as large as, if not larger than, direct costs. Reducing the economic impact of RA, SLE, AS, and low back pain requires treatments that reduce work disability associated with each of these conditions. Some promising results from short term studies have been reported, but it would appear to be an appropriate time to inaugurate trials focused on longterm work outcomes.

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