

Global Economic Impact of Multiple Sclerosis

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Literature Review

Executive Summary

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1. INTRODUCTION

Multiple sclerosis (MS) is a chronic, disabling disease that affects 2 million people worldwide and is typically diagnosed between ages 20 and 40. Common symptoms that include upper and lower extremity disabilities, visual disturbances, balance and coordination problems, spasticity, altered sensation, abnormal speech, swallowing disorders, fatigue, bladder and bowel problems, sexual dysfunction, and cognitive and emotional disturbances. MS can substantially and adversely affect an individual's quality of life (QOL) and is associated with high costs for MS patients, their families, and society as a whole.

A key issue for policy makers and advocacy organizations is the cost to society of MS. Cost of illness studies quantify the economic burden of specific diseases and can be used by policy makers to allocate research and service funding. Several cost of illness estimates for MS in many different countries have been published over the past 10 years, with all finding a high cost on a per person basis.

To help raise awareness of the high global costs of MS, this literature review provides international data that are useful for estimating the costs and QOL impacts of MS at the national level. A companion report includes a cost calculator that can be used to estimate the economic impact of MS at the country level.

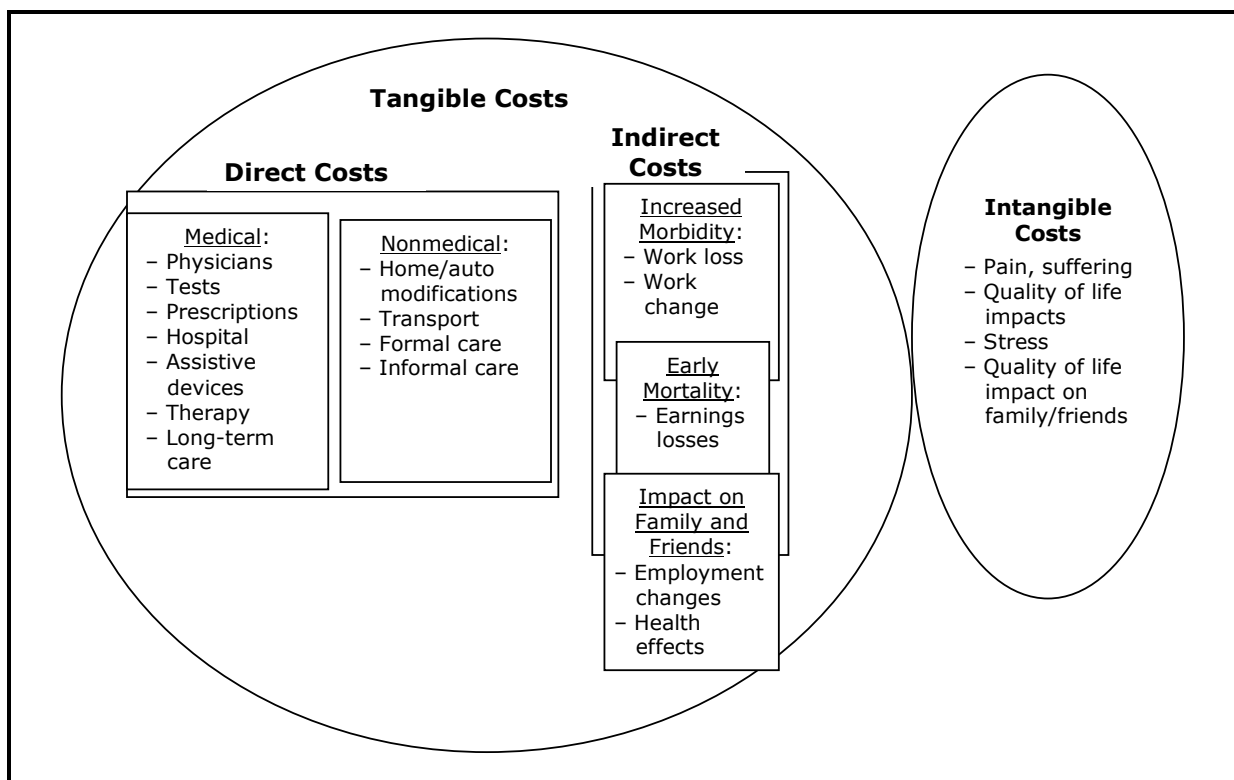
Figure 1 presents the conceptual model of the tangible and intangible costs of MS that was used to guide this literature review and the development of the cost calculator. This model categorizes the elements of costs that ideally should be included in a cost of illness study. The conceptual model divides the impact of MS into two broad categories: tangible costs and intangible costs. Tangible costs include direct medical and nonmedical costs. Direct medical costs include costs such as prescription drugs, physician services, hospital stays, and nursing home stays. Direct nonmedical costs include home and automobile modifications, informal care provided by family and friends, and most home and community-based services. Indirect costs address the labor productivity losses and wages associated with withdrawal from the workforce by people with MS and employment and health impacts on their family and friends. Finally, intangible costs refer to the impact of MS on QOL for patients and their primary caregivers.

2. LITERATURE REVIEW METHODOLOGY

This literature review on the cost of MS included two steps. The first step involved conducting a detailed literature search, including electronic databases of peer-reviewed journal articles. To identify potential articles for the literature review, we searched 11 electronic publication databases, including PubMed, PsycINFO, CINAHL, Cochrane Database of Scientific Reviews, and others, for articles relevant to the cost of MS, published after 1997. The second step involved reviewing citations found in the literature search, selecting relevant journal articles for more detailed review, and abstracting data on the economic burden of MS from the selected articles using a standardized abstraction form. A total of 1,608 possible articles were identified for review, of which 215 were abstracted. Relevant articles about 19 countries were identified.¹

¹ The 19 countries are Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Mexico, the Netherlands, New Zealand, Norway, Spain, Sweden, Switzerland, the United Kingdom, and the United States.

Figure 1. Conceptual Model of MS Cost Categories for Economic Burden Analysis



3. PREVALENCE OF MS BY COUNTRY

The first step in determining the economic impact of MS in a particular country is to identify the total number of MS patients residing in that country. Data on the prevalence of MS per 100,000 people were recently estimated for 122 countries by the World Health Organization (WHO) and the Multiple Sclerosis International Federation (MSIF) (WHO and MSIF, 2008). Globally, the median estimated prevalence of MS is 30 people per 100,000. Countries with the highest estimated prevalence included Hungary (176), Slovenia (150), Germany (149), United States (135), Canada (133), Czech Republic (130), Norway (125), Denmark (122), Poland (120), and Cyprus (110).

A study by Pugliatti et al. (2006) on European MS epidemiology found broadly similar results as those reported in the MS Atlas, although the estimates differ for some countries. They conducted a literature review of studies published over the past three decades on the epidemiology of MS in Europe. They found an overall estimated prevalence rate of MS in Europe of 83 per 100,000, with higher rates in northern countries. They reviewed studies from 33 countries, with a wide range in prevalence rates from lows of 36 to 39 per 100,000 in Spain to highs of 116, 135, 165, 153, and 186 in Denmark, Ireland, Norway, Sweden, and the United Kingdom, respectively. Mean MS prevalence rates tended to be higher in countries where the degree of disease investigation is higher, where better survey methodologies are used, and where assessments have been repeatedly conducted over time, often based on nationwide surveys or registry systems. A number of studies have found lower rates in countries located closer to the

equator and higher rates in northern and southern latitudes. Lower prevalence rates have been found in non-white populations.

4. TOTAL COSTS

Total costs of MS varied substantially across countries for which studies have been conducted but are substantial in all countries. As shown in Table 1, for the 15 countries for which we have complete estimates, total average cost per person with MS in 2007 varied from a low of 16,400 U.S. international dollars in France to a high of 54,500 U.S. international dollars in Norway and Sweden, for an overall prevalence-weighted average of 41,000 U.S. international dollars (2007). Estimated costs varied because of the availability and costs of medical care, the use of paid and unpaid home and community-based services, and the extent to which people withdraw from the labor force and the resultant loss of income. Estimates also reflect differences in study methodologies and the specific categories of costs included across countries.

5. DIRECT COSTS

Direct costs of a disease represent the value of all resources consumed to diagnose, treat, or accommodate people with the condition. A wide variety of MS-related direct costs are reported in the literature. Examples include the costs of neurologist visits, the costs of installing wheelchair ramps at home, and the value of caregiving provided by family or friends. Our review considered two broad categories of direct costs—direct medical costs and direct nonmedical costs—a categorization typically used in cost-of-illness and cost-effectiveness studies. Most MS cost analyses estimated direct costs for the prevalent population with MS for a specified time period, such as 1 year. These analyses are known as prevalence-based cost studies. We reviewed 28 recent studies that report original analyses of the direct medical or nonmedical costs of MS. For the 15 countries for which we have complete cost data, total direct costs ranged from a low of 5,600 U.S. international dollars in Canada to a high of 37,000 U.S. international dollars in Sweden, for an overall prevalence-weighted average of 24,600 U.S. international dollars. For these studies, direct costs accounted for 26% to 87% of total costs.

5.1 Direct Medical Costs

Direct medical costs include all costs related to patient encounters with the health care system, including inpatient hospital care, nursing homes, rehabilitation hospitals, outpatient hospital services, physician services, prescription drugs, diagnostic testing, ancillary services, and medical supplies.

Most of the studies used a bottom-up approach to estimate direct costs, meaning they collected data on resource utilization from a sample of patients and estimated medical costs for those patients. Two studies used a top-down approach to allocate national estimates of health care spending to MS. Many of the earlier studies took place before the widespread use of disease-modifying drugs or specifically excluded disease-modifying drug costs from direct medical cost calculations.

All of the studies found that MS is associated with large direct medical costs, which vary greatly across countries. For the 15 countries for which we have data, direct medical costs varied from a low of 3,200 U.S. international dollars in Canada to a high of 24,000 U.S. international dollars in the United States, for an overall prevalence-weighted average of 13,200 U.S. international dollars. For these studies, direct medical costs accounted for 15% to 69% of total costs. Differences in use of disease-modifying drugs account for much of this variation.

In addition to the studies that involved primary data collection, Sobocki et al. (2007) estimated per-person direct costs in each country by adjusting for differences in health care spending, gross domestic product, and wages between the estimation country and the nine original European countries studied by Kolbelt et al. Using this ratio approach, they estimated 2005 per-person direct costs (medical and nonmedical) of MS ranging from less than €10,000 (2005) in Estonia to over €30,000 in Sweden.

Many of the studies disaggregated direct costs of MS by Expanded Disability Status Scale (EDSS) category, which is a measure of impairment for people with MS, finding that costs increased with EDSS level. Patwardhan et al. (2005) found that direct costs for patients at the highest EDSS levels are generally 2.5 to 7 times the direct costs of patients at the lowest EDSS levels.

5.2 Direct Nonmedical Costs

Direct nonmedical costs include all nonmedical resources that are consumed to care for MS patients, including paid nonmedical home care (e.g., personal care or help with activities of daily living), informal care provided by family and friends, MS adult day care, home or automobile modifications, mobility devices (e.g., wheelchairs, scooters), transportation services, job retraining, and other resources (e.g., child care, housekeeping).

We reviewed 24 recent studies that describe original analyses of the direct nonmedical costs of MS. For the 15 countries for which we have complete cost data, direct nonmedical costs varied from a low of 2,400 U.S. international dollars in Canada to a high of 21,600 U.S. international dollars in Sweden, for an overall prevalence-weighted average of 11,400 U.S. international dollars. For these studies, direct nonmedical costs accounted for 11% to 42% of total costs. The largest share of nonmedical costs of MS is for informal care. For example, informal care costs in the United States are 63% of total nonmedical

costs. Differences in informal care costs across countries are sensitive to differences in the amount of paid home and community-based services provided by government and other sources. Informal care costs are also higher in countries with lower female labor force participation rates, such as in Spain and Italy.

Most studies used a replacement cost method to value informal care, meaning they applied the hourly wage rate for those who provide home care or personal assistance to the time spent by family members providing care for the person with MS. The nine European studies used a disposable income approach, where the value assigned to home care was net income after social contributions and income tax.

The cost of investments in home and auto modifications and mobility aids averaged about €1,000 (2005) per person per year across the nine Kobelt et al. studies. Additionally, other than in Sweden, per-person costs for home help and personal assistance were close to €2000 (2005) per year.

6. INDIRECT COSTS

6.1 Work Loss

People with MS often have difficulty continuing to work, due to the disabilities, fatigue, cognitive impairments, transportation difficulties, speech impairments, and other aspects of the disease. A substantial body of research documents the significant adverse impact of MS on labor force participation. These costs include short-term and long-term absence from work, reduced hours of work, changing the type of work to a less physically challenging and stressful nature (usually at lower pay), and early retirement. We identified 22 original studies, one synthesis article, and one systematic review that contained quantitative data on labor force participation by MS patients. For the 15 countries for which we have complete cost data, indirect costs, mostly work loss, varied from a low of 5,600 U.S. international dollars in France to a high of 31,000 U.S. international dollars in Norway, for an overall prevalence-weighted average of 16,800 U.S. international dollars. For these studies, indirect costs accounted for 13% to 74% of total MS costs.

Although these costs vary by disability level, MS resulted in reduced productivity and substantial income loss for MS patients. Indeed, this indirect cost constitutes at least one-third of the total costs of MS in most of the studies of the cost of the illness.

Not surprisingly, given the duties of being an informal caregiver, all of the studies that examined the effect of caring for a person with MS on labor force participation found that this role had a negative impact or that there was work-related strain because of work adjustments. Compared to studies of caregiver strain, this research is more limited.

6.2 Early Mortality

Premature death from MS or its complications causes an economic burden due to the underlying economic value of the lost years of healthy life. MS is usually viewed as a disease that results primarily in morbidity, disability, and loss of QOL, but without dramatic impacts on life expectancy. However, recent studies across multiple countries show a consistent, significant negative impact on life expectancy due to

MS. Estimates of reduced life expectancy due to MS in these studies range from 5 to 15 years. In addition, these studies find that average survival time of MS patients is long, ranging from 20 to nearly 45 years from the onset of disease symptoms and that MS is not generally lethal by itself, but death is usually the result of high levels of disability, increasing age, or concurrent diseases. Treatments adopted to improve MS symptoms and to prevent and cure complications in more disabled persons may result in improved survival for MS patients.

Table 1 Total Costs of MS by Reference Country

In the table below, although MS cost estimates from each study have been updated to a common currency and year, because of differences across studies in the time period for analysis and the methodologies used, cross-country comparisons of MS costs are not recommended. Differences in MS costs across countries are driven by differences in the categories of costs included in each study, differences in the typical care provided to MS patients during the time period of analysis, and differences in cost analysis approaches, in addition to underlying differences in the costs of MS treatment and management. For example, because the most recent published studies for Canada and France used patient data from 1995, treatment costs from those studies do not reflect patterns of treatment that have been adopted and in wide use after the late 1990s.

Country	Total Direct Medical Cost (2007 Int'l Dollars)	Total Direct Non-Medical Cost (2007 Int'l Dollars)	Total Indirect Costs (2007 Int'l Dollars)	Total Cost (2007 Int'l Dollars)
Australia	\$18,809	\$16,167	\$6,890	\$41,866
Austria	\$20,738	\$10,010	\$17,569	\$48,317
Belgium	\$13,746	\$10,108	\$13,267	\$37,121
Canada	\$3,162	\$2,421	\$15,932	\$21,514
France	\$6,078	\$4,718	\$5,582	\$16,378
Germany	\$20,246	\$6,986	\$19,946	\$47,178
Italy	\$13,001	\$19,225	\$13,237	\$45,462
Netherlands	\$9,845	\$8,910	\$15,849	\$34,605
Norway	\$10,995	\$12,472	\$31,023	\$54,489
Poland	\$3,495	\$2,713	\$11,423	\$17,631
Spain	\$15,973	\$16,498	\$11,544	\$44,015
Sweden	\$15,431	\$21,607	\$17,427	\$54,465
Switzerland	\$10,211	\$13,365	\$14,473	\$38,048
United Kingdom	\$10,969	\$19,858	\$17,995	\$48,822
United States	\$23,975	\$7,844	\$18,888	\$50,707
Weighted average ^a	\$13,198	\$11,383	\$16,755	\$41,335

^aWeighted by prevalence of MS in each country.

7. INTANGIBLE COSTS

QOL has become a widely used health care outcome measure. For chronic diseases, it is important because diseases such as MS can dramatically affect the QOL of patients for many years without causing death. As a result, a significant but unquantifiable component of the economic burden of MS is its impact on QOL. QOL can be measured for general domains common across multiple diseases and for disease-specific domains that are more closely related to the morbidity or disability impacts of MS.

7.1 Quality of Life: Generic Domains

Studies of the generic QOL impact of MS consistently show substantial negative effects from the disease. Overall, 13 studies were identified that analyze the impacts of MS on generic QOL across multiple domains. Several patterns across different QOL domains can be identified from these studies. First, the impacts on physical functioning were larger than those on social functioning or mental functioning. In addition, the physical health QOL impacts increase as the disease progresses over time and physical impairments become more severe. Significant impacts on social and mental functioning were also found.

Overall, these studies indicate a 30% decline in physical functioning for mild MS, increasing to 40% for moderate MS and 50% for severe MS. A 20% decline in social functioning can be identified for mild and moderate MS, increasing to 30% for severe MS. Mental functioning declined by about 10% across the range of severity levels.

7.2 Quality of Life: MS-Specific Domains

MS has a broad range of impacts on QOL, and many of them are not captured in the generic measures of utility and QOL. As a result, a comprehensive assessment of the burden of MS includes an assessment of the impacts of MS not captured by the generic QOL measures. Studies find that MS has a negative impact on QOL through cognitive impairment, bladder dysfunction, bowel dysfunction, sleep problems, and sexual dysfunction.

7.3 Utility Measures

Utility measures are similar to QOL measures, although they are based on economic theory rather than the psychological theories that underlie QOL concepts. The loss in utility due to MS was consistent across the European and American studies at between 0.20 and 0.31 out of a range of 0.0 to 1.0. Thus, an overall estimate of the burden of MS in terms of utility is an average loss of 0.25. Using the U.K. population norm for the overall population of 0.86 as a baseline, this 0.25 decline in utility can be interpreted as a loss of 29% of utility by people with MS compared to an overall population norm.

7.4 Impacts on Family and Friends

People with MS often require help performing daily tasks because of health care problems and functional and cognitive impairments. This care is mostly provided by informal caregivers, principally spouses and other relatives. In addition to the direct cost related to the hours of care that informal caregivers provide, the disabling aspects of the disease, its impact on mortality, the financial burdens, and MS's uncertain course often create additional psychological stress and anxiety for the informal caregivers, especially those living with the person with MS. The stress and physical burden of caring for MS patients may have

an adverse effect on the psychological and physical health of caregivers and increase their health care use.

We identified 13 studies—12 original studies and one systematic review—that addressed the indirect costs of informal caregivers: caregiver burden, caregiver labor force participation, and caregiver health and health care use. The research suggests two main findings: (1) the burden/stress on caregivers is substantial, but it is far less than it is on MS patients; and (2) the amount of burden/stress varies by level of disability. A conservative estimate of the economic value of stress/burden for caregivers is 10% of what is estimated for MS patients by EDSS level.

Closely related to the level of caregiver burden and stress is whether these factors result in negative health outcomes for caregivers. Only a few studies have addressed this issue at all. Almost all of the studies that report a negative impact do so for depression or some other mental health problem. Data on the impact of MS on caregivers' physical health are much less common and inconclusive.

8. CONCLUSIONS

The results of this literature review indicate that MS imposes substantial economic burdens on MS patients, on their families, and on society as a whole. Moreover, these burdens span a broad range of impacts, including prevalence of MS, direct costs, indirect costs, QOL, and other intangible costs.