Disability-related costs from MS: Quantifying the impact on employer benefits

Commissioned by Sanofi

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Disability-related costs from multiple sclerosis can be substantial, with estimated employer costs exceeding $1 billion annually. This study utilizes actuarial models to analyze various scenarios of reduced disease progression and their associated impact on disability costs.

As newer treatments become available to slow the progression of multiple sclerosis (MS), Sanofi has engaged Milliman to quantify the cost of disability in the commercially insured MS population and the expected impact under scenarios of slowing disability accumulation. This report summarizes the findings from this study.

MS is a chronic disease impacting the central nervous system. In MS, the protective myelin sheath of the central nervous system is attacked by the body's own immune system.[1] This contributes to damage and a disruption in the normal signaling process of the central nervous system to the rest of the body, leading to a wide range of disabilities and impairments. Early and milder symptoms of MS can include alterations in skin sensation and tingling, while severe symptoms can leave patients bed-bound and unable to eat. Throughout the course of the disease, most patients with MS experience relapses (where patients experience an acute worsening of symptoms) and almost all patients experience gradual worsening of symptoms over time.

Recent shift in focus: From managing relapses to slowing disease progression

Traditionally, relapses have been a major focus of discussion regarding the burden of MS. This is likely to be due to an increased clinical burden to the patient at the time of a relapse as well as increased healthcare utilization and corresponding costs. However, a focus on relapses overlooks the important costs incurred when the disease progresses.

Recent research has focused on the underlying pathophysiology that drives the progression of disability.[2] Research has also shown that while relapses lead to an increase in hospitalization costs, another significant driver of cost was a worsened disability status.[3] In patients with mild disability, the major source of direct healthcare costs is use of disease-modifying therapies (DMTs), whereas those with severe disability incur substantial indirect costs from supportive care in addition to work impairment.[3]

Challenges for employers

MS is a costly disease, with an estimated total cost burden in the U.S. of $85.4 billion in 2019, and a projected cost of $108.1 billion by 2039.[4] Indirect costs represent approximately 25% of the total cost burden.[4] Sources of indirect costs of MS include missed work/absenteeism and costs for informal care. As patients progress to more severe disease states, the total cost burden of MS is largely driven by these indirect costs rather than the costs of medical services and treatments.

Working-age patients 18–64 years old represent over 75% of the total MS population,[3] with notable workday and productivity losses.[5] Patients are typically diagnosed between 20–40 years old,[6] and it is estimated that 15 years after an MS diagnosis up to 40% of patients will require a mobility aid (such as a wheelchair or crutches) or will become severely disabled.[7] This represents a high burden of both short- and long-term disability (STD and LTD) over time in a predominantly working-age population.

Options for employers to reduce the disability accumulation among patients with MS have been limited. While DMTs are widely used in MS, traditional DMTs target relapses rather than disability accumulation. However, in recent years, the US Food and Drug Administration has approved new treatments[8] (including newer DMTs[9]) to address disease progression. Additionally, pipeline products have shown promising results in clinical trials[10,11] to target functional limitations in the MS population. These innovative therapies offer new opportunities for employers to help address disease progression and reduce the disability burden.

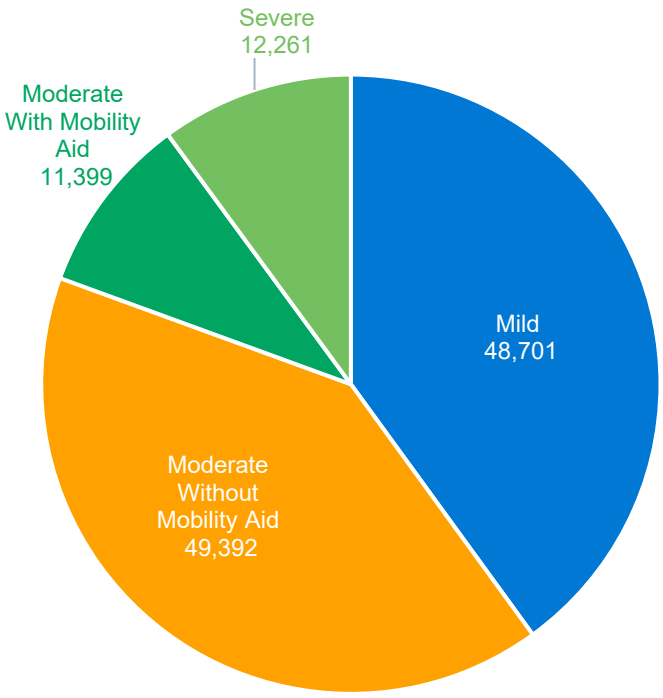
Assessing the cost burden of MS-related disability to employers

MS is included in the listing of impairments for disability evaluation by the U.S. Social Security Administration (SSA),[12] however there is limited research quantifying the costs of STD and LTD to employers. To understand the cost burden to employers of MS-related disability, we utilized retrospective administrative claims data to identify commercially insured patients diagnosed with MS and eligible for disability benefits. We further assigned patients into four categories of functional disability based on an approximation of the Expanded Disability Status Scale (EDSS). The EDSS measures disability in MS, monitors changes in the degree of neurologic impairment in MS over time, and ranges from 0 (normal neurological exam) to 10 (death due to MS), assessing functions such as walking, coordination, sensory, and cognitive abilities.[13] After categorizing patients into four disability groups (mild, moderate without mobility aid, moderate with mobility aid, and severe), we calculated the incidence of disability claims for both STD and LTD by group. We combined incidence rates with actuarial cost models to quantify the national cost burden of MS disability benefits on employers and assess how new treatments could reduce these costs under various scenarios of delaying disability and reducing the incidence of disability.

RESULTS

In 2024, the estimated prevalence of MS in commercially insured adults was approximately 0.45%,[14] with over 650,000 commercially insured working-age adults[15] with MS and over 120,000 patients estimated to be eligible for disability benefits.[16] Of these patients, we estimated the proportion of the MS population with a mild level of disability to be 40%, 41% have moderate without mobility aid, 9% have moderate with mobility aid, and 10% have severe disability (Figure 1).

FIGURE 1—DISTRIBUTION OF COUNTS OF MS PATIENTS ELIGIBLE FOR DISABILITY BENEFITS BY EDSS CATEGORY



An assessment of the MS population by EDSS category shows that the incidence of disability claims increases with greater levels of disability (Figure 2). Overall, the incidence of STD and LTD was 13.4% and 1.7%, respectively. The total annual cost to U.S. employers due to disability from MS is estimated to be $1.1 billion (Figure 3). Despite the higher incidence rates, STD claims accounted for only about one-third ($394 million) of the total annual employer costs related to disability, whereas LTD claims comprised roughly two-thirds of these costs ($727 million).

When considering the potential impacts of reducing the incidence of disability claims, delaying the average age at disability claim, and improving recovery rates for patients who are disabled, the estimated costs of disability are reduced to $722 million (Figure 3). Reducing the incidence of disability has the greatest impact on disability costs ($336 million), followed by improved recovery ($47 million), and delay in age of disability onset ($16 million) (Figure 3).

FIGURE 2—DISTRIBUTION OF MS PATIENTS, STD AND LTD INCIDENCE RATES BY EDSS CATEGORY

			DISABILITY INCIDENCE RATE	
DISABILITY LEVEL	**ESTIMATED EDSS SCORE**	**DISABILITY INDICATORS**	**SHORT-TERM**	**LONG-TERM**
Mild Disability	0–2.5	No claims for any disability indicators, or claims for mild indicators such as fatigue, hearing loss, skin sensation abnormalities, and ataxia	11.0%	1.2%
Moderate Disability Without Mobility Aid	3.0–5.5	Neurological conditions such as bladder dysfunction, spasticity, cognition issues, vision impairment	13.3%	1.6%
Moderate Disability With Mobility Aid	6.0–6.5	Walking aids such as cane, walker, crutches, or other functional aids (i.e., bath and commode)	18.7%	2.4%
Severe Disability	7.0–9.5	Wheelchair, hospital bed, nutrition, home health, hospice, or other severe MS-related conditions (i.e., paraplegia, quadriplegia)	18.1%	3.7%

CONCLUSIONS

Relapses are typically associated with an increase in healthcare resource utilization. Additionally, DMTs have been viewed as one of the major economic burdens,[3] though most have shown limited effectiveness in reducing disability.[17] The current focus in MS of addressing disability progression, and its associated impact on quality of life and costs, offers new opportunities to employers.

This analysis estimated the overall annual cost of disability benefits to employers due to MS to be over $1 billion nationally, with the opportunity to reduce disability-related claim costs by up to 30% based on various scenarios modeling reduced disability progression. Most patients in this commercially insured population were classified as having mild to moderate disability, underscoring the potential for treatment in this population to reduce disability and costs. In this analysis, we observed an increase in the likelihood of patients filing disability claims as the level of disability impairment worsened (defined by proxy EDSS scores). Employers have the opportunity to reduce the rate of disability progression and realize significant long-term cost savings by earlier identification and support of employees with lower-severity MS.

Although our study concentrated on costs associated with group disability benefits, slowing the progression of MS can yield broader savings related to direct medical expenses and indirect costs such as productivity, absenteeism, and caregiving resources. Moreover, earlier intervention in the working-age population could have longer-term benefits to other payers such as Medicare or Medicaid, which usually assume the burden of patients with MS as they age and their disease progresses.[18] However, the evaluation of those savings was outside of the scope of our analysis.

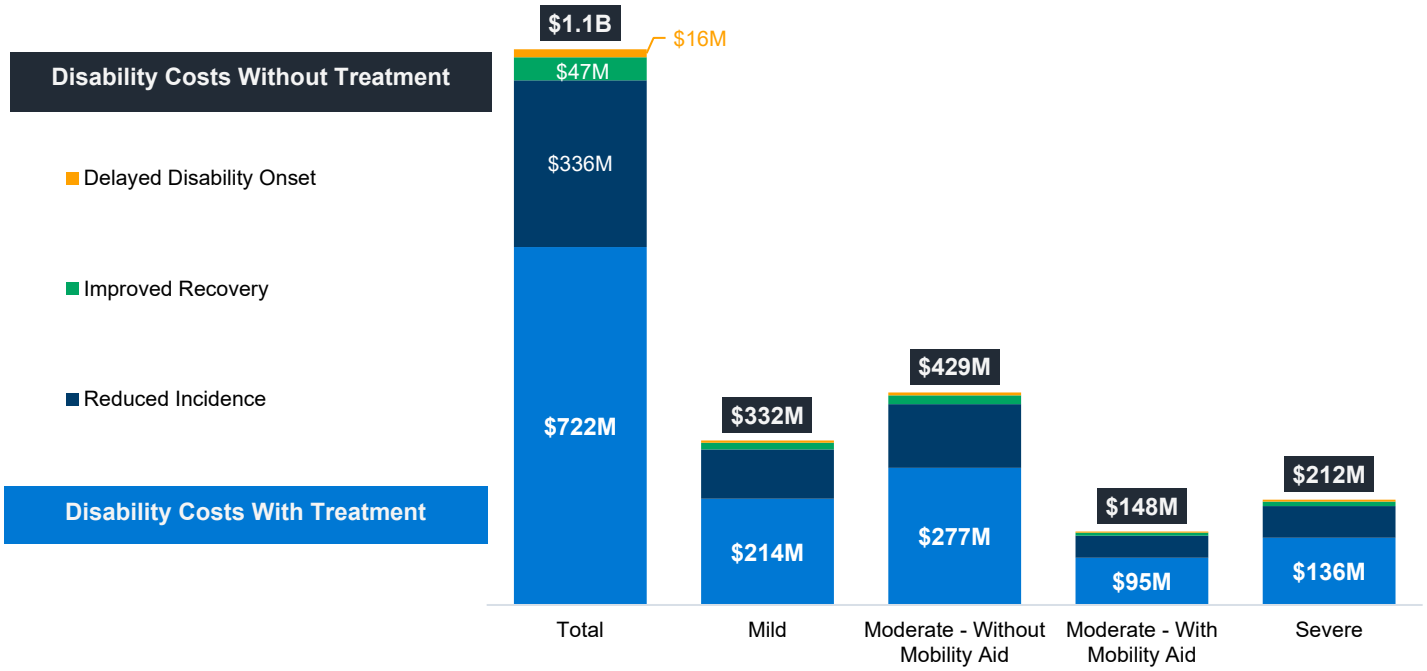
METHODOLOGY

Patients diagnosed with MS and disability claimants were identified using the Merative™ MarketScan® Commercial Claims Database and Health and Productivity Management (HPM) Databases. Patients were identified as commercially insured members, age < 67 years old with a claim in any position for MS (ICD-10 G35) between January 1, 2019, and December 31, 2023. Patients were also assigned to a disability impairment status of mild, moderate without mobility aid, moderate with mobility aid, or severe using a claim-based algorithm to identify disability indicators and approximate their classification on the EDSS (Figure 2).

Patients were further assessed for evidence of a disability marker using a 24-month look-back period from the first MS diagnosis occurring in a calendar year. For a given calendar year, if a patient with a prior MS diagnosis claim did not have an MS diagnosis claim, an artificial index date of July 1 for the calendar year was assigned for the purpose of assessing disability markers. Note, if a patient had multiple disability indicators, the most severe indicator would be used for assignment and indicators could be applied forward to future years.

All patients were required to have two years of benefit eligibility to align with the look-back period to assess disability impairment status. The calculated proportion of the mild EDSS category was lower than expected when compared to observed distribution in published literature.[19] Limitations may exist using administrative claims to estimate mild disability markers; therefore the estimated distribution of 40% was assumed for the mild category using estimated disability rates for patients with mild EDSS scores

FIGURE 3—MS-RELATED ESTIMATED COSTS OF DISABILITY TO EMPLOYERS BY EDSS CATEGORY AND SCENARIOS REDUCING DISABILITY PROGRESSION



	Total	Mild	Moderate Without Mobility Aid	Moderate With Mobility Aid	Severe
Disability Costs Without Treatment	**$1.1B**	**$332M**	**$429M**	**$148M**	**$212M**
Delayed Disability Onset	$16M	$4M	$6M	$2M	$4M
Improved Recovery	$47M	$14M	$18M	$6M	$9M
Reduced Incidence	$336M	$100M	$129M	$44M	$64M
Disability Costs With Treatment	**$722M**	**$214M**	**$277M**	**$95M**	**$136M**

obtained directly from literature,[19] and the distribution in the moderate disability category was offset accordingly.

Disability claims occurring on or after the first MS claim observed at any time between 2019–2023 were captured as either STD or LTD. STD insurance provides employees who become disabled due to accident or illness with a portion of their income—generally around 60%—for a limited time, usually lasting three to six months. Employees who are unable to return to work at the end of the STD benefit period may qualify for LTD benefits. LTD benefits typically replace 60% of an employee's monthly gross income and are paid until normal retirement age, unless the employee recovers or dies before reaching retirement age. Disability claims related to pregnancy were removed. The incidence of disability was calculated by EDSS group separately for STD and LTD, using disability claims from the HPM database, as the total number of disability claims divided by the total number of patients with MS who are eligible for disability benefits (Figure 2). Given that the proportion of patients with mild disability was estimated based on literature, the disability incidence rates were redistributed for the patients in the mild and moderate groups.

The expected lifetime disability costs per claimant were calculated as the actuarial present value (APV) of expected future benefits from STD and LTD insurance coverage. The projections are based on claim termination rates (i.e., recovery and mortality rates) from the "Nervous System" diagnosis category of the 2012 Group Long-Term Disability Valuation Table,[20] with MS-specific adjustment factors applied to reflect differences in morbidity between MS and the other conditions included in the Nervous System segment. Both the STD and LTD benefit projections are based on 60% income replacement and 2023 median household income by sex and age group[21] trended to 2024 dollars using the Consumer Price Index.[22]

The number of commercially insured patients with MS eligible for disability benefits was estimated based on the total number of working adults in the U.S. population[15] multiplied by the estimated prevalence of MS[14] in the commercially insured population with disability benefits.[16] Population disability costs due to MS were then estimated by applying the APV for both STD and LTD to this population.

Disability-related costs due to MS were calculated for a base case scenario as standard of care and as modeled under the following scenarios to estimate the potential impact of novel treatments that address the progression of disability:

1) **Reduced incidence of disability claim**. Based on clinical trial data[10] demonstrating reduced progression of disability impairment, we assumed a 70% reduction in the incidence rate of disability.

2) **Delayed disability (later age at disability claim).** The average age among patients with MS with mild disability impairment is approximately 45. It was assumed that a two-year delay would shift the age of disability onset to age 47.

3) **Improvement in recovery.** Also based on clinical trial data demonstrating improvement in disability impairment,[10] we assumed recovery rates were 35% higher than the baseline scenario in each year.

DATA SOURCES

Merative™ MarketScan® Commercial Claims Database and Health and Productivity Management (HPM) Database were used in this analysis.

The MarketScan® database contains historical commercially insured experience, and includes healthcare resource utilization and costs for inpatient, outpatient, and prescription drug service use of individuals nationwide for ~25 million commercially insured lives. The database also includes STD and LTD information for about 6 million employees.

The estimated costs were calculated based on claim termination rates from the 2012 Group Long-Term Disability Valuation Table. [20]

LIMITATIONS AND CAVEATS

The EDSS is a clinical tool used by neurologists to determine the extent of patient disability as well as progression or improvement of disability status. The EDSS was not intended for calculation based on retrospective claims data. Additionally, there is evidence that demonstrates that a claims-based algorithm used to approximate EDSS may underestimate those with more mild disability scores,[23] therefore we applied a literature-based estimate of the proportion of patients with MS that are expected to be classified as having a mild level of impairment. [19]

This analysis focused on quantifying disability-related costs to employers and did not include additional indirect costs to patients with MS, which may consist of formal or informal caregiving or other indirect costs such as transportation needs. The remaining cost burden is left to patients and caregivers. In addition, given that LTD benefits typically replace only 60% of employee income, disability often means substantial income opportunity loss and reduced retirement benefits.

The assumptions used in the modeling of the scenarios of reduced incidence of disability and improved recovery were based on clinical trial data,[10] and there may be limitations in applying assumptions from clinical trial data to real-world retrospective claims data. Real-world patients may experience different treatment patterns, disability recovery, or disability incidence from those observed in clinical trials. Moreover, clinical trial data estimated the reduced disability progression and

improved disability recovery based on clinical assessment, and we have applied these assumptions to estimate impacts on changes in disability claims and payment patterns.

Estimates of the potential reduction in disability-related costs to employers due to treatment relied on several sources in the public domain, including publicly available research conducted by Sanofi.[10] This analysis does not constitute an endorsement of any treatments for MS.

Differences between our estimates and actual amounts depend on the extent to which future experience conforms to the assumptions made for this analysis. It is certain that actual experience will not conform exactly to the assumptions used in this analysis. Actual amounts will differ from projected amounts to the extent that actual experience deviates from expected experience.

This analysis summarizes data among patients diagnosed with MS between 2019 and 2023 using Merative™ MarketScan® Commercial Claims Database and Health and Productivity Management (HPM) Databases, and therefore analyses of different years, data sources, or methodologies may produce different results. Data included in this analysis included administrative and disability claims data occurring during the SARS-COV-2 pandemic. Therefore, different study periods may produce higher or lower rates of disability. Additionally, we extrapolated findings based on the subset of patients that were linked to the HPM database. We observed a linkage rate of approximately 20%, therefore any outliers in this population could skew results. Not all employers offer LTD benefits, and some unemployed patients may be eligible for SSDI benefits based on their previous employment history.

Gabriela Dieguez, Prachi Bhatt, and Charmaine Girdish are employed by Milliman. The American Academy of Actuaries requires its members to identify their credentials in their work product. Gabriela Dieguez is a member of the American Academy of Actuaries and meets its relevant qualification requirements.

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