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The Economic Cost of Preventable Blindness: Projecting the Socioeconomic Burden of Diabetic Macular Edema in Chile

A. Atitallah[1], M. Müller[1], D. Lovera[1], C. Gejman[2], C. Esquivel[2], X. Paredes[2], J. Hidalgo[2], J. Altuna[2]

[1]WifOR Institute, Darmstadt, Germany
[2]Roche Chile, Santiago, Chile

Introduction

Diabetic Macular Edema (DME), a critical manifestation of Diabetic Retinopathy (DR), constitutes the primary cause of irreversible blindness in the working-age population worldwide. Its progression leads to severe long-term socioeconomic consequences, including reduced labor participation and increased healthcare costs. Given the sustained growth in Diabetes Mellitus (DM) prevalence in Chile, quantifying the Socioeconomic Burden (SoB) of DME is essential for effective strategic planning and resource allocation.

Objective

This study quantifies and projects the health and socioeconomic impact of DME in Chile for the 2017–2032 period, employing the methodology developed by the WifOR Institute, to inform effective public health policies.

Methods

The Socioeconomic Burden (SOB) aims to determine the cost that disease and disability exert upon the individual and society, considering health, social, and economic factors. There are two channels through which diseases can decrease productivity potential and thus wealth to the society:

1. Shortening life decreases the time to spend on paid and unpaid work.
2. Adverse effects on health decrease quality of life leading to lower working capability.

The SOB consists of two complementing viewpoints to assess the effects of diseases on health and economy: the Health Burden and the Socioeconomic Burden (figure 1).

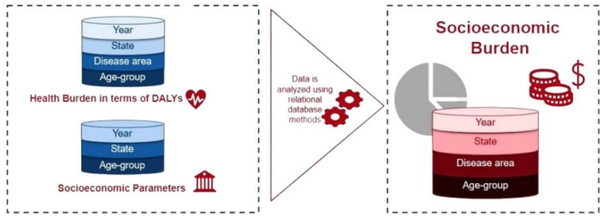

Figure 1: WifOR approach of socioeconomic burden of a disease.

To quantify the health burden of a disease in Chile, Disability Adjusted Life Years (DALYs) are used as health outcomes. It is assumed that one DALY equals one year of full disability and therefore a full year without working capability.

All four effects on productivity are captured for the Socioeconomic Burden of Diseases, namely direct paid, indirect paid, induced paid and unpaid work.

All four effects on productivity are captured for the Socioeconomic Burden of Diseases, namely direct paid, indirect paid, induced paid and unpaid work. For this, age-group-specific DALYs are extracted from the IHME and are monetised differently (Figure 3).

The result is expressed in monetary terms applying Gross Value Added (GVA) as a measure of labour productivity.

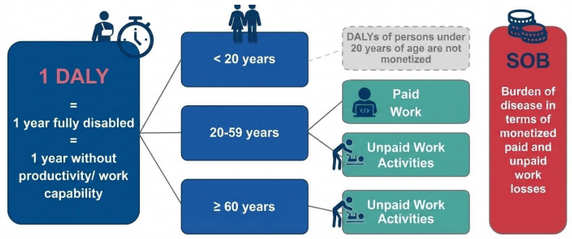

Figure 2: WifOR approach for monetisation of DALYs by different age groups.

Due to missing DME-specific Global Burden of Disease (GBD) data, DME DALYs were estimated by leveraging the DME/Age-Related Macular Degeneration (AMD) prevalence ratio multiplied by readily available AMD DALYs.

- Calculation of DME prevalences: $P_{DME,c,a} = P_{DM,c,a} * P_{DME|DM,c}$
- Calculation of DME/AMD prevalence ratio: $R_{DME|AMD,c,a} = \frac{P_{DME,c,a}}{P_{AMD,c,a}}$

Finally, the DME DALYs were estimated by multiplying the calculated prevalence ratios by the AMD DALYs for Chile.

$$DALY_{DME,c,a} = R_{DME|AMD,c,a} * DALY_{AMD,c,a}$$

Where:
$DALY$ = Disability-Adjusted Life Years
R = ratio
DME, c, a = DALY of DME in a specific country and age-group
$DME \mid AMD, c, a$ = DME to AMD ratio in a specific country and age-group
AMD, c, a = DALY of AMD in a specific country and age-group.

Results

The findings are structured into two distinct series: a retrospective evaluation based on published data (2017–2023), and a prospective forecast modeled within this study (2024–2032). From 2017 to 2023, DME resulted in a loss of 45,412 DALYs, associated with a socioeconomic impact of USD 1.1 billion.

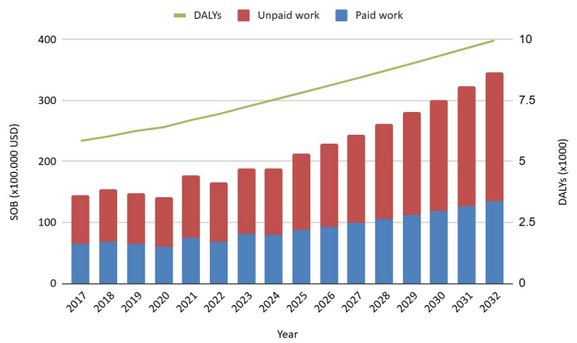

Figure 3: Economic impact (USD) and DALYs lost due to DME in Chile: 2017–2032 period.

Projections for 2024–2032 show 78,517 DALYs lost, associated with an impact of USD 2,387,636,160. Over the study period, a projected increase of 70% in DALYs and 140% in lost productivity is observed. Crucially, the socioeconomic burden analysis reveals that the majority of this overall economic toll (59%) occurs in the working-age population (20–59 years).

When categorized by work type, this profound productivity loss is composed of two main drivers: paid work (~39%), representing the disruption of the working-age population's participation in the formal labor market; and unpaid work (~61%), which consistently accounts for the largest overall share of the financial burden by impairing vital societal activities, such as household management and patient independence, across all adult age groups.

The cumulative productivity loss due to diabetic retinopathy between 2017 and 2023 represents approximately 0.054% of Chile's accumulated GDP over the same period.

Conclusion

The projected trajectory of DME in Chile reveals a macroeconomic threat, with a 140% projected increase in productivity loss, positioning it as an issue that extends far beyond clinical metrics. This burden has a "ripple effect" that strains informal carers, families, and social welfare systems. Therefore, these findings highlight the urgent need for a paradigm shift: the appropriate treatment of DME must be viewed as a strategic investment to protect Chile's human capital and a driver of economic growth, rather than an isolated cost.

By treating patients, Chile can prevent irreversible blindness, avoid premature retirement, and sustain the full economic potential of its diabetic population. To maximize this impact, it is imperative to implement comprehensive public policies focused on prevention, early detection, optimal management, and ensuring access to innovation, thereby safeguarding Chile's economic resilience and human capital.

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