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Invasive Meningococcal Disease Economic Burden: A Comprehensive Analysis

Langevin Edith¹, Lesage Henri¹, Juniper Melissa²

¹Sanofi Vaccines, Lyon, France. ²RTI Health Solutions, Research Triangle Park, North Carolina, USA

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INTRODUCTION

Invasive meningococcal disease (IMD) is a serious infection caused by *Neisseria meningitis*. The disease often has a rapid progression, with an 8–15% case-fatality ratio, and can cause long-term sequelae in 10-20% of survivors. Management of acute episodes, long-term complications, and outbreaks requires extensive public health and medical resources, representing a considerable economic burden. The objective of this study was to provide a comprehensive analysis of the associated costs.

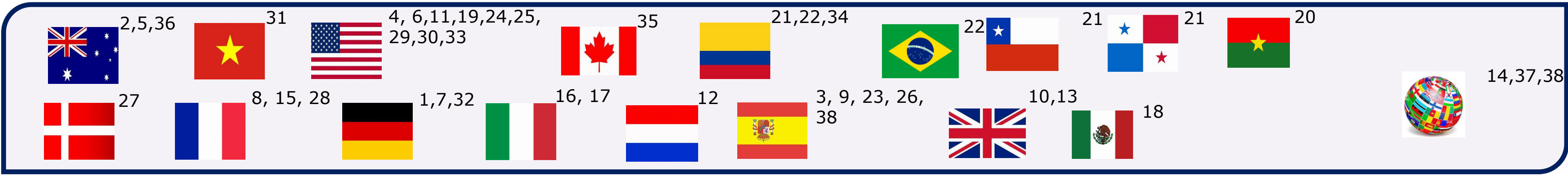
METHODS

A targeted literature review on the economic burden of IMD was performed. The search was conducted in PubMed, limited to articles published from 1 January 2000 to 9 December 2022, using key search terms related to IMD and economic burden. For level 1 screening, identified titles and abstracts were reviewed to determine eligibility for inclusion (based on inclusion and exclusion criteria). After this first selection, we conducted level 2 screening of the full-text articles to determine eligibility for inclusion. All costs were inflated to 2022 using consumer price index and converted to EUR.

RESULTS

After level 1 and level 2 screening, 38 references from the PubMed literature related to 17 countries were selected. The following cost categories were used: Acute phase; public health management; years following the diagnosis; and lifetime cost.

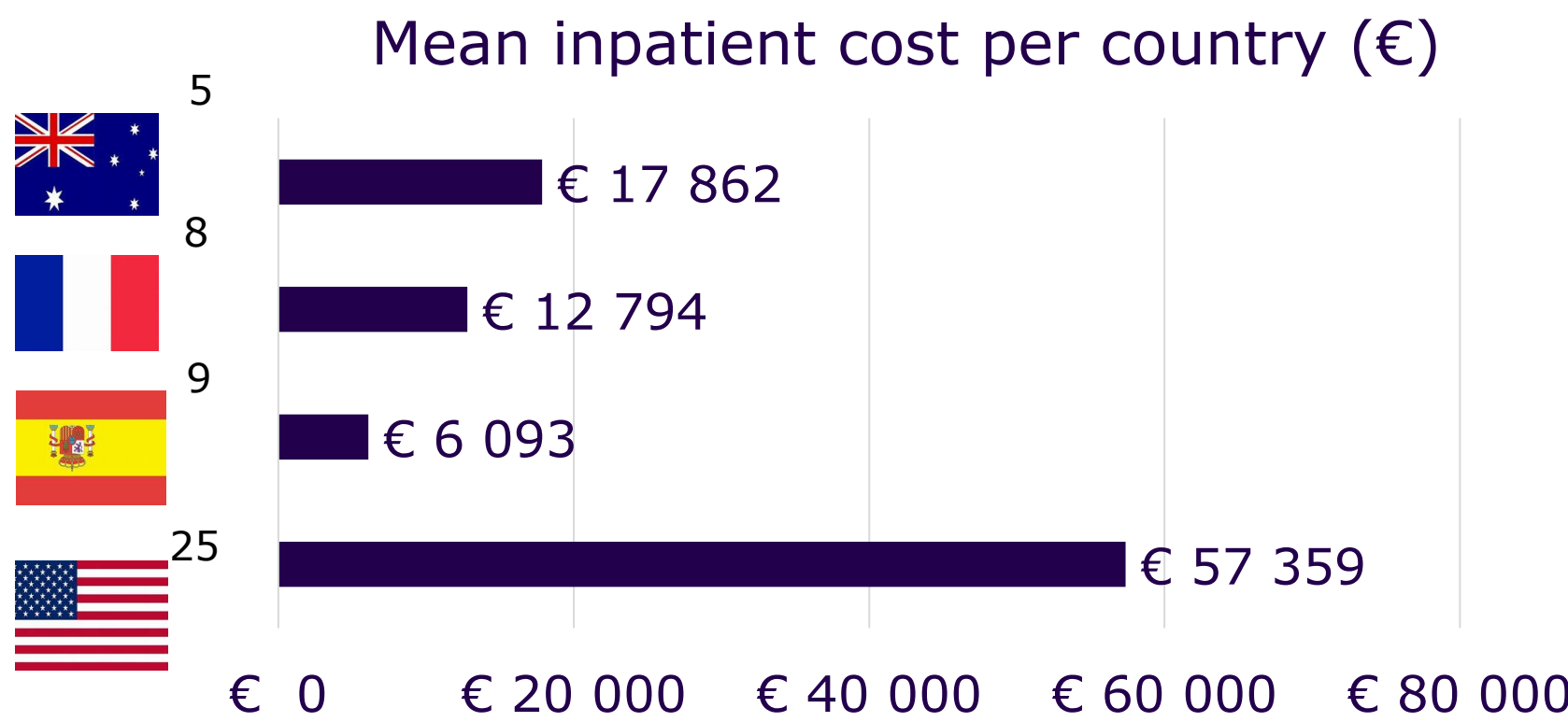
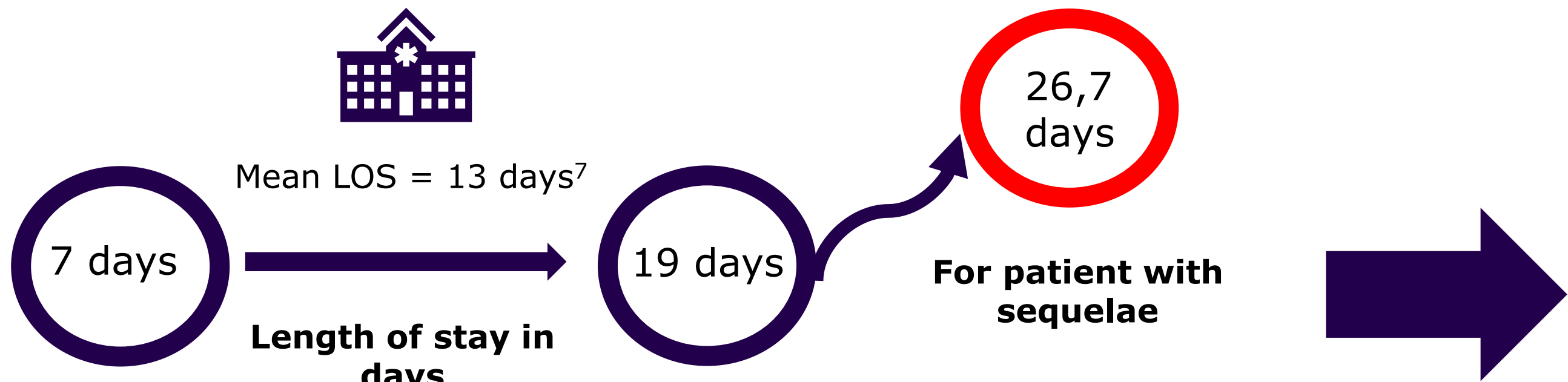
Data by country



Acute phase (inpatient costs and hospital service use)

During the acute phase of infection, patients are managed primarily in the hospital, often requiring long stays. Hospital length of stay (LOS) ranges from 7 to 19 days^{4-9,19,25,26,28,33} and could be up to 26.7⁶ days in those with sequelae.

The mean acute hospitalization costs per patient were reported in 31 articles^{1-12,15-19,21,23-29,31,33-35,37-38}. Heterogeneity between countries was observed as illustrated below. Inpatient costs were higher for those with sequelae than those without sequelae.

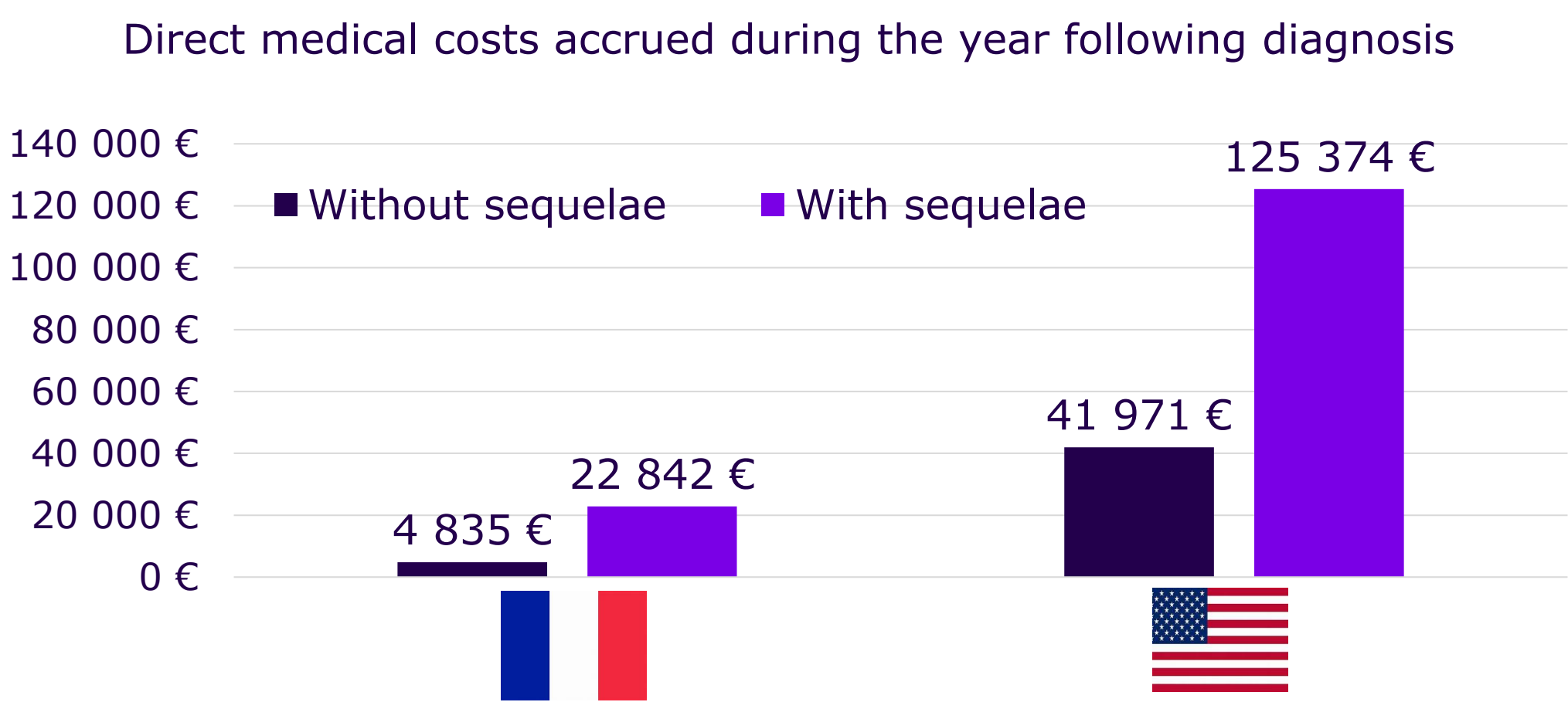


Public health management

Total public health costs associated with IMD outbreaks vary considerably by country^{13,14,16,20,22,30,32,34,36,38} and include reactive vaccination campaigns, case management, and other surveillance and response activities. The associated cost depends on the size of the outbreak, resources of the host country, and other factors. A study from Letouze et al. estimated that the cost of managing two cases was 17 times more than the cost of managing a single case.

Years following diagnosis (direct medical costs)

Most of the studies^{1-3,5-8,10-12,15,16,18,23,25,27,28,35,38} assessed the direct medical costs in the year following diagnosis. Costs were substantial and were higher in cases with sequelae compared to uncomplicated IMD cases.



Studies examining costs by sequelae found that patients with chronic renal failure, limb amputation, epilepsy, brain injuries are predicted to have high healthcare costs.

In a scientific literature review¹⁶ on disease burden, the following annual direct costs/case during long-term phase were reported:

- Severe skin damage: €1,276
- Amputation with substantial disability: €2,895
- Renal dysfunction: €5,106
- Severe neurological damage: €116,616

In a case-control study using French national public health insurance database⁸, the highest annual costs for the management of long-term sequelae were reported for:

- Skin scarring: €15,577
- Amputation: €19,005
- Renal disease: €10,361
- Mental retardation: €23,946

Lifetime costs

Two realistic scenarios of meningitis and septicemia with severe sequelae were developed in 3 countries^{10,15,23} to estimate the **lifetime cost of severe IMD cases**:

Costs ranged from **€925,546** to **€2,316,620**.

4 studies^{1,2,3,12} evaluated the **lifetime cost per case** of IMD using a model-based approach:

An Australian study estimated the total lifetime cost per patient including direct medical, non-medical and indirect costs at **€52,945**.

Three EU studies estimated the total lifetime cost per patient, which ranged from **€105,442** to **€204,894**

Productivity losses and sequelae-related costs are the main drivers of the overall cost of IMD

CONCLUSIONS

Costs associated with IMD vary according to a number of factors, including the clinical presentation of the acute event and the type of long-term sequelae that patients present. IMD costs also vary across countries based on the availability of public health resources, the medical health system structure, and other resources available. There is substantial heterogeneity across countries in these variables. Finally, the extent of the economic burden differs according to the perspective adopted (either the healthcare system or society). Understanding IMD burden and its broad economic impact (beyond direct medical costs and healthcare perspective) enabled informed decision-making when establishing healthcare priorities.

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CONFLICTS OF INTEREST:

Langevin E, Lesage H: Sanofi — employee, may hold stock and/or stock options in the company.

Juniper M: RTI Solution — salaried employees; received professional service fees from Sanofi for conducting this research.