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Burden of Dengue Fever and Its Economic and Social Impacts Worldwide: A Systematic Review

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ABSTRACT

Objectives: This study aimed to investigate the social and economic impacts and disease burden of dengue fever globally through a systematic literature review. **Methods:** We performed a comprehensive literature search through MEDLINE (via PubMed), LILACS, EMBASE, Web of Science, and grey literature, including studies of populations diagnosed with dengue fever or at risk of infection published in English, Spanish, French, or Portuguese, without date restrictions. Two reviewers independently performed study selection, data extraction, and quality assessment. Methodological quality was assessed using different tools. **Results:** Seventy-eight publications were included. Until 2010, publications originated solely from the Asian and American continents. From 2015 onwards, South America and Southeast Asia emerged as the predominant sources. Publications were classified as cost studies (48), including cost-of-illness (42) and program cost (6); burden of disease studies (18); cost-outcome studies (8), including cost-effectiveness (6) and cost-utility (2); and quality-of-life studies (12). Reported total direct costs associated with dengue fever ranged from US$15.0 per outpatient case (Burkina Faso) to US$8.9 billion globally (2013). Direct medical costs varied from US$4.35 per outpatient case (China) to US$9,386.1 per ICU patient (Mexico). Vector control program costs ranged from US$888,000 annually (Greece, 2013–2017) to US$466 million (Brazil, 2016). Estimated disability-adjusted life years per 100,000 population ranged from 24.3 (Cambodia, 2008) to 3,267.6 (Paraguay). Quality-of-life studies demonstrated substantial declines across multiple domains, indicating significant functional impairment due to dengue fever. **Conclusion:** Dengue fever imposes a considerable economic and social burden, representing one of the most significant arboviral diseases globally. These findings underscore the need for further research to accurately quantify the full scope of dengue fever-related costs and impacts on affected populations.

1. Introduction

Dengue fever (DF) is an arboviral disease caused by the dengue virus (DENV), a flavivirus that belongs to the Flaviviridae family. The DENV has four distinct serotypes: DENV-1, DENV-2, DENV-3, and DENV-4 [1]. The virus is primarily transmitted to humans by infected female mosquitoes of the Aedes genus. Aedes aegypti is reported as the primary vector in urban outbreaks and epidemics, operating through the mosquito–human–mosquito transmission cycle, while Aedes albopictus serves as a secondary vector.

From the 1960s to the 2010s, a dramatic shift in the status of dengue was observed. The disease transitioned from a sporadic, self-limiting febrile illness confined to Southeast Asia to one of the most rapidly spreading mosquito-borne viral diseases globally. Due to its explosive potential for causing large-scale outbreaks and epidemics, combined with the widespread distribution and adaptation of its vector across all continents, dengue has emerged as a significant international public health concern. In a globalised context, infected travellers play a critical role in introducing the virus to previously unaffected areas. Additionally, urbanisation, climate

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change, and inadequate vector control have markedly enhanced the transmission efficiency of the virus [2][3].

Since the 2000s, dengue outbreaks have been reported across nearly all continents. These include Africa, the Americas, Asia, Europe, and islands in the Indian and Pacific Oceans. Globally, between 2000 and 2024, reported cases increased tenfold. They rose from 0.5 million in 2000 to 6.5 million in 2019, with further increases observed in subsequent years. The World Health Organization (WHO) estimates that approximately 40% of the global population (about 3.9 billion people) is at risk of dengue infection. An estimated 100–400 million infections occur annually.

Despite its relatively low case fatality rate (less than 1% with proper case management), the expansion of the disease raises concerns. These concerns include underreporting of cases and deaths, as well as the increasing severity of the disease in its severe forms. These severe forms include dengue haemorrhagic fever (DHF) and dengue shock syndrome (DSS) [4]. In this context, clinical manifestations previously considered rare are now being observed more frequently. Post-dengue sequelae, including chronic fatigue and long-term disability, significantly impair quality of life (QoL). This impairment is particularly notable among children and the elderly [5].

Outbreaks, epidemics, or sustained transmission impose significant economic and social burdens. These burdens affect individual and collective health, as well as healthcare systems and services. Despite this, dengue remains largely neglected in terms of comprehensive economic evaluation. Studies on the economic and social impacts of the disease, while growing, remain insufficient relative to its global burden. The economic impacts of a disease comprise direct, indirect, and intangible costs [6]. Direct costs are those associated with healthcare expenditures. They can be further classified into healthcare (medical) and non-healthcare (non-medical) costs. Indirect costs are related to productivity losses, absenteeism, or premature death. In contrast, intangible costs refer to losses in QoL due to pain, suffering, or social exclusion resulting from the disease [7].

This study aimed to investigate the social and economic impacts and disease burden of sustained transmission, outbreaks, and epidemics of dengue fever worldwide through a systematic literature review.

2. Materials and methods

2.1. Study Design and Registration Protocol

This study is a systematic literature review. A descriptive approach was employed following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines [8]. Ethics approval was not required for this study, as it was based exclusively on the analysis of publicly available published data.

2.2. Research Question

The study was guided by the following research question: ‘What is the social and economic impact, as well as the impact in disability-adjusted life years (DALYs) and quality-adjusted life years (QALYs), of sustained transmission, outbreaks, and epidemics of dengue fever worldwide?’

2.3. Eligibility Criteria

We included primary studies on health economic evaluation, cost-of-illness analyses, program cost assessments, studies assessing the burden of the disease, and qualitative investigations focused on social and economic losses. Eligible studies had to report at least one of the following outcome measures:

- Disability-Adjusted Life Years (DALYs): expresses years of life lost to premature death and years lived with a disability of specified severity and duration. It is calculated as follows: DALY = YLL + YLD [9][10].
- Years of life lost due to premature mortality (YLLs): quantifies the years of potential life lost due to premature death. It is calculated by multiplying the number of deaths at each age by the standard life expectancy remaining at that age.
- Years lived with disability (YLDs): quantifies the impact of non-fatal health outcomes by estimating the years lived with reduced health status as a result of disease or injury. It is calculated by multiplying the prevalence of a condition by a disability weight, which reflects the severity of the health loss, and by the average duration of the condition.
- Quality-adjusted life-year (QALYs): quantify the total amount of quality-adjusted health an individual experiences over a given period. One QALY represents 1 year lived in perfect health or in a state perceived by the individual as equivalent to full health.
- Direct costs: refer to expenditures associated with patient care and can be categorised into two components: direct medical costs and direct non-medical costs.
- Direct medical costs: include costs directly attributable to the primary disease, as well as those associated with comorbid conditions arising from the disease itself or its treatment. These include consultations, hospitalisations, medications, and diagnostic procedures including specific laboratory tests.
- Direct non-medical costs: refer to expenses arising from illness that are not directly tied to the provision of medical services or treatments. These include accommodation, caregiver expenses, and related expenditures.
- Indirect costs: represent costs related to productivity loss due to illness, including lost income from work absenteeism.
- Costs related to vector prevention and control: include all expenditures aimed at reducing or interrupting the transmission of vector-borne diseases.
- Catastrophic health expenditures: occur when out-of-pocket health expenditures surpass a defined proportion of household income and its capacity to pay, leading to financial hardship or risk of impoverishment [11][12].

Inclusion and exclusion criteria for study selection were defined a priori and applied systematically. Eligible studies comprised national and international publications, indexed from the inception of each database through December 31, 2024, and published in English, Spanish, French, or Portuguese. Review articles, opinion pieces, short communications, and experimental studies were excluded from the analysis.

2.4. Search Terms and Strategies

Search terms were identified through iterative pilot searches. These informed the development of search syntaxes incorporating terms and keywords that maximised search sensitivity [13]. The original search strategy was developed for the MEDLINE database (via PubMed) and subsequently adapted for use in the following databases: EMBASE, accessed through the Coordination for the Improvement of Higher Education Personnel—CAPES/MEC Portal; LILACS, accessed via the Virtual Health Library (Biblioteca Virtual em Saúde, in Portuguese); and Web of Science.

2.5. Selection and Screening of Publications

Systematic searches across the selected databases were initially conducted on December 31, 2023, and updated in March 2025. Metadata from the retrieved publications were exported to Mendeley. This software was also used to identify and remove duplicate records. Following de-duplication, two independent reviewers (V.D.P. and V.B.R.) screened the titles and abstracts of the publications using Rayyan. Rayyan is a web-based application designed to support systematic reviews. The reviewers independently selected studies that aligned with the scope of the research question based on the relevance of their reported outcomes.

Two reviewers (V.D.P. and V.B.R.) independently conducted full-text screening to determine which studies met the inclusion criteria for this systematic review. Reviewer discrepancies were resolved through discussion and consensus at both stages of the selection process. In cases where disagreement persisted, a third reviewer (M.R.F.d.O.) was consulted to provide arbitration and make the final decision regarding study inclusion.

A complementary search was also conducted to identify relevant publications within the grey literature. This search included thesis and dissertation databases from CAPES/MEC, the University of Brasília (UnB), and the University of São Paulo (USP), using the keyword 'dengue'. No filters related to study type were applied during this search. Two independent reviewers (V.D.P. and V.B.R.) also screened and selected grey literature publications.

Additionally, the reference lists of key systematic reviews and meta-analyses were screened. This ensured that all relevant studies had been captured by the initial database search.

2.6. Data Extraction and Analysis

Metadata from the included studies were recorded in duplicate using a pre-defined data extraction framework. Data synthesis was conducted following the Methodological Guidelines for Economic Evaluations published by the Brazilian Ministry of Health. The following variables were extracted from each study: study location, geographic scope, healthcare setting (public/private), study period, type of study and evaluation, target population and its characteristics, sample size, analytical perspective, time horizon, cost data, YLL, YLD, disability weights, DALYs, QALYs, and the type of QoL instrument used. Studies that assessed multiple outcomes were classified into all relevant analytical categories.

To facilitate cost comparisons across different currencies, all monetary values were converted to US dollars (USD) based on the exchange rate as of July 1st of the respective year of data collection [14]. For studies covering multiple years, values were converted based on the midpoint year of the study period.

The cost estimation methodology proposed by Silva et al. was adopted to analyse and classify healthcare costs. This methodology follows six key steps: (i) definition of the study perspective; (ii) determination of the time horizon; (iii) identification of costs; (iv) measurement of costs; (v) selection of the method for cost valuation; and (vi) temporal adjustments.

2.7. Quality Assessment

We applied the following tools to assess the methodological quality of the selected publications: 'Economic Evaluation of Health Technologies: A Critical Review Framework'; 'Checklist for Analytical Cross-Sectional Studies – Critical Appraisal Tools for Use in JBI Systematic Reviews'; and 'A Consensus-Based Checklist for the Critical Appraisal of Cost-of-Illness (COI) Studies' [15][16][17].

Studies were categorised based on quality score ranges as follows: high (80%–100%), medium-high (60%–79%), medium-low (40%–59%), or low (<40%). These checklists outline the minimum set of information that should be provided in each category when reporting evaluation studies. They assist in assessing the publications' reliability, relevance, and key findings.

3. Results

3.1. Study Selection

A total of 2,847 records were identified across the four databases searched. After removing duplicate publications (n = 487), 2,360 records were screened based on title and abstract to assess their eligibility according to the inclusion criteria. Of these, 2,156 were excluded. The full text of the remaining 204 publications was reviewed, and 142 articles were included in this review. Sixty-two publications were excluded because they did not meet the eligibility criteria regarding publication type (n = 18), study design (n = 12), population studied (n = 8), or were out of scope (n = 24).

The screening of the reference lists of key systematic reviews and meta-analyses, and the search of the grey literature, yielded 612 records related to the search term 'dengue'. Of these, 498 were retrieved from the CAPES/MEC portal, 67 from the University of Brasília (UnB) thesis and dissertation database, 28 from the University of São Paulo (USP) database, and 19 through citation searching. After removing 78 duplicate publications, 534 were screened based on their title and abstract. Of these, 512 were excluded for not meeting the eligibility criteria, and one publication was excluded because it was not publicly available. Twenty-two publications were reviewed in full, of which 20 were included in this review and 2 were excluded for not meeting the inclusion criteria.

In total, 78 publications were included in this systematic review: 42 from database searches and 36 from grey literature and citation searching (Figure 1).

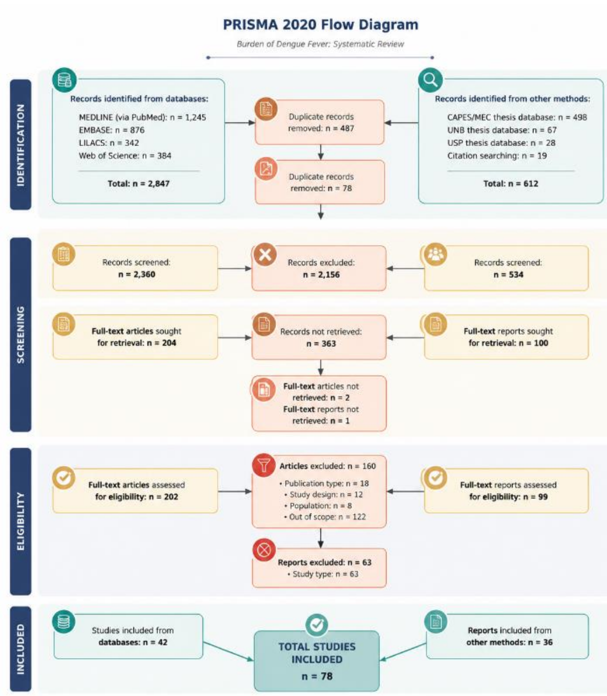

Fig.1 - Flowchart of the selection process for the systematic review of the economic and social impact of dengue fever.

3.2. Characteristics of the Selected Studies

Seventy-eight publications were included in this systematic review, spanning 24 years from 2001 to 2024 . Most studies (71.8%) were published from 2015 onwards. Until 2010, all published studies originated exclusively from the Asian and American continents, accounting for 58.2% and 41.8%, respectively. From 2015 onwards, South America and Southeast Asia emerged as the continents with the highest concentration of publications. The geographical distribution of studies was determined based on the origin of the data analysed [18][19][20]. Most published studies originated from Asia (38.5%), followed by the Americas (35.9%), Europe (15.4%), and Africa (10.2%).Regarding the country of origin, Brazil (14 studies), India (11), Thailand (8), Colombia (7), Mexico (6), and Cambodia (5) accounted for 64.1% of the publications included [21][22]. Approximately 62.8% of the studies used data from the public health sector as their primary source [23][24], while 32.1% adopted a mixed (public and private) approach. Most analyses were conducted using data at the local or national level, with 28 studies (35.9%) at the local level and 26 studies (33.3%) at the national level (Table 1).

Forty-eight cost studies were included, of which 42 assessed the cost of dengue fever, and 6 reported programme costs. Among the cost-of-illness studies, 35 estimated direct medical and non-medical costs, while 38 reported on indirect costs. In addition, 14 (17.9%) of the 78 reviewed studies estimated the economic impact of dengue fever at the family level and patients' out-of-pocket expenses. The costs encompassed expenditures related to medical care, diagnosis, follow-up during dengue treatment, resources spent on vector control, and income loss due to absenteeism. Ten studies focused on out-of-pocket expenses, while 4 estimated catastrophic costs.

Table 1 - Distribution of studies included in the systematic review according to the geographical origin of the data studied, type of evaluation, and other characteristics (n = 78).

Features	n	%
Publication year		
2001–2005	4	5.1
2006–2010	12	15.4
2011–2015	22	28.2
2016–2020	28	35.9
2021–2024	12	15.4
Continent of origin		
Africa	8	10.2
Americas	28	35.9
Asia	30	38.5
Europe	12	15.4
Country (top 10)		
Brazil	14	17.9
India	11	14.1
Thailand	8	10.3
Colombia	7	9.0
Mexico	6	7.7
Cambodia	5	6.4
Sri Lanka	4	5.1
Indonesia	4	5.1
Vietnam	4	5.1
Bangladesh	3	3.8
World Bank Classification		
Low-income	3	3.8
Lower middle-income	28	35.9
Upper middle-income	35	44.9
High-income	12	15.4
Classification based on analytical approach		
Cost studies		
Cost-of-Illness	42	53.8
Program cost	6	7.7
Burden-of-disease studies	18	23.1
Cost-outcome studies		
Cost-effectiveness	6	7.7
Cost-utility	2	2.6
Quality-of-Life studies	12	15.4
Scenario		
Private	2	2.6
Public	49	62.8
Public and private	25	32.1
Coverage		
Local	28	35.9
Municipal	8	10.3
State	10	12.8
National	26	33.3
Regional	4	5.1
Continental	2	2.6
Quality Assessment		
Cost studies		

Features	n	%
Medium-high	26	54.2
High	22	45.8
Cost-outcome studies		
Medium-high	4	50.0
High	4	50.0
Quality-of-Life studies		
Medium-high	2	16.7
High	10	83.3

Note: The World Bank divides economies into income groups according to 2023 gross national income (GNI) per capita, calculated using the World Bank Atlas method [21][22].

3.3. Cost-of-Illness Studies

3.3.1 Direct Medical and Non-Medical Costs

Direct costs associated with patient care were the primary cost components estimated in 35 studies [25][39]. These included medical costs, such as medical consultations, hospitalisations, laboratory and imaging tests, and pharmaceuticals. They also included non-medical costs, such as transportation, accommodation, and expenses for accompanying persons (Table 2).

Global estimates: Shepard et al. (2016) estimated the total annual global aggregate cost of dengue illness at US$8.9 billion in 2013 [20]. This was based on 58.4 million global dengue cases. Of these, 10.5 million were treated in hospital settings, 28.1 million in ambulatory settings, and 19.7 million remained outside the healthcare system. The cost composition was: 46.0% from non-fatal cases admitted to hospital, 33.6% from non-fatal ambulatory cases, 18.4% from non-medical settings, and 2.0% from fatal cases.

Regional and country-level estimates:

- **Southeast Asia:** Shepard et al. (2013) estimated the economic and disease burden of dengue in Southeast Asia [5]. The DALY burden per million inhabitants in the region was higher than that of 17 other conditions. These included Japanese encephalitis, upper respiratory infections, and hepatitis B.
- **Latin America and the Caribbean:** The economic impact of dengue in this region has been extensively studied. About 60% of dengue fever costs for the region are the result of indirect costs. These are expressed in the loss of productivity due to non-fatal dengue cases. In Nicaragua, lost DALYs ranged from 99 to 805 per million inhabitants. In Colombia, they ranged from 83 to 199. In Mexico, the figure was 65 per million inhabitants.
- **Puerto Rico:** Halasa et al. (2012) estimated the economic cost of dengue in Puerto Rico [30], where dengue is endemic. The annual economic cost was US$46.45 million (US$12.47 per capita). Work absenteeism because of a dengue episode exceeded the absenteeism for an episode of influenza or acute otitis media.
- **Paraguay:** Lovera et al. estimated the unit cost per ambulatory case at US$52.5 and for hospitalised patients at US$300 [28]. Total costs for a 4-year period were US$276,804.86 and US$23,236.45, respectively. DALYs were estimated at 32,676 years per million inhabitants.
- **Cambodia:** Beauté and Vong (2010) estimated the mean cost per dengue case varying from US$36 to US$75 over 2006–2008 [27]. This resulted in an overall annual cost from US$3,327,284 in 2008 to US$14,429,513 during a large epidemic in 2007. Patients sustained the highest share of costs by paying an average of 78% of total costs and 63% of direct medical costs. DALY rates per 100,000 individuals ranged from 24.3 to 100.6 in 2007–2008, with 80% on average due to premature mortality.
- **Colombia (Meta State):** The burden of dengue in the State of Meta showed a high economic burden. Costs ranged from USD 204,819,006 in 2011 to USD 1,615,456,216 in 2013. There were 170,337 DALYs lost per year. These were mainly caused by hemorrhagic cases and long periods of hospitalisation.
- **India:** A retrospective study conducted among 220 dengue patients admitted between June 2018 and December 2019 found the median total direct medical cost was US$119.29. Laboratory charges incurred 34.02% of the total cost, consultation charges 17.18%, and medication charges 14.72%.
- **China (Hainan):** Li et al. (2026) assessed the disease and economic burden of dengue fever patients in Hainan Province in 2019. The average DALY burden was 0.03 person-years. The median total economic burden was 1,822.11 yuan, with direct economic burden at 1,513.03 yuan and indirect economic burden at 219.28 yuan. The estimated economic cost per DALY was 59,182.39 yuan.
- **Pakistan:** Multiple studies have documented that dengue causes substantial medical costs and productivity losses. These particularly impact low socio-economic populations through out-of-pocket health expenditure.

Table 2 -- Summary of direct medical and non-medical costs reported in included studies by region.

Region/Country	Study Period	Outpatient Cost (USD)	Inpatient Cost (USD)	ICU Cost (USD)	Key Cost Drivers
Africa					
Burkina Faso	2015	15.0	30.1	—	Direct medical

Kenya	2015	84.3	—	—	Direct medical
Americas					
Brazil	2015	128.0	275.6	—	Productivity
Colombia	2014	128.0	562.2	—	Productivity
Mexico	2015	105.3	1,855.3	9,386.1	Direct medical
Peru	2015	—	—	—	Productivity
Puerto Rico	2010	—	—	—	Indirect (60%)
Paraguay	2010–2014	52.5	300.0	—	DALYs 32,676/million
Southeast Asia					
India	2018–2019	23.9	100.9	—	Laboratory (34%)
Indonesia	2015	42.3	435.9	—	Direct medical
Thailand	2015	40.8	263.0	—	Productivity
Sri Lanka	2015	—	255.0	—	Direct medical
Bangladesh	2015	329.9	—	—	Direct medical
Western Pacific					
China	2019	4.4	—	—	Productivity
Vietnam	2015	70.4	985.4	2,185.7	Direct medical
Philippines	2015	—	78.2	—	Direct medical
Eastern Mediterranean					
Pakistan	2015	191.7	—	—	Direct medical

Note: All costs are reported in 2023 USD values. — indicates data not reported or not applicable.

3.3.2 Indirect Costs: Productivity Loss

Thirty-eight studies estimated the indirect costs. These resulted from absenteeism and reduced work performance due to the morbidity and mortality associated with dengue fever. The number of workdays lost due to dengue varied widely across studies, ranging from 3 days to 28 days per episode.

In the Americas, Shepard et al. (2011) estimated that about 60% of dengue fever costs for the region were the result of indirect costs. These were expressed in the loss of productivity due to non-fatal dengue cases. The estimated economic losses at country level varied significantly.

In Cambodia, patients sustained the highest share of costs. Productivity losses represented a substantial proportion of total costs during epidemic years. In Paraguay, indirect costs contributed significantly to the total economic burden. This was particularly through lost workdays and reduced economic output.

In Puerto Rico, work absenteeism because of a dengue episode exceeded the absenteeism for an episode of influenza or acute otitis media. This highlights the significant productivity impact of the disease.

In Burkina Faso, the average productivity loss per case was US$5.78 for outpatients and US$6.93 for inpatients. In Colombia, productivity losses were the main driver of total costs, reaching US$79.40 per outpatient case and US$107.74 per inpatient case.

3.4. Program Cost

Six studies reported program costs related to surveillance, prevention, and vector control. The national cost of vector control programmes was estimated by several studies. These varied significantly by country and region.

In Southeast Asia, vector control program costs represent a substantial proportion of public health expenditure in endemic countries. In Latin America, Brazil reported vector control program costs of US$466 million in 2016. Greece estimated annual costs of US$888,000–1,476,300 (2013–2017).

In Ecuador, the median household expenses related to the acquisition of mosquito control products in areas infested with Aedes aegypti were US$2.00 per week. The study showed that families in low-income communities spent more than 10% of their discretionary household income on interventions related to mosquito-borne diseases.

In Italy, Canali et al. evaluated the expenditure on a vector control programme in the Emilia-Romagna region during 2008–2011. They reported an annual expenditure of approximately US$1.63 per inhabitant. This decreased from US$2.97 in 2008 to US$1.75 in 2011.

In Colombia, Salinas-López et al. evaluated the vector-borne disease control programmes in the municipalities of Girón and Guadalajara de Buga in 2016. They estimated total costs of US$146,651 (US$0.88 per capita) in Girón and US$97,936 (US$0.99 per capita) in Guadalajara de Buga. These were comprised mainly of expenses with personnel and chemical products.

3.5. Burden of Disease Studies

Eighteen studies assessed the burden of dengue through DALYs. Most studies were carried out in Asia and the Americas. Several studies presented estimates of DALYs per 100,000 population or per million inhabitants attributable to dengue fever.

Key findings:

- **Global:** Stanaway et al. (2016) estimated 1.14 million DALYs lost worldwide due to dengue.
- **Paraguay:** DALYs were estimated at 32,676 years per million inhabitants. YLL was at 18,469.7 per million and YLD at 185,835 per million.
- **Cambodia:** DALY rates per 100,000 individuals ranged from 24.3 to 100.6 in 2007–2008, with 80% on average due to premature mortality.
- **Colombia (Meta State):** 170,337 DALYs lost per year, mainly caused by hemorrhagic cases.
- **Nicaragua:** Lost DALYs ranged from 99 to 805 per million inhabitants.
- **Americas:** Shepard et al. (2011) estimated lost DALYs for all regions along the continent. The burden of disease differed between countries according to: (a) the number of people infected; (b) the medical costs in each system; and (c) the economic potential of each citizen relative to the national GDP.
- **Southeast Asia:** The DALY burden per million inhabitants in the region was higher than that of 17 other conditions. These included Japanese encephalitis, upper respiratory infections, and hepatitis B.
- **China (Hainan):** The total DALY burden of dengue cases in Hainan Province in 2019 was 11.33 person-years, with an average DALY burden of 0.03 person-years per patient.
- **Brazil:** Vidal et al. estimated the national burden of dengue in 2016–2017. They reported average values of 77,422.61 DALYs (0.3757 DALYs per 1,000 inhabitants) for 2016, and 59,307.59 DALYs (0.2856 DALYs per 1,000 inhabitants) for 2017.

Table 3 -- Summary of DALY estimates reported in included studies by region.

Region/Country	Study Period	DALYs per 100,000	YLL per 100,000	YLD per 100,000	Main Driver
Global	2013	—	—	—	1.14 million total
Africa					
Burkina Faso	2015	—	—	—	Limited data
Americas					
Brazil	2016–2017	37.6	—	—	Acute phase (89%)
Colombia (Meta)	2010–2016	25,909.7	—	—	Hemorrhagic cases
Colombia (national)	2010–2012	119.9	—	—	National estimate
Mexico	2015	6.5	—	—	National estimate
Nicaragua	1996–2010	9.9–80.5	—	—	Epidemic variation
Paraguay	2010–2014	3,267.6	1,846.9	18,583.5	Highest reported
Puerto Rico	1984–1994	93.3	—	—	Epidemic years
Southeast Asia					
Cambodia	2006–2008	24.3–100.6	—	—	Premature mortality (80%)
India	2006	4.5	—	—	Lowest reported
Thailand	2001	13.9	—	—	National estimate
Western Pacific					
China (Hainan)	2019	3.0	—	—	Per patient average
Vietnam	2015	—	—	—	Limited DALY data

Note: All DALY rates are standardised per 100,000 population where reported. — indicates data not reported or not applicable.

The earliest published burden of disease studies were conducted in Southeast Asia and the Americas during major outbreaks. When comparing the burden of vector-borne diseases, dengue consistently ranks among the highest burden arboviral diseases globally.

3.6. Cost-Outcome Studies

Eight publications in this review were cost-outcome studies of various preventive or control interventions for DENV and its vector. These studies were conducted in various countries and employed different methodological approaches.

- **Vaccination:** Immunization was found to be the most cost-effective intervention at US$2,435 per DALY averted. This compared to US$3,368 per DALY averted for vector control of adult A. aegypti, and US$6,883 per DALY for combined immunization, case management, and environmental control. The incremental cost-effectiveness ratio for a dengue vaccine in Southeast Asia was estimated at US $62.47 perDALYsaved (in 2011 US)$. This is comparable to most favorable public health programs for children.
- **Vector control:** In Italy, routine larvicide-based prevention in municipalities with fewer than 35,000 inhabitants effectively reduced mosquito populations. A single, well-timed larvicide application was projected to reduce local dengue transmission risk. Cost-effectiveness ratios varied by intervention type and setting.
- **Integrated approaches:** In Colombia, studies evaluated the cost-effectiveness and incremental benefits of indoor residual insecticide spraying. This was in reducing clinical dengue cases and DALYs in endemic areas. Modelling results suggested that insecticide use is a cost-effective strategy for dengue prevention.

3.7. Quality-of-Life Studies

Twelve studies evaluated the impact of dengue fever on patient functionality and QoL domains. These investigations were conducted across multiple countries, mostly in Asia and the Americas. Most studies focused on populations across various age groups, with significant impact observed in children and working-age adults.

Regarding the timing of functionality and QoL assessments, the studies evaluated the acute, post-acute, and chronic phases of the disease. Several studies employed the Short Form Health Survey (SF-36). Others adopted various validated tools including the WHO Quality of Life questionnaire (WHOQoL-bref) and disease-specific instruments.

The findings demonstrated marked impairments in the physical and mental domains during the acute phase of illness. Furthermore, post-dengue sequelae, including chronic fatigue and long-term disability, were identified as contributors to greater functional impairment. Studies have increasingly reported long-term post-viral effects, such as chronic fatigue syndrome and depression. These significantly impact quality of life beyond the acute illness period.

In endemic settings, dengue predominantly affects urban poor populations. These populations have limited access to amenities that may prevent indoor mosquito biting, such as air conditioning and screening of windows and doors. This social dimension further compounds the quality-of-life impact of the disease.

3.8. Methodological Quality Assessment of the Studies

Among the 48 cost-of-illness and burden-of-disease studies, 54.2% were classified as having medium-high methodological quality. Meanwhile, 45.8% were rated as high quality. Of the 8 cost-outcome studies, 4 were classified as having high methodological quality, and 4 as medium-high quality. Finally, among the 12 QoL studies, 83.3% were considered to have high methodological quality, and 16.7% as medium-high quality.

4. Discussion

As of 2025, dengue has been identified in over 129 countries and territories across Asia, Africa, Europe, and the Americas. All regions with established populations of Aedes aegypti or Aedes albopictus mosquitoes have reported local DENV transmission via mosquito vectors. The majority of research on dengue has been conducted since the year 2000. A substantial body of literature emerged in response to major outbreaks in Southeast Asia, the Americas, and the Indian subcontinent.

Despite the increasing body of scientific literature on dengue fever, the number of studies retrieved in this review (n = 78) does not appear to adequately reflect or document the disease's true relevance in terms of its economic and social impact. We acknowledge the existence of previously published systematic reviews that addressed topics closely related to those examined in the present review. In 2016, Stanaway et al. published the Global Burden of Disease Study 2013 analysis of dengue. Shepard et al. (2016) conducted a systematic analysis of the global economic burden of dengue. More recently, a systematic literature review of dengue cost-of-illness studies was conducted in 2025. This identified 56 studies and revealed significant variations in costs across countries. Additionally, Oliveira et al. (2019) conducted a systematic review of dengue cost-of-illness and program cost studies, identifying 22 studies.

Our review expands upon previous systematic reviews in several important ways. First, we included a broader range of study types. While previous reviews focused primarily on cost-of-illness studies, we also included burden-of-disease studies, cost-outcome studies, and quality-of-life studies. This provides a more comprehensive picture of the multifaceted impacts of dengue fever.

Second, we incorporated grey literature from multiple sources. This included thesis and dissertation databases from Brazil, which previous reviews largely excluded. This approach strengthened the evidence base, particularly for Latin American countries where published economic evaluations remain limited.

Third, we included studies published in multiple languages (English, Spanish, French, and Portuguese). This allowed us to capture important studies from Latin America and Francophone Africa that may have been missed by English-only searches. As a result, our review identified 20 additional studies not captured by previous systematic reviews.

Fourth, our temporal scope was broader. We included studies from 2001 to 2024, capturing the recent surge in dengue cases associated with climate change and urbanisation. This is particularly important given the increasing frequency and intensity of dengue outbreaks in previously non-endemic areas.

The rising number of dengue cases and their consequences have led to the designation of DENV as a priority pathogen and a threat to global public health. This is particularly relevant in the context of climate change and globalisation. It is estimated that approximately 100–400 million dengue infections occur annually, with about 40% of the global population at risk. The clinical burden of the disease and its long-term implications are likely to impose a substantial economic burden on affected households, health systems, and local and national economies.

Dengue represents one of the most significant economic impacts among arboviral diseases globally. In 2013, the global economic burden was estimated at US$8.9 billion, with 42% resulting from productivity losses. Between 2010 and 2019, dengue was responsible for an estimated average annual loss of over 1.14 million DALYs globally. The disease particularly affects low- and middle-income countries across the Americas, Africa, and Asia.

The majority of the publications included in this review originate from countries classified by the World Bank as lower middle-income and upper-middle-income. These countries are characterised by mixed health systems (public and private), although with markedly different configurations. India, for instance, maintains a predominantly private healthcare system supplemented by targeted programmes for vulnerable populations. In contrast, Brazil operates a Unified Health System (Sistema Único de Saúde). This provides free access to all citizens and coexists with a parallel private sector. In such settings, estimating the actual costs associated with dengue remains challenging due to limitations in surveillance quality.

Direct and indirect costs can exacerbate affected families' economic and financial situation, particularly in developing countries. Losses associated with morbidity and productivity may be even higher when considering the expenses of family members who generally accompany the patients. This is especially true in cases involving children or the elderly. Furthermore, healthcare expenses directly impact the family economy and, consequently, the broader society. The greater the healthcare expenditure the patient covers, the lower the family's well-being regarding healthcare access and living standards. This represents a significant cause of impoverishment in affected communities.

The partial economic evaluation approach was employed to estimate the costs of dengue fever in most of the studies included in this review. These 'disease cost' and 'program cost' analyses indicate the amount that would have been saved in the absence of the disease. This amount could have been allocated to other expenses or investments. A significant diversity of methodologies, analytic perspectives, and indicators was observed. Studies estimated direct costs, especially medical costs, and indirect costs, including productivity losses. Thus, the adoption of standardised economic evaluation frameworks for assessing the impact of dengue fever across diverse geographical and healthcare settings is essential. This would generate robust and comparable evidence on its economic burden.

Estimates of the burden of disease, using the DALY indicator or one of its components (YLL or YLD), may be underestimated in the studies retrieved. This is because they are directly influenced by factors such as passive surveillance. Passive surveillance is applied in most contexts rather than active case finding. Other factors include the absence of more robust data regarding severe cases, and the scarcity of information on hospitalisation or severe cases, mortality, and lethality. These factors may explain differences in the findings of the studies reviewed.

In this scenario, our results reinforce the need for longitudinal cohort studies. These should systematically assess chronic outcomes and long-term disability associated with dengue fever. Such studies are essential to accurately quantify the burden of the disease. Robust estimates of chronic morbidity and DALYs would provide a more comprehensive understanding of the enduring health impacts of dengue fever. They are critical to informing national and global health priorities. Furthermore, the routine inclusion of dengue in global burden of disease (GBD) assessments is essential. This would document its growing epidemiological and socioeconomic impact, particularly in regions with recurrent outbreaks.

Additionally, we highlight the potential and cost-effectiveness of timely use of vaccines, larvicides, and adulticides. These interventions reduce mosquito population density and, consequently, the risk of contracting the disease. Vaccination, when available, has been shown to be the most cost-effective policy. It has favourable cost-effectiveness ratios compared to vector control strategies alone. However, while it is presumed that reducing mosquito populations would decrease transmission risk, few studies provide conclusive evidence of this relationship in all settings.

Some limitations must be considered for the appropriate interpretation of the findings of this review. First, considering the methodology used, it is possible that the search strategy did not identify some publications. Some may not have been retrieved due to language limitations. However, it is important to emphasise that the study was conducted using a rigorous and reproducible methodology. This included the review of grey literature, particularly in Brazil, through searches in thesis and dissertation databases. Second, the data reported on dengue mainly come from outbreaks and epidemics. This hampers the establishment of standardised and rigorous scientific protocols. Researchers need to adapt to the dynamic nature of the event. Moreover, most of the data are analysed retrospectively. This sometimes hinders the accurate estimation of specific indicators. Thus, significant heterogeneity is observed in the methods and the estimates presented. This results in a limited number of studies employing comparable methodologies and metrics. Third, given the aforementioned heterogeneity, it was impossible to consolidate estimates from different studies by applying meta-analysis.

Finally, we acknowledge certain limitations inherent in the tools employed to assess the methodological quality of the studies. These particularly regard their ability to detect potential biases in cost estimation. These tools can offer limited appraisal of the validity, accuracy, and representativeness of the cost data sources used. They also provide insufficient assessment of the appropriateness of the costing methods applied. These can vary substantially across studies and introduce methodological heterogeneity. These limitations indicate that, while structured quality assessment tools offer valuable guidance, they may not comprehensively capture the potential for bias specifically related to cost estimation in economic evaluations.

5. Conclusion

This systematic review reported the key and most relevant publications in the literature addressing the economic and social impact of dengue fever. It emphasised the importance of studies aimed at estimating the economic and social burden of the disease. This includes direct healthcare costs caused by dengue fever, as well as other costs for patients and families. These include expenses with repellents and vector control products. These findings reinforce the understanding of dengue fever as a disease with acute and potentially chronic impacts throughout an individual's life. It affects various dimensions beyond health, leading to absenteeism, economic losses, and years of life lost. Furthermore, the consequences of the disease impact healthcare systems and economies at both national and local levels. This depends on the scope of outbreaks and epidemics.

The limitations in knowledge regarding the cost and burden of dengue fever are related to inadequate surveillance and underdiagnosis. This is especially true in scenarios of co-circulation and co-infection with DENV, CHIKV, and ZIKV. In this context, the importance of early detection and appropriate management of dengue fever is highlighted. These measures can prevent severe cases related to hospitalisation and mortality. They can also prevent long-term consequences such as chronic fatigue and post-dengue sequelae. These result in loss of productivity and reduced QoL for affected individuals. Additionally, there is a need for standardised methods to minimise the inherent limitations in economic evaluations. This includes the design of the health intervention or programme being assessed. It seeks to overcome epidemiological and demographic differences, distinct clinical practices, and financing methods between regions and countries. This is for economic evaluation and burden estimation of dengue fever. Thus, it is hoped that a robust body of evidence will be generated. This would support the proposal, implementation, and evaluation of public policies that support individuals affected by the disease. This applies both in healthcare and social assistance, especially in middle- or low-income countries and vulnerable populations.

Conflicts of interst

The authors declare no conflicts of interest.

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