

INCORPORATING ENVIRONMENTAL IMPACT INTO HEALTH ECONOMIC EVALUATIONS: A REVIEW OF METHODOLOGICAL APPROACHES AND PRACTICAL APPLICATIONS



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ISPOR EUROPE 2025
9-12 NOVEMBER 2025 —
GLASGOW, SCOTLAND, UK

INTRODUCTION

HEALTHCARE SYSTEMS ACCOUNT FOR A SUBSTANTIAL SHARE OF GLOBAL GREENHOUSE GAS EMISSIONS.

Within this sector, health products represent a major source of these emissions. As the transition toward more sustainable healthcare becomes imperative, **assessing the environmental footprint of health technologies** has gained growing attention.

In this context, integrating environmental considerations into health economic evaluations represents a key step toward more comprehensive and **sustainable decision-making**. The objective of this study is to provide an overview of **existing methodologies** for integrating environmental impact into health economic evaluations and to **analyze early applications**.

METHOD

1. Definition of the search strategy:

- Systematic scoping review conducted in May 2025 and performed on PubMed, Google Scholar, and HTA agencies' websites.
- Search terms combined health technology assessment / economic evaluation / carbon footprint / environmental impact.

2. Selection of articles based on inclusion/exclusion criteria:

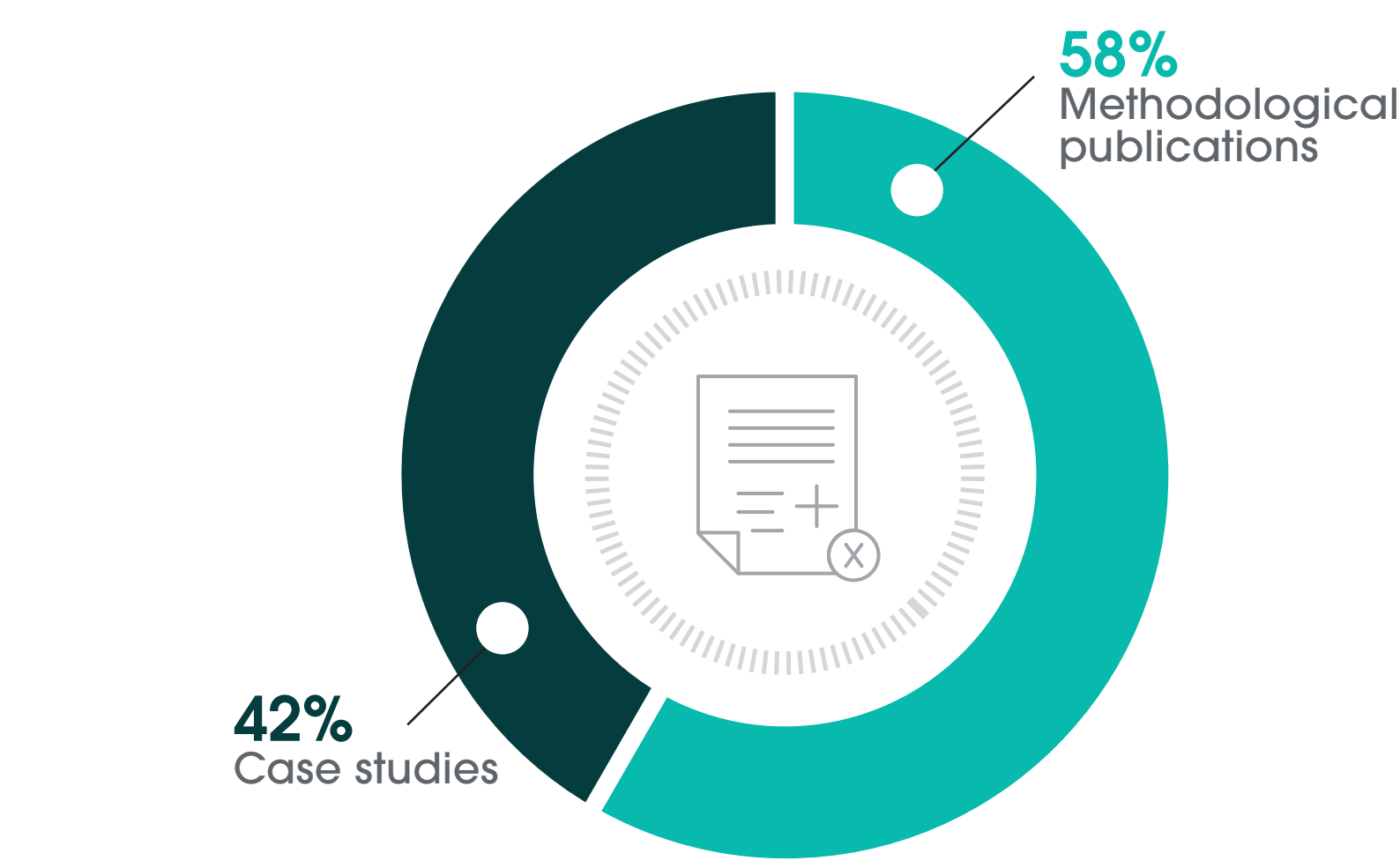
Title/abstract and full-text screening according to the selection criteria:

- Methodology for assessing the environmental impact in health economic evaluations.
- Economic evaluation integrating an environmental impact criterion. Language: French or English.
- Open-access publication.
- Products: medicines or medical devices.

3. Analysis of selected publications

RESULTS

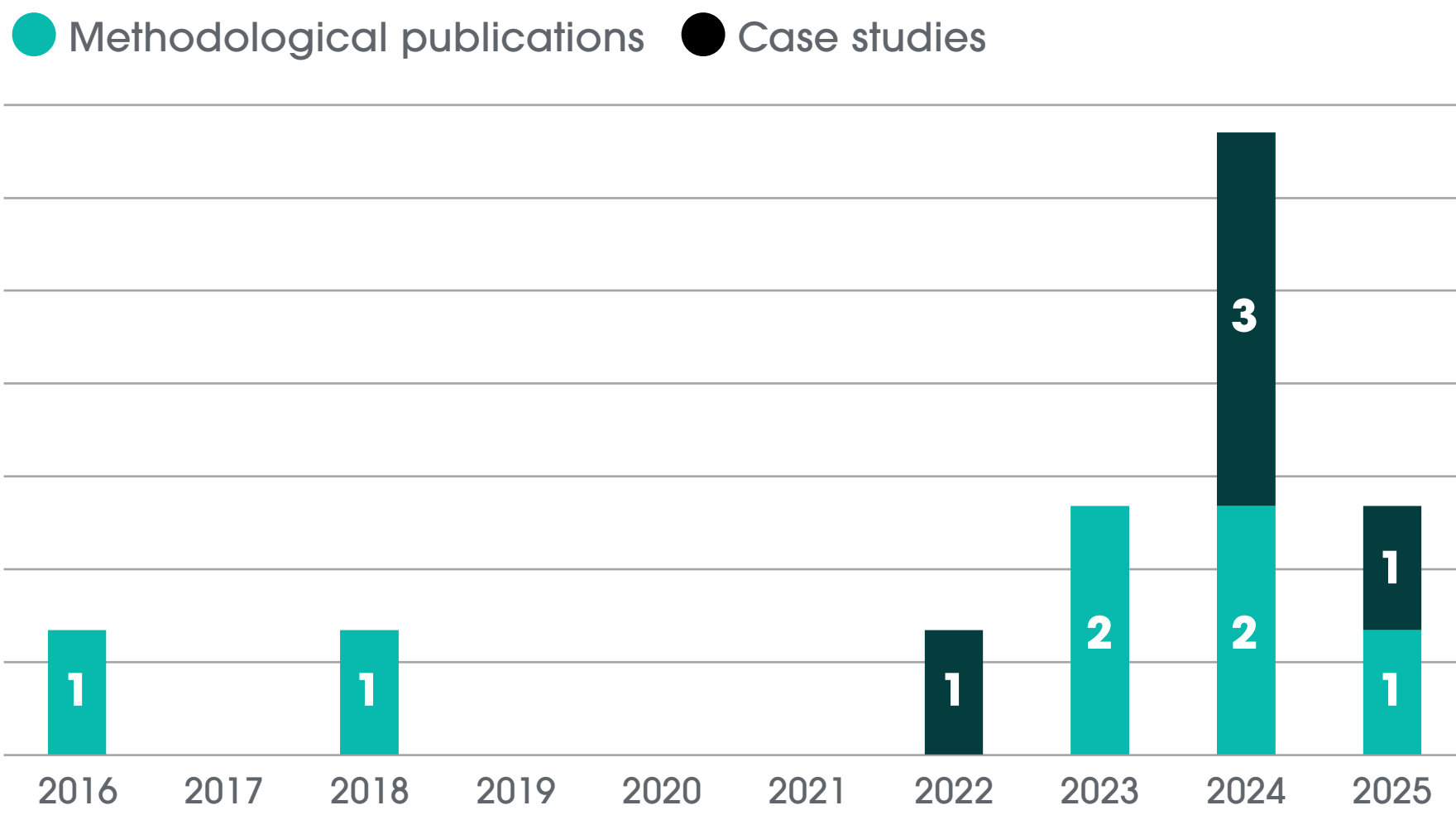
FIGURE 1. DISTRIBUTION OF DOCUMENTS BY TYPE



— A total of 12 documents were included: 7 publications identified through PubMed and 5 ISPOR posters.

Of the 12 documents of interest, most had a methodological scope:

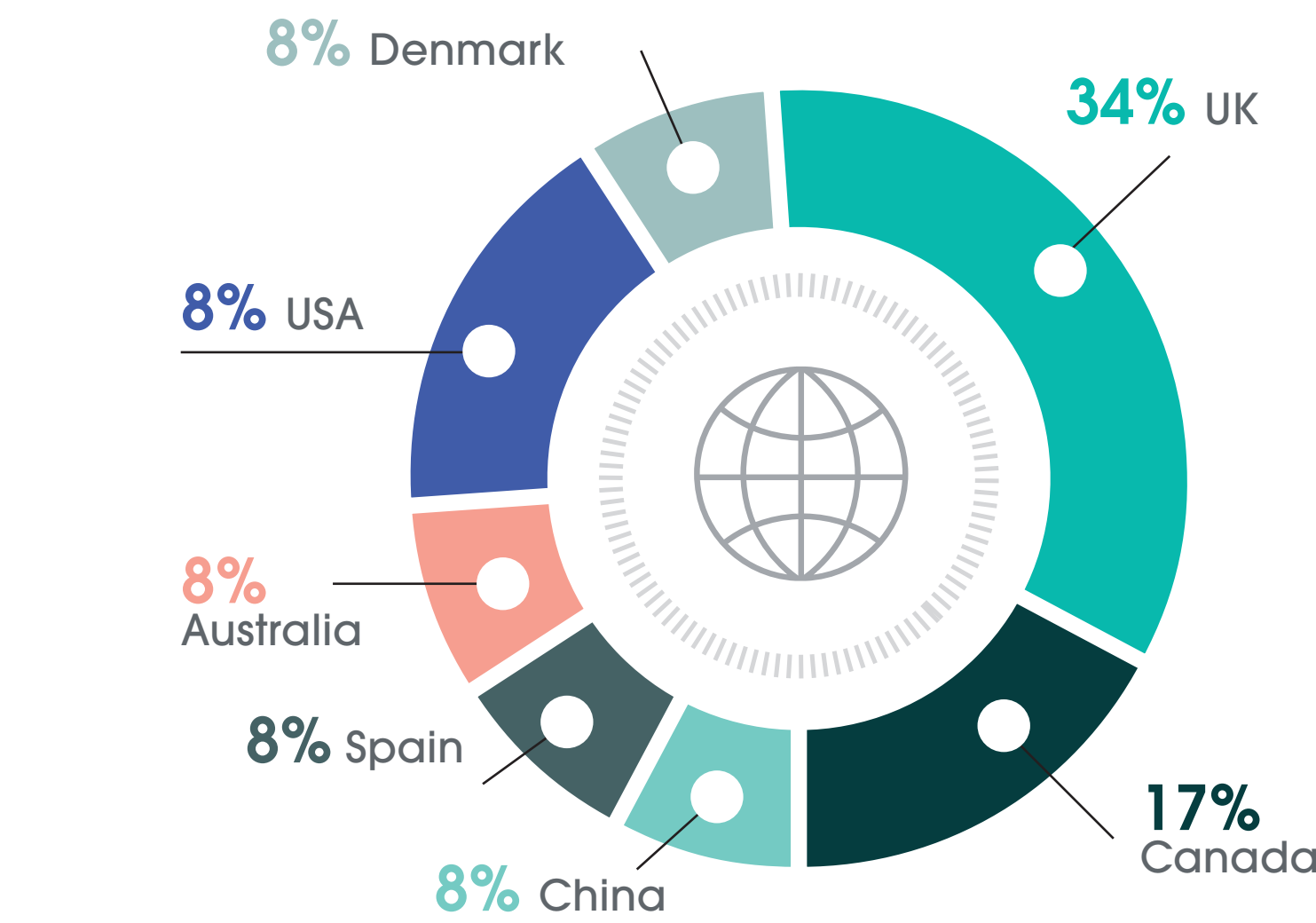
FIGURE 2. YEAR OF PUBLICATION OF THE DOCUMENTS



- 7 focused on the methodology for integrating environmental impact into health economic evaluations
- 5 were applied case illustrations (Figure 1).

Publications were mainly issued after 2023 (Figure 2), confirming that the integration of environmental

FIGURE 3. DISTRIBUTION OF PUBLICATIONS BY COUNTRY



impacts into health economic evaluations remains a recent and emerging research area.

The United Kingdom stands out as the most advanced country on this issue (Figure 3).

FOCUS ON METHODOLOGIES

Two methodological approaches were identified in the literature:

1. The integrated approach to health economic evaluation

This approach incorporates environmental impacts **directly into conventional health economic models** (Cost-Effectiveness Analysis – CEA, Cost-Utility Analysis – CUA, Cost-Benefit Analysis – CBA) **through the Incremental Cost-Effectiveness Ratio (ICER)**.

→ The environmental impact can be included either in the denominator of the ICER—translated into losses or gains in **Quality-Adjusted Life Years (QALYs)** or Disability-Adjusted Life Years (DALYs)—or in the cost component, by monetizing emissions using the **social cost of carbon**.

2. The parallel approach to health economic evaluation

This approach consists of conducting a **separate environmental assessment alongside the traditional economic model**.

→ The parallel approach can take two main forms:

Multi-Criteria Decision Analysis (MCDA): a decision-support method that evaluates multiple criteria—economic, clinical, organizational, and environmental—to compare different options.

Incremental Carbon Ratios: Incremental Carbon Footprint Effectiveness Ratio (ICFER): the difference in carbon footprint between the intervention and its comparator, divided by the difference in their effects / Incremental Carbon Footprint Cost Ratio (ICFCR): the difference in carbon footprint between the intervention and its comparator, divided by the difference in their costs.

FOCUS ON CASE STUDIES

Among the five case studies:

Across the reviewed publications, the integration of environmental impact into health economic evaluations was found to be **more extensively explored for pharmaceuticals than for medical devices** (Figure 4), primarily because environmental data for pharmaceuticals are more readily available and standardized.

The five case studies addressed **different diseases**, with asthma appearing in two publications (Figure 5). Asthma, obesity, and type 2 diabetes appear to be among the **conditions most associated with environmental impact** in public health.

FIGURE 4. TYPE OF HEALTH PRODUCT ASSESSED IN THE CASE STUDIES

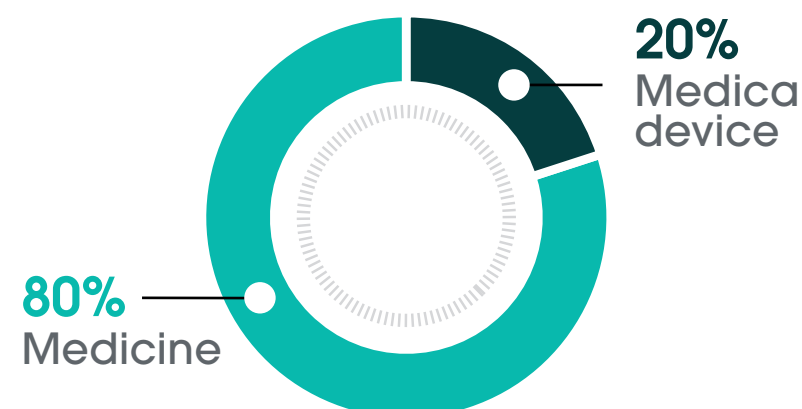
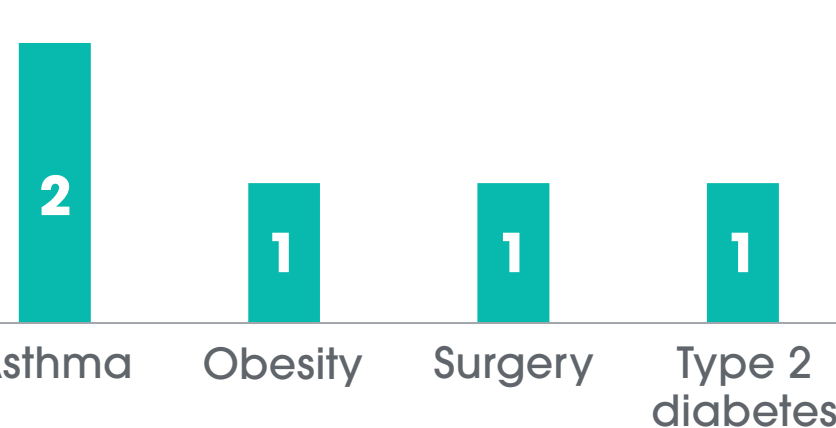


FIGURE 5. DISTRIBUTION OF DISEASES COVERED BY THE CASE STUDIES



CONCLUSION

Several methodologies for incorporating the environmental footprint of health technologies into health economic evaluations have been identified in the literature, including **integrated approaches** (CUA, CEA, CBA) and **parallel**

approaches (MCDA, incremental carbon ratios ICFER/ICFCR). However, these methodologies are **still recent**, and few **applied examples** involving health products—particularly medical devices—have been reported to date.