November 2024

VALESOR
Valuation of environmental stressors

Policy Brief

Reviewing economic costs of health endpoints related to pollution and chemicals exposure

Key messages

- Health damage costs are available in the literature for more health endpoints than currently considered in key health impact assessment models.
- The health damage cost estimates vary with respect to methodological approach, terminology used, and completeness in the cost components considered.
- The results from the review enable more complete estimates of the socio-economic costs of health impacts from air pollutants and chemical substances.
- In future impact assessments, the cost-efficient levels of environmental stressors will be lower than in earlier assessments.

Assessments of economic health damage of environmental stressors are important for air pollution and chemicals policy advice. To this date, the most considered damage cost is related to premature mortality. However, various types of morbidity are also affected by air pollutants and chemical substances and contribute significantly to the cost. To be complete, assessments should include the health cost components direct cost, indirect cost and utility loss (OECD 2016).

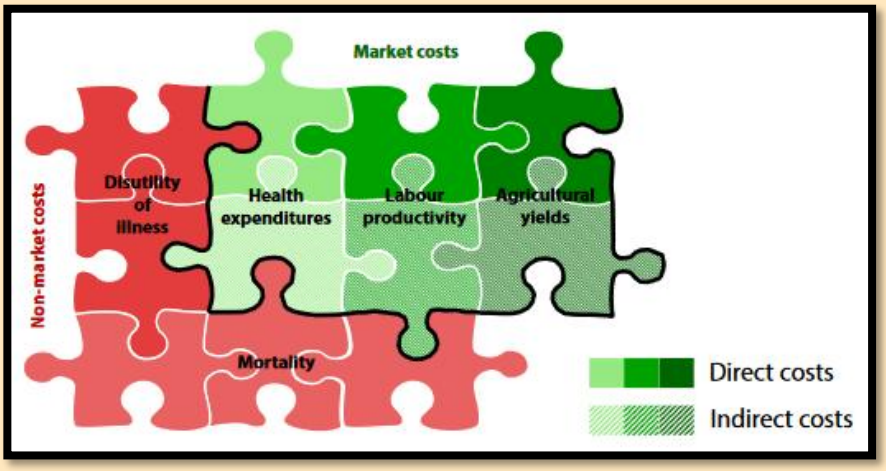

Figure 1: Cost categories considered important for pollution and chemicals, copied from OECD 2016

How is health damage economically assessed?

Health damage costs consist of direct and indirect costs and of utility loss. Direct costs are market costs and refer to costs for consultations, care, medication, exams, exams, hospitalization and may be covered by the health insurance or consist in out-of-pocket expenses by the patient. They are usually easiest to assess since they can be derived from registries and bills. Indirect costs refer to productivity loss which can be paid (e.g., loss in income to the patient and losses to the employer) or unpaid (e.g., family members taking time off work caring for the patient). While they can also be derived from market costs, more effort is needed to assess these. Assessment of utility loss, which is not reflected in market prices, requires different methods that have been developed and improved for decades.

The first of the two main methods involves revealing costs through observation of behavior on other markets (such as labor markets).

The second involves subjects declaring their preferences, either through direct questionnaires or by participating in experiments that involve choices, from which costs are then derived.

Health endpoints, and also their costs, are quantified based on data referring either to incidence or prevalence numbers. Incidence refers to the new cases occurring in the year for which the assessment is carried out. Depending on the health effect considered, new cases may last for several years. Prevalence refers to the total number of health impacts suffered in a given year, including both new and preexisting cases. The prevalence-based approach is appropriate for an environmental burden of disease assessment, but less for an assessment of policy impacts which VALESOR is more interested in.

How this review was done

In the VALESOR project, a literature review of the last 20 years of published health cost studies was carried out for a set of 21 non-fatal health effects identified in earlier tasks of the project as being affected by air pollutants and chemical substances. The economic literature search was based on key words associated with costs of the health effects considered. The screening and review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) checklist (Page et al. 2021).

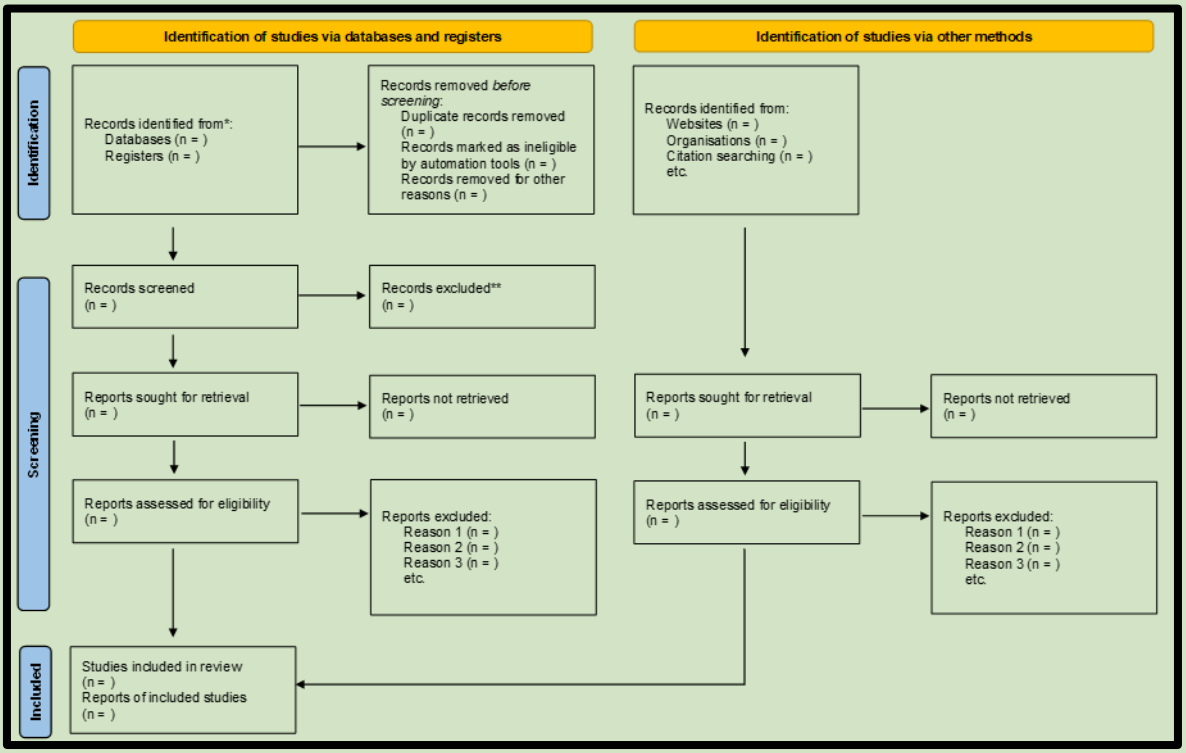

Figure 2: The basic PRISMA literature review structure (Page et al., 2021)

The literature search also included informal searches based on expert elicitations and reports published outside the academic publishing procedures. The data collection aimed at acquiring at least 10 relevant studies per health effect. If more than 20 studies were found, priority was given to review studies. If there were still more than 20 studies, priority was given to European studies or North American, then to studies made in Western Europe. For some health endpoints, prioritization still resulted in more than 20 relevant studies.

The initial literature search yielded ~10,000 articles related to our 21 health endpoints. Of these 3,500 were considered as relevant and 306 remained after screening and prioritization. Heart failure was the health endpoint with largest number of studies (39), while Reproductive system disorders was the endpoint for which no suitable studies could be identified (Figure 3).

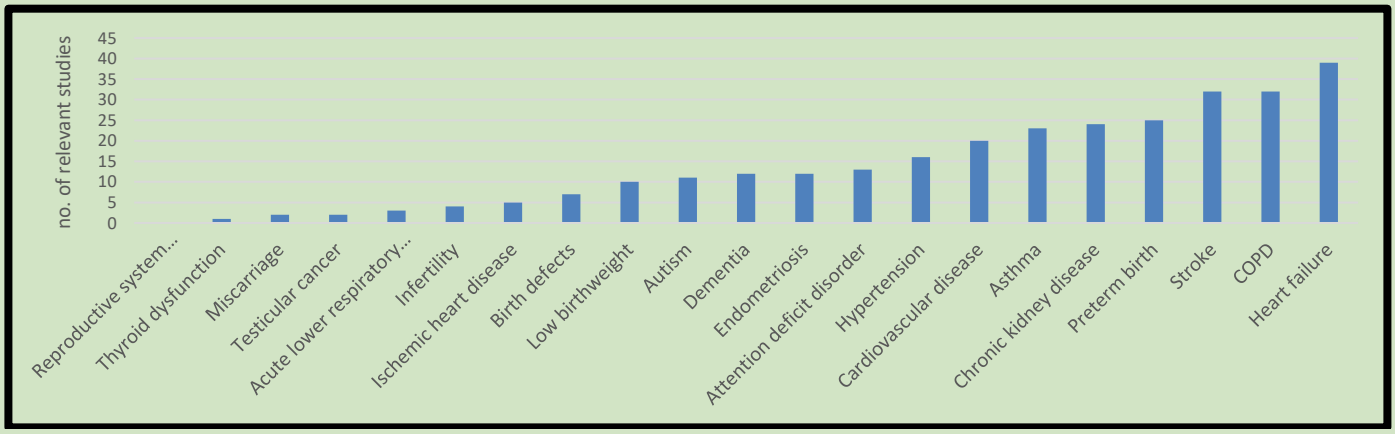

Figure 3: Number of relevant studies per health effect included in the review

Findings

The review shows that there is a large variation over the studies with respect to methods used, approaches taken, and cost components included. This variation makes it unsuitable to directly aggregate results from several studies into one 'average value' for any specific health effect.

Instead, more work is needed to come to comprehensive cost results or to appreciate the level of uncertainty in the available data.

The review also shows that assessments of direct and indirect costs (cost-of-illness components) are more common than assessments of welfare-related losses. This is not surprising since health care cost records and statistics in many countries are collected and documented in public sector databases and thus easier to assess. This finding points to a gap in the valuations, since welfare-related values can constitute a substantial part of the total socio-economic cost of several health effects.

For the 21 health effects, incidence-based cost assessments, preferred in VALESOR, were only found for 14 (More were found for prevalence-based assessments). There are significant ranges in the cost estimates per health endpoint (Figure 4). Amongst these 21 health endpoints, at least autism, dementia, hypertension, and chronic kidney disease, are yet to be included in impact assessments.

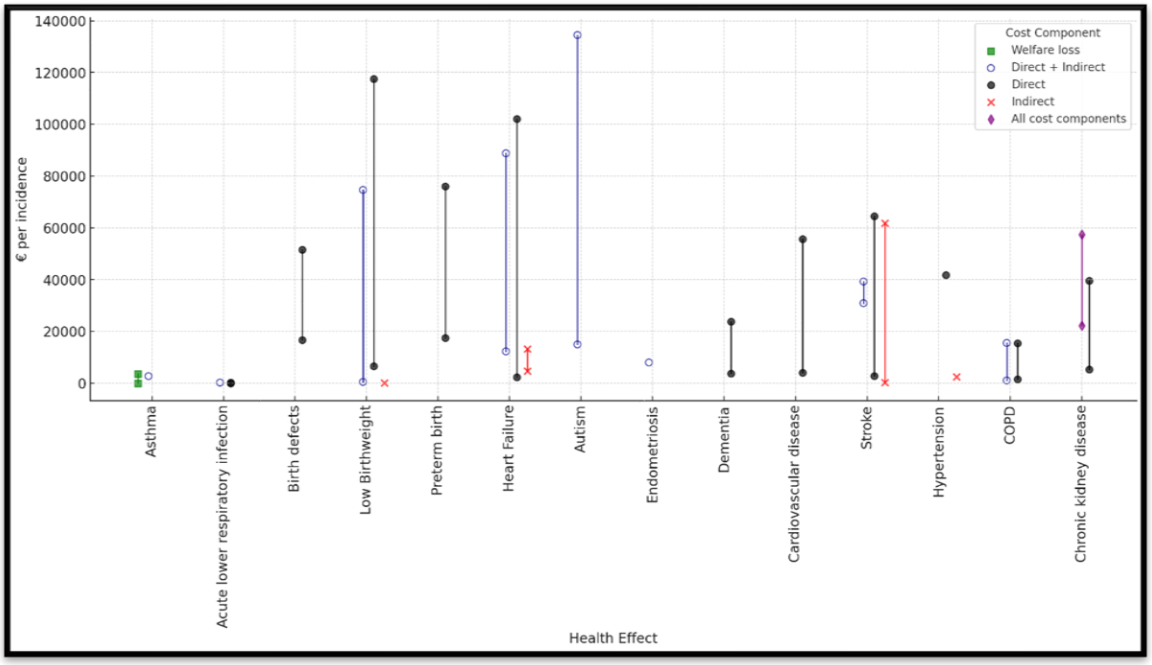

Figure 4: Ranges of incidence-based cost estimates per case of health effect and year, in €2020

Extending the results for VALESOR modelling

The results from the literature review indicate that several additional health effects associated to air pollutants and chemical substances can be assessed in monetary terms and therefore used in health impact assessment that informs policy decisions. However, to do so, additional analysis is required for comprehensive cost results.

This was accomplished for lung cancer. The lifetime incidence cost of this health end point was analyzed based on an EU-27 study by Luengo-Fernandez et al. (2013) for 2009. First, the study cost components were updated to more recent (2020) values. Update of costs for health care expenditures relied on data on health care sector cost increases. Data on productivity losses was updated with respect to inflation and income growth. The initial study, Luengo-Fernandez et al. (2013), did not estimate quality-of-life-related utility costs. To close this gap, disability-adjusted life year (DALY) loss estimates for lung cancer were identified and monetized using EU values for this health metric. By this, all major cost components for lung cancer were brought together (Figure 5).

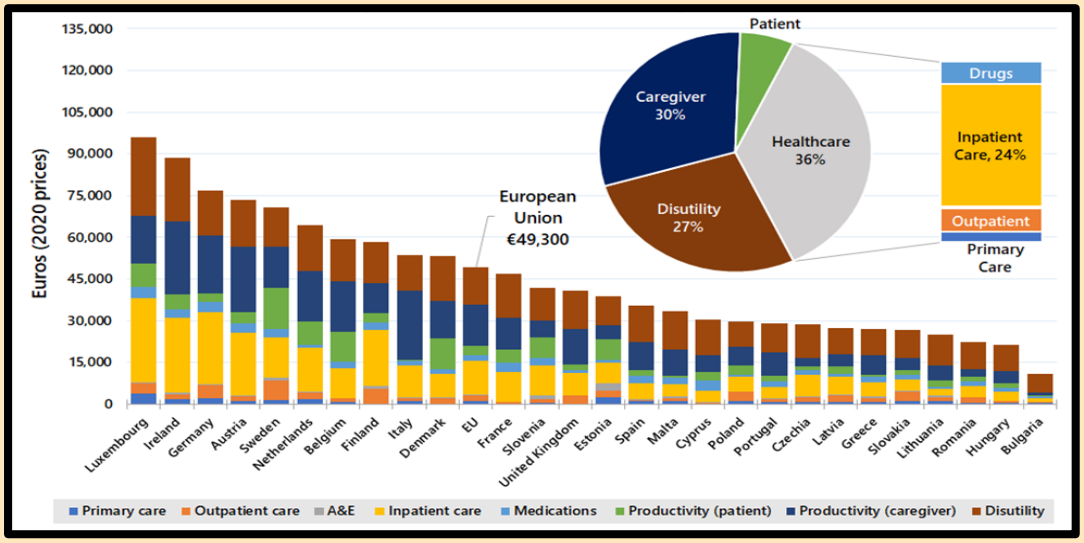

Figure 5: Incidence costs for lung cancer in EU27 countries, when assuming that the annual increment of cancer-related treatment costs is equal to the annual increment in cost of the overall health care system. Results derived from Luengo-Fernandez et al. (2013), extended with disutility costs.

Policy Implications

More health effects monetized

Our results facilitate inclusion of more health effects in health impact assessments.

More economically efficient with cleaner environment than in earlier assessments

If future cost-benefit analyses were to include the health effects presented in this brief, the balance between abatement costs and damage costs will imply that the cost-efficient level of environmental stressors is lower than earlier assessed.

References:

OECD, "The Economic Consequences of Outdoor Air Pollution - Policy Highlights," 2016.

Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., Shamseer, L., Tetzlaff, J. M., Akl, E. A., Brennan, S. E., Chou, R., Glanville, J., Grimshaw, J. M., Hróbjartsson, A., Lalu, M. M., Li, T., Loder, E. W., Mayo-Wilson, E., McDonald, S., … Moher, D. (2021). The PRISMA 2020 statement: An updated guideline for reporting systematic reviews. BMJ, 372, n71. https://doi.org/10.1136/bmj.n71

Ramon Luengo-Fernandez et al., "Economic Burden of Cancer across the European Union: A Population-Based Cost Analysis," The Lancet Oncology 14, no. 12 (November 1, 2013): 1165–74, https://doi.org/10.1016/S1470-2045(13)70442-X.

The VALESOR project aims to make major contributions to the scientific- and policy communities, with efforts to accommodate economic values of environmental stressors more homogenously in policy making and planning. The environmental stressors of concern for VALESOR are chemical stressors including chemicals and pollutants transmitted via air, water, and soil vectors. VALESOR is supported by the EU's Horizon Europe Programme (Grant agreement ID:101095430).