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HOW SHOULD WE VALUE IMPROVEMENTS IN OUR HEALTH?

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- Quality adjusted life years (QALYs) are used to assess improvements in health
- To assess the costs and benefits of policies dealing with health improvements practitioners often resort to place a monetary value for a QALY
- We show that standard methods to monetize a QALY are subject to an upward bias
- We propose a robust method that accounts for the upward bias: the use of bounds!

This vulgarization piece is based on the paper “Theoretical bounds on the value of improved health”* publish in Journal of Health Economics and on on-going work in the VHEALTH project. The author recognizes funding from the French National Research Agency (ANR) through the VHEALTH project, award number ANR-20-CE36-0010-01.

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You wake up one morning and realize that your back hurts. You make a note-to-self: it's due time to change your 10-year-old pillows. Likely you will forget about the note after breakfast. To calm you pain, you take a couple of pills from your health cupboard. Then a very random question pops-up in your mind: who decides which pills get funded by the national insurance? A very random question indeed.

Not all the existing pills, and more broadly speaking, health treatments, that we have available to improve our health in France (or more modestly, in our cupboards) are financed by the national health insurance. So, this "random" question is highly relevant for the sustainability of the health care sector. The answer to your question depends on where in the world you are waking up. The common denominator of most systems is how the measure of the health improvements is done.

The standard measure is a quality-adjusted-life year, or in short a "QALY". To a policy decision maker, a QALY is an essential tool allowing comparisons between different health conditions. The more QALYs you have, the better condition you are in. So, if a treatment increases more the number of QALYs than another, it is considered as a better treatment.

Even though QALYs are useful tools to guide the decision process, a decision maker will always need to account for "the elephant in the room": the cost of the treatment. Different health systems vary in the extent to which a transparent measure of "how much society values a QALY" – the value of a QALY– is used. To fix ideas, in the UK, a threshold value, expressed in monetary units, is used. That is, a treatment that provides an additional QALY for a cost lower than that of the threshold is considered as "cost-effective" and it is more likely to be financed by the UK's National Health Insurance than a treatment that is not cost-effective. In France, an "official" notion of a threshold does not exist, but the firms who seek reimbursement by the national health insurance for their treatments need to provide a cost-per-QALY measure in their submission.

The threshold value approximates society's willingness to pay for an additional QALY. As an approximation, it has two key particularities. First, the value from the threshold is constant. What does it mean? That the value of a QALY is the same regardless of the severity of the disease, whether the gains the additional QALY go to a younger or older individual, and so on… Second, as the threshold comes from a measure of costs-to-produce a QALY, it is likely an underestimation of society's value of a QALY.

Three other methods to assess the value that society assigns to a health improvement exist. All three are seemingly more robust than the threshold method.

To deal with the single-value issue of a QALY, approach #1 estimates the value of an improvement in health by producing a questionnaire aimed directly at eliciting the value for a specific health condition. This first approach uses a non-market valuation method named stated preference. Stated preference methods are based on respondents' answers to hypothetical choices. In these studies, individuals are directly asked about their willingness to pay for a mortality risk reduction. This is ideal, but completely unfeasible. To see why, just think about all the different severity levels for which your back may hurt. As each value

requires a separate study, it is virtually impossible to elicit so many: we call this the “curse of dimensionality”.

Approach #2 estimates the value of reductions for specific health improvements that are modeled as a (nonlinear) function of QALY gains. Such estimates may be obtained by asking individuals how much are they willing to pay for an additional QALY and can be obtained from a single study or by combining estimates from multiple studies. This approach deals with the shortcoming of the threshold method as it is based on a willingness to pay framework – no longer based on cost-per-QALY. Moreover, it exploits a key feature of QALYs: it’s ability to compare across health conditions. This helps to overcome the “curse of dimensionality” that plagues approach #1.

The last approach estimates the value of improvements in health by dividing an estimate of the VSL by your remaining future QALYs.

What is VSL, exactly? In short, VSL measures the willingness to pay to reduce mortality risk to oneself by a very (very) small amount. Long entrenched in the governments toolkit, the Value per Statistical Life (VSL) is used to quantify the monetary benefits of regulation-induced or investment-induced reductions in mortality risk. To give you an idea of its prominence and importance, a retrospective analysis one of the most important environmental regulations in the US, the US Clean Air Act, finds that improvements in survival risk accounted for 95 percent of the present value of the Act’s monetized benefits from 1970 to 1990.

For its simplicity, approach #3 is often recommended to value an improvement in health in impact regulatory and investment assessment guidelines.

A host of theoretical findings suggest, however, that this value should vary depending on your future quality of life. As for the threshold method, using a constant monetary value per unit of improved health, as is the case in approach #1 and #3, to assess the impact of environmental and health policies over long periods and across heterogeneous populations is likely to result in biased estimates of the actual benefits.

In addition, government guidelines suggest that both the direct elicitation of the WTP for a QALY (approach #2) and the VSL-based (approach #3) derivation are equally valid methods to value improvements in health and longevity. This is only true under very strong assumptions. The differences between these approaches for valuing improved health and longevity are related to the conceptual foundation of the QALY measure: how much you care for a health state when young will not affect how much you care for a health state when old. It does not take to be a health economist to recognize that this is a very strong assumption.

Our paper “Theoretical bounds on the value of improved health” co-author with James K. Hammitt and Christoph Rheinberger, reveals a not-yet-known fact: approach #3 estimates a theoretical upper bound for the value of improved health. Therefore, analysts applying this approach to approximate monetary benefits of quality-of-life improvements generally overestimate the value of the program or policy assessed.

We also identify a lower bound on the willingness to pay a health improvement. This lower bound equal's the willingness to pay for an improvement when health approaches its maximum value, but otherwise underestimates it. In studies evaluating the benefits of interventions to improve health, the upper and lower bounds may prove very useful for sensitivity analysis.

In practice, analysts' justification for use of the value per QALY estimates to value an intervention improving health depends crucially whether we believe that the QALY model is fit to describe our preferences. Unless preferences for wealth and health are compatible with both the standard WTP model and the QALY model, approach #3 always overestimate the health benefits from policy interventions.

As a practical remedy, policy analysts using approach #3 to approximate the value of an intervention improving health can perform a sensitivity analysis. We suggest dividing the value per QALY estimates by two to roughly correct for the overestimation. This approach is currently recommended for use in the recent guidelines of "evaluation socio-économique des effets de santé des projets d'investissement public" published in 2022 by France Stratégie for its evaluation of health improvements.

As approach #3 provides only a single value for a QALY, a better solution requires an estimation of both upper and lower bounds for different severity levels. This is part of the on-going ANR JCJC VHEALTH project lead by Daniel Herrera-Araujo. The results of the study will be able to inform policy decision makers about the value that society is willing to pay for a continuum of severity levels using the QALY framework.

Keep your random questions popping up! It's a healthy habit that pays up in the end!

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