Universität Basel

Research Project

The valuation of medical interventions at the end of life

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Expenditures for medical treatments are not evenly distributed over time, but are concentrated in the beginning and the end of patients' lives. Given the increase of health care expenditures (HCE) towards the end of life, some authors suspect a misallocation of resources that would otherwise be available for alternative uses within or outside the health care sector (Leaf, 1977; Ginzberg, 1980; Lundberg, 1993). This claim is based on a comparison of the costs of terminal care and the monetized benefits of a life extension implied by the value of a statistical life year (VSLY).

However, it is not clear whether the VSLY is a useful measure to value a life extension at the end of life, as the valuation of a life-year may depend on the remaining life expectancy (Hammitt, 2007). Furthermore, the empirical literature defines end-of-life costs as those that took place during a given time range (usually a year) before death. However, one should be cautious about making normative inferences based on end-of-life HCE computed from this ex-post point of view, because a significant share of these expenditures may be associated with treatments that, on average, are quite effective. In contrast, if we think about end-of-life HCE from an ex-ante view, which is more appropriate in the context of a cost-benefit analysis, we would define those expenditures as "end-of-life" that are associated with treatments that do not significantly alter survival prospects.

In this paper, we develop a theoretical model in which a social planner allocates resources across consumption and health. To our knowledge, our model is the first to allow for heterogeneous treatment options and a continuum of health states across the population. This yields an expression for the marginal cost of saving a statistical life year (MCSLY) from an ex-ante perspective, which in the baseline model is equalized across treatment options and equal to the VSLY.

We propose learning externalities as a rationale for why the benefits from seemingly futile medical treatments may exceed the VSLY associated with the treated patients themselves. We posit that learning externalities arise from the treatment of diseases that are currently not well understood and thus cannot be cured, but which constitute the medical frontier. Learning in the context of one disease may produce knowledge that turns out to be useful in the treatment of other diseases. Our model is motivated by the observation that technological progress has been a major cause underlying the increase in life expectancy. However, because we all die at some point, a decrease in the mortality rate associated with a particular disease leads to a shift in the cause of death to other diseases over time. We capture this dynamic feature in a static framework by assuming that the treatment effectiveness of the end-of-life disease group, the composition of which will generally change over time, remains low regardless of the technical progress in the rest of the health sector.

There are other reasons for why a cost-benefit analysis of end-of-life HCE based on a simple comparison between treatment costs and VSLY may be misleading. In a paper that is conceptually related to ours, Phillipson et al. (2010) study the option value inherent in a treatment that reflects the probability to survive until a new medical innovation, which may give rise to risk-loving behavior for treatment decisions at the end of life. The total value of terminal treatment for HIV patients, including the ”value of hope”, was found to be well above the value implied by standard VSLY estimates. Similarly, Wessling (2013) finds experimental support for risk-loving behavior at the end of life if there is a positive exogenous chance to survive until a better cure is developed.

We apply our model to health expenditures in Switzerland. We focus on admissions to intensive care units (ICUs) and separate diseases into cancer (which constitutes our “end-of-life” sector) vs. all other diseases. We calibrate the free model parameters using ICU admission rates, survival rates, treatment costs, overall health expenditure, aggregate income and an estimate for the VSLY from the literature. We solve the model for different magnitudes of learning spillovers that arise from the treatment of cancer cases. We find that the presence of learning spillovers that lead to a decrease of non-cancer mortality by one percentage point (relative to the situation without spillovers) implies that the optimal MCSLY associated with cancer treatments exceeds the VSLY by 78%.

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