

# Use of Cost-Effectiveness Analysis in Health-Care Resource Allocation Decision-Making: How Are Cost-Effectiveness Thresholds Expected to Emerge?

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## ABSTRACT

**Background:** An increasing number of health-care systems, both public and private, such as managed-care organizations, are adopting results from cost-effectiveness (CE) analysis as one of the measures to inform decisions on allocation of health-care resources. It is expected that thresholds for CE ratios may be established for the acceptance of reimbursement or formulary listing.

**Objective:** This paper provides an overview of the development of and debate on CE thresholds, reviews threshold figures (i.e., cost per unit of health gain) currently proposed for or applied to resource-allocation decisions, and explores how thresholds may emerge.

**Discussion:** At the time of this review, there is no evidence from the literature that any health-care system has yet implemented explicit CE ratio thresholds. The fact

that some government agencies have utilized results from CE analysis in pricing/reimbursement decisions allows for retrospective analysis of the consistency of these decisions. As CE analysis becomes more widely utilized in assisting health-care decision-making, this may cause decision-makers to become increasingly consistent.

**Conclusions:** When CE analysis is conducted, well-established methodology should be used and transparency should be ensured. CE thresholds are expected to emerge in many countries, driven by the need for transparent and consistent decision-making. Future thresholds will likely be higher in most high-income countries than currently cited rules of thumb.

**Keywords:** cost-effectiveness, decision making, efficiency, health economics, health care, thresholds.

## Introduction

Identifying the optimal allocation of available resources to maximize health will be the key challenge to health-care systems such as government agencies and managed-care organizations over the next decade. Medical research is expected to continue to produce an ever-increasing number of alternatives for the detection, prevention, and treatment of diseases. However, budgetary constraints will not allow health-care systems to make all of these available for everybody. This is probably recognized by health-care decision-makers in many countries, but their response to the challenge is, as yet, heterogeneous. Some have implemented an explicit or semi-explicit approach to guiding resource-allocation

decisions by formal health-economic analysis, the most popular approach currently being the cost-effectiveness (CE) analysis. This is frequently used in decision making in some countries, for example, Australia, Canada, Sweden, and the United Kingdom (UK). In most other countries, formal economic analysis is not yet a key input into the decision-making process [1]. However, there is an increasing awareness that resource allocation must be addressed in a systematic rather than intuitive manner. Several countries have recently introduced guidelines or legislation to mandate CE assessment of at least some aspects of health care, most often for the reimbursement of pharmaceuticals [2].

It is therefore reasonable to expect that decisions about resource allocation will increasingly rely on CE analysis. Inevitably, this will call for more transparency and consistency in the decision-making process and, in turn, for the definition of what policymakers regard as an “acceptable threshold” of cost-effectiveness below which they will make avail-

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able a technology and above which they will ration access. It is recognized that a number of issues of cost-effectiveness assessment remain the subject of debate. However, this paper is not concerned with the technical limitations of CE analysis as such. We review the current concept of and debate on thresholds and discuss recent reports indicative of emerging CE thresholds. In the last section, we explore how thresholds are expected to evolve in future.

### The Concept of Thresholds

The concept of “threshold” was originally proposed by Weinstein and Zeckhauser in 1973 [3], and refers to the level of costs and effects that an intervention must achieve to be acceptable in a given health-care system [4]. This implies a ratio between monetary cost, usually national currencies, the US dollar (\$) or the European Euro (€), in the numerator and a measure of health gain in the denominator. The decision rule of CE analysis using a critical ratio results from a solution to a constrained optimization problem [3]. For mutually exclusive programs, CE ratios are usually and appropriately described as incremental CE ratios (ICER), comparing the cost-effectiveness of each intervention with that of the next most effective option [5].

Comparability of CE ratios is affected by the lack of a single, universally accepted measure of “health gain.” A recent survey of health economic studies [6] demonstrated that cost-effectiveness analysis (CEA) and cost-utility analyses (CUA) are favored over cost-benefit analyses (CBA), but major differences remain in the choice of health-outcome measures across disease categories. However, Quality Adjusted Life-Years (QALYs), which represent years of healthy life weighted by a “utility” factor, have emerged as one of the most widely used and recommended measures by the academic community and many health-care systems [7,8]. In contrast, some international institutions, like the World Health Organization (WHO) or the World Bank frequently base their CE assessments on cost per Disability Adjusted Life-Year (DALY); [9,10], though the method of obtaining values for DALYs has been questioned [11]. Another measure of health gain that avoids the need for utility weighting is cost per Life-Year Gained (LYG) [12,13]. An in-depth discussion of some of the outcome measurements used in economic analyses can be found in Johannesson et al. [14]. Although the use of different denominators further complicates comparability of CE analysis-based decisions, most considerations about thresholds may be equally applicable to all types of

CE analyses, irrespective of the type of denominator used. In the following section, we briefly describe basic characteristics of CE thresholds.

Adoption of a threshold concept by a given health care system may be explicit or implicit. Here, explicit means that a group of decision-makers formally adopt and make public in advance any threshold (e.g., \$/QALY) by which their decisions on resource allocation would be bound. In contrast, implicit thresholds are not official or public, but may be inferred retrospectively by analysis of the decision-making pattern in a given health-care system—provided there is at least some degree of consistency in decision making. The analysis by George et al. [13] of pharmaceutical reimbursement decisions in Australia offers an instructive example of implicit thresholds.

Setting an explicit threshold has been welcomed by a number of authors, as it offers a range of theoretical advantages [15]. These include reduced burden of responsibility upon those who previously made implicit rationing decisions alone, and better consistency and transparency of the decision-making process, equity, efficiency and public trust—as opposed to veiled denial of health-care services. Setting explicit thresholds would almost certainly generate public debate about societal willingness-to-pay for health care. Practical experience, such as that from the “Oregon experiment” [16] and results from public surveys [15,17,18] suggest that such debate might result in an increase in the health-care package and resource allocation to health care.

Setting explicit thresholds is politically sensitive, however, for these very reasons. In addition, decision-makers are not necessarily economists, and are reluctant to base their decisions on a single summary measure alone [19]. It is not entirely surprising therefore that, to the best of our knowledge, no single health-care system has yet implemented an explicit threshold. Not using explicit thresholds allows more room for arbitrariness and “ad hoc” considerations, which may be more attractive to policy decision-makers.

An additional characteristic of thresholds is their degree of flexibility, which distinguishes between hard and soft thresholds. A “hard” threshold approach dictates that results from CE analysis, expressed for example as \$/QALY, are taken *prima facie* and become the sole decision criterion for resource allocation. While this rigid approach offers the theoretical advantages of transparency, consistency, and predictability, it denies the possibility of incorporating into the decision other, non-CE-based societal preferences. In contrast, adopting a “soft”

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