Updating Cost-Effectiveness — The Curious Resilience of the $50,000-per-QALY Threshold

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For more than two decades, the ratio of $50,000 per quality-adjusted life-year (QALY) gained by using a given health care intervention has played an important if enigmatic role in health policy circles as a benchmark for the value of care. Researchers have summoned this cost-effectiveness ratio in order to champion or denounce particular investments in medical technologies and health programs. Critics, meanwhile, have argued that the ratio is misunderstood and misused.

The fact that the $50,000-per-QALY yardstick has persisted attests to the medical community's need for a value threshold and to the advantages enjoyed by incumbents. It has endured even as the United States has legislated against the explicit use of cost-per-QALY thresholds, and it has held its own even though common sense might dictate that it should be updated to reflect inflation and economic growth. Like the 4-minute mile in running, which has withstood threats to its relevance (the current record is 3:43, and the sport long ago switched championship races to 1500 m, the "metric mile"), $50,000-per-QALY retains its place in the imagination. As the United States debates anew how much to spend on medical care — a question that has been highlighted by high-priced drugs for cancer and hepatitis C — it is useful to reexamine what the ratio means, why it persists, and how it might be applied more reasonably to inform resource-prioritization discussions in today's health care and economic climate.

The $50,000-per-QALY ratio has murky origins. It is often attributed to the U.S. decision to mandate Medicare coverage for patients with end-stage renal disease (ESRD) in the 1970s: because the cost-effectiveness ratio for dialysis at the time was roughly $50,000 per QALY, the government's decision arguably endorsed that cutoff point implicitly.[1] However, the link to dialysis is inexact — and even something of an urban legend, given that the cost-effectiveness ratio for dialysis was probably more like $25,000 to $30,000 per QALY, the ESRD decision was controversial, and even at the time Medicare was covering some treatments costing more than $50,000 per QALY.[1]

Furthermore, the $50,000-per-QALY standard did not gain widespread use until the mid-1990s, long after the ESRD decision, and seems to stem more from a series of articles that proposed rough ranges ($20,000 to $100,000 per QALY) for defining cost-effective care. The field settled on $50,000 per QALY as an arbitrary but convenient round number, after several prominent cost-effectiveness analyses in the mid-1990s referenced that threshold and helped to congeal it into conventional wisdom.[1] Researchers continue to cite the threshold regularly, although in recent years more have been referencing $100,000 per QALY (see table).

A society's cost-effectiveness threshold — which indicates its willingness to pay for improvements in health — can also be inferred from its budget for health care expenditures. In theory, if all interventions could be measured in similar terms and ranked by the favorability of their incremental cost-effectiveness ratios, decision makers with a fixed budget could maximize health gains by choosing interventions with the lowest (most favorable) ratios and working their way down the list until the available resources were consumed. The cost-effectiveness of the last (least favorable) technology covered would represent society's willingness-to-pay threshold — the highest price society is willing to pay for health gains.

In practice, cost-effectiveness information is spotty, and U.S. decision makers do not face rigidly fixed budgets. Instead, thresholds are used as rough guides to help determine whether particular investments constitute reasonable value.[1] Referencing a $50,000-per-QALY threshold has in practice implied adding new "favorable" interventions (with ratios below $50,000 per QALY), but without displacing any "unfavorable" interventions (with ratios of $50,000 per QALY or above).

Researchers have attempted in various ways to deduce what constitutes a reasonable threshold on the basis of economic theory or empirical estimates.[1] Some economists as well as the World Health Organization have argued, on the basis of plausible assumptions about people's values and attitudes toward risk, for a threshold of two to three times the per capita annual income, which would imply a U.S. threshold of $110,000 to $160,000 per QALY today (given that the per capita income is roughly $54,000). Others have in-

Cost-Effectiveness Thresholds Referenced by Authors of U.S.-Based Cost-Utility Analyses, 1990–2012.*

Threshold	1990–1999 Analyses (N=207)	2000–2009 Analyses (N=851)	2010–2012 Analyses (N=444)
		percent	
$50,000 per QALY	19.3	36.6	36.9
$100,000 per QALY	6.3	7.8	16.9
Both $50,000 and $100,000 per QALY	3.9	19.9	23.7
Other	18.4	10.6	7.4
No threshold referenced	51.9	25.1	15.3

* Data are from the Tufts Medical Center Cost-Effectiveness Analysis Registry (www.cearegistry.org). QALY denotes quality-adjusted life-year.

ferred a threshold of $200,000 to $300,000 per QALY on the basis of increases in health care spending over time and the health gains that have been associated with those increases, surveys that ask people how much they would be willing to pay for health gains, or the trade-offs that people make in the workplace between pay and safety risks.[2,3]

All this research suggests that $50,000 per QALY is too low, although in truth it is impossible to find a single threshold to represent society's willingness to pay for QALYs gained, because different approaches yield different values, each of which is based on different assumptions, inferences, and contexts. Searching for a single benchmark is at best a quixotic exercise because there is no threshold that is appropriate in all decision contexts.[4] In principle, the threshold should depend on the budget available to a decision maker and the costs and benefits of alternative uses of that budget. In the United States, no single decision maker knows the opportunity costs of alternative health investments and issues health care decisions under a single budget.[4] Moreover, U.S. policymakers, who are already averse to explicit rationing, would balk at such a rigid exercise.

Still, we face a powerful need to assess comparative value. The effective but costly hepatitis C drug sofosbuvir (Sovaldi, Gilead Sciences) is only the most recent example to remind us that society cannot avoid difficult trade-offs in choosing among health-improving technologies. Despite its problems, the threshold is a useful tool for organizing evidence and informing decisions. It should, however, be used with greater thoughtfulness and consistency. For example, it is useful to know that sofosbuvir may in fact be cost-effective in certain populations according to traditional cost-per-QALY thresholds, but its widespread use at its current price raises critical questions about its affordability and about what services will not be provided in order to pay for it.

Rather than settling on a single threshold, we believe it would be preferable to use multiple thresholds, ideally ones based on the available resources for the relevant decision maker and possible alternative uses of those resources. For example, decision makers in resource-poor settings would have a more stringent (lower) ceiling.

Given the evidence suggesting that $50,000 per QALY is too low in the United States, it might best be thought of as an implied lower boundary.[4] Instead, we would recommend that analysts use $50,000, $100,000, and $200,000 per QALY. If one had to select a single threshold outside the context of an explicit resource constraint or opportunity cost, we suggest using either $100,000 or $150,000.

Invoking thresholds, however, means acknowledging limits — and thus in some cases displacing currently provided interventions that have cost-effectiveness ratios exceeding the threshold. It also suggests that more of our spending should focus on underutilized interventions with ratios below the threshold; substituting more cost-effective interventions for less cost-effective ones could improve health outcomes and save money.[5] Finally, much more work is needed to elucidate the comparative effectiveness and cost-effectiveness of existing care and to establish systemwide incentives to encourage cost-conscious decisions.

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