Reply to Commentary

Time Preference in Medical Economics: Science or Religion?

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In the beginning, God created the Universe. He saw that it was good. At a later date, He created people who traded in financial markets, where individuals borrowed money and were expected to return more money than originally lent. Still later, God created economists, who introduced the exponential discount model for time preference, a mathematical formula for comparing different amounts of money at different points in time. The model respected several commandments, including simplicity, stationarity, separability, constant marginal utility, applicability to diverse time spans, and flexibility for analyzing both isolated events and perpetual sequences. The model was fully specified, aside from one easily-measured variable, and nicely described the prices (interest rates) observed in financial markets. Whenever a monarch considered building a road, arranging a marriage, or setting off to war, the royal cost-benefit analyst could use exponential discounting to calculate the present value of the investment.

The charm of the exponential discount model was not lost on the medical cost-benefit analysts (and their descendants, the medical cost-effectiveness analysts). Keeler and Cretin, from the West, and Weinstein and Stason, from the East, were among the first to search for proof that time discounting for health outcomes ought to be identical to time discounting for financial resources. In essence, two axioms were proclaimed: 1) health and money can be exchanged for each other at a rate that remains constant (at the margin) over time, and 2) money can be invested in productive enterprises that will let it grow in real value exponentially over time. Keeler and Cretin showed that without equal discounting of money and health, it might be best never to spend money today to obtain future health, provided that the expenditure can be postponed. Weinstein and Stason showed that the two axioms implied that consistency over time in the exchange of money and health occurs only if health outcomes are discounted at the financial discount rate. Naturally, some philosophers, psychologists, and Canadians dissented. Contrary to the first axiom, money cannot be exchanged for health, only for health care. In turn, the temporal relation between health care and health is extremely complex and characterized by an increasing average productivity of resources in improving health. Greater productivity has brought increased rather than decreased spending on health care, suggesting that society prefers to maintain a constant marginal rate of productivity of health resources rather than a constant level of total health. As our success in treating one disease increases, for example, we expand our resources to treat other diseases that are more resistant to our efforts. Thus, the first axiom of constant marginal tradeoff between health and money is plausible. But is it correct? We doubt that the marginal value of a quality-adjusted life year is increasing with time at an exponential rate exactly equal to the financial interest rate—the necessary condition to justify no discounting of health effects. Yet, the marginal value is unlikely to be constant either—the necessary condition to justify discounting at financial interest rates.

A more subtle problem with the axiom of constant marginal substitution arises when one considers the individual. The axiom implies that it is possible to exchange money for health at a rate that is constant throughout a person’s life. Indeed, the optimality of the economic model rests on the assumption that individuals face a constant marginal rate of substitution between health and other goods and adjust their consumption to the point where marginal rates of sub-
stitution are equal across individuals over time. The trouble is that health cannot easily be “banked” across time, in that there are few effective methods for accepting less health today for more health tomorrow. Opportunities to “buy” and “sell” health are infrequent and generally appear as lumpy alternatives. In contrast to the smooth opportunity sets coveted by economists, individuals cannot exchange money for health (or health for health) over time through small, independent, private transactions. Even if individuals on average discounted health at approximately the same rate at which they discount money, we would expect—and indeed have found—enormous variation across individuals.7

Further confounding the debate over the exponential time-preference model are several psychological factors that encourage people to value delayed outcomes differently from immediate concerns. Future events, by definition, are uncertain and thereby raise the suspicion that the upcoming benefit or loss will not be realized.8 Delayed arrangements also necessitate keeping track of the account: a fixed cost of keeping a ledger helps explain many of peoples’ violations of the exponential discount model (including the proximity effect,9 magnitude effect,10 and gain-loss asymmetry”). The awareness of future events may evoke feelings of anticipation and anxiety that are not offset by the memories or relief retained afterwards.” Any particular outcome is only one member in a larger set of experiences, and people think in complex ways about sequences.13-15 Overall, such psychological factors could cause many people to depart from exponential time discounting for both health and money, even if continuous market opportunities were available.

The credibility of the first axiom increases by taking a population perspective. From this viewpoint, the analyst considers small changes in the probability of health for a population. Selective adoption of individual programs and policies allows societal decision makers to alter the amount of resources directed at health care and, thus, the marginal rate of exchange between money and health in the population. Smooth exchanges between money and health are possible, smooth at least when measured at the level of precision used in public health. This set of opportunities for exchanging money for health facilitates the equilibration of societal time preference for health with societal time preference for health care resources.16 As Keeler and Cretin emphasize, furthermore, societal decision makers who do not discount future health benefits face temptations to postpone allocating, health care resources to nes- sential services: a greater reward can always be reaped by investing the resources and spending them later.

Societal decision makers may be tempted to delay spending, yet the Keeler-Cretin paradox is almost never seen. We believe that the rarity of this paradox reflects countervailing forces rather than a basic devotion to exponential discounting for health outcomes. Political issues, such as the greater priority people assign to identified lives relative to statistical lives, may demand that resources be diverted to immediate concerns rather than future problems.17 Public accountability often leads to a liberal definition of “essential” services that outstrips the available resources.18 Self-interested voters may block proposals to defer too many health benefits to future generations or other people. Budget processes usually require spending this year’s budget this year, leaving limited opportunities to retain unspent money with interest.19 A wise societal decision maker, therefore, can ignore the first axiom without becoming a “perpetual scrooge” or a “money pump.”

If the axiom of a constant marginal exchange rate between money and health is not exactly true, we assert that it is reasonable. Indeed, it may be as reasonable as the assumption that markets for private goods are sufficiently in equilibrium to justify using prices as measures of marginal societal value. One of the ironies of economics is that cost-benefit and cost-effectiveness analyses are needed only when market forces fail to allocate resources optimally, as in health care because of inadequate consumer information and distortions caused by insurance. But both methods rely on market signals for the parameters needed in mathematical calculations, notably prices and discount rates. When markets break down, incredibly complex methods replace the relatively simple approaches of marginal cost pricing and exponential discounting.20,21 Methods are not yet available for health-related cost-effectiveness analyses to account for individuals who may have different marginal rates of time preference for health and money.22 The solution is almost certainly not to stop discounting, because doing so would ignore opportunity costs at the societal level.

So, do we accept the first axiom as a reasonable approximation to reality, or do we abandon it? Ganiats provides his judgment by stating, “There is no a priori reason to believe that there must be a constant relationship between dollars and health.”23 Abandoning the first axiom, however, means forgoing cost-effectiveness ratios as a method for prioritizing health care interventions in the contemporary health care environment. Without cost-effectiveness ratios, each analysis would need to be indexed to a particular moment in time and not be comparable to other interventions at other times (even after correcting for currency inflation). Whether the exponential model is a perfect description of peoples’ behavior is not the crucial question. We know that it is not. Instead, analysts need to decide whether the model is a worthwhile guide to improving peoples’ behavior. And that decision must be braved without empiric proof that the model is “good enough” to justify its use. The first axiom is therefore a matter of faith, not of science.
References