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Education and debate

Need for differential discounting of costs and health effects in cost effectiveness analyses

Werner B F Brouwer, Louis W Niessen, Maarten J Postma, Frans F H Rutten

The decision of the National Institute for Health and Clinical Excellence to abandon differential discounting of future health is a step backwards and could change funding decisions

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Discounting can have a strong influence on cost effectiveness ratios for priority setting, especially in preventive interventions. It is therefore crucial that appropriate discount rates are used in economic evaluations. Increasingly, it is argued that the rate for future non-monetary health effects should be below that for future costs, to account for the growing value of health effects. The previous guidelines of the National Institute for Health and Clinical Excellence (NICE) on economic evaluation were the first national guidelines to prescribe such differential discounting (6% for costs and 1.5% for effects). However, in its latest guidelines both rates are set at 3.5%, implying a lower weight for future effects.¹ We argue that this change is not based on contemporary health economic literature nor convincingly justified.

Discounting

Decisions about the resources dedicated to prevention depend on the weight given to future health in economic evaluations. Future costs and health gains are commonly weighted in relation to the time at which they occur, future costs and effects receiving less weight than present ones. This procedure is called discounting² and is prescribed in international and *BMJ* guidelines for economic evaluations of health care.³⁻⁵

Although discounting may seem a rather technical procedure, its consequences on the cost effectiveness ratio are often substantial.^{2 4 6-8} Attaching lower weight to future health makes preventive health care seem less

cost effective because such interventions typically involve current costs and future effects (table). Thus, the rate at which costs and effects are discounted can affect funding decisions.

Problems with current practice

International and national guidelines and practical studies agree that cost and effects should be discounted, normally using an equal discount rate of 3-5%.³ Equal discounting is recommended irrespective of how the effects are expressed—for example, in money terms, as quality adjusted life years (QALYs), or as life years gained. This consensus seems primarily based on the consistency argument (box 1)¹³ and the postponing paradox (box 2).¹⁴ Both arguments imply that using different discount rates for costs and effects would lead to undesirable decisions. If you agree with these arguments, as most guidelines up till now (implicitly) do, only one discount rate needs to be set for both costs and effects. Normally, this rate is based on monetary measures, such as the return on risk-free government bonds.⁴

Both arguments underlying equal discounting have been criticised.¹⁵⁻¹⁷ Firstly, it was argued that the money value of health benefits such as QALYs is not stable but may change over time, invalidating the consistency argument.^{16 17} Secondly, the option of infinite postponing hardly seems relevant in the real world.^{4 8} Indeed,

Effect of equal and differential discounting of money and health on cost effectiveness of preventive interventions from selected studies that reported sensitivity analysis on discount rates

Study	Subject (outcome)	Equal discounting at 6%	Differential discounting*
Walker et al ⁹	Public place defibrillators (£/QALY)	47 671	41 146
Trotter and Edmunds ¹⁰	Meningococcal C vaccine (£/life year gained)	15 710	3 845
UKPDS ¹¹	Improved blood pressure control in type 2 diabetes (£/event-free year gained)	1 049	434†
Torgerson and Raftery ²	Prevention of hip fracture with hormone replacement therapy (£/fracture prevented)	42 374	7 362†
Torgerson and Raftery ²	Prevention of hip fracture with vitamin D and calcium (£/fracture prevented)	28 022	15 646
Gray et al ¹²	Intensive blood glucose control on type 2 diabetes (£/event-free year gained)	1 166	563

QALY=quality adjusted life year, UKPDS=UK prospective diabetes study.

*6% for money and 1.5% for health.

†0% discounting for health gains; value for 1.5% discounting not reported.

although until recently the National Institute for Health and Clinical Excellence used differential discount rates for costs (6%) and effects (1.5%), it never recommended postponing all new programmes. We therefore question the need for equal discounting and believe new discount rules need to be found.

Alternative strategies

A first way of finding appropriate discount rates could be to directly measure time preferences for health and money—that is, the weight people attach to future health gains or costs relative to present ones. But although empirical evidence on time preferences for money and health is available, the estimates differ substantially (partly because of differences in the methods). Moreover, discount rates for health often turn out higher than those for money, and the observed rates for both are often implausibly high.⁶ As such, it is questionable whether data on individual preferences can be meaningfully used in societal decisions, which also need to consider future generations and paternalistic concern for sufficient preventive measures. The economist Pigou noted that “There is wide agreement that the State should protect the interests of the future in some degree against the effects of our irrational discounting and of our preference for ourselves over our descendants.”¹⁸ We may therefore need other, more normative rationales for choosing discount rates.

Recently, an alternative discount rule was developed. Van Hout suggests that the discount rates for health and costs need not be equal but depend on distinct aspects of both quantities, such as the growth rates of national income and healthy life expectancy.¹⁷ Gravelle and Smith,¹⁶ moreover, show that the monetary value of health effects is expected to grow over time. This growth needs to be accounted for in economic evaluations. When health effects are valued monetarily this can be done by using a growing value for health. When non-monetary quantities are used, such as QALYs (as proposed in the NICE guidelines), the growth can be accounted for by lowering the discount rate for effects relative to that of costs—that is, differential discounting. Following this strategy, Gravelle and Smith calculate that non-monetary health effects should typically be discounted some 2% to 5% less than costs, which implies a maximum discount rate for health of 1.5% if costs are discounted at 3.5%. Adopting differential discounting will thus (rightfully) give more weight to future health effects, especially since discount rates for health are normally set equal to those for costs.

These arguments are gaining greater acceptance, and differential discounting seems likely to be adopted in other national guidelines.¹⁹ So why has NICE returned to equal discounting at 3.5%?

Treasuring future health

NICE explains its return to equal discounting and higher discount rates for health by simply indicating that the “Annual rate of 3.5%, for both costs and health effects, is based on the recommendations of the UK Treasury.”²¹ The Treasury’s *Green Book*,²⁰ in which its recommendations are laid down, indeed prescribes a

Box 1: Consistency argument

The consistency argument can be easily explained by considering programmes A and B below:

Programme A costs £30 000 this year and has an effect of 1 QALY this year.

Programme B costs £30 000 in year 40 and has an effect of 1 QALY in year 40.

If we assume the monetary valuation of health effects remains equal over the years, as the consistency argument does, it is easy to see that these two programmes should receive equal priority. If we want to discount future costs and effects and want identical programmes like A and B to receive equal priority, the discount rate of costs (r) should equal that of effects (i), since only then does the cost effectiveness ratio of B ($(£30\,000/(1+r)^{40})/(1+i)^{40}$) = £30 000/1) equal that of A (£30 000/1).

single 3.5% discount rate for evaluations. A closer look at the Treasury’s guideline, however, shows that it is based on the same framework Gravelle and Smith use to derive a discount rate for costs.¹⁷

Unfortunately, the Treasury, while recognising QALYs as outcome measures, neither refers to nor uses their expansion of this framework to derive an appropriate discount rate for non-monetary health effects. The Treasury therefore does not account for the fact that equal discounting is inappropriate when measures such as QALYs are used for effects, unless the growing value of health is otherwise accounted for. But the growing value of health is not accounted for in the institute’s guidelines. Although NICE judges the cost-effectiveness of a programme in comparison to some monetary standard or range,²¹ it does not explicitly adjust this range in relation to the timing of effects nor use a growing (monetary) value for QALYs. In addition, dealing with this issue implicitly in the decision making process seems undesirable and obscures this process.

Therefore, the institute’s decision to use equal discounting at 3.5% for costs and non-monetary effects is unexpected and risks undervaluing future health in decision making. It is also unnecessary since differential discounting is not so much in contradiction with the Treasury’s recommendation but rather its correct application in the context of non-monetary health effects. Gravelle and Smith show how to combine appropriate discount rates with the Treasury’s own theoretical framework.¹⁶

The Treasury indicates that the discount rate can be varied to analyse its effect on outcomes, and indeed NICE prescribes advanced, probabilistic sensitivity

Box 2: Postponing paradox

The postponing paradox is based on the simple fact that if one uses lower discount rates for effects than for costs postponing any given programme will improve its cost effectiveness ratio.

Consider programme A from box 1 with a cost effectiveness ratio of £30 000 per QALY. Assuming a 5% discount rate for costs and a zero discount rate for effects, postponing the programme by one year would improve its cost effectiveness ratio to $£30\,000/(1.05)^1$ = £28 571 per QALY. Further postponement would again improve the ratio, since the cost component declines more rapidly than the effect component (which in our example stays stable because of the zero discount rate). The paradox is therefore that a lower discount rate for effects makes infinite postponement theoretically optimal but it is practically undesirable.

Summary points

New National Institute for Health and Clinical Excellence guidelines change the discount rates for costs and effects from 6% and 1.5% respectively to 3.5% for both

This change gives a lower weight to future health effects and may worsen the cost effectiveness ratio, especially for preventive interventions

Differential discounting is more appropriate when non-monetary outcomes like QALYs are used

NICE should return to a 1.5% discount rate for effects

analysis. But this can never be an alternative for using appropriate discount rates. A small consolation may be that the Treasury prescribes a declining discount rate of 3.5% for the first 30 years, 3.0% for the years 31 to 75, 2.5% from year 76 to 125, and 2.0% from year 126 to year 200. However, it takes 200 years before the previous discount rate for health effects of 1.5% is reached, and most healthcare evaluations are likely to look at much shorter time spans.

Back to the future

NICE's new guideline on discounting is an unexpected step back in time. Not only could it have a large influence on decision making, it may prevent other countries from adopting differential discounting. Remedial action is both urgent and straightforward. The institute can simply follow the recommendation of the Treasury²⁰ and use the correction indicated by Gravelle and Smith in discounting health effects,¹⁶ setting the discount rate for health at 1.5% again. Such a step would be in line with current theoretical insights, would rightfully improve the cost effectiveness of

prevention, and ensures a healthier consideration of the future.

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- 1 National Institute for Clinical Excellence. *Guide to the methods of technology appraisal*. London: NICE, 2004.
- 2 Torgerson DJ, Raftery J. Economic notes: discounting. *BMJ* 1999;319:914-5.
- 3 Drummond MF, O'Brien B, Stoddard GL, Torrance GW. *Methods for the economic evaluation of health care programmes*. 2nd ed. Oxford: Oxford University Press, 1997.
- 4 Gold MR, Siegel JE, Russell LB, Weinstein MC, eds. *Cost-effectiveness in health and medicine*. Oxford: Oxford University Press, 1996.
- 5 Drummond MF, Jefferson TO. Guidelines for authors and peer reviewers of economic submissions to the *BMJ*. *BMJ* 1996;313:275-83.
- 6 Cairns J. Discounting in economic evaluation. In: Drummond MF, McGuire A, eds. *Economic evaluation in health care: Merging theory with practice*. New York: Oxford University Press, 2001.
- 7 Smith DH, Gravelle H. The practice of discounting in economic evaluations of healthcare interventions. *Int J Technol Assess Health Care* 2001;17:236-43.
- 8 Brouwer WBF, van Hout BA, Rutten FFH. A fair representation of future effects: taking a societal perspective. *J Health Services Res Policy* 2000;5:1-5.
- 9 Walker A, Sirel JM, Marsden AK, Cobbe SM, Pell JP. Cost effectiveness and cost utility model of public place defibrillators in improving survival after prehospital cardiopulmonary arrest. *BMJ* 2003;327:1316.
- 10 Trotter CL, Edmunds WJ. Modelling cost effectiveness of meningococcal serogroup C conjugate vaccination campaign in England and Wales. *BMJ* 2002;324:809.
- 11 UK Prospective Diabetes Study Group. Cost effectiveness analysis of improved blood pressure control in hypertensive patients with type 2 diabetes: UKPDS 40. *BMJ* 1998;317:720-6.
- 12 Gray A, Clarke P, Farmer A, Holman R, UK Prospective Diabetes Study Group. Implementing intensive control of blood glucose concentration and blood pressure in type 2 diabetes in England: cost analysis (UKPDS 63). *BMJ* 2002;325:860.
- 13 Weinstein MC, Stason WB. Foundations of cost-effectiveness analysis for health and medical practices. *N Engl J Med* 1977;296:716-21.
- 14 Keeler EB, Cretin S. Discounting of life-saving and other non-monetary effects. *Manage Sci* 1983;29:300-6.
- 15 Parsonage M, Neuburger H. Discounting and health benefits. *Health Econ* 1992;1:71-6.
- 16 Gravelle H, Smith D. Discounting for health effects in cost-benefit and cost-effectiveness analysis. *Health Econ* 2001;10:587-99.
- 17 Van Hout BA. Discounting costs and effects: a reconsideration. *Health Econ* 1998;7:581-94.
- 18 Pigou AC. *The economics of welfare*. 4th ed. London: Macmillan, 1932.
- 19 Brouwer WBF, Rutten FFH. *The level of discount rates in economic evaluations: is the time right for a new guideline?* [in Dutch] Rotterdam: Institute for Medical Technology Assessment, 2005.
- 20 Her Majesty's Treasury. *The green book*. London: Stationery Office, 2004.
- 21 Rawlins MD, AJ Culyer. National Institute for Clinical Excellence and its value judgments. *BMJ* 2004;329:224-7.

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Malpractice in Mexico: arbitration not litigation

Carlos Tena-Tamayo, Julio Sotelo

Accusations of malpractice often end in the courts, damaging the doctor-patient relationship and encouraging defensive practice. In Mexico, an alternative system based on arbitration and conciliation has been effective

The growing number of lawsuits against doctors seems to be related to poor personal communication, unrealistic expectations of performance, the high costs of medical attention, and better informed and more critical patients.^{1,2} A lucrative industry has developed around this phenomenon. In response, doctors buy expensive insurance, which seriously affects their medical practice, summarised in the concept of "defensive medicine."³ The practice of defensive medi-

cine includes ordering excessive diagnostic procedures and consultations to minimise the risks of being sued.⁴ Consequently, the cost of medical care increases, promoting resentment in patients, which in turn favours lawsuits, creating a vicious circle.⁵

Fear of being sued drives some doctors to additional detrimental actions, such as abandoning risky specialties; refusing to treat seriously ill patients; and using clinical records and informed consent forms

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