

This is a repository copy of *The practice of discounting in economic evaluations of healthcare interventions*.

White Rose Research Online URL for this paper:  
<http://eprints.whiterose.ac.uk/255/>

---

**Article:**

Smith, D.H. and Gravelle, H. (2001) The practice of discounting in economic evaluations of healthcare interventions. *International Journal of Technology Assessment in Health Care*. pp. 236-243. ISSN 0266-4623

---

**Reuse**

Unless indicated otherwise, fulltext items are protected by copyright with all rights reserved. The copyright exception in section 29 of the Copyright, Designs and Patents Act 1988 allows the making of a single copy solely for the purpose of non-commercial research or private study within the limits of fair dealing. The publisher or other rights-holder may allow further reproduction and re-use of this version - refer to the White Rose Research Online record for this item. Where records identify the publisher as the copyright holder, users can verify any specific terms of use on the publisher's website.

**Takedown**

If you consider content in White Rose Research Online to be in breach of UK law, please notify us by emailing [eprints@whiterose.ac.uk](mailto:eprints@whiterose.ac.uk) including the URL of the record and the reason for the withdrawal request.

---

# RESEARCH NOTES

---

## THE PRACTICE OF DISCOUNTING IN ECONOMIC EVALUATIONS OF HEALTHCARE INTERVENTIONS

David H. Smith

*The Kaiser Permanente Center for Health Research*

Hugh Gravelle

*University of York*

### Abstract

**Objectives:** Discounting of costs in health-related economic evaluation is generally regarded as uncontroversial, but there is disagreement about discounting health benefits. We sought to explore the current recommendations and practice in health economic evaluations with regard to discounting of costs and benefits.

**Methods:** Recommendations for best practice on discounting for health effects as set out by government agencies, regulatory bodies, learned journals, and leading health economics texts were surveyed. A review of a sample of primary literature on health economic evaluations was undertaken to ascertain the actual current practice on discounting health effects and costs.

**Results:** All of the official sources recommended a positive discount rate for both health effects and costs, and most recommended a specific rate (range, 1% to 8%). The most frequently specified rates were 3% and 5%.

A total of 147 studies were reviewed; most of these used a discount rate for health of either 0% ( $n = 50$ ) or 5% ( $n = 67$ ). Over 90% of studies used the same discount rate for both health and cost. While 28% used a zero rate for both health and cost, in 64% a nonzero rate was used for both. Studies where the health measure was in natural clinical units (direct) were significantly more likely to have a zero discount rate.

**Conclusion:** The finding that 28% of studies did not discount costs or benefits is surprising and concerning. A lower likelihood of discounting for benefits when they are in natural units may indicate confusion regarding the rationale for discounting health effects.

**Keywords:** Discounting, Economics, Health effects, Time preference

Discounting, the practice of weighting future gains and losses less heavily than those that occur in the present, is a common practice in economic evaluations. The discounting of costs in health-related economic evaluations is generally regarded as being uncontroversial, but more disagreement exists for discounting of health benefits (13). With both costs and benefits there is disagreement about the appropriate rate (or rates) to use and whether the same rate should be used for both.

Supported by the European Commission under contract F14P-CT96-0056 and from the Department of Health to the National Primary Care Research and Development. The views expressed are not necessarily those of the funders. At the time this work was carried out, Dave Smith was a Visiting Research Fellow at the Centre for Health Economics, University of York, from the Department of Pharmacy, University of Washington.

We sought to investigate whether the methodologic debate about discounting health effects at the same rate as costs was reflected in official recommendations and in actual practice. We surveyed the literature regarding recommendations for best practice on discounting for health as set by government agencies, regulatory bodies, learned journals, and leading health economics texts. We reviewed a sample of the primary literature on health economic evaluations to ascertain the current practice on discounting health effects and costs. We wished to see if practice was in line with the recommendations, to examine the extent of the consensus among practitioners on discounting, and to determine if differences in practice were systematic.

## **METHODS**

### **Literature on Recommendations for Discounting**

We sought to locate recommendations from the primary literature and textbooks, official and semi-official sources, and government bodies. A literature search was undertaken to identify a range of potential advice using electronic databases (MEDLINE, HealthStar, EconLit, EMBase). A request was also posted to an international health economics mailing list, subscribed to principally by researchers working in economic evaluation in health care. The request asked for references concerning discount rates for health effects from official bodies, texts, handbooks, and guidelines.

### **Literature Discounting Practice**

We drew on the studies abstracted in an existing database of published evaluations: the National Health Service Economic Evaluation Database (NHS EED), a database funded by the U.K. NHS (<http://nhscr.d.york.ac.uk/welcome.html>). The NHS EED is maintained by the Centre for Reviews and Dissemination (CRD) and was commissioned by the Department of Health "to develop and maintain a database of critical abstracts of economic evaluations of health care" (5). Potential articles selected for inclusion are found by standardized electronic and hand searches.

We included studies only when the time horizon for costs and benefits exceeded 18 months; over 96% of studies included had a time horizon of 2 years or greater. We selected from the studies included in the database between 1992 and 1998. Since the type of health effect measure used in the study (volume or value) could have implications for the discounting procedure, we wanted a sample with a range of health outcome measures. The preponderance of studies in the database are cost-effectiveness studies, with a smaller number of cost utility and cost benefit studies. We accordingly selected all the cost benefit studies and cost utility studies included in the 1992–98 database and the first 15 (by accession number) of the cost-effectiveness studies in each year. The following information was collected from each abstract in the database: accession number, country of origin, date of publication, discount rate (and range) for health and cost, journal, health measure, disease, type of intervention, time horizon, and average age of study population. When a specific discount rate for health effects or cost was not reported in the abstract, we obtained the original article to determine whether discounting had been carried out. In cases where no discounting was mentioned in the original article, it was assumed that none had been carried out (i.e., rate = 0%). The discount rates reported here are the rates used in the base case. It should be noted that no studies with a zero discount rate (on health or costs) used a positive rate in a sensitivity analysis.

We also collected information on the impact factor for each journal where the articles were published. The journal impact factor is a measure of the frequency with which the

average article in a journal has been cited in a particular year and is a gauge of a journal's relative importance, especially compared with other journals in the same field.

The type of health effect measure was also recorded according to four categories: a) cost benefit analysis (CBA); b) adjusted survival; c) survival; and d) direct health measure. In the CBA analyses, health gains were measured in monetary units. The adjusted survival category included, for example, quality-adjusted life-years (QALYs), while simple survival used life-years gained. Direct health measures are those that use some sort of natural clinical measure of effect without conversion to survival (e.g., decrease in milligrams per deciliters of HDL cholesterol).

## RESULTS

### Literature on Recommendations for Discounting

We identified 16 different sources, displayed in Table 1. Eight are guidelines for pharmaceuticals, five are from government agencies, three are textbooks, and one is from a journal (some sources fit into more than one category). These official and semi-official publications contained little detailed discussion of the rationale for discounting and for the specific rates recommended. Most seemed to be aimed at cost-effectiveness rather than CBA. Most confined themselves to the assertion that discounting was appropriate for health interventions to reflect the fact that future costs and benefits were less valuable. As might be expected, the more academic sources were more likely to discuss the rationale for their recommendations. For example, the chapter on discounting in the volume (13) produced for the U.S. Public Health Service by a team of expert practitioners has a very full discussion of the arguments for and against discounting health effects at the same rate as costs.

All of the sources recommend a positive discount rate for both health effects and costs. Most (13 of 16) recommend a specific rate or range of rates, and eight suggest including a zero rate in the analysis. The range of positive rates is between 1% and 8%. The most frequently specified rates are 3% and 5%. Recognition of the difficulties in determining the "correct" rate led most sources to recommend that sensitivity analysis be conducted using a range of discount rates. None of the sources recommended that the rate should depend on the length of the time horizon. Only one source (9) recommended that a lower discount rate be used for health effects.

### Literature on Actual Practice of Discounting

In all, 147 articles were selected for analysis (for a full listing, see reference 18). Most studies were from the United States ( $n = 83$ , 57%), followed by the United Kingdom ( $n = 24$ , 16%) and Canada ( $n = 10$ , 7%). Table 2 shows the distribution of discount rates used in the 147 articles reviewed. Most studies used a base discount rate for health of either 0% (35% of studies) or 5% (47% of studies), with 10% of studies using a 3% rate for health. Over 90% of studies used the same discount rate for both health and cost, and 28% used a zero rate for both health and cost. It is interesting to note that none of the publications from the United Kingdom followed the U.K. Department of Health (9) recommendation to use a lower discount rate for health.

A logistic regression was also carried out. Studies where the health measure was in natural clinical units (direct) were significantly less likely to have a nonzero discount rate. Those studies with a nonzero discount rate for cost were more likely to have a nonzero discount rate. No other factors included (country, year of publication, health measure, impact factor of journal) in the analysis were shown to be associated with a nonzero discount rate for health benefits.

**Table 1.** Literature on Recommendations for Discounting

Title	Year	Country	Agency/authors	Technology	Discount rate for cost	Discount rate for health	Same discount rates for cost and health
Dutch Pharmacoeconomic Guidelines (unpublished draft)	1999	The Netherlands	Sick Funds Council	Pharmaceuticals	4%; must be varied in sensitivity analysis	4%; must be varied in sensitivity analysis	Yes
Guidelines and Recommendations Pharmacoeconomic for French Studies (6)	1997	France	College des Economistes de la Sante	Pharmaceuticals	2.5% or 5%	2.5% or 5%; must include 0% in sensitivity analysis	Not stated
Report on Guidelines for Socioeconomic Analyses of Pharmaceuticals (1)	1998	Denmark	Sick Funds Council	Pharmaceuticals	Discounting recommended; rate to be justified for each case	Discounting recommended; rate to be justified for each case	Not stated
Methodological Orientation: Economic Evaluation of Medicines (8)	1998	Portugal	Infarmed	Pharmaceuticals	5% with sensitivity analysis at 3%	5% with sensitivity analysis to include 0% and 3%	Yes, must justify if different rates used
A Proposal for Italian Guidelines in Pharmacoeconomics (12)	1995	Italy	Garattini et al.	Pharmaceuticals	5%	5%	Yes
Guidelines for Economic Evaluation of Pharmaceuticals, 2nd ed (4)	1997	Canada	CCOHTA	Pharmaceuticals	0 and 5% and 3%	0 and 5% and 3%	Yes
A Proposal for Methodological Guidelines for Economic Evaluation of Pharmaceuticals (3)	1995	Belgium	Belgian Society for Pharmacoeconomics	Pharmaceuticals	0%, 5% and >5%	0% and >5%	Yes

EU-Project: Harmonisation of Methodology—Principles of Good Evaluation Practice in Clinical Economic Studies (draft)	1995		European Union	Medical technologies and policy	No rate recommended, but discounting should be undertaken	No rate recommended, but discounting should be undertaken	Not stated
Guidelines for the Pharmaceutical Industry on Preparation of Submissions to the Pharmaceutical Benefits Advisory Committee (7)	1995	Australia	Pharmaceutical Benefits Advisory Committee	Pharmaceuticals	5%	5%	Yes
Guidelines for Authors and Peer Reviewers of Economic Submissions to the BMJ (10)	1996	UK	<i>British Medical Journal</i>	Medical technologies and policy	0%, and between 3% and 6%	0%, and between 3% and 6%	Yes
Policy Appraisal and Health (9)	1996	UK	Department of Health	Medical technologies and policy	6%	1.5–2%	No
Valuing Health Care (19)	1995	US	Viscusi	Medical technologies and policy	3% and between 1% and 7%	3% and between 1% and 7%	Not stated
Cost-effectiveness in Health and Medicine (13)	1996	US	U.S. Public Health Service (Gold et al.)	Medical technologies and policy	3%, 5%, and 0 and 7%	3%, 5%, and 0 and 7%	Yes
Assessing the Effectiveness of Disease and Injury Programs: Costs and Consequences (2)	1995	US	Centers for Disease Control	Prevention programs	3%, and 0 and 8%	3%, and 0 and 8%	Yes
Methods for the Economic Evaluation of Health Care Programmes (11)	1997	UK	Drummond et al.	Medical technologies and policy	3% and 5% and 0%	3% and 5% and 0%	Yes
The Disability Adjusted Life Year (DALY) Definition, Measurement and Potential Use (15)	1995		World Bank	Health service priority setting	NA	3% for DALYs	NA

---

**Table 2.** Base Case Discount Rates in Articles in Review

Rate	Health		Cost	
	n	(%)	n	(%)
0%	50	(35)	43	(30)
2%	1	(<1)	1	(<1)
3%	14	(10)	17	(12)
4%	4	(3)	4	(3)
5%	67	(47)	69	(48)
6%	7	(5)	8	(6)
7%	1	(<1)	1	(<1)
<i>Same rate</i>				
Both zero			40	(28)
Both nonzero			95	(64)
<i>Different rates</i>				
Cost zero, health nonzero			3	(2)
Cost nonzero, health zero			9	(6)

## DISCUSSION

Only one source (9), produced by the English Department of Health, recommends a different rate for health effects and costs. Here the recommendation is a 6% discount rate for costs and a 1.5% to 2% rate for the volume of health effects. The justification is the growth in the value of future health effects and is supported by references to the earlier Treasury guidance on economic appraisal (14) and to the paper by Parsonage and Neuburger (17), who were economic advisors at the Department of Health and the Treasury.

The chapter by Lipscomb, Weinstein, and Torrance in the volume commissioned by the U.S. Public Health Service (13) notes the possibility of increases in the future value of health and suggests that they could be taken account of in a cost-effectiveness analysis by adjusting the discount rate or the volume of health effects. The chapter notes that no evaluations appeared to have followed this practice, and our sample of evaluations discussed previously also found no examples. Lipscomb et al. appear to downplay the significance of increases in the future value of health in their final recommendations. They state that they believe that the case for adjusting health effects to allow for the growth in their future value has yet to be fully made, although they do not provide any direct arguments against doing so.

There is some consensus in discounting practice in health economics evaluations: health effects are discounted at the same rate as costs in over 90% of the studies in our sample. The majority view in the methodologic literature is reflected by practitioners. There was far less consensus on the discount rate. Base case discount rates varied between 0% and 7%, with 0%, 3%, and 5% being most prominent. Surprisingly, 30% of our sample did not discount costs. This is clearly at variance with the recommendations surveyed previously and with nearly all the methodologic literature.

The majority "official" view, as evidenced by the recommendations examined, is that the cost and health consequences of interventions should be discounted at the same positive rate, and that evaluators should undertake sensitivity analysis to examine whether the results of evaluations are affected by assumptions about the discount rate. Most of the sources seem to be concerned with cost-effectiveness studies and therefore with discounting the volume of health effects. None of the majority recommendations makes any distinction between discounting the value of health effects and the volume of health effects.

We investigated the possible determinants of the choice of discounting procedures in the studies by multiple regression. Because the large majority of studies used the same rate

for cost and health effects, we could not examine the factors correlated with the decision to use the same or different rates. There was sufficient variation in the choice of discount rate for health to enable us to conduct a logistic regression analysis of the decision to use a positive versus a zero discount rate. The analysis showed that studies that use a direct form of health measure are less likely to discount health effects ( $p < .01$ ). This finding is independent of whether costs have been discounted. There is thus an indication that there is some disagreement or uncertainty in the literature about whether all health effects should be discounted. It may be that studies where the effects are left in natural units are more likely to be undertaken by authors who feel that discounting for costs is standard practice but do not feel that discounting benefits is justified. Alternatively, the idea of discounting, for example, a future millimeter of mercury of blood pressure reduction, may not be intuitive, whereas discounting a QALY is.

This finding is at odds with conventional logic in economics. While there is debate about the “right” discount rate and whether benefits should be discounted at the same rate as costs, it is interesting that the decision not to discount benefits is associated with measuring in direct or natural units. This is a seemingly illogical finding given that benefits, however measured, are subject to the same reasoning of time preference. This point of inconsistency should be of interest to those who assist in peer reviews of journal articles and to those who use the findings. Failing to discount future benefits has the effect of dampening the impact of costs, potentially showing interventions to be more cost-effective than they would otherwise appear.

The results from this report are, of course, dependent on the sample used. For identification of studies, we used a database that aims to include a wide range of evaluations. One potential criticism is that our sample from this database was based on the accession number. We chose that method of selection because random sampling was logistically awkward, and further, there was no obvious reason to suspect bias from the chosen method. These findings should be taken in the context of the years over which the studies were performed. Over half of the included studies were done before 1995. Although we did not find an effect of year of publication, a larger sample size may yield different results.

## POLICY IMPLICATIONS

Our findings that 28% of studies did not discount costs or benefits, where seemingly appropriate, is surprising and concerning. A previous analysis by Neumann et al. (16) that examined discounting of QALYs showed similar results. These analyses indicate that economic evaluations in health may be in need of further methodologic rigor. There are also implications from this work for the peer review process. There appears to be room for improvement in the presentation and production of economic evaluations; it is incumbent on reviewers and journal editors to be sedulous and informed in the reviewing of these studies.

## REFERENCES

1. Alban A, Keiding H, Sogaard J. *Report on guidelines for socioeconomic analyses of pharmaceuticals*. Copenhagen: Danish Ministry of Health; 1998.
2. Assessing the effectiveness of disease and injury programs: Costs and consequences. *MMWR*. 1995;44:1-10.
3. Belgian Society of Pharmacoepidemiology. *A proposal for methodological guidelines for economic evaluation of pharmaceuticals, Belgium*. Brussels: Belgian Society of Pharmacoepidemiology (BESPE); 1995.
4. Canadian Coordinating Office for Health Technology Assessment. *Guidelines for economic evaluation of pharmaceuticals: Canada*. 2nd ed. Ottawa: Canadian Coordinating Center for Health Technology Assessment (CCOHTA); 1997.



5. Centre for Reviews and Dissemination. *Making cost-effectiveness information accessible: The NHS Economic Evaluation Database Project*. York: University of York; 1996.
6. College Des Economistes De La Sante. *Guidelines and recommendations for French pharmacoeconomic studies*; 1997.
7. Commonwealth Department of Human Services and Health. *Guidelines for the pharmaceutical industry on preparation of submission to the pharmaceutical benefits advisory committee*. Canberra: Australian Government Publishing Service; 1995.
8. da Silva E, Pinto C, Sampaio C, et al. *Orientacoes metodologicas para estudos de avaliacao economica de medicamentos*. Infarmed; 1998.
9. Department of Health. *Policy appraisal and health*. London: Department of Health; 1995.
10. Drummond M, Jefferson T. Guidelines for authors and peer reviewers of economic submissions to the BMJ. *BMJ*. 1996;313:275.
11. Drummond MF, O'Brien B, Stoddart GL, Torrance GW. *Methods for the economic evaluation of health care programmes*. 2nd ed. Oxford: Oxford University Press; 1997.
12. Garattini L, Grilli R, Scopelliti D, Mantovani L. A proposal for Italian guidelines in pharmacoeconomics. *PharmacoEconomics*. 1995;7:1-6.
13. Gold M, Siegel J, Russel L, Weinstein M. *Cost effectiveness in health and medicine*. New York: Oxford University Press; 1996.
14. HM Treasury Great Britain. *Economic appraisal in central government: A technical guide for government departments*. London: HMSO Publications; 1991.
15. Homedes N. *The disability adjusted life year (DALY) definition, measurement and potential use*. New York: The World Bank, Human Capital Development and Operations Policy; 1995.
16. Neumann PJ, Zinner DE, Wright JC. Are methods for estimating QALYs in cost-effectiveness analyses improving? *Med Decis Making*. 1997;17:402-408.
17. Parsonage M, Neuburger H. Discounting and health benefits. *Health Econ*. 1992;1:71-76.
18. Smith D, Gravelle H. Discounting in health economics: A review of current practice. *CHE Technical Paper Series*. 2000;19. Available at: <http://www.york.ac.uk/inst/che/tech.htm>.
19. Viscusi K. *Discounting health effects for medical decisions*. In: *Valuing Health Care*, F. Sloan ed. New York: Press Syndicate of the University of Cambridge; 1996.