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The Practice of Discounting Economic Evaluation of Health Care Interventions

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The Practice of Discounting Economic Evaluation of Health Care Interventions

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Running head: Discounting in Health Care Interventions

Abstract

Background:

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 are 3% and 5%.

A total of 147 studies were included, 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 non-zero 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.

Discussion:

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.

Introduction

Discounting, the practice of weighting future gains and losses less heavily than those that occur in the present, is a common practice in the economic evaluation of health and other goods. 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 or not the same rate should be used for both.

We sought to explore if the methodological 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 out by government agencies, regulatory bodies, learned journals and leading health economics texts. To observe the situation in actual practice we reviewed of 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 amongst 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 UK NHS. 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) This database of structured abstracts is comprehensive since 1994, but contains earlier studies as well. The abstracts are written by a group of CRD commissioned reviewers according to guidelines written by a group of health economists. A second reviewer checks each abstract written by a first reviewer, and it is then sent out to the author of the original study for comment or correction. Abstracts are then loaded onto the database, which is accessible via the World Wide Web at http://nhscrd.york.ac.uk/welcome.html. Potential articles are selected for inclusion are found by electronic searches as well as hand searching.

MEDLINE and the Cumulative Index of Nursing and Allied Health Literature (CINAHL) are searched monthly, and Current Contents (Clinical Medicine) is searched weekly. All databases are searched using standardised strategies. Over 30 journals and discussion paper series are also included via hand searching. All studies that are full economic evaluations are selected for abstracting. A full economic evaluation is defined as a study that includes a comparison of two or more alternatives, where the costs and outcomes of the alternatives are examined. Examples of studies not included for full abstracting are methodologic papers, review papers, and costing studies.

We included studies from the NHS EED only if they had a time horizon for costs and benefits that exceeded 18 months. 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 data base 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 1992-1998 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.

We did not presume that the omission of a discount rate in the NHS EED abstract meant that the work was undiscounted. When a specific discount rate for health effects or cost was not reported in the abstract, we obtained the original article to determine if 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 and a discount rate of 0% was recorded. 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 (or 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. The impact factor is a gauge of the a journal's relative importance, especially compared to other journals in the same field. We wished to see if there was any relationship between journal quality and discounting procedures used.

The type of health effect measure used in the economic analysis was also recorded. The measures were divided into 4 categories: CBA, adjusted survival, survival, and direct health measure. In the CBA analyses health gains were measured in monetary units. With both types of survival measures life years gained were used. The adjusted survival category includes both quality adjusted life years (QALYs) and disability adjusted life years (DALYs). Direct health measures are those that use some sort of natural clinical

measure of effect without conversion to survival. Milligrams per decilitres of HDL cholesterol decrease, or millimetres of mercury of blood pressure lowered are examples of direct health measures.

Results
Literature on Recommendations for Discounting

We identified 16 different sources, displayed in Table 1. Eight are guidelines for pharmaceuticals, 5 are from government agencies, 3 are textbooks, and 1 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 cost benefit analysis. 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 US 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 out of 16) recommend a specific rate or range of rates, and 8 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.

Literature on Actual Practice of Discounting

In all, 147 articles were selected for analysis (see Appendix A for a complete listing). Most studies were from the US (n=83, 57%), followed by the UK (n=24, 16%), and Canada (n=10, 7%). Study characteristics are detailed in Table 2.

Table 3 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.

Table 4 indicates the extent to which studies used the same discount rate for costs and health effects. Over 90% of studies used the same discount rate for both health and cost. Twenty eight percent used a zero rate for both health and cost, but 64% used a non-zero rate for both health and cost). It is interesting to note that none of the publications from the UK followed the UK Department of Health (9) recommendation to use a lower discount rate for health.

A logistic regression (Table 5) was also carried out to determine the extent to which the practice of discounting was associated with particular study characteristics. In the regression, the dependent variable was whether or not a non-zero discount rate was used. Studies where the health measure was in natural clinical units (direct) were significantly less likely to have a non-zero discount rate. Those studies with a non-zero discount rate for cost were more likely to have a non-zero 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 non-zero discount rate for health benefits.

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 DH and the Treasury.

The chapter by Lipscomb, Weinstein and Torrance in the volume commissioned by the US 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 CEA 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 in section 4 also found no examples. Lipscomb, Weinstein and Torrance 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 been fully made, though 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 methodological 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 in section 3 and with nearly all the methodological 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 ($p<0.01$). This finding is independent of whether or not costs have been discounted. There is thus an indication that there is some disagreement or uncertaintanty 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 mm of Hg of blood pressure reduction, may not be intuitive, whereas discounting a quality adjusted life year is.

This finding is at odds with conventional logic in economics. While there is debate about the 'right' discount rate, and whether or not 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 peer review journal articles, and 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.

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.

Our findings that 28% of studies did not discount costs or benefits, where seemingly appropriate, is surprising and concerning. This analysis indicates that economic evaluations in health may be in need of further methodologic rigor.

Acknowledgements:

Table 1

Title	Year	Country	Agency / authors	Technology	Discount Rate for Cost	Discount Rate for Health	Discount Rate for Cost and Health the Same?
Dutch Pharmacoeconomic Guidelines. Draft (18)	1999	The Netherlands	Sickfunds Council	Pharmaceuticals	4%; must be varied in sensitivity analysis	4%; must be varied in sensitivity analysis	Yes
Guidelines and Recommendations for French Pharmacoeconomic 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	Sickfunds 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

Title	Year	Country	Agency / authors	Technology	Discount Rate for Cost	Discount Rate for Health	Discount Rate for Cost and Health the Same?
A Proposal for Italian Guidelines in Pharmacoeconomics (12)	1995	Italy	Garattini, et al.	Pharmaceuticals	5%	5%	Yes
Guidelines for Economic Evaluation of Pharmaceuticals: Canada 2nd edition (4)	1997	Canada	Canadian Coordinating Office for Health Technology Assessment	Pharmaceuticals	0 and 5% and 3%	0 and 5% and 3%	Yes
A Proposal for Methodological Guidelines for Economic Evaluation of Pharmaceuticals(2)	1995	Belgium	Belgian Society for Pharmaco-epidemiology	Pharmaceuticals	0%, 5% and >5%	0% and >5%	Yes
EU-Project: Harmonisation of Methodology. Principles of Good Evaluation Practice in Clinical Economic Studies. Draft(3)	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

Title	Year	Country	Agency / authors	Technology	Discount Rate for Cost	Discount Rate for Health	Discount Rate for Cost and Health the Same?
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 Submission to the BMJ(10)	1996	UK	The British Medical Journal	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	USA	Sloan	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	USA	US Public Health Service (Gold, et al)	Medical technologies and policy	3%,5% and 0 and 7%	3%,5% and 0 and 7%	Yes

Title	Year	Country	Agency / authors	Technology	Discount Rate for Cost	Discount Rate for Health	Discount Rate for Cost and Health the Same?
Assessing the Effectiveness of Disease and Injury Programs: Costs and Consequences(16)	1995	USA	Center 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
Description of Included Studies

Year of Publication	N	(%)
Pre 1993	52	(35)
1994	18	(12)
1995	33	(22)
1996	19	(13)
1997	22	(15)
1998	3	(2)
Health Outcome Measures		
CBA (monetary value)	14	(10)
Adjusted survival	90	(62)
Survival	23	(16)
Direct health measure	20	(13)
Time Horizon		
1.5 – 5 years	42	(29)
6 - 10 years	21	(14)
11 - 30 years	39	(27)
>30 years	45	(30)

Table 3
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)

Table 4
Comparison of Discount Rates Used

	N	%
Same Rate		
Both zero	40	(28)
Both non-zero	95	(64)
Different Rates		
Cost zero, health non-zero	3	(2)
Cost non-zero, health zero	9	(6)

Table 5
Logistic Regression of Discounting for Health Effects

Variable	Parameter Estimate	Std Error	Pr
Country (referent = US)			
UK	-0.52	1.33	0.70
Canada	-0.31	1.94	0.87
Other	0.92	1.04	0.38
Year of Publication	-0.08	0.12	0.48
Time Horizon	0.03	0.02	0.22
Impact factor	0.07	0.07	0.30
Health Measure (referent = adjusted survival)			
Direct	-3.87	1.34	0.01
Survival	-0.51	1.17	0.66
CBA	-0.08	1.44	0.99
Discount Rate Cost	134.79	26.8	0.01
CONSTANT	164.43	236.02	--

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APPENDIX A

Listing of Included Studies Characteristics

Accession Number in NHS EED	Journal	Pub Date	Country	Disease	Inferred time horizon (assume avg lifespan=80)	Health Measure	Rate Health	Rate Cost	High Rate Health	Low Rate Health	High Rate Cost	Low Rate Cost	Impact factor
950450	Journal of Invasive Cardiology	1995	USA	Coronary stenting	19	QALY	5	5					0.503
960490	Academic Radiology	1996	USA	MRI for prostate Ca	12	QALY	0	0					0.505
970312	Public Health	1997	Spain	Hypercholester olemia treatment	8	cases prevented	5	5					0.582
950300	Swedish Dental Journal	1994	Sweden	Caries	4	caries prevented	0	0					0.604
955178	Transplantation Proceedings	1990	Holland	Liver Transplantation	5	QALY	5	5					0.698
950217	South African Medical Journal	1995	South Africa	H Flu	100	CBA	2	2			3	1.5	0.726
955231	Health Policy	1987	UK	Kidney stones and lithotripsy	30	QALY	5	5	10	2	10	2	0.728
955243	Health Policy	1988	.	Renal transplantation immunosuppersion	3	QALY	0	0					0.728

Accession Number in NHS EED	Journal	Pub Date	Country	Disease	Inferred time horizon (assume avg lifespan=80)	Health Measure	Rate Health	Rate Cost	High Rate Health	Low Rate Health	High Rate Cost	Low Rate Cost	Impact factor
955180	Health Policy	1991	UK	Chiropody for foot care	20	QALY	0	0					0.728
968201	Health Policy	1996	New Zealand	Breast cancer screening	30	Life years gained	5	5	10	0	10	0	0.728
960687	Scandinavian Journal of Rheumatology	1996	USA	drug therapy for hip fracture	10	hip fracture prevented	0	0					0.855
957046	Journal of Public Health Medicine	1993	UK	AAA	2	Life years gained	5	5					0.866
955203	International Journal of Technology Assessment in Health Care	1989	USA	Preoperative TPN	10	QALY	0	0					0.902
955028	International Journal of Technology Assessment in Health Care	1995	Australia	Colorectal ca screening	2	Life years gained	0	0					0.902
955029	International Journal of Technology Assessment in Health Care	1995	Sweden	Dementia care location	8	QALY	4	4					0.902

Accession Number in NHS EED	Journal	Pub Date	Country	Disease	Inferred time horizon (assume avg lifespan=80)	Health Measure	Rate Health	Rate Cost	High Rate Health	Low Rate Health	High Rate Cost	Low Rate Cost	Impact factor
968125	International Journal of Technology Assessment in Health Care	1996	Spain	Breast cancer screening	30	Life years gained	0	0					0.902
988036	International Journal of Technology Assessment in Health Care	1997	Finland	Hip replacement	2	Functional ability	0	0					0.902
988179	International Journal of Technology Assessment in Health Care	1998	UK	Breast cancer screening	11	Life years gained	6	6					0.902
988193	International Journal of Technology Assessment in Health Care	1998	UK	Interferon for MS	5	QALY	6	6					0.902
950144	American Journal Otology	1995	USA	Cochlear implant	35	QALY	0	5					0.956
980604	Clinical and Investigative Medicine	1988	Canada	GM CSF in non-Hodgkins lymphoma	51	Life years gained	0	0					0.963
950810	Public Health Reports	1995	USA	Bicycle helmet use	4	Head injuries avoided	5	5					0.978

Accession Number in NHS EED	Journal	Pub Date	Country	Disease	Inferred time horizon (assume avg lifespan=80)	Health Measure	Rate Health	Rate Cost	High Rate Health	Low Rate Health	High Rate Cost	Low Rate Cost	Impact factor
955255	Clinics inPernatology	1984	.	Antepartum Rh immunization	14	QALY	5	5					0.979
955240	American Journal of Preventive Medicine	1988	USA	TB prevention	60	QALY	5	5		0		0	0.995
980518	Respiratory Medicine	1988	UK	Asthma	2	Peak flow	0	0					1.032
957084	Clincal Therapeutics	1994	USA	Contraceptive methods	5	CBA	0	0					1.045
957032	Scandanavian Journal of Infectious Diseases	1994	Sweden	H Flu	10	CBA	0	0					1.173
950595	Archives of Pediatrics and Adolescent Medicine	1995	USA	Risky behavior	5	CBA	0	0					1.338
970299	Maturitatas	1997	UK	HRT replacement for osteoporosis	10	cases prevented	0	6					1.409
957064	Medical Journal of Australia	1994	Australia	Flu vaccine	1.5	QALY	5	5					1.43
961695	Epidemiology and infection	1996	Scotland	Hepatitis B antigen v screening	35	Life years gained	0	0					1.48

Accession Number in NHS EED	Journal	Pub Date	Country	Disease	Inferred time horizon (assume avg lifespan=80)	Health Measure	Rate Health	Rate Cost	High Rate Health	Low Rate Health	High Rate Cost	Low Rate Cost	Impact factor
955014	Journal of Epidemiology and Community Health	1995	UK	Breast cancer screening	3	Life years gained	5	5					1.531
950751	Journal of Epidemiology and Community Health	1995	UK	Hepatitis B vaccination	75	QALY	6	6		0		0	1.531
957011	Pharmacoeconomics	1994	USA	Depression pharmacotherapy	45	QALY	5	5					1.538
978011	Pharmacoeconomics	1996	UK	Chemotherapy in Breast Cancer	5	QALY	0	0					1.538
978267	Pharmacoeconomics	1997	UK	HIV treatement	20	Life years gained	6	6		0		0	1.538
978293	Pharmacoeconomics	1997	Spain	Hep A immunisation	10	cases prevented	6	6		0		0	1.538
971361	annals of emergency medicine	1997	USA	Helicopter EMS for trauma	49	Life years gained	3	3					1.574
955204	Canadian Medical Association Journal	1989	Canada	Nonionic Contrast media	30	QALY	0	0					1.589

Accession Number in NHS EED	Journal	Pub Date	Country	Disease	Inferred time horizon (assume avg lifespan=80)	Health Measure	Rate Health	Rate Cost	High Rate Health	Low Rate Health	High Rate Cost	Low Rate Cost	Impact factor
978230	Canadian Medical Association Journal	1997	Canada	Needle exchange program	5	CBA	5	5	10	1			1.589
957061	Diabetic Medicine	1994	France	Diabetes	5	QALY	0	0					1.601
957039	Scandinavian Journal of Gastro-enterology	1994	Sweden	Duodenal ulcer	5	relapse rate	0	5					1.641
955232	Archives of Disease in Childhood	1988	UK	Neonatal intensive care	80	QALY	5	5		0		0	1.701
950577	American Journal of Neuroradiology	1995	USA	Diagnostic screening for penetrating neck trauma with clinical exam	45	Strokes prevented	0	0					1.707
957015	Medical Decision Making	1994	Sweden	Hypertension control in diabetes	40	Life years gained	5	5					1.78
957095	Medical Decision Making	1994	Canada	Cardiac Angiography	25	QALY	5	5					1.78
955109	Medical Decision Making	1995	Ireland	tPA v SK for MI	5	QALY	0	0					1.78

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955009	Medical Decision Making	1995	USA	Childhood Lead poisoning chelation therapy	18	QALY	5	5					1.78
978348	Medical Decision Making	1997	USA	Kidney transplant	12	QALY	5	5	10	0	10	0	1.78
955534	European Respiratory Journal	1993	Germany	Asthma	3	CBA	5	5					1.923
960522	Journal of the American College of Surgeons	1996	USA	Cancer of the colon detection	5		0	0					2.025
950542	Urology	1995	USA	Prostate Cancer	10	Life years gained	5	5					2.173
959542	Urology	1995	USA	Flutamide in prostate cancer	10	QALY	5	5					2.173
950972	American Journal of Surgery	1995	USA	Abdominal aortic aneurysm repair	26	Life years gained	0	0					2.174
960882	American Journal of Surgery	1996	USA	Ultrasound of Carotic Artery for Stoke	11	Strokes prevented	0	0					2.174

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955242	Medical Care	1985	USA	Elective hysterectomy	50	QALY	5	5					2.186
951344	Chest	1995	USA	Antithrombotic therapy in heart disease	45	QALY	5	5					2.341
960869	American Journal of Cardiology	1996	USA	CAD	10	Life years gained	5	5					2.402
971497	Jounal of Acquired Deficiency Syndromes and Human Retrovirology	1997	USA	CMV treatment	1.5	QALY	0	3			5	0	2.573
971498	Journal of Acquired Immune Deficiency Syndromes and Human Retrovirology	1997	USA	AIDS	21	QALY	3	3	5	0	5	3	2.573
971488	International Journal of Radiation oncology, biology and physics	1997	USA	Radiation therapy for prostate cancer	4	Survival	0	0					2.636

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980498	Journal of Vascular Surgery	1998	USA	Screening for carotid stenosis	20	QALY	5	5					2.763
960870	Gastrointestinal Endoscopy	1996	Canada	Pacreatitis	22	QALW	5	5					2.77
957031	Journal of Pediatrics	1994	USA	Varicella Zoster vaccinaton	24	CBA	5	5					2.836
955001	Cancer	1993	USA	Breast cancer biopsy	10	CBA	5	5					3.296
950069	Cancer	1994	USA	Screening for prostate cancer	5	cases detected	0	0					3.296
955069	Cancer	1994	USA	PSA testing	5	Cancer detection rate	0	0					3.296
950528	Cancer	1995	USA	Prostate Cancer	5	CBA	0	0					3.296
970290	transfusion	1997	USA	HIV detection in blood supply	10	QALY	5	5					3.379
988225	American Journal of Public Health	1988	USA	Behavior change in HIV risk taking	12	QALY	3	3	5	0	5	0	3.453
955278	American Journal of Public Health	1988	USA	Jogging - health promotion	45	QALY	3	3					3.453

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955257	American Journal of Public Health	1989	USA	Antibiotic prophylaxis in dentistry	17	QALY	0	0					3.453
955086	American Journal of Public Health	1995	USA	Meningococcal disease	18	CBA	4	4					3.453
950541	American Journal of Public Health	1995	USA	Contraceptive methods	5	CBA	5	5					3.453
978064	American Journal of Public Health	1996	USA	Hiv prevention	20	cases prevented	0	0					3.453
970437	Journal of clinical Psychiatry	1997	USA	Depression pharmacotherapy	15	QALY	5	5			10	0	4.003
960735	Kidney International	1996	Canada	Renal transplantation	2	QALY	0	0					4.071
950453	Osteoporosis International	1995	Sweden	Fracture prevention in osteoporosis	18	QALY	5	5					4.232
970276	American Journal of Medicine	1997	USA	Erosive reflux esophagitis	5	QALY	3	3					4.237
957028	Stroke	1994	USA	Antiplatelet therapy to reduce stroke	10	QALY	5	5					4.323

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961032	Stroke	1996	USA	Screening for carotid atherosclerotic disease	20	QALY	3	3					4.323
957070	Archives of Internal Medicine	1993	USA	AIDS	15	CBA	6	6					4.781
955505	Archives of Internal Medicine	1994	USA	Hemochromatosis screening	50	Life years gained	3	3			10	0	4.781
957002	Archives of Internal Medicine	1994	USA	CHF	10	Life years gained	5	5					4.781
950618	Archives of Internal Medicine	1995	USA	H2 antagonists in duodenal ulcer	15	Symptom free time	0	3					4.781
968061	Archives of Internal Medicine	1996	USA	HIV screening	50	QALY	5	5					4.781
978188	Archives of Internal Medicine	1997	USA	Tuberculosis skin testing and INH	56	Life years gained	0	5					4.781
955270	British Medical Journal	1985	UK	CABG	25	QALY	5	5					4.994
988227	British Medical Journal	1988	UK	Hypertension control in diabetes	25	Life years gained	3	3	6	0			4.994

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955234	British Medical Journal	1990	UK	Neurosurgical Care	8	QALY	0	0					4.994
955258	British Medical Journal	1990	.	RDS	80	QALY	5	0		0		0	4.994
955290	British Medical Journal	1991	Norway	Serum Cholesterol lowering	11	QALY	7	7					4.994
968006	British Medical Journal	1995	Canada	Screening for renal failure in diabetics	60	QALY	5	5		0		0	4.994
950626	British Medical Journal	1995	UK	Screening for CHD	45	Life years gained	6	6					4.994
950407	Arthritis and Rheumatism	1995	USA	Liver biopsy in MTX treatment	30	QALY	0	5					6.167
957129	Journal of Clinical Oncology	1993	USA	Chemotherapy in Breast Cancer	35	QALY	5	5		0		0	7.878
955248	Journal of the American Medical Association	1986	USA	Drug treatment of TB	20	QALY	5	5					9.258
955208	Journal of the American Medical Association	1992	USA	breast cancer high dose chemo	15	QALY	5	5					9.258

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957053	Journal of the American Medical Association	1993	USA	Caesarean delivery with genital herpes	30	QALY	4	4					9.258
955297	Journal of the American Medical Association	1994	Canada	Prostate Cancer	20	QALY	5	5					9.258
955301	Journal of the American Medical Association	1994	USA	Solvent detergent treatment of frozen plasma	11	QALY	5	5					9.258
957017	Journal of the American Medical Association	1994	USA	Varicella Zoster vaccinaton	30	Life years gained	5	5					9.258
957097	Journal of the American Medical Association	1995	USA	Diabetic foot infection	14	QALY	5	5					9.258
968079	Journal of the American Medical Association	1996	USA	Hip replacement	20	QALY	3	3					9.258
955265	Circulation	1982	USA	CABG	25	QALY	5	5		0		0	9.762
960868	Circulation	1996	USA	Routine coronary angiography	45	QALY	3	3					9.762

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970155	Circulation	1997	USA	Hypercholesterolemia educations	45	QALY	5	5	5	0	5	0	9.762
955266	Archives of General Psychiatry	1980	USA	Mental Hospital treatment	3	CBA	0	0					10.751
960992	Archives of General Psychiatry	1996	USA	Clozapine	1.5	QALY	0	0					10.751
955247	Annals of Internal Medicine	1986	USA	Vaccination for Pneumonia	15	QALY	5	5					12.047
988061	Annals of Internal Medicine	1988	USA	Chlamydia	10	Case prevented	0	3					12.047
955256	Annals of Internal Medicine	1990	USA	Osteoporosis screening	45	QALY	5	5					12.047
957068	Annals of Internal Medicine	1993	USA	Abdominal aortic aneurysm repair	60	Life years gained	5	5					12.047
950602	Annals of Internal Medicine	1995	USA	HIV screening of surgeons	21	QALY	5	5					12.047
950603	Annals of Internal Medicine	1995	USA	Interferon for HepB	45	QALY	5	5		0		0	12.047

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968127	Annals of Internal Medicine	1996	USA	Diabetic retinopathy screening	30	QALY	5	5					12.047
978231	Annals of Internal Medicine	1997	USA	Dialysis	19	QALY	3	3	10	0	10	0	12.047
978318	Annals of Internal Medicine	1997	USA	Breast cancer screening	5	QALY	3	3					12.047
978381	Annals of Internal Medicine	1997	USA	Mammography screening	15	QALY	3	3					12.047
978077	Lancet	1997	USA	Needle exchange program	8	CBA	Unk	Unk					16.135
955264	New England Journal of Medicine	1980	USA	HRT	30	QALY	5	5					27.766
955209	New England Journal of Medicine	1991	USA	Chemotherapy in Breast Cancer	31	QALY	5	5					27.766
955122	New England Journal of Medicine	1995	switzerland	NH admission prevention by in-home assessment	3	Disability free life year	0	0					27.766
950677	New England Journal of Medicine	1995	USA	tPA v SK for MI	15	QALY	5	5					27.766

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978018	New England Journal of Medicine	1997	USA	Revascularization for CHD	5		3	3					27.766
955179	New Journal of Medicine	1983	Canada	Neonatal intensive care	5	QALY	5	5					27.766
955033	New Journal of Medicine	1995	USA	Preoperative autologous blood donation	5	QALY	5	5	5	0	5	0	27.766
955181	Book Chapter: Hospital Research and Education Trust	1973	USA	Phenylketonuria testing	80	QALY	4	4					
968080	Centre for Health Program Evaluation	1995	Australia	Cochlear implant	10	QALY	5	5	10		10		
955129	CHE DP	1991	UK	Arterial reconstruction in ischemic leg	3	QALY	0	0					
955249	DoH SMAC	1990	UK	Testing for blood cholesterol level	40	QALY	5	5					
968045	Health Bulletin	1992	UK	Thrombolytic	30	QALY	5	0					

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955284	Health Promotion	1988	USA	Diet and exercise in diabetes	1.5	QALY	0	0					
968153	Health Promotion	1996	Finland	Health promotion	3	Health behavior	0	0					
968046	Health Trends	1991	UK	MI	30	QALY	5	0					
986241	Japanese Journal of Cancer and Chemotherapy	1988	Japan	Cervical cancer	4	Survival	0	0					
978487	Journal Canadien d'Ophthalmologie	1997	Canada	Glaucoma treatment	10	QALY	5	5					
955294	Journal of Chronic Diseases	1982	USA	Serum AlkPhos testing	30	QALY	Unk	Unk					
980523	Journal of Haematology	1988	The Netherlands	GM CSF in AML	2	QALY	Unk	Unk					
955252	Journal of Lithotripsy and Stone Disease	1991	USA	Lithotripsy for kidney stones	5	QALY	5	5					
976380	Journal of Mathematics Applied in Medicine & Biology	1995	UK	Colorectal ca screening	50	QALY	0	Unk					

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955262	Journal of Radiology Protection	1988	.	Diagnostic radiology	30	QALY	0	0					
955224	Office of Technology Assessment	1979	USA	Vaccination for Pneumonia	78	QALY	5	5					
955188	Report of Scottish Home Office	1991	UK	Breast cancer screening	7	QALY	5	5					
955032	Social Science and Medicine	1995	UK	Learning disability	10	succesful resettlement	0	5					1.2
955271	Strategy for Screening for risk of CHD	1987	UK	CHD risk	40	QALY	5	5					
955254	Studiecentrum voor Economisch en Sociaal Onderzoek	1991	Belgium	Alcoholic weaning	3	QALY	0	0					