THE NEW ZEALAND MEDICAL JOURNAL
Vol 118 No 1214 ISSN 1175 8716

Valuing prevention: discounting health benefits and costs in New Zealand

Richard Milne

It is generally agreed that *prevention is better than cure*: the fence at the top of the cliff is preferable to the ambulance at the bottom. Public health programmes such as the National Cervical Screening Programme, BreastScreen Aotearoa, tobacco control, neonatal screening, prophylaxis against recurrent rheumatic fever, and the Immunisation Schedule were developed on this premise. The same principles apply to smoking cessation, antihypertensive and lipid-lowering therapies, and tamoxifen.

But is *prevention* a good use of healthcare resources? How can benefits that are realised immediately (such as resolution of an acute infection) be compared with benefits that occur in the future (such as avoidance of the disability ensuing from breast or lung cancer, meningitis or stroke)?

Internationally, it is well recognised that *future* costs and benefits of healthcare expenditure must be adjusted downwards to take into account both the 'social opportunity cost' of investment (i.e. alternative uses for expenditure) and the 'social rate of time preference' (individuals prefer to defer costs but to enjoy benefits sooner rather than later). With this adjustment ('discounting to present value'), a healthcare funder can compare programmes that deliver future benefits with those that deliver immediate benefits.[1–4]

Discounting reduces future annual costs and/or benefits by multiplying them by $1/(1+d)^n$ where d is the annual 'social discount rate' and n is the year in the future. There is consensus that future costs should be discounted and that future health outcomes or benefits should also be discounted, usually at the same rate.[1–8] Discounting is independent of inflation and the 'real discount rate' excludes inflation.[3]

Discounting allows Government departments, funding agencies, and formulary managers to compare and rank programmes with future costs and/or benefits against those with present costs and/or benefits. Treasury's discount rate for *costs* can be proxied by the real (i.e. inflation adjusted) interest rate on a *risk-free* long term investment[5]—this is consistent with international thinking about discounting.[2]

In 2002, the discount rate was estimated at 5.6% per annum, based on the nominal rate of return of 7.2% on a forecast 10-year Government bond rate adjusted for inflation.[5] In practice, Treasury utilises an historic discount rate of 10% per annum in policy development[9] and has not been able to provide information on why 10% was originally selected. Importantly, the discount rate (used by Treasury to guide policy development) was not developed for comparison of health benefits or outcomes, nor was it mandated for use by the health sector.[9]

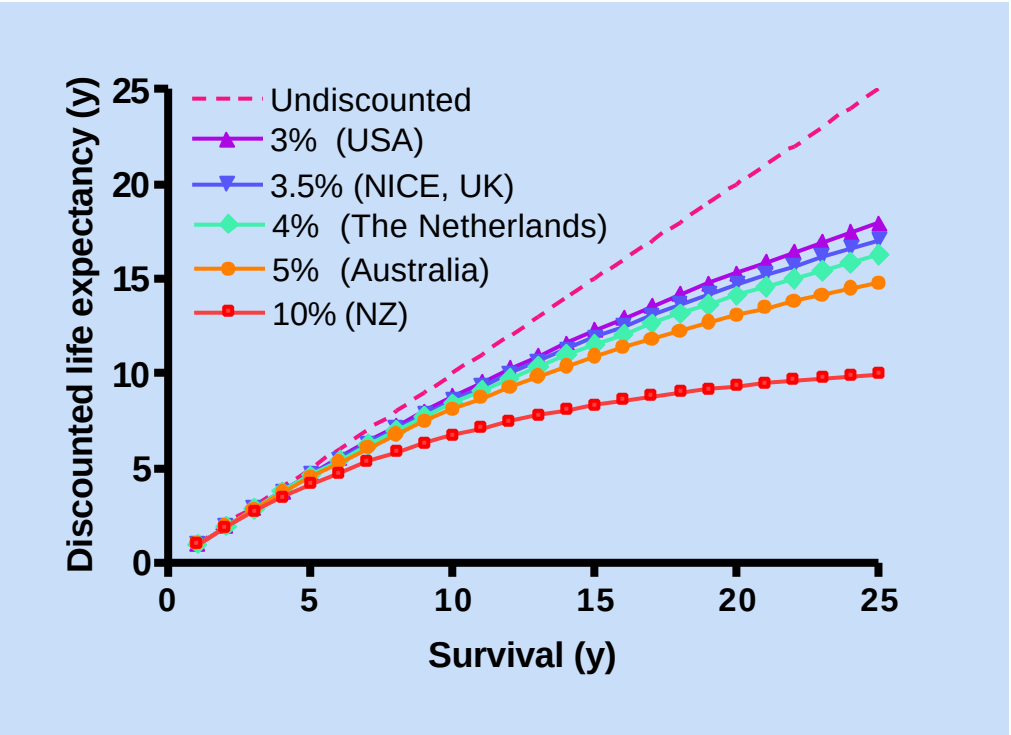
When a country develops a discount policy for use in the health sector, it must carefully consider the impact on future health benefits and costs. Recent 'burden of disease' analyses by the Ministry of Health[10] discount future health benefits at 3% per annum, consistent with US[8] and WHO[11] recommendations. In contrast, PHARMAC

mandates a 10% discount rate for both costs and health benefits in the cost utility analysis that it 'prescribes' to assist in ranking new therapies and new indications for funding. This rate was based on the *risk-inclusive* long term cost of capital to the Health Funding Authority in July 1999.[6]

Discounting can have a profound impact on the present value of future health benefits. For example, a benefit that is achieved 10 years from now is reduced by 29% (i.e. 1-$[1/1.035]^{10}$) if the discount rate is 3.5% per annum (as in the UK) but by 61% (1-$[1/1.1]^{10}$) if the rate is 10%. The same applies to future cost savings to the healthcare system. For example, a $5000 hospitalisation that is averted 10 years in the future by lipid lowering therapy would be valued by PHARMAC at about $2000, thereby implicitly devaluing the intervention providing that economic benefit.

Cumulative health benefits are reduced even more; for example, preventing the death of one infant by vaccination would achieve a gain of nearly 80 life-years, which amounts to 28 life-years discounted at 3.5% (as in the UK) but only 11 life years discounted at 10% (as in New Zealand). Discounting at 10% per annum virtually extinguishes incremental survival benefits beyond 20 years (Figure 1).

Figure 1. The present value of survival for up to 25 years, at various discount rates



Since the cost-effectiveness ratios that are used to compare health programmes are inversely proportional to incremental health benefits, discounting these benefits at 10% per annum can profoundly increase cost-effectiveness ratios of preventive healthcare programmes, particularly those targeted to children. This will drastically reduce the apparent value of such programmes or therapies relative to programmes

with short-term health benefits. The issue is compounded if the preventive programme reduces future healthcare expenditure (e.g. by averting hospital admissions), because this is also devalued by discounting.

High discount rates are particularly debilitating for preventive healthcare and public health programmes that target fatal illnesses in young people. For example, the life-years gained by immunisation against paediatric meningococcal disease cumulate for many years after the period of vaccination. Furthermore, many of the costs of the disability experienced by some survivors of meningococcal disease are incurred well into the future. The cost to the Ministry of Education for a child who is profoundly deaf can be as much as $25,000 per year for up to 15 years; and the cost of residential care for an adult with severe intellectual and/or physical impairment can be as high as $50,000 per year. If these costs in the distant future are heavily discounted, their significance for policy development is diminished enormously.

Table 1 shows the results of an economic analysis of the current paediatric meningococcal vaccination programme.[12] Because 'future life-years gained' and 'future costs averted' are both discounted, the cost per quality adjusted life year (QALY) or life year gained from a Government perspective is over 10-fold higher at 10% compared to 5% discount rate, when all relevant costs are included. From a societal perspective, immunisation even provides 'net present value' savings (negative costs) at the 3% discount rate that is recommended for use in the US.[4]

Table 1. Incremental cost-effectiveness ratios for meningococcal vaccination of individuals under 20 years of age, from a societal or Government perspective[12]

Discount rate	Cost per QALY (x1000)		Cost per life year gained (x1000)	
	Societal	Government	Societal	Government
0%	-$36	-$19	-$48	-$25
3%	-$14	$27	-$19	$36
5%	$6	$68	$8	$91
10%	$64	$191	$90	$266

Although each country must decide on its own social rate of discount, international usage can guide New Zealand. All but 2 of the 21 countries that have formal guidelines for pharmacoeconomic analysis (including our major trading partners) have discount rates between 3% and 5%. The exceptions are Spain (6%) and New Zealand (10%). International discount rates bear no relationship to population or per capita GDP. Compared to the rest of the world, New Zealand is discriminating against prevention in general and against public health programmes in particular. Reducing the discount rate would change priority rankings for healthcare programmes in favour of prevention, at no additional cost to the healthcare budget.

The New Zealand Health Strategy, the Primary Healthcare Strategy, the Child Health Strategy, the National Drug Policy, the New Zealand Strategic & Action Plan for Public Health, the National Mental Health Strategy, and the Maori Health Strategy are directed towards improving population health (including prevention of disease and injury as fundamental principles). A high discount rate runs counter to all these initiatives, however.

Now that economic analysis is increasingly required as an input to healthcare funding decisions (both internationally and locally), it is time to reconsider discounting. Since the budget for public health in New Zealand is dwarfed by that for personal health, and could be further compromised by continued use of a high discount rate, those who work in the public health sector should take the lead, along with a national panel of stakeholders including Treasury, the Ministry of Health, District Health Boards, and PHARMAC.

Author information: Richard J Milne, Associate Professor, Section of Epidemiology and Biostatistics, School of Population Health, University of Auckland, Auckland

Acknowledgements The author is grateful to Alistair Woodward, Toni Ashton, and Martin Tobias for commenting on an early draft. (The author takes sole responsibility for the content.)

Correspondence: Dr Richard Milne, Section of Epidemiology and Biostatistics, School of Population Health, University of Auckland, Private Bag 92019, Auckland. Fax: (09) 373 7494; email: rj.milne@auckland.ac.nz

References:

1. Severens JL, Milne RJ. Discounting health outcomes in economic evaluation; the ongoing debate. Value in Health. 2004;7:397–401.
2. Lipscomb J, Weinstein M, Torrance G. Time preference. In: Cost effectiveness in health and medicine. New York, Oxford: Oxford University Press; 1996, p214–35.
3. Drummond M, O'Brien B, Stoddart G, Torrance G. Methods for the economic evaluation of health care programmes. 2nd ed: Oxford Medical Publications; 1997.
4. Weinstein MC, Siegel JE, Gold MR, et al. Recommendations of the panel on cost-effectiveness in health and medicine. JAMA. 1996;276:1253–8.
5. Young L. Determining the discount rate for Government projects: NZ Government; NZ Treasury Working Paper 02/21; 2002. Available online. URL: http://www.treasury.govt.nz/workingpapers/2002/twp02-21.pdf Accessed April 2005.
6. PHARMAC. Prescription for Pharmaco-economic Analysis. 1999.
7. Cairns J. Discounting in economic evaluation. In: McGuire A, editor. Economic evaluation in health care. Oxford: OHE; 2001, p236–55.
8. Gold M, Siegel J, Russell L, Weinstein M. Cost effectiveness in health and medicine. New York, Oxford: Oxford University Press; 1996.
9. Treasury N. Office Minute 1999 Part IV: cf section 51 and note 3. 1999.
10. Anon. Nutrition and the burden of disease: New Zealand 1997-2011. Wellington: Ministry of Health; 2003. Report No.: Public Health Intelligence Occasional Bulletin Number 17; ISBN 0-478-25677-9.
11. Murray C, Lopez A. The global burden of disease: World Health Organization; 2004.
12. Milne RJ, Evers J, Ashton T, Lennon D. An economic evaluation of vaccination against meningococcal disease.(Report to the Ministry of Health.) Auckland: University of Auckland; 2001.